सत्यमेव जयते

THE

INDIAN ASTRONOMICAL EPHEMERIS

FOR THE YEAR

2022

POSITIONAL ASTRONOMY CENTRE
INDIA METEOROLOGICAL DEPARTMENT
MINISTRY OF EARTH SCIENCES

THE

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INDIA METEOROLOGICAL DEPARTMENT

Issued under the authority of

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PREFACE

The Indian Astronomical Ephemeris is published annually by the India Meteorological Department (IMD) for providing data to astronomers. The speciality of this publication is that it contains calendric information which caters to the requirement of the country's panchang makers and other users. Thus, it has great civil and cultural significance. This has been the mandate given to the Positional Astronomy Centre at Kolkata by the Govt. of India.

The calculations of the Indian Calendar portion, such as tithi, nakshatra, etc. are given in Indian Standard Time (IST) and covers an extended period upto 21st March, 2023 which is the end of the year 1944 Saka Era of the Indian National Calendar. A separate note has also been given to explain the terminology and the basis of different calculations relating to the Indian Calendar.

The epoch of the standard reference system in this publication is J 2000.0 and the argument of the ephemerides is Terrestrial Time (TT). The resolutions of the Indian Astronomical Union (IAU) recommending the changes from time to time including a list of new IAU constants are given in Part VI – Indian Calendar and Explanation.

Our sincere thanks are due to the Nautical Almanac Office, United States Naval Observatory and Her Majesty's Nautical Almanac office, U.K.

The work of preparation and publication of the Indian Astronomical Ephemeris for 2022 has been done under the supervision of Shri S. Sen, Head, Positional Astronomy Centre, India Meteorological Department, Kolkata.

Dr. M. Mohapatra
Director General of Meteorology

Mausam Bhawan
New Delhi – 110 003
14th Sept. 2021 A.D.
(Bhadra 23, 1943 Saka Era)

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CONTENTS

PART - I

TIME, SUN, MOON, PLANETS

Julian date for Standard epoch

1900 January 0, 12^h U.T.				=	JD	241	5020.0
B	1950.0	=	1950 Jan. 0.923	=	JD	243	3282.423
B	2022.0	=	2022 Jan. 0.362	=	JD	245	9579.862
J	2022.5	=	2022 July 2.625	=	JD	245	9763.125
J	2000.0	=	2000 Jan. 1.5	=	JD	245	1545.0

Tabulations of Julian date against calendar date for 2022 are given on pages 4 to12 and for other years are given at Table IX of Part-V on page 361.

The fraction of the year from 2022.5 is tabulated with the Besselian day numbers on pages 244-251.

The lengths of the principal years and mean months at 2022.0 as derived from the Sun's mean motion and mean Orbital elements respectively are:

Length of the year (ephemeris days) :

	d		d	h	m	s
Tropical (equinox to equinox)	365.242190	=	365	05	48	45.2
Sidereal (fixed star to fixed star)	365.256363	=	365	06	09	09.8
Anomalistic (perigee to perigee)	365.259635	=	365	06	13	52.5
Eclipse (node to node)	346.620074	=	346	14	52	54.4

Length of the Month (ephemeris days)

	d		d	h	m	s
Synodic (new moon to new moon)	29.5305888	=	29	12	44	02.9
Tropical (equinox to equinox)	27.3215822	=	27	07	43	04.7
Sidereal (fixed star to fixed star)	27.3216615	=	27	07	43	11.6
Anomalistic (perigee to perigee)	27.5545501	=	27	13	18	33.1
Nodical (node to node)	27.2122207	=	27	05	05	35.9

		h	m	s
Length of the day:	Mean Sidereal	23	56	04.09053 of mean Solar time.
	Mean Solar	24	03	56.55537 of mean Sidereal time.

CHRONOLOGICAL TABLE

CHRONOLOGICAL CYCLES

Golden Number or Lunar Cycle	IX	Solar Cycle	15
Epact	27	Roman Indiction	15
Dominical Letter	B		

CHRONOLOGICAL ERAS

The year 1944 of the Saka Era (Indian National Calendar) begins on March 22, 2022.
The year 1944 of the Saka Era or Saka Shalivahana (Lunisolar, Traditional Calendar) begins on April 2, 2022.
The year 1944 of the Saka Era (Solar, Traditional Calendar) begins on April 14, 2022.
The year 5123 of the Kali Era begins on April 14, 2022.
The year 2079 of the Vikram Samvat begins on April 2, 2022 (Chaitradi) and October 26, 2022 (Kartikadi) according to different systems of reckoning.
The year 1429 of the Bengali San begins on April 15, 2022.
The year 1198 of the Kollam Era begins on August 17, 2022.
Jovian year (Barhaspatya Varsa or 60-year cycle of Jupiter) 50 Anala (Nala) begins on May 23, 2022 (North Indian Usage), and 36 Subhakrt on April 2, 2022 (Lunar Chaitradi) or April 14, 2022 (Solar) (South Indian Usage).
Vedanga Jyotisa year 3- Idavatsara of the 5-year cycle (389 th cycle of Paitamaha Siddhanta) begins on February 13, 2022.
The year 2566 of the Buddha Nirvana Era begins on May 16, 2022.
The year 2549 of the Mahavira Nirvana Era begins on October 26, 2022.
The year 1444 of the Mohammedan Era begins on July 31, 2022.
The year 1392 of the Yazdejardi Era begins on August 16, 2022 according to the Parsi (Shahenshahi) Calendar.
The year 6735 of the Julian period begins on January 21, 2022.
The year 5783 of the Jewish Era (A.M.) begins on September 27, 2022.
The year 2798 of the Greek Olympiad, being the 2nd year of the 4-Year cycle (700 th Olympiad) begins on July, 2022.
The year 2775 of the Foundation of Rome (A.U.C.) begins on January 14, 2022.
The year 2771 of the Nabonassar begins on April 18, 2022.
The year 2334 of the Seleucidean era begins in the present-day usage of the Syrians on September 14 or October 14, 2022 according to different sects.
The Gregorian Year 2022 begins on January 1, 2022.

CALENDAR, 2022

Day of Month	Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar: Day of Month	Indian Calendar: Day of Year	Phases of the Moon
					2459	1943 Saka Era		
Dec. 27	361	Mon	-187.625	-0.0137	575.5	Pausha 6	281	27-Last Quarter
28	362	Tue	186.625	-0.0110	576.5	7	282	$2^h\ 24^m$ U.T.
29	363	Wed	185.625	-0.0082	577.5	8	283	
30	364	Thu	184.625	-0.0055	578.5	9	284	
Dec. 31	365	Fri	183.625	-0.0027	579.5	10	285	
Jan. 1	1	Sat	182.625	0.0000	580.5	11	286	
2	2	Sun	181.625	0.0027	581.5	12	287	2-New Moon $18^h\ 33^m$ U.T.
3	3	Mon	-180.625	0.0055	582.5	13	288	
4	4	Tue	179.625	0.0082	583.5	14	289	
5	5	Wed	178.625	0.0110	584.5	15	290	
6	6	Thu	177.625	0.0137	585.5	16	291	
7	7	Fri	176.625	0.0164	586.5	17	292	
8	8	Sat	175.625	0.0192	587.5	18	293	
9	9	Sun	174.625	0.0219	588.5	19	294	9-First Quarter $18^h\ 11^m$ U.T.
10	10	Mon	-173.625	0.0246	589.5	20	295	
11	11	Tue	172.625	0.0274	590.5	21	296	
12	12	Wed	171.625	0.0301	591.5	22	297	
13	13	Thu	170.625	0.0329	592.5	23	298	
14	14	Fri	169.625	0.0356	593.5	24	299	
15	15	Sat	168.625	0.0383	594.5	25	300	
16	16	Sun	167.625	0.0411	595.5	26	301	
17	17	Mon	-166.625	0.0438	596.5	27	302	17-Full Moon
18	18	Tue	165.625	0.0465	597.5	28	303	$23^h\ 48^m$ U.T.
19	19	Wed	164.625	0.0493	598.5	29	304	
20	20	Thu	163.625	0.0520	599.5	30	305	
21	21	Fri	162.625	0.0548	600.5	Magha 1	306	
22	22	Sat	161.625	0.0575	601.5	2	307	
23	23	Sun	160.625	0.0602	602.5	3	308	
24	24	Mon	-159.625	0.0630	603.5	4	309	
25	25	Tue	158.625	0.0657	604.5	5	310	25-Last Quarter
26	26	Wed	157.625	0.0684	605.5	6	311	$13^h\ 41^m$ U.T.
27	27	Thu	156.625	0.0712	606.5	7	312	
28	28	Fri	155.625	0.0739	607.5	8	313	
29	29	Sat	154.625	0.0767	608.5	9	314	
30	30	Sun	153.625	0.0794	609.5	10	315	
31	31	Mon	-152.625	0.0821	610.5	11	316	
Feb. 1	32	Tue	151.625	0.0849	611.5	12	317	1-New Moon
2	33	Wed	150.625	0.0876	612.5	13	318	$5^h\ 46^m$ U.T.
3	34	Thu	149.625	0.0904	613.5	14	319	
4	35	Fri	148.625	0.0931	614.5	15	320	
5	36	Sat	147.625	0.0958	615.5	16	321	
6	37	Sun	-146.625	0.0986	616.5	17	322	

CALENDAR, 2022

Day of Month	Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar		Phases of the Moon
						Day of Month	Day of Year	
					2459	1943 Saka Era		
Feb. 7	38	Mon	-145.625	0.1013	617.5	Magha 18	323	
8	39	Tue	144.625	0.1040	618.5	19	324	8-First Quarter
9	40	Wed	143.625	0.1068	619.5	20	325	13^h 50^m U.T.
10	41	Thu	142.625	0.1095	620.5	21	326	
11	42	Fri	141.625	0.1123	621.5	22	327	
12	43	Sat	140.625	0.1150	622.5	23	328	
13	44	Sun	139.625	0.1177	623.5	24	329	
14	45	Mon	-138.625	0.1205	624.5	25	330	
15	46	Tue	137.625	0.1232	625.5	26	331	
16	47	Wed	136.625	0.1259	626.5	27	332	16-Full Moon
17	48	Thu	135.625	0.1287	627.5	28	333	16^h 56^m U.T.
18	49	Fri	134.625	0.1314	628.5	29	334	
19	50	Sat	133.625	0.1342	629.5	30	335	
20	51	Sun	132.625	0.1369	630.5	Phalguna 1	336	
21	52	Mon	-131.625	0.1396	631.5	2	337	
22	53	Tue	130.625	0.1424	632.5	3	338	
23	54	Wed	129.625	0.1451	633.5	4	339	23-Last Quarter
24	55	Thu	128.625	0.1478	634.5	5	340	22^h 32^m U.T.
25	56	Fri	127.625	0.1506	635.5	6	341	
26	57	Sat	126.625	0.1533	636.5	7	342	
27	58	Sun	125.625	0.1561	637.5	8	343	
28	59	Mon	-124.625	0.1588	638.5	9	344	
Mar. 1	60	Tue	123.625	0.1615	639.5	10	345	
2	61	Wed	122.625	0.1643	640.5	11	346	2-New Moon
3	62	Thu	121.625	0.1670	641.5	12	347	17^h 35^m U.T.
4	63	Fri	120.625	0.1698	642.5	13	348	
5	64	Sat	119.625	0.1725	643.5	14	349	
6	65	Sun	118.625	0.1752	644.5	15	350	
7	66	Mon	-117.625	0.1780	645.5	16	351	
8	67	Tue	116.625	0.1807	646.5	17	352	
9	68	Wed	115.625	0.1834	647.5	18	353	
10	69	Thu	114.625	0.1862	648.5	19	354	10-First Quarter
11	70	Fri	113.625	0.1889	649.5	20	355	10^h 45^m U.T.
12	71	Sat	112.625	0.1917	650.5	21	356	
13	72	Sun	111.625	0.1944	651.5	22	357	
14	73	Mon	-110.625	0.1971	652.5	23	358	
15	74	Tue	109.625	0.1999	653.5	24	359	
16	75	Wed	108.625	0.2026	654.5	25	360	
17	76	Thu	107.625	0.2053	655.5	26	361	
18	77	Fri	106.625	0.2081	656.5	27	362	18-Full Moon
19	78	Sat	105.625	0.2108	657.5	28	363	7^h 18^m U.T.
20	79	Sun	-104.625	0.2136	658.5	29	364	

CALENDAR, 2022

Day of Month	Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar: Day of Month	Indian Calendar: Day of Year	Phases of the Moon
					2459	1943 Saka Era		
Mar. 21	80	Mon	-103.625	0.2163	659.5	Phulguna 30	365	
22	81	Tue	102.625	0.2190	660.5	1944 Chaitra 1	1	
23	82	Wed	101.625	0.2218	661.5	2	2	
24	83	Thu	100.625	0.2245	662.5	3	3	
25	84	Fri	99.625	0.2272	663.5	4	4	25-Last Quarter
26	85	Sat	98.625	0.2300	664.5	5	5	$5^h\ 37^m$ U.T.
27	86	Sun	97.625	0.2327	665.5	6	6	
28	87	Mon	-96.625	0.2355	666.5	7	7	
29	88	Tue	95.625	0.2382	667.5	8	8	
30	89	Wed	94.625	0.2409	668.5	9	9	
31	90	Thu	93.625	0.2437	669.5	10	10	
Apr. 1	91	Fri	92.625	0.2464	670.5	11	11	1-New Moon
2	92	Sat	91.625	0.2491	671.5	12	12	$6^h\ 24^m$ U.T.
3	93	Sun	90.625	0.2519	672.5	13	13	
4	94	Mon	-89.625	0.2546	673.5	14	14	
5	95	Tue	88.625	0.2574	674.5	15	15	
6	96	Wed	87.625	0.2601	675.5	16	16	
7	97	Thu	86.625	0.2628	676.5	17	17	
8	98	Fri	85.625	0.2656	677.5	18	18	
9	99	Sat	84.625	0.2683	678.5	19	19	9-First Quarter
10	100	Sun	83.625	0.2711	679.5	20	20	$6^h\ 48^m$ U.T.
11	101	Mon	-82.625	0.2738	680.5	21	21	
12	102	Tue	81.625	0.2765	681.5	22	22	
13	103	Wed	80.625	0.2793	682.5	23	23	
14	104	Thu	79.625	0.2820	683.5	24	24	
15	105	Fri	78.625	0.2847	684.5	25	25	
16	106	Sat	77.625	0.2875	685.5	26	26	16-Full Moon
17	107	Sun	76.625	0.2902	686.5	27	27	$18^h\ 55^m$ U.T.
18	108	Mon	-75.625	0.2930	687.5	28	28	
19	109	Tue	74.625	0.2957	688.5	29	29	
20	110	Wed	73.625	0.2984	689.5	30	30	
21	111	Thu	72.625	0.3012	690.5	Vaisakha 1	31	
22	112	Fri	71.625	0.3039	691.5	2	32	
23	113	Sat	70.625	0.3066	692.5	3	33	23-Last Quarter
24	114	Sun	69.625	0.3094	693.5	4	34	$11^h\ 56^m$ U.T.
25	115	Mon	-68.625	0.3121	694.5	5	35	
26	116	Tue	67.625	0.3149	695.5	6	36	
27	117	Wed	66.625	0.3176	696.5	7	37	
28	118	Thu	65.625	0.3203	697.5	8	38	
29	119	Fri	64.625	0.3231	698.5	9	39	
30	120	Sat	63.625	0.3258	699.5	10	40	30-New Moon
May 1	121	Sun	-62.625	0.3285	700.5	11	41	$20^h\ 28^m$ U.T.

CALENDAR, 2022

Day of Month	Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar: Day of Month	Indian Calendar: Day of Year	Phases of the Moon
					2459	1944 Saka Era		
May 2	122	Mon	-61.625	0.3313	701.5	Vaisakha 12	42	
3	123	Tue	60.625	0.3340	702.5	13	43	
4	124	Wed	59.625	0.3368	703.5	14	44	
5	125	Thu	58.625	0.3395	704.5	15	45	
6	126	Fri	57.625	0.3422	705.5	16	46	
7	127	Sat	56.625	0.3450	706.5	17	47	
8	128	Sun	55.625	0.3477	707.5	18	48	
9	129	Mon	-54.625	0.3505	708.5	19	49	9-First Quarter
10	130	Tue	53.625	0.3532	709.5	20	50	$0^h\ 21^m$ U.T.
11	131	Wed	52.625	0.3559	710.5	21	51	
12	132	Thu	51.625	0.3587	711.5	22	52	
13	133	Fri	50.625	0.3614	712.5	23	53	
14	134	Sat	49.625	0.3641	713.5	24	54	
15	135	Sun	48.625	0.3669	714.5	25	55	
16	136	Mon	-47.625	0.3696	715.5	26	56	16-Full Moon
17	137	Tue	46.625	0.3724	716.5	27	57	$4^h\ 14^m$ U.T.
18	138	Wed	45.625	0.3751	717.5	28	58	
19	139	Thu	44.625	0.3778	718.5	29	59	
20	140	Fri	43.625	0.3806	719.5	30	60	
21	141	Sat	42.625	0.3833	720.5	31	61	
22	142	Sun	41.625	0.3860	721.5	Jyaishtha 1	62	22-Last Quarter $18^h\ 43^m$ U.T.
23	143	Mon	-40.625	0.3888	722.5	2	63	
24	144	Tue	39.625	0.3915	723.5	3	64	
25	145	Wed	38.625	0.3943	724.5	4	65	
26	146	Thu	37.625	0.3970	725.5	5	66	
27	147	Fri	36.625	0.3997	726.5	6	67	
28	148	Sat	35.625	0.4025	727.5	7	68	
29	149	Sun	34.625	0.4052	728.5	8	69	
30	150	Mon	-33.625	0.4079	729.5	9	70	30-New Moon
31	151	Tue	32.625	0.4107	730.5	10	71	$11^h\ 30^m$ U.T.
June 1	152	Wed	31.625	0.4134	731.5	11	72	
2	153	Thu	30.625	0.4162	732.5	12	73	
3	154	Fri	29.625	0.4189	733.5	13	74	
4	155	Sat	28.625	0.4216	734.5	14	75	
5	156	Sun	27.625	0.4244	735.5	15	76	
6	157	Mon	-26.625	0.4271	736.5	16	77	
7	158	Tue	25.625	0.4299	737.5	17	78	07-First Quarter
8	159	Wed	24.625	0.4326	738.5	18	79	$14^h\ 48^m$ U.T.
9	160	Thu	23.625	0.4353	739.5	19	80	
10	161	Fri	22.625	0.4381	740.5	20	81	
11	162	Sat	21.625	0.4408	741.5	21	82	
12	163	Sun	-20.625	0.4435	742.5	22	83	

CALENDAR, 2022

Day of Month	Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar: Day of Month	Indian Calendar: Day of Year	Phases of the Moon
					2459	1944 Saka Era		
June 13	164	Mon	-19.625	0.4463	743.5	Jyaishtha 23	84	
14	165	Tue	18.625	0.4490	744.5	24	85	14-Full Moon
15	166	Wed	17.625	0.4518	745.5	25	86	$11^h\ 52^m$ U.T.
16	167	Thu	16.625	0.4545	746.5	26	87	
17	168	Fri	15.625	0.4572	747.5	27	88	
18	169	Sat	14.625	0.4600	748.5	28	89	
19	170	Sun	13.625	0.4627	749.5	29	90	
20	171	Mon	-12.625	0.4654	750.5	30	91	
21	172	Tue	11.625	0.4682	751.5	31	92	21-Last Quarter
22	173	Wed	10.625	0.4709	752.5	Ashadha 1	93	$3^h\ 11^m$ U.T.
23	174	Thu	9.625	0.4737	753.5	2	94	
24	175	Fri	8.625	0.4764	754.5	3	95	
25	176	Sat	7.625	0.4791	755.5	4	96	
26	177	Sun	-6.625	0.4819	756.5	5	97	
27	178	Mon	-5.625	0.4846	757.5	6	98	
28	179	Tue	4.625	0.4873	758.5	7	99	
29	180	Wed	3.625	0.4901	759.5	8	100	29-New Moon
30	181	Thu	2.625	0.4928	760.5	9	101	$2^h\ 52^m$ U.T.
July 1	182	Fri	1.625	0.4956	761.5	10	102	
2	183	Sat	-0.625	0.4983	762.5	11	103	
3	184	Sun	+0.375	0.5010	763.5	12	104	
4	185	Mon	+1.375	0.5038	764.5	13	105	
5	186	Tue	2.375	0.5065	765.5	14	106	
6	187	Wed	3.375	0.5093	766.5	15	107	
7	188	Thu	4.375	0.5120	767.5	16	108	7-First Quarter
8	189	Fri	5.375	0.5147	768.5	17	109	$2^h\ 14^m$ U.T.
9	190	Sat	6.375	0.5175	769.5	18	110	
10	191	Sun	7.375	0.5202	770.5	19	111	
11	192	Mon	+8.375	0.5229	771.5	20	112	
12	193	Tue	9.375	0.5257	772.5	21	113	
13	194	Wed	10.375	0.5284	773.5	22	114	13-Full Moon
14	195	Thu	11.375	0.5312	774.5	23	115	$18^h\ 38^m$ U.T.
15	196	Fri	12.375	0.5339	775.5	24	116	
16	197	Sat	13.375	0.5366	776.5	25	117	
17	198	Sun	14.375	0.5394	777.5	26	118	
18	199	Mon	+15.375	0.5421	778.5	27	119	
19	200	Tue	16.375	0.5448	779.5	28	120	
20	201	Wed	17.375	0.5476	780.5	29	121	20-Last Quarter
21	202	Thu	18.375	0.5503	781.5	30	122	$14^h\ 19^m$ U.T.
22	203	Fri	19.375	0.5531	782.5	31	123	
23	204	Sat	20.375	0.5558	783.5	Sravana 1	124	
24	205	Sun	+21.375	0.5585	784.5	2	125	

CALENDAR, 2022

Day of Month		Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month	Indian Calendar Day of Year	Phases of the Moon
						2459	1944 Saka Era		
July	25	206	Mon	+22.375	0.5613	785.5	Sravana 3	126	
	26	207	Tue	23.375	0.5640	786.5	4	127	
	27	208	Wed	24.375	0.5667	787.5	5	128	
	28	209	Thu	25.375	0.5695	788.5	6	129	28-New Moon
	29	210	Fri	26.375	0.5722	789.5	7	130	$17^h\ 55^m$ U.T.
	30	211	Sat	27.375	0.5750	790.5	8	131	
	31	212	Sun	28.375	0.5777	791.5	9	132	
Aug.	1	213	Mon	+29.375	0.5804	792.5	10	133	
	2	214	Tue	30.375	0.5832	793.5	11	134	
	3	215	Wed	31.375	0.5859	794.5	12	135	
	4	216	Thu	32.375	0.5887	795.5	13	136	
	5	217	Fri	33.375	0.5914	796.5	14	137	5-First Quarter
	6	218	Sat	34.375	0.5941	797.5	15	138	$11^h\ 07^m$ U.T.
	7	219	Sun	35.375	0.5969	798.5	16	139	
	8	220	Mon	+36.375	0.5996	799.5	17	140	
	9	221	Tue	37.375	0.6023	800.5	18	141	
	10	222	Wed	38.375	0.6051	801.5	19	142	
	11	223	Thu	39.375	0.6078	802.5	20	143	
	12	224	Fri	40.375	0.6106	803.5	21	144	12-Full Moon
	13	225	Sat	41.375	0.6133	804.5	22	145	$1^h\ 36^m$ U.T.
	14	226	Sun	42.375	0.6160	805.5	23	146	
	15	227	Mon	+43.375	0.6188	806.5	24	147	
	16	228	Tue	44.375	0.6215	807.5	25	148	
	17	229	Wed	45.375	0.6242	808.5	26	149	
	18	230	Thu	46.375	0.6270	809.5	27	150	
	19	231	Fri	47.375	0.6297	810.5	28	151	19-Last Quarter
	20	232	Sat	48.375	0.6325	811.5	29	152	$4^h\ 36^m$ U.T.
	21	233	Sun	49.375	0.6352	812.5	30	153	
	22	234	Mon	+50.375	0.6379	813.5	31	154	
	23	235	Tue	51.375	0.6407	814.5	Bhadra 1	155	
	24	236	Wed	52.375	0.6434	815.5	2	156	
	25	237	Thu	53.375	0.6461	816.5	3	157	
	26	238	Fri	54.375	0.6489	817.5	4	158	
	27	239	Sat	55.375	0.6516	818.5	5	159	27-New Moon
	28	240	Sun	56.375	0.6544	819.5	6	160	$8^h\ 17^m$ U.T.
	29	241	Mon	+57.375	0.6571	820.5	7	161	
	30	242	Tue	58.375	0.6598	821.5	8	162	
	31	243	Wed	59.375	0.6626	822.5	9	163	
Sept.	1	244	Thu	60.375	0.6653	823.5	10	164	
	2	245	Fri	61.375	0.6680	824.5	11	165	
	3	246	Sat	62.375	0.6708	825.5	12	166	03-First Quarter
	4	247	Sun	+63.375	0.6735	826.5	13	167	$18^h\ 08^m$ U.T.

CALENDAR, 2022

Day of Month		Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month	Indian Calendar Day of Year	Phases of the Moon
						2459	1944 Saka Era		
Sept.	5	248	Mon	+64.375	0.6763	827.5	Bhadra 14	168	
	6	249	Tue	65.375	0.6790	828.5	15	169	
	7	250	Wed	66.375	0.6817	829.5	16	170	
	8	251	Thu	67.375	0.6845	830.5	17	171	
	9	252	Fri	68.375	0.6872	831.5	18	172	
	10	253	Sat	69.375	0.6900	832.5	19	173	10-Full Moon
	11	254	Sun	70.375	0.6927	833.5	20	174	$9^h\ 59^m$ U.T.
	12	255	Mon	+71.375	0.6954	834.5	21	175	
	13	256	Tue	72.375	0.6982	835.5	22	176	
	14	257	Wed	73.375	0.7009	836.5	23	177	
	15	258	Thu	74.375	0.7036	837.5	24	178	
	16	259	Fri	75.375	0.7064	838.5	25	179	
	17	260	Sat	76.375	0.7091	839.5	26	180	17-Last Quarter
	18	261	Sun	77.375	0.7119	840.5	27	181	$21^h\ 52^m$ U.T.
	19	262	Mon	+78.375	0.7146	841.5	28	182	
	20	263	Tue	79.375	0.7173	842.5	29	183	
	21	264	Wed	80.375	0.7201	843.5	30	184	
	22	265	Thu	81.375	0.7228	844.5	31	185	
	23	266	Fri	82.375	0.7255	845.5	Asvina 1	186	
	24	267	Sat	83.375	0.7283	846.5	2	187	
	25	268	Sun	84.375	0.7310	847.5	3	188	25-New Moon $21^h\ 55^m$ U.T.
	26	269	Mon	+85.375	0.7338	848.5	4	189	
	27	270	Tue	86.375	0.7365	849.5	5	190	
	28	271	Wed	87.375	0.7392	850.5	6	191	
	29	272	Thu	88.375	0.7420	851.5	7	192	
	30	273	Fri	89.375	0.7447	852.5	8	193	
Oct.	1	274	Sat	90.375	0.7474	853.5	9	194	
	2	275	Sun	91.375	0.7502	854.5	10	195	
	3	276	Mon	+92.375	0.7529	855.5	11	196	3-First Quarter
	4	277	Tue	93.375	0.7557	856.5	12	197	$0^h\ 14^m$ U.T.
	5	278	Wed	94.375	0.7584	857.5	13	198	
	6	279	Thu	95.375	0.7611	858.5	14	199	
	7	280	Fri	96.375	0.7639	859.5	15	200	
	8	281	Sat	97.375	0.7666	860.5	16	201	
	9	282	Sun	98.375	0.7694	861.5	17	202	9-Full Moon $20^h\ 55^m$ U.T.
	10	283	Mon	+99.375	0.7721	862.5	18	203	
	11	284	Tue	100.375	0.7748	863.5	19	204	
	12	285	Wed	101.375	0.7776	864.5	20	205	
	13	286	Thu	102.375	0.7803	865.5	21	206	
	14	287	Fri	103.375	0.7830	866.5	22	207	
	15	288	Sat	104.375	0.7858	867.5	23	208	
	16	289	Sun	+105.375	0.7885	868.5	24	209	

CALENDAR, 2022

Day of Month		Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month	Indian Calendar Day of Year	Phases of the Moon
						2459	1944 Saka Era		
Oct.	17	290	Mon	+106.375	0.7913	869.5	Asvina 25	210	17-Last Quarter
	18	291	Tue	107.375	0.7940	870.5	26	211	17^h 15^m U.T.
	19	292	Wed	108.375	0.7967	871.5	27	212	
	20	293	Thu	109.375	0.7995	872.5	28	213	
	21	294	Fri	110.375	0.8022	873.5	29	214	
	22	295	Sat	111.375	0.8049	874.5	30	215	
	23	296	Sun	112.375	0.8077	875.5	Kartika 1	216	
	24	297	Mon	+113.375	0.8104	876.5	2	217	
	25	298	Tue	114.375	0.8132	877.5	3	218	25-New Moon
	26	299	Wed	115.375	0.8159	878.5	4	219	10^h 49^m U.T.
	27	300	Thu	116.375	0.8186	879.5	5	220	
	28	301	Fri	117.375	0.8214	880.5	6	221	
	29	302	Sat	118.375	0.8241	881.5	7	222	
	30	303	Sun	119.375	0.8268	882.5	8	223	
	31	304	Mon	+120.375	0.8296	883.5	9	224	
Nov.	1	305	Tue	121.375	0.8323	884.5	10	225	1-First Quarter
	2	306	Wed	122.375	0.8351	885.5	11	226	6^h 37^m U.T.
	3	307	Thu	123.375	0.8378	886.5	12	227	
	4	308	Fri	124.375	0.8405	887.5	13	228	
	5	309	Sat	125.375	0.8433	888.5	14	229	
	6	310	Sun	126.375	0.8460	889.5	15	230	
	7	311	Mon	+127.375	0.8488	890.5	16	231	
	8	312	Tue	128.375	0.8515	891.5	17	232	08-Full Moon
	9	313	Wed	129.375	0.8542	892.5	18	233	11^h 02^m U.T.
	10	314	Thu	130.375	0.8570	893.5	19	234	
	11	315	Fri	131.375	0.8597	894.5	20	235	
	12	316	Sat	132.375	0.8624	895.5	21	236	
	13	317	Sun	133.375	0.8652	896.5	22	237	
	14	318	Mon	+134.375	0.8679	897.5	23	238	
	15	319	Tue	135.375	0.8707	898.5	24	239	
	16	320	Wed	136.375	0.8734	899.5	25	240	16-Last Quarter
	17	321	Thu	137.375	0.8761	900.5	26	241	13^h 27^m U.T.
	18	322	Fri	138.375	0.8789	901.5	27	242	
	19	323	Sat	139.375	0.8816	902.5	28	243	
	20	324	Sun	140.375	0.8843	903.5	29	244	
	21	325	Mon	+141.375	0.8871	904.5	30	245	
	22	326	Tue	142.375	0.8898	905.5	Agrahayana 1	246	
	23	327	Wed	143.375	0.8926	906.5	2	247	23-New Moon
	24	328	Thu	144.375	0.8953	907.5	3	248	22^h 57^m U.T.
	25	329	Fri	145.375	0.8980	908.5	4	249	
	26	330	Sat	146.375	0.9008	909.5	5	250	
	27	331	Sun	+147.375	0.9035	910.5	6	251	

CALENDAR, 2022

Day of Month		Day of Year	Day of Week	Days since J 2021.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month	Indian Calendar Day of Year	Phases of the Moon
						2459	1944 Saka Era		
Nov.	28	332	Mon	+148.375	0.9062	911.5	Agrahayana 7	252	
	29	333	Tue	149.375	0.9090	912.5	8	253	
	30	334	Wed	150.375	0.9117	913.5	9	254	30-First Quarter
Dec.	1	335	Thu	151.375	0.9145	914.5	10	255	$14^h\ 37^m$ U.T.
	2	336	Fri	152.375	0.9172	915.5	11	256	
	3	337	Sat	153.375	0.9199	916.5	12	257	
	4	338	Sun	154.375	0.9227	917.5	13	258	
	5	339	Mon	+155.375	0.9254	918.5	14	259	
	6	340	Tue	156.375	0.9282	919.5	15	260	
	7	341	Wed	157.375	0.9309	920.5	16	261	
	8	342	Thu	158.375	0.9336	921.5	17	262	8-Full Moon
	9	343	Fri	159.375	0.9364	922.5	18	263	$4^h\ 08^m$ U.T.
	10	344	Sat	160.375	0.9391	923.5	19	264	
	11	345	Sun	161.375	0.9418	924.5	20	265	
	12	346	Mon	+162.375	0.9446	925.5	21	266	
	13	347	Tue	163.375	0.9473	926.5	22	267	
	14	348	Wed	164.375	0.9501	927.5	23	268	
	15	349	Thu	165.375	0.9528	928.5	24	269	
	16	350	Fri	166.375	0.9555	929.5	25	270	16-Last Quarter
	17	351	Sat	167.375	0.9583	930.5	26	271	$8^h\ 56^m$ U.T.
	18	352	Sun	168.375	0.9610	931.5	27	272	
	19	353	Mon	+169.375	0.9637	932.5	28	273	
	20	354	Tue	170.375	0.9665	933.5	29	274	
	21	355	Wed	171.375	0.9692	934.5	30	275	
	22	356	Thu	172.375	0.9720	935.5	Pausha 1	276	
	23	357	Fri	173.375	0.9747	936.5	2	277	23-New Moon
	24	358	Sat	174.375	0.9774	937.5	3	278	$10^h\ 17^m$ U.T.
	25	359	Sun	175.375	0.9802	938.5	4	279	
	26	360	Mon	+176.375	0.9829	939.5	5	280	
	27	361	Tue	177.375	0.9856	940.5	6	281	
	28	362	Wed	178.375	0.9884	941.5	7	282	
	29	363	Thu	179.375	0.9911	942.5	8	283	
	30	364	Fri	180.375	0.9939	943.5	9	284	30-First Quarter
	31	365	Sat	181.375	0.9966	944.5	10	285	$1^h\ 21^m$ U.T.
	32	1	Sun	+182.375	0.9993	945.5	11	286	

The new epoch is the middle of the Julian year, denoted by J 2022.5 (i.e. 2022, July 2.625) where the length of the Julian year is taken to be 365.25 days.

The Fraction of year is reckoned from January 1, 0^h U.T and is based on the tropical year of 365.2422 days. The Julian Day begins at noon. In order to obtain the Julian Day Number completed at noon as given in Table IX, increase the above figure by 0.5.

The Day of year of the Gregorian Calendar is reckoned from January 1, and that of the Indian Calendar from Chaitra 1.

SIDEREAL TIME, 2022

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Jan.	0	6	38	34.653	-0.887	17	18	34.735	Feb.	15	9	39	56.200	-0.780	14	17	42.899
	1	6	42	31.209	0.877	17	14	38.825		16	9	43	52.756	0.780	14	13	46.990
	2	6	46	27.764	0.864	17	10	42.916		17	9	47	49.311	0.782	14	09	51.080
	3	6	50	24.319	0.851	17	06	47.006		18	9	51	45.866	0.787	14	05	55.171
	4	6	54	20.875	0.840	17	02	51.097		19	9	55	42.422	0.795	14	01	59.261
	5	6	58	17.430	0.832	16	58	55.187		20	9	59	38.977	0.803	13	58	03.352
	6	7	02	13.986	-0.830	16	54	59.278		21	10	03	35.533	-0.810	13	54	07.442
	7	7	06	10.541	0.830	16	51	03.368		22	10	07	32.088	0.815	13	50	11.533
	8	7	10	07.096	0.834	16	47	07.459		23	10	11	28.643	0.816	13	46	15.623
	9	7	14	03.652	0.838	16	43	11.549		24	10	15	25.199	0.814	13	42	19.714
	10	7	17	60.207	0.841	16	39	15.640		25	10	19	21.754	0.808	13	38	23.804
	11	7	21	56.762	0.843	16	35	19.731		26	10	23	18.309	0.801	13	34	27.895
	12	7	25	53.318	-0.843	16	31	23.821		27	10	27	14.865	-0.793	13	30	31.985
	13	7	29	49.873	0.840	16	27	27.912		28	10	31	11.420	0.788	13	26	36.076
	14	7	33	46.429	0.835	16	23	32.002	Mar.	1	10	35	07.975	0.787	13	22	40.167
	15	7	37	42.984	0.829	16	19	36.093		2	10	39	04.531	0.790	13	18	44.257
	16	7	41	39.539	0.822	16	15	40.183		3	10	43	01.086	0.796	13	14	48.348
	17	7	45	36.095	0.814	16	11	44.274		4	10	46	57.642	0.804	13	10	52.438
	18	7	49	32.650	-0.808	16	07	48.364		5	10	50	54.197	-0.813	13	06	56.529
	19	7	53	29.205	0.803	16	03	52.455		6	10	54	50.752	0.821	13	03	00.619
	20	7	57	25.761	0.801	15	59	56.545		7	10	58	47.308	0.827	12	59	04.710
	21	8	01	22.316	0.802	15	56	00.636		8	11	02	43.863	0.830	12	55	08.800
	22	8	05	18.871	0.805	15	52	04.726		9	11	06	40.418	0.831	12	51	12.891
	23	8	09	15.427	0.810	15	48	08.817		10	11	10	36.974	0.830	12	47	16.981
	24	8	13	11.982	-0.815	15	44	12.907		11	11	14	33.529	-0.827	12	43	21.072
	25	8	17	08.538	0.819	15	40	16.998		12	11	18	30.085	0.824	12	39	25.162
	26	8	21	05.093	0.821	15	36	21.088		13	11	22	26.640	0.822	12	35	29.253
	27	8	25	01.648	0.819	15	32	25.179		14	11	26	23.195	0.820	12	31	33.343
	28	8	28	58.204	0.813	15	28	29.270		15	11	30	19.751	0.821	12	27	37.434
	29	8	32	54.759	0.803	15	24	33.360		16	11	34	16.306	0.824	12	23	41.524
	30	8	36	51.314	-0.793	15	20	37.451		17	11	38	12.861	-0.830	12	19	45.615
	31	8	40	47.870	0.783	15	16	41.541		18	11	42	09.417	0.838	12	15	49.705
Feb.	1	8	44	44.425	0.776	15	12	45.632		19	11	46	05.972	0.847	12	11	53.796
	2	8	48	40.980	0.773	15	08	49.722		20	11	50	02.527	0.856	12	07	57.887
	3	8	52	37.536	0.775	15	04	53.813		21	11	53	59.083	0.863	12	04	01.977
	4	8	56	34.091	0.780	15	00	57.903		22	11	57	55.638	0.866	12	00	06.068
	5	9	00	30.647	-0.786	14	57	01.994		23	12	01	52.194	-0.866	11	56	10.158
	6	9	04	27.202	0.793	14	53	06.084		24	12	05	48.749	0.862	11	52	14.249
	7	9	08	23.757	0.798	14	49	10.175		25	12	09	45.304	0.855	11	48	18.339
	8	9	12	20.313	0.801	14	45	14.265		26	12	13	41.860	0.849	11	44	22.430
	9	9	16	16.868	0.801	14	41	18.356		27	12	17	38.415	0.844	11	40	26.520
	10	9	20	13.423	0.799	14	37	22.446		28	12	21	34.970	0.842	11	36	30.611
	11	9	24	09.979	-0.796	14	33	26.537		29	12	25	31.526	-0.845	11	32	34.701
	12	9	28	06.534	0.791	14	29	30.628		30	12	29	28.081	0.850	11	28	38.792
	13	9	32	03.090	0.786	14	25	34.718		31	12	33	24.637	0.858	11	24	42.882
	14	9	35	59.645	0.782	14	21	38.809	Apr.	1	12	37	21.192	0.868	11	20	46.973
	15	9	39	56.200	-0.780	14	17	42.899		2	12	41	17.747	-0.876	11	16	51.063

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SIDEREAL TIME, 2022

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Apr.	1	12	37	21.192	-0.868	11	20	46.973	May	17	15	38	42.739	-0.902	8	19	55.137
	2	12	41	17.747	0.876	11	16	51.063		18	15	42	39.294	0.892	8	15	59.228
	3	12	45	14.303	0.883	11	12	55.154		19	15	46	35.850	0.880	8	12	03.318
	4	12	49	10.858	0.887	11	08	59.245		20	15	50	32.405	0.870	8	08	07.409
	5	12	53	07.413	0.889	11	05	03.335		21	15	54	28.960	0.862	8	04	11.499
	6	12	57	03.969	0.888	11	01	07.426		22	15	58	25.516	0.858	8	00	15.590
	7	13	00	60.524	-0.886	10	57	11.516		23	16	02	22.071	-0.858	7	56	19.680
	8	13	04	57.079	0.882	10	53	15.607		24	16	06	18.626	0.861	7	52	23.771
	9	13	08	53.635	0.879	10	49	19.697		25	16	10	15.182	0.866	7	48	27.862
	10	13	12	50.190	0.876	10	45	23.788		26	16	14	11.737	0.871	7	44	31.952
	11	13	16	46.746	0.876	10	41	27.878		27	16	18	08.293	0.875	7	40	36.043
	12	13	20	43.301	0.877	10	37	31.969		28	16	22	04.848	0.876	7	36	40.133
	13	13	24	39.856	-0.881	10	33	36.059		29	16	26	01.403	-0.875	7	32	44.224
	14	13	28	36.412	0.888	10	29	40.150		30	16	29	57.959	0.872	7	28	48.314
	15	13	32	32.967	0.896	10	25	44.240		31	16	33	54.514	0.866	7	24	52.405
	16	13	36	29.522	0.904	10	21	48.331	June	1	16	37	51.069	0.859	7	20	56.495
	17	13	40	26.078	0.911	10	17	52.421		2	16	41	47.625	0.852	7	17	00.586
	18	13	44	22.633	0.914	10	13	56.512		3	16	45	44.180	0.845	7	13	04.676
	19	13	48	19.189	-0.913	10	10	00.602		4	16	49	40.735	-0.839	7	09	08.767
	20	13	52	15.744	0.908	10	06	04.693		5	16	53	37.291	0.835	7	05	12.857
	21	13	56	12.299	0.900	10	02	08.784		6	16	57	33.846	0.834	7	01	16.948
	22	14	00	08.855	0.892	9	58	12.874		7	17	01	30.402	0.834	6	57	21.038
	23	14	04	05.410	0.885	9	54	16.965		8	17	05	26.957	0.837	6	53	25.129
	24	14	08	01.965	0.881	9	50	21.055		9	17	09	23.512	0.842	6	49	29.219
	25	14	11	58.521	-0.880	9	46	25.146		10	17	13	20.068	-0.846	6	45	33.310
	26	14	15	55.076	0.884	9	42	29.236		11	17	17	16.623	0.848	6	41	37.401
	27	14	19	51.631	0.890	9	38	33.327		12	17	21	13.178	0.847	6	37	41.491
	28	14	23	48.187	0.897	9	34	37.417		13	17	25	09.734	0.841	6	33	45.582
	29	14	27	44.742	0.904	9	30	41.508		14	17	29	06.289	0.831	6	29	49.672
	30	14	31	41.298	0.909	9	26	45.598		15	17	33	02.845	0.818	6	25	53.763
May	1	14	35	37.853	-0.913	9	22	49.689		16	17	36	59.400	-0.804	6	21	57.853
	2	14	39	34.408	0.913	9	18	53.779		17	17	40	55.955	0.793	6	18	01.944
	3	14	43	30.964	0.911	9	14	57.870		18	17	44	52.511	0.786	6	14	06.034
	4	14	47	27.519	0.907	9	11	01.960		19	17	48	49.066	0.784	6	10	10.125
	5	14	51	24.074	0.902	9	07	06.051		20	17	52	45.621	0.785	6	06	14.215
	6	14	55	20.630	0.896	9	03	10.142		21	17	56	42.177	0.789	6	02	18.306
	7	14	59	17.185	-0.891	8	59	14.232		22	18	00	38.732	-0.793	5	58	22.396
	8	15	03	13.741	0.888	8	55	18.322		23	18	04	35.287	0.796	5	54	26.487
	9	15	07	10.296	0.886	8	51	22.413		24	18	08	31.843	0.797	5	50	30.577
	10	15	11	06.851	0.887	8	47	26.504		25	18	12	28.398	0.796	5	46	34.668
	11	15	15	03.407	0.891	8	43	30.594		26	18	16	24.954	0.793	5	42	38.759
	12	15	18	59.962	0.896	8	39	34.685		27	18	20	21.509	0.787	5	38	42.849
	13	15	22	56.517	-0.902	8	35	38.775		28	18	24	18.064	-0.780	5	34	46.940
	14	15	26	53.073	0.907	8	31	42.866		29	18	28	14.620	0.772	5	30	51.030
	15	15	30	49.628	0.910	8	27	46.956		30	18	32	11.175	0.764	5	26	55.121
	16	15	34	46.183	0.908	8	23	51.047	July	1	18	36	07.730	0.758	5	22	59.211
	17	15	38	42.739	-0.902	8	19	55.137		2	18	40	04.286	-0.753	5	19	03.302

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SIDEREAL TIME, 2022

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)	Equation of the Equinoxes at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)	Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)	Equation of the Equinoxes at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)
		h m s	s	h m s			h m s	s	h m s
July	1	18 36 07.730	-0.758	5 22 59.211	Aug.	16	21 37 29.277	-0.694	2 22 07.376
	2	18 40 04.286	0.753	5 19 03.302		17	21 41 25.833	0.700	2 18 11.466
	3	18 44 00.841	0.751	5 15 07.392		18	21 45 22.388	0.704	2 14 15.557
	4	18 47 57.397	0.751	5 11 11.483		19	21 49 18.943	0.705	2 10 19.647
	5	18 51 53.952	0.754	5 07 15.573		20	21 53 15.499	0.703	2 06 23.738
	6	18 55 50.507	0.758	5 03 19.664		21	21 57 12.054	0.700	2 02 27.828
	7	18 59 47.063	-0.762	4 59 23.754		22	22 01 08.610	-0.696	1 58 31.919
	8	19 03 43.618	0.765	4 55 27.845		23	22 05 05.165	0.692	1 54 36.009
	9	19 07 40.173	0.766	4 51 31.935		24	22 09 01.720	0.688	1 50 40.100
	10	19 11 36.729	0.763	4 47 36.026		25	22 12 58.276	0.687	1 46 44.190
	11	19 15 33.284	0.755	4 43 40.116		26	22 16 54.831	0.687	1 42 48.281
	12	19 19 29.839	0.744	4 39 44.207		27	22 20 51.386	0.690	1 38 52.371
	13	19 23 26.395	-0.731	4 35 48.297		28	22 24 47.942	-0.696	1 34 56.462
	14	19 27 22.950	0.719	4 31 52.388		29	22 28 44.497	0.703	1 31 00.552
	15	19 31 19.506	0.711	4 27 56.479		30	22 32 41.053	0.712	1 27 04.643
	16	19 35 16.061	0.707	4 24 00.569		31	22 36 37.608	0.720	1 23 08.734
	17	19 39 12.616	0.707	4 20 04.660	Sept.	1	22 40 34.163	0.726	1 19 12.824
	18	19 43 09.172	0.711	4 16 08.750		2	22 44 30.719	0.729	1 15 16.915
	19	19 47 05.727	-0.716	4 12 12.841		3	22 48 27.274	-0.728	1 11 21.005
	20	19 51 02.282	0.721	4 08 16.931		4	22 52 23.829	0.724	1 07 25.096
	21	19 54 58.838	0.724	4 04 21.022		5	22 56 20.385	0.717	1 03 29.186
	22	19 58 55.393	0.725	4 00 25.112		6	23 00 16.940	0.710	0 59 33.277
	23	20 02 51.949	0.723	3 56 29.203		7	23 04 13.495	0.704	0 55 37.367
	24	20 06 48.504	0.719	3 52 33.293		8	23 08 10.051	0.701	0 51 41.458
	25	20 10 45.059	-0.713	3 48 37.384		9	23 12 06.606	-0.702	0 47 45.548
	26	20 14 41.615	0.707	3 44 41.474		10	23 16 03.162	0.707	0 43 49.639
	27	20 18 38.170	0.700	3 40 45.565		11	23 19 59.717	0.716	0 39 53.729
	28	20 22 34.725	0.695	3 36 49.655		12	23 23 56.272	0.725	0 35 57.820
	29	20 26 31.281	0.692	3 32 53.746		13	23 27 52.828	0.733	0 32 01.910
	30	20 30 27.836	0.691	3 28 57.836		14	23 31 49.383	0.739	0 28 06.001
	31	20 34 24.391	-0.692	3 25 01.927		15	23 35 45.938	-0.742	0 24 10.091
Aug.	1	20 38 20.947	0.696	3 21 06.018		16	23 39 42.494	0.743	0 20 14.182
	2	20 42 17.502	0.702	3 17 10.108		17	23 43 39.049	0.742	0 16 18.272
	3	20 46 14.058	0.708	3 13 14.199		18	23 47 35.605	0.739	0 12 22.363
	4	20 50 10.613	0.713	3 09 18.289		19	23 51 32.160	0.736	0 08 26.454
	5	20 54 07.168	0.717	3 05 22.380		20	23 55 28.715	0.733	0 04 30.544
	6	20 58 03.724	-0.717	3 01 26.470		21	23 59 25.271	-0.732	0 00 34.635
	7	21 01 60.279	0.713	2 57 30.561		22	0 03 21.826	0.733	23 52 42.816
	8	21 05 56.834	0.706	2 53 34.651		23	0 07 18.381	0.736	23 48 46.906
	9	21 09 53.390	0.696	2 49 38.742		24	0 11 14.937	0.742	23 44 50.997
	10	21 13 49.945	0.686	2 45 42.832		25	0 15 11.492	0.750	23 40 55.087
	11	21 17 46.501	0.678	2 41 46.923		26	0 19 08.047	0.759	23 36 59.178
	12	21 21 43.056	-0.674	2 37 51.013		27	0 23 04.603	-0.768	23 33 03.268
	13	21 25 39.611	0.675	2 33 55.104		28	0 27 01.158	0.775	23 29 07.359
	14	21 29 36.167	0.680	2 29 59.194		29	0 30 57.714	0.780	23 25 11.450
	15	21 33 32.722	0.687	2 26 03.285		30	0 34 54.269	0.781	23 21 15.540
	16	21 37 29.277	-0.694	2 22 07.376	Oct.	1	0 38 50.824	-0.778	23 17 19.631

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SIDEREAL TIME, 2022

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Oct.	1	0	38	50.824	-0.778	23	17	19.631	Nov.	16	3	40	12.371	-0.773	20	16	27.795
	2	0	42	47.380	0.772	23	13	23.721		17	3	44	08.927	0.773	20	12	31.885
	3	0	46	43.935	0.765	23	09	27.812		18	3	48	05.482	0.776	20	08	35.976
	4	0	50	40.490	0.759	23	05	31.902		19	3	52	02.037	0.780	20	04	40.067
	5	0	54	37.046	0.755	23	01	35.993		20	3	55	58.593	0.785	20	00	44.157
	6	0	58	33.601	0.756	22	57	40.083		21	3	59	55.148	0.790	19	56	48.248
	7	1	02	30.157	-0.760	22	53	44.174		22	4	03	51.703	-0.792	19	52	52.338
	8	1	06	26.712	0.767	22	49	48.264		23	4	07	48.259	0.791	19	48	56.429
	9	1	10	23.267	0.776	22	45	52.355		24	4	11	44.814	0.786	19	45	00.519
	10	1	14	19.823	0.785	22	41	56.445		25	4	15	41.370	0.777	19	41	04.610
	11	1	18	16.378	0.791	22	38	00.536		26	4	19	37.925	0.765	19	37	08.700
	12	1	22	12.933	0.795	22	34	04.626		27	4	23	34.480	0.752	19	33	12.791
	13	1	26	09.489	-0.796	22	30	08.717		28	4	27	31.036	-0.742	19	29	16.881
	14	1	30	06.044	0.795	22	26	12.807		29	4	31	27.591	0.736	19	25	20.972
	15	1	34	02.599	0.792	22	22	16.898		30	4	35	24.146	0.733	19	21	25.062
	16	1	37	59.155	0.787	22	18	20.989	Dec.	1	4	39	20.702	0.735	19	17	29.153
	17	1	41	55.710	0.784	22	14	25.079		2	4	43	17.257	0.738	19	13	33.243
	18	1	45	52.266	0.781	22	10	29.170		3	4	47	13.813	0.743	19	09	37.334
	19	1	49	48.821	-0.780	22	06	33.260		4	4	51	10.368	-0.746	19	05	41.424
	20	1	53	45.376	0.781	22	02	37.351		5	4	55	06.923	0.747	19	01	45.515
	21	1	57	41.932	0.785	21	58	41.441		6	4	59	03.479	0.745	18	57	49.606
	22	2	01	38.487	0.791	21	54	45.532		7	5	02	60.034	0.741	18	53	53.696
	23	2	05	35.042	0.798	21	50	49.622		8	5	06	56.589	0.734	18	49	57.787
	24	2	09	31.598	0.806	21	46	53.713		9	5	10	53.145	0.725	18	46	01.877
	25	2	13	28.153	-0.813	21	42	57.803		10	5	14	49.700	-0.717	18	42	05.968
	26	2	17	24.709	0.817	21	39	01.894		11	5	18	46.255	0.708	18	38	10.058
	27	2	21	21.264	0.817	21	35	05.984		12	5	22	42.811	0.702	18	34	14.149
	28	2	25	17.819	0.813	21	31	10.075		13	5	26	39.366	0.697	18	30	18.239
	29	2	29	14.375	0.806	21	27	14.165		14	5	30	35.922	0.695	18	26	22.330
	30	2	33	10.930	0.797	21	23	18.256		15	5	34	32.477	0.695	18	22	26.420
	31	2	37	07.485	-0.788	21	19	22.346		16	5	38	29.032	-0.697	18	18	30.511
Nov.	1	2	41	04.041	0.782	21	15	26.437		17	5	42	25.588	0.700	18	14	34.601
	2	2	44	60.596	0.779	21	11	30.527		18	5	46	22.143	0.704	18	10	38.692
	3	2	48	57.151	0.781	21	07	34.618		19	5	50	18.698	0.706	18	06	42.782
	4	2	52	53.707	0.785	21	03	38.709		20	5	54	15.254	0.705	18	02	46.873
	5	2	56	50.262	0.792	20	59	42.799		21	5	58	11.809	0.700	17	58	50.964
	6	3	00	46.818	-0.798	20	55	46.890		22	6	02	08.365	-0.691	17	54	55.054
	7	3	04	43.373	0.804	20	51	50.980		23	6	06	04.920	0.678	17	50	59.144
	8	3	08	39.928	0.806	20	47	55.071		24	6	10	01.475	0.664	17	47	03.235
	9	3	12	36.484	0.806	20	43	59.161		25	6	13	58.031	0.651	17	43	07.326
	10	3	16	33.039	0.803	20	40	03.252		26	6	17	54.586	0.642	17	39	11.416
	11	3	20	29.594	0.798	20	36	07.342		27	6	21	51.141	0.637	17	35	15.507
	12	3	24	26.150	-0.791	20	32	11.433		28	6	25	47.697	-0.636	17	31	19.597
	13	3	28	22.705	0.785	20	28	15.523		29	6	29	44.252	0.639	17	27	23.688
	14	3	32	19.261	0.779	20	24	19.614		30	6	33	40.807	0.642	17	23	27.778
	15	3	36	15.816	0.775	20	20	23.704		31	6	37	37.363	0.645	17	19	31.869
	16	3	40	12.371	-0.773	20	16	27.795		32	6	41	33.918	-0.646	17	15	35.959

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SUN, 2022
MEAN LONGITUDE AND ANOMALY

Date		Horizontal Parallax	Mean Longitude			Mean Anomaly	Date		Horizontal Parallax	Mean Longitude			Mean Anomaly
		"	°	′	"	°			"	°	′	"	°
Jan.	1	8.94	280	38	08.911	357.320	July	10	8.65	107	54	31.705	184.584
	11	8.94	290	29	32.216	7.176		20	8.65	117	45	55.010	194.440
	21	8.94	300	20	55.521	17.032		30	8.66	127	37	18.315	204.296
	31	8.93	310	12	18.826	26.888	Aug.	9	8.67	137	28	41.620	214.152
Feb.	10	8.91	320	03	42.131	36.744		19	8.69	147	20	04.925	224.008
	20	8.90	329	55	05.435	46.600		29	8.71	157	11	28.230	233.864
Mar.	2	8.87	339	46	28.740	56.456	Sept.	8	8.73	167	02	51.535	243.720
	12	8.85	349	37	52.045	66.312		18	8.75	176	54	14.840	253.576
	22	8.83	359	29	15.350	76.168		28	8.77	186	45	38.145	263.432
Apr.	1	8.80	9	20	38.655	86.024	Oct.	8	8.80	196	37	01.450	273.288
	11	8.78	19	12	01.960	95.880		18	8.82	206	28	24.755	283.144
	21	8.75	29	03	25.265	105.736		28	8.85	216	19	48.059	293.000
May	1	8.73	38	54	48.570	115.592	Nov.	7	8.87	226	11	11.364	302.856
	11	8.71	48	46	11.875	125.448		17	8.89	236	02	34.669	312.712
	21	8.69	58	37	35.180	135.304		27	8.91	245	53	57.974	322.568
	31	8.67	68	28	58.485	145.160	Dec.	7	8.93	255	45	21.279	332.424
June	10	8.66	78	20	21.790	155.016		17	8.94	265	36	44.584	342.280
	20	8.65	88	11	45.095	164.872		27	8.94	275	28	07.889	352.136
	30	8.65	98	03	08.400	174.728		37	8.94	285	19	31.194	1.992
July	10	8.65	107	54	31.705	184.584		47	8.94	295	10	54.499	11.848

SUN, 2022

FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra-tion	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Jan	0	279	31	06.01	-0.29	279	30	30.71	20.84	-25.53	-14.51	+4.12	15.22
	1	280	32	16.37	0.43	280	31	41.23	20.84	25.39	14.34	4.08	15.18
	2	281	33	27.01	0.58	281	32	52.08	20.84	25.25	14.13	4.07	15.18
	3	282	34	37.74	0.68	282	34	03.04	20.84	25.11	13.91	4.10	15.20
	4	283	35	48.52	0.79	283	35	13.99	20.84	24.97	13.73	4.16	15.25
	5	284	36	59.17	0.83	284	36	24.77	20.84	24.83	13.61	4.23	15.33
	6	285	38	09.62	-0.86	285	37	35.26	20.84	-24.69	-13.56	+4.30	15.40
	7	286	39	19.72	0.86	286	38	45.35	20.84	24.56	13.58	4.37	15.46
	8	287	40	29.51	0.83	287	39	55.08	20.84	24.42	13.63	4.41	15.50
	9	288	41	38.84	0.76	288	41	04.34	20.84	24.28	13.70	4.43	15.52
	10	289	42	47.65	0.65	289	42	13.10	20.84	24.14	13.76	4.43	15.52
	11	290	43	56.01	0.54	290	43	21.43	20.84	24.00	13.79	4.42	15.51
	12	291	45	03.80	-0.43	291	44	29.22	20.84	-23.86	-13.78	+4.40	15.49
	13	292	46	11.04	0.29	292	45	36.50	20.84	23.72	13.74	4.38	15.46
	14	293	47	17.74	0.18	293	46	43.28	20.84	23.58	13.66	4.36	15.45
	15	294	48	23.87	-0.04	294	47	49.52	20.84	23.44	13.56	4.36	15.44
	16	295	49	29.41	+0.07	295	48	55.19	20.84	23.30	13.44	4.37	15.45
	17	296	50	34.42	0.18	296	50	00.31	20.83	23.17	13.32	4.40	15.48
	18	297	51	38.86	+0.25	297	51	04.86	20.83	-23.03	-13.21	+4.45	15.53
	19	298	52	42.79	0.29	298	52	08.87	20.83	22.89	13.14	4.51	15.59
	20	299	53	46.19	0.32	299	53	12.30	20.83	22.75	13.10	4.58	15.66
	21	300	54	49.09	0.32	300	54	15.19	20.83	22.61	13.12	4.65	15.72
	22	301	55	51.53	0.29	301	55	17.58	20.83	22.47	13.17	4.71	15.78
	23	302	56	53.49	0.22	302	56	19.46	20.82	22.33	13.25	4.75	15.82
	24	303	57	54.99	+0.14	303	57	20.88	20.82	-22.19	-13.33	+4.77	15.84
	25	304	58	56.00	+0.04	304	58	21.83	20.82	22.05	13.40	4.77	15.84
	26	305	59	56.58	-0.07	305	59	22.38	20.82	21.91	13.42	4.75	15.82
	27	307	00	56.62	0.22	307	00	22.46	20.81	21.78	13.39	4.72	15.79
	28	308	01	56.14	0.36	308	01	22.08	20.81	21.64	13.29	4.70	15.76
	29	309	02	55.06	0.50	309	02	21.16	20.81	21.50	13.14	4.69	15.76
	30	310	03	53.27	-0.61	310	03	19.55	20.81	-21.36	-12.96	+4.71	15.78
	31	311	04	50.70	0.68	311	04	17.15	20.80	21.22	12.80	4.77	15.83
Feb	1	312	05	47.25	0.76	312	05	13.81	20.80	21.08	12.69	4.84	15.91
	2	313	06	42.83	0.79	313	06	09.43	20.80	20.94	12.64	4.93	15.99
	3	314	07	37.29	0.79	314	07	03.86	20.80	20.80	12.67	5.01	16.07
	4	315	08	30.50	0.76	315	07	57.00	20.79	20.66	12.75	5.07	16.13
	5	316	09	22.44	-0.72	316	08	48.84	20.79	-20.52	-12.86	+5.11	16.17
	6	317	10	13.01	0.65	317	09	39.31	20.79	20.39	12.96	5.13	16.18
	7	318	11	02.12	0.54	318	10	28.34	20.78	20.25	13.04	5.12	16.18
	8	319	11	49.79	0.40	319	11	15.97	20.78	20.11	13.09	5.11	16.16
	9	320	12	35.92	0.29	320	12	02.09	20.78	19.97	13.10	5.09	16.14
	10	321	13	20.52	0.18	321	12	46.73	20.77	19.83	13.07	5.08	16.13
	11	322	14	03.59	-0.04	322	13	29.86	20.77	-19.69	-13.01	+5.07	16.12
	12	323	14	45.09	+0.07	323	14	11.44	20.76	19.55	12.94	5.08	16.13
	13	324	15	25.00	0.18	324	14	51.43	20.76	19.41	12.86	5.11	16.16
	14	325	16	03.38	0.25	325	15	29.88	20.76	19.27	12.79	5.16	16.20
	15	326	16	40.16	+0.29	326	16	06.71	20.75	-19.13	-12.75	+5.22	16.26

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

SUN, 2022

FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	True Distance from the Earth	Semi Diameter '	"	Ephemeris Transit h	m	s
Jan	0	18	41	23.01	-23	05	48.56	0.983 3691	16	15.87	12	03	03.65
	1	18	45	48.21	23	01	12.64	0.983 3556	16	15.89	12	03	32.15
	2	18	50	13.11	22	56	09.13	0.983 3458	16	15.90	12	04	00.33
	3	18	54	37.68	22	50	38.19	0.983 3395	16	15.90	12	04	28.16
	4	18	59	01.87	22	44	39.97	0.983 3367	16	15.91	12	04	55.59
	5	19	03	25.66	22	38	14.65	0.983 3375	16	15.91	12	05	22.61
	6	19	07	49.00	-22	31	22.42	0.983 3420	16	15.90	12	05	49.16
	7	19	12	11.86	22	24	03.46	0.983 3506	16	15.89	12	06	15.22
	8	19	16	34.21	22	16	18.00	0.983 3636	16	15.88	12	06	40.77
	9	19	20	56.04	22	08	06.27	0.983 3811	16	15.86	12	07	05.78
	10	19	25	17.31	21	59	28.52	0.983 4035	16	15.84	12	07	30.21
	11	19	29	38.01	21	50	25.01	0.983 4311	16	15.81	12	07	54.06
	12	19	33	58.10	-21	40	56.01	0.983 4640	16	15.78	12	08	17.30
	13	19	38	17.58	21	31	01.81	0.983 5025	16	15.74	12	08	39.90
	14	19	42	36.42	21	20	42.71	0.983 5468	16	15.70	12	09	01.85
	15	19	46	54.60	21	09	59.00	0.983 5969	16	15.65	12	09	23.14
	16	19	51	12.11	20	58	51.00	0.983 6531	16	15.59	12	09	43.74
	17	19	55	28.93	20	47	19.01	0.983 7154	16	15.53	12	10	03.65
	18	19	59	45.05	-20	35	23.35	0.983 7839	16	15.46	12	10	22.85
	19	20	04	00.45	20	23	04.35	0.983 8585	16	15.39	12	10	41.33
	20	20	08	15.12	20	10	22.34	0.983 9394	16	15.31	12	10	59.08
	21	20	12	29.06	19	57	17.62	0.984 0263	16	15.22	12	11	16.09
	22	20	16	42.25	19	43	50.54	0.984 1192	16	15.13	12	11	32.35
	23	20	20	54.68	19	30	01.44	0.984 2178	16	15.03	12	11	47.85
	24	20	25	06.36	-19	15	50.63	0.984 3220	16	14.93	12	12	02.59
	25	20	29	17.27	19	01	18.48	0.984 4314	16	14.82	12	12	16.56
	26	20	33	27.42	18	46	25.35	0.984 5457	16	14.71	12	12	29.76
	27	20	37	36.79	18	31	11.59	0.984 6646	16	14.59	12	12	42.18
	28	20	41	45.38	18	15	37.59	0.984 7877	16	14.47	12	12	53.81
	29	20	45	53.18	17	59	43.75	0.984 9146	16	14.34	12	13	04.64
	30	20	50	00.19	-17	43	30.47	0.985 0450	16	14.21	12	13	14.68
	31	20	54	06.40	17	26	58.16	0.985 1786	16	14.08	12	13	23.91
Feb	1	20	58	11.79	17	10	07.25	0.985 3153	16	13.95	12	13	32.32
	2	21	02	16.36	16	52	58.15	0.985 4548	16	13.81	12	13	39.92
	3	21	06	20.10	16	35	31.28	0.985 5972	16	13.67	12	13	46.69
	4	21	10	23.02	16	17	47.05	0.985 7427	16	13.52	12	13	52.63
	5	21	14	25.11	-15	59	45.89	0.985 8914	16	13.38	12	13	57.76
	6	21	18	26.38	15	41	28.22	0.986 0434	16	13.23	12	14	02.06
	7	21	22	26.83	15	22	54.48	0.986 1990	16	13.07	12	14	05.54
	8	21	26	26.46	15	04	05.08	0.986 3584	16	12.92	12	14	08.21
	9	21	30	25.29	14	45	00.45	0.986 5218	16	12.76	12	14	10.07
	10	21	34	23.32	14	25	41.04	0.986 6893	16	12.59	12	14	11.14
	11	21	38	20.56	-14	06	07.26	0.986 8612	16	12.42	12	14	11.42
	12	21	42	17.01	13	46	19.54	0.987 0377	16	12.25	12	14	10.92
	13	21	46	12.70	13	26	18.30	0.987 2187	16	12.07	12	14	09.66
	14	21	50	07.63	13	06	03.96	0.987 4045	16	11.89	12	14	07.65
	15	21	54	01.81	-12	45	36.92	0.987 5952	16	11.70	12	14	04.89

SUN, 2022

FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra- tion	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Feb	15	326	16	40.16	+0.29	326	16	06.71	20.75	-19.13	-12.75	+5.22	16.26
	16	327	17	15.47	0.32	327	16	42.02	20.75	19.00	12.75	5.29	16.33
	17	328	17	49.24	0.32	328	17	15.76	20.74	18.86	12.79	5.36	16.40
	18	329	18	21.54	0.29	329	17	47.98	20.74	18.72	12.87	5.42	16.46
	19	330	18	52.40	0.25	330	18	18.72	20.74	18.58	12.99	5.47	16.51
	20	331	19	21.87	0.14	331	18	48.06	20.73	18.44	13.12	5.49	16.53
	21	332	19	49.95	+0.04	332	19	16.03	20.73	-18.30	-13.24	+5.49	16.53
	22	333	20	16.74	-0.07	333	19	42.74	20.72	18.16	13.32	5.47	16.51
	23	334	20	42.14	0.22	334	20	08.12	20.72	18.02	13.34	5.44	16.47
	24	335	21	06.25	0.36	335	20	32.28	20.71	17.88	13.30	5.41	16.44
	25	336	21	29.02	0.47	336	20	55.14	20.71	17.74	13.21	5.40	16.43
	26	337	21	50.42	0.58	337	21	16.67	20.70	17.61	13.09	5.40	16.43
	27	338	22	10.42	-0.68	338	21	36.79	20.70	-17.47	-12.97	+5.44	16.47
	28	339	22	28.94	0.76	339	21	55.40	20.69	17.33	12.89	5.50	16.53
Mar	1	340	22	45.90	0.79	340	22	12.40	20.69	17.19	12.87	5.58	16.60
	2	341	23	01.24	0.79	341	22	27.70	20.68	17.05	12.91	5.65	16.68
	3	342	23	14.88	0.76	342	22	41.23	20.68	16.91	13.01	5.71	16.74
	4	343	23	26.67	0.72	343	22	52.90	20.67	16.77	13.15	5.75	16.78
	5	344	23	36.60	-0.61	344	23	02.69	20.67	-16.63	-13.29	+5.77	16.79
	6	345	23	44.54	0.50	345	23	10.50	20.66	16.49	13.42	5.76	16.78
	7	346	23	50.46	0.40	346	23	16.33	20.66	16.35	13.52	5.74	16.75
	8	347	23	54.29	0.29	347	23	20.11	20.65	16.22	13.57	5.71	16.72
	9	348	23	56.03	0.14	348	23	21.84	20.65	16.08	13.59	5.68	16.69
	10	349	23	55.61	-0.04	349	23	21.44	20.64	15.94	13.57	5.66	16.67
	11	350	23	53.01	+0.07	350	23	18.89	20.64	-15.80	-13.53	+5.65	16.66
	12	351	23	48.24	0.18	351	23	14.17	20.63	15.66	13.48	5.66	16.67
	13	352	23	41.27	0.25	352	23	07.26	20.62	15.52	13.44	5.68	16.69
	14	353	23	32.17	0.32	353	22	58.19	20.62	15.38	13.41	5.72	16.73
	15	354	23	20.87	0.36	354	22	46.88	20.61	15.24	13.42	5.78	16.79
	16	355	23	07.46	0.36	355	22	33.42	20.61	15.10	13.47	5.83	16.84
	17	356	22	51.92	+0.32	356	22	17.80	20.60	-14.96	-13.57	+5.89	16.89
	18	357	22	34.34	0.29	357	22	00.08	20.60	14.83	13.70	5.92	16.93
	19	358	22	14.76	0.22	358	21	40.36	20.59	14.69	13.86	5.94	16.94
	20	359	21	53.19	+0.11	359	21	18.65	20.59	14.55	14.00	5.93	16.93
	21	0	21	29.75	-0.04	0	20	55.10	20.58	14.41	14.11	5.90	16.90
	22	1	21	04.49	0.14	1	20	29.80	20.57	14.27	14.16	5.85	16.85
	23	2	20	37.44	-0.29	2	20	02.76	20.57	-14.13	-14.15	+5.80	16.80
	24	3	20	08.63	0.43	3	19	34.03	20.56	13.99	14.09	5.76	16.76
	25	4	19	38.11	0.54	4	19	03.61	20.56	13.85	13.98	5.75	16.74
	26	5	19	05.88	0.61	5	18	31.50	20.55	13.71	13.88	5.76	16.75
	27	6	18	31.92	0.68	6	17	57.62	20.54	13.57	13.80	5.80	16.79
	28	7	17	56.25	0.72	7	17	21.98	20.54	13.43	13.77	5.85	16.84
	29	8	17	18.73	-0.76	8	16	44.44	20.53	-13.30	-13.81	+5.91	16.90
	30	9	16	39.40	0.72	9	16	05.02	20.53	13.16	13.90	5.95	16.94
	31	10	15	58.16	0.65	10	15	23.65	20.52	13.02	14.04	5.98	16.97
Apr	1	11	15	14.96	0.58	11	14	40.31	20.51	12.88	14.19	5.99	16.97
	2	12	14	29.74	-0.47	12	13	54.95	20.51	-12.74	-14.33	+5.97	16.95

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

SUN, 2022

FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Feb	15	21	54	01.81	-12	45	36.92	0.987 5952	16	11.70	12	14	04.89
	16	21	57	55.25	12	24	57.60	0.987 7908	16	11.51	12	14	01.42
	17	22	01	47.98	12	04	06.39	0.987 9914	16	11.31	12	13	57.23
	18	22	05	40.01	11	43	03.68	0.988 1968	16	11.11	12	13	52.36
	19	22	09	31.35	11	21	49.86	0.988 4072	16	10.90	12	13	46.81
	20	22	13	22.03	11	00	25.31	0.988 6222	16	10.69	12	13	40.61
	21	22	17	12.06	-10	38	50.40	0.988 8416	16	10.47	12	13	33.77
	22	22	21	01.46	10	17	05.51	0.989 0654	16	10.25	12	13	26.31
	23	22	24	50.25	9	55	11.03	0.989 2929	16	10.03	12	13	18.25
	24	22	28	38.46	9	33	07.35	0.989 5240	16	09.80	12	13	09.60
	25	22	32	26.09	9	10	54.87	0.989 7582	16	09.58	12	13	00.38
	26	22	36	13.16	8	48	33.99	0.989 9951	16	09.34	12	12	50.61
	27	22	39	59.68	-8	26	05.13	0.990 2343	16	09.11	12	12	40.30
	28	22	43	45.67	8	03	28.72	0.990 4753	16	08.87	12	12	29.46
Mar	1	22	47	31.14	7	40	45.17	0.990 7180	16	08.64	12	12	18.12
	2	22	51	16.10	7	17	54.91	0.990 9621	16	08.40	12	12	06.27
	3	22	55	00.56	6	54	58.35	0.991 2073	16	08.16	12	11	53.94
	4	22	58	44.54	6	31	55.90	0.991 4538	16	07.92	12	11	41.14
	5	23	02	28.06	-6	08	47.98	0.991 7014	16	07.68	12	11	27.89
	6	23	06	11.13	5	45	35.00	0.991 9502	16	07.43	12	11	14.20
	7	23	09	53.78	5	22	17.36	0.992 2004	16	07.19	12	11	00.08
	8	23	13	36.02	4	58	55.47	0.992 4520	16	06.94	12	10	45.57
	9	23	17	17.86	4	35	29.75	0.992 7053	16	06.70	12	10	30.67
	10	23	20	59.33	4	12	00.57	0.992 9604	16	06.45	12	10	15.40
	11	23	24	40.45	-3	48	28.35	0.993 2175	16	06.20	12	09	59.79
	12	23	28	21.24	3	24	53.46	0.993 4766	16	05.95	12	09	43.86
	13	23	32	01.71	3	01	16.30	0.993 7380	16	05.69	12	09	27.63
	14	23	35	41.88	2	37	37.24	0.994 0018	16	05.44	12	09	11.11
	15	23	39	21.78	2	13	56.65	0.994 2681	16	05.18	12	08	54.33
	16	23	43	01.44	1	50	14.90	0.994 5370	16	04.92	12	08	37.32
	17	23	46	40.86	-1	26	32.35	0.994 8087	16	04.65	12	08	20.09
	18	23	50	20.08	1	02	49.33	0.995 0832	16	04.39	12	08	02.67
	19	23	53	59.12	0	39	06.18	0.995 3604	16	04.12	12	07	45.09
	20	23	57	38.01	-0	15	23.23	0.995 6404	16	03.85	12	07	27.37
	21	0	01	16.77	+0	08	19.21	0.995 9229	16	03.57	12	07	09.53
	22	0	04	55.43	0	32	00.79	0.996 2079	16	03.30	12	06	51.60
	23	0	08	34.02	+0	55	41.21	0.996 4949	16	03.02	12	06	33.60
	24	0	12	12.55	1	19	20.11	0.996 7836	16	02.74	12	06	15.55
	25	0	15	51.04	1	42	57.16	0.997 0736	16	02.46	12	05	57.48
	26	0	19	29.52	2	06	31.99	0.997 3645	16	02.18	12	05	39.40
	27	0	23	08.00	2	30	04.24	0.997 6558	16	01.90	12	05	21.34
	28	0	26	46.51	2	53	33.53	0.997 9472	16	01.62	12	05	03.30
	29	0	30	25.04	+3	16	59.50	0.998 2382	16	01.34	12	04	45.32
	30	0	34	03.63	3	40	21.77	0.998 5286	16	01.06	12	04	27.40
	31	0	37	42.30	4	03	39.97	0.998 8181	16	00.78	12	04	09.56
Apr	1	0	41	21.05	4	26	53.73	0.999 1065	16	00.50	12	03	51.81
	2	0	44	59.90	+4	50	02.67	0.999 3938	16	00.23	12	03	34.18

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra- tion	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Apr	1	11	15	14.96	-0.58	11	14	40.31	20.51	-12.88	-14.19	+5.99	16.97
	2	12	14	29.74	0.47	12	13	54.95	20.51	12.74	14.33	5.97	16.95
	3	13	13	42.43	0.36	13	13	07.54	20.50	12.60	14.44	5.93	16.91
	4	14	12	52.96	0.22	14	12	18.00	20.50	12.46	14.51	5.88	16.86
	5	15	12	01.32	-0.11	15	11	26.34	20.49	12.32	14.53	5.83	16.81
	6	16	11	07.44	+0.04	16	10	32.48	20.48	12.18	14.52	5.79	16.77
	7	17	10	11.34	+0.14	17	09	36.43	20.48	-12.04	-14.48	+5.76	16.74
	8	18	09	12.93	0.25	18	08	38.08	20.47	11.91	14.42	5.74	16.72
	9	19	08	12.28	0.36	19	07	37.49	20.47	11.77	14.37	5.75	16.72
	10	20	07	09.31	0.40	20	06	34.56	20.46	11.63	14.33	5.77	16.74
	11	21	06	04.06	0.47	21	05	29.33	20.46	11.49	14.32	5.80	16.77
	12	22	04	56.57	0.47	22	04	21.83	20.45	11.35	14.34	5.84	16.81
	13	23	03	46.80	+0.43	23	03	11.99	20.44	-11.21	-14.41	+5.87	16.85
	14	24	02	34.86	0.40	24	01	59.95	20.44	11.07	14.52	5.90	16.87
	15	25	01	20.72	0.32	25	00	45.68	20.43	10.93	14.65	5.91	16.88
	16	26	00	04.53	0.22	25	59	29.36	20.43	10.79	14.78	5.89	16.86
	17	26	58	46.26	+0.11	26	58	10.99	20.42	10.65	14.89	5.85	16.82
	18	27	57	26.06	-0.04	27	56	50.75	20.42	10.52	14.95	5.79	16.76
	19	28	56	04.03	-0.14	28	55	28.74	20.41	-10.38	-14.93	+5.72	16.69
	20	29	54	40.17	0.29	29	54	04.97	20.40	10.24	14.85	5.66	16.63
	21	30	53	14.65	0.40	30	52	39.58	20.40	10.10	14.72	5.63	16.59
	22	31	51	47.42	0.50	31	51	12.49	20.39	09.96	14.58	5.62	16.58
	23	32	50	18.63	0.58	32	49	43.82	20.39	09.82	14.46	5.64	16.60
	24	33	48	48.27	0.65	33	48	13.54	20.38	09.68	14.40	5.68	16.63
	25	34	47	16.28	-0.65	34	46	41.56	20.38	-09.54	-14.39	+5.72	16.68
	26	35	45	42.77	0.61	35	45	07.99	20.37	09.40	14.45	5.76	16.71
	27	36	44	07.64	0.58	36	43	32.77	20.37	09.26	14.54	5.78	16.73
	28	37	42	30.84	0.50	37	41	55.86	20.36	09.12	14.66	5.78	16.73
	29	38	40	52.41	0.40	38	40	17.33	20.35	08.99	14.78	5.76	16.71
	30	39	39	12.28	0.29	39	38	37.10	20.35	08.85	14.87	5.71	16.66
May	1	40	37	30.37	-0.14	40	36	55.15	20.34	-08.71	-14.92	+5.66	16.61
	2	41	35	46.69	-0.00	41	35	11.47	20.34	08.57	14.93	5.60	16.55
	3	42	34	01.18	+0.11	42	33	25.99	20.33	08.43	14.89	5.55	16.49
	4	43	32	13.82	0.25	43	31	38.71	20.33	08.29	14.83	5.50	16.45
	5	44	30	24.62	0.36	44	29	49.60	20.32	08.15	14.74	5.47	16.42
	6	45	28	33.50	0.47	45	27	58.57	20.32	08.01	14.65	5.46	16.41
	7	46	26	40.48	+0.54	46	26	05.64	20.31	-07.87	-14.57	+5.47	16.41
	8	47	24	45.54	0.58	47	24	10.76	20.31	07.73	14.51	5.49	16.43
	9	48	22	48.70	0.61	48	22	13.94	20.31	07.60	14.49	5.52	16.46
	10	49	20	49.98	0.61	49	20	15.22	20.30	07.46	14.51	5.56	16.49
	11	50	18	49.36	0.58	50	18	14.54	20.30	07.32	14.57	5.58	16.52
	12	51	16	46.90	0.50	51	16	12.00	20.29	07.18	14.65	5.59	16.53
	13	52	14	42.65	+0.40	52	14	07.66	20.29	-07.04	-14.75	+5.59	16.52
	14	53	12	36.62	0.29	53	12	01.55	20.28	06.90	14.84	5.55	16.48
	15	54	10	28.93	0.18	54	09	53.82	20.28	06.76	14.88	5.49	16.42
	16	55	08	19.66	+0.04	55	07	44.58	20.27	06.62	14.85	5.42	16.35
	17	56	06	08.87	-0.11	56	05	33.90	20.27	-06.48	-14.75	+5.36	16.28

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

SUN, 2022

FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Apr	1	0	41	21.05	+4	26	53.73	0.999 1065	16	00.50	12	03	51.81
	2	0	44	59.90	4	50	02.67	0.999 3938	16	00.23	12	03	34.18
	3	0	48	38.88	5	13	06.44	0.999 6798	15	59.95	12	03	16.68
	4	0	52	17.99	5	36	04.65	0.999 9646	15	59.68	12	02	59.32
	5	0	55	57.26	5	58	56.94	1.000 2482	15	59.41	12	02	42.12
	6	0	59	36.70	6	21	42.94	1.000 5308	15	59.14	12	02	25.10
	7	1	03	16.32	+6	44	22.29	1.000 8124	15	58.87	12	02	08.27
	8	1	06	56.15	7	06	54.64	1.001 0931	15	58.60	12	01	51.64
	9	1	10	36.19	7	29	19.62	1.001 3732	15	58.33	12	01	35.25
	10	1	14	16.47	7	51	36.87	1.001 6527	15	58.06	12	01	19.09
	11	1	17	57.00	8	13	46.07	1.001 9318	15	57.79	12	01	03.20
	12	1	21	37.79	8	35	46.85	1.002 2107	15	57.53	12	00	47.59
	13	1	25	18.87	+8	57	38.88	1.002 4895	15	57.26	12	00	32.27
	14	1	29	00.25	9	19	21.83	1.002 7683	15	57.00	12	00	17.26
	15	1	32	41.95	9	40	55.39	1.003 0475	15	56.73	12	00	02.58
	16	1	36	23.99	10	02	19.25	1.003 3269	15	56.46	11	59	48.26
	17	1	40	06.40	10	23	33.10	1.003 6068	15	56.20	11	59	34.31
	18	1	43	49.19	10	44	36.66	1.003 8870	15	55.93	11	59	20.74
	19	1	47	32.38	+11	05	29.64	1.004 1675	15	55.66	11	59	07.58
	20	1	51	15.99	11	26	11.73	1.004 4480	15	55.40	11	58	54.85
	21	1	55	00.04	11	46	42.64	1.004 7283	15	55.13	11	58	42.56
	22	1	58	44.54	12	07	02.05	1.005 0080	15	54.86	11	58	30.73
	23	2	02	29.50	12	27	09.62	1.005 2866	15	54.60	11	58	19.36
	24	2	06	14.93	12	47	05.03	1.005 5638	15	54.34	11	58	08.48
	25	2	10	00.85	+13	06	47.93	1.005 8392	15	54.07	11	57	58.09
	26	2	13	47.27	13	26	17.98	1.006 1122	15	53.81	11	57	48.21
	27	2	17	34.18	13	45	34.83	1.006 3827	15	53.56	11	57	38.83
	28	2	21	21.61	14	04	38.15	1.006 6502	15	53.31	11	57	29.98
	29	2	25	09.57	14	23	27.60	1.006 9146	15	53.05	11	57	21.64
	30	2	28	58.04	14	42	02.83	1.007 1757	15	52.81	11	57	13.83
May	1	2	32	47.06	+15	00	23.51	1.007 4333	15	52.56	11	57	06.56
	2	2	36	36.61	15	18	29.31	1.007 6873	15	52.32	11	56	59.82
	3	2	40	26.70	15	36	19.90	1.007 9379	15	52.09	11	56	53.62
	4	2	44	17.33	15	53	54.93	1.008 1849	15	51.85	11	56	47.97
	5	2	48	08.51	16	11	14.07	1.008 4284	15	51.62	11	56	42.86
	6	2	52	00.23	16	28	17.01	1.008 6686	15	51.40	11	56	38.29
	7	2	55	52.50	+16	45	03.43	1.008 9055	15	51.17	11	56	34.28
	8	2	59	45.32	17	01	32.99	1.009 1393	15	50.95	11	56	30.82
	9	3	03	38.69	17	17	45.40	1.009 3701	15	50.74	11	56	27.90
	10	3	07	32.61	17	33	40.34	1.009 5982	15	50.52	11	56	25.55
	11	3	11	27.09	17	49	17.52	1.009 8236	15	50.31	11	56	23.74
	12	3	15	22.11	18	04	36.64	1.010 0466	15	50.10	11	56	22.50
	13	3	19	17.69	+18	19	37.44	1.010 2675	15	49.89	11	56	21.80
	14	3	23	13.83	18	34	19.63	1.010 4864	15	49.69	11	56	21.67
	15	3	27	10.53	18	48	42.97	1.010 7036	15	49.48	11	56	22.10
	16	3	31	07.80	19	02	47.22	1.010 9190	15	49.28	11	56	23.08
	17	3	35	05.63	+19	16	32.14	1.011 1329	15	49.08	11	56	24.63

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
May	17	56	06	08.87	-0.11	56	05	33.90	20.27	-06.48	-14.75	+5.36	16.28
	18	57	03	56.73	0.22	57	03	21.92	20.27	06.34	14.58	5.31	16.23
	19	58	01	43.30	0.36	58	01	08.69	20.26	06.21	14.39	5.29	16.22
	20	58	59	28.66	0.43	58	58	54.23	20.26	06.07	14.22	5.30	16.23
	21	59	57	12.88	0.47	59	56	38.58	20.25	05.93	14.09	5.34	16.26
	22	60	54	56.08	0.50	60	54	21.85	20.25	05.79	14.03	5.39	16.31
	23	61	52	38.24	-0.50	61	52	04.01	20.25	-05.65	-14.03	+5.43	16.35
	24	62	50	19.36	0.47	62	49	45.08	20.24	05.51	14.08	5.46	16.38
	25	63	47	59.54	0.40	63	47	25.19	20.24	05.37	14.16	5.47	16.39
	26	64	45	38.68	0.29	64	45	04.25	20.23	05.23	14.24	5.46	16.37
	27	65	43	16.82	0.18	65	42	42.34	20.23	05.09	14.30	5.42	16.34
	28	66	40	53.93	-0.04	66	40	19.42	20.23	04.95	14.33	5.38	16.29
	29	67	38	29.98	+0.07	67	37	55.49	20.22	-04.81	-14.31	+5.32	16.24
	30	68	36	04.95	0.22	68	35	30.52	20.22	04.68	14.26	5.27	16.18
	31	69	33	38.84	0.36	69	33	04.50	20.22	04.54	14.16	5.23	16.14
Jun	1	70	31	11.62	0.47	70	30	37.40	20.21	04.40	14.05	5.21	16.12
	2	71	28	43.25	0.58	71	28	09.16	20.21	04.26	13.93	5.20	16.11
	3	72	26	13.73	0.65	72	25	39.76	20.21	04.12	13.81	5.21	16.12
	4	73	23	43.04	+0.68	73	23	09.17	20.20	-03.98	-13.71	+5.24	16.14
	5	74	21	11.16	0.72	74	20	37.36	20.20	03.84	13.65	5.27	16.18
	6	75	18	38.10	0.72	75	18	04.32	20.20	03.70	13.63	5.31	16.22
	7	76	16	03.89	0.72	76	15	30.10	20.20	03.56	13.64	5.35	16.25
	8	77	13	28.49	0.65	77	12	54.65	20.19	03.42	13.69	5.38	16.28
	9	78	10	51.99	0.58	78	10	18.08	20.19	03.29	13.76	5.39	16.29
	10	79	08	14.34	+0.47	79	07	40.37	20.19	-03.15	-13.83	+5.38	16.27
	11	80	05	35.61	0.36	80	05	01.61	20.19	03.01	13.86	5.34	16.23
	12	81	02	55.89	0.22	81	02	21.91	20.19	02.87	13.84	5.29	16.18
	13	82	00	15.28	+0.07	81	59	41.39	20.18	02.73	13.75	5.23	16.12
	14	82	57	33.79	-0.04	82	57	00.07	20.18	02.59	13.58	5.18	16.07
	15	83	54	51.58	0.18	83	54	18.07	20.18	02.45	13.37	5.16	16.05
	16	84	52	08.74	-0.25	84	51	35.46	20.18	-02.31	-13.15	+5.18	16.07
	17	85	49	25.44	0.32	85	48	52.34	20.18	02.17	12.97	5.22	16.11
	18	86	46	41.74	0.36	86	46	08.76	20.17	02.03	12.86	5.29	16.17
	19	87	43	57.72	0.36	87	43	24.78	20.17	01.89	12.82	5.35	16.23
	20	88	41	13.44	0.32	88	40	40.48	20.17	01.76	12.84	5.40	16.28
	21	89	38	28.97	0.29	89	37	55.96	20.17	01.62	12.89	5.43	16.31
	22	90	35	44.34	-0.18	90	35	11.26	20.17	-01.48	-12.96	+5.44	16.32
	23	91	32	59.54	-0.07	91	32	26.41	20.17	01.34	13.01	5.42	16.30
	24	92	30	14.58	+0.04	92	29	41.42	20.16	01.20	13.03	5.39	16.27
	25	93	27	29.50	0.18	93	26	56.36	20.16	01.06	13.02	5.36	16.23
	26	94	24	44.27	0.29	94	24	11.20	20.16	00.92	12.96	5.32	16.20
	27	95	21	58.90	0.43	95	21	25.92	20.16	00.78	12.86	5.29	16.17
	28	96	19	13.33	+0.54	96	18	40.46	20.16	-00.64	-12.75	+5.28	16.15
	29	97	16	27.60	0.65	97	15	54.86	20.16	00.50	12.62	5.28	16.16
	30	98	13	41.62	0.72	98	13	09.01	20.16	00.37	12.49	5.30	16.18
Jul	1	99	10	55.48	0.79	99	10	22.98	20.16	00.23	12.39	5.34	16.21
	2	100	08	09.05	+0.79	100	07	36.62	20.16	-00.09	-12.31	+5.39	16.26

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

SUN, 2022

FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
May	17	3	35	05.63	+19	16	32.14	1.011 1329	15	49.08	11	56	24.63
	18	3	39	04.03	19	29	57.50	1.011 3450	15	48.88	11	56	26.75
	19	3	43	02.99	19	43	03.06	1.011 5552	15	48.68	11	56	29.43
	20	3	47	02.52	19	55	48.57	1.011 7633	15	48.49	11	56	32.66
	21	3	51	02.60	20	08	13.77	1.011 9689	15	48.29	11	56	36.45
	22	3	55	03.22	20	20	18.40	1.012 1715	15	48.10	11	56	40.80
	23	3	59	04.39	+20	32	02.21	1.012 3709	15	47.92	11	56	45.68
	24	4	03	06.10	20	43	24.94	1.012 5665	15	47.74	11	56	51.09
	25	4	07	08.33	20	54	26.35	1.012 7581	15	47.56	11	56	57.03
	26	4	11	11.07	21	05	06.18	1.012 9454	15	47.38	11	57	03.47
	27	4	15	14.32	21	15	24.22	1.013 1280	15	47.21	11	57	10.41
	28	4	19	18.05	21	25	20.23	1.013 3058	15	47.04	11	57	17.83
	29	4	23	22.25	+21	34	54.00	1.013 4786	15	46.88	11	57	25.70
	30	4	27	26.91	21	44	05.31	1.013 6462	15	46.73	11	57	34.02
	31	4	31	32.00	21	52	53.95	1.013 8086	15	46.57	11	57	42.76
June	1	4	35	37.51	22	01	19.74	1.013 9658	15	46.43	11	57	51.91
	2	4	39	43.42	22	09	22.47	1.014 1177	15	46.29	11	58	01.44
	3	4	43	49.70	22	17	01.97	1.014 2645	15	46.15	11	58	11.34
	4	4	47	56.33	+22	24	18.05	1.014 4061	15	46.02	11	58	21.59
	5	4	52	03.30	22	31	10.56	1.014 5428	15	45.89	11	58	32.15
	6	4	56	10.58	22	37	39.33	1.014 6747	15	45.77	11	58	43.02
	7	5	00	18.14	22	43	44.23	1.014 8019	15	45.65	11	58	54.18
	8	5	04	25.98	22	49	25.12	1.014 9246	15	45.53	11	59	05.59
	9	5	08	34.07	22	54	41.87	1.015 0431	15	45.42	11	59	17.24
	10	5	12	42.38	+22	59	34.38	1.015 1577	15	45.32	11	59	29.12
	11	5	16	50.91	23	04	02.56	1.015 2686	15	45.21	11	59	41.19
	12	5	20	59.63	23	08	06.33	1.015 3761	15	45.11	11	59	53.45
	13	5	25	08.53	23	11	45.64	1.015 4804	15	45.02	12	00	05.86
	14	5	29	17.59	23	15	00.44	1.015 5817	15	44.92	12	00	18.43
	15	5	33	26.79	23	17	50.68	1.015 6802	15	44.83	12	00	31.12
	16	5	37	36.10	+23	20	16.34	1.015 7758	15	44.74	12	00	43.93
	17	5	41	45.52	23	22	17.36	1.015 8683	15	44.65	12	00	56.83
	18	5	45	55.02	23	23	53.70	1.015 9576	15	44.57	12	01	09.80
	19	5	50	04.58	23	25	05.31	1.016 0433	15	44.49	12	01	22.83
	20	5	54	14.18	23	25	52.15	1.016 1250	15	44.42	12	01	35.88
	21	5	58	23.79	23	26	14.20	1.016 2025	15	44.34	12	01	48.95
	22	6	02	33.41	+23	26	11.45	1.016 2753	15	44.28	12	02	02.01
	23	6	06	42.99	23	25	43.90	1.016 3432	15	44.21	12	02	15.02
	24	6	10	52.53	23	24	51.56	1.016 4059	15	44.16	12	02	27.97
	25	6	15	01.99	23	23	34.46	1.016 4631	15	44.10	12	02	40.83
	26	6	19	11.35	23	21	52.65	1.016 5147	15	44.05	12	02	53.57
	27	6	23	20.59	23	19	46.16	1.016 5606	15	44.01	12	03	06.17
	28	6	27	29.66	+23	17	15.05	1.016 6005	15	43.97	12	03	18.59
	29	6	31	38.56	23	14	19.40	1.016 6345	15	43.94	12	03	30.83
	30	6	35	47.24	23	10	59.28	1.016 6624	15	43.92	12	03	42.83
July	1	6	39	55.69	23	07	14.78	1.016 6844	15	43.90	12	03	54.60
	2	6	44	03.88	+23	03	06.00	1.016 7005	15	43.88	12	04	06.08

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Jul	1	99	10	55.48	+0.79	99	10	22.98	20.16	-00.23	-12.39	+5.34	16.21
	2	100	08	09.05	0.79	100	07	36.62	20.16	-00.09	12.31	5.39	16.26
	3	101	05	22.41	0.83	101	04	50.02	20.16	+00.05	12.28	5.45	16.32
	4	102	02	35.52	0.79	102	02	03.12	20.16	00.19	12.28	5.51	16.37
	5	102	59	48.34	0.76	102	59	15.90	20.16	00.33	12.32	5.55	16.42
	6	103	57	00.93	0.68	103	56	28.43	20.16	00.47	12.39	5.58	16.45
	7	104	54	13.24	+0.58	104	53	40.67	20.16	+00.61	-12.46	+5.59	16.45
	8	105	51	25.32	0.47	105	50	52.69	20.16	00.75	12.51	5.58	16.44
	9	106	48	37.17	0.32	106	48	04.54	20.16	00.89	12.52	5.55	16.41
	10	107	45	48.89	0.22	107	45	16.31	20.16	01.03	12.47	5.51	16.37
	11	108	43	00.47	+0.07	108	42	28.01	20.16	01.16	12.35	5.47	16.33
	12	109	40	12.02	-0.04	109	39	39.74	20.16	01.30	12.16	5.46	16.31
	13	110	37	23.62	-0.14	110	36	51.55	20.16	+01.44	-11.95	+5.47	16.33
	14	111	34	35.45	0.22	111	34	03.58	20.16	01.58	11.76	5.52	16.38
	15	112	31	47.52	0.25	112	31	15.78	20.16	01.72	11.62	5.60	16.45
	16	113	29	00.02	0.29	113	28	28.34	20.16	01.86	11.56	5.68	16.53
	17	114	26	13.03	0.25	114	25	41.34	20.17	02.00	11.57	5.75	16.60
	18	115	23	26.63	0.22	115	22	54.88	20.17	02.14	11.63	5.81	16.66
	19	116	20	40.90	-0.11	116	20	09.06	20.17	+02.28	-11.71	+5.84	16.68
	20	117	17	55.91	-0.04	117	17	24.00	20.17	02.42	11.79	5.84	16.69
	21	118	15	11.62	+0.07	118	14	39.66	20.17	02.56	11.84	5.83	16.67
	22	119	12	28.16	0.22	119	11	56.18	20.17	02.69	11.85	5.81	16.65
	23	120	09	45.45	0.32	120	09	13.50	20.17	02.83	11.82	5.78	16.62
	24	121	07	03.53	0.47	121	06	31.64	20.17	02.97	11.75	5.76	16.61
	25	122	04	22.44	+0.58	122	03	50.65	20.18	+03.11	-11.66	+5.76	16.60
	26	123	01	42.14	0.65	123	01	10.45	20.18	03.25	11.55	5.77	16.61
	27	123	59	02.59	0.76	123	58	31.01	20.18	03.39	11.45	5.80	16.64
	28	124	56	23.82	0.79	124	55	52.32	20.18	03.53	11.36	5.85	16.68
	29	125	53	45.84	0.83	125	53	14.39	20.18	03.67	11.31	5.91	16.74
	30	126	51	08.57	0.83	126	50	37.14	20.19	03.81	11.29	5.98	16.81
	31	127	48	32.00	+0.83	127	48	00.54	20.19	+03.95	-11.32	+6.04	16.88
Aug	1	128	45	56.15	0.79	128	45	24.62	20.19	04.08	11.38	6.10	16.93
	2	129	43	20.94	0.72	129	42	49.32	20.19	04.22	11.47	6.15	16.98
	3	130	40	46.42	0.61	130	40	14.70	20.20	04.36	11.57	6.17	17.00
	4	131	38	12.54	0.50	131	37	40.73	20.20	04.50	11.66	6.17	17.00
	5	132	35	39.32	0.36	132	35	07.44	20.20	04.64	11.72	6.16	16.98
	6	133	33	06.75	+0.25	133	32	34.87	20.21	+04.78	-11.72	+6.13	16.95
	7	134	30	34.85	+0.11	134	30	03.02	20.21	04.92	11.66	6.10	16.92
	8	135	28	03.67	-0.00	135	27	31.97	20.21	05.06	11.54	6.08	16.90
	9	136	25	33.25	0.11	136	25	01.70	20.21	05.20	11.38	6.09	16.91
	10	137	23	03.69	0.18	137	22	32.30	20.22	05.34	11.21	6.13	16.95
	11	138	20	35.03	0.25	138	20	03.77	20.22	05.48	11.08	6.20	17.02
	12	139	18	07.41	-0.25	139	17	36.20	20.22	+05.61	-11.02	+6.29	17.11
	13	140	15	40.94	0.25	140	15	09.72	20.23	05.75	11.04	6.38	17.19
	14	141	13	15.73	0.22	141	12	44.42	20.23	05.89	11.12	6.44	17.26
	15	142	10	51.85	0.11	142	10	20.42	20.23	06.03	11.24	6.49	17.30
	16	143	08	29.41	-0.04	143	07	57.86	20.24	+06.17	-11.36	+6.50	17.31

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

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FOR 0^{h} TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
July	1	6	39	55.69	+23	07	14.78	1.016 6844	15	43.90	12	03	54.60
	2	6	44	03.88	23	03	06.00	1.016 7005	15	43.88	12	04	06.08
	3	6	48	11.78	22	58	33.04	1.016 7107	15	43.87	12	04	17.27
	4	6	52	19.36	22	53	36.01	1.016 7151	15	43.87	12	04	28.14
	5	6	56	26.61	22	48	15.04	1.016 7140	15	43.87	12	04	38.67
	6	7	00	33.51	22	42	30.26	1.016 7076	15	43.87	12	04	48.83
	7	7	04	40.03	+22	36	21.83	1.016 6961	15	43.89	12	04	58.60
	8	7	08	46.16	22	29	49.89	1.016 6797	15	43.90	12	05	07.97
	9	7	12	51.87	22	22	54.63	1.016 6588	15	43.92	12	05	16.91
	10	7	16	57.16	22	15	36.21	1.016 6337	15	43.94	12	05	25.42
	11	7	21	02.01	22	07	54.84	1.016 6048	15	43.97	12	05	33.48
	12	7	25	06.40	21	59	50.72	1.016 5724	15	44.00	12	05	41.07
	13	7	29	10.33	+21	51	24.04	1.016 5366	15	44.03	12	05	48.19
	14	7	33	13.78	21	42	35.02	1.016 4977	15	44.07	12	05	54.83
	15	7	37	16.74	21	33	23.83	1.016 4557	15	44.11	12	06	00.98
	16	7	41	19.20	21	23	50.68	1.016 4105	15	44.15	12	06	06.63
	17	7	45	21.15	21	13	55.73	1.016 3620	15	44.20	12	06	11.77
	18	7	49	22.59	21	03	39.19	1.016 3098	15	44.24	12	06	16.40
	19	7	53	23.51	+20	53	01.25	1.016 2537	15	44.30	12	06	20.51
	20	7	57	23.91	20	42	02.14	1.016 1933	15	44.35	12	06	24.08
	21	8	01	23.77	20	30	42.08	1.016 1285	15	44.41	12	06	27.12
	22	8	05	23.09	20	19	01.30	1.016 0589	15	44.48	12	06	29.60
	23	8	09	21.85	20	07	00.06	1.015 9844	15	44.55	12	06	31.52
	24	8	13	20.05	19	54	38.60	1.015 9046	15	44.62	12	06	32.88
	25	8	17	17.69	+19	41	57.20	1.015 8195	15	44.70	12	06	33.66
	26	8	21	14.74	19	28	56.12	1.015 7290	15	44.78	12	06	33.85
	27	8	25	11.20	19	15	35.63	1.015 6328	15	44.87	12	06	33.46
	28	8	29	07.07	19	01	56.01	1.015 5310	15	44.97	12	06	32.46
	29	8	33	02.33	18	47	57.54	1.015 4235	15	45.07	12	06	30.86
	30	8	36	56.98	18	33	40.51	1.015 3103	15	45.17	12	06	28.64
	31	8	40	51.02	+18	19	05.20	1.015 1914	15	45.28	12	06	25.82
Aug	1	8	44	44.44	18	04	11.92	1.015 0671	15	45.40	12	06	22.37
	2	8	48	37.23	17	49	00.95	1.014 9373	15	45.52	12	06	18.30
	3	8	52	29.41	17	33	32.59	1.014 8024	15	45.65	12	06	13.61
	4	8	56	20.96	17	17	47.16	1.014 6625	15	45.78	12	06	08.30
	5	9	00	11.89	17	01	44.95	1.014 5179	15	45.91	12	06	02.36
	6	9	04	02.20	+16	45	26.28	1.014 3689	15	46.05	12	05	55.81
	7	9	07	51.90	16	28	51.48	1.014 2160	15	46.19	12	05	48.64
	8	9	11	40.99	16	12	00.85	1.014 0594	15	46.34	12	05	40.86
	9	9	15	29.47	15	54	54.72	1.013 8997	15	46.49	12	05	32.48
	10	9	19	17.37	15	37	33.40	1.013 7370	15	46.64	12	05	23.52
	11	9	23	04.67	15	19	57.19	1.013 5718	15	46.80	12	05	13.97
	12	9	26	51.40	+15	02	06.39	1.013 4042	15	46.95	12	05	03.86
	13	9	30	37.56	14	44	01.27	1.013 2343	15	47.11	12	04	53.19
	14	9	34	23.18	14	25	42.11	1.013 0620	15	47.27	12	04	41.98
	15	9	38	08.25	14	07	09.17	1.012 8874	15	47.43	12	04	30.25
	16	9	41	52.81	+13	48	22.73	1.012 7100	15	47.60	12	04	18.00

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Aug	16	143	08	29.41	-0.04	143	07	57.86	20.24	+06.17	-11.36	+6.50	17.31
	17	144	06	08.46	+0.07	144	05	36.82	20.24	06.31	11.45	6.50	17.31
	18	145	03	49.06	0.22	145	03	17.35	20.25	06.45	11.51	6.48	17.28
	19	146	01	31.24	0.32	146	00	59.51	20.25	06.59	11.53	6.45	17.26
	20	146	59	14.99	0.43	146	58	43.28	20.25	06.73	11.50	6.43	17.24
	21	147	57	00.41	0.54	147	56	28.75	20.26	06.87	11.45	6.42	17.23
	22	148	54	47.44	+0.65	148	54	15.84	20.26	+07.01	-11.38	+6.43	17.23
	23	149	52	36.08	0.72	149	52	04.55	20.26	07.14	11.31	6.46	17.26
	24	150	50	26.35	0.79	150	49	54.88	20.27	07.28	11.25	6.50	17.30
	25	151	48	18.24	0.83	151	47	46.79	20.27	07.42	11.22	6.55	17.35
	26	152	46	11.75	0.83	152	45	40.28	20.28	07.56	11.23	6.62	17.42
	27	153	44	06.78	0.83	153	43	35.26	20.28	07.70	11.28	6.68	17.48
	28	154	42	03.39	+0.76	154	41	31.78	20.29	+07.84	-11.37	+6.74	17.54
	29	155	40	01.48	0.68	155	39	29.74	20.29	07.98	11.50	6.79	17.58
	30	156	38	01.06	0.61	156	37	29.17	20.30	08.12	11.63	6.81	17.60
	31	157	36	02.10	0.47	157	35	30.08	20.30	08.26	11.76	6.81	17.60
Sep	1	158	34	04.53	0.36	158	33	32.40	20.31	08.40	11.87	6.79	17.58
	2	159	32	08.34	0.22	159	31	36.16	20.31	08.54	11.92	6.76	17.55
	3	160	30	13.53	+0.11	160	29	41.35	20.32	+08.67	-11.91	+6.72	17.51
	4	161	28	20.10	-0.04	161	27	47.99	20.32	08.81	11.84	6.70	17.48
	5	162	26	28.00	0.14	162	25	55.99	20.33	08.95	11.73	6.69	17.48
	6	163	24	37.37	0.22	163	24	05.47	20.33	09.09	11.61	6.71	17.50
	7	164	22	48.12	0.29	164	22	16.32	20.34	09.23	11.51	6.77	17.55
	8	165	21	00.40	0.32	165	20	28.64	20.34	09.37	11.46	6.84	17.62
	9	166	19	14.26	-0.29	166	18	42.48	20.35	+09.51	-11.48	+6.91	17.69
	10	167	17	29.77	0.25	167	16	57.90	20.35	09.65	11.56	6.98	17.76
	11	168	15	47.06	0.18	168	15	15.05	20.36	09.79	11.70	7.02	17.80
	12	169	14	06.20	-0.11	169	13	34.03	20.36	09.93	11.85	7.04	17.81
	13	170	12	27.23	+0.00	170	11	54.92	20.37	10.07	11.99	7.03	17.80
	14	171	10	50.32	0.14	171	10	17.90	20.37	10.20	12.09	7.00	17.77
	15	172	09	15.44	+0.25	172	08	42.97	20.38	+10.34	-12.14	+6.96	17.73
	16	173	07	42.69	0.40	173	07	10.20	20.38	10.48	12.15	6.92	17.69
	17	174	06	12.06	0.50	174	05	39.59	20.39	10.62	12.13	6.90	17.67
	18	175	04	43.56	0.61	175	04	11.14	20.39	10.76	12.08	6.89	17.65
	19	176	03	17.26	0.68	176	02	44.88	20.40	10.90	12.03	6.89	17.66
	20	177	01	53.13	0.76	177	01	20.78	20.40	11.04	11.99	6.91	17.68
	21	178	00	31.18	+0.79	177	59	58.85	20.41	+11.18	-11.96	+6.95	17.72
	22	178	59	11.38	0.79	178	58	39.04	20.42	11.32	11.98	7.00	17.76
	23	179	57	53.72	0.76	179	57	21.31	20.42	11.46	12.03	7.05	17.81
	24	180	56	38.18	0.72	180	56	05.68	20.43	11.60	12.13	7.10	17.86
	25	181	55	24.70	0.65	181	54	52.06	20.43	11.73	12.26	7.13	17.89
	26	182	54	13.25	0.54	182	53	40.45	20.44	11.87	12.41	7.15	17.91
	27	183	53	03.82	+0.43	183	52	30.86	20.44	+12.01	-12.55	+7.14	17.90
	28	184	51	56.30	0.32	184	51	23.22	20.45	12.15	12.68	7.11	17.86
	29	185	50	50.64	0.18	185	50	17.48	20.46	12.29	12.75	7.06	17.81
	30	186	49	46.80	+0.04	186	49	13.62	20.46	12.43	12.76	7.01	17.76
Oct	1	187	48	44.76	-0.11	187	48	11.63	20.47	+12.57	-12.71	+6.96	17.71

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

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FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Aug	16	9	41	52.81	+13	48	22.73	1.012 7100	15	47.60	12	04	18.00
	17	9	45	36.85	13	29	23.07	1.012 5299	15	47.77	12	04	05.25
	18	9	49	20.41	13	10	10.51	1.012 3467	15	47.94	12	03	52.00
	19	9	53	03.48	12	50	45.33	1.012 1602	15	48.12	12	03	38.28
	20	9	56	46.08	12	31	07.86	1.011 9701	15	48.29	12	03	24.09
	21	10	00	28.22	12	11	18.40	1.011 7764	15	48.48	12	03	09.45
	22	10	04	09.90	+11	51	17.29	1.011 5788	15	48.66	12	02	54.36
	23	10	07	51.15	11	31	04.85	1.011 3772	15	48.85	12	02	38.83
	24	10	11	31.97	11	10	41.40	1.011 1714	15	49.04	12	02	22.88
	25	10	15	12.37	10	50	07.28	1.010 9614	15	49.24	12	02	06.53
	26	10	18	52.36	10	29	22.81	1.010 7471	15	49.44	12	01	49.77
	27	10	22	31.96	10	08	28.33	1.010 5283	15	49.65	12	01	32.62
	28	10	26	11.16	+9	47	24.18	1.010 3053	15	49.86	12	01	15.09
	29	10	29	50.00	9	26	10.69	1.010 0779	15	50.07	12	00	57.20
	30	10	33	28.48	9	04	48.20	1.009 8462	15	50.29	12	00	38.96
	31	10	37	06.61	8	43	17.05	1.009 6105	15	50.51	12	00	20.38
Sept.	1	10	40	44.41	8	21	37.58	1.009 3710	15	50.74	12	00	01.48
	2	10	44	21.90	7	59	50.13	1.009 1279	15	50.96	11	59	42.26
	3	10	47	59.09	+7	37	55.04	1.008 8815	15	51.20	11	59	22.76
	4	10	51	35.99	7	15	52.66	1.008 6322	15	51.43	11	59	02.97
	5	10	55	12.63	6	53	43.33	1.008 3804	15	51.67	11	58	42.92
	6	10	58	49.02	6	31	27.40	1.008 1266	15	51.91	11	58	22.64
	7	11	02	25.17	6	09	05.19	1.007 8711	15	52.15	11	58	02.13
	8	11	06	01.12	5	46	37.04	1.007 6143	15	52.39	11	57	41.42
	9	11	09	36.87	+5	24	03.24	1.007 3566	15	52.64	11	57	20.54
	10	11	13	12.45	5	01	24.09	1.007 0981	15	52.88	11	56	59.50
	11	11	16	47.89	4	38	39.87	1.006 8390	15	53.13	11	56	38.34
	12	11	20	23.21	4	15	50.87	1.006 5793	15	53.37	11	56	17.07
	13	11	23	58.44	3	52	57.37	1.006 3190	15	53.62	11	55	55.71
	14	11	27	33.59	3	29	59.66	1.006 0579	15	53.87	11	55	34.30
	15	11	31	08.71	+3	06	58.06	1.005 7960	15	54.11	11	55	12.85
	16	11	34	43.79	2	43	52.86	1.005 5331	15	54.36	11	54	51.38
	17	11	38	18.87	2	20	44.40	1.005 2689	15	54.62	11	54	29.91
	18	11	41	53.97	1	57	33.01	1.005 0033	15	54.87	11	54	08.47
	19	11	45	29.10	1	34	19.01	1.004 7362	15	55.12	11	53	47.07
	20	11	49	04.28	1	11	02.74	1.004 4673	15	55.38	11	53	25.73
	21	11	52	39.53	+0	47	44.56	1.004 1966	15	55.63	11	53	04.47
	22	11	56	14.87	0	24	24.81	1.003 9240	15	55.89	11	52	43.31
	23	11	59	50.31	+0	01	03.83	1.003 6492	15	56.16	11	52	22.28
	24	12	03	25.89	-0	22	18.02	1.003 3722	15	56.42	11	52	01.37
	25	12	07	01.60	0	45	40.37	1.003 0930	15	56.69	11	51	40.62
	26	12	10	37.48	1	09	02.87	1.002 8115	15	56.95	11	51	20.05
	27	12	14	13.54	-1	32	25.15	1.002 5277	15	57.23	11	50	59.66
	28	12	17	49.79	1	55	46.85	1.002 2418	15	57.50	11	50	39.47
	29	12	21	26.26	2	19	07.60	1.001 9538	15	57.77	11	50	19.51
	30	12	25	02.97	2	42	27.02	1.001 6641	15	58.05	11	49	59.78
Oct	1	12	28	39.93	-3	05	44.74	1.001 3728	15	58.33	11	49	40.32

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Oct	1	187	48	44.76	-0.11	187	48	11.63	20.47	+12.57	-12.71	+6.96	17.71
	2	188	47	44.45	0.22	188	47	11.40	20.47	12.71	12.62	6.93	17.68
	3	189	46	45.84	0.32	189	46	12.90	20.48	12.85	12.51	6.93	17.68
	4	190	45	48.98	0.36	190	45	16.13	20.49	12.99	12.41	6.96	17.70
	5	191	44	53.81	0.40	191	44	21.01	20.49	13.12	12.35	7.00	17.75
	6	192	44	00.39	0.40	192	43	27.59	20.50	13.26	12.35	7.06	17.81
	7	193	43	08.74	-0.36	193	42	35.86	20.50	+13.40	-12.42	+7.11	17.86
	8	194	42	18.97	0.32	194	41	45.96	20.51	13.54	12.54	7.15	17.89
	9	195	41	31.13	0.22	195	40	57.97	20.52	13.68	12.69	7.15	17.90
	10	196	40	45.23	-0.11	196	40	11.93	20.52	13.82	12.83	7.13	17.88
	11	197	40	01.39	+0.00	197	39	27.97	20.53	13.96	12.94	7.09	17.83
	12	198	39	19.67	0.14	198	38	46.18	20.53	14.10	13.00	7.04	17.78
	13	199	38	40.13	+0.25	199	38	06.61	20.54	+14.24	-13.02	+6.98	17.72
	14	200	38	02.77	0.40	200	37	29.28	20.54	14.38	13.00	6.94	17.67
	15	201	37	27.66	0.50	201	36	54.22	20.55	14.52	12.94	6.90	17.63
	16	202	36	54.81	0.58	202	36	21.42	20.56	14.65	12.87	6.88	17.62
	17	203	36	24.26	0.65	203	35	50.93	20.56	14.79	12.81	6.88	17.62
	18	204	35	55.96	0.72	204	35	22.67	20.57	14.93	12.77	6.90	17.63
	19	205	35	29.95	+0.72	205	34	56.68	20.57	+15.07	-12.75	+6.93	17.66
	20	206	35	06.22	0.72	206	34	32.92	20.58	15.21	12.77	6.96	17.69
	21	207	34	44.76	0.68	207	34	11.39	20.58	15.35	12.83	7.00	17.72
	22	208	34	25.50	0.61	208	33	52.02	20.59	15.49	12.93	7.02	17.75
	23	209	34	08.42	0.50	209	33	34.81	20.60	15.63	13.06	7.03	17.75
	24	210	33	53.47	0.40	210	33	19.73	20.60	15.77	13.18	7.01	17.74
	25	211	33	40.59	+0.25	211	33	06.73	20.61	+15.91	-13.29	+6.97	17.70
	26	212	33	29.71	+0.11	212	32	55.79	20.61	16.05	13.36	6.92	17.63
	27	213	33	20.76	-0.04	213	32	46.82	20.62	16.18	13.36	6.85	17.56
	28	214	33	13.64	0.14	214	32	39.77	20.62	16.32	13.29	6.78	17.50
	29	215	33	08.27	0.29	215	32	34.51	20.63	16.46	13.17	6.73	17.45
	30	216	33	04.60	0.40	216	32	30.98	20.64	16.60	13.03	6.71	17.43
	31	217	33	02.56	-0.47	217	32	29.08	20.64	+16.74	-12.89	+6.72	17.43
Nov	1	218	33	02.14	0.50	218	32	28.75	20.65	16.88	12.78	6.75	17.46
	2	219	33	03.25	0.50	219	32	29.90	20.65	17.02	12.74	6.79	17.50
	3	220	33	05.91	0.50	220	32	32.53	20.66	17.16	12.76	6.84	17.55
	4	221	33	10.16	0.43	221	32	36.71	20.66	17.30	12.84	6.86	17.57
	5	222	33	16.00	0.36	222	32	42.43	20.67	17.44	12.94	6.87	17.58
	6	223	33	23.46	-0.25	223	32	49.78	20.67	+17.58	-13.05	+6.85	17.55
	7	224	33	32.55	-0.14	224	32	58.78	20.68	17.72	13.14	6.80	17.51
	8	225	33	43.36	+0.00	225	33	09.54	20.68	17.85	13.18	6.75	17.45
	9	226	33	55.92	0.14	226	33	22.10	20.69	17.99	13.18	6.68	17.38
	10	227	34	10.24	0.25	227	33	36.47	20.69	18.13	13.13	6.62	17.32
	11	228	34	26.40	0.40	228	33	52.70	20.70	18.27	13.04	6.58	17.27
	12	229	34	44.40	+0.47	229	34	10.81	20.70	+18.41	-12.94	+6.55	17.24
	13	230	35	04.28	0.58	230	34	30.79	20.71	18.55	12.83	6.53	17.23
	14	231	35	26.04	0.61	231	34	52.64	20.71	18.69	12.73	6.54	17.24
	15	232	35	49.67	0.65	232	35	16.33	20.72	18.83	12.66	6.56	17.26
	16	233	36	15.16	+0.65	233	35	41.86	20.72	+18.97	-12.63	+6.59	17.28

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

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FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Oct	1	12	28	39.93	-3	05	44.74	1.001 3728	15	58.33	11	49	40.32
	2	12	32	17.15	3	29	00.38	1.001 0805	15	58.61	11	49	21.13
	3	12	35	54.67	3	52	13.56	1.000 7874	15	58.89	11	49	02.23
	4	12	39	32.48	4	15	23.91	1.000 4939	15	59.17	11	48	43.64
	5	12	43	10.62	4	38	31.05	1.000 2007	15	59.45	11	48	25.40
	6	12	46	49.10	5	01	34.63	0.999 9079	15	59.73	11	48	07.50
	7	12	50	27.95	-5	24	34.31	0.999 6160	16	00.01	11	47	49.99
	8	12	54	07.18	5	47	29.73	0.999 3254	16	00.29	11	47	32.89
	9	12	57	46.83	6	10	20.59	0.999 0363	16	00.57	11	47	16.20
	10	13	01	26.92	6	33	06.55	0.998 7488	16	00.85	11	46	59.97
	11	13	05	07.47	6	55	47.28	0.998 4630	16	01.12	11	46	44.21
	12	13	08	48.51	7	18	22.45	0.998 1789	16	01.40	11	46	28.95
	13	13	12	30.06	-7	40	51.73	0.997 8965	16	01.67	11	46	14.20
	14	13	16	12.14	8	03	14.75	0.997 6157	16	01.94	11	45	60.00
	15	13	19	54.77	8	25	31.17	0.997 3364	16	02.21	11	45	46.34
	16	13	23	37.97	8	47	40.59	0.997 0584	16	02.48	11	45	33.27
	17	13	27	21.76	9	09	42.66	0.996 7816	16	02.74	11	45	20.79
	18	13	31	06.14	9	31	36.98	0.996 5059	16	03.01	11	45	08.92
	19	13	34	51.15	-9	53	23.17	0.996 2310	16	03.28	11	44	57.69
	20	13	38	36.79	10	15	00.83	0.995 9570	16	03.54	11	44	47.10
	21	13	42	23.09	10	36	29.57	0.995 6835	16	03.81	11	44	37.17
	22	13	46	10.05	10	57	48.97	0.995 4105	16	04.07	11	44	27.91
	23	13	49	57.69	11	18	58.63	0.995 1378	16	04.33	11	44	19.34
	24	13	53	46.03	11	39	58.15	0.994 8653	16	04.60	11	44	11.48
	25	13	57	35.07	-12	00	47.10	0.994 5930	16	04.86	11	44	04.32
	26	14	01	24.83	12	21	25.07	0.994 3208	16	05.13	11	43	57.89
	27	14	05	15.33	12	41	51.64	0.994 0488	16	05.39	11	43	52.18
	28	14	09	06.56	13	02	06.39	0.993 7771	16	05.65	11	43	47.21
	29	14	12	58.53	13	22	08.88	0.993 5059	16	05.92	11	43	42.99
	30	14	16	51.26	13	41	58.69	0.993 2356	16	06.18	11	43	39.53
	31	14	20	44.74	-14	01	35.39	0.992 9665	16	06.44	11	43	36.82
Nov	1	14	24	38.99	14	20	58.55	0.992 6990	16	06.70	11	43	34.89
	2	14	28	34.01	14	40	07.75	0.992 4335	16	06.96	11	43	33.73
	3	14	32	29.81	14	59	02.58	0.992 1704	16	07.22	11	43	33.36
	4	14	36	26.41	15	17	42.65	0.991 9103	16	07.47	11	43	33.80
	5	14	40	23.80	15	36	07.56	0.991 6533	16	07.72	11	43	35.04
	6	14	44	22.01	-15	54	16.96	0.991 3999	16	07.97	11	43	37.10
	7	14	48	21.04	16	12	10.46	0.991 1501	16	08.21	11	43	39.99
	8	14	52	20.91	16	29	47.69	0.990 9044	16	08.45	11	43	43.71
	9	14	56	21.62	16	47	08.29	0.990 6626	16	08.69	11	43	48.28
	10	15	00	23.18	17	04	11.88	0.990 4249	16	08.92	11	43	53.70
	11	15	04	25.60	17	20	58.08	0.990 1912	16	09.15	11	43	59.98
	12	15	08	28.87	-17	37	26.52	0.989 9616	16	09.38	11	44	07.11
	13	15	12	33.01	17	53	36.80	0.989 7359	16	09.60	11	44	15.11
	14	15	16	38.00	18	09	28.53	0.989 5140	16	09.81	11	44	23.96
	15	15	20	43.86	18	25	01.33	0.989 2958	16	10.03	11	44	33.68
	16	15	24	50.58	-18	40	14.80	0.989 0812	16	10.24	11	44	44.26

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Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra-tion	Prec. in Long. (J 2022.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Nov	16	233	36	15.16	+0.65	233	35	41.86	20.72	+18.97	-12.63	+6.59	17.28
	17	234	36	42.53	0.61	234	36	09.22	20.73	19.11	12.64	6.62	17.31
	18	235	37	11.78	0.54	235	36	38.41	20.73	19.25	12.68	6.65	17.34
	19	236	37	42.85	0.47	236	37	09.41	20.73	19.38	12.75	6.66	17.35
	20	237	38	15.70	0.36	237	37	42.17	20.74	19.52	12.84	6.65	17.34
	21	238	38	50.27	0.22	238	38	16.66	20.74	19.66	12.91	6.62	17.31
	22	239	39	26.53	+0.11	239	38	52.87	20.75	+19.80	-12.96	+6.57	17.25
	23	240	40	04.39	-0.07	240	39	30.74	20.75	19.94	12.94	6.50	17.18
	24	241	40	43.76	0.18	241	40	10.20	20.76	20.08	12.85	6.43	17.11
	25	242	41	24.54	0.32	242	40	51.13	20.76	20.22	12.70	6.38	17.06
	26	243	42	06.61	0.43	243	41	33.40	20.76	20.36	12.50	6.35	17.03
	27	244	42	49.90	0.54	244	42	16.88	20.77	20.50	12.30	6.35	17.03
	28	245	43	34.27	-0.58	245	43	01.42	20.77	+20.64	-12.13	+6.38	17.06
	29	246	44	19.68	0.61	246	43	46.92	20.78	20.78	12.03	6.43	17.11
	30	247	45	06.05	0.58	247	44	33.32	20.78	20.91	11.99	6.48	17.16
Dec	1	248	45	53.34	0.54	248	45	20.59	20.78	21.05	12.01	6.52	17.19
	2	249	46	41.54	0.47	249	46	08.72	20.79	21.19	12.07	6.54	17.21
	3	250	47	30.60	0.36	250	46	57.72	20.79	21.33	12.14	6.53	17.20
	4	251	48	20.56	-0.25	251	47	47.62	20.79	+21.47	-12.19	+6.50	17.17
	5	252	49	11.41	-0.11	252	48	38.45	20.80	21.61	12.21	6.45	17.12
	6	253	50	03.19	+0.00	253	49	30.25	20.80	21.75	12.18	6.40	17.06
	7	254	50	55.89	0.14	254	50	23.03	20.80	21.89	12.11	6.35	17.01
	8	255	51	49.57	0.25	255	51	16.81	20.80	22.03	12.00	6.30	16.97
	9	256	52	44.19	0.36	256	52	11.57	20.81	22.17	11.86	6.28	16.94
	10	257	53	39.85	+0.43	257	53	07.37	20.81	+22.31	-11.72	+6.27	16.94
	11	258	54	36.49	0.50	258	54	04.14	20.81	22.44	11.58	6.29	16.95
	12	259	55	34.16	0.54	259	55	01.92	20.82	22.58	11.47	6.31	16.97
	13	260	56	32.84	0.54	260	56	00.67	20.82	22.72	11.40	6.35	17.01
	14	261	57	32.57	0.54	261	57	00.43	20.82	22.86	11.36	6.40	17.05
	15	262	58	33.30	0.47	262	58	01.16	20.82	23.00	11.36	6.44	17.09
	16	263	59	35.04	+0.40	263	59	02.87	20.82	+23.14	-11.40	+6.47	17.12
	17	265	00	37.77	0.29	265	00	05.54	20.83	23.28	11.45	6.48	17.13
	18	266	01	41.44	0.18	266	01	09.16	20.83	23.42	11.51	6.47	17.13
	19	267	02	46.06	+0.04	267	02	13.74	20.83	23.56	11.54	6.45	17.10
	20	268	03	51.53	-0.07	268	03	19.22	20.83	23.70	11.53	6.40	17.05
	21	269	04	57.81	0.22	269	04	25.57	20.83	23.84	11.45	6.35	17.00
	22	270	06	04.80	-0.36	270	05	32.71	20.83	+23.97	-11.30	+6.30	16.95
	23	271	07	12.38	0.47	271	06	40.50	20.83	24.11	11.09	6.28	16.92
	24	272	08	20.48	0.58	272	07	48.83	20.84	24.25	10.86	6.28	16.93
	25	273	09	28.92	0.65	273	08	57.48	20.84	24.39	10.65	6.32	16.96
	26	274	10	37.63	0.65	274	10	06.35	20.84	24.53	10.49	6.39	17.03
	27	275	11	46.49	0.65	275	11	15.29	20.84	24.67	10.41	6.46	17.10
	28	276	12	55.42	-0.61	276	12	24.23	20.84	+24.81	-10.40	+6.52	17.16
	29	277	14	04.30	0.54	277	13	33.06	20.84	24.95	10.44	6.57	17.20
	30	278	15	13.12	0.47	278	14	41.82	20.84	25.09	10.50	6.58	17.22
	31	279	16	21.82	0.36	279	15	50.47	20.84	25.23	10.55	6.57	17.21
	32	280	17	30.42	-0.22	280	16	59.05	20.84	+25.37	-10.57	+6.55	17.18

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -18' 51".544 and subtract precession from J 2022.5.

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FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Nov	16	15	24	50.58	-18	40	14.80	0.989 0812	16	10.24	11	44	44.26
	17	15	28	58.15	18	55	08.55	0.988 8699	16	10.45	11	44	55.70
	18	15	33	06.57	19	09	42.19	0.988 6619	16	10.65	11	45	07.98
	19	15	37	15.84	19	23	55.32	0.988 4568	16	10.85	11	45	21.12
	20	15	41	25.95	19	37	47.58	0.988 2547	16	11.05	11	45	35.09
	21	15	45	36.89	19	51	18.56	0.988 0552	16	11.25	11	45	49.89
	22	15	49	48.66	-20	04	27.89	0.987 8582	16	11.44	11	46	05.50
	23	15	54	01.23	20	17	15.21	0.987 6635	16	11.63	11	46	21.91
	24	15	58	14.60	20	29	40.15	0.987 4710	16	11.82	11	46	39.11
	25	16	02	28.75	20	41	42.35	0.987 2808	16	12.01	11	46	57.07
	26	16	06	43.66	20	53	21.46	0.987 0929	16	12.19	11	47	15.77
	27	16	10	59.29	21	04	37.11	0.986 9075	16	12.38	11	47	35.20
	28	16	15	15.64	-21	15	28.97	0.986 7249	16	12.56	11	47	55.33
	29	16	19	32.68	21	25	56.69	0.986 5454	16	12.73	11	48	16.14
	30	16	23	50.38	21	35	59.95	0.986 3694	16	12.91	11	48	37.61
Dec	1	16	28	08.73	21	45	38.45	0.986 1974	16	13.08	11	48	59.73
	2	16	32	27.71	21	54	51.91	0.986 0297	16	13.24	11	49	22.46
	3	16	36	47.29	22	03	40.07	0.985 8666	16	13.40	11	49	45.80
	4	16	41	07.47	-22	12	02.66	0.985 7085	16	13.56	11	50	09.71
	5	16	45	28.22	22	19	59.47	0.985 5556	16	13.71	11	50	34.19
	6	16	49	49.52	22	27	30.26	0.985 4082	16	13.86	11	50	59.20
	7	16	54	11.35	22	34	34.83	0.985 2664	16	14.00	11	51	24.73
	8	16	58	33.69	22	41	12.97	0.985 1303	16	14.13	11	51	50.75
	9	17	02	56.50	22	47	24.48	0.985 0000	16	14.26	11	52	17.24
	10	17	07	19.78	-22	53	09.17	0.984 8754	16	14.38	11	52	44.17
	11	17	11	43.48	22	58	26.87	0.984 7566	16	14.50	11	53	11.52
	12	17	16	07.58	23	03	17.38	0.984 6435	16	14.61	11	53	39.26
	13	17	20	32.06	23	07	40.56	0.984 5359	16	14.72	11	54	07.36
	14	17	24	56.88	23	11	36.23	0.984 4338	16	14.82	11	54	35.79
	15	17	29	22.01	23	15	04.26	0.984 3370	16	14.92	11	55	04.53
	16	17	33	47.43	-23	18	04.52	0.984 2452	16	15.01	11	55	33.54
	17	17	38	13.11	23	20	36.89	0.984 1584	16	15.09	11	56	02.79
	18	17	42	39.01	23	22	41.25	0.984 0763	16	15.17	11	56	32.24
	19	17	47	05.10	23	24	17.53	0.983 9985	16	15.25	11	57	01.87
	20	17	51	31.35	23	25	25.64	0.983 9250	16	15.32	11	57	31.64
	21	17	55	57.72	23	26	05.54	0.983 8553	16	15.39	11	58	01.50
	22	18	00	24.17	-23	26	17.20	0.983 7893	16	15.46	11	58	31.43
	23	18	04	50.68	23	26	00.58	0.983 7268	16	15.52	11	59	01.38
	24	18	09	17.18	23	25	15.71	0.983 6677	16	15.58	11	59	31.32
	25	18	13	43.65	23	24	02.57	0.983 6120	16	15.63	12	00	01.19
	26	18	18	10.03	23	22	21.20	0.983 5598	16	15.69	12	00	30.96
	27	18	22	36.29	23	20	11.63	0.983 5113	16	15.73	12	01	00.60
	28	18	27	02.39	-23	17	33.90	0.983 4670	16	15.78	12	01	30.06
	29	18	31	28.29	23	14	28.10	0.983 4270	16	15.82	12	01	59.31
	30	18	35	53.96	23	10	54.31	0.983 3917	16	15.85	12	02	28.31
	31	18	40	19.38	23	06	52.64	0.983 3616	16	15.88	12	02	57.04
	32	18	44	44.50	-23	02	23.25	0.983 3368	16	15.91	12	03	25.47

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Date	$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
Jan. 0	+0.158 2536	+0.157 4096	-0.890 6102	-0.890 6082	-0.385 7253	-0.386 0752
1	0.175 4949	0.174 6536	0.887 8871	0.887 8850	0.384 5079	0.384 8956
2	0.192 6821	0.191 8436	0.884 8860	0.884 8839	0.383 1702	0.383 5954
3	0.209 8093	0.208 9740	0.881 6078	0.881 6058	0.381 7124	0.382 1750
4	0.226 8708	0.226 0389	0.878 0536	0.878 0516	0.380 1349	0.380 6348
5	0.243 8607	0.243 0324	0.874 2248	0.874 2228	0.378 4384	0.378 9754
6	+0.260 7734	+0.259 9491	-0.870 1227	-0.870 1208	-0.376 6234	-0.377 1974
7	0.277 6034	0.276 7833	0.865 7492	0.865 7472	0.374 6908	0.375 3016
8	0.294 3455	0.293 5298	0.861 1058	0.861 1038	0.372 6412	0.373 2886
9	0.310 9943	0.310 1833	0.856 1944	0.856 1925	0.370 4755	0.371 1593
10	0.327 5447	0.326 7387	0.851 0169	0.851 0149	0.368 1945	0.368 9144
11	0.343 9919	0.343 1910	0.845 5751	0.845 5732	0.365 7992	0.366 5550
12	+0.360 3307	+0.359 5353	-0.839 8711	-0.839 8692	-0.363 2903	-0.364 0818
13	0.376 5564	0.375 7667	0.833 9068	0.833 9049	0.360 6687	0.361 4957
14	0.392 6642	0.391 8804	0.827 6843	0.827 6824	0.357 9355	0.358 7977
15	0.408 6493	0.407 8717	0.821 2056	0.821 2037	0.355 0916	0.355 9887
16	0.424 5072	0.423 7360	0.814 4728	0.814 4710	0.352 1378	0.353 0696
17	0.440 2332	0.439 4687	0.807 4882	0.807 4864	0.349 0753	0.350 0413
18	+0.455 8227	+0.455 0651	-0.800 2538	-0.800 2521	-0.345 9048	-0.346 9050
19	0.471 2713	0.470 5209	0.792 7719	0.792 7702	0.342 6275	0.343 6614
20	0.486 5745	0.485 8314	0.785 0447	0.785 0430	0.339 2444	0.340 3117
21	0.501 7277	0.500 9922	0.777 0745	0.777 0728	0.335 7563	0.336 8567
22	0.516 7266	0.515 9989	0.768 8635	0.768 8618	0.332 1644	0.333 2975
23	0.531 5665	0.530 8469	0.760 4140	0.760 4123	0.328 4696	0.329 6351
24	+0.546 2432	+0.545 5318	-0.751 7284	-0.751 7268	-0.324 6729	-0.325 8705
25	0.560 7520	0.560 0491	0.742 8092	0.742 8076	0.320 7754	0.322 0047
26	0.575 0884	0.574 3942	0.733 6588	0.733 6572	0.316 7782	0.318 0388
27	0.589 2478	0.588 5625	0.724 2798	0.724 2783	0.312 6824	0.313 9738
28	0.603 2255	0.602 5494	0.714 6750	0.714 6735	0.308 4890	0.309 8110
29	0.617 0170	0.616 3502	0.704 8472	0.704 8457	0.304 1994	0.305 5515
30	+0.630 6176	+0.629 9604	-0.694 7995	-0.694 7980	-0.299 8147	-0.301 1965
31	0.644 0227	0.643 3752	0.684 5350	0.684 5336	0.295 3364	0.296 7475
Feb. 1	0.657 2277	0.656 5902	0.674 0571	0.674 0558	0.290 7660	0.292 2058
2	0.670 2283	0.669 6010	0.663 3695	0.663 3682	0.286 1048	0.287 5731
3	0.683 0203	0.682 4033	0.652 4759	0.652 4746	0.281 3547	0.282 8508
4	0.695 5995	0.694 9930	0.641 3800	0.641 3787	0.276 5172	0.278 0408
5	+0.707 9621	+0.707 3664	-0.630 0858	-0.630 0845	-0.271 5940	-0.273 1446
6	0.720 1045	0.719 5197	0.618 5972	0.618 5960	0.266 5869	0.268 1640
7	0.732 0231	0.731 4494	0.606 9181	0.606 9169	0.261 4976	0.263 1007
8	0.743 7145	0.743 1521	0.595 0526	0.595 0514	0.256 3279	0.257 9565
9	0.755 1755	0.754 6246	0.583 0045	0.583 0034	0.251 0796	0.252 7332
10	0.766 4028	0.765 8635	0.570 7778	0.570 7767	0.245 7543	0.247 4324
11	+0.777 3935	+0.776 8660	-0.558 3766	-0.558 3756	-0.240 3539	-0.242 0560
12	0.788 1445	0.787 6289	0.545 8048	0.545 8038	0.234 8802	0.236 6057
13	0.798 6530	0.798 1495	0.533 0663	0.533 0654	0.229 3348	0.231 0832
14	0.808 9162	0.808 4250	0.520 1653	0.520 1643	0.223 7195	0.225 4904
15	+0.818 9313	+0.818 4525	-0.507 1055	-0.507 1046	-0.218 0362	-0.219 8288

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Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
Feb.	15	+0.818 9313	+0.818 4525	-0.507 1055	-0.507 1046	-0.218 0362	-0.219 8288
	16	0.828 6958	0.828 2296	0.493 8911	0.493 8902	0.212 2864	0.214 1004
	17	0.838 2071	0.837 7535	0.480 5259	0.480 5250	0.206 4720	0.208 3067
	18	0.847 4626	0.847 0218	0.467 0139	0.467 0131	0.200 5947	0.202 4496
	19	0.856 4597	0.856 0319	0.453 3590	0.453 3583	0.194 6562	0.196 5307
	20	0.865 1961	0.864 7814	0.439 5653	0.439 5645	0.188 6581	0.190 5516
	21	+0.873 6691	+0.873 2677	-0.425 6366	-0.425 6359	-0.182 6023	-0.184 5142
	22	0.881 8763	0.881 4882	0.411 5769	0.411 5762	0.176 4903	0.178 4202
	23	0.889 8152	0.889 4406	0.397 3904	0.397 3897	0.170 3240	0.172 2712
	24	0.897 4832	0.897 1222	0.383 0811	0.383 0805	0.164 1051	0.166 0689
	25	0.904 8779	0.904 5305	0.368 6534	0.368 6529	0.157 8354	0.159 8153
	26	0.911 9967	0.911 6631	0.354 1116	0.354 1111	0.151 5168	0.153 5122
	27	+0.918 8372	+0.918 5176	-0.339 4602	-0.339 4597	-0.145 1512	-0.147 1615
	28	0.925 3972	0.925 0915	0.324 7039	0.324 7034	0.138 7405	0.140 7651
Mar.	1	0.931 6743	0.931 3828	0.309 8473	0.309 8469	0.132 2869	0.134 3251
	2	0.937 6667	0.937 3893	0.294 8954	0.294 8950	0.125 7924	0.127 8436
	3	0.943 3724	0.943 1093	0.279 8531	0.279 8528	0.119 2591	0.121 3228
	4	0.948 7898	0.948 5411	0.264 7255	0.264 7252	0.112 6894	0.114 7648
	5	+0.953 9175	+0.953 6832	-0.249 5175	-0.249 5172	-0.106 0853	-0.108 1719
	6	0.958 7541	0.958 5343	0.234 2341	0.234 2339	0.099 4490	0.101 5462
	7	0.963 2986	0.963 0934	0.218 8804	0.218 8802	0.092 7829	0.094 8899
	8	0.967 5501	0.967 3595	0.203 4613	0.203 4612	0.086 0889	0.088 2052
	9	0.971 5077	0.971 3318	0.187 9817	0.187 9816	0.079 3694	0.081 4942
	10	0.975 1708	0.975 0096	0.172 4465	0.172 4464	0.072 6264	0.074 7592
	11	+0.978 5387	+0.978 3923	-0.156 8604	-0.156 8604	-0.065 8621	-0.068 0022
	12	0.981 6110	0.981 4794	0.141 2283	0.141 2283	0.059 0786	0.061 2253
	13	0.984 3873	0.984 2706	0.125 5549	0.125 5549	0.052 2779	0.054 4306
	14	0.986 8672	0.986 7654	0.109 8449	0.109 8450	0.045 4621	0.047 6201
	15	0.989 0506	0.988 9638	0.094 1029	0.094 1030	0.038 6332	0.040 7959
	16	0.990 9374	0.990 8655	0.078 3336	0.078 3337	0.031 7932	0.033 9600
	17	+0.992 5274	+0.992 4705	-0.062 5414	-0.062 5416	-0.024 9442	-0.027 1144
	18	0.993 8207	0.993 7787	0.046 7309	0.046 7312	0.018 0880	0.020 2610
	19	0.994 8171	0.994 7902	0.030 9065	0.030 9068	0.011 2266	0.013 4017
	20	0.995 5167	0.995 5048	-0.015 0726	-0.015 0729	-0.004 3618	-0.006 5383
	21	0.995 9195	0.995 9226	+0.000 7664	+0.000 7661	+0.002 5044	+0.000 3271
	22	0.996 0254	0.996 0435	0.016 6061	0.016 6057	0.009 3703	0.007 1928
	23	+0.995 8343	+0.995 8674	+0.032 4421	+0.032 4417	+0.016 2339	+0.014 0569
	24	0.995 3463	0.995 3944	0.048 2698	0.048 2694	0.023 0932	0.020 9174
	25	0.994 5613	0.994 6244	0.064 0847	0.064 0842	0.029 9464	0.027 7724
	26	0.993 4793	0.993 5574	0.079 8820	0.079 8814	0.036 7915	0.034 6199
	27	0.992 1006	0.992 1936	0.095 6570	0.095 6564	0.043 6264	0.041 4579
	28	0.990 4254	0.990 5334	0.111 4048	0.111 4042	0.050 4490	0.048 2842
	29	+0.988 4541	+0.988 5770	+0.127 1206	+0.127 1199	+0.057 2573	+0.055 0968
	30	0.986 1874	0.986 3251	0.142 7993	0.142 7986	0.064 0490	0.061 8936
	31	0.983 6259	0.983 7784	0.158 4361	0.158 4354	0.070 8220	0.068 6723
Apr.	1	0.980 7707	0.980 9380	0.174 0259	0.174 0251	0.077 5742	0.075 4308
	2	+0.977 6228	+0.977 8049	+0.189 5638	+0.189 5630	+0.084 3034	+0.082 1669

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MEAN EQUATOR AND EQUINOX OF J 2022.5 AND J 2000.0

Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
Apr.	1	+0.980 7707	+0.980 9380	+0.174 0259	+0.174 0251	+0.077 5742	+0.075 4308
	2	0.977 6228	0.977 8049	0.189 5638	0.189 5630	0.084 3034	0.082 1669
	3	0.974 1837	0.974 3804	0.205 0450	0.205 0442	0.091 0074	0.088 8785
	4	0.970 4547	0.970 6660	0.220 4646	0.220 4638	0.097 6842	0.095 5635
	5	0.966 4374	0.966 6633	0.235 8180	0.235 8171	0.104 3316	0.102 2198
	6	0.962 1336	0.962 3739	0.251 1005	0.251 0995	0.110 9477	0.108 8453
	7	+0.957 5450	+0.957 7997	+0.266 3075	+0.266 3065	+0.117 5303	+0.115 4381
	8	0.952 6735	0.952 9426	0.281 4345	0.281 4335	0.124 0777	0.121 9961
	9	0.947 5212	0.947 8045	0.296 4772	0.296 4762	0.130 5877	0.128 5175
	10	0.942 0900	0.942 3875	0.311 4313	0.311 4302	0.137 0586	0.135 0004
	11	0.936 3822	0.936 6938	0.326 2925	0.326 2914	0.143 4885	0.141 4428
	12	0.930 3998	0.930 7254	0.341 0567	0.341 0555	0.149 8756	0.147 8430
	13	+0.924 1453	+0.924 4847	+0.355 7197	+0.355 7186	+0.156 2181	+0.154 1993
	14	0.917 6207	0.917 9739	0.370 2778	0.370 2766	0.162 5144	0.160 5099
	15	0.910 8285	0.911 1954	0.384 7269	0.384 7257	0.168 7627	0.166 7731
	16	0.903 7709	0.904 1514	0.399 0633	0.399 0621	0.174 9614	0.172 9873
	17	0.896 4502	0.896 8442	0.413 2833	0.413 2820	0.181 1090	0.179 1510
	18	0.888 8687	0.889 2760	0.427 3831	0.427 3818	0.187 2038	0.185 2624
	19	+0.881 0284	+0.881 4490	+0.441 3591	+0.441 3577	+0.193 2444	+0.191 3202
	20	0.872 9317	0.873 3653	0.455 2075	0.455 2061	0.199 2291	0.197 3227
	21	0.864 5806	0.865 0272	0.468 9245	0.468 9231	0.205 1564	0.203 2683
	22	0.855 9774	0.856 4368	0.482 5064	0.482 5049	0.211 0247	0.209 1555
	23	0.847 1242	0.847 5964	0.495 9491	0.495 9477	0.216 8322	0.214 9824
	24	0.838 0236	0.838 5084	0.509 2489	0.509 2474	0.222 5774	0.220 7476
	25	+0.828 6779	+0.829 1752	+0.522 4015	+0.522 4000	+0.228 2585	+0.226 4491
	26	0.819 0900	0.819 5995	0.535 4032	0.535 4016	0.233 8737	0.232 0853
	27	0.809 2624	0.809 7841	0.548 2498	0.548 2482	0.239 4213	0.237 6545
	28	0.799 1984	0.799 7321	0.560 9374	0.560 9358	0.244 8997	0.243 1550
	29	0.788 9008	0.789 4464	0.573 4621	0.573 4605	0.250 3071	0.248 5849
	30	0.778 3731	0.778 9304	0.585 8202	0.585 8185	0.255 6419	0.253 9427
May	1	+0.767 6186	+0.768 1874	+0.598 0079	+0.598 0062	+0.260 9023	+0.259 2267
	2	0.756 6408	0.757 2209	0.610 0215	0.610 0198	0.266 0868	0.264 4353
	3	0.745 4433	0.746 0346	0.621 8576	0.621 8559	0.271 1939	0.269 5669
	4	0.734 0297	0.734 6321	0.633 5128	0.633 5110	0.276 2220	0.274 6201
	5	0.722 4039	0.723 0171	0.644 9837	0.644 9819	0.281 1698	0.279 5933
	6	0.710 5697	0.711 1936	0.656 2672	0.656 2654	0.286 0357	0.284 4851
	7	+0.698 5309	+0.699 1653	+0.667 3601	+0.667 3583	+0.290 8185	+0.289 2943
	8	0.686 2914	0.686 9361	0.678 2596	0.678 2577	0.295 5168	0.294 0194
	9	0.673 8552	0.674 5100	0.688 9626	0.688 9608	0.300 1295	0.298 6593
	10	0.661 2262	0.661 8910	0.699 4666	0.699 4647	0.304 6552	0.303 2127
	11	0.648 4085	0.649 0830	0.709 7688	0.709 7668	0.309 0929	0.307 6785
	12	0.635 4060	0.636 0900	0.719 8666	0.719 8646	0.313 4415	0.312 0555
	13	+0.622 2227	+0.622 9160	+0.729 7576	+0.729 7557	+0.317 6999	+0.316 3428
	14	0.608 8625	0.609 5649	0.739 4396	0.739 4376	0.321 8671	0.320 5393
	15	0.595 3293	0.596 0407	0.748 9101	0.748 9081	0.325 9423	0.324 6441
	16	0.581 6269	0.582 3471	0.758 1671	0.758 1651	0.329 9244	0.328 6562
	17	+0.567 7590	+0.568 4878	+0.767 2082	+0.767 2062	+0.333 8127	+0.332 5748

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MEAN EQUATOR AND EQUINOX OF J 2022.5 AND J 2000.0

Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
May	17	+0.567 7590	+0.568 4878	+0.767 2082	+0.767 2062	+0.333 8127	+0.332 5748
	18	0.553 7294	0.554 4664	0.776 0313	0.776 0292	0.337 6061	0.336 3989
	19	0.539 5416	0.540 2868	0.784 6340	0.784 6320	0.341 3037	0.340 1276
	20	0.525 1994	0.525 9524	0.793 0141	0.793 0120	0.344 9046	0.343 7599
	21	0.510 7064	0.511 4672	0.801 1691	0.801 1670	0.348 4078	0.347 2948
	22	0.496 0665	0.496 8348	0.809 0966	0.809 0945	0.351 8122	0.350 7313
	23	+0.481 2838	+0.482 0593	+0.816 7942	+0.816 7921	+0.355 1168	+0.354 0682
	24	0.466 3622	0.467 1448	0.824 2594	0.824 2573	0.358 3206	0.357 3047
	25	0.451 3061	0.452 0955	0.831 4900	0.831 4879	0.361 4224	0.360 4395
	26	0.436 1198	0.436 9158	0.838 4837	0.838 4815	0.364 4215	0.363 4717
	27	0.420 8078	0.421 6102	0.845 2382	0.845 2360	0.367 3167	0.366 4005
	28	0.405 3747	0.406 1832	0.851 7516	0.851 7494	0.370 1071	0.369 2247
	29	+0.389 8251	+0.390 6394	+0.858 0218	+0.858 0196	+0.372 7920	+0.371 9436
	30	0.374 1637	0.374 9837	0.864 0470	0.864 0448	0.375 3704	0.374 5562
	31	0.358 3953	0.359 2208	0.869 8255	0.869 8233	0.377 8416	0.377 0619
June	1	0.342 5247	0.343 3555	0.875 3557	0.875 3535	0.380 2049	0.379 4599
	2	0.326 5569	0.327 3926	0.880 6362	0.880 6339	0.382 4596	0.381 7496
	3	0.310 4966	0.311 3370	0.885 6654	0.885 6632	0.384 6051	0.383 9302
	4	+0.294 3488	+0.295 1937	+0.890 4423	+0.890 4401	+0.386 6409	+0.386 0013
	5	0.278 1184	0.278 9675	0.894 9656	0.894 9634	0.388 5664	0.387 9624
	6	0.261 8102	0.262 6633	0.899 2344	0.899 2322	0.390 3813	0.389 8130
	7	0.245 4291	0.246 2860	0.903 2478	0.903 2456	0.392 0852	0.391 5527
	8	0.228 9799	0.229 8404	0.907 0050	0.907 0027	0.393 6777	0.393 1812
	9	0.212 4676	0.213 3313	0.910 5052	0.910 5030	0.395 1586	0.394 6981
	10	+0.195 8968	+0.196 7636	+0.913 7480	+0.913 7458	+0.396 5276	+0.396 1034
	11	0.179 2722	0.180 1417	0.916 7329	0.916 7307	0.397 7846	0.397 3967
	12	0.162 5984	0.163 4705	0.919 4594	0.919 4572	0.398 9294	0.398 5780
	13	0.145 8799	0.146 7543	0.921 9273	0.921 9250	0.399 9620	0.399 6472
	14	0.129 1212	0.129 9976	0.924 1361	0.924 1338	0.400 8822	0.400 6040
	15	0.112 3264	0.113 2046	0.926 0855	0.926 0832	0.401 6900	0.401 4485
	16	+0.095 4998	+0.096 3796	+0.927 7750	+0.927 7728	+0.402 3851	+0.402 1805
	17	0.078 6458	0.079 5269	0.929 2042	0.929 2020	0.402 9676	0.402 7998
	18	0.061 7686	0.062 6508	0.930 3725	0.930 3703	0.403 4370	0.403 3061
	19	0.044 8727	0.045 7557	0.931 2794	0.931 2772	0.403 7933	0.403 6993
	20	0.027 9626	0.028 8462	0.931 9243	0.931 9221	0.404 0361	0.403 9791
	21	+0.011 0430	+0.011 9269	0.932 3068	0.932 3045	0.404 1653	0.404 1453
	22	-0.005 8814	-0.004 9974	+0.932 4263	+0.932 4241	+0.404 1807	+0.404 1977
	23	0.022 8057	0.021 9219	0.932 2827	0.932 2805	0.404 0821	0.404 1361
	24	0.039 7251	0.038 8417	0.931 8757	0.931 8735	0.403 8694	0.403 9604
	25	0.056 6345	0.055 7518	0.931 2053	0.931 2031	0.403 5425	0.403 6705
	26	0.073 5290	0.072 6472	0.930 2714	0.930 2692	0.403 1015	0.403 2664
	27	0.090 4035	0.089 5229	0.929 0742	0.929 0721	0.402 5464	0.402 7482
	28	-0.107 2530	-0.106 3738	+0.927 6141	+0.927 6119	+0.401 8774	+0.402 1160
	29	0.124 0725	0.123 1950	0.925 8914	0.925 8893	0.401 0944	0.401 3698
	30	0.140 8568	0.139 9813	0.923 9067	0.923 9045	0.400 1979	0.400 5100
July	1	0.157 6011	0.156 7277	0.921 6605	0.921 6583	0.399 1880	0.399 5367
	2	-0.174 3003	-0.173 4293	+0.919 1537	+0.919 1515	+0.398 0651	+0.398 4502

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
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Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
July	1	-0.157 6011	-0.156 7277	+0.921 6605	+0.921 6583	+0.399 1880	+0.399 5367
	2	0.174 3003	0.173 4293	0.919 1537	0.919 1515	0.398 0651	0.398 4502
	3	0.190 9494	0.190 0810	0.916 3871	0.916 3849	0.396 8295	0.397 2511
	4	0.207 5435	0.206 6780	0.913 3617	0.913 3596	0.395 4817	0.395 9395
	5	0.224 0778	0.223 2155	0.910 0786	0.910 0765	0.394 0222	0.394 5162
	6	0.240 5474	0.239 6886	0.906 5391	0.906 5370	0.392 4516	0.392 9815
	7	-0.256 9478	-0.256 0925	+0.902 7443	+0.902 7422	+0.390 7703	+0.391 3361
	8	0.273 2742	0.272 4228	0.898 6958	0.898 6937	0.388 9791	0.389 5805
	9	0.289 5221	0.288 6748	0.894 3949	0.894 3929	0.387 0786	0.387 7155
	10	0.305 6872	0.304 8443	0.889 8432	0.889 8412	0.385 0695	0.385 7418
	11	0.321 7651	0.320 9268	0.885 0423	0.885 0403	0.382 9526	0.383 6600
	12	0.337 7518	0.336 9183	0.879 9937	0.879 9917	0.380 7286	0.381 4709
	13	-0.353 6431	-0.352 8147	+0.874 6989	+0.874 6969	+0.378 3981	+0.379 1752
	14	0.369 4351	0.368 6120	0.869 1593	0.869 1574	0.375 9620	0.376 7735
	15	0.385 1238	0.384 3062	0.863 3764	0.863 3745	0.373 4207	0.374 2665
	16	0.400 7052	0.399 8934	0.857 3515	0.857 3496	0.370 7749	0.371 6548
	17	0.416 1752	0.415 3693	0.851 0859	0.851 0841	0.368 0252	0.368 9389
	18	0.431 5296	0.430 7299	0.844 5810	0.844 5791	0.365 1722	0.366 1194
	19	-0.446 7640	-0.445 9707	+0.837 8381	+0.837 8363	+0.362 2165	+0.363 1969
	20	0.461 8741	0.461 0875	0.830 8588	0.830 8570	0.359 1586	0.360 1721
	21	0.476 8555	0.476 0758	0.823 6446	0.823 6428	0.355 9993	0.357 0455
	22	0.491 7038	0.490 9312	0.816 1974	0.816 1956	0.352 7392	0.353 8179
	23	0.506 4144	0.505 6491	0.808 5189	0.808 5171	0.349 3793	0.350 4901
	24	0.520 9830	0.520 2252	0.800 6111	0.800 6094	0.345 9202	0.347 0628
	25	-0.535 4051	-0.534 6551	+0.792 4761	+0.792 4744	+0.342 3630	+0.343 5370
	26	0.549 6763	0.548 9342	0.784 1160	0.784 1144	0.338 7084	0.339 9136
	27	0.563 7922	0.563 0583	0.775 5333	0.775 5316	0.334 9575	0.336 1936
	28	0.577 7485	0.577 0229	0.766 7302	0.766 7285	0.331 1113	0.332 3779
	29	0.591 5409	0.590 8239	0.757 7093	0.757 7077	0.327 1710	0.328 4676
	30	0.605 1652	0.604 4570	0.748 4732	0.748 4716	0.323 1376	0.324 4640
	31	-0.618 6172	-0.617 9180	+0.739 0247	+0.739 0232	+0.319 0124	+0.320 3681
Aug.	1	0.631 8929	0.631 2029	0.729 3666	0.729 3651	0.314 7965	0.316 1812
	2	0.644 9884	0.644 3078	0.719 5018	0.719 5004	0.310 4913	0.311 9046
	3	0.657 8997	0.657 2287	0.709 4334	0.709 4320	0.306 0981	0.307 5396
	4	0.670 6232	0.669 9619	0.699 1644	0.699 1630	0.301 6183	0.303 0875
	5	0.683 1552	0.682 5039	0.688 6980	0.688 6966	0.297 0532	0.298 5498
	6	-0.695 4922	-0.694 8510	+0.678 0373	+0.678 0359	+0.292 4043	+0.293 9279
	7	0.707 6310	0.707 0001	0.667 1856	0.667 1843	0.287 6731	0.289 2232
	8	0.719 5682	0.718 9479	0.656 1462	0.656 1449	0.282 8610	0.284 4371
	9	0.731 3010	0.730 6913	0.644 9221	0.644 9208	0.277 9693	0.279 5710
	10	0.742 8262	0.742 2273	0.633 5166	0.633 5154	0.272 9996	0.274 6265
	11	0.754 1410	0.753 5531	0.621 9327	0.621 9315	0.267 9532	0.269 6047
	12	-0.765 2425	-0.764 6658	+0.610 1735	+0.610 1723	+0.262 8314	+0.264 5072
	13	0.776 1278	0.775 5625	0.598 2418	0.598 2407	0.257 6356	0.259 3350
	14	0.786 7939	0.786 2401	0.586 1407	0.586 1396	0.252 3669	0.254 0896
	15	0.797 2379	0.796 6958	0.573 8731	0.573 8720	0.247 0266	0.248 7721
	16	-0.807 4566	-0.806 9263	+0.561 4419	+0.561 4409	+0.241 6161	+0.243 3839

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Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
Aug.	16	-0.807 4566	-0.806 9263	+0.561 4419	+0.561 4409	+0.241 6161	+0.243 3839
	17	0.817 4469	0.816 9285	0.548 8504	0.548 8494	0.236 1366	0.237 9262
	18	0.827 2056	0.826 6994	0.536 1017	0.536 1007	0.230 5896	0.232 4005
	19	0.836 7296	0.836 2356	0.523 1991	0.523 1982	0.224 9764	0.226 8080
	20	0.846 0158	0.845 5341	0.510 1461	0.510 1452	0.219 2985	0.221 1504
	21	0.855 0610	0.854 5919	0.496 9462	0.496 9453	0.213 5574	0.215 4290
	22	-0.863 8622	-0.863 4058	+0.483 6029	+0.483 6021	+0.207 7546	+0.209 6453
	23	0.872 4165	0.871 9729	0.470 1201	0.470 1193	0.201 8917	0.203 8011
	24	0.880 7210	0.880 2903	0.456 5016	0.456 5008	0.195 9705	0.197 8980
	25	0.888 7729	0.888 3552	0.442 7512	0.442 7504	0.189 9924	0.191 9375
	26	0.896 5693	0.896 1649	0.428 8729	0.428 8722	0.183 9594	0.185 9215
	27	0.904 1078	0.903 7166	0.414 8708	0.414 8702	0.177 8732	0.179 8516
	28	-0.911 3856	-0.911 0079	+0.400 7491	+0.400 7485	+0.171 7355	+0.173 7298
	29	0.918 4005	0.918 0363	0.386 5121	0.386 5115	0.165 5482	0.167 5578
	30	0.925 1501	0.924 7995	0.372 1639	0.372 1633	0.159 3132	0.161 3375
	31	0.931 6323	0.931 2954	0.357 7090	0.357 7085	0.153 0325	0.155 0709
Sept.	1	0.937 8451	0.937 5220	0.343 1519	0.343 1514	0.146 7079	0.148 7598
	2	0.943 7866	0.943 4774	0.328 4968	0.328 4963	0.140 3415	0.142 4063
	3	-0.949 4552	-0.949 1600	+0.313 7483	+0.313 7479	+0.133 9352	+0.136 0123
	4	0.954 8494	0.954 5683	0.298 9107	0.298 9103	0.127 4909	0.129 5797
	5	0.959 9677	0.959 7008	0.283 9885	0.283 9882	0.121 0105	0.123 1105
	6	0.964 8090	0.964 5563	0.268 9859	0.268 9856	0.114 4961	0.116 6066
	7	0.969 3721	0.969 1337	0.253 9072	0.253 9069	0.107 9494	0.110 0699
	8	0.973 6558	0.973 4317	0.238 7565	0.238 7563	0.101 3723	0.103 5021
	9	-0.977 6591	-0.977 4495	+0.223 5380	+0.223 5378	+0.094 7666	+0.096 9050
	10	0.981 3809	0.981 1858	0.208 2555	0.208 2554	0.088 1340	0.090 2805
	11	0.984 8202	0.984 6396	0.192 9133	0.192 9132	0.081 4762	0.083 6301
	12	0.987 9757	0.987 8097	0.177 5151	0.177 5151	0.074 7949	0.076 9557
	13	0.990 8462	0.990 6949	0.162 0652	0.162 0652	0.068 0919	0.070 2589
	14	0.993 4306	0.993 2940	0.146 5676	0.146 5676	0.061 3689	0.063 5415
	15	-0.995 7276	-0.995 6058	+0.131 0265	+0.131 0265	+0.054 6277	+0.056 8052
	16	0.997 7361	0.997 6290	0.115 4462	0.115 4463	0.047 8702	0.050 0520
	17	0.999 4550	0.999 3627	0.099 8310	0.099 8312	0.041 0981	0.043 2836
	18	1.000 8831	1.000 8057	0.084 1855	0.084 1857	0.034 3134	0.036 5020
	19	1.002 0196	1.001 9571	0.068 5141	0.068 5143	0.027 5180	0.029 7090
	20	1.002 8636	1.002 8159	0.052 8214	0.052 8216	0.020 7139	0.022 9067
	21	-1.003 4143	-1.003 3815	+0.037 1120	+0.037 1123	+0.013 9031	+0.016 0970
	22	1.003 6710	1.003 6531	0.021 3907	0.021 3910	0.007 0876	0.009 2820
	23	1.003 6332	1.003 6302	+0.005 6622	+0.005 6625	+0.000 2695	+0.002 4637
	24	1.003 3003	1.003 3122	-0.010 0687	-0.010 0684	-0.006 5491	-0.004 3557
	25	1.002 6721	1.002 6990	0.025 7972	0.025 7968	0.013 3662	0.011 1742
	26	1.001 7484	1.001 7901	0.041 5183	0.041 5178	0.020 1796	0.017 9897
	27	-1.000 5291	-1.000 5858	-0.057 2271	-0.057 2266	-0.026 9871	-0.024 7999
	28	0.999 0145	0.999 0860	0.072 9186	0.072 9180	0.033 7865	0.031 6027
	29	0.997 2047	0.997 2911	0.088 5878	0.088 5873	0.040 5757	0.038 3960
	30	0.995 1004	0.995 2016	0.104 2300	0.104 2294	0.047 3525	0.045 1774
Oct.	1	-0.992 7021	-0.992 8181	-0.119 8401	-0.119 8394	-0.054 1147	-0.051 9450

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MEAN EQUATOR AND EQUINOX OF J 2022.5 AND J 2000.0

Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
Oct.	1	-0.992 7021	-0.992 8181	-0.119 8401	-0.119 8394	-0.054 1147	-0.051 9450
	2	0.990 0108	0.990 1415	0.135 4134	0.135 4127	0.060 8603	0.058 6965
	3	0.987 0273	0.987 1728	0.150 9452	0.150 9445	0.067 5871	0.065 4299
	4	0.983 7527	0.983 9129	0.166 4309	0.166 4301	0.074 2931	0.072 1431
	5	0.980 1882	0.980 3630	0.181 8660	0.181 8652	0.080 9764	0.078 8343
	6	0.976 3349	0.976 5243	0.197 2460	0.197 2452	0.087 6350	0.085 5014
	7	-0.972 1941	-0.972 3979	-0.212 5668	-0.212 5659	-0.094 2672	-0.092 1426
	8	0.967 7668	0.967 9851	0.227 8240	0.227 8231	0.100 8709	0.098 7562
	9	0.963 0543	0.963 2870	0.243 0134	0.243 0125	0.107 4446	0.105 3402
	10	0.958 0578	0.958 3048	0.258 1308	0.258 1299	0.113 9863	0.111 8929
	11	0.952 7783	0.953 0395	0.273 1721	0.273 1711	0.120 4943	0.118 4125
	12	0.947 2169	0.947 4924	0.288 1330	0.288 1320	0.126 9668	0.124 8973
	13	-0.941 3750	-0.941 6645	-0.303 0092	-0.303 0081	-0.133 4020	-0.131 3453
	14	0.935 2535	0.935 5570	0.317 7963	0.317 7952	0.139 7980	0.137 7548
	15	0.928 8539	0.929 1713	0.332 4900	0.332 4889	0.146 1530	0.144 1238
	16	0.922 1774	0.922 5087	0.347 0859	0.347 0848	0.152 4651	0.150 4505
	17	0.915 2256	0.915 5705	0.361 5795	0.361 5784	0.158 7323	0.156 7330
	18	0.907 9999	0.908 3585	0.375 9664	0.375 9652	0.164 9528	0.162 9694
	19	-0.900 5020	-0.900 8741	-0.390 2420	-0.390 2407	-0.171 1247	-0.169 1577
	20	0.892 7337	0.893 1192	0.404 4017	0.404 4005	0.177 2458	0.175 2959
	21	0.884 6968	0.885 0956	0.418 4412	0.418 4399	0.183 3144	0.181 3821
	22	0.876 3933	0.876 8053	0.432 3558	0.432 3545	0.189 3285	0.187 4144
	23	0.867 8253	0.868 2504	0.446 1410	0.446 1397	0.195 2860	0.193 3907
	24	0.858 9952	0.859 4331	0.459 7922	0.459 7908	0.201 1849	0.199 3090
	25	-0.849 9053	-0.850 3560	-0.473 3049	-0.473 3035	-0.207 0233	-0.205 1674
	26	0.840 5583	0.841 0217	0.486 6746	0.486 6731	0.212 7993	0.210 9638
	27	0.830 9569	0.831 4328	0.499 8967	0.499 8953	0.218 5107	0.216 6962
	28	0.821 1041	0.821 5924	0.512 9670	0.512 9655	0.224 1557	0.222 3628
	29	0.811 0032	0.811 5037	0.525 8811	0.525 8796	0.229 7324	0.227 9617
	30	0.800 6572	0.801 1698	0.538 6350	0.538 6334	0.235 2390	0.233 4909
	31	-0.790 0697	-0.790 5941	-0.551 2246	-0.551 2230	-0.240 6737	-0.238 9489
Nov.	1	0.779 2439	0.779 7802	0.563 6461	0.563 6445	0.246 0349	0.244 3337
	2	0.768 1835	0.768 7313	0.575 8959	0.575 8942	0.251 3209	0.249 6440
	3	0.756 8919	0.757 4511	0.587 9703	0.587 9687	0.256 5302	0.254 8781
	4	0.745 3725	0.745 9430	0.599 8660	0.599 8643	0.261 6614	0.260 0345
	5	0.733 6288	0.734 2103	0.611 5794	0.611 5777	0.266 7129	0.265 1118
	6	-0.721 6641	-0.722 2566	-0.623 1073	-0.623 1055	-0.271 6835	-0.270 1085
	7	0.709 4819	0.710 0851	0.634 4463	0.634 4446	0.276 5716	0.275 0233
	8	0.697 0856	0.697 6993	0.645 5933	0.645 5915	0.281 3759	0.279 8548
	9	0.684 4785	0.685 1026	0.656 5448	0.656 5430	0.286 0950	0.284 6015
	10	0.671 6641	0.672 2983	0.667 2977	0.667 2959	0.290 7276	0.289 2622
	11	0.658 6458	0.659 2900	0.677 8486	0.677 8468	0.295 2723	0.293 8353
	12	-0.645 4270	-0.646 0810	-0.688 1942	-0.688 1924	-0.299 7276	-0.298 3196
	13	0.632 0114	0.632 6750	0.698 3313	0.698 3294	0.304 0922	0.302 7136
	14	0.618 4027	0.619 0756	0.708 2566	0.708 2547	0.308 3647	0.307 0159
	15	0.604 6044	0.605 2865	0.717 9667	0.717 9648	0.312 5436	0.311 2250
	16	-0.590 6206	-0.591 3117	-0.727 4584	-0.727 4565	-0.316 6277	-0.315 3397

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MEAN EQUATOR AND EQUINOX OF J 2022.5 AND J 2000.0

Date		$X_{2022.5}$	$X_{2000.0}$	$Y_{2022.5}$	$Y_{2000.0}$	$Z_{2022.5}$	$Z_{2000.0}$
Nov.	16	-0.590 6206	-0.591 3117	-0.727 4584	-0.727 4565	-0.316 6277	-0.315 3397
	17	0.576 4550	0.577 1548	0.736 7286	0.736 7266	0.320 6154	0.319 3584
	18	0.562 1118	0.562 8201	0.745 7740	0.745 7720	0.324 5055	0.323 2799
	19	0.547 5949	0.548 3116	0.754 5914	0.754 5894	0.328 2965	0.327 1027
	20	0.532 9087	0.533 6335	0.763 1777	0.763 1757	0.331 9871	0.330 8254
	21	0.518 0575	0.518 7902	0.771 5299	0.771 5278	0.335 5759	0.334 4467
	22	-0.503 0458	-0.503 7861	-0.779 6448	-0.779 6427	-0.339 0615	-0.337 9652
	23	0.487 8782	0.488 6260	0.787 5195	0.787 5174	0.342 4428	0.341 3797
	24	0.472 5597	0.473 3146	0.795 1511	0.795 1490	0.345 7183	0.344 6887
	25	0.457 0950	0.457 8569	0.802 5369	0.802 5348	0.348 8869	0.347 8912
	26	0.441 4894	0.442 2580	0.809 6743	0.809 6723	0.351 9474	0.350 9858
	27	0.425 7480	0.426 5231	0.816 5610	0.816 5589	0.354 8988	0.353 9717
	28	-0.409 8760	-0.410 6574	-0.823 1948	-0.823 1927	-0.357 7401	-0.356 8477
	29	0.393 8787	0.394 6661	0.829 5737	0.829 5715	0.360 4705	0.359 6130
	30	0.377 7613	0.378 5545	0.835 6957	0.835 6936	0.363 0891	0.362 2669
Dec.	1	0.361 5290	0.362 3277	0.841 5594	0.841 5573	0.365 5952	0.364 8086
	2	0.345 1868	0.345 9907	0.847 1630	0.847 1609	0.367 9883	0.367 2374
	3	0.328 7397	0.329 5487	0.852 5052	0.852 5030	0.370 2676	0.369 5527
	4	-0.312 1927	-0.313 0065	-0.857 5843	-0.857 5822	-0.372 4326	-0.371 7539
	5	0.295 5507	0.296 3691	0.862 3991	0.862 3969	0.374 4828	0.373 8405
	6	0.278 8187	0.279 6413	0.866 9482	0.866 9460	0.376 4176	0.375 8119
	7	0.262 0015	0.262 8281	0.871 2303	0.871 2281	0.378 2365	0.377 6676
	8	0.245 1040	0.245 9344	0.875 2440	0.875 2419	0.379 9389	0.379 4069
	9	0.228 1311	0.228 9650	0.878 9882	0.878 9860	0.381 5244	0.381 0295
	10	-0.211 0876	-0.211 9248	-0.882 4616	-0.882 4594	-0.382 9924	-0.382 5349
	11	0.193 9786	0.194 8187	0.885 6629	0.885 6607	0.384 3425	0.383 9224
	12	0.176 8089	0.177 6518	0.888 5910	0.888 5888	0.385 5742	0.385 1916
	13	0.159 5837	0.160 4290	0.891 2448	0.891 2426	0.386 6869	0.386 3420
	14	0.142 3080	0.143 1555	0.893 6231	0.893 6210	0.387 6803	0.387 3732
	15	0.124 9869	0.125 8364	0.895 7251	0.895 7229	0.388 5540	0.388 2847
	16	-0.107 6256	-0.108 4768	-0.897 5496	-0.897 5474	-0.389 3074	-0.389 0761
	17	0.090 2294	0.091 0820	0.899 0957	0.899 0935	0.389 9402	0.389 7469
	18	0.072 8037	0.073 6574	0.900 3627	0.900 3605	0.390 4520	0.390 2968
	19	0.055 3537	0.056 2084	0.901 3497	0.901 3475	0.390 8425	0.390 7255
	20	0.037 8851	0.038 7404	0.902 0560	0.902 0538	0.391 1113	0.391 0325
	21	0.020 4034	0.021 2590	0.902 4811	0.902 4789	0.391 2581	0.391 2175
	22	-0.002 9143	-0.003 7701	-0.902 6243	-0.902 6222	-0.391 2828	-0.391 2804
	23	+0.014 5763	+0.013 7207	0.902 4856	0.902 4834	0.391 1851	0.391 2210
	24	0.032 0625	0.031 2074	0.902 0646	0.902 0625	0.390 9649	0.391 0390
	25	0.049 5385	0.048 6840	0.901 3615	0.901 3594	0.390 6223	0.390 7347
	26	0.066 9982	0.066 1447	0.900 3767	0.900 3746	0.390 1575	0.390 3080
	27	0.084 4359	0.083 5837	0.899 1106	0.899 1085	0.389 5706	0.389 7592
	28	+0.101 8458	+0.100 9951	-0.897 5640	-0.897 5619	-0.388 8620	-0.389 0886
	29	0.119 2224	0.118 3735	0.895 7376	0.895 7355	0.388 0320	0.388 2966
	30	0.136 5602	0.135 7133	0.893 6324	0.893 6303	0.387 0811	0.387 3836
	31	0.153 8538	0.153 0092	0.891 2494	0.891 2473	0.386 0098	0.386 3501
	32	+0.171 0980	+0.170 2560	-0.888 5895	-0.888 5875	-0.384 8185	-0.385 1966

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Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0	Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°		°	°	°
Jan. 0	+2.56	-2.88	155.72	Feb. 15	-17.36	-6.82	270.01
1	2.07	3.00	142.55	16	17.69	6.86	256.84
2	1.59	3.12	129.38	17	18.02	6.91	243.68
3	1.10	3.23	116.21	18	18.34	6.94	230.51
4	0.62	3.35	103.04	19	18.66	6.98	217.34
5	+0.13	3.46	89.87	20	18.97	7.01	204.17
6	-0.35	-3.57	76.70	21	-19.27	-7.04	191.00
7	0.83	3.68	63.53	22	19.57	7.07	177.83
8	1.31	3.80	50.36	23	19.86	7.10	164.66
9	1.79	3.90	37.19	24	20.15	7.13	151.49
10	2.27	4.01	24.02	25	20.43	7.15	138.32
11	2.75	4.12	10.85	26	20.71	7.17	125.15
12	-3.23	-4.22	357.69	27	-20.97	-7.19	111.98
13	3.70	4.33	344.52	28	21.23	7.20	98.80
14	4.17	4.43	331.35	Mar. 1	21.49	7.22	85.63
15	4.64	4.53	318.18	2	21.74	7.23	72.46
16	5.11	4.63	305.01	3	21.98	7.24	59.29
17	5.57	4.73	291.85	4	22.22	7.24	46.12
18	-6.03	-4.83	278.68	5	-22.45	-7.25	32.94
19	6.49	4.92	265.51	6	22.67	7.25	19.77
20	6.95	5.02	252.34	7	22.89	7.25	6.59
21	7.40	5.11	239.18	8	23.10	7.25	353.42
22	7.85	5.20	226.01	9	23.31	7.25	340.24
23	8.30	5.29	212.84	10	23.50	7.24	327.06
24	-8.74	-5.38	199.68	11	-23.70	-7.23	313.89
25	9.18	5.46	186.51	12	23.88	7.22	300.71
26	9.61	5.55	173.34	13	24.06	7.21	287.53
27	10.04	5.63	160.18	14	24.23	7.19	274.35
28	10.47	5.71	147.01	15	24.39	7.18	261.17
29	10.89	5.79	133.84	16	24.55	7.16	247.99
30	-11.31	-5.86	120.68	17	-24.70	-7.13	234.81
31	11.73	5.94	107.51	18	24.85	7.11	221.63
Feb. 1	12.14	6.01	94.35	19	24.98	7.08	208.45
2	12.54	6.08	81.18	20	25.11	7.06	195.26
3	12.95	6.15	68.01	21	25.24	7.03	182.08
4	13.34	6.22	54.85	22	25.35	6.99	168.89
5	-13.73	-6.28	41.68	23	-25.46	-6.96	155.71
6	14.12	6.35	28.52	24	25.57	6.92	142.52
7	14.50	6.41	15.35	25	25.66	6.88	129.34
8	14.88	6.47	2.18	26	25.75	6.84	116.15
9	15.25	6.52	349.02	27	25.83	6.80	102.96
10	15.61	6.58	335.85	28	25.91	6.76	89.77
11	-15.97	-6.63	322.68	29	-25.97	-6.71	76.59
12	16.33	6.68	309.52	30	26.03	6.66	63.40
13	16.68	6.73	296.35	31	26.09	6.61	50.20
14	17.02	6.78	283.18	Apr. 1	26.13	6.56	37.01
15	-17.36	-6.82	270.01	2	-26.17	-6.50	23.82

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Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
		°	°	°
Apr.	1	-26.13	-6.56	37.01
	2	26.17	6.50	23.82
	3	26.21	6.45	10.63
	4	26.23	6.39	357.43
	5	26.25	6.33	344.24
	6	26.26	6.27	331.05
	7	-26.26	-6.20	317.85
	8	26.26	6.14	304.65
	9	26.24	6.07	291.45
	10	26.23	6.00	278.25
	11	26.20	5.93	265.06
	12	26.17	5.86	251.85
	13	-26.12	-5.79	238.65
	14	26.08	5.71	225.45
	15	26.02	5.63	212.25
	16	25.96	5.55	199.04
	17	25.89	5.47	185.84
	18	25.81	5.39	172.63
	19	-25.72	-5.31	159.43
	20	25.63	5.22	146.22
	21	25.53	5.14	133.01
	22	25.43	5.05	119.80
	23	25.31	4.96	106.59
	24	25.19	4.87	93.38
	25	-25.06	-4.78	80.17
	26	24.92	4.68	66.96
	27	24.78	4.59	53.75
	28	24.63	4.49	40.53
	29	24.47	4.39	27.32
	30	24.30	4.30	14.11
May	1	-24.13	-4.20	0.89
	2	23.95	4.10	347.67
	3	23.76	3.99	334.46
	4	23.57	3.89	321.24
	5	23.37	3.79	308.02
	6	23.16	3.68	294.80
	7	-22.94	-3.58	281.58
	8	22.72	3.47	268.36
	9	22.49	3.36	255.14
	10	22.26	3.25	241.92
	11	22.01	3.14	228.70
	12	21.76	3.03	215.47
	13	-21.51	-2.92	202.25
	14	21.24	2.81	189.03
	15	20.97	2.70	175.80
	16	20.70	2.58	162.57
	17	-20.41	-2.47	149.35

Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
		°	°	°
May	17	-20.41	-2.47	149.35
	18	20.12	2.35	136.12
	19	19.83	2.24	122.89
	20	19.52	2.12	109.66
	21	19.22	2.01	96.44
	22	18.90	1.89	83.21
	23	-18.58	-1.77	69.98
	24	18.26	1.65	56.75
	25	17.92	1.54	43.52
	26	17.59	1.42	30.29
	27	17.24	1.30	17.06
	28	16.89	1.18	3.82
	29	-16.54	-1.06	350.59
	30	16.18	0.94	337.36
	31	15.81	0.82	324.13
June	1	15.44	0.70	310.89
	2	15.07	0.58	297.66
	3	14.69	0.46	284.43
	4	-14.31	-0.34	271.19
	5	13.92	0.22	257.96
	6	13.52	-0.09	244.73
	7	13.13	+0.03	231.49
	8	12.73	0.15	218.26
	9	12.32	0.27	205.02
	10	-11.91	+0.39	191.78
	11	11.50	0.51	178.55
	12	11.08	0.63	165.31
	13	10.66	0.75	152.07
	14	10.24	0.87	138.84
	15	9.82	0.99	125.60
	16	-9.39	+1.11	112.36
	17	8.96	1.23	99.13
	18	8.52	1.35	85.89
	19	8.09	1.46	72.65
	20	7.65	1.58	59.42
	21	7.21	1.70	46.18
	22	-6.76	+1.82	32.94
	23	6.32	1.93	19.71
	24	5.87	2.05	6.47
	25	5.43	2.16	353.23
	26	4.98	2.28	340.00
	27	4.53	2.39	326.76
	28	-4.08	+2.51	313.52
	29	3.62	2.62	300.29
	30	3.17	2.73	287.05
July	1	2.72	2.84	273.81
	2	-2.26	+2.95	260.58

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Date		Position Angle of Axis	Heliographic		Date		Position Angle of Axis	Heliographic	
			Latitude	Longitude				Latitude	Longitude
		P	B_0	L_0			P	B_0	L_0
		°	°	°			°	°	°
July	1	-2.72	+2.84	273.81	Aug.	16	+16.29	+6.68	25.29
	2	2.26	2.95	260.58		17	16.62	6.72	12.07
	3	1.81	3.06	247.34		18	16.95	6.77	358.85
	4	1.36	3.17	234.11		19	17.28	6.81	345.64
	5	0.90	3.28	220.87		20	17.60	6.85	332.42
	6	-0.45	3.39	207.64		21	17.91	6.89	319.21
	7	+0.00	+3.49	194.40		22	+18.22	+6.93	305.99
	8	0.45	3.60	181.17		23	18.52	6.96	292.78
	9	0.90	3.70	167.93		24	18.82	7.00	279.56
	10	1.35	3.80	154.70		25	19.12	7.03	266.35
	11	1.80	3.91	141.46		26	19.40	7.06	253.14
	12	2.25	4.01	128.23		27	19.69	7.08	239.92
	13	+2.70	+4.11	114.99		28	+19.97	+7.11	226.71
	14	3.14	4.21	101.76		29	20.24	7.13	213.50
	15	3.59	4.30	88.53		30	20.51	7.15	200.29
	16	4.03	4.40	75.29		31	20.77	7.17	187.08
	17	4.47	4.50	62.06	Sept.	1	21.02	7.19	173.87
	18	4.91	4.59	48.83		2	21.28	7.20	160.66
	19	+5.34	+4.68	35.60		3	+21.52	+7.22	147.45
	20	5.78	4.77	22.36		4	21.76	7.23	134.24
	21	6.21	4.86	9.13		5	21.99	7.24	121.04
	22	6.64	4.95	355.90		6	22.22	7.24	107.83
	23	7.07	5.04	342.67		7	22.45	7.25	94.62
	24	7.49	5.13	329.44		8	22.66	7.25	81.42
	25	+7.91	+5.21	316.21		9	+22.87	+7.25	68.21
	26	8.33	5.29	302.99		10	23.08	7.25	55.00
	27	8.75	5.38	289.76		11	23.28	7.25	41.80
	28	9.16	5.46	276.53		12	23.47	7.24	28.59
	29	9.57	5.54	263.30		13	23.66	7.23	15.39
	30	9.97	5.61	250.08		14	23.84	7.22	2.19
	31	+10.38	+5.69	236.85		15	+24.01	+7.21	348.98
Aug.	1	10.78	5.76	223.62		16	24.18	7.20	335.78
	2	11.17	5.84	210.40		17	24.35	7.18	322.58
	3	11.56	5.91	197.17		18	24.50	7.16	309.38
	4	11.95	5.98	183.95		19	24.65	7.14	296.18
	5	12.34	6.04	170.72		20	24.80	7.12	282.98
	6	+12.72	+6.11	157.50		21	+24.93	+7.09	269.78
	7	13.09	6.18	144.28		22	25.06	7.07	256.58
	8	13.47	6.24	131.05		23	25.19	7.04	243.38
	9	13.84	6.30	117.83		24	25.31	7.01	230.18
	10	14.20	6.36	104.61		25	25.42	6.97	216.98
	11	14.56	6.42	91.39		26	25.52	6.94	203.78
	12	+14.91	+6.47	78.17		27	+25.62	+6.90	190.59
	13	15.27	6.53	64.95		28	25.71	6.86	177.39
	14	15.61	6.58	51.73		29	25.79	6.82	164.19
	15	15.95	6.63	38.51		30	25.87	6.78	151.00
	16	+16.29	+6.68	25.29	Oct.	1	+25.94	+6.73	137.80

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Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0	Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°		°	°	°
Oct. 1	+25.94	+6.73	137.80	Nov. 16	+21.13	+2.76	251.11
2	26.01	6.69	124.61	17	20.85	2.65	237.93
3	26.06	6.64	111.41	18	20.55	2.53	224.75
4	26.11	6.59	98.21	19	20.25	2.41	211.56
5	26.15	6.53	85.02	20	19.95	2.29	198.38
6	26.19	6.48	71.83	21	19.63	2.17	185.20
7	+26.22	+6.42	58.63	22	+19.31	+2.04	172.02
8	26.24	6.36	45.44	23	18.98	1.92	158.84
9	26.25	6.30	32.24	24	18.65	1.80	145.66
10	26.26	6.24	19.05	25	18.31	1.67	132.48
11	26.26	6.17	5.86	26	17.96	1.55	119.30
12	26.25	6.11	352.67	27	17.60	1.42	106.12
13	+26.23	+6.04	339.47	28	+17.24	+1.30	92.94
14	26.21	5.97	326.28	29	16.87	1.17	79.76
15	26.18	5.89	313.09	30	16.50	1.05	66.58
16	26.14	5.82	299.90	Dec. 1	16.12	0.92	53.40
17	26.10	5.74	286.71	2	15.73	0.79	40.22
18	26.04	5.67	273.52	3	15.34	0.66	27.04
19	+25.98	+5.59	260.33	4	+14.94	+0.54	13.87
20	25.92	5.51	247.14	5	14.54	0.41	0.69
21	25.84	5.42	233.95	6	14.13	0.28	347.51
22	25.76	5.34	220.76	7	13.71	0.15	334.33
23	25.66	5.25	207.57	8	13.30	+0.03	321.15
24	25.57	5.17	194.38	9	12.87	-0.10	307.98
25	+25.46	+5.08	181.19	10	+12.44	-0.23	294.80
26	25.34	4.99	168.01	11	12.01	0.36	281.62
27	25.22	4.89	154.82	12	11.57	0.49	268.45
28	25.09	4.80	141.63	13	11.13	0.62	255.27
29	24.95	4.70	128.44	14	10.68	0.74	242.09
30	24.81	4.61	115.26	15	10.23	0.87	228.92
31	+24.65	+4.51	102.07	16	+9.78	-1.00	215.74
Nov. 1	24.49	4.41	88.88	17	9.32	1.13	202.57
2	24.32	4.31	75.70	18	8.86	1.25	189.39
3	24.14	4.21	62.51	19	8.40	1.38	176.22
4	23.96	4.10	49.33	20	7.93	1.50	163.05
5	23.77	4.00	36.14	21	7.47	1.63	149.87
6	+23.57	+3.89	22.95	22	+6.99	-1.75	136.70
7	23.36	3.78	9.77	23	6.52	1.88	123.53
8	23.14	3.67	356.58	24	6.04	2.00	110.35
9	22.92	3.56	343.40	25	5.57	2.13	97.18
10	22.68	3.45	330.21	26	5.09	2.25	84.01
11	22.44	3.34	317.03	27	4.61	2.37	70.84
12	+22.20	+3.23	303.85	28	+4.13	-2.49	57.67
13	21.94	3.11	290.66	29	3.64	2.61	44.49
14	21.68	3.00	277.48	30	3.16	2.73	31.32
15	21.41	2.88	264.29	31	2.68	2.85	18.15
16	+21.13	+2.76	251.11	32	+2.19	-2.97	4.98

MOON, 2022

UNIVERSAL TIME

PHASES OF THE MOON

Lunation	New Moon	d	h	m	First Quarter	d	h	m	Full Moon	d	h	m	Last Quarter	d	h	m
1226	Jan.	02	18	33	Jan.	09	18	11	Jan.	17	23	48	Jan.	25	13	41
1227	Feb.	01	05	46	Feb.	08	13	50	Feb.	16	16	56	Feb.	23	22	32
1228	Mar.	02	17	35	Mar.	10	10	45	Mar.	18	07	18	Mar.	25	05	37
1229	Apr.	01	06	24	Apr.	09	06	48	Apr.	16	18	55	Apr.	23	11	56
1230	Apr.	30	20	28	May	09	00	21	May	16	04	14	May	22	18	43
1231	May	30	11	30	June	07	14	48	June	14	11	52	June	21	03	11
1232	June	29	02	52	July	07	02	14	July	13	18	38	July	20	14	19
1233	July	28	17	55	Aug.	05	11	07	Aug.	12	01	36	Aug.	19	04	36
1234	Aug.	27	08	17	Sept.	03	18	08	Sept.	10	09	59	Sept.	17	21	52
1235	Sept.	25	21	55	Oct.	03	00	14	Oct.	09	20	55	Oct.	17	17	15
1236	Oct.	25	10	49	Nov.	01	06	37	Nov.	08	11	02	Nov.	16	13	27
1237	Nov.	23	22	57	Nov.	30	14	37	Dec.	08	04	08	Dec.	16	08	56
1238	Dec.	23	10	17	Dec.	30	01	21	Jan.	06	23	08	Jan.	15	02	10

MOON AT PERIGEE

	d	h		d	h		d	h
Dec	04	10	Apr.	19	15	Sept.	07	18
Jan.	01	23	May	17	15	Oct.	04	17
Jan.	30	07	June	14	23	Oct.	29	15
Feb.	26	22	July	13	09	Nov.	26	02
Mar.	24	00	Aug.	10	17	Dec.	24	08

MOON AT APOGEE

	d	h		d	h		d	h
Dec.	18	02	May	05	13	Sept.	19	15
Jan.	14	09	June	02	01	Oct.	17	10
Feb.	11	03	June	29	06	Nov.	14	07
Mar.	10	23	July	26	10	Dec.	12	00
Apr.	07	19	Aug.	22	22	Jan.	08	09

MOON, 2022
MEAN EQUATOR, ORBIT, LONGITUDE AND ELONGATION

Date		Mean Equator			Orbit Perigee			Node			Mean Longitude			Mean Elongation
		i	Δ	Ω'	Γ'			Ω			☾			D
		°	°	°	°	′	″	°	′	″	°	′	″	°
Jan.	1	22.639	242.703	356.552	258	32	08.7	59	32	04.8	257	15	01.6	336.615
	11	22.623	242.158	356.569	259	38	59.2	59	00	18.5	29	00	51.9	98.522
	21	22.607	241.612	356.587	260	45	49.7	58	28	32.2	160	46	42.1	220.430
	31	22.592	241.067	356.604	261	52	40.2	57	56	45.8	292	32	32.4	342.337
Feb.	10	22.576	240.521	356.623	262	59	30.8	57	24	59.5	64	18	22.7	104.245
	20	22.560	239.974	356.641	264	06	21.3	56	53	13.2	196	04	12.9	226.152
Mar.	2	22.544	239.427	356.660	265	13	11.8	56	21	26.8	327	50	03.2	348.060
	12	22.528	238.880	356.679	266	20	02.3	55	49	40.5	99	35	53.5	109.967
	22	22.512	238.333	356.699	267	26	52.9	55	17	54.2	231	21	43.8	231.875
Apr.	1	22.496	237.785	356.719	268	33	43.4	54	46	07.8	3	07	34.0	353.782
	11	22.480	237.237	356.739	269	40	33.9	54	14	21.5	134	53	24.3	115.690
	21	22.464	236.689	356.759	270	47	24.4	53	42	35.2	266	39	14.6	237.597
May	1	22.447	236.141	356.780	271	54	14.9	53	10	48.8	38	25	04.9	359.505
	11	22.431	235.592	356.801	273	01	05.5	52	39	02.5	170	10	55.1	121.412
	21	22.415	235.043	356.823	274	07	56.0	52	07	16.2	301	56	45.4	243.320
	31	22.399	234.493	356.845	275	14	46.5	51	35	29.8	73	42	35.7	5.227
June	10	22.382	233.943	356.867	276	21	37.0	51	03	43.5	205	28	25.9	127.134
	20	22.366	233.393	356.890	277	28	27.6	50	31	57.2	337	14	16.2	249.042
	30	22.350	232.843	356.912	278	35	18.1	50	00	10.8	109	00	06.5	10.949
July	10	22.333	232.292	356.936	279	42	08.6	49	28	24.5	240	45	56.8	132.857
	20	22.317	231.741	356.959	280	48	59.1	48	56	38.1	12	31	47.0	254.764
	30	22.300	231.190	356.983	281	55	49.6	48	24	51.8	144	17	37.3	16.672
Aug.	9	22.284	230.638	357.007	283	02	40.2	47	53	05.5	276	03	27.6	138.579
	19	22.267	230.086	357.032	284	09	30.7	47	21	19.1	47	49	17.9	260.487
	29	22.250	229.534	357.057	285	16	21.2	46	49	32.8	179	35	08.1	22.394
Sept.	8	22.234	228.981	357.082	286	23	11.7	46	17	46.5	311	20	58.4	144.302
	18	22.217	228.428	357.107	287	30	02.3	45	46	00.1	83	06	48.7	266.209
	28	22.200	227.875	357.133	288	36	52.8	45	14	13.8	214	52	38.9	28.117
Oct.	8	22.183	227.322	357.159	289	43	43.3	44	42	27.5	346	38	29.2	150.024
	18	22.167	226.768	357.186	290	50	33.8	44	10	41.1	118	24	19.5	271.932
	28	22.150	226.214	357.213	291	57	24.3	43	38	54.8	250	10	09.8	33.839
Nov.	7	22.133	225.659	357.240	293	04	14.9	43	07	08.5	21	56	00.0	155.747
	17	22.116	225.105	357.268	294	11	05.4	42	35	22.1	153	41	50.3	277.654
	27	22.099	224.550	357.296	295	17	55.9	42	03	35.8	285	27	40.6	39.562
Dec.	7	22.082	223.994	357.324	296	24	46.4	41	31	49.5	57	13	30.8	161.469
	17	22.065	223.439	357.352	297	31	37.0	41	00	03.1	188	59	21.1	283.377
	27	22.048	222.883	357.381	298	38	27.5	40	28	16.8	320	45	11.4	45.284
	37	22.031	222.326	357.410	299	45	18.0	39	56	30.5	92	31	01.7	167.192
	47	22.013	221.770	357.440	300	52	08.5	39	24	44.1	224	16	51.9	289.099

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Jan.	0.0	240	31	13.3	+0	03	50.3	2.4164	16	31.35
	0.5	247	57	47.2	-0	36	38.7	2.4064	16	35.48
	1.0	255	28	04.1	1	16	47.3	2.3990	16	38.53
	1.5	263	01	06.8	1	55	47.3	2.3946	16	40.38
	2.0	270	35	49.3	2	32	50.4	2.3933	16	40.93
	2.5	278	10	59.5	3	07	10.8	2.3952	16	40.13
	3.0	285	45	21.4	-3	38	07.0	2.4003	16	38.01
	3.5	293	17	38.7	4	05	04.0	2.4085	16	34.61
	4.0	300	46	38.3	4	27	34.3	2.4196	16	30.05
	4.5	308	11	12.7	4	45	19.2	2.4334	16	24.45
	5.0	315	30	23.7	4	58	08.5	2.4494	16	18.01
	5.5	322	43	23.6	5	06	00.0	2.4673	16	10.90
	6.0	329	49	36.6	-5	08	59.1	2.4867	16	03.32
	6.5	336	48	39.6	5	07	17.1	2.5072	15	55.48
	7.0	343	40	21.6	5	01	09.8	2.5282	15	47.54
	7.5	350	24	42.8	4	50	56.4	2.5493	15	39.68
	8.0	357	01	53.5	4	36	58.3	2.5702	15	32.05
	8.5	3	32	12.6	4	19	37.9	2.5904	15	24.77
	9.0	9	56	05.8	-3	59	17.9	2.6097	15	17.94
	9.5	16	14	04.4	3	36	20.8	2.6277	15	11.63
	10.0	22	26	43.5	3	11	08.5	2.6443	15	05.91
	10.5	28	34	41.1	2	44	02.2	2.6593	15	00.82
	11.0	34	38	36.3	2	15	22.3	2.6724	14	56.38
	11.5	40	39	09.0	1	45	28.3	2.6837	14	52.61
	12.0	46	36	58.8	-1	14	39.1	2.6931	14	49.49
	12.5	52	32	44.0	0	43	13.3	2.7006	14	47.02
	13.0	58	27	01.8	-0	11	28.9	2.7063	14	45.18
	13.5	64	20	27.1	+0	20	16.2	2.7101	14	43.93
	14.0	70	13	32.5	0	51	44.3	2.7122	14	43.26
	14.5	76	06	47.9	1	22	37.5	2.7126	14	43.11
	15.0	82	00	40.4	+1	52	38.0	2.7115	14	43.45
	15.5	87	55	34.3	2	21	28.0	2.7091	14	44.25
	16.0	93	51	50.4	2	48	49.6	2.7054	14	45.46
	16.5	99	49	46.9	3	14	25.2	2.7006	14	47.04
	17.0	105	49	38.8	3	37	57.3	2.6948	14	48.95
	17.5	111	51	38.4	3	59	09.1	2.6881	14	51.17
	18.0	117	55	55.3	+4	17	44.5	2.6806	14	53.66
	18.5	124	02	37.1	4	33	28.3	2.6724	14	56.41
	19.0	130	11	49.5	4	46	06.8	2.6635	14	59.38
	19.5	136	23	36.6	4	55	27.7	2.6541	15	02.56
	20.0	142	38	02.1	5	01	20.6	2.6442	15	05.95
	20.5	148	55	08.9	5	03	37.1	2.6338	15	09.54
	21.0	155	15	00.3	+5	02	11.1	2.6229	15	13.33
	21.5	161	37	40.3	4	56	58.9	2.6115	15	17.31
	22.0	168	03	13.8	4	47	59.5	2.5996	15	21.50
	22.5	174	31	47.0	4	35	14.2	2.5873	15	25.88
	23.0	181	03	27.7	+4	18	47.6	2.5746	15	30.46

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Jan.	23.0	181	03	27.7	+4	18	47.6	2.5746	15	30.46
	23.5	187	38	25.2	3	58	46.7	2.5614	15	35.22
	24.0	194	16	50.1	3	35	21.8	2.5480	15	40.16
	24.5	200	58	53.8	3	08	46.2	2.5343	15	45.23
	25.0	207	44	48.1	2	39	16.2	2.5205	15	50.41
	25.5	214	34	44.4	2	07	11.9	2.5067	15	55.64
	26.0	221	28	52.6	+1	32	56.6	2.4931	16	00.85
	26.5	228	27	19.9	0	56	57.1	2.4800	16	05.95
	27.0	235	30	09.6	+0	19	43.8	2.4675	16	10.84
	27.5	242	37	19.6	-0	18	09.5	2.4559	16	15.42
	28.0	249	48	41.3	0	56	06.0	2.4456	16	19.54
	28.5	257	03	58.2	1	33	26.5	2.4367	16	23.10
	29.0	264	22	44.9	-2	09	30.4	2.4297	16	25.95
	29.5	271	44	27.2	2	43	36.6	2.4247	16	27.98
	30.0	279	08	21.6	3	15	05.2	2.4220	16	29.09
	30.5	286	33	36.1	3	43	19.0	2.4217	16	29.19
	31.0	293	59	12.1	4	07	44.8	2.4240	16	28.24
	31.5	301	24	06.3	4	27	55.2	2.4290	16	26.22
Feb.	1.0	308	47	13.1	-4	43	29.9	2.4366	16	23.16
	1.5	316	07	27.7	4	54	15.8	2.4466	16	19.12
	2.0	323	23	48.9	5	00	07.9	2.4590	16	14.20
	2.5	330	35	22.2	5	01	08.5	2.4734	16	08.52
	3.0	337	41	21.3	4	57	27.1	2.4896	16	02.22
	3.5	344	41	10.3	4	49	18.6	2.5072	15	55.46
	4.0	351	34	24.1	-4	37	02.6	2.5258	15	48.41
	4.5	358	20	49.0	4	21	01.9	2.5451	15	41.22
	5.0	5	00	22.1	4	01	41.2	2.5646	15	34.06
	5.5	11	33	10.4	3	39	26.1	2.5840	15	27.07
	6.0	17	59	29.9	3	14	42.4	2.6028	15	20.36
	6.5	24	19	44.1	2	47	55.1	2.6208	15	14.05
	7.0	30	34	22.7	-2	19	28.2	2.6376	15	08.24
	7.5	36	44	00.0	1	49	44.4	2.6529	15	02.99
	8.0	42	49	14.2	1	19	05.2	2.6665	14	58.37
	8.5	48	50	45.7	0	47	50.8	2.6783	14	54.41
	9.0	54	49	16.6	-0	16	20.0	2.6882	14	51.14
	9.5	60	45	29.2	+0	15	09.0	2.6959	14	48.58
	10.0	66	40	05.8	+0	46	19.0	2.7015	14	46.72
	10.5	72	33	47.7	1	16	53.2	2.7051	14	45.57
	11.0	78	27	14.8	1	46	35.2	2.7065	14	45.10
	11.5	84	21	04.9	2	15	08.8	2.7060	14	45.27
	12.0	90	15	53.3	2	42	17.7	2.7035	14	46.07
	12.5	96	12	12.3	3	07	45.8	2.6994	14	47.44
	13.0	102	10	30.9	+3	31	16.7	2.6936	14	49.35
	13.5	108	11	14.5	3	52	34.3	2.6864	14	51.73
	14.0	114	14	44.2	4	11	22.6	2.6780	14	54.53
	14.5	120	21	17.4	4	27	26.1	2.6685	14	57.69
	15.0	126	31	06.8	+4	40	29.8	2.6583	15	01.16

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Feb.	15.0	126	31	06.8	+4	40	29.8	2.6583	15	01.16
	15.5	132	44	21.0	4	50	20.1	2.6474	15	04.87
	16.0	139	01	04.4	4	56	44.6	2.6360	15	08.76
	16.5	145	21	17.6	4	59	33.1	2.6244	15	12.77
	17.0	151	44	57.6	4	58	37.5	2.6127	15	16.87
	17.5	158	11	58.7	4	53	52.5	2.6011	15	20.98
	18.0	164	42	12.8	+4	45	16.1	2.5895	15	25.09
	18.5	171	15	30.5	4	32	49.4	2.5782	15	29.15
	19.0	177	51	41.5	4	16	37.4	2.5672	15	33.13
	19.5	184	30	36.0	3	56	48.7	2.5565	15	37.02
	20.0	191	12	04.8	3	33	35.4	2.5463	15	40.80
	20.5	197	56	00.2	3	07	13.5	2.5364	15	44.47
	21.0	204	42	16.3	+2	38	02.2	2.5269	15	48.01
	21.5	211	30	49.2	2	06	23.9	2.5178	15	51.43
	22.0	218	21	37.0	1	32	43.9	2.5092	15	54.71
	22.5	225	14	39.4	0	57	30.1	2.5010	15	57.84
	23.0	232	09	57.5	+0	21	12.6	2.4932	16	00.81
	23.5	239	07	32.5	-0	15	36.6	2.4860	16	03.60
	24.0	246	07	25.2	-0	52	24.3	2.4794	16	06.17
	24.5	253	09	34.7	1	28	35.9	2.4735	16	08.49
	25.0	260	13	57.6	2	03	36.5	2.4683	16	10.51
	25.5	267	20	26.5	2	36	51.4	2.4641	16	12.16
	26.0	274	28	49.3	3	07	46.7	2.4610	16	13.40
	26.5	281	38	48.3	3	35	50.1	2.4591	16	14.16
	27.0	288	49	59.8	-4	00	31.7	2.4585	16	14.37
	27.5	296	01	54.2	4	21	25.3	2.4595	16	13.99
	28.0	303	13	56.2	4	38	08.9	2.4621	16	12.96
	28.5	310	25	25.4	4	50	25.9	2.4664	16	11.25
Mar.	1.0	317	35	38.5	4	58	05.3	2.4725	16	08.86
	1.5	324	43	50.0	5	01	02.4	2.4804	16	05.79
	2.0	331	49	14.7	-4	59	18.8	2.4900	16	02.07
	2.5	338	51	09.3	4	53	02.2	2.5012	15	57.76
	3.0	345	48	54.7	4	42	25.8	2.5139	15	52.92
	3.5	352	41	57.4	4	27	47.5	2.5279	15	47.65
	4.0	359	29	50.4	4	09	29.1	2.5429	15	42.04
	4.5	6	12	15.0	3	47	55.1	2.5587	15	36.21
	5.0	12	49	00.3	-3	23	31.7	2.5750	15	30.28
	5.5	19	20	03.8	2	56	45.8	2.5915	15	24.37
	6.0	25	45	30.7	2	28	04.4	2.6078	15	18.59
	6.5	32	05	33.9	1	57	53.7	2.6237	15	13.04
	7.0	38	20	32.4	1	26	38.7	2.6388	15	07.83
	7.5	44	30	51.4	0	54	43.0	2.6527	15	03.04
	8.0	50	37	00.5	-0	22	28.8	2.6654	14	58.76
	8.5	56	39	33.4	+0	09	43.5	2.6764	14	55.04
	9.0	62	39	06.8	0	41	34.7	2.6857	14	51.95
	9.5	68	36	19.5	1	12	47.2	2.6931	14	49.52
	10.0	74	31	52.0	+1	43	04.1	2.6983	14	47.79

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Mar.	10.0	74	31	52.0	+1	43	04.1	2.6983	14	47.79
	10.5	80	26	25.4	2	12	09.7	2.7014	14	46.76
	11.0	86	20	40.9	2	39	48.6	2.7024	14	46.46
	11.5	92	15	19.3	3	05	45.9	2.7011	14	46.87
	12.0	98	11	00.1	3	29	47.1	2.6977	14	47.98
	12.5	104	08	21.4	3	51	37.7	2.6923	14	49.78
	13.0	110	07	58.8	+4	11	03.1	2.6849	14	52.21
	13.5	116	10	25.0	4	27	49.0	2.6758	14	55.25
	14.0	122	16	09.5	4	41	41.3	2.6652	14	58.83
	14.5	128	25	37.4	4	52	26.1	2.6532	15	02.89
	15.0	134	39	09.6	4	59	50.4	2.6401	15	07.37
	15.5	140	57	01.9	5	03	42.2	2.6262	15	12.17
	16.0	147	19	24.8	+5	03	51.1	2.6117	15	17.23
	16.5	153	46	23.1	5	00	08.7	2.5970	15	22.43
	17.0	160	17	56.1	4	52	29.6	2.5823	15	27.69
	17.5	166	53	57.5	4	40	51.4	2.5678	15	32.91
	18.0	173	34	15.9	4	25	15.8	2.5538	15	38.01
	18.5	180	18	35.4	4	05	48.6	2.5406	15	42.89
	19.0	187	06	36.3	+3	42	40.5	2.5283	15	47.47
	19.5	193	57	56.2	3	16	06.6	2.5171	15	51.70
	20.0	200	52	10.8	2	46	27.0	2.5071	15	55.51
	20.5	207	48	55.0	2	14	06.1	2.4983	15	58.86
	21.0	214	47	44.2	1	39	32.2	2.4908	16	01.74
	21.5	221	48	14.9	1	03	17.0	2.4847	16	04.13
	22.0	228	50	05.3	+0	25	54.6	2.4798	16	06.03
	22.5	235	52	56.1	-0	11	59.2	2.4761	16	07.46
	23.0	242	56	30.3	0	49	47.7	2.4736	16	08.45
	23.5	250	00	33.4	1	26	54.2	2.4721	16	09.01
	24.0	257	04	52.9	2	02	43.0	2.4717	16	09.18
	24.5	264	09	18.1	2	36	39.7	2.4722	16	09.00
	25.0	271	13	38.8	-3	08	12.0	2.4735	16	08.48
	25.5	278	17	45.7	3	36	50.4	2.4756	16	07.64
	26.0	285	21	28.6	4	02	08.4	2.4785	16	06.51
	26.5	292	24	36.3	4	23	43.2	2.4822	16	05.08
	27.0	299	26	56.1	4	41	15.9	2.4866	16	03.36
	27.5	306	28	13.4	4	54	31.8	2.4918	16	01.36
	28.0	313	28	11.3	-5	03	20.8	2.4978	15	59.06
	28.5	320	26	31.0	5	07	37.6	2.5046	15	56.46
	29.0	327	22	52.1	5	07	21.6	2.5122	15	53.56
	29.5	334	16	53.0	5	02	36.9	2.5207	15	50.35
	30.0	341	08	11.5	4	53	32.5	2.5300	15	46.84
	30.5	347	56	26.1	4	40	21.4	2.5402	15	43.05
	31.0	354	41	16.2	-4	23	20.6	2.5511	15	39.01
	31.5	1	22	23.7	4	02	50.5	2.5628	15	34.73
Apr.	1.0	7	59	33.2	3	39	14.0	2.5750	15	30.29
	1.5	14	32	33.2	3	12	55.9	2.5878	15	25.71
	2.0	21	01	16.3	-2	44	22.5	2.6008	15	21.07

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Apr.	1.0	7	59	33.2	-3	39	14.0	2.5750	15	30.29
	1.5	14	32	33.2	3	12	55.9	2.5878	15	25.71
	2.0	21	01	16.3	2	44	22.5	2.6008	15	21.07
	2.5	27	25	39.6	2	14	00.3	2.6140	15	16.44
	3.0	33	45	45.3	1	42	15.8	2.6270	15	11.88
	3.5	40	01	40.0	1	09	35.0	2.6398	15	07.48
	4.0	46	13	35.5	-0	36	22.8	2.6520	15	03.30
	4.5	52	21	47.8	-0	03	02.7	2.6634	14	59.43
	5.0	58	26	37.1	+0	30	03.3	2.6738	14	55.93
	5.5	64	28	27.6	1	02	34.6	2.6829	14	52.88
	6.0	70	27	46.8	1	34	12.2	2.6906	14	50.33
	6.5	76	25	05.0	2	04	38.6	2.6966	14	48.34
	7.0	82	20	55.2	+2	33	37.5	2.7009	14	46.95
	7.5	88	15	52.4	3	00	53.7	2.7031	14	46.21
	8.0	94	10	32.8	3	26	12.9	2.7033	14	46.14
	8.5	100	05	33.9	3	49	21.5	2.7014	14	46.77
	9.0	106	01	33.9	4	10	06.3	2.6973	14	48.10
	9.5	111	59	10.6	4	28	14.6	2.6911	14	50.15
	10.0	117	59	01.6	+4	43	33.8	2.6829	14	52.90
	10.5	124	01	43.1	4	55	51.9	2.6726	14	56.32
	11.0	130	07	49.6	5	04	56.8	2.6605	15	00.40
	11.5	136	17	53.3	5	10	37.0	2.6468	15	05.07
	12.0	142	32	23.0	5	12	42.0	2.6316	15	10.28
	12.5	148	51	43.5	5	11	01.9	2.6153	15	15.96
	13.0	155	16	15.0	+5	05	28.8	2.5982	15	22.01
	13.5	161	46	12.4	4	55	56.7	2.5805	15	28.34
	14.0	168	21	44.4	4	42	22.6	2.5625	15	34.82
	14.5	175	02	52.9	4	24	46.9	2.5448	15	41.34
	15.0	181	49	33.3	4	03	14.3	2.5276	15	47.76
	15.5	188	41	33.4	3	37	54.3	2.5112	15	53.95
	16.0	195	38	34.6	+3	09	02.1	2.4960	15	59.76
	16.5	202	40	11.3	2	36	58.1	2.4822	16	05.07
	17.0	209	45	52.5	2	02	08.7	2.4702	16	09.76
	17.5	216	55	02.4	1	25	05.5	2.4601	16	13.74
	18.0	224	07	01.4	0	46	24.5	2.4521	16	16.93
	18.5	231	21	08.0	+0	06	45.6	2.4462	16	19.28
	19.0	238	36	39.7	-0	33	09.2	2.4425	16	20.77
	19.5	245	52	54.6	1	12	36.9	2.4409	16	21.41
	20.0	253	09	12.5	1	50	55.0	2.4414	16	21.23
	20.5	260	24	56.1	2	27	22.9	2.4437	16	20.28
	21.0	267	39	31.2	3	01	23.1	2.4478	16	18.64
	21.5	274	52	28.1	3	32	22.2	2.4534	16	16.40
	22.0	282	03	21.0	-3	59	51.5	2.4604	16	13.64
	22.5	289	11	48.3	4	23	27.2	2.4685	16	10.45
	23.0	296	17	32.7	4	42	51.2	2.4775	16	06.93
	23.5	303	20	20.2	4	57	50.3	2.4872	16	03.15
	24.0	310	20	00.2	-5	08	16.7	2.4975	15	59.18

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	′	″	°	′	″	(X 10^{-3})	′	″
Apr.	24.0	310	20	00.2	-5	08	16.7	2.4975	15	59.18
	24.5	317	16	24.8	5	14	07.2	2.5082	15	55.09
	25.0	324	09	28.3	5	15	23.2	2.5192	15	50.91
	25.5	330	59	06.8	5	12	10.2	2.5304	15	46.70
	26.0	337	45	17.6	5	04	37.3	2.5417	15	42.48
	26.5	344	27	59.2	4	52	57.1	2.5531	15	38.26
	27.0	351	07	10.8	-4	37	25.0	2.5646	15	34.07
	27.5	357	42	52.2	4	18	19.2	2.5761	15	29.92
	28.0	4	15	04.0	3	55	59.8	2.5875	15	25.80
	28.5	10	43	47.3	3	30	48.9	2.5989	15	21.74
	29.0	17	09	04.1	3	03	09.9	2.6102	15	17.74
	29.5	23	30	57.1	2	33	27.3	2.6214	15	13.83
	30.0	29	49	30.5	-2	02	05.9	2.6324	15	10.00
	30.5	36	04	49.5	1	29	30.8	2.6432	15	06.30
May	1.0	42	17	00.9	0	56	07.0	2.6536	15	02.76
	1.5	48	26	13.4	-0	22	18.7	2.6635	14	59.39
	2.0	54	32	37.6	+0	11	30.6	2.6728	14	56.25
	2.5	60	36	26.0	0	44	58.3	2.6815	14	53.37
	3.0	66	37	53.4	+1	17	43.5	2.6892	14	50.80
	3.5	72	37	17.1	1	49	26.3	2.6959	14	48.58
	4.0	78	34	56.3	2	19	48.3	2.7014	14	46.77
	4.5	84	31	12.7	2	48	32.5	2.7055	14	45.41
	5.0	90	26	30.3	3	15	23.2	2.7082	14	44.55
	5.5	96	21	15.1	3	40	06.0	2.7092	14	44.23
	6.0	102	15	55.0	+4	02	27.5	2.7084	14	44.49
	6.5	108	11	00.1	4	22	15.3	2.7057	14	45.36
	7.0	114	07	01.6	4	39	17.8	2.7011	14	46.87
	7.5	120	04	32.3	4	53	24.1	2.6945	14	49.05
	8.0	126	04	05.8	5	04	24.0	2.6858	14	51.91
	8.5	132	06	16.4	5	12	07.7	2.6752	14	55.44
	9.0	138	11	38.3	+5	16	26.1	2.6627	14	59.65
	9.5	144	20	45.3	5	17	10.8	2.6484	15	04.51
	10.0	150	34	10.1	5	14	14.2	2.6325	15	09.99
	10.5	156	52	23.3	5	07	29.9	2.6151	15	16.04
	11.0	163	15	53.1	4	56	53.2	2.5965	15	22.58
	11.5	169	45	04.0	4	42	21.3	2.5771	15	29.54
	12.0	176	20	15.7	+4	23	54.1	2.5571	15	36.81
	12.5	183	01	42.6	4	01	35.2	2.5369	15	44.26
	13.0	189	49	32.3	3	35	32.1	2.5170	15	51.76
	13.5	196	43	45.0	3	05	57.4	2.4976	15	59.13
	14.0	203	44	12.7	2	33	09.0	2.4793	16	06.23
	14.5	210	50	38.5	1	57	31.1	2.4624	16	12.86
	15.0	218	02	36.5	+1	19	33.6	2.4473	16	18.86
	15.5	225	19	32.0	+0	39	52.5	2.4343	16	24.07
	16.0	232	40	41.8	-0	00	51.2	2.4238	16	28.35
	16.5	240	05	15.7	0	41	52.6	2.4159	16	31.57
	17.0	247	32	17.7	-1	22	24.4	2.4108	16	33.66

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
May	17.0	247	32	17.7	-1	22	24.4	2.4108	16	33.66
	17.5	255	00	47.7	2	01	38.7	2.4086	16	34.59
	18.0	262	29	44.1	2	38	49.0	2.4091	16	34.35
	18.5	269	58	05.5	3	13	12.4	2.4125	16	32.98
	19.0	277	24	53.2	3	44	10.8	2.4183	16	30.57
	19.5	284	49	12.9	4	11	12.5	2.4265	16	27.23
	20.0	292	10	16.7	-4	33	52.6	2.4367	16	23.08
	20.5	299	27	23.6	4	51	53.8	2.4487	16	18.28
	21.0	306	40	01.0	5	05	05.9	2.4621	16	12.96
	21.5	313	47	44.3	5	13	25.3	2.4766	16	07.28
	22.0	320	50	17.1	5	16	54.5	2.4918	16	01.37
	22.5	327	47	30.5	5	15	41.0	2.5075	15	55.34
	23.0	334	39	22.2	-5	09	56.7	2.5234	15	49.31
	23.5	341	25	55.8	4	59	56.4	2.5393	15	43.37
	24.0	348	07	19.8	4	45	58.0	2.5550	15	37.58
	24.5	354	43	46.2	4	28	21.1	2.5703	15	32.00
	25.0	1	15	30.0	4	07	26.7	2.5851	15	26.67
	25.5	7	42	47.7	3	43	36.9	2.5993	15	21.62
	26.0	14	05	57.5	-3	17	14.4	2.6128	15	16.85
	26.5	20	25	17.7	2	48	42.3	2.6256	15	12.39
	27.0	26	41	06.7	2	18	24.0	2.6376	15	08.23
	27.5	32	53	42.7	1	46	42.8	2.6488	15	04.37
	28.0	39	03	23.3	1	14	01.9	2.6593	15	00.81
	28.5	45	10	25.3	0	40	44.3	2.6690	14	57.54
	29.0	51	15	04.9	-0	07	12.5	2.6779	14	54.56
	29.5	57	17	37.6	+0	26	11.6	2.6859	14	51.88
	30.0	63	18	18.4	0	59	06.7	2.6931	14	49.50
	30.5	69	17	22.0	1	31	12.4	2.6994	14	47.43
	31.0	75	15	03.0	2	02	09.5	2.7048	14	45.67
	31.5	81	11	36.3	2	31	39.6	2.7091	14	44.25
June	1.0	87	07	16.9	+2	59	25.6	2.7123	14	43.20
	1.5	93	02	20.9	3	25	11.6	2.7144	14	42.52
	2.0	98	57	05.1	3	48	43.1	2.7152	14	42.26
	2.5	104	51	47.5	4	09	46.5	2.7147	14	42.44
	3.0	110	46	47.7	4	28	09.8	2.7127	14	43.09
	3.5	116	42	26.6	4	43	42.1	2.7091	14	44.25
	4.0	122	39	06.8	+4	56	13.5	2.7039	14	45.95
	4.5	128	37	12.6	5	05	35.2	2.6970	14	48.20
	5.0	134	37	10.0	5	11	39.5	2.6884	14	51.05
	5.5	140	39	26.5	5	14	19.7	2.6781	14	54.50
	6.0	146	44	31.0	5	13	29.9	2.6660	14	58.56
	6.5	152	52	53.3	5	09	05.6	2.6521	15	03.24
	7.0	159	05	04.1	+5	01	03.2	2.6367	15	08.53
	7.5	165	21	34.1	4	49	20.6	2.6198	15	14.40
	8.0	171	42	53.7	4	33	57.4	2.6015	15	20.81
	8.5	178	09	31.9	4	14	55.4	2.5822	15	27.71
	9.0	184	41	55.4	+3	52	18.6	2.5620	15	35.03

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	′	″	°	′	″	(X 10^{-3})	′	″
June	9.0	184	41	55.4	+3	52	18.6	2.5620	15	35.03
	9.5	191	20	27.9	3	26	14.8	2.5412	15	42.66
	10.0	198	05	28.4	2	56	54.9	2.5203	15	50.48
	10.5	204	57	10.1	2	24	34.8	2.4996	15	58.36
	11.0	211	55	39.1	1	49	35.0	2.4795	16	06.12
	11.5	219	00	53.0	1	12	21.7	2.4605	16	13.60
	12.0	226	12	39.5	+0	33	26.8	2.4429	16	20.60
	12.5	233	30	35.8	-0	06	32.5	2.4273	16	26.92
	13.0	240	54	07.6	0	46	54.0	2.4139	16	32.37
	13.5	248	22	29.7	1	26	51.6	2.4032	16	36.79
	14.0	255	54	45.9	2	05	37.0	2.3954	16	40.04
	14.5	263	29	51.3	2	42	21.7	2.3908	16	42.00
	15.0	271	06	33.4	-3	16	18.8	2.3893	16	42.61
	15.5	278	43	35.9	3	46	46.1	2.3911	16	41.87
	16.0	286	19	41.0	4	13	06.9	2.3960	16	39.81
	16.5	293	53	33.2	4	34	52.7	2.4039	16	36.53
	17.0	301	24	02.2	4	51	43.2	2.4145	16	32.15
	17.5	308	50	05.8	5	03	27.1	2.4275	16	26.82
	18.0	316	10	51.8	-5	10	01.7	2.4426	16	20.74
	18.5	323	25	39.4	5	11	31.9	2.4593	16	14.07
	19.0	330	33	59.5	5	08	09.0	2.4773	16	07.00
	19.5	337	35	35.1	5	00	09.8	2.4961	15	59.71
	20.0	344	30	19.7	4	47	54.5	2.5154	15	52.35
	20.5	351	18	16.6	4	31	46.2	2.5348	15	45.06
	21.0	357	59	37.6	-4	12	09.4	2.5540	15	37.96
	21.5	4	34	40.7	3	49	29.3	2.5727	15	31.14
	22.0	11	03	49.4	3	24	11.2	2.5907	15	24.67
	22.5	17	27	30.8	2	56	40.2	2.6077	15	18.63
	23.0	23	46	14.4	2	27	20.5	2.6237	15	13.03
	23.5	30	00	30.8	1	56	35.9	2.6385	15	07.90
	24.0	36	10	51.1	-1	24	49.2	2.6521	15	03.26
	24.5	42	17	45.9	0	52	22.4	2.6644	14	59.10
	25.0	48	21	44.6	0	19	36.9	2.6753	14	55.42
	25.5	54	23	15.3	-0	13	06.7	2.6849	14	52.21
	26.0	60	22	44.2	+0	45	28.6	2.6933	14	49.45
	26.5	66	20	35.6	1	17	09.5	2.7003	14	47.12
	27.0	72	17	11.7	+1	47	50.7	2.7062	14	45.21
	27.5	78	12	52.9	2	17	14.6	2.7108	14	43.70
	28.0	84	07	57.4	2	45	03.9	2.7142	14	42.58
	28.5	90	02	41.9	3	11	02.5	2.7165	14	41.84
	29.0	95	57	21.7	3	34	55.2	2.7177	14	41.46
	29.5	101	52	11.0	3	56	27.7	2.7177	14	41.46
	30.0	107	47	23.2	+4	15	27.0	2.7166	14	41.82
	30.5	113	43	11.2	4	31	41.4	2.7143	14	42.57
July	1.0	119	39	48.1	4	45	00.3	2.7108	14	43.70
	1.5	125	37	27.4	4	55	14.6	2.7061	14	45.23
	2.0	131	36	23.3	+5	02	16.6	2.7002	14	47.18

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
July	1.0	119	39	48.1	+4	45	00.3	2.7108	14	43.70
	1.5	125	37	27.4	4	55	14.6	2.7061	14	45.23
	2.0	131	36	23.3	5	02	16.6	2.7002	14	47.18
	2.5	137	36	51.1	5	06	00.0	2.6929	14	49.57
	3.0	143	39	07.6	5	06	20.0	2.6843	14	52.41
	3.5	149	43	31.1	5	03	13.4	2.6744	14	55.72
	4.0	155	50	21.9	+4	56	38.2	2.6631	14	59.53
	4.5	162	00	01.8	4	46	34.2	2.6504	15	03.83
	5.0	168	12	54.4	4	33	02.7	2.6364	15	08.64
	5.5	174	29	24.9	4	16	06.8	2.6211	15	13.94
	6.0	180	49	59.6	3	55	51.7	2.6046	15	19.73
	6.5	187	15	05.5	3	32	24.6	2.5870	15	25.98
	7.0	193	45	09.4	+3	05	55.2	2.5686	15	32.63
	7.5	200	20	37.2	2	36	36.2	2.5494	15	39.64
	8.0	207	01	52.8	2	04	43.5	2.5299	15	46.90
	8.5	213	49	16.9	1	30	36.9	2.5102	15	54.33
	9.0	220	43	05.3	0	54	40.1	2.4907	16	01.79
	9.5	227	43	27.2	+0	17	21.2	2.4718	16	09.14
	10.0	234	50	24.2	-0	20	47.1	2.4539	16	16.21
	10.5	242	03	47.9	0	59	07.8	2.4374	16	22.81
	11.0	249	23	18.9	1	37	00.1	2.4227	16	28.77
	11.5	256	48	25.8	2	13	40.6	2.4102	16	33.90
	12.0	264	18	24.6	2	48	24.2	2.4003	16	38.03
	12.5	271	52	19.1	3	20	26.1	2.3931	16	40.99
	13.0	279	29	02.3	-3	49	03.9	2.3891	16	42.69
	13.5	287	07	18.4	4	13	40.0	2.3883	16	43.05
	14.0	294	45	45.7	4	33	42.8	2.3907	16	42.03
	14.5	302	23	00.4	4	48	49.0	2.3963	16	39.68
	15.0	309	57	40.4	4	58	44.3	2.4050	16	36.07
	15.5	317	28	29.2	5	03	23.6	2.4165	16	31.31
	16.0	324	54	19.1	-5	02	50.9	2.4306	16	25.57
	16.5	332	14	13.5	4	57	18.1	2.4468	16	19.03
	17.0	339	27	29.0	4	47	03.7	2.4649	16	11.87
	17.5	346	33	35.6	4	32	31.3	2.4842	16	04.30
	18.0	353	32	16.7	4	14	07.8	2.5045	15	56.49
	18.5	0	23	28.2	3	52	21.9	2.5253	15	48.62
	19.0	7	07	17.0	-3	27	43.4	2.5461	15	40.86
	19.5	13	43	59.2	3	00	41.3	2.5667	15	33.32
	20.0	20	13	58.8	2	31	44.0	2.5866	15	26.12
	20.5	26	37	45.3	2	01	18.5	2.6056	15	19.36
	21.0	32	55	52.4	1	29	49.9	2.6235	15	13.10
	21.5	39	08	56.4	0	57	42.0	2.6400	15	07.39
	22.0	45	17	35.2	-0	25	16.9	2.6550	15	02.26
	22.5	51	22	27.0	+0	07	04.7	2.6684	14	57.73
	23.0	57	24	09.4	0	39	03.5	2.6801	14	53.81
	23.5	63	23	18.8	1	10	21.1	2.6901	14	50.49
	24.0	69	20	29.8	+1	40	40.2	2.6984	14	47.76

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
July	24.0	69	20	29.8	+1	40	40.2	2.6984	14	47.76
	24.5	75	16	14.9	2	09	44.1	2.7050	14	45.59
	25.0	81	11	03.9	2	37	17.0	2.7100	14	43.97
	25.5	87	05	24.0	3	03	03.6	2.7134	14	42.86
	26.0	92	59	39.7	3	26	49.5	2.7153	14	42.24
	26.5	98	54	12.6	3	48	20.8	2.7158	14	42.08
	27.0	104	49	21.3	+4	07	24.3	2.7149	14	42.35
	27.5	110	45	22.2	4	23	48.1	2.7129	14	43.02
	28.0	116	42	29.2	4	37	21.0	2.7097	14	44.07
	28.5	122	40	54.1	4	47	53.1	2.7054	14	45.47
	29.0	128	40	47.1	4	55	16.1	2.7001	14	47.21
	29.5	134	42	17.2	4	59	22.8	2.6938	14	49.28
	30.0	140	45	32.6	+5	00	08.2	2.6866	14	51.67
	30.5	146	50	41.3	4	57	28.7	2.6785	14	54.37
	31.0	152	57	51.7	4	51	22.9	2.6695	14	57.38
	31.5	159	07	12.8	4	41	51.3	2.6596	15	00.70
Aug.	1.0	165	18	54.7	4	28	56.4	2.6489	15	04.35
	1.5	171	33	09.1	4	12	43.1	2.6373	15	08.31
	2.0	177	50	09.5	+3	53	18.1	2.6249	15	12.61
	2.5	184	10	11.2	3	30	50.5	2.6117	15	17.23
	3.0	190	33	31.5	3	05	31.7	2.5977	15	22.17
	3.5	197	00	29.1	2	37	35.4	2.5830	15	27.43
	4.0	203	31	24.2	2	07	17.8	2.5676	15	32.97
	4.5	210	06	37.5	1	34	57.6	2.5518	15	38.77
	5.0	216	46	29.7	+1	00	56.3	2.5355	15	44.78
	5.5	223	31	20.3	+0	25	38.3	2.5191	15	50.94
	6.0	230	21	26.4	-0	10	29.1	2.5027	15	57.17
	6.5	237	17	01.3	0	46	55.6	2.4866	16	03.37
	7.0	244	18	12.9	1	23	08.0	2.4711	16	09.42
	7.5	251	25	02.2	1	58	30.7	2.4565	16	15.19
	8.0	258	37	21.5	-2	32	25.9	2.4431	16	20.54
	8.5	265	54	53.0	3	04	14.8	2.4312	16	25.32
	9.0	273	17	08.3	3	33	18.6	2.4213	16	29.37
	9.5	280	43	27.3	3	59	00.1	2.4135	16	32.56
	10.0	288	12	58.6	4	20	44.9	2.4082	16	34.74
	10.5	295	44	41.1	4	38	03.6	2.4056	16	35.83
	11.0	303	17	25.2	-4	50	33.2	2.4058	16	35.74
	11.5	310	49	56.2	4	57	58.2	2.4089	16	34.46
	12.0	318	20	57.5	5	00	11.7	2.4149	16	31.99
	12.5	325	49	13.6	4	57	15.3	2.4237	16	28.39
	13.0	333	13	34.3	4	49	19.2	2.4351	16	23.76
	13.5	340	32	57.3	4	36	40.9	2.4489	16	18.23
	14.0	347	46	31.0	-4	19	44.2	2.4647	16	11.94
	14.5	354	53	35.3	3	58	57.1	2.4822	16	05.06
	15.0	1	53	43.2	3	34	50.9	2.5011	15	57.79
	15.5	8	46	39.9	3	07	58.1	2.5209	15	50.28
	16.0	15	32	22.4	-2	38	51.3	2.5411	15	42.71

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Aug.	16.0	15	32	22.4	-2	38	51.3	2.5411	15	42.71
	16.5	22	10	58.6	2	08	02.2	2.5614	15	35.23
	17.0	28	42	45.0	1	36	01.0	2.5815	15	27.98
	17.5	35	08	06.1	1	03	15.7	2.6008	15	21.07
	18.0	41	27	32.0	-0	30	11.9	2.6192	15	14.61
	18.5	47	41	37.2	+0	02	46.9	2.6363	15	08.67
	19.0	53	50	59.3	+0	35	19.4	2.6519	15	03.32
	19.5	59	56	17.8	1	07	06.2	2.6659	14	58.59
	20.0	65	58	12.9	1	37	49.7	2.6780	14	54.52
	20.5	71	57	24.7	2	07	13.8	2.6882	14	51.12
	21.0	77	54	32.7	2	35	03.2	2.6965	14	48.39
	21.5	83	50	14.8	3	01	04.0	2.7027	14	46.33
	22.0	89	45	06.9	+3	25	02.7	2.7071	14	44.92
	22.5	95	39	42.6	3	46	46.9	2.7094	14	44.14
	23.0	101	34	33.0	4	06	04.3	2.7100	14	43.95
	23.5	107	30	05.9	4	22	43.6	2.7089	14	44.32
	24.0	113	26	46.1	4	36	34.1	2.7061	14	45.22
	24.5	119	24	55.2	4	47	25.7	2.7020	14	46.59
	25.0	125	24	51.5	+4	55	09.7	2.6965	14	48.40
	25.5	131	26	49.8	4	59	38.1	2.6898	14	50.60
	26.0	137	31	02.1	5	00	44.7	2.6821	14	53.14
	26.5	143	37	37.4	4	58	24.8	2.6736	14	55.99
	27.0	149	46	42.3	4	52	35.8	2.6644	14	59.09
	27.5	155	58	21.2	4	43	17.2	2.6545	15	02.42
	28.0	162	12	37.0	+4	30	31.0	2.6442	15	05.95
	28.5	168	29	31.4	4	14	21.7	2.6335	15	09.63
	29.0	174	49	05.9	3	54	56.6	2.6225	15	13.45
	29.5	181	11	22.0	3	32	25.8	2.6112	15	17.40
	30.0	187	36	21.6	3	07	02.2	2.5998	15	21.44
	30.5	194	04	07.9	2	39	01.2	2.5881	15	25.58
	31.0	200	34	45.3	+2	08	41.2	2.5764	15	29.79
	31.5	207	08	19.9	1	36	22.9	2.5646	15	34.08
Sept.	1.0	213	44	59.1	1	02	29.5	2.5527	15	38.44
	1.5	220	24	51.7	+0	27	26.3	2.5408	15	42.84
	2.0	227	08	07.5	-0	08	19.2	2.5289	15	47.26
	2.5	233	54	56.3	0	44	17.8	2.5171	15	51.69
	3.0	240	45	27.5	-1	19	58.7	2.5055	15	56.09
	3.5	247	39	48.9	1	54	49.8	2.4943	16	00.41
	4.0	254	38	05.7	2	28	18.2	2.4835	16	04.59
	4.5	261	40	18.8	2	59	50.3	2.4733	16	08.56
	5.0	268	46	24.4	3	28	53.0	2.4639	16	12.24
	5.5	275	56	11.9	3	54	53.7	2.4556	16	15.55
	6.0	283	09	23.7	-4	17	22.1	2.4485	16	18.38
	6.5	290	25	33.9	4	35	50.3	2.4428	16	20.64
	7.0	297	44	08.9	4	49	54.7	2.4389	16	22.23
	7.5	305	04	27.0	4	59	16.6	2.4368	16	23.08
	8.0	312	25	39.6	-5	03	43.3	2.4367	16	23.10

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Sept.	8.0	312	25	39.6	-5	03	43.3	2.4367	16	23.10
	8.5	319	46	52.9	5	03	08.9	2.4388	16	22.25
	9.0	327	07	09.7	4	57	34.8	2.4432	16	20.50
	9.5	334	25	31.7	4	47	09.6	2.4498	16	17.86
	10.0	341	41	02.0	4	32	09.0	2.4586	16	14.36
	10.5	348	52	47.6	4	12	54.7	2.4694	16	10.07
	11.0	356	00	01.7	-3	49	53.6	2.4822	16	05.07
	11.5	3	02	05.0	3	23	36.2	2.4967	15	59.47
	12.0	9	58	27.1	2	54	35.4	2.5126	15	53.39
	12.5	16	48	47.1	2	23	25.2	2.5296	15	46.99
	13.0	23	32	54.0	1	50	39.4	2.5474	15	40.39
	13.5	30	10	45.6	1	16	50.4	2.5655	15	33.73
	14.0	36	42	28.6	-0	42	29.0	2.5837	15	27.15
	14.5	43	08	17.1	+0	08	03.5	2.6016	15	20.78
	15.0	49	28	32.1	0	26	00.4	2.6189	15	14.72
	15.5	55	43	39.7	0	59	19.6	2.6351	15	09.07
	16.0	61	54	10.7	1	31	33.5	2.6501	15	03.93
	16.5	68	00	39.0	2	02	24.0	2.6636	14	59.34
	17.0	74	03	41.1	+2	31	34.7	2.6754	14	55.38
	17.5	80	03	54.8	2	58	51.3	2.6853	14	52.08
	18.0	86	01	59.0	3	24	00.7	2.6932	14	49.46
	18.5	91	58	32.5	3	46	50.9	2.6990	14	47.55
	19.0	97	54	13.7	4	07	11.0	2.7027	14	46.35
	19.5	103	49	39.8	4	24	50.9	2.7042	14	45.84
	20.0	109	45	26.6	+4	39	40.9	2.7037	14	46.03
	20.5	115	42	07.8	4	51	32.0	2.7011	14	46.87
	21.0	121	40	14.6	5	00	15.9	2.6966	14	48.34
	21.5	127	40	15.7	5	05	44.9	2.6904	14	50.39
	22.0	133	42	36.4	5	07	52.2	2.6826	14	52.98
	22.5	139	47	38.6	5	06	32.3	2.6734	14	56.05
		145	55	40.6	5	01	40.8	2.6631	14	59.53
	23.0									
	23.5	152	06	56.9	+4	53	15.3	2.6518	15	03.37
	24.0	158	21	38.2	4	41	15.5	2.6397	15	07.49
	24.5	164	39	51.4	4	25	43.7	2.6272	15	11.82
	25.0	171	01	39.7	4	06	44.8	2.6144	15	16.29
	25.5	177	27	03.1	3	44	27.2	2.6015	15	20.83
	26.0	183	55	58.7	+3	19	02.4	2.5887	15	25.36
	26.5	190	28	20.8	2	50	45.6	2.5763	15	29.84
	27.0	197	04	02.3	2	19	55.6	2.5642	15	34.20
	27.5	203	42	54.4	1	46	54.4	2.5528	15	38.40
	28.0	210	24	47.6	1	12	07.5	2.5419	15	42.40
	28.5	217	09	32.4	+0	36	02.7	2.5318	15	46.18
	29.0	223	56	59.3	-0	00	49.3	2.5224	15	49.70
	29.5	230	46	59.4	0	37	56.4	2.5138	15	52.96
	30.0	237	39	24.5	1	14	45.2	2.5059	15	55.95
	30.5	244	34	07.2	1	50	41.8	2.4988	15	58.67
Oct.	1.0	251	31	00.3	-2	25	12.4	2.4924	16	01.12

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Oct.	1.0	251	31	00.3	-2	25	12.4	2.4924	16	01.12
	1.5	258	29	57.0	2	57	43.8	2.4868	16	03.31
	2.0	265	30	50.1	3	27	44.3	2.4818	16	05.22
	2.5	272	33	31.5	3	54	44.0	2.4776	16	06.86
	3.0	279	37	51.5	4	18	15.5	2.4742	16	08.20
	3.5	286	43	38.6	4	37	54.4	2.4715	16	09.24
	4.0	293	50	38.0	-4	53	20.1	2.4697	16	09.95
	4.5	300	58	32.4	5	04	16.0	2.4689	16	10.30
	5.0	308	07	00.5	5	10	30.2	2.4690	16	10.25
	5.5	315	15	38.0	5	11	55.8	2.4702	16	09.76
	6.0	322	23	57.1	5	08	31.6	2.4726	16	08.82
	6.5	329	31	27.6	5	00	21.6	2.4763	16	07.37
	7.0	336	37	37.0	-4	47	35.7	2.4814	16	05.41
	7.5	343	41	51.9	4	30	29.1	2.4878	16	02.92
	8.0	350	43	39.1	4	09	21.9	2.4956	15	59.89
	8.5	357	42	26.4	3	44	38.8	2.5048	15	56.36
	9.0	4	37	44.1	3	16	47.8	2.5154	15	52.35
	9.5	11	29	05.8	2	46	19.7	2.5272	15	47.90
	10.0	18	16	09.5	-2	13	46.8	2.5401	15	43.09
	10.5	24	58	38.2	1	39	42.0	2.5539	15	38.00
	11.0	31	36	20.4	1	04	37.9	2.5684	15	32.70
	11.5	38	09	10.2	-0	29	06.0	2.5834	15	27.29
	12.0	44	37	07.5	+0	06	23.9	2.5985	15	21.88
	12.5	51	00	17.9	0	41	24.3	2.6136	15	16.56
	13.0	57	18	52.1	+1	15	30.3	2.6283	15	11.42
	13.5	63	33	06.0	1	48	19.6	2.6424	15	06.57
	14.0	69	43	19.6	2	19	32.2	2.6556	15	02.08
	14.5	75	49	57.0	2	48	51.0	2.6675	14	58.04
	15.0	81	53	25.5	3	16	00.8	2.6780	14	54.51
	15.5	87	54	15.3	3	40	48.6	2.6869	14	51.56
	16.0	93	52	58.8	+4	03	03.1	2.6939	14	49.23
	16.5	99	50	10.1	4	22	34.1	2.6990	14	47.56
	17.0	105	46	24.6	4	39	12.9	2.7019	14	46.59
	17.5	111	42	18.4	4	52	51.6	2.7027	14	46.33
	18.0	117	38	27.7	5	03	23.1	2.7013	14	46.79
	18.5	123	35	28.6	5	10	40.8	2.6978	14	47.97
	19.0	129	33	56.6	+5	14	39.1	2.6921	14	49.85
	19.5	135	34	25.7	5	15	12.7	2.6843	14	52.41
	20.0	141	37	28.4	5	12	17.3	2.6747	14	55.61
	20.5	147	43	34.7	5	05	49.5	2.6634	14	59.42
	21.0	153	53	12.1	4	55	47.4	2.6506	15	03.76
	21.5	160	06	44.6	4	42	10.6	2.6366	15	08.58
	22.0	166	24	32.6	+4	25	00.9	2.6216	15	13.78
	22.5	172	46	51.9	4	04	22.6	2.6059	15	19.28
	23.0	179	13	53.9	3	40	23.1	2.5898	15	24.99
	23.5	185	45	44.7	3	13	13.3	2.5737	15	30.78
	24.0	192	22	25.3	+2	43	08.1	2.5578	15	36.55

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Oct.	24.0	192	22	25.3	+2	43	08.1	2.5578	15	36.55
	24.5	199	03	51.3	2	10	26.5	2.5425	15	42.19
	25.0	205	49	53.0	1	35	31.8	2.5280	15	47.59
	25.5	212	40	15.8	0	58	51.5	2.5146	15	52.65
	26.0	219	34	40.4	+0	20	57.0	2.5025	15	57.26
	26.5	226	32	43.5	-0	17	36.9	2.4918	16	01.35
	27.0	233	33	58.6	-0	56	13.2	2.4827	16	04.87
	27.5	240	37	56.8	1	34	13.1	2.4753	16	07.77
	28.0	247	44	07.4	2	10	57.6	2.4695	16	10.03
	28.5	254	51	59.3	2	45	48.5	2.4654	16	11.65
	29.0	262	01	01.4	3	18	09.3	2.4629	16	12.64
	29.5	269	10	43.6	3	47	26.7	2.4619	16	13.04
	30.0	276	20	37.2	-4	13	11.0	2.4623	16	12.89
	30.5	283	30	15.6	4	34	57.0	2.4639	16	12.25
	31.0	290	39	14.4	4	52	24.5	2.4667	16	11.16
	31.5	297	47	11.5	5	05	18.4	2.4704	16	09.69
Nov.	1.0	304	53	47.5	5	13	28.8	2.4750	16	07.88
	1.5	311	58	45.1	5	16	51.3	2.4804	16	05.78
	2.0	319	01	48.9	-5	15	26.2	2.4865	16	03.42
	2.5	326	02	45.4	5	09	19.0	2.4931	16	00.85
	3.0	333	01	22.7	4	58	39.3	2.5004	15	58.07
	3.5	339	57	30.0	4	43	41.1	2.5082	15	55.10
	4.0	346	50	57.2	4	24	42.2	2.5164	15	51.95
	4.5	353	41	35.4	4	02	03.5	2.5253	15	48.63
	5.0	0	29	16.1	-3	36	08.9	2.5346	15	45.14
	5.5	7	13	51.4	3	07	24.8	2.5444	15	41.49
	6.0	13	55	14.3	2	36	19.2	2.5547	15	37.68
	6.5	20	33	18.4	2	03	21.3	2.5656	15	33.73
	7.0	27	07	58.4	1	29	01.1	2.5768	15	29.65
	7.5	33	39	10.2	0	53	48.5	2.5884	15	25.48
	8.0	40	06	51.2	-0	18	13.1	2.6003	15	21.25
	8.5	46	31	00.7	+0	17	16.7	2.6124	15	17.00
	9.0	52	51	39.9	0	52	14.0	2.6244	15	12.78
	9.5	59	08	52.2	1	26	13.6	2.6364	15	08.63
	10.0	65	22	43.7	1	58	52.7	2.6481	15	04.63
	10.5	71	33	23.0	2	29	50.3	2.6592	15	00.83
	11.0	77	41	01.5	+2	58	48.3	2.6697	14	57.30
	11.5	83	45	53.5	3	25	30.4	2.6793	14	54.10
	12.0	89	48	16.0	3	49	43.0	2.6877	14	51.29
	12.5	95	48	28.8	4	11	14.1	2.6948	14	48.94
	13.0	101	46	54.6	4	29	53.9	2.7004	14	47.09
	13.5	107	43	58.3	4	45	34.2	2.7043	14	45.81
	14.0	113	40	07.3	+4	58	08.1	2.7064	14	45.13
	14.5	119	35	51.2	5	07	29.9	2.7065	14	45.09
	15.0	125	31	41.5	5	13	35.0	2.7046	14	45.73
	15.5	131	28	11.0	5	16	19.7	2.7005	14	47.06
	16.0	137	25	53.9	+5	15	40.9	2.6943	14	49.11

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Nov.	16.0	137	25	53.9	+5	15	40.9	2.6943	14	49.11
	16.5	143	25	25.3	5	11	36.6	2.6860	14	51.87
	17.0	149	27	20.5	5	04	05.3	2.6756	14	55.33
	17.5	155	32	14.6	4	53	06.6	2.6632	14	59.48
	18.0	161	40	42.1	4	38	41.3	2.6491	15	04.27
	18.5	167	53	16.1	4	20	51.6	2.6334	15	09.67
	19.0	174	10	27.3	+3	59	41.7	2.6163	15	15.60
	19.5	180	32	43.8	3	35	18.1	2.5982	15	21.99
	20.0	187	00	29.6	3	07	50.0	2.5794	15	28.73
	20.5	193	34	03.8	2	37	30.3	2.5601	15	35.71
	21.0	200	13	39.9	2	04	35.6	2.5409	15	42.79
	21.5	206	59	24.6	1	29	27.0	2.5220	15	49.84
	22.0	213	51	17.0	+0	52	30.3	2.5040	15	56.69
	22.5	220	49	08.0	+0	14	15.7	2.4871	16	03.19
	23.0	227	52	39.6	-0	24	41.8	2.4717	16	09.19
	23.5	235	01	25.3	1	03	43.5	2.4581	16	14.52
	24.0	242	14	49.7	1	42	07.8	2.4467	16	19.07
	24.5	249	32	09.9	2	19	11.4	2.4376	16	22.73
	25.0	256	52	36.4	-2	54	11.3	2.4310	16	25.40
	25.5	264	15	14.5	3	26	25.9	2.4269	16	27.06
	26.0	271	39	06.8	3	55	17.1	2.4254	16	27.70
	26.5	279	03	15.0	4	20	11.7	2.4263	16	27.34
	27.0	286	26	42.3	4	40	42.8	2.4295	16	26.03
	27.5	293	48	35.2	4	56	30.3	2.4348	16	23.88
	28.0	301	08	05.6	-5	07	21.4	2.4420	16	20.97
	28.5	308	24	32.1	5	13	10.5	2.4508	16	17.43
	29.0	315	37	20.6	5	13	58.8	2.4610	16	13.38
	29.5	322	46	05.1	5	09	53.6	2.4723	16	08.95
	30.0	329	50	27.3	5	01	07.5	2.4844	16	04.23
	30.5	336	50	16.2	4	47	57.1	2.4970	15	59.34
Dec.	1.0	343	45	27.4	-4	30	42.8	2.5101	15	54.37
	1.5	350	36	02.1	4	09	47.3	2.5233	15	49.38
	2.0	357	22	06.1	3	45	35.3	2.5365	15	44.43
	2.5	4	03	48.4	3	18	32.9	2.5496	15	39.57
	3.0	10	41	20.7	2	49	06.8	2.5625	15	34.84
	3.5	17	14	56.1	2	17	44.3	2.5752	15	30.25
	4.0	23	44	48.2	-1	44	52.7	2.5875	15	25.81
	4.5	30	11	11.0	1	10	59.2	2.5995	15	21.53
	5.0	36	34	17.8	0	36	30.5	2.6112	15	17.42
	5.5	42	54	21.2	-0	01	52.6	2.6224	15	13.47
	6.0	49	11	33.0	+0	32	29.2	2.6333	15	09.69
	6.5	55	26	03.8	1	06	10.8	2.6438	15	06.09
	7.0	61	38	03.5	+1	38	49.4	2.6539	15	02.66
	7.5	67	47	41.2	2	10	03.7	2.6634	14	59.41
	8.0	73	55	05.4	2	39	34.1	2.6724	14	56.38
	8.5	80	00	24.7	3	07	02.7	2.6808	14	53.57
	9.0	86	03	47.8	+3	32	13.6	2.6885	14	51.01

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Dec.	9.0	86	03	47.8	+3	32	13.6	2.6885	14	51.01
	9.5	92	05	24.1	3	54	52.8	2.6954	14	48.74
	10.0	98	05	24.0	4	14	48.3	2.7013	14	46.79
	10.5	104	03	59.2	4	31	50.0	2.7062	14	45.19
	11.0	110	01	23.1	4	45	49.7	2.7099	14	43.99
	11.5	115	57	51.4	4	56	41.1	2.7122	14	43.24
	12.0	121	53	41.6	+5	04	19.2	2.7131	14	42.96
	12.5	127	49	13.7	5	08	40.7	2.7123	14	43.21
	13.0	133	44	50.5	5	09	43.5	2.7098	14	44.01
	13.5	139	40	56.9	5	07	26.8	2.7055	14	45.42
	14.0	145	38	00.4	5	01	50.8	2.6993	14	47.45
	14.5	151	36	30.8	4	52	56.6	2.6912	14	50.13
	15.0	157	37	00.2	+4	40	46.6	2.6811	14	53.48
	15.5	163	40	02.2	4	25	23.9	2.6691	14	57.51
	16.0	169	46	12.0	4	06	53.0	2.6552	15	02.20
	16.5	175	56	05.6	3	45	19.7	2.6396	15	07.55
	17.0	182	10	19.1	3	20	51.6	2.6223	15	13.51
	17.5	188	29	28.2	2	53	38.0	2.6037	15	20.05
	18.0	194	54	06.9	+2	23	50.9	2.5839	15	27.09
	18.5	201	24	46.5	1	51	45.3	2.5633	15	34.53
	19.0	208	01	54.3	1	17	39.3	2.5423	15	42.28
	19.5	214	45	52.0	0	41	55.2	2.5211	15	50.18
	20.0	221	36	54.5	+0	04	59.4	2.5003	15	58.10
	20.5	228	35	07.6	-0	32	37.1	2.4802	16	05.85
	21.0	235	40	27.3	-1	10	19.3	2.4614	16	13.24
	21.5	242	52	37.8	1	47	28.1	2.4442	16	20.09
	22.0	250	11	10.8	2	23	21.2	2.4291	16	26.19
	22.5	257	35	25.1	2	57	15.0	2.4164	16	31.36
	23.0	265	04	27.4	3	28	25.7	2.4065	16	35.46
	23.5	272	37	12.9	3	56	11.6	2.3995	16	38.34
	24.0	280	12	28.2	-4	19	55.0	2.3957	16	39.94
	24.5	287	48	53.7	4	39	04.5	2.3950	16	40.21
	25.0	295	25	07.6	4	53	16.3	2.3975	16	39.18
	25.5	302	59	49.4	5	02	15.3	2.4030	16	36.90
	26.0	310	31	43.5	5	05	55.8	2.4112	16	33.48
	26.5	317	59	42.8	5	04	20.6	2.4220	16	29.07
	27.0	325	22	50.7	-4	57	40.9	2.4349	16	23.83
	27.5	332	40	22.8	4	46	14.4	2.4496	16	17.93
	28.0	339	51	47.3	4	30	24.2	2.4657	16	11.54
	28.5	346	56	45.2	4	10	37.4	2.4828	16	04.84
	29.0	353	55	08.8	3	47	23.0	2.5006	15	57.99
	29.5	0	47	00.8	3	21	11.5	2.5186	15	51.12
	30.0	7	32	32.3	-2	52	33.5	2.5367	15	44.36
	30.5	14	12	01.2	2	21	58.9	2.5544	15	37.79
	31.0	20	45	50.3	1	49	56.8	2.5717	15	31.50
	31.5	27	14	25.8	1	16	54.9	2.5882	15	25.55
	32.0	33	38	15.9	-0	43	19.6	2.6039	15	19.96

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	0.0	15	53	30.09	-20	11	44.67	60	39.52
	0.5	16	24	21.17	22	14	15.68	60	54.67
	1.0	16	56	17.32	23	55	02.91	61	05.87
	1.5	17	29	08.55	25	10	50.20	61	12.65
	2.0	18	02	39.25	25	59	00.67	61	14.66
	2.5	18	36	29.27	26	17	54.55	61	11.76
	3.0	19	10	15.92	-26	07	01.84	61	03.96
	3.5	19	43	36.63	25	27	06.09	60	51.49
	4.0	20	16	11.56	24	19	58.27	60	34.72
	4.5	20	47	45.59	22	48	22.44	60	14.18
	5.0	21	18	09.14	20	55	36.91	59	50.51
	5.5	21	47	18.14	18	45	15.37	59	24.41
	6.0	22	15	13.18	-16	20	50.92	58	56.59
	6.5	22	41	58.41	13	45	44.74	58	27.78
	7.0	23	07	40.44	11	02	59.39	57	58.65
	7.5	23	32	27.36	8	15	16.07	57	29.81
	8.0	23	56	27.99	5	24	54.61	57	01.79
	8.5	0	19	51.46	-2	33	55.39	56	35.05
	9.0	0	42	46.76	+0	15	57.76	56	09.96
	9.5	1	05	22.66	3	03	14.35	55	46.81
	10.0	1	27	47.48	5	46	33.83	55	25.81
	10.5	1	50	09.09	8	24	42.51	55	07.12
	11.0	2	12	34.79	10	56	30.81	54	50.83
	11.5	2	35	11.30	13	20	50.90	54	36.96
	12.0	2	58	04.58	+15	36	34.94	54	25.52
	12.5	3	21	19.79	17	42	33.78	54	16.45
	13.0	3	45	01.05	19	37	36.46	54	09.68
	13.5	4	09	11.29	21	20	30.36	54	05.12
	14.0	4	33	52.02	22	50	02.14	54	02.63
	14.5	4	59	03.15	24	04	59.56	54	02.09
	15.0	5	24	42.90	+25	04	14.05	54	03.35
	15.5	5	50	47.72	25	46	43.84	54	06.28
	16.0	6	17	12.44	26	11	37.46	54	10.71
	16.5	6	43	50.57	26	18	17.12	54	16.51
	17.0	7	10	34.78	26	06	21.51	54	23.55
	17.5	7	37	17.39	25	35	47.66	54	31.69
	18.0	8	03	51.10	+24	46	51.57	54	40.84
	18.5	8	30	09.47	23	40	07.46	54	50.91
	19.0	8	56	07.44	22	16	25.96	55	01.81
	19.5	9	21	41.59	20	36	51.46	55	13.51
	20.0	9	46	50.33	18	42	39.10	55	25.95
	20.5	10	11	33.83	16	35	11.82	55	39.13
	21.0	10	35	53.95	+14	15	57.78	55	53.03
	21.5	10	59	54.00	11	46	28.39	56	07.66
	22.0	11	23	38.60	9	08	17.12	56	23.03
	22.5	11	47	13.43	6	22	59.00	56	39.12
	23.0	12	10	45.05	+3	32	10.92	56	55.93

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	23.0	12	10	45.05	+3	32	10.92	56	55.93
	23.5	12	34	20.79	+0	37	32.57	57	13.43
	24.0	12	58	08.55	-2	19	12.08	57	31.54
	24.5	13	22	16.71	5	16	12.75	57	50.19
	25.0	13	46	53.91	8	11	30.62	58	09.20
	25.5	14	12	08.85	11	02	55.99	58	28.40
	26.0	14	38	09.95	-13	48	06.18	58	47.51
	26.5	15	05	04.86	16	24	24.28	59	06.24
	27.0	15	32	59.81	18	48	59.21	59	24.21
	27.5	16	01	58.78	20	58	48.05	59	41.00
	28.0	16	32	02.54	22	50	41.42	59	56.15
	28.5	17	03	07.74	24	21	32.45	60	09.20
	29.0	17	35	06.23	-25	28	29.30	60	19.68
	29.5	18	07	44.96	26	09	10.24	60	27.13
	30.0	18	40	46.70	26	21	58.81	60	31.19
	30.5	19	13	51.62	26	06	15.87	60	31.57
	31.0	19	46	39.41	25	22	25.70	60	28.08
	31.5	20	18	51.60	24	11	54.18	60	20.67
Feb.	1.0	20	50	13.37	-22	36	59.83	60	09.44
	1.5	21	20	34.57	20	40	39.72	59	54.62
	2.0	21	49	49.93	18	26	13.62	59	36.54
	2.5	22	17	58.58	15	57	09.25	59	15.67
	3.0	22	45	03.16	13	16	50.39	58	52.54
	3.5	23	11	08.85	10	28	28.50	58	27.73
	4.0	23	36	22.57	-7	34	57.98	58	01.84
	4.5	0	00	52.18	4	38	54.09	57	35.46
	5.0	0	24	45.98	-1	42	33.13	57	09.17
	5.5	0	48	12.38	+1	12	06.11	56	43.48
	6.0	1	11	19.61	4	03	19.94	56	18.85
	6.5	1	34	15.58	6	49	37.11	55	55.70
	7.0	1	57	07.80	+9	29	35.94	55	34.35
	7.5	2	20	03.22	12	02	01.66	55	15.08
	8.0	2	43	08.23	14	25	43.98	54	58.11
	8.5	3	06	28.45	16	39	35.20	54	43.57
	9.0	3	30	08.70	18	42	28.64	54	31.57
	9.5	3	54	12.76	20	33	17.88	54	22.17
	10.0	4	18	43.23	+22	10	56.52	54	15.36
	10.5	4	43	41.35	23	34	18.84	54	11.12
	11.0	5	09	06.82	24	42	21.04	54	09.38
	11.5	5	34	57.77	25	34	03.42	54	10.04
	12.0	6	01	10.72	26	08	32.89	54	12.96
	12.5	6	27	40.75	26	25	05.96	54	18.00
	13.0	6	54	21.80	+26	23	11.61	54	24.99
	13.5	7	21	07.12	26	02	33.78	54	33.73
	14.0	7	47	49.78	25	23	13.12	54	44.02
	14.5	8	14	23.24	24	25	27.72	54	55.64
	15.0	8	40	41.81	+23	09	52.87	55	08.36

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
Feb.	15.0	8	40	41.81	+23	09	52.87	55	08.36
	15.5	9	06	41.11	21	37	19.84	55	21.97
	16.0	9	32	18.32	19	48	54.03	55	36.26
	16.5	9	57	32.25	17	45	52.73	55	51.01
	17.0	10	22	23.35	15	29	42.85	56	06.03
	17.5	10	46	53.60	13	01	58.82	56	21.15
	18.0	11	11	06.33	+10	24	20.92	56	36.22
	18.5	11	35	06.05	7	38	33.97	56	51.12
	19.0	11	58	58.23	4	46	26.64	57	05.74
	19.5	12	22	49.15	+1	49	51.15	57	20.03
	20.0	12	46	45.70	-1	09	16.49	57	33.92
	20.5	13	10	55.27	4	08	55.97	57	47.38
	21.0	13	35	25.53	-7	07	01.77	58	00.38
	21.5	14	00	24.24	10	01	22.15	58	12.92
	22.0	14	25	58.98	12	49	38.21	58	24.96
	22.5	14	52	16.78	15	29	23.23	58	36.46
	23.0	15	19	23.64	17	58	02.81	58	47.37
	23.5	15	47	23.93	20	12	56.21	58	57.61
	24.0	16	16	19.66	-22	11	19.47	59	07.06
	24.5	16	46	09.79	23	50	30.77	59	15.57
	25.0	17	16	49.59	25	07	58.22	59	22.97
	25.5	17	48	10.43	26	01	29.63	59	29.06
	26.0	18	19	59.92	26	29	23.36	59	33.61
	26.5	18	52	02.86	26	30	38.21	59	36.39
	27.0	19	24	02.56	-26	05	00.58	59	37.17
	27.5	19	55	42.61	25	13	07.03	59	35.76
	28.0	20	26	48.50	23	56	21.76	59	31.98
	28.5	20	57	08.92	22	16	49.46	59	25.72
Mar.	1.0	21	26	36.32	20	17	05.27	59	16.94
	1.5	21	55	07.04	18	00	03.71	59	05.67
	2.0	22	22	40.90	-15	28	48.32	58	52.01
	2.5	22	49	20.48	12	46	23.01	58	36.17
	3.0	23	15	10.48	9	55	45.61	58	18.40
	3.5	23	40	16.98	6	59	43.59	57	59.04
	4.0	0	04	46.92	4	00	51.65	57	38.45
	4.5	0	28	47.66	-1	01	30.73	57	17.06
	5.0	0	52	26.64	+1	56	11.78	56	55.30
	5.5	1	15	51.21	4	50	21.22	56	33.58
	6.0	1	39	08.41	7	39	14.20	56	12.34
	6.5	2	02	24.90	10	21	16.98	55	51.97
	7.0	2	25	46.80	12	55	03.74	55	32.84
	7.5	2	49	19.63	15	19	14.99	55	15.27
	8.0	3	13	08.13	+17	32	36.08	54	59.54
	8.5	3	37	16.17	19	33	56.22	54	45.90
	9.0	4	01	46.58	21	22	07.80	54	34.55
	9.5	4	26	41.00	22	56	06.33	54	25.63
	10.0	4	51	59.74	+24	14	50.93	54	19.26

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
Mar.	10.0	4	51	59.74	+24	14	50.93	54	19.26
	10.5	5	17	41.71	25	17	25.38	54	15.50
	11.0	5	43	44.43	26	02	59.62	54	14.38
	11.5	6	10	04.06	26	30	51.68	54	15.89
	12.0	6	36	35.72	26	40	29.59	54	19.98
	12.5	7	03	13.72	26	31	33.28	54	26.56
	13.0	7	29	52.08	+26	03	55.99	54	35.51
	13.5	7	56	24.92	25	17	45.15	54	46.65
	14.0	8	22	46.96	24	13	22.64	54	59.80
	14.5	8	48	53.93	22	51	24.35	55	14.73
	15.0	9	14	42.78	21	12	39.38	55	31.16
	15.5	9	40	11.92	19	18	08.87	55	48.80
	16.0	10	05	21.25	+17	09	04.82	56	07.35
	16.5	10	30	12.08	14	46	49.05	56	26.45
	17.0	10	54	47.05	12	12	52.27	56	45.76
	17.5	11	19	09.98	9	28	53.56	57	04.94
	18.0	11	43	25.69	6	36	39.98	57	23.65
	18.5	12	07	39.82	3	38	06.46	57	41.56
	19.0	12	31	58.69	+0	35	15.84	57	58.40
	19.5	12	56	29.12	-2	29	41.06	58	13.91
	20.0	13	21	18.23	5	34	25.37	58	27.90
	20.5	13	46	33.23	8	36	30.26	58	40.21
	21.0	14	12	21.15	11	33	21.23	58	50.78
	21.5	14	38	48.47	14	22	16.94	58	59.54
	22.0	15	06	00.66	-17	00	30.66	59	06.53
	22.5	15	34	01.60	19	25	12.90	59	11.79
	23.0	16	02	52.99	21	33	35.22	59	15.41
	23.5	16	32	33.66	23	22	55.85	59	17.48
	24.0	17	02	59.13	24	50	46.85	59	18.12
	24.5	17	34	01.33	25	55	02.44	59	17.43
	25.0	18	05	28.89	-26	34	07.73	59	15.52
	25.5	18	37	07.89	26	47	06.20	59	12.45
	26.0	19	08	43.11	26	33	44.61	59	08.28
	26.5	19	39	59.54	25	54	34.09	59	03.05
	27.0	20	10	43.84	24	50	47.18	58	56.75
	27.5	20	40	45.44	23	24	11.39	58	49.39
	28.0	21	09	57.20	-21	37	00.72	58	40.95
	28.5	21	38	15.50	19	31	46.61	58	31.40
	29.0	22	05	39.89	17	11	09.66	58	20.73
	29.5	22	32	12.59	14	37	52.92	58	08.95
	30.0	22	57	57.82	11	54	36.91	57	56.08
	30.5	23	23	01.21	9	03	56.39	57	42.17
	31.0	23	47	29.28	-6	08	18.45	57	27.31
	31.5	0	11	28.99	3	10	01.69	57	11.63
Apr.	1.0	0	35	07.50	-0	11	15.98	56	55.30
	1.5	0	58	31.88	+2	45	57.19	56	38.50
	2.0	1	21	48.98	+5	39	44.24	56	21.47

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	1.0	0	35	07.50	-0	11	15.98	56	55.30
	1.5	0	58	31.88	+2	45	57.19	56	38.50
	2.0	1	21	48.98	5	39	44.24	56	21.47
	2.5	1	45	05.27	8	28	18.77	56	04.45
	3.0	2	08	26.73	11	10	00.89	55	47.72
	3.5	2	31	58.76	13	43	16.56	55	31.55
	4.0	2	55	46.00	+16	06	37.05	55	16.22
	4.5	3	19	52.22	18	18	38.62	55	02.01
	5.0	3	44	20.18	20	18	02.47	54	49.18
	5.5	4	09	11.47	22	03	35.00	54	37.96
	6.0	4	34	26.39	23	34	08.49	54	28.60
	6.5	5	00	03.87	24	48	42.10	54	21.28
	7.0	5	26	01.46	+25	46	23.13	54	16.19
	7.5	5	52	15.46	26	26	28.46	54	13.46
	8.0	6	18	41.09	26	48	25.98	54	13.21
	8.5	6	45	12.86	26	51	55.68	54	15.52
	9.0	7	11	44.96	26	36	50.37	54	20.43
	9.5	7	38	11.69	26	03	15.88	54	27.94
	10.0	8	04	27.93	+25	11	30.61	54	38.02
	10.5	8	30	29.53	24	02	04.66	54	50.60
	11.0	8	56	13.52	22	35	38.69	55	05.55
	11.5	9	21	38.37	20	53	02.65	55	22.71
	12.0	9	46	43.94	18	55	14.78	55	41.84
	12.5	10	11	31.55	16	43	20.85	56	02.68
	13.0	10	36	03.78	+14	18	33.90	56	24.91
	13.5	11	00	24.44	11	42	14.50	56	48.14
	14.0	11	24	38.31	8	55	51.38	57	11.95
	14.5	11	48	51.09	6	01	02.48	57	35.89
	15.0	12	13	09.17	+2	59	36.25	57	59.46
	15.5	12	37	39.55	-0	06	27.03	58	22.17
	16.0	13	02	29.62	-3	14	54.08	58	43.51
	16.5	13	27	46.95	6	23	17.71	59	03.01
	17.0	13	53	39.07	9	28	56.61	59	20.24
	17.5	14	20	13.05	12	28	55.97	59	34.85
	18.0	14	47	35.02	15	20	09.37	59	46.56
	18.5	15	15	49.58	17	59	22.21	59	55.19
	19.0	15	44	59.03	-20	23	17.09	60	00.66
	19.5	16	15	02.61	22	28	41.34	60	03.00
	20.0	16	45	55.85	24	12	36.56	60	02.33
	20.5	17	17	30.21	25	32	29.53	59	58.86
	21.0	17	49	33.27	26	26	23.33	59	52.85
	21.5	18	21	49.54	26	53	06.64	59	44.61
	22.0	18	54	01.89	-26	52	19.36	59	34.47
	22.5	19	25	53.32	26	24	33.22	59	22.77
	23.0	19	57	08.73	25	31	06.97	59	09.83
	23.5	20	27	36.27	24	13	57.42	58	55.95
	24.0	20	57	08.00	-22	35	28.16	58	41.39

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	24.0	20	57	08.00	-22	35	28.16	58	41.39
	24.5	21	25	40.05	20	38	18.28	58	26.36
	25.0	21	53	12.13	18	25	12.57	58	11.04
	25.5	22	19	46.91	15	58	54.16	57	55.57
	26.0	22	45	29.24	13	21	59.77	57	40.07
	26.5	23	10	25.42	10	36	57.21	57	24.59
	27.0	23	34	42.65	-7	46	04.55	57	09.20
	27.5	23	58	28.57	4	51	30.47	56	53.94
	28.0	0	21	50.93	-1	55	15.21	56	38.84
	28.5	0	44	57.37	+1	00	48.10	56	23.93
	29.0	1	07	55.26	3	54	52.17	56	09.25
	29.5	1	30	51.58	6	45	14.31	55	54.87
	30.0	1	53	52.80	+9	30	15.45	55	40.84
	30.5	2	17	04.77	12	08	19.48	55	27.25
May	1.0	2	40	32.62	14	37	52.82	55	14.22
	1.5	3	04	20.56	16	57	24.51	55	01.86
	2.0	3	28	31.80	19	05	26.63	54	50.32
	2.5	3	53	08.29	21	00	35.14	54	39.75
	3.0	4	18	10.64	+22	41	31.21	54	30.31
	3.5	4	43	37.95	24	07	02.90	54	22.19
	4.0	5	09	27.80	25	16	07.11	54	15.54
	4.5	5	35	36.35	26	07	51.61	54	10.55
	5.0	6	01	58.48	26	41	36.93	54	07.39
	5.5	6	28	28.17	26	56	57.79	54	06.21
	6.0	6	54	58.96	+26	53	43.88	54	07.16
	6.5	7	21	24.40	26	31	59.82	54	10.36
	7.0	7	47	38.63	25	52	04.26	54	15.91
	7.5	8	13	36.73	24	54	28.32	54	23.91
	8.0	8	39	15.13	23	39	53.54	54	34.39
	8.5	9	04	31.76	22	09	09.74	54	47.37
	9.0	9	29	26.12	+20	23	13.03	55	02.82
	9.5	9	53	59.24	18	23	04.27	55	20.67
	10.0	10	18	13.59	16	09	48.17	55	40.78
	10.5	10	42	12.93	13	44	33.11	56	02.98
	11.0	11	06	02.11	11	08	31.67	56	27.01
	11.5	11	29	46.96	8	23	01.81	56	52.57
	12.0	11	53	34.13	+5	29	28.76	57	19.26
	12.5	12	17	30.98	+2	29	27.25	57	46.62
	13.0	12	41	45.43	-0	35	15.85	58	14.13
	13.5	13	06	25.83	3	42	38.88	58	41.22
	14.0	13	31	40.77	6	50	22.87	59	07.26
	14.5	13	57	38.75	9	55	49.68	59	31.62
	15.0	14	24	27.80	-12	56	01.17	59	53.66
	15.5	14	52	14.88	15	47	40.13	60	12.78
	16.0	15	21	05.07	18	27	13.62	60	28.47
	16.5	15	51	00.61	20	50	59.43	60	40.31
	17.0	16	21	59.88	-22	55	16.16	60	48.00

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
May	17.0	16	21	59.88	-22	55	16.16	60	48.00
	17.5	16	53	56.56	24	36	36.75	60	51.39
	18.0	17	26	39.18	25	52	04.41	60	50.50
	18.5	17	59	51.47	26	39	28.64	60	45.49
	19.0	18	33	13.71	26	57	38.27	60	36.64
	19.5	19	06	24.75	26	46	28.22	60	24.37
	20.0	19	39	04.45	-26	06	58.22	60	09.15
	20.5	20	10	55.91	25	01	03.72	59	51.51
	21.0	20	41	46.82	23	31	21.41	59	31.99
	21.5	21	11	30.06	21	40	52.84	59	11.12
	22.0	21	40	03.31	19	32	49.22	58	49.41
	22.5	22	07	28.31	17	10	19.52	58	27.29
	23.0	22	33	49.80	-14	36	22.59	58	05.16
	23.5	22	59	14.56	11	53	42.84	57	43.34
	24.0	23	23	50.59	9	04	48.96	57	22.09
	24.5	23	47	46.50	6	11	54.44	57	01.60
	25.0	0	11	11.06	3	16	59.44	56	42.03
	25.5	0	34	12.92	-0	21	53.09	56	23.47
	26.0	0	57	00.44	+2	31	43.96	56	05.98
	26.5	1	19	41.54	5	22	17.22	55	49.59
	27.0	1	42	23.61	8	08	16.20	55	34.32
	27.5	2	05	13.44	10	48	12.80	55	20.15
	28.0	2	28	17.06	13	20	40.04	55	07.07
	28.5	2	51	39.70	15	44	11.45	54	55.07
	29.0	3	15	25.52	+17	57	20.95	54	44.15
	29.5	3	39	37.52	19	58	43.47	54	34.30
	30.0	4	04	17.29	21	46	56.15	54	25.56
	30.5	4	29	24.86	23	20	40.19	54	17.94
	31.0	4	54	58.60	24	38	43.28	54	11.49
	31.5	5	20	55.17	25	40	02.34	54	06.29
June	1.0	5	47	09.69	+26	23	46.31	54	02.41
	1.5	6	13	35.97	26	49	18.66	53	59.93
	2.0	6	40	07.00	26	56	19.25	53	58.97
	2.5	7	06	35.45	26	44	45.09	53	59.63
	3.0	7	32	54.28	26	14	50.14	54	02.03
	3.5	7	58	57.27	25	27	03.77	54	06.29
	4.0	8	24	39.49	+24	22	08.60	54	12.51
	4.5	8	49	57.57	23	00	57.58	54	20.80
	5.0	9	14	49.86	21	24	31.15	54	31.24
	5.5	9	39	16.41	19	33	54.57	54	43.90
	6.0	10	03	18.92	17	30	15.89	54	58.82
	6.5	10	27	00.51	15	14	44.59	55	16.00
	7.0	10	50	25.57	+12	48	31.07	55	35.41
	7.5	11	13	39.59	10	12	47.00	55	56.96
	8.0	11	36	48.99	7	28	46.37	56	20.51
	8.5	12	00	00.99	4	37	47.30	56	45.86
	9.0	12	23	23.51	+1	41	14.44	57	12.72

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
June	9.0	12	23	23.51	+1	41	14.44	57	12.72
	9.5	12	47	05.07	-1	19	18.09	57	40.73
	10.0	13	11	14.68	4	22	03.46	58	09.45
	10.5	13	36	01.68	7	24	58.67	58	38.37
	11.0	14	01	35.47	10	25	41.34	59	06.88
	11.5	14	28	05.12	13	21	27.24	59	34.33
	12.0	14	55	38.78	-16	09	09.16	60	00.01
	12.5	15	24	22.82	18	45	18.30	60	23.22
	13.0	15	54	20.75	21	06	09.00	60	43.26
	13.5	16	25	31.97	23	07	48.08	60	59.49
	14.0	16	57	50.66	24	46	29.11	61	11.40
	14.5	17	31	05.03	25	58	50.86	61	18.59
	15.0	18	04	57.54	-26	42	17.71	61	20.84
	15.5	18	39	06.16	26	55	17.83	61	18.12
	16.0	19	13	06.85	26	37	34.59	61	10.57
	16.5	19	46	36.37	25	50	08.04	60	58.52
	17.0	20	19	15.10	24	35	05.78	60	42.43
	17.5	20	50	48.75	22	55	26.08	60	22.89
	18.0	21	21	09.07	-20	54	37.71	60	00.53
	18.5	21	50	13.42	18	36	20.71	59	36.04
	19.0	22	18	03.77	16	04	11.25	59	10.09
	19.5	22	44	45.49	13	21	31.44	58	43.32
	20.0	23	10	26.16	10	31	23.93	58	16.29
	20.5	23	35	14.59	7	36	30.21	57	49.53
	21.0	23	59	20.20	-4	39	11.48	57	23.46
	21.5	0	22	52.47	-1	41	30.99	56	58.42
	22.0	0	46	00.66	+1	14	42.87	56	34.70
	22.5	1	08	53.65	4	07	53.23	56	12.49
	23.0	1	31	39.78	6	56	31.62	55	51.93
	23.5	1	54	26.80	9	39	15.12	55	33.10
	24.0	2	17	21.75	+12	14	44.04	55	16.06
	24.5	2	40	30.87	14	41	40.15	55	00.79
	25.0	3	03	59.44	16	58	45.51	54	47.29
	25.5	3	27	51.68	19	04	42.08	54	35.49
	26.0	3	52	10.47	20	58	12.05	54	25.35
	26.5	4	16	57.22	22	37	58.96	54	16.81
	27.0	4	42	11.65	+24	02	49.63	54	09.80
	27.5	5	07	51.74	25	11	36.75	54	04.26
	28.0	5	33	53.67	26	03	21.88	54	00.14
	28.5	6	00	12.05	26	37	18.62	53	57.41
	29.0	6	26	40.23	26	52	55.44	53	56.04
	29.5	6	53	10.75	26	49	57.79	53	56.03
	30.0	7	19	35.97	+26	28	29.10	53	57.37
	30.5	7	45	48.66	25	48	50.51	54	00.10
July	1.0	8	11	42.58	24	51	39.40	54	04.25
	1.5	8	37	12.88	23	37	46.94	54	09.87
	2.0	9	02	16.41	+22	08	15.04	54	17.03

MOON, 2022

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	1.0	8	11	42.58	+24	51	39.40	54	04.25
	1.5	8	37	12.88	23	37	46.94	54	09.87
	2.0	9	02	16.41	22	08	15.04	54	17.03
	2.5	9	26	51.76	20	24	13.22	54	25.80
	3.0	9	50	59.30	18	26	55.66	54	36.23
	3.5	10	14	40.98	16	17	38.88	54	48.40
	4.0	10	38	00.19	+13	57	40.13	55	02.37
	4.5	11	01	01.54	11	28	16.51	55	18.17
	5.0	11	23	50.65	8	50	44.96	55	35.82
	5.5	11	46	34.07	6	06	23.00	55	55.30
	6.0	12	09	19.07	3	16	30.04	56	16.56
	6.5	12	32	13.61	+0	22	29.48	56	39.48
	7.0	12	55	26.23	-2	34	08.84	57	03.92
	7.5	13	19	05.93	5	31	45.58	57	29.63
	8.0	13	43	22.10	8	28	28.66	57	56.31
	8.5	14	08	24.27	11	22	09.97	58	23.58
	9.0	14	34	21.73	14	10	22.32	58	50.98
	9.5	15	01	23.05	16	50	17.47	59	17.95
	10.0	15	29	35.27	-19	18	45.91	59	43.90
	10.5	15	59	02.89	21	32	19.54	60	08.16
	11.0	16	29	46.61	23	27	18.51	60	30.05
	11.5	17	01	42.18	25	00	03.03	60	48.87
	12.0	17	34	39.46	26	07	10.06	61	04.01
	12.5	18	08	22.35	26	45	53.41	61	14.91
	13.0	18	42	29.78	-26	54	23.60	61	21.14
	13.5	19	16	37.84	26	32	02.94	61	22.44
	14.0	19	50	22.69	25	39	31.58	61	18.72
	14.5	20	23	23.37	24	18	42.76	61	10.09
	15.0	20	55	23.97	22	32	28.75	60	56.82
	15.5	21	26	14.52	20	24	21.31	60	39.37
	16.0	21	55	50.92	-17	58	11.41	60	18.29
	16.5	22	24	14.01	15	17	51.81	59	54.27
	17.0	22	51	28.34	12	27	04.23	59	27.99
	17.5	23	17	41.00	9	29	11.58	59	00.17
	18.0	23	43	00.54	6	27	14.35	58	31.50
	18.5	0	07	36.24	3	23	50.21	58	02.62
	19.0	0	31	37.57	-0	21	15.63	57	34.10
	19.5	0	55	13.82	+2	38	31.25	57	06.43
	20.0	1	18	33.88	5	33	47.34	56	40.02
	20.5	1	41	46.14	8	23	01.13	56	15.20
	21.0	2	04	58.31	11	04	49.55	55	52.21
	21.5	2	28	17.38	13	37	55.19	55	31.24
	22.0	2	51	49.48	+16	01	04.11	55	12.41
	22.5	3	15	39.72	18	13	04.30	54	55.79
	23.0	3	39	52.07	20	12	44.90	54	41.39
	23.5	4	04	29.15	21	58	56.17	54	29.19
	24.0	4	29	32.02	+23	30	30.39	54	19.15

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	24.0	4	29	32.02	+23	30	30.39	54	19.15
	24.5	4	55	00.12	24	46	23.44	54	11.20
	25.0	5	20	51.09	25	45	37.19	54	05.24
	25.5	5	47	00.93	26	27	22.21	54	01.18
	26.0	6	13	24.12	26	51	00.77	53	58.91
	26.5	6	39	54.04	26	56	09.43	53	58.32
	27.0	7	06	23.43	+26	42	41.01	53	59.30
	27.5	7	32	44.98	26	10	45.58	54	01.76
	28.0	7	58	51.91	25	20	50.19	54	05.60
	28.5	8	24	38.48	24	13	37.64	54	10.75
	29.0	8	50	00.39	22	50	04.21	54	17.15
	29.5	9	14	54.93	21	11	17.00	54	24.74
	30.0	9	39	21.14	+19	18	31.04	54	33.51
	30.5	10	03	19.67	17	13	06.63	54	43.42
	31.0	10	26	52.70	14	56	27.11	54	54.47
	31.5	10	50	03.70	12	29	57.29	55	06.69
Aug.	1.0	11	12	57.29	9	55	02.43	55	20.07
	1.5	11	35	39.04	7	13	07.99	55	34.63
	2.0	11	58	15.29	+4	25	39.97	55	50.40
	2.5	12	20	53.09	+1	34	05.80	56	07.36
	3.0	12	43	40.08	-1	20	04.18	56	25.51
	3.5	13	06	44.38	4	-15	14.85	56	44.80
	4.0	13	30	14.54	7	09	44.05	57	05.16
	4.5	13	54	19.34	10	01	39.99	57	26.46
	5.0	14	19	07.64	-12	48	58.74	57	48.53
	5.5	14	44	48.02	15	29	21.84	58	11.15
	6.0	15	11	28.28	18	00	14.76	58	34.01
	6.5	15	39	14.78	20	18	46.74	58	56.77
	7.0	16	08	11.49	22	21	52.95	59	18.98
	7.5	16	38	19.03	24	06	19.90	59	40.18
	8.0	17	09	33.60	-25	28	54.84	59	59.82
	8.5	17	41	46.31	26	26	39.12	60	17.36
	9.0	18	14	43.06	26	57	04.49	60	32.24
	9.5	18	48	05.38	26	58	29.79	60	43.93
	10.0	19	21	32.20	26	30	14.39	60	51.95
	10.5	19	54	42.19	25	32	45.19	60	55.94
	11.0	20	27	16.26	-24	07	35.15	60	55.63
	11.5	20	58	59.41	22	17	13.87	60	50.92
	12.0	21	29	41.76	20	04	52.86	60	41.86
	12.5	21	59	18.62	17	34	08.73	60	28.65
	13.0	22	27	49.83	14	48	47.50	60	11.64
	13.5	22	55	18.83	11	52	31.96	59	51.31
	14.0	23	21	51.55	-8	48	52.63	59	28.22
	14.5	23	47	35.54	5	41	02.45	59	02.99
	15.0	0	12	39.19	-2	31	54.34	58	36.27
	15.5	0	37	11.22	+0	35	58.99	58	08.70
	16.0	1	01	20.27	+3	40	23.65	57	40.91

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Aug.	16.0	1	01	20.27	+3	40	23.65	57	40.91
	16.5	1	25	14.68	6	39	22.44	57	13.45
	17.0	1	49	02.26	9	31	12.09	56	46.82
	17.5	2	12	50.22	12	14	20.56	56	21.47
	18.0	2	36	44.99	14	47	24.51	55	57.74
	18.5	3	00	52.10	17	09	07.09	55	35.94
	19.0	3	25	16.02	+19	18	16.39	55	16.28
	19.5	3	50	00.02	21	13	44.46	54	58.92
	20.0	4	15	06.01	22	54	27.10	54	43.97
	20.5	4	40	34.35	24	19	24.39	54	31.49
	21.0	5	06	23.82	25	27	41.95	54	21.48
	21.5	5	32	31.60	26	18	32.71	54	13.92
	22.0	5	58	53.38	+26	51	19.11	54	08.74
	22.5	6	25	23.65	27	05	35.24	54	05.87
	23.0	6	51	56.07	27	01	08.76	54	05.18
	23.5	7	18	23.98	26	38	02.16	54	06.55
	24.0	7	44	40.90	25	56	33.25	54	09.83
	24.5	8	10	41.06	24	57	14.75	54	14.87
	25.0	8	36	19.77	+23	40	53.08	54	21.51
	25.5	9	01	33.77	22	08	26.56	54	29.58
	26.0	9	26	21.28	20	21	03.32	54	38.92
	26.5	9	50	42.11	18	19	59.21	54	49.36
	27.0	10	14	37.51	16	06	35.84	55	00.77
	27.5	10	38	10.06	13	42	19.03	55	13.00
	28.0	11	01	23.48	+11	08	37.69	55	25.94
	28.5	11	24	22.49	8	27	03.14	55	39.46
	29.0	11	47	12.61	5	39	08.87	55	53.50
	29.5	12	10	00.06	+2	46	30.82	56	07.97
	30.0	12	32	51.63	-0	09	12.13	56	22.82
	30.5	12	55	54.57	3	06	17.18	56	38.01
	31.0	13	19	16.53	-6	02	56.44	56	53.49
	31.5	13	43	05.36	8	57	15.52	57	09.25
Sept.	1.0	14	07	28.99	11	47	12.05	57	25.22
	1.5	14	32	35.16	14	30	34.28	57	41.38
	2.0	14	58	31.05	17	05	00.13	57	57.64
	2.5	15	25	22.78	19	27	57.02	58	13.90
	3.0	15	53	14.75	-21	36	43.11	58	30.05
	3.5	16	22	08.87	23	28	30.45	58	45.90
	4.0	16	52	03.78	25	00	30.78	59	01.24
	4.5	17	22	54.17	26	10	04.06	59	15.82
	5.0	17	54	30.47	26	54	49.40	59	29.34
	5.5	18	26	39.18	27	12	57.27	59	41.48
	6.0	18	59	03.77	-27	03	20.91	59	51.87
	6.5	19	31	26.35	26	25	44.60	60	00.17
	7.0	20	03	29.54	25	20	46.92	60	06.02
	7.5	20	34	58.27	23	49	58.25	60	09.12
	8.0	21	05	41.09	-21	55	33.27	60	09.20

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Sept.	8.0	21	05	41.09	-21	55	33.27	60	09.20
	8.5	21	35	30.77	19	40	20.19	60	06.08
	9.0	22	04	24.22	17	07	29.01	59	59.66
	9.5	22	32	22.01	14	20	20.43	59	49.98
	10.0	22	59	27.58	11	22	16.63	59	37.13
	10.5	23	25	46.41	8	16	34.33	59	21.37
	11.0	23	51	25.34	-5	06	20.01	59	03.00
	11.5	0	16	31.92	-1	54	27.06	58	42.44
	12.0	0	41	13.99	+1	16	25.50	58	20.14
	12.5	1	05	39.35	4	23	53.28	57	56.62
	13.0	1	29	55.47	7	25	45.87	57	32.38
	13.5	1	54	09.33	10	20	05.72	57	07.94
	14.0	2	18	27.27	+13	05	06.77	56	43.80
	14.5	2	42	54.78	15	39	13.05	56	20.39
	15.0	3	07	36.39	18	00	57.38	55	58.15
	15.5	3	32	35.50	20	09	00.50	55	37.42
	16.0	3	57	54.18	22	02	10.56	55	18.52
	16.5	4	23	33.10	23	39	23.16	55	01.69
	17.0	4	49	31.41	+24	59	41.88	54	47.14
	17.5	5	15	46.72	26	02	19.34	54	35.01
	18.0	5	42	15.24	26	46	38.46	54	25.41
	18.5	6	08	52.01	27	12	13.82	54	18.39
	19.0	6	35	31.22	27	18	52.81	54	13.97
	19.5	7	02	06.68	27	06	36.35	54	12.13
	20.0	7	28	32.30	+26	35	39.01	54	12.80
	20.5	7	54	42.56	25	46	28.49	54	15.89
	21.0	8	20	32.90	24	39	44.54	54	21.29
	21.5	8	46	00.01	23	16	17.45	54	28.82
	22.0	9	11	02.01	21	37	06.45	54	38.33
	22.5	9	35	38.46	19	43	18.11	54	49.59
	23.0	9	59	50.35	+17	36	05.03	55	02.39
	23.5	10	23	39.91	15	16	44.90	55	16.48
	24.0	10	47	10.54	12	46	39.91	55	31.60
	24.5	11	10	26.59	10	07	16.61	55	47.50
	25.0	11	33	33.23	7	20	06.10	56	03.91
	25.5	11	56	36.31	4	26	44.50	56	20.56
	26.0	12	19	42.25	+1	28	53.57	56	37.23
	26.5	12	42	57.92	-1	31	38.44	56	53.67
	27.0	13	06	30.51	4	32	56.05	57	09.69
	27.5	13	30	27.43	7	32	55.62	57	25.11
	28.0	13	54	56.10	10	29	24.82	57	39.79
	28.5	14	20	03.72	13	20	02.16	57	53.64
	29.0	14	45	56.91	-16	02	17.13	58	06.57
	29.5	15	12	41.25	18	33	31.17	58	18.54
	30.0	15	40	20.71	20	50	59.73	58	29.52
	30.5	16	08	56.96	22	51	56.01	58	39.52
Oct.	1.0	16	38	28.68	-24	33	36.56	58	48.53

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
Oct.	1.0	16	38	28.68	-24	33	36.56	58	48.53
	1.5	17	08	51.05	25	53	28.92	58	56.54
	2.0	17	39	55.42	26	49	20.78	59	03.57
	2.5	18	11	29.68	27	19	29.81	59	09.57
	3.0	18	43	18.97	27	22	52.42	59	14.52
	3.5	19	15	07.14	26	59	09.88	59	18.33
	4.0	19	46	38.37	-26	08	50.24	59	20.93
	4.5	20	17	38.70	24	53	05.94	59	22.20
	5.0	20	47	57.31	23	13	47.44	59	22.02
	5.5	21	17	27.06	21	13	14.58	59	20.25
	6.0	21	46	04.61	18	54	07.26	59	16.77
	6.5	22	13	49.99	16	19	16.82	59	11.47
	7.0	22	40	46.01	-13	31	39.05	59	04.26
	7.5	23	06	57.55	10	34	08.94	58	55.10
	8.0	23	32	30.87	7	29	37.17	58	44.01
	8.5	23	57	33.11	4	20	47.92	58	31.03
	9.0	0	22	11.80	-1	10	17.64	58	16.29
	9.5	0	46	34.51	+1	59	25.48	57	59.98
	10.0	1	10	48.67	+5	06	01.67	57	42.33
	10.5	1	35	01.25	8	07	19.52	57	23.61
	11.0	1	59	18.67	11	01	15.78	57	04.16
	11.5	2	23	46.58	13	45	55.24	56	44.31
	12.0	2	48	29.68	16	19	30.68	56	24.43
	12.5	3	13	31.54	18	40	23.03	56	04.89
	13.0	3	38	54.43	+20	47	01.80	55	46.04
	13.5	4	04	39.11	22	38	05.85	55	28.21
	14.0	4	30	44.79	24	12	24.47	55	11.74
	14.5	4	57	09.03	25	28	58.65	54	56.90
	15.0	5	23	47.89	26	27	02.56	54	43.95
	15.5	5	50	36.12	27	06	04.74	54	33.11
	16.0	6	17	27.55	+27	25	48.95	54	24.56
	16.5	6	44	15.58	27	26	14.47	54	18.45
	17.0	7	10	53.66	27	07	35.50	54	14.88
	17.5	7	37	15.84	26	30	20.01	54	13.92
	18.0	8	03	17.19	25	35	07.80	54	15.60
	18.5	8	28	54.10	24	22	48.34	54	19.92
	19.0	8	54	04.50	+22	54	18.56	54	26.83
	19.5	9	18	47.85	21	10	40.80	54	36.23
	20.0	9	43	05.07	19	13	01.27	54	48.00
	20.5	10	06	58.48	17	02	29.13	55	01.96
	21.0	10	30	31.54	14	40	16.14	55	17.91
	21.5	10	53	48.74	12	07	36.89	55	35.59
	22.0	11	16	55.42	+9	25	49.69	55	54.70
	22.5	11	39	57.60	6	36	17.75	56	14.91
	23.0	12	03	01.94	3	40	30.78	56	35.84
	23.5	12	26	15.54	+0	40	06.71	56	57.11
	24.0	12	49	45.91	-2	23	06.50	57	18.31

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Oct.	24.0	12	49	45.91	-2	23	06.50	57	18.31
	24.5	13	13	40.81	5	27	09.20	57	39.02
	25.0	13	38	08.07	8	29	48.58	57	58.84
	25.5	14	03	15.40	11	28	37.89	58	17.39
	26.0	14	29	09.97	14	20	56.36	58	34.33
	26.5	14	55	57.98	17	03	50.31	58	49.37
	27.0	15	23	44.02	-19	34	15.95	59	02.29
	27.5	15	52	30.28	21	49	04.13	59	12.93
	28.0	16	22	15.81	23	45	07.56	59	21.22
	28.5	16	52	55.77	25	19	30.27	59	27.16
	29.0	17	24	21.12	26	29	38.95	59	30.80
	29.5	17	56	18.83	27	13	34.69	59	32.27
	30.0	18	28	32.71	-27	30	03.21	59	31.73
	30.5	19	00	44.97	27	18	41.47	59	29.36
	31.0	19	32	38.09	26	39	58.95	59	25.38
	31.5	20	03	56.68	25	35	13.46	59	19.97
Nov.	1.0	20	34	28.79	24	06	22.35	59	13.33
	1.5	21	04	06.66	22	15	51.40	59	05.61
	2.0	21	32	46.74	-20	06	23.41	58	56.97
	2.5	22	00	29.21	17	40	48.40	58	47.50
	3.0	22	27	17.25	15	01	56.24	58	37.29
	3.5	22	53	16.27	12	12	31.88	58	26.39
	4.0	23	18	33.11	9	15	12.81	58	14.84
	4.5	23	43	15.52	6	12	28.24	58	02.64
	5.0	0	07	31.62	-3	06	39.42	57	49.83
	5.5	0	31	29.63	-0	00	00.44	57	36.42
	6.0	0	55	17.57	+3	05	20.58	57	22.44
	6.5	1	19	03.10	6	07	20.50	57	07.93
	7.0	1	42	53.31	9	04	00.23	56	52.98
	7.5	2	06	54.63	11	53	24.30	56	37.67
	8.0	2	31	12.55	+14	33	40.70	56	22.13
	8.5	2	55	51.52	17	03	01.39	56	06.52
	9.0	3	20	54.64	19	19	43.15	55	51.01
	9.5	3	46	23.52	21	22	09.18	55	35.80
	10.0	4	12	18.02	23	08	51.06	55	21.11
	10.5	4	38	36.22	24	38	31.16	55	07.16
	11.0	5	05	14.33	+25	50	05.27	54	54.19
	11.5	5	32	06.94	26	42	44.98	54	42.44
	12.0	5	59	07.32	27	15	59.66	54	32.13
	12.5	6	26	07.91	27	29	37.53	54	23.49
	13.0	6	53	00.98	27	23	45.57	54	16.71
	13.5	7	19	39.20	26	58	48.30	54	11.99
	14.0	7	45	56.24	+26	15	25.45	54	09.50
	14.5	8	11	47.20	25	14	28.95	54	09.36
	15.0	8	37	08.89	23	56	59.54	54	11.71
	15.5	9	01	59.88	22	24	03.62	54	16.61
	16.0	9	26	20.50	+20	36	50.51	54	24.12

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Nov.	16.0	9	26	20.50	+20	36	50.51	54	24.12
	16.5	9	50	12.63	18	36	30.43	54	34.24
	17.0	10	13	39.56	16	24	13.39	54	46.96
	17.5	10	36	45.74	14	01	08.84	55	02.18
	18.0	10	59	36.60	11	28	26.13	55	19.80
	18.5	11	22	18.39	8	47	15.73	55	39.61
	19.0	11	44	58.01	+5	58	50.94	56	01.39
	19.5	12	07	42.96	3	04	30.19	56	24.84
	20.0	12	30	41.25	+0	05	39.64	56	49.58
	20.5	12	54	01.28	-2	56	03.88	57	15.20
	21.0	13	17	51.77	5	58	49.94	57	41.22
	21.5	13	42	21.58	9	00	31.69	58	07.09
	22.0	14	07	39.43	-11	58	43.50	58	32.25
	22.5	14	33	53.50	14	50	39.72	58	56.12
	23.0	15	01	10.80	17	33	14.86	59	18.13
	23.5	15	29	36.39	20	03	06.36	59	37.73
	24.0	15	59	12.33	22	16	40.44	59	54.43
	24.5	16	29	56.69	24	10	21.83	60	07.84
	25.0	17	01	42.58	-25	40	47.27	60	17.67
	25.5	17	34	17.82	26	45	01.84	60	23.77
	26.0	18	07	25.31	27	20	55.78	60	26.10
	26.5	18	40	44.50	27	27	18.35	60	24.76
	27.0	19	13	53.55	27	04	05.43	60	19.98
	27.5	19	46	31.94	26	12	18.74	60	12.06
	28.0	20	18	22.65	-24	53	56.86	60	01.39
	28.5	20	49	13.60	23	11	40.73	59	48.40
	29.0	21	18	58.08	21	08	37.01	59	33.54
	29.5	21	47	34.35	18	48	02.73	59	17.25
	30.0	22	15	04.75	16	13	13.26	58	59.94
	30.5	22	41	34.62	13	27	14.39	58	41.99
Dec.	1.0	23	07	11.32	-10	32	58.01	58	23.71
	1.5	23	32	03.40	7	33	00.84	58	05.39
	2.0	23	56	19.94	4	29	45.11	57	47.23
	2.5	0	20	10.18	-1	25	20.40	57	29.40
	3.0	0	43	43.15	+1	38	13.95	57	12.02
	3.5	1	07	07.56	4	39	06.29	56	55.16
	4.0	1	30	31.55	+7	35	30.36	56	38.86
	4.5	1	54	02.63	10	25	43.31	56	23.16
	5.0	2	17	47.50	13	08	04.28	56	08.06
	5.5	2	41	51.86	15	40	53.69	55	53.57
	6.0	3	06	20.23	18	02	33.15	55	39.70
	6.5	3	31	15.71	20	11	26.32	55	26.45
	7.0	3	56	39.72	+22	06	00.49	55	13.86
	7.5	4	22	31.81	23	44	49.09	55	01.96
	8.0	4	48	49.51	25	06	34.71	54	50.81
	8.5	5	15	28.39	26	10	12.55	54	40.50
	9.0	5	42	22.22	26	54	53.81	54	31.11

MOON, 2022
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Dec.	9.0	5	42	22.22	+26	54	53.81	54	31.11
	9.5	6	09	23.38	27	20	08.42	54	22.77
	10.0	6	36	23.44	27	25	46.77	54	15.60
	10.5	7	03	13.88	27	11	59.97	54	09.74
	11.0	7	29	46.73	26	39	18.61	54	05.34
	11.5	7	55	55.27	25	48	30.15	54	02.56
	12.0	8	21	34.38	+24	40	35.37	54	01.54
	12.5	8	46	40.87	23	16	44.37	54	02.45
	13.0	9	11	13.50	21	38	12.77	54	05.41
	13.5	9	35	12.87	19	46	18.36	54	10.57
	14.0	9	58	41.23	17	42	18.59	54	18.03
	14.5	10	21	42.25	15	27	29.03	54	27.88
	15.0	10	44	20.79	+13	03	02.63	54	40.18
	15.5	11	06	42.67	10	30	09.98	54	54.95
	16.0	11	28	54.49	7	50	00.22	55	12.19
	16.5	11	51	03.56	5	03	42.61	55	31.82
	17.0	12	13	17.77	+2	12	28.79	55	53.72
	17.5	12	35	45.52	-0	42	24.58	56	17.72
	18.0	12	58	35.73	-3	39	32.73	56	43.55
	18.5	13	21	57.69	6	37	19.25	57	10.89
	19.0	13	46	00.99	9	33	52.55	57	39.32
	19.5	14	10	55.25	12	27	02.31	58	08.36
	20.0	14	36	49.75	15	14	16.56	58	37.42
	20.5	15	03	52.83	17	52	40.01	59	05.87
	21.0	15	32	11.04	-20	18	54.63	59	33.01
	21.5	16	01	47.97	22	29	23.61	59	58.14
	22.0	16	32	43.03	24	20	19.96	60	20.54
	22.5	17	04	50.22	25	48	00.31	60	39.54
	23.0	17	37	57.38	26	49	03.59	60	54.57
	23.5	18	11	46.38	27	20	52.13	61	05.17
	24.0	18	45	54.53	-27	21	51.16	61	11.03
	24.5	19	19	57.04	26	51	41.83	61	12.03
	25.0	19	53	30.13	25	51	23.98	61	08.23
	25.5	20	26	13.81	24	23	07.87	60	59.87
	26.0	20	57	53.72	22	29	57.47	60	47.34
	26.5	21	28	21.78	20	15	29.95	60	31.14
	27.0	21	57	35.66	-17	43	35.81	60	11.88
	27.5	22	25	37.79	14	58	02.96	59	50.21
	28.0	22	52	33.98	12	02	25.86	59	26.77
	28.5	23	18	32.28	8	59	59.56	59	02.18
	29.0	23	43	41.96	5	53	37.67	58	37.02
	29.5	0	08	12.84	-2	45	53.00	58	11.81
	30.0	0	32	14.77	+0	21	00.13	57	46.97
	30.5	0	55	57.33	3	25	02.73	57	22.87
	31.0	1	19	29.63	6	24	27.74	56	59.77
	31.5	1	43	00.16	9	17	36.84	56	37.90
	32.0	2	06	36.65	+12	02	57.59	56	17.40

MOON, 2022
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination		Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'			d		d	h	m	°	'
Jan.	0	26.68	U	31	09	38.1	-21	51.6	Jan.	23		L	23	16	31.4	-0	28.9
	0		L	31	22	09.2	23	41.1		24	21.23	U	24	04	54.0	3	31.6
	1	27.68	U	1	10	41.2	25	03.7		24		L	24	17	17.1	6	33.8
	1		L	1	23	14.1	25	56.8		25	22.23	U	25	05	40.8	9	33.3
	2	28.68	U	2	11	47.4	26	17.8		25		L	25	18	05.2	12	27.7
	3	0.23	L	3	00	20.6	26	06.3		26	23.23	U	26	06	30.6	15	14.2
	3		U	3	12	53.4	-25	23.1		26		L	26	18	57.0	-17	49.8
	4	1.23	L	4	01	25.3	24	10.4		27	24.23	U	27	07	24.6	20	11.1
	4		U	4	13	56.1	22	31.7		27		L	27	19	53.4	22	14.6
	5	2.23	L	5	02	25.4	20	30.6		28	25.23	U	28	08	23.4	23	56.5
	5		U	5	14	53.4	18	11.7		28		L	28	20	54.4	25	13.6
	6	3.23	L	6	03	20.0	15	38.7		29	26.23	U	29	09	26.2	26	02.7
	6		U	6	15	45.4	-12	55.5		29		L	29	21	58.6	-26	21.8
	7	4.23	L	7	04	09.6	10	05.3		30	27.23	U	30	10	31.1	26	09.7
	7		U	7	16	32.9	7	10.9		30		L	30	23	03.3	25	26.9
	8	5.23	L	8	04	55.3	4	14.7		31	28.23	U	31	11	35.0	24	14.9
	8		U	8	17	17.2	-1	18.8	Feb.	1	29.23	L	1	00	05.6	22	36.2
	9	6.23	L	9	05	38.6	+1	35.0		1		U	1	12	35.2	20	34.6
	9		U	9	17	59.7	+4	25.4		2	0.76	L	2	01	03.5	-18	13.6
	10	7.23	L	10	06	20.7	7	10.9		2		U	2	13	30.6	15	37.6
	10		U	10	18	41.7	9	50.3		3	1.76	L	3	01	56.5	12	50.1
	11	8.23	L	11	07	02.8	12	22.3		3		U	3	14	21.3	9	54.8
	11		U	11	19	24.2	14	45.7		4	2.76	L	4	02	45.1	6	54.7
	12	9.23	L	12	07	46.0	16	59.3		4		U	4	15	08.2	3	52.7
	12		U	12	20	08.2	+19	01.8		5	3.76	L	5	03	30.7	-0	51.2
	13	10.23	L	13	08	31.0	20	51.9		5		U	5	15	52.7	+2	07.9
	13		U	13	20	54.3	22	28.3		6	4.76	L	6	04	14.4	5	02.7
	14	11.23	L	14	09	18.1	23	49.5		6		U	6	16	36.0	7	51.8
	14		U	14	21	42.5	24	54.2		7	5.76	L	7	04	57.5	10	33.6
	15	12.23	L	15	10	07.4	25	41.2		7		U	7	17	19.1	13	06.9
	15		U	15	22	32.6	+26	09.6		8	6.76	L	8	05	41.0	+15	30.4
	16	13.23	L	16	10	58.1	26	18.4		8		U	8	18	03.2	17	43.0
	16		U	16	23	23.8	26	07.4		9	7.76	L	9	06	25.7	19	43.4
	17	14.23	L	17	11	49.4	25	36.4		9		U	9	18	48.8	21	30.4
	18	15.23	U	18	00	14.9	24	45.7		10	8.76	L	10	07	12.3	23	02.8
	18		L	18	12	40.0	23	35.9		10		U	10	19	36.4	24	19.3
	19	16.23	U	19	01	04.8	+22	08.1		11	9.76	L	11	08	00.9	+25	18.7
	19		L	19	13	29.2	20	23.5		11		U	11	20	25.9	26	00.1
	20	17.23	U	20	01	53.1	18	23.5		12	10.76	L	12	08	51.2	26	22.5
	20		L	20	14	16.5	16	09.7		12		U	12	21	16.7	26	25.3
	21	18.23	U	21	02	39.5	13	43.7		13	11.76	L	13	09	42.4	26	08.0
	21		L	21	15	02.1	11	07.2		13		U	13	22	08.0	25	30.6
	22	19.23	U	22	03	24.6	+8	22.0		14	12.76	L	14	10	33.5	+24	33.4
	22		L	22	15	46.8	5	29.7		14		U	14	22	58.7	23	17.0
	23	20.23	U	23	04	09.0	+2	32.1		15	13.76	L	15	11	23.6	21	42.4
	23		L	23	16	31.4	-0	28.9		15		U	15	23	48.1	+19	50.8

MOON, 2022
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Feb.	15		U	15	23	48.1	+19	50.8
	16	14.76	L	16	12	12.1	17	43.7
	17	15.76	U	17	00	35.7	15	22.6
	17		L	17	12	59.0	12	49.4
	18	16.76	U	18	01	21.9	10	05.9
	18		L	18	13	44.6	7	13.9
	19	17.76	U	19	02	07.2	+4	15.5
	19		L	19	14	29.8	+1	12.7
	20	18.76	U	20	02	52.5	-1	52.3
	20		L	20	15	15.5	4	57.5
	21	19.76	U	21	03	38.9	8	00.5
	21		L	21	16	02.8	10	58.9
	22	20.76	U	22	04	27.5	-13	50.1
	22		L	22	16	53.0	16	31.4
	23	21.76	U	23	05	19.4	18	59.7
	23		L	23	17	46.9	21	12.2
	24	22.76	U	24	06	15.4	23	05.6
	24		L	24	18	44.9	24	36.9
	25	23.76	U	25	07	15.2	-25	43.3
	25		L	25	19	46.1	26	22.5
	26	24.76	U	26	08	17.4	26	33.1
	26		L	26	20	48.8	26	14.4
	27	25.76	U	27	09	19.9	25	26.9
	27		L	27	21	50.4	24	11.9
	28	26.76	U	28	10	20.1	-22	32.0
	28		L	28	22	48.8	20	29.8
Mar.	1	27.76	U	1	11	16.5	18	08.8
	1		L	1	23	43.1	15	32.5
	2	28.76	U	2	12	08.7	12	44.4
	3	0.27	L	3	00	33.3	9	47.7
	3		U	3	12	57.2	-6	45.6
	4	1.27	L	4	01	20.4	3	40.8
	4		U	4	13	43.1	-0	35.9
	5	2.27	L	5	02	05.4	+2	26.8
	5		U	5	14	27.5	5	25.4
	6	3.27	L	6	02	49.4	8	18.0
	6		U	6	15	11.4	+11	03.0
	7	4.27	L	7	03	33.5	13	38.9
	7		U	7	15	55.8	16	04.2
	8	5.27	L	8	04	18.4	18	17.6
	8		U	8	16	41.4	20	17.9
	9	6.27	L	9	05	04.8	22	03.7
	9		U	9	17	28.7	+23	34.0
	10	7.27	L	10	05	53.0	24	47.6
	10		U	10	18	17.7	25	43.5
	11	8.27	L	11	06	42.8	+26	20.8

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Mar.	11	8.27	L	11	06	42.8	+26	20.8
	11		U	11	19	08.2	26	38.8
	12	9.27	L	12	07	33.7	26	37.0
	12		U	12	19	59.2	26	15.2
	13	10.27	L	13	08	24.7	25	33.5
	13		U	13	20	50.0	24	32.1
	14	11.27	L	14	09	15.1	+23	11.7
	14		U	14	21	39.8	21	33.2
	15	12.27	L	15	10	04.2	19	37.6
	15		U	15	22	28.2	17	26.3
	16	13.27	L	16	10	51.9	15	00.8
	16		U	16	23	15.2	12	22.8
	17	14.27	L	17	11	38.4	9	34.0
	18	15.27	U	18	00	01.4	6	36.3
	18		L	18	12	24.3	3	32.0
	19	16.27	U	19	00	47.4	+0	23.1
	19		L	19	13	10.7	-2	47.9
	20	17.27	U	20	01	34.4	-5	58.5
	20		L	20	13	58.5	9	06.0
	21	18.27	U	21	02	23.3	12	07.7
	21		L	21	14	48.8	15	00.4
	22	19.27	U	22	03	15.1	17	41.2
	22		L	22	15	42.4	20	06.7
	23	20.27	U	23	04	10.6	-22	13.9
	23		L	23	16	39.8	23	59.7
	24	21.27	U	24	05	09.6	25	21.4
	24		L	24	17	40.2	26	16.7
	25	22.27	U	25	06	11.0	26	44.1
	25		L	25	18	41.9	26	42.9
	26	23.27	U	26	07	12.7	-26	13.3
	26		L	26	19	42.8	25	16.3
	27	24.27	U	27	08	12.4	23	54.0
	27		L	27	20	40.9	22	08.6
	28	25.27	U	28	09	08.6	20	03.1
	28		L	28	21	35.1	17	40.6
	29	26.27	U	29	10	00.8	-15	04.0
	29		L	29	22	25.5	12	16.5
	30	27.27	U	30	10	49.4	9	20.9
	30		L	30	23	12.7	6	19.9
	31	28.27	U	31	11	35.5	3	16.1
	31		L	31	23	57.8	-0	11.8
	1	29.27	U	1	12	19.9	+2	50.8
Apr.	1	29.27	U	1	12	19.9	+2	50.8
	2	0.73	L	2	00	41.9	5	49.7
	2		U	2	13	03.8	8	43.0
	3	1.73	L	3	01	25.9	+11	28.8

MOON, 2022
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Apr.	1	29.27	U	1	12	19.9	+2	50.8
	2	0.73	L	2	00	41.9	5	49.7
	2		U	2	13	03.8	8	43.0
	3	1.73	L	3	01	25.9	11	28.8
	3		U	3	13	48.1	14	05.5
	4	2.73	L	4	02	10.7	16	31.5
	4		U	4	14	33.6	+18	45.2
	5	3.73	L	5	02	56.9	20	45.3
	5		U	5	15	20.6	22	30.4
	6	4.73	L	6	03	44.8	23	59.2
	6		U	6	16	09.3	25	10.6
	7	5.73	L	7	04	34.3	26	03.8
	7		U	7	16	59.5	+26	37.8
	8	6.73	L	8	05	24.8	26	52.3
	8		U	8	17	50.3	26	46.9
	9	7.73	L	9	06	15.7	26	21.6
	9		U	9	18	40.9	25	36.7
	10	8.73	L	10	07	05.9	24	32.5
	10		U	10	19	30.6	+23	09.9
	11	9.73	L	11	07	55.0	21	29.7
	11		U	11	20	19.0	19	33.0
	12	10.73	L	12	08	42.7	17	20.8
	12		U	12	21	06.0	14	54.7
	13	11.73	L	13	09	29.2	12	15.9
	13		U	13	21	52.2	+9	26.1
	14	12.73	L	14	10	15.1	6	27.0
	14		U	14	22	38.1	3	20.5
	15	13.73	L	15	11	01.4	+0	08.8
	15		U	15	23	24.9	-3	05.7
	16	14.73	L	16	11	49.0	6	20.4
	17	15.73	U	17	00	13.7	-9	32.4
	17		L	17	12	39.3	12	38.5
	18	16.73	U	18	01	05.6	15	35.2
	18		L	18	13	33.0	18	18.9
	19	17.73	U	19	02	01.4	20	45.8
	19		L	19	14	30.8	22	52.3
	20	18.73	U	20	03	01.1	-24	35.0
	20		L	20	15	32.1	25	51.1
	21	19.73	U	21	04	03.6	26	38.5
	21		L	21	16	35.2	26	56.0
	22	20.73	U	22	05	06.7	26	43.8
	22		L	22	17	37.6	26	02.6
	23	21.73	U	23	06	07.7	-24	54.6
	23		L	23	18	36.8	23	22.2
	24	22.73	U	24	07	04.9	21	28.4
	24		L	24	19	31.9	-19	16.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Apr.	24		L	24	19	31.9	-19	16.5
	25	23.73	U	25	07	57.7	16	49.5
	25		L	25	20	22.6	14	10.4
	26	24.73	U	26	08	46.5	11	22.0
	26		L	26	21	09.7	8	26.9
	27	25.73	U	27	09	32.3	5	27.5
	27		L	27	21	54.4	-2	26.0
	28	26.73	U	28	10	16.3	+0	35.5
	28		L	28	22	37.9	3	35.2
	29	27.73	U	29	10	59.5	6	31.1
	29		L	29	23	21.2	9	21.5
	30	28.73	U	30	11	43.0	12	04.7
May	1	0.15	L	1	00	05.2	+14	38.9
	1		U	1	12	27.7	17	02.5
	2	1.15	L	2	00	50.6	19	14.0
	2		U	2	13	14.0	21	11.6
	3	2.15	L	3	01	37.9	22	54.1
	3		U	3	14	02.2	24	19.9
	4	3.15	L	4	02	27.0	+25	28.1
	4		U	4	14	52.0	26	17.6
	5	4.15	L	5	03	17.3	26	47.7
	5		U	5	15	42.7	26	57.9
	6	5.15	L	6	04	08.1	26	48.3
	6		U	6	16	33.3	26	19.0
	7	6.15	L	7	04	58.3	+25	30.3
	7		U	7	17	23.0	24	23.1
	8	7.15	L	8	05	47.3	22	58.1
	8		U	8	18	11.2	21	16.4
	9	8.15	L	9	06	34.7	19	19.0
	9		U	9	18	57.9	17	07.3
	10	9.15	L	10	07	20.7	+14	42.2
	10		U	10	19	43.3	12	05.3
	11	10.15	L	11	08	05.8	9	17.8
	11		U	11	20	28.2	6	21.3
	12	11.15	L	12	08	50.8	3	17.3
	12		U	12	21	13.7	+0	07.7
	13	12.15	L	13	09	37.1	-3	05.4
	13		U	13	22	01.0	6	19.4
	14	13.15	L	14	10	25.7	9	31.8
	14		U	14	22	51.3	12	39.1
	15	14.15	L	15	11	18.0	15	37.9
	15		U	15	23	45.8	18	24.2
	16	15.15	L	16	12	15.0	-20	53.7
	17	16.15	U	17	00	45.2	23	02.3
	17		L	17	13	16.6	24	45.8
	18	17.15	U	18	01	48.7	-26	01.1

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
May	18	17.15	U	18	01	48.7	-26	01.1
	18		L	18	14	21.4	26	45.3
	19	18.15	U	19	02	54.2	26	57.6
	19		L	19	15	26.7	26	38.0
	20	19.15	U	20	03	58.5	25	48.0
	20		L	20	16	29.3	24	30.2
	21	20.15	U	21	04	59.0	-22	47.9
	21		L	21	17	27.3	20	44.7
	22	21.15	U	22	05	54.4	18	24.3
	22		L	22	18	20.1	15	50.3
	23	22.15	U	23	06	44.8	13	05.8
	23		L	23	19	08.6	10	13.8
	24	23.15	U	24	07	31.5	-7	16.7
	24		L	24	19	53.8	4	16.9
	25	24.15	U	25	08	15.6	-1	16.4
	25		L	25	20	37.1	+1	43.1
	26	25.15	U	26	08	58.4	4	39.7
	26		L	26	21	19.7	7	31.8
	27	26.15	U	27	09	41.2	+10	17.9
	27		L	27	22	02.9	12	56.4
	28	27.15	U	28	10	24.9	15	25.8
	28		L	28	22	47.3	17	44.4
	29	28.15	U	29	11	10.2	19	50.7
	29		L	29	23	33.6	21	43.2
	30	29.15	U	30	11	57.4	+23	20.3
	31	0.52	L	31	00	21.8	24	40.8
	31		U	31	12	46.6	25	43.4
June	1	1.52	L	1	01	11.8	26	27.1
	1		U	1	13	37.1	26	51.3
	2	2.52	L	2	02	02.5	26	55.7
	2		U	2	14	27.8	+26	40.1
	3	3.52	L	3	02	53.0	26	05.0
	3		U	3	15	17.8	25	10.9
	4	4.52	L	4	03	42.2	23	58.8
	4		U	4	16	06.2	22	29.7
	5	5.52	L	5	04	29.7	20	44.7
	5		U	5	16	52.8	+18	45.1
	6	6.52	L	6	05	15.4	16	32.3
	6		U	6	17	37.6	14	07.4
	7	7.52	L	7	05	59.6	11	31.8
	7		U	7	18	21.5	8	46.8
	8	8.52	L	8	06	43.3	5	53.7
	8		U	8	19	05.3	+2	54.1
	9	9.52	L	9	07	27.6	-0	10.6
	9		U	9	19	50.3	3	18.6
	10	10.52	L	10	08	13.6	-6	27.6

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
June	10	10.52	L	10	08	13.6	-6	27.6
	10		U	10	20	37.7	9	35.3
	11	11.52	L	11	09	02.8	12	38.8
	11		U	11	21	29.1	15	34.8
	12	12.52	L	12	09	56.6	18	19.5
	12		U	12	22	25.5	20	48.7
	13	13.52	L	13	10	55.9	-22	57.7
	13		U	13	23	27.4	24	42.6
	14	14.52	L	14	12	00.1	25	58.7
	15	15.52	U	15	00	33.5	26	43.6
	15		L	15	13	07.1	26	54.9
	16	16.52	U	16	01	40.6	26	32.7
	16		L	16	14	13.4	-25	38.3
	17	17.52	U	17	02	45.2	24	14.3
	17		L	17	15	15.7	22	24.6
	18	18.52	U	18	03	44.9	20	13.2
	18		L	18	16	12.6	17	44.4
	19	19.52	U	19	04	39.0	15	02.2
	19		L	19	17	04.2	-12	10.4
	20	20.52	U	20	05	28.3	9	12.1
	20		L	20	17	51.5	6	10.1
	21	21.52	U	21	06	14.0	3	06.8
	21		L	21	18	36.0	-0	04.3
	22	22.52	U	22	06	57.6	+2	55.6
	22		L	22	19	19.1	+5	51.4
	23	23.52	U	23	07	40.5	8	41.4
	23		L	23	20	02.0	11	24.2
	24	24.52	U	24	08	23.7	13	58.5
	24		L	24	20	45.8	16	22.8
	25	25.52	U	25	09	08.2	18	35.7
	25		L	25	21	31.2	+20	35.8
	26	26.52	U	26	09	54.6	22	21.6
	26		L	26	22	18.6	23	51.8
	27	27.52	U	27	10	43.0	25	05.0
	27		L	27	23	07.9	26	00.2
	28	28.52	U	28	11	33.0	26	36.4
	28		L	28	23	58.4	+26	52.9
	29	29.52	U	29	12	23.8	26	49.5
	30	0.88	L	30	00	49.1	26	26.4
	30		U	30	13	14.1	25	43.8
July	1	1.88	L	1	01	38.8	24	42.5
	1		U	1	14	03.1	23	23.6
	2	2.88	L	2	02	26.9	+21	48.2
	2		U	2	14	50.1	19	57.7
	3	3.88	L	3	03	12.9	17	53.4
	3		U	3	15	35.2	+15	36.9

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
July	1	1.88	L	1	01	38.8	+24	42.5
	1		U	1	14	03.1	23	23.6
	2	2.88	L	2	02	26.9	21	48.2
	2		U	2	14	50.1	19	57.7
	3	3.88	L	3	03	12.9	17	53.4
	3		U	3	15	35.2	15	36.9
	4	4.88	L	4	03	57.1	+13	09.5
	4		U	4	16	18.7	10	32.5
	5	5.88	L	5	04	40.1	7	47.5
	5		U	5	17	01.5	4	55.8
	6	6.88	L	6	05	22.9	+1	58.9
	6		U	6	17	44.7	-1	01.8
	7	7.88	L	7	06	06.8	-4	04.6
	7		U	7	18	29.4	7	07.6
	8	8.88	L	8	06	52.9	10	08.6
	8		U	8	19	17.3	13	05.2
	9	9.88	L	9	07	42.8	15	54.3
	9		U	9	20	09.6	18	32.7
	10	10.88	L	10	08	37.7	-20	56.5
	10		U	10	21	07.3	23	01.6
	11	11.88	L	11	09	38.3	24	43.6
	11		U	11	22	10.4	25	58.7
	12	12.88	L	12	10	43.6	26	43.1
	12		U	12	23	17.2	26	54.7
	13	13.88	L	13	11	50.8	-26	32.5
	14	14.88	U	14	00	24.1	25	37.3
	14		L	14	12	56.4	24	11.4
	15	15.88	U	15	01	27.7	22	18.0
	15		L	15	13	57.6	20	01.7
	16	16.88	U	16	02	26.1	17	26.7
	16		L	16	14	53.2	-14	37.7
	17	17.88	U	17	03	19.1	11	38.5
	17		L	17	15	43.9	8	32.9
	18	18.88	U	18	04	07.8	5	24.2
	18		L	18	16	30.9	-2	14.9
	19	19.88	U	19	04	53.5	+0	52.5
	19		L	19	17	15.6	+3	56.0
	20	20.88	U	20	05	37.6	6	54.0
	20		L	20	17	59.4	9	44.8
	21	21.88	U	21	06	21.4	12	27.1
	21		L	21	18	43.5	14	59.4
	22	22.88	U	22	07	05.9	17	20.6
	22		L	22	19	28.7	+19	29.2
	23	23.88	U	23	07	51.9	21	23.9
	23		L	23	20	15.6	23	03.6
	24	24.88	U	24	08	39.7	+24	26.9

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
July	24	24.88	U	24	08	39.7	+24	26.9
	24		L	24	21	04.3	25	32.7
	25	25.88	U	25	09	29.2	26	20.1
	25		L	25	21	54.5	26	48.2
	26	26.88	U	26	10	19.8	26	56.5
	26		L	26	22	45.2	26	44.9
	27	27.88	U	27	11	10.5	+26	13.5
	27		L	27	23	35.5	25	22.8
	28	28.88	U	28	12	00.1	24	13.6
	29	0.25	L	29	00	24.3	22	47.0
	29		U	29	12	48.0	21	04.2
	30	1.25	L	30	01	11.1	19	06.7
	30		U	30	13	33.8	+16	55.9
	31	2.25	L	31	01	56.0	14	33.5
	31		U	31	14	17.8	12	00.9
Aug.	1	3.25	L	1	02	39.3	9	19.8
	1		U	1	15	00.6	6	31.6
	2	4.25	L	2	03	21.8	3	37.9
	2		U	2	15	43.2	+0	40.3
	3	5.25	L	3	04	04.7	-2	19.6
	3		U	3	16	26.6	5	20.0
	4	6.25	L	4	04	49.0	8	19.2
	4		U	4	17	12.1	11	14.9
	5	7.25	L	5	05	36.1	14	04.9
	5		U	5	18	01.1	-16	46.4
	6	8.25	L	6	06	27.3	19	16.5
	6		U	6	18	54.7	21	31.8
	7	9.25	L	7	07	23.5	23	28.6
	7		U	7	19	53.5	25	03.3
	8	10.25	L	8	08	24.8	26	12.1
	8		U	8	20	56.9	-26	52.0
	9	11.25	L	9	09	29.7	27	00.6
	9		U	9	22	02.6	26	36.9
	10	12.25	L	10	10	35.2	25	41.0
	10		U	10	23	07.3	24	14.7
	11	13.25	L	11	11	38.4	22	21.0
	12	14.25	U	12	00	08.4	-20	03.2
	12		L	12	12	37.1	17	26.0
	13	15.25	U	13	01	04.6	14	33.4
	13		L	13	13	30.9	11	29.7
	14	16.25	U	14	01	56.2	8	18.8
	14		L	14	14	20.6	5	04.1
	15	17.25	U	15	02	44.4	-1	48.8
	15		L	15	15	07.6	+1	24.5
	16	18.25	U	16	03	30.4	4	33.3
	16		L	16	15	52.9	+7	35.8

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Date	Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
	d		d	h	m	°	'
Aug. 16		L	16	15	52.9	+7	35.8
17	19.25	U	17	04	15.4	10	30.2
17		L	17	16	38.0	13	14.7
18	20.25	U	18	05	00.7	15	48.0
18		L	18	17	23.6	18	08.8
19	21.25	U	19	05	46.9	20	15.7
19		L	19	18	10.6	+22	07.5
20	22.25	U	20	06	34.7	23	43.0
20		L	20	18	59.2	25	01.2
21	23.25	U	21	07	24.1	26	01.2
21		L	21	19	49.3	26	42.0
22	24.25	U	22	08	14.6	27	03.1
22		L	22	20	40.0	+27	04.3
23	25.25	U	23	09	05.4	26	45.3
23		L	23	21	30.6	26	06.6
24	26.25	U	24	09	55.6	25	08.7
24		L	24	22	20.1	23	52.5
25	27.25	U	25	10	44.2	22	18.9
25		L	25	23	07.8	+20	29.3
26	28.25	U	26	11	31.0	18	25.1
26		L	26	23	53.6	16	07.8
27	29.25	U	27	12	15.9	13	39.0
28	0.65	L	28	00	37.8	11	00.3
28		U	28	12	59.4	8	13.4
29	1.65	L	29	01	20.9	+5	20.0
29		U	29	13	42.4	+2	21.7
30	2.65	L	30	02	03.9	-0	39.6
30		U	30	14	25.7	3	42.1
31	3.65	L	31	02	47.8	6	43.9
31		U	31	15	10.5	9	42.7
Sept. 1	4.65	L	1	03	33.8	-12	36.5
1		U	1	15	58.0	15	22.7
2	5.65	L	2	04	23.1	17	58.7
2		U	2	16	49.3	20	21.5
3	6.65	L	3	05	16.6	22	28.1
3		U	3	17	45.1	24	15.2
4	7.65	L	4	06	14.7	-25	39.6
4		U	4	18	45.1	26	38.4
5	8.65	L	5	07	16.4	27	09.0
5		U	5	19	48.1	27	09.9
6	9.65	L	6	08	19.9	26	40.2
6		U	6	20	51.4	25	40.4
7	10.65	L	7	09	22.3	-24	12.0
7		U	7	21	52.5	22	17.4
8	11.65	L	8	10	21.6	19	60.0
8		U	8	22	49.8	-17	23.1

Date	Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
	d		d	h	m	°	'
Sept. 8		U	8	22	49.8	-17	23.1
9	12.65	L	9	11	16.8	14	30.8
9		U	9	23	42.9	11	26.6
10	13.65	L	10	12	08.1	8	14.5
11	14.65	U	11	00	32.5	4	57.7
11		L	11	12	56.4	-1	39.4
12	15.65	U	12	01	19.9	+1	37.4
12		L	12	13	43.0	4	50.3
13	16.65	U	13	02	06.0	7	56.9
13		L	13	14	29.0	10	55.1
14	17.65	U	14	02	52.1	13	43.0
14		L	14	15	15.3	16	19.0
15	18.65	U	15	03	38.9	+18	41.4
15		L	15	16	02.8	20	48.9
16	19.65	U	16	04	27.0	22	40.1
16		L	16	16	51.6	24	14.0
17	20.65	U	17	05	16.6	25	29.4
17		L	17	17	41.8	26	25.7
18	21.65	U	18	06	07.2	+27	02.0
18		L	18	18	32.8	27	18.2
19	22.65	U	19	06	58.3	27	14.0
19		L	19	19	23.7	26	49.7
20	23.65	U	20	07	48.9	26	05.7
20		L	20	20	13.7	25	02.6
21	24.65	U	21	08	38.1	+23	41.3
21		L	21	21	02.0	22	03.0
22	25.65	U	22	09	25.5	20	08.9
22		L	22	21	48.6	18	00.3
23	26.65	U	23	10	11.2	15	38.5
23		L	23	22	33.4	13	05.2
24	27.65	U	24	10	55.4	+10	21.9
24		L	24	23	17.2	7	30.2
25	28.65	U	25	11	38.9	4	31.9
26	0.09	L	26	00	00.7	+1	28.7
26		U	26	12	22.6	-1	37.3
27	1.09	L	27	00	44.9	4	44.2
27		U	27	13	07.6	-7	49.7
28	2.09	L	28	01	30.9	10	51.3
28		U	28	13	55.0	13	46.6
29	3.09	L	29	02	19.9	16	32.6
29		U	29	14	45.7	19	06.5
30	4.09	L	30	03	12.6	21	25.1
30		U	30	15	40.5	-23	25.2
Oct. 1	5.09	L	1	04	09.5	25	03.8
1		U	1	16	39.3	26	18.1
2	6.09	L	2	05	09.8	-27	05.5

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Oct.	1	5.09	L	1	04	09.5	-25	03.8
	1		U	1	16	39.3	26	18.1
	2	6.09	L	2	05	09.8	27	05.5
	2		U	2	17	40.8	27	24.4
	3	7.09	L	3	06	12.0	27	14.0
	3		U	3	18	43.0	26	34.2
	4	8.09	L	4	07	13.5	-25	26.2
	4		U	4	19	43.3	23	51.8
	5	9.09	L	5	08	12.2	21	53.6
	5		U	5	20	40.2	19	34.4
	6	10.09	L	6	09	07.2	16	57.7
	6		U	6	21	33.3	14	06.7
	7	11.09	L	7	09	58.5	-11	04.7
	7		U	7	22	23.0	7	54.8
	8	12.09	L	8	10	46.9	4	40.1
	8		U	8	23	10.3	-1	23.4
	9	13.09	L	9	11	33.5	+1	52.5
	9		U	9	23	56.4	5	05.1
	10	14.09	L	10	12	19.4	+8	12.1
	11	15.09	U	11	00	42.4	11	11.2
	11		L	11	13	05.7	14	00.4
	12	16.09	U	12	01	29.2	16	37.7
	12		L	12	13	53.1	19	01.2
	13	17.09	U	13	02	17.3	21	09.5
	13		L	13	14	42.0	+23	00.8
	14	18.09	U	14	03	07.0	24	34.0
	14		L	14	15	32.4	25	48.1
	15	19.09	U	15	03	58.0	26	42.1
	15		L	15	16	23.7	27	15.6
	16	20.09	U	16	04	49.5	27	28.3
	16		L	16	17	15.1	+27	20.4
	17	21.09	U	17	05	40.6	26	52.3
	17		L	17	18	05.6	26	04.5
	18	22.09	U	18	06	30.3	24	58.0
	18		L	18	18	54.5	23	33.8
	19	23.09	U	19	07	18.2	21	53.0
	19		L	19	19	41.4	+19	56.8
	20	24.09	U	20	08	04.2	17	46.6
	20		L	20	20	26.5	15	23.6
	21	25.09	U	21	08	48.6	12	49.1
	21		L	21	21	10.4	10	04.7
	22	26.09	U	22	09	32.1	7	11.7
	22		L	22	21	53.8	+4	11.7
	23	27.09	U	23	10	15.7	+1	06.4
	23		L	23	22	37.9	-2	02.1
	24	28.09	U	24	11	00.5	-5	12.0

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Oct.	24	28.09	U	24	11	00.5	-5	12.0
	24		L	24	23	23.6	8	20.7
	25	29.09	U	25	11	47.5	11	25.6
	26	0.55	L	26	00	12.3	14	23.8
	26		U	26	12	38.0	17	12.1
	27	1.55	L	27	01	04.9	19	47.1
	27		U	27	13	32.8	-22	05.1
	28	2.55	L	28	02	01.8	24	02.7
	28		U	28	14	31.8	25	36.3
	29	3.55	L	29	03	02.7	26	43.3
	29		U	29	15	34.0	27	21.3
	30	4.55	L	30	04	05.6	27	29.3
	30		U	30	16	37.1	-27	07.0
	31	5.55	L	31	05	08.1	26	15.4
	31		U	31	17	38.3	24	56.4
Nov.	1	6.55	L	1	06	07.6	23	12.5
	1		U	1	18	35.9	21	06.9
	2	7.55	L	2	07	03.0	18	42.7
	2		U	2	19	29.2	-16	03.1
	3	8.55	L	3	07	54.3	13	11.4
	3		U	3	20	18.6	10	10.4
	4	9.55	L	4	08	42.3	7	03.1
	4		U	4	21	05.4	3	51.9
	5	10.55	L	5	09	28.2	-0	39.3
	5		U	5	21	50.7	+2	32.2
	6	11.55	L	6	10	13.1	5	40.6
	6		U	6	22	35.7	8	43.7
	7	12.55	L	7	10	58.4	11	39.2
	7		U	7	23	21.4	14	25.3
	8	13.55	L	8	11	44.8	16	60.0
	9	14.55	U	9	00	08.6	+19	21.3
	9		L	9	12	33.0	21	27.4
	10	15.55	U	10	00	57.7	23	16.7
	10		L	10	13	23.0	24	47.7
	11	16.55	U	11	01	48.5	25	59.3
	11		L	11	14	14.4	26	50.4
	12	17.55	U	12	02	40.3	+27	20.7
	12		L	12	15	06.2	27	30.0
	13	18.55	U	13	03	32.0	27	18.4
	13		L	13	15	57.4	26	46.5
	14	19.55	U	14	04	22.4	25	55.2
	14		L	14	16	46.9	24	45.5
	15	20.55	U	15	05	10.9	+23	18.7
	15		L	15	17	34.3	21	36.0
	16	21.55	U	16	05	57.1	19	38.7
	16		L	16	18	19.5	+17	28.2

MOON, 2022
AT EPHEMERIS TRANSIT

Date	Age (at 0^h)	Ephemeris Transit			Geocentric Declination		Date	Age (at 0^h)	Ephemeris Transit			Geocentric Declination	
	d	d	h	m	°	'		d	d	h	m	°	'
Nov. 16	L	16	18	19.5	+17	28.2	Dec. 10	16.04 U	10	01	24.5	+27	25.2
17	22.55 U	17	06	41.4	15	05.7	10	L	10	13	50.3	27	08.2
17	L	17	19	03.0	12	32.5	11	17.04 U	11	02	15.6	26	31.1
18	23.55 U	18	07	24.4	9	49.9	11	L	11	14	40.5	25	34.8
18	L	18	19	45.7	6	59.1	12	18.04 U	12	03	04.9	24	20.5
19	24.55 U	19	08	07.1	4	01.5	12	L	12	15	28.6	22	49.7
19	L	19	20	28.6	+0	58.5	13	19.04 U	13	03	51.8	+21	03.6
20	25.55 U	20	08	50.5	-2	08.1	13	L	13	16	14.3	19	03.8
20	L	20	21	12.9	5	16.4	14	20.04 U	14	04	36.3	16	51.8
21	26.55 U	21	09	36.0	8	24.4	14	L	14	16	57.8	14	28.8
21	L	21	21	60.0	11	29.4	15	21.04 U	15	05	18.9	11	56.3
22	27.55 U	22	10	24.9	14	28.4	15	L	15	17	39.8	9	15.4
22	L	22	22	51.0	-17	18.2	16	22.04 U	16	06	00.6	+6	27.4
23	28.55 U	23	11	18.4	19	54.8	16	L	16	18	21.4	3	33.5
23	L	23	23	47.1	22	14.4	17	23.04 U	17	06	42.4	+0	35.1
24	0.04 U	24	12	17.0	24	12.7	17	L	17	19	03.7	-2	26.5
25	1.04 L	25	00	48.1	25	45.9	18	24.04 U	18	07	25.5	5	29.6
25	U	25	13	20.0	26	50.4	18	L	18	19	48.0	8	32.4
26	2.04 L	26	01	52.6	-27	23.9	19	25.04 U	19	08	11.4	-11	32.6
26	U	26	14	25.3	27	25.0	19	L	19	20	35.8	14	27.6
27	3.04 L	27	02	57.8	26	53.9	20	26.04 U	20	09	01.5	17	14.4
27	U	27	15	29.7	25	52.2	20	L	20	21	28.5	19	49.3
28	4.04 L	28	04	00.5	24	22.3	21	27.04 U	21	09	56.9	22	08.3
28	U	28	16	30.3	22	27.8	21	L	21	22	26.9	24	07.2
29	5.04 L	29	04	58.7	-20	12.3	22	28.04 U	22	10	58.1	-25	41.3
29	U	29	17	25.9	17	39.6	22	L	22	23	30.6	26	47.1
30	6.04 L	30	05	51.8	14	53.3	23	29.04 U	23	12	03.8	27	20.9
30	U	30	18	16.8	11	56.9	24	0.57 L	24	00	37.4	27	21.1
Dec. 1	7.04 L	1	06	40.8	8	53.3	24	U	24	13	11.0	26	47.1
1	U	1	19	04.0	5	45.3	25	1.57 L	25	01	43.9	25	40.4
2	8.04 L	2	07	26.8	-2	35.3	25	U	25	14	15.9	-24	03.7
2	U	2	19	49.1	+0	34.5	26	2.57 L	26	02	46.6	22	00.6
3	9.04 L	3	08	11.2	3	42.0	26	U	26	15	16.0	19	35.8
3	U	3	20	33.3	6	45.4	27	3.57 L	27	03	44.0	16	53.4
4	10.04 L	4	08	55.5	9	42.8	27	U	27	16	10.7	13	57.9
4	U	4	21	17.8	12	32.3	28	4.57 L	28	04	36.2	10	53.1
5	11.04 L	5	09	40.6	+15	12.1	28	U	28	17	00.7	-7	42.5
5	U	5	22	03.7	17	40.5	29	5.47 L	29	05	24.3	4	29.1
6	12.04 L	6	10	27.3	19	55.6	29	U	29	17	47.3	-1	15.5
6	U	6	22	51.5	21	55.8	30	6.57 L	30	06	09.9	+1	56.0
7	13.04 L	7	11	16.2	23	39.3	30	U	30	18	32.2	5	03.5
7	U	7	23	41.3	25	04.7	31	7.57 L	31	06	54.4	8	05.0
8	14.04 L	8	12	06.9	+26	10.7	31	U	31	19	16.6	+10	58.9
9	15.04 U	9	00	32.7	26	56.5	32	8.57 L	1	07	39.0	13	43.6
9	L	9	12	58.6	27	21.3	32	U	1	20	01.8	16	17.5
10	16.04 U	10	01	24.5	+27	25.2	33	9.57 L	2	08	24.9	+18	39.1

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Jan.	0	-3.554	-0.026	234.49	-0.99	11	102	0.112
	1	-1.821	+1.717	246.67	1.01	5	94	0.047
	2	+0.103	3.358	258.86	1.04	358	77	0.010
	3	2.077	4.765	271.05	1.06	352	312	0.002
	4	3.935	5.828	283.24	1.08	346	271	0.024
	5	5.518	6.481	295.43	1.11	342	261	0.073
	6	+6.701	+6.705	307.61	-1.13	339	254	0.144
	7	7.408	6.525	319.79	1.15	338	250	0.230
	8	7.618	5.991	331.97	1.17	337	248	0.326
	9	7.358	5.165	344.14	1.18	338	248	0.425
	10	6.689	4.114	356.30	1.20	340	248	0.525
	11	5.693	2.900	8.45	1.22	342	250	0.621
	12	+4.462	+1.581	20.60	-1.24	345	253	0.711
	13	3.086	+0.211	32.75	1.25	349	257	0.793
	14	1.651	-1.160	44.89	1.27	353	263	0.863
	15	+0.231	2.479	57.02	1.29	358	269	0.921
	16	-1.112	3.695	69.16	1.30	3	279	0.963
	17	2.332	4.757	81.29	1.32	8	295	0.990
	18	-3.397	-5.617	93.42	-1.33	13	13	0.999
	19	4.288	6.227	105.55	1.34	17	84	0.989
	20	4.998	6.552	117.68	1.36	20	98	0.960
	21	5.525	6.563	129.81	1.37	22	105	0.912
	22	5.866	6.247	141.95	1.38	23	109	0.846
	23	6.017	5.605	154.09	1.39	23	111	0.764
	24	-5.963	-4.654	166.23	-1.40	22	111	0.669
	25	5.682	3.429	178.39	1.41	20	111	0.564
	26	5.148	1.984	190.55	1.42	16	108	0.453
	27	4.338	-0.390	202.71	1.43	12	104	0.343
	28	3.243	+1.259	214.89	1.44	7	98	0.238
	29	1.882	2.854	227.07	1.45	1	90	0.145
	30	-0.313	+4.278	239.26	-1.46	355	81	0.072
	31	+1.363	5.421	251.45	1.47	349	67	0.023
Feb.	1	3.012	6.195	263.64	1.48	344	19	0.003
	2	4.482	6.552	275.83	1.50	340	276	0.010
	3	5.637	6.489	288.03	1.51	338	259	0.044
	4	6.376	6.039	300.22	1.51	337	253	0.100
	5	+6.650	+5.264	312.40	-1.52	338	250	0.173
	6	6.460	4.237	324.59	1.53	339	250	0.258
	7	5.851	3.032	336.76	1.54	341	250	0.350
	8	4.896	1.716	348.93	1.54	344	253	0.446
	9	3.688	+0.349	1.10	1.55	348	256	0.542
	10	2.325	-1.015	13.26	1.55	352	260	0.635
	11	+0.905	-2.326	25.42	-1.56	356	266	0.722
	12	-0.482	3.539	37.56	1.56	1	272	0.802
	13	1.756	4.606	49.71	1.56	6	279	0.871
	14	2.857	5.481	61.85	1.56	11	287	0.928
	15	-3.742	-6.116	73.99	-1.56	15	298	0.969

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic		The Sun's Selenographic		Position Angle of		Fraction Illuminated
		Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
		°	°	°	°	°	°	
Feb.	15	-3.742	-6.116	73.99	-1.56	15	298	0.969
	16	4.390	6.471	86.13	1.56	19	319	0.993
	17	4.801	6.512	98.26	1.55	21	56	0.997
	18	4.991	6.221	110.40	1.55	23	96	0.980
	19	4.986	5.597	122.54	1.54	23	105	0.942
	20	4.814	4.660	134.68	1.53	22	109	0.883
	21	-4.495	-3.449	146.83	-1.52	20	109	0.806
	22	4.039	2.027	158.98	1.52	17	108	0.712
	23	3.443	-0.470	171.14	1.51	13	105	0.607
	24	2.698	+1.134	183.31	1.50	9	100	0.494
	25	1.797	2.686	195.48	1.50	3	94	0.381
	26	-0.743	4.087	207.66	1.50	357	86	0.273
	27	+0.435	+5.240	219.85	-1.49	351	78	0.177
	28	1.678	6.064	232.04	1.49	346	70	0.098
Mar.	1	2.897	6.503	244.24	1.49	342	60	0.041
	2	3.987	6.535	256.45	1.48	339	41	0.009
	3	4.839	6.171	268.65	1.48	337	301	0.003
	4	5.367	5.457	280.86	1.48	337	261	0.021
	5	+5.516	+4.459	293.06	-1.47	338	253	0.061
	6	5.270	3.255	305.26	1.47	340	252	0.120
	7	4.653	1.920	317.46	1.46	343	252	0.193
	8	3.719	+0.526	329.65	1.46	346	255	0.276
	9	2.544	-0.867	341.84	1.45	350	258	0.366
	10	+1.216	2.205	354.02	1.44	355	263	0.459
	11	-0.169	-3.442	6.20	-1.43	360	269	0.553
	12	1.517	4.532	18.37	1.42	5	275	0.645
	13	2.740	5.435	30.54	1.41	10	281	0.733
	14	3.764	6.108	42.70	1.39	14	287	0.814
	15	4.529	6.510	54.86	1.38	18	293	0.884
	16	5.001	6.605	67.01	1.36	20	300	0.940
	17	-5.168	-6.366	79.16	-1.34	22	309	0.979
	18	5.046	5.781	91.31	1.32	23	343	0.997
	19	4.671	4.862	103.46	1.30	22	90	0.993
	20	4.092	3.646	115.62	1.28	21	105	0.965
	21	3.365	2.197	127.77	1.25	18	107	0.913
	22	2.536	-0.602	139.93	1.23	14	105	0.839
	23	-1.643	+1.041	152.09	-1.21	10	102	0.746
	24	-0.712	2.625	164.26	1.19	4	96	0.641
	25	+0.239	4.051	176.44	1.17	358	90	0.528
	26	1.193	5.229	188.63	1.15	352	83	0.414
	27	2.125	6.087	200.82	1.13	347	76	0.305
	28	3.002	6.576	213.02	1.12	343	69	0.207
	29	+3.776	+6.672	225.23	-1.10	340	64	0.124
	30	4.391	6.381	237.44	1.09	338	58	0.061
	31	4.791	5.734	249.66	1.07	337	51	0.020
Apr.	1	4.929	4.784	261.88	1.06	338	19	0.002
	2	+4.774	+3.601	274.10	-1.04	339	265	0.006

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
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Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Apr.	1	+4.929	+4.784	261.88	-1.06	338	19	0.002
	2	4.774	3.601	274.10	1.04	339	265	0.006
	3	4.317	2.259	286.32	1.03	342	255	0.032
	4	3.573	+0.835	298.54	1.01	345	254	0.076
	5	2.579	-0.602	310.75	1.00	349	257	0.136
	6	1.390	1.991	322.97	0.98	353	261	0.209
	7	+0.074	-3.279	335.17	-0.96	358	265	0.292
	8	-1.288	4.421	347.38	0.94	3	271	0.381
	9	2.613	5.377	359.57	0.92	8	277	0.474
	10	3.818	6.108	11.77	0.90	13	283	0.570
	11	4.822	6.578	23.95	0.88	17	288	0.664
	12	5.556	6.753	36.14	0.85	20	293	0.753
	13	-5.966	-6.605	48.31	-0.83	22	296	0.835
	14	6.021	6.112	60.48	0.80	23	300	0.905
	15	5.716	5.272	72.65	0.77	23	303	0.959
	16	5.075	4.106	84.82	0.74	21	309	0.991
	17	4.147	2.665	96.98	0.70	19	74	0.999
	18	3.004	-1.033	109.15	0.67	16	105	0.980
	19	-1.725	+0.684	121.32	-0.64	11	104	0.935
	20	-0.394	2.363	133.49	0.60	6	99	0.865
	21	+0.912	3.888	145.67	0.57	360	93	0.774
	22	2.129	5.155	157.85	0.54	354	86	0.670
	23	3.206	6.089	170.05	0.51	348	79	0.558
	24	4.102	6.645	182.25	0.49	343	73	0.445
	25	+4.789	+6.804	194.45	-0.46	340	68	0.336
	26	5.247	6.577	206.67	0.44	338	65	0.237
	27	5.463	5.993	218.89	0.42	337	62	0.152
	28	5.431	5.102	231.12	0.40	338	61	0.084
	29	5.151	3.965	243.35	0.38	339	60	0.036
	30	4.630	2.650	255.58	0.36	341	58	0.008
May	1	+3.882	+1.228	267.82	-0.34	344	282	0.000
	2	2.930	-0.229	280.05	0.31	347	255	0.013
	3	1.808	1.656	292.29	0.29	352	257	0.044
	4	+0.555	2.995	304.52	0.27	356	262	0.091
	5	-0.778	4.195	316.75	0.25	1	267	0.154
	6	2.134	5.212	328.98	0.23	6	273	0.228
	7	-3.447	-6.008	341.20	-0.20	11	279	0.312
	8	4.649	6.552	353.41	0.18	15	284	0.403
	9	5.668	6.813	5.62	0.15	19	288	0.500
	10	6.434	6.767	17.83	0.13	21	292	0.598
	11	6.883	6.393	30.03	0.10	22	295	0.695
	12	6.964	5.682	42.22	0.07	23	297	0.787
	13	-6.646	-4.639	54.41	-0.03	22	297	0.869
	14	5.922	3.294	66.60	+0.00	20	296	0.935
	15	4.820	-1.709	78.78	0.04	17	293	0.980
	16	3.400	+0.023	90.96	0.07	13	284	1.000
	17	-1.755	+1.779	103.13	+0.11	8	106	0.990

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
May	17	-1.755	+1.779	103.13	+0.11	8	106	0.990
	18	-0.002	3.424	115.32	0.15	2	99	0.951
	19	+1.732	4.832	127.50	0.18	356	91	0.886
	20	3.324	5.903	139.69	0.21	350	84	0.799
	21	4.673	6.574	151.89	0.24	345	77	0.698
	22	5.708	6.827	164.09	0.27	341	72	0.588
	23	+6.389	+6.673	176.30	+0.30	339	68	0.477
	24	6.709	6.152	188.52	0.32	337	65	0.370
	25	6.684	5.317	200.74	0.34	338	64	0.271
	26	6.348	4.231	212.97	0.37	339	65	0.184
	27	5.741	2.960	225.21	0.39	340	66	0.112
	28	4.908	1.571	237.45	0.41	343	69	0.057
	29	+3.892	+0.130	249.69	+0.43	346	74	0.020
	30	2.735	-1.299	261.94	0.45	350	89	0.002
	31	1.475	2.658	274.19	0.47	355	244	0.003
June	1	+0.151	3.891	286.43	0.49	360	259	0.022
	2	-1.201	4.952	298.68	0.51	5	267	0.058
	3	2.541	5.800	310.92	0.53	10	273	0.110
	4	-3.825	-6.402	323.16	+0.55	14	279	0.176
	5	5.004	6.731	335.40	0.57	18	285	0.254
	6	6.024	6.765	347.63	0.60	20	289	0.343
	7	6.825	6.490	359.85	0.62	22	292	0.439
	8	7.347	5.898	12.07	0.64	23	294	0.540
	9	7.528	4.992	24.28	0.67	22	295	0.643
	10	-7.318	-3.790	36.49	+0.70	21	294	0.743
	11	6.680	2.332	48.69	0.73	19	292	0.834
	12	5.607	-0.686	60.88	0.76	15	287	0.911
	13	4.132	+1.049	73.07	0.79	10	280	0.967
	14	2.330	2.747	85.26	0.82	5	260	0.996
	15	-0.327	4.270	97.45	0.85	358	114	0.995
	16	+1.721	+5.492	109.64	+0.88	352	93	0.964
	17	3.643	6.319	121.83	0.91	346	84	0.906
	18	5.286	6.706	134.02	0.94	342	77	0.825
	19	6.536	6.655	146.22	0.96	339	72	0.728
	20	7.333	6.207	158.43	0.98	338	68	0.623
	21	7.664	5.424	170.65	1.00	337	67	0.516
	22	+7.559	+4.378	182.87	+1.02	338	66	0.410
	23	7.076	3.142	195.10	1.04	340	67	0.312
	24	6.284	1.786	207.33	1.06	342	70	0.224
	25	5.256	+0.373	219.57	1.07	346	74	0.148
	26	4.062	-1.036	231.82	1.09	349	79	0.086
	27	2.764	-2.384	244.06	1.10	354	87	0.040
	28	+1.413	-3.621	256.31	+1.12	359	100	0.012
	29	+0.053	4.697	268.57	1.13	4	163	0.001
	30	-1.284	5.570	280.82	1.14	9	254	0.008
July	1	2.568	6.205	293.07	1.16	13	270	0.033
	2	-3.774	-6.572	305.32	+1.17	17	278	0.076

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date		The Earth's Selenographic		The Sun's Selenographic		Position Angle of		Fraction Illuminated
0^h TT		Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
		°	°	°	°	°	°	
July	1	-2.568	-6.205	293.07	+1.16	13	270	0.033
	2	3.774	6.572	305.32	1.17	17	278	0.076
	3	4.872	6.653	317.56	1.18	20	284	0.134
	4	5.829	6.434	329.81	1.20	22	288	0.207
	5	6.605	5.913	342.04	1.21	22	291	0.292
	6	7.150	5.098	354.27	1.23	22	293	0.388
	7	-7.409	-4.008	6.50	+1.24	22	293	0.491
	8	7.325	2.674	18.72	1.26	20	291	0.598
	9	6.845	-1.151	30.93	1.28	17	289	0.704
	10	5.936	+0.488	43.13	1.30	13	284	0.802
	11	4.599	2.141	55.33	1.32	7	277	0.887
	12	2.879	3.689	67.52	1.34	1	267	0.952
	13	-0.881	+5.002	79.71	+1.36	355	247	0.990
	14	+1.240	5.965	91.90	1.38	349	134	0.998
	15	3.298	6.501	104.09	1.39	344	89	0.975
	16	5.108	6.582	116.28	1.41	340	78	0.925
	17	6.522	6.229	128.47	1.42	338	72	0.853
	18	7.449	5.504	140.67	1.43	337	69	0.764
	19	+7.862	+4.488	152.88	+1.44	338	68	0.665
	20	7.786	3.265	165.09	1.45	339	68	0.563
	21	7.283	1.915	177.31	1.46	342	70	0.460
	22	6.437	+0.510	189.53	1.47	345	73	0.363
	23	5.336	-0.889	201.76	1.48	348	77	0.272
	24	4.069	2.229	214.00	1.48	353	83	0.192
	25	+2.715	-3.459	226.24	+1.49	357	89	0.123
	26	+1.340	4.535	238.49	1.49	2	97	0.068
	27	-0.004	5.416	250.73	1.50	7	108	0.029
	28	1.278	6.065	262.98	1.50	12	131	0.007
	29	2.456	6.452	275.23	1.50	16	225	0.002
	30	3.521	6.554	287.48	1.51	19	270	0.017
	31	-4.461	-6.360	299.73	+1.51	21	281	0.049
Aug.	1	5.261	5.867	311.97	1.51	22	287	0.100
	2	5.903	5.086	324.21	1.51	23	290	0.168
	3	6.357	4.042	336.45	1.51	22	291	0.250
	4	6.585	2.772	348.68	1.52	20	291	0.346
	5	6.538	-1.325	0.90	1.52	18	289	0.451
	6	-6.167	+0.232	13.12	+1.52	14	285	0.561
	7	5.432	1.814	25.33	1.53	9	280	0.670
	8	4.314	3.324	37.53	1.54	4	273	0.774
	9	2.836	4.651	49.72	1.54	357	265	0.865
	10	-1.069	5.685	61.91	1.55	351	254	0.936
	11	+0.859	6.335	74.10	1.55	346	239	0.981
	12	+2.783	+6.545	86.28	+1.55	342	172	0.998
	13	4.523	6.306	98.46	1.55	339	89	0.986
	14	5.924	5.660	110.64	1.55	338	75	0.946
	15	6.879	4.680	122.83	1.55	338	71	0.884
	16	+7.339	+3.460	135.02	+1.55	339	69	0.805

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Aug.	16	+7.339	+3.460	135.02	+1.55	339	69	0.805
	17	7.313	2.090	147.22	1.54	341	70	0.715
	18	6.852	+0.657	159.42	1.54	344	72	0.619
	19	6.032	-0.770	171.63	1.53	347	76	0.520
	20	4.946	2.132	183.84	1.53	351	80	0.423
	21	3.687	3.379	196.06	1.52	356	86	0.331
	22	+2.343	-4.470	208.29	+1.52	1	92	0.245
	23	+0.994	5.366	220.52	1.51	6	99	0.169
	24	-0.296	6.033	232.75	1.50	11	106	0.105
	25	1.479	6.442	244.99	1.49	15	114	0.054
	26	2.520	6.567	257.23	1.49	18	126	0.020
	27	3.404	6.392	269.47	1.48	21	162	0.003
	28	-4.122	-5.914	281.71	+1.47	22	262	0.006
	29	4.676	5.142	293.95	1.46	23	282	0.029
	30	5.064	4.102	306.19	1.45	22	288	0.072
	31	5.282	2.834	318.42	1.44	21	290	0.135
Sept.	1	5.315	-1.395	330.65	1.42	18	289	0.215
	2	5.141	+0.145	342.87	1.41	15	287	0.311
	3	-4.730	+1.704	355.09	+1.40	11	282	0.417
	4	4.056	3.193	7.29	1.40	5	277	0.529
	5	3.105	4.515	19.49	1.39	359	270	0.642
	6	1.890	5.576	31.69	1.38	353	262	0.748
	7	-0.461	6.291	43.87	1.37	348	254	0.843
	8	+1.093	6.599	56.05	1.36	343	245	0.918
	9	+2.649	+6.472	68.23	+1.34	340	236	0.971
	10	4.070	5.925	80.40	1.33	338	208	0.996
	11	5.226	5.012	92.57	1.31	338	93	0.994
	12	6.021	3.814	104.74	1.30	338	75	0.967
	13	6.399	2.429	116.92	1.28	340	71	0.918
	14	6.351	+0.950	129.09	1.26	342	72	0.851
	15	+5.907	-0.536	141.27	+1.24	346	74	0.771
	16	5.126	1.959	153.46	1.23	350	78	0.682
	17	4.084	3.264	165.65	1.21	354	83	0.588
	18	2.867	4.406	177.85	1.19	359	88	0.493
	19	1.562	5.348	190.06	1.17	4	94	0.399
	20	+0.253	6.060	202.26	1.16	9	101	0.309
	21	-0.985	-6.513	214.48	+1.14	14	107	0.225
	22	2.090	6.685	226.70	1.12	17	112	0.150
	23	3.016	6.557	238.92	1.10	20	118	0.088
	24	3.731	6.120	251.14	1.08	22	123	0.040
	25	4.223	5.378	263.37	1.06	22	134	0.010
	26	4.491	4.349	275.60	1.04	22	221	0.001
	27	-4.546	-3.072	287.83	+1.02	21	283	0.014
	28	4.404	1.607	300.05	1.00	19	288	0.049
	29	4.079	-0.029	312.27	0.98	16	287	0.107
	30	3.585	+1.572	324.49	0.96	12	284	0.185
Oct.	1	-2.930	+3.099	336.70	+0.94	7	279	0.280

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Oct.	1	-2.930	+3.099	336.70	+0.94	7	279	0.280
	2	2.123	4.457	348.90	0.92	1	273	0.387
	3	1.178	5.557	1.09	0.89	355	266	0.500
	4	-0.118	6.324	13.28	0.87	349	259	0.614
	5	+1.015	6.703	25.46	0.85	344	252	0.722
	6	2.162	6.667	37.63	0.83	341	246	0.819
	7	+3.248	+6.221	49.80	+0.80	339	242	0.898
	8	4.193	5.399	61.96	0.78	338	237	0.956
	9	4.921	4.266	74.12	0.75	338	230	0.990
	10	5.369	2.908	86.28	0.72	339	122	0.999
	11	5.500	+1.416	98.44	0.69	341	74	0.985
	12	5.300	-0.117	110.60	0.67	344	73	0.950
	13	+4.785	-1.610	122.76	+0.64	348	75	0.896
	14	3.988	2.994	134.92	0.61	353	79	0.828
	15	2.964	4.216	147.09	0.59	358	85	0.749
	16	1.778	5.235	159.26	0.56	3	90	0.661
	17	+0.503	6.020	171.44	0.53	8	96	0.569
	18	-0.782	6.546	183.63	0.51	12	102	0.475
	19	-2.003	-6.794	195.82	+0.49	16	107	0.381
	20	3.087	6.746	208.01	0.46	19	112	0.290
	21	3.971	6.392	220.21	0.44	21	115	0.206
	22	4.604	5.730	232.41	0.41	22	118	0.131
	23	4.951	4.769	244.62	0.39	22	120	0.070
	24	4.994	3.535	256.83	0.36	22	121	0.026
	25	-4.737	-2.078	269.04	+0.33	20	127	0.003
	26	4.203	-0.471	281.26	0.31	17	286	0.004
	27	3.429	+1.192	293.47	0.28	13	287	0.030
	28	2.469	2.803	305.67	0.25	8	283	0.082
	29	1.381	4.253	317.88	0.23	2	277	0.157
	30	-0.230	5.441	330.07	0.20	356	270	0.250
	31	+0.925	+6.289	342.26	+0.17	350	262	0.356
Nov.	1	2.027	6.745	354.45	0.14	345	256	0.470
	2	3.025	6.787	6.62	0.11	342	250	0.583
	3	3.877	6.424	18.79	0.08	339	246	0.692
	4	4.551	5.691	30.95	0.05	338	244	0.789
	5	5.019	4.642	43.10	+0.02	338	243	0.871
	6	+5.264	+3.351	55.25	-0.01	339	243	0.935
	7	5.273	1.900	67.40	0.04	340	244	0.977
	8	5.043	+0.374	79.54	0.07	343	249	0.998
	9	4.577	-1.144	91.69	0.11	347	67	0.997
	10	3.887	2.579	103.83	0.14	351	73	0.976
	11	2.996	3.870	115.98	0.17	356	79	0.937
	12	+1.933	-4.967	128.12	-0.20	1	85	0.881
	13	+0.742	5.832	140.27	0.23	6	92	0.813
	14	-0.527	6.439	152.43	0.25	11	98	0.734
	15	1.815	6.770	164.59	0.28	15	103	0.647
	16	-3.055	-6.812	176.75	-0.30	18	108	0.555

MOON, 2022
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Nov.	16	-3.055	-6.812	176.75	-0.30	18	108	0.555
	17	4.177	6.557	188.92	0.33	20	111	0.459
	18	5.107	6.004	201.10	0.35	22	114	0.363
	19	5.776	5.159	213.28	0.38	22	116	0.270
	20	6.122	4.036	225.47	0.40	22	116	0.184
	21	6.098	2.669	237.66	0.42	21	115	0.109
	22	-5.680	-1.113	249.86	-0.45	18	112	0.050
	23	4.872	+0.552	262.05	0.47	15	104	0.012
	24	3.715	2.221	274.25	0.50	10	353	0.000
	25	2.286	3.773	286.45	0.53	4	287	0.016
	26	-0.691	5.087	298.64	0.55	358	277	0.060
	27	+0.943	6.063	310.84	0.58	352	268	0.129
	28	+2.489	+6.631	323.02	-0.61	347	260	0.218
	29	3.841	6.766	335.20	0.63	342	254	0.322
	30	4.921	6.480	347.38	0.66	339	250	0.433
Dec.	1	5.688	5.814	359.54	0.69	338	247	0.545
	2	6.131	4.831	11.70	0.72	338	245	0.652
	3	6.267	3.605	23.85	0.75	338	245	0.750
	4	+6.124	+2.213	36.00	-0.78	340	247	0.835
	5	5.739	+0.734	48.14	0.81	342	250	0.904
	6	5.147	-0.757	60.28	0.83	346	255	0.955
	7	4.380	2.189	72.41	0.86	350	265	0.987
	8	3.465	3.499	84.54	0.89	354	317	0.999
	9	2.424	4.634	96.68	0.92	359	67	0.993
	10	+1.278	-5.550	108.81	-0.94	4	82	0.968
	11	+0.052	6.216	120.95	0.97	9	91	0.927
	12	-1.226	6.609	133.08	0.99	14	98	0.871
	13	2.518	6.718	145.22	1.01	17	103	0.802
	14	3.778	6.539	157.37	1.02	20	108	0.722
	15	4.947	6.074	169.52	1.04	21	111	0.633
	16	-5.956	-5.332	181.68	-1.06	22	113	0.538
	17	6.730	4.328	193.84	1.07	22	114	0.439
	18	7.191	3.087	206.01	1.09	21	113	0.340
	19	7.266	1.649	218.18	1.10	19	112	0.244
	20	6.895	-0.073	230.36	1.12	16	108	0.156
	21	6.050	+1.558	242.55	1.14	12	102	0.083
	22	-4.743	+3.138	254.73	-1.15	7	92	0.030
	23	3.043	4.544	266.92	1.17	1	62	0.004
	24	-1.076	5.655	279.12	1.19	355	293	0.006
	25	+0.988	6.370	291.30	1.21	349	271	0.039
	26	2.962	6.635	303.49	1.23	344	261	0.099
	27	4.678	6.445	315.67	1.24	340	254	0.182
	28	+6.013	+5.842	327.85	-1.26	338	250	0.280
	29	6.905	4.899	340.02	1.28	338	247	0.386
	30	7.345	3.701	352.18	1.30	338	247	0.495
	31	7.369	2.336	4.34	1.32	339	248	0.601
	32	+7.034	+0.887	16.49	-1.34	342	250	0.699

MERCURY, 2022
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ' "	° ' "			° ' "	° ' "	
Jan. 0	349 20 19.0	-6 01 42.3	0.368 9454	Feb. 15	217 52 53.6	+1 18 29.8	0.440 0479
1	353 49 53.5	5 43 51.7	0.363 1489	16	220 56 00.2	0 56 17.8	0.443 6605
2	358 27 52.2	5 23 14.5	0.357 3996	17	223 56 13.0	0 34 17.2	0.447 0261
3	3 14 31.5	4 59 45.2	0.351 7369	18	226 53 48.9	+0 12 30.1	0.450 1391
4	8 10 05.0	4 33 20.2	0.346 2037	19	229 49 03.9	-0 09 01.8	0.452 9944
5	13 14 42.1	4 03 58.3	0.340 8456	20	232 42 13.4	0 30 16.9	0.455 5879
6	18 28 26.8	-3 31 41.6	0.335 7110	21	235 33 32.4	-0 51 13.8	0.457 9159
7	23 51 17.5	2 56 36.5	0.330 8504	22	238 23 15.1	1 11 51.1	0.459 9753
8	29 23 04.9	2 18 53.6	0.326 3157	23	241 11 35.5	1 32 07.8	0.461 7633
9	35 03 31.3	1 38 49.3	0.322 1593	24	243 58 47.0	1 52 02.7	0.463 2778
10	40 52 09.7	0 56 45.4	0.318 4325	25	246 45 02.8	2 11 34.7	0.464 5169
11	46 48 22.8	-0 13 09.6	0.315 1847	26	249 30 35.7	2 30 43.0	0.465 4791
12	52 51 22.8	+0 31 24.7	0.312 4614	27	252 15 38.3	-2 49 26.3	0.466 1634
13	59 00 11.3	1 16 19.6	0.310 3027	28	255 00 23.0	3 07 43.6	0.466 5689
14	65 13 39.7	2 00 53.2	0.308 7419	Mar. 1	257 45 02.2	3 25 34.0	0.466 6952
15	71 30 30.7	2 44 21.9	0.307 8035	2	260 29 47.9	3 42 56.2	0.466 5422
16	77 49 19.8	3 26 02.0	0.307 5028	3	263 14 52.5	3 59 48.9	0.466 1099
17	84 08 37.8	4 05 12.0	0.307 8447	4	266 00 28.1	4 16 11.0	0.465 3990
18	90 26 53.8	+4 41 14.5	0.308 8236	5	268 46 47.0	-4 32 00.8	0.464 4103
19	96 42 37.7	5 13 38.1	0.310 4237	6	271 34 01.7	4 47 17.0	0.463 1447
20	102 54 23.2	5 41 58.5	0.312 6197	7	274 22 24.8	5 01 57.7	0.461 6040
21	109 00 51.3	6 05 59.4	0.315 3780	8	277 12 09.1	5 16 01.2	0.459 7899
22	115 00 51.2	6 25 32.2	0.318 6579	9	280 03 27.7	5 29 25.2	0.457 7047
23	120 53 23.1	6 40 36.1	0.322 4139	10	282 56 34.1	5 42 07.5	0.455 3511
24	126 37 38.4	+6 51 16.6	0.326 5962	11	285 51 42.1	-5 54 05.6	0.452 7324
25	132 12 59.9	6 57 44.8	0.331 1534	12	288 49 06.0	6 05 16.7	0.449 8522
26	137 39 02.0	7 00 15.8	0.336 0332	13	291 49 00.4	6 15 37.7	0.446 7148
27	142 55 29.5	6 59 07.8	0.341 1837	14	294 51 40.7	6 25 05.2	0.443 3253
28	148 02 16.3	6 54 40.6	0.346 5546	15	297 57 22.8	6 33 35.6	0.439 6894
29	152 59 24.6	6 47 14.6	0.352 0975	16	301 06 22.9	6 41 04.5	0.435 8134
30	157 47 03.4	+6 37 10.3	0.357 7671	17	304 18 58.3	-6 47 27.7	0.431 7049
31	162 25 26.8	6 24 47.6	0.363 5207	18	307 35 26.7	6 52 40.1	0.427 3722
Feb. 1	166 54 53.3	6 10 25.1	0.369 3190	19	310 56 06.5	6 56 36.5	0.422 8248
2	171 15 44.5	5 54 20.1	0.375 1259	20	314 21 17.1	6 59 10.9	0.418 0737
3	175 28 23.9	5 36 48.6	0.380 9084	21	317 51 18.1	7 00 17.2	0.413 1310
4	179 33 16.5	5 18 04.9	0.386 6367	22	321 26 30.4	6 59 48.4	0.408 0105
5	183 30 48.2	+4 58 21.6	0.392 2837	23	325 07 15.0	-6 57 37.4	0.402 7278
6	187 21 24.8	4 37 50.3	0.397 8254	24	328 53 53.7	6 53 36.5	0.397 3002
7	191 05 32.1	4 16 40.8	0.403 2399	25	332 46 48.9	6 47 37.5	0.391 7476
8	194 43 35.5	3 55 01.9	0.408 5078	26	336 46 22.8	6 39 32.1	0.386 0916
9	198 15 59.7	3 33 01.1	0.413 6120	27	340 52 58.2	6 29 11.7	0.380 3570
10	201 43 08.5	3 10 45.0	0.418 5369	28	345 06 57.1	6 16 27.7	0.374 5708
11	205 05 24.9	+2 48 19.4	0.423 2690	29	349 28 41.4	-6 01 11.8	0.368 7633
12	208 23 10.9	2 25 49.1	0.427 7963	30	353 58 31.5	5 43 16.0	0.362 9676
13	211 36 47.8	2 03 18.4	0.432 1079	31	358 36 46.3	5 22 33.6	0.357 2203
14	214 46 35.6	1 40 50.9	0.436 1946	Apr. 1	3 23 42.2	4 58 58.9	0.351 5609
15	217 52 53.6	+1 18 29.8	0.440 0479	2	8 19 32.7	-4 32 28.4	0.346 0323

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Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Apr. 1	3 23 42.2	-4 58 58.9	0.351 5609	May 17	226 59 26.1	+0 11 49.9	0.450 2321
2	8 19 32.7	4 32 28.4	0.346 0323	18	229 54 37.0	-0 09 41.5	0.453 0794
3	13 24 26.9	4 03 01.0	0.340 6804	19	232 47 42.8	0 30 56.0	0.455 6647
4	18 38 28.9	3 30 39.0	0.335 5535	20	235 38 58.6	0 51 52.2	0.457 9844
5	24 01 36.7	2 55 28.7	0.330 7023	21	238 28 38.6	1 12 29.0	0.460 0353
6	29 33 40.7	2 17 41.1	0.326 1787	22	241 16 56.6	1 32 45.0	0.461 8149
7	35 14 23.1	-1 37 32.7	0.322 0348	23	244 04 06.2	-1 52 39.2	0.463 3208
8	41 03 16.4	0 55 25.4	0.318 3223	24	246 50 20.5	2 12 10.6	0.464 5513
9	46 59 43.2	-0 11 47.3	0.315 0902	25	249 35 52.3	2 31 18.0	0.465 5049
10	53 02 55.3	+0 32 48.3	0.312 3840	26	252 20 54.1	2 50 00.6	0.466 1805
11	59 11 53.7	1 17 43.2	0.310 2436	27	255 05 38.5	3 08 17.1	0.466 5774
12	65 25 29.8	2 02 15.5	0.308 7019	28	257 50 17.6	3 26 06.6	0.466 6950
13	71 42 25.9	+2 45 41.5	0.307 7834	29	260 35 03.7	-3 43 27.9	0.466 5333
14	78 01 17.4	3 27 17.6	0.307 5028	30	263 20 09.0	4 00 19.7	0.466 0925
15	84 20 35.0	4 06 22.3	0.307 8649	31	266 05 45.8	4 16 40.8	0.465 3729
16	90 38 47.7	4 42 18.5	0.308 8636	June 1	268 52 06.2	4 32 29.7	0.464 3756
17	96 54 25.4	5 14 34.9	0.310 4828	2	271 39 22.9	4 47 44.8	0.463 1015
18	103 06 02.3	5 42 47.4	0.312 6970	3	274 27 48.2	5 02 24.4	0.461 5523
19	109 12 19.2	+6 06 40.0	0.315 4724	4	277 17 35.3	-5 16 26.6	0.459 7297
20	115 12 06.1	6 26 04.5	0.318 7680	5	280 08 57.0	5 29 49.4	0.457 6362
21	121 04 23.1	6 41 00.0	0.322 5382	6	283 02 06.9	5 42 30.4	0.455 2743
22	126 48 22.2	6 51 32.5	0.326 7331	7	285 57 18.9	5 54 27.1	0.452 6474
23	132 23 26.6	6 57 53.1	0.331 3013	8	288 54 47.2	6 05 36.7	0.449 7592
24	137 49 10.9	7 00 17.0	0.336 1903	9	291 54 46.6	6 15 56.1	0.446 6140
25	143 05 20.2	+6 59 02.5	0.341 3485	10	294 57 32.2	-6 25 21.9	0.443 2168
26	148 11 48.8	6 54 29.4	0.346 7255	11	298 03 20.1	6 33 50.4	0.439 5732
27	153 08 39.2	6 46 58.2	0.352 2732	12	301 12 26.7	6 41 17.4	0.435 6900
28	157 56 00.3	6 36 49.4	0.357 9460	13	304 25 09.0	6 47 38.5	0.431 5743
29	162 34 06.6	6 24 22.7	0.363 7016	14	307 41 44.8	6 52 48.7	0.427 2348
30	167 03 16.7	6 09 56.7	0.369 5007	15	311 02 32.8	6 56 42.6	0.422 6810
May 1	171 23 52.1	+5 53 48.9	0.375 3073	16	314 27 52.0	-6 59 14.4	0.417 9238
2	175 36 16.5	5 36 14.9	0.381 0885	17	317 58 02.4	7 00 17.9	0.412 9753
3	179 40 55.0	5 17 29.1	0.386 8146	18	321 33 24.5	6 59 46.0	0.407 8495
4	183 38 13.2	4 57 44.3	0.392 4587	19	325 14 19.8	6 57 31.8	0.402 5620
5	187 28 37.3	4 37 11.6	0.397 9967	20	329 01 09.8	6 53 27.3	0.397 1303
6	191 12 32.9	4 16 01.1	0.403 4069	21	332 54 17.0	6 47 24.5	0.391 5740
7	194 50 25.3	+3 54 21.3	0.408 6699	22	336 54 03.6	-6 39 15.1	0.385 9153
8	198 22 39.3	3 32 20.0	0.413 7687	23	341 00 52.3	6 28 50.4	0.380 1786
9	201 49 38.6	3 10 03.6	0.418 6878	24	345 15 05.4	6 16 01.8	0.374 3912
10	205 11 46.2	2 47 37.7	0.423 4136	25	349 37 04.4	6 00 41.0	0.368 5835
11	208 29 24.2	2 25 07.4	0.427 9343	26	354 07 09.9	5 42 40.3	0.362 7887
12	211 42 53.5	2 02 36.7	0.432 2390	27	358 45 40.5	5 21 52.6	0.357 0435
13	214 52 34.5	+1 40 09.4	0.436 3185	28	3 32 52.8	-4 58 12.5	0.351 3875
14	217 58 46.3	1 17 48.6	0.440 1644	29	8 29 00.0	4 31 36.5	0.345 8637
15	221 01 47.3	0 55 36.9	0.443 7694	30	13 34 11.2	4 02 03.6	0.340 5180
16	224 01 55.0	0 33 36.6	0.447 1272	July 1	18 48 30.2	3 29 36.3	0.335 3989
17	226 59 26.1	+0 11 49.9	0.450 2321	2	24 11 54.7	-2 54 20.9	0.330 5570

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Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	18	48	30.2	-3	29	36.3	0.335 3989	Aug.	16	235	44	24.0	-0	52	30.7	0.458 0519
	2	24	11	54.7	2	54	20.9	0.330 5570		17	238	34	01.2	1	13	06.7	0.460 0945
	3	29	44	15.2	2	16	28.7	0.326 0443		18	241	22	17.0	1	33	22.1	0.461 8656
	4	35	25	13.2	1	36	16.3	0.321 9131		19	244	09	24.6	1	53	15.6	0.463 3631
	5	41	14	21.3	0	54	05.8	0.318 2147		20	246	55	37.4	2	12	46.3	0.464 5850
	6	47	11	01.4	-0	10	25.3	0.314 9983		21	249	41	08.0	2	31	53.0	0.465 5300
	7	53	14	25.1	+0	34	11.6	0.312 3090		22	252	26	09.2	-2	50	34.7	0.466 1970
	8	59	23	33.2	1	19	06.4	0.310 1868		23	255	10	53.2	3	08	50.5	0.466 5852
	9	65	37	16.7	2	03	37.3	0.308 6641		24	257	55	32.4	3	26	39.1	0.466 6942
	10	71	54	17.7	2	47	00.6	0.307 7651		25	260	40	18.9	3	43	59.5	0.466 5238
	11	78	13	11.3	3	28	32.6	0.307 5045		26	263	25	25.0	4	00	50.5	0.466 0743
	12	84	32	28.3	4	07	32.0	0.307 8864		27	266	11	03.0	4	17	10.6	0.465 3462
	13	90	50	37.5	+4	43	21.8	0.308 9047		28	268	57	25.0	-4	32	58.4	0.464 3403
	14	97	06	09.0	5	15	31.0	0.310 5428		29	271	44	43.5	4	48	12.4	0.463 0577
	15	103	17	37.1	5	43	35.7	0.312 7750		30	274	33	11.3	5	02	51.0	0.461 4999
	16	109	23	42.9	6	07	20.1	0.315 5670		31	277	23	01.0	5	16	52.0	0.459 6690
	17	115	23	16.6	6	26	36.2	0.318 8781	Sept.	1	280	14	25.9	5	30	13.6	0.457 5671
	18	121	15	18.9	6	41	23.6	0.322 6622		2	283	07	39.4	5	42	53.2	0.455 1970
	19	126	59	01.9	+6	51	48.0	0.326 8695		3	286	02	55.4	-5	54	48.5	0.452 5620
	20	132	33	49.2	6	58	01.0	0.331 4484		4	289	00	28.2	6	05	56.6	0.449 6657
	21	137	59	15.8	7	00	18.0	0.336 3465		5	292	00	32.4	6	16	14.4	0.446 5127
	22	143	15	07.2	6	58	57.1	0.341 5122		6	295	03	23.5	6	25	38.6	0.443 1078
	23	148	21	17.8	6	54	18.1	0.346 8952		7	298	09	17.3	6	34	05.2	0.439 4568
	24	153	17	50.4	6	46	41.8	0.352 4474		8	301	18	30.3	6	41	30.3	0.435 5662
	25	158	04	54.1	+6	36	28.4	0.358 1234		9	304	31	19.6	-6	47	49.2	0.431 4436
	26	162	42	43.5	6	23	57.7	0.363 8809		10	307	48	03.0	6	52	57.2	0.427 0973
	27	167	11	37.3	6	09	28.4	0.369 6807		11	311	08	59.0	6	56	48.7	0.422 5371
	28	171	31	57.1	5	53	17.6	0.375 4870		12	314	34	26.9	6	59	17.8	0.417 7738
	29	175	44	06.7	5	35	41.3	0.381 2670		13	318	04	46.6	7	00	18.4	0.412 8197
	30	179	48	31.1	5	16	53.5	0.386 9909		14	321	40	18.8	6	59	43.6	0.407 6887
	31	183	45	36.2	+4	57	07.0	0.392 6321		15	325	21	24.7	-6	57	26.0	0.402 3966
Aug.	1	187	35	47.8	4	36	33.0	0.398 1664		16	329	08	26.0	6	53	18.0	0.396 9607
	2	191	19	31.8	4	15	21.4	0.403 5722		17	333	01	45.2	6	47	11.5	0.391 4011
	3	194	57	13.3	3	53	41.0	0.408 8304		18	337	01	44.5	6	38	58.0	0.385 7396
	4	198	29	17.2	3	31	39.0	0.413 9238		19	341	08	46.6	6	28	28.9	0.380 0010
	5	201	56	07.1	3	09	22.2	0.418 8371		20	345	23	13.7	6	15	35.8	0.374 2126
	6	205	18	06.1	+2	46	56.2	0.423 5568		21	349	45	27.4	-6	00	10.2	0.368 4049
	7	208	35	36.0	2	24	25.8	0.428 0709		22	354	15	48.1	5	42	04.4	0.362 6112
	8	211	48	58.1	2	01	55.2	0.432 3688		23	358	54	34.6	5	21	11.5	0.356 8682
	9	214	58	32.3	1	39	28.0	0.436 4411		24	3	42	03.2	4	57	26.0	0.351 2157
	10	218	04	37.8	1	17	07.4	0.440 2797		25	8	38	27.0	4	30	44.5	0.345 6968
	11	221	07	33.2	0	54	56.0	0.443 8771		26	13	43	54.9	4	01	06.2	0.340 3574
	12	224	07	35.8	+0	32	56.2	0.447 2272		27	18	58	30.8	-3	28	33.6	0.335 2462
	13	227	05	02.4	+0	11	09.9	0.450 3242		28	24	22	11.9	2	53	13.2	0.330 4138
	14	230	00	09.1	-0	10	21.0	0.453 1634		29	29	54	48.5	2	15	16.4	0.325 9121
	15	232	53	11.4	0	31	35.0	0.455 7405		30	35	36	02.0	1	34	60.0	0.321 7935
	16	235	44	24.0	-0	52	30.7	0.458 0519	Oct.	1	41	25	24.5	-0	52	46.2	0.318 1094

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	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Oct. 1	41 25 24.5	-0 52 46.2	0.318 1094	Nov. 16	247 00 53.6	-2 13 21.9	0.464 6190
2	47 22 17.6	-0 09 03.5	0.314 9086	17	249 46 23.1	2 32 27.8	0.465 5556
3	53 25 52.7	+0 35 34.5	0.312 2363	18	252 31 23.6	2 51 08.8	0.466 2143
4	59 35 10.2	1 20 29.2	0.310 1321	19	255 16 07.2	3 09 23.7	0.466 5941
5	65 49 00.8	2 04 58.7	0.308 6283	20	258 00 46.4	3 27 11.5	0.466 6948
6	72 06 06.4	2 48 19.1	0.307 7489	21	260 45 33.3	3 44 31.0	0.466 5161
7	78 25 02.0	+3 29 47.0	0.307 5080	22	263 30 40.2	-4 01 21.0	0.466 0583
8	84 44 18.0	4 08 41.2	0.307 9096	23	266 16 19.2	4 17 40.1	0.465 3219
9	91 02 23.5	4 44 24.6	0.308 9472	24	269 02 42.7	4 33 27.0	0.464 3078
10	97 17 48.6	5 16 26.6	0.310 6040	25	271 50 03.1	4 48 39.9	0.463 0170
11	103 29 07.8	5 44 23.5	0.312 8539	26	274 38 33.0	5 03 17.3	0.461 4512
12	109 35 02.4	6 07 59.8	0.315 6625	27	277 28 25.4	5 17 17.2	0.459 6122
13	115 34 22.9	+6 27 07.6	0.318 9888	28	280 19 53.2	-5 30 37.4	0.457 5023
14	121 26 10.4	6 41 46.7	0.322 7865	29	283 13 10.1	5 43 15.8	0.455 1244
15	127 09 37.2	6 52 03.3	0.327 0059	30	286 08 29.9	5 55 09.6	0.452 4816
16	132 44 07.6	6 58 08.8	0.331 5953	Dec. 1	289 06 06.9	6 06 16.2	0.449 5778
17	138 09 16.6	7 00 18.8	0.336 5024	2	292 06 15.8	6 16 32.4	0.446 4172
18	143 24 50.1	6 58 51.4	0.341 6754	3	295 09 12.0	6 25 54.8	0.443 0050
19	148 30 42.8	+6 54 06.8	0.347 0642	4	298 15 11.4	-6 34 19.7	0.439 3469
20	153 26 57.7	6 46 25.3	0.352 6207	5	301 24 30.4	6 41 42.7	0.435 4494
21	158 13 44.1	6 36 07.4	0.358 2997	6	304 37 26.2	6 47 59.6	0.431 3200
22	162 51 16.7	6 23 32.8	0.364 0590	7	307 54 16.7	6 53 05.3	0.426 9674
23	167 19 54.4	6 09 00.1	0.369 8595	8	311 15 20.4	6 56 54.3	0.422 4010
24	171 39 58.8	5 52 46.5	0.375 6653	9	314 40 56.5	6 59 20.9	0.417 6319
25	175 51 53.7	+5 35 07.8	0.381 4439	10	318 11 25.1	-7 00 18.6	0.412 6724
26	179 56 04.3	5 16 18.0	0.387 1656	11	321 47 06.7	6 59 40.8	0.407 5364
27	183 52 56.3	4 56 29.9	0.392 8037	12	325 28 22.6	6 57 20.0	0.402 2397
28	187 42 55.6	4 35 54.6	0.398 3343	13	329 15 34.6	6 53 08.5	0.396 7999
29	191 26 28.2	4 14 42.0	0.403 7359	14	333 09 05.1	6 46 58.3	0.391 2369
30	195 03 59.0	3 53 00.8	0.408 9892	15	337 09 16.5	6 38 40.8	0.385 5727
31	198 35 52.9	+3 30 58.3	0.414 0772	16	341 16 31.3	-6 28 07.6	0.379 8321
Nov. 1	202 02 33.7	3 08 41.1	0.418 9848	17	345 31 11.7	6 15 10.0	0.374 0427
2	205 24 24.0	2 46 14.9	0.423 6983	18	349 53 39.3	5 59 39.7	0.368 2348
3	208 41 46.1	2 23 44.4	0.428 2059	19	354 24 14.5	5 41 29.0	0.362 4419
4	211 55 00.9	2 01 13.9	0.432 4970	20	359 03 16.1	5 20 31.0	0.356 7008
5	215 04 28.5	1 38 46.8	0.436 5623	21	3 51 00.2	4 56 40.3	0.351 0515
6	218 10 28.0	+1 16 26.5	0.440 3935	22	8 47 39.8	-4 29 53.5	0.345 5370
7	221 13 17.8	0 54 15.4	0.443 9835	23	13 53 23.8	4 00 10.0	0.340 2035
8	224 13 15.4	0 32 15.9	0.447 3259	24	19 08 15.6	3 27 32.3	0.335 0996
9	227 10 37.6	+0 10 30.1	0.450 4151	25	24 32 12.7	2 52 07.1	0.330 2759
10	230 05 40.3	-0 11 00.3	0.453 2464	26	30 05 04.9	2 14 05.9	0.325 7846
11	232 58 39.0	0 32 13.8	0.455 8155	27	35 46 33.2	1 33 45.6	0.321 6779
12	235 49 48.5	-0 53 08.9	0.458 1188	28	41 36 09.6	0 51 28.7	0.318 0070
13	238 39 23.0	1 13 44.4	0.460 1533	29	47 33 15.5	-0 07 43.9	0.314 8209
14	241 27 36.5	1 33 59.1	0.461 9162	30	53 37 01.7	+0 36 55.2	0.312 1646
15	244 14 42.3	1 53 51.9	0.463 4053	31	59 46 28.5	1 21 49.8	0.310 0775
16	247 00 53.6	-2 13 21.9	0.464 6190	32	66 00 26.3	+2 06 17.8	0.308 5916

MERCURY, 2022
GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	296	44	31.9	-1	54	36.9	Feb.	15	300	04	46.5	+0	36	34.7
	1	298	10	53.9	1	49	16.1		16	301	01	19.3	0	26	01.3
	2	299	35	13.6	1	43	06.7		17	302	00	43.9	0	15	43.9
	3	300	57	06.7	1	36	05.9		18	303	02	47.4	+0	5	43.4
	4	302	16	05.8	1	28	11.1		19	304	07	18.1	-0	3	59.6
	5	303	31	39.4	1	19	19.7		20	305	14	05.8	0	13	24.4
	6	304	43	11.7	-1	9	29.4		21	306	23	01.2	-0	22	30.6
	7	305	50	03.0	0	58	38.0		22	307	33	56.2	0	31	17.9
	8	306	51	29.0	0	46	44.2		23	308	46	43.5	0	39	45.8
	9	307	46	41.9	0	33	47.0		24	310	01	16.8	0	47	54.0
	10	308	34	50.2	0	19	46.7		25	311	17	30.4	0	55	42.2
	11	309	15	00.4	-0	4	44.7		26	312	35	19.1	1	3	10.2
	12	309	46	18.4	+0	11	15.8		27	313	54	38.7	-1	10	17.7
	13	310	07	52.0	0	28	09.5		28	315	15	25.2	1	17	04.4
	14	310	18	53.6	0	45	48.6	Mar.	1	316	37	35.3	1	23	30.1
	15	310	18	44.2	1	4	02.5		2	318	01	06.1	1	29	34.5
	16	310	06	57.6	1	22	37.2		3	319	25	55.0	1	35	17.4
	17	309	43	24.8	1	41	15.5		4	320	52	00.2	1	40	38.4
	18	309	08	18.4	+1	59	37.3		5	322	19	19.7	-1	45	37.3
	19	308	22	16.2	2	17	19.8		6	323	47	52.3	1	50	13.8
	20	307	26	22.5	2	33	58.9		7	325	17	36.8	1	54	27.6
	21	306	22	08.0	2	49	10.4		8	326	48	32.4	1	58	18.3
	22	305	11	26.7	3	2	32.1		9	328	20	38.4	2	1	45.7
	23	303	56	29.5	3	13	45.1		10	329	53	54.4	2	4	49.3
	24	302	39	36.5	+3	22	35.6		11	331	28	20.3	-2	7	28.8
	25	301	23	07.7	3	28	55.6		12	333	03	56.0	2	9	43.8
	26	300	09	14.7	3	32	43.6		13	334	40	41.6	2	11	33.9
	27	298	59	53.0	3	34	03.9		14	336	18	37.3	2	12	58.7
	28	297	56	37.4	3	33	05.4		15	337	57	43.7	2	13	57.7
	29	297	00	39.9	3	30	00.9		16	339	38	01.2	2	14	30.6
	30	296	12	49.4	+3	25	05.2		17	341	19	30.4	-2	14	36.8
	31	295	33	34.1	3	18	33.8		18	343	02	12.1	2	14	15.9
Feb.	1	295	03	04.5	3	10	42.4		19	344	46	07.1	2	13	27.4
	2	294	41	16.8	3	1	45.7		20	346	31	16.1	2	12	10.8
	3	294	27	56.5	2	51	57.2		21	348	17	40.0	2	10	25.7
	4	294	22	41.8	2	41	28.8		22	350	05	19.6	2	8	11.7
	5	294	25	06.0	+2	30	30.7		23	351	54	15.5	-2	5	28.2
	6	294	34	39.6	2	19	11.9		24	353	44	28.3	2	2	14.8
	7	294	50	52.6	2	7	39.8		25	355	35	58.4	1	58	31.2
	8	295	13	14.5	1	56	00.4		26	357	28	45.7	1	54	16.9
	9	295	41	16.3	1	44	19.1		27	359	22	50.2	1	49	31.8
	10	296	14	30.3	1	32	39.8		28	1	18	11.2	1	44	15.6
	11	296	52	30.6	+1	21	06.0		29	3	14	47.6	-1	38	28.2
	12	297	34	53.2	1	9	40.6		30	5	12	37.8	1	32	09.6
	13	298	21	16.4	0	58	25.7		31	7	11	39.3	1	25	20.0
	14	299	11	20.1	0	47	23.3	Apr.	1	9	11	49.0	1	17	59.6
	15	300	04	46.5	+0	36	34.7		2	11	13	02.5	-1	10	09.1

MERCURY, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	9	11	49.0	-1	17	59.6	May	17	63	16	20.4	+0	9	22.9
	2	11	13	02.5	1	10	09.1		18	62	47	59.5	-0	7	43.6
	3	13	15	14.6	1	1	49.3		19	62	17	15.3	0	25	09.1
	4	15	18	18.3	0	53	01.0		20	61	44	40.7	0	42	44.2
	5	17	22	05.4	0	43	45.9		21	61	10	50.8	1	0	19.3
	6	19	26	26.2	0	34	05.6		22	60	36	21.5	1	17	44.4
	7	21	31	09.1	-0	24	02.4		23	60	01	49.1	-1	34	50.0
	8	23	36	00.7	0	13	38.7		24	59	27	49.7	1	51	26.8
	9	25	40	46.1	-0	2	57.5		25	58	54	58.1	2	7	26.1
	10	27	45	08.4	+0	7	57.6		26	58	23	47.2	2	22	40.0
	11	29	48	49.5	0	19	03.0		27	57	54	48.0	2	37	01.6
	12	31	51	30.0	0	30	14.4		28	57	28	28.1	2	50	25.0
	13	33	52	49.4	+0	41	27.2		29	57	05	12.4	-3	2	45.3
	14	35	52	26.9	0	52	36.8		30	56	45	22.3	3	13	58.9
	15	37	50	01.6	1	3	38.3		31	56	29	15.8	3	24	03.0
	16	39	45	12.8	1	14	26.5	June	1	56	17	07.5	3	32	56.0
	17	41	37	41.0	1	24	56.7		2	56	09	09.1	3	40	37.0
	18	43	27	07.2	1	35	03.9		3	56	05	29.1	3	47	06.0
	19	45	13	14.3	+1	44	43.5		4	56	06	13.3	-3	52	23.8
	20	46	55	46.5	1	53	51.1		5	56	11	25.4	3	56	31.4
	21	48	34	29.5	2	2	22.5		6	56	21	06.8	3	59	30.7
	22	50	09	10.8	2	10	13.9		7	56	35	17.4	4	1	23.4
	23	51	39	39.3	2	17	21.8		8	56	53	55.6	4	2	12.0
	24	53	05	45.3	2	23	42.9		9	57	16	58.7	4	1	58.9
	25	54	27	20.4	+2	29	14.3		10	57	44	23.2	-4	0	46.5
	26	55	44	17.1	2	33	53.2		11	58	16	05.1	3	58	37.6
	27	56	56	28.9	2	37	37.1		12	58	51	59.7	3	55	34.8
	28	58	03	50.0	2	40	23.8		13	59	32	02.6	3	51	40.7
	29	59	06	15.2	2	42	11.1		14	60	16	08.7	3	46	57.9
	30	60	03	39.6	2	42	57.0		15	61	04	13.4	3	41	29.0
May	1	60	55	59.1	+2	42	39.9		16	61	56	12.0	-3	35	16.6
	2	61	43	09.6	2	41	18.1		17	62	52	00.0	3	28	23.1
	3	62	25	07.7	2	38	50.2		18	63	51	33.2	3	20	51.0
	4	63	01	50.5	2	35	14.9		19	64	54	47.7	3	12	42.6
	5	63	33	15.8	2	30	31.2		20	66	01	40.1	3	4	00.4
	6	63	59	22.2	2	24	38.5		21	67	12	06.9	2	54	46.7
	7	64	20	09.4	+2	17	36.5		22	68	26	05.3	-2	45	03.9
	8	64	35	38.4	2	9	25.2		23	69	43	32.7	2	34	54.3
	9	64	45	51.8	2	0	05.3		24	71	04	26.7	2	24	20.4
	10	64	50	54.1	1	49	38.0		25	72	28	44.9	2	13	24.5
	11	64	50	52.2	1	38	05.0		26	73	56	25.3	2	2	09.3
	12	64	45	55.2	1	25	29.2		27	75	27	25.4	1	50	37.3
	13	64	36	15.3	+1	11	54.1		28	77	01	43.0	-1	38	51.4
	14	64	22	07.8	0	57	24.0		29	78	39	15.3	1	26	54.4
	15	64	03	51.1	0	42	04.4		30	80	19	59.1	1	14	49.4
	16	63	41	46.9	0	26	01.6	July	1	82	03	50.4	1	2	39.7
	17	63	16	20.4	+0	9	22.9		2	83	50	44.4	-0	50	28.7

MERCURY, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	82	03	50.4	-1	2	39.7	Aug.	16	167	53	27.2	-0	21	57.6
	2	83	50	44.4	0	50	28.7		17	169	14	31.3	0	31	06.8
	3	85	40	35.3	0	38	19.9		18	170	33	48.9	0	40	24.3
	4	87	33	15.9	0	26	17.3		19	171	51	17.4	0	49	49.2
	5	89	28	37.6	0	14	24.6		20	173	06	53.7	0	59	20.4
	6	91	26	30.3	-0	2	46.0		21	174	20	34.1	1	8	57.1
	7	93	26	42.1	+0	8	34.5		22	175	32	14.7	-1	18	38.0
	8	95	28	59.9	0	19	32.8		23	176	41	50.8	1	28	22.1
	9	97	33	08.6	0	30	04.9		24	177	49	17.1	1	38	08.3
	10	99	38	52.2	0	40	06.9		25	178	54	27.8	1	47	55.4
	11	101	45	53.4	0	49	35.4		26	179	57	16.2	1	57	42.1
	12	103	53	54.4	0	58	27.1		27	180	57	35.2	2	7	26.9
	13	106	02	37.1	+1	6	39.2		28	181	55	16.4	-2	17	08.4
	14	108	11	43.5	1	14	09.5		29	182	50	11.0	2	26	45.0
	15	110	20	56.2	1	20	55.9		30	183	42	09.0	2	36	14.8
	16	112	29	58.7	1	26	57.3		31	184	30	59.6	2	45	35.8
	17	114	38	35.8	1	32	12.8	Sept.	1	185	16	30.8	2	54	45.9
	18	116	46	33.7	1	36	41.9		2	185	58	29.6	3	3	42.4
	19	118	53	40.2	+1	40	24.9		3	186	36	42.0	-3	12	22.7
	20	120	59	44.6	1	43	22.1		4	187	10	52.8	3	20	43.6
	21	123	04	37.9	1	45	34.4		5	187	40	45.8	3	28	41.6
	22	125	08	12.6	1	47	02.7		6	188	06	03.9	3	36	12.6
	23	127	10	22.5	1	47	48.3		7	188	26	29.2	3	43	12.2
	24	129	11	02.8	1	47	52.6		8	188	41	43.2	3	49	35.4
	25	131	10	09.7	+1	47	17.1		9	188	51	27.3	-3	55	16.6
	26	133	07	40.4	1	46	03.5		10	188	55	23.1	4	0	09.6
	27	135	03	33.0	1	44	13.2		11	188	53	13.5	4	4	07.5
	28	136	57	46.0	1	41	48.1		12	188	44	42.7	4	7	03.1
	29	138	50	18.8	1	38	49.7		13	188	29	38.0	4	8	48.5
	30	140	41	10.9	1	35	19.7		14	188	07	50.9	4	9	15.5
	31	142	30	22.4	+1	31	19.7		15	187	39	18.0	-4	8	15.6
Aug.	1	144	17	53.5	1	26	51.1		16	187	04	03.5	4	5	40.8
	2	146	03	44.5	1	21	55.6		17	186	22	20.4	4	1	23.5
	3	147	47	56.0	1	16	34.6		18	185	34	32.2	3	55	17.4
	4	149	30	28.4	1	10	49.5		19	184	41	14.7	3	47	17.7
	5	151	11	22.3	1	4	41.7		20	183	43	16.4	3	37	22.1
	6	152	50	38.2	+0	58	12.5		21	182	41	39.3	-3	25	31.3
	7	154	28	16.4	0	51	23.1		22	181	37	38.1	3	11	49.3
	8	156	04	17.2	0	44	14.8		23	180	32	38.1	2	56	23.9
	9	157	38	40.6	0	36	48.8		24	179	28	12.7	2	39	26.5
	10	159	11	26.6	0	29	06.2		25	178	25	59.8	2	21	11.9
	11	160	42	34.9	0	21	08.1		26	177	27	37.2	2	1	57.6
	12	162	12	05.1	+0	12	55.6		27	176	34	38.5	-1	42	02.9
	13	163	39	56.5	+0	4	29.8		28	175	48	28.7	1	21	47.9
	14	165	06	08.2	-0	4	08.4		29	175	10	21.1	1	1	32.7
	15	166	30	38.9	0	12	57.8		30	174	41	14.6	0	41	36.1
	16	167	53	27.2	-0	21	57.6	Oct.	1	174	21	52.8	-0	22	15.2

MERCURY, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	174	21	52.8	-0	22	15.2	Nov.	16	237	51	43.0	-0	42	49.0
	2	174	12	43.0	-0	3	44.6		17	239	25	52.1	0	49	06.8
	3	174	13	57.5	+0	13	43.5		18	240	59	46.2	0	55	18.2
	4	174	25	34.4	0	29	59.6		19	242	33	26.4	1	1	22.6
	5	174	47	19.6	0	44	56.8		20	244	06	53.5	1	7	19.3
	6	175	18	48.7	0	58	30.5		21	245	40	08.3	1	13	07.6
	7	175	59	29.3	+1	10	38.3		22	247	13	11.6	-1	18	46.9
	8	176	48	42.8	1	21	19.5		23	248	46	04.0	1	24	16.6
	9	177	45	46.6	1	30	35.1		24	250	18	46.1	1	29	35.9
	10	178	49	55.7	1	38	27.2		25	251	51	18.2	1	34	44.1
	11	180	00	24.7	1	44	58.8		26	253	23	40.6	1	39	40.4
	12	181	16	28.5	1	50	13.8		27	254	55	53.4	1	44	24.2
	13	182	37	23.8	+1	54	16.5		28	256	27	56.4	-1	48	54.6
	14	184	02	29.9	1	57	11.6		29	257	59	49.4	1	53	10.8
	15	185	31	08.9	1	59	03.9		30	259	31	31.9	1	57	11.8
	16	187	02	46.4	1	59	58.2	Dec.	1	261	03	03.2	2	0	56.7
	17	188	36	51.4	1	59	59.2		2	262	34	22.4	2	4	24.5
	18	190	12	56.3	1	59	11.5		3	264	05	28.0	2	7	34.2
	19	191	50	36.9	+1	57	39.7		4	265	36	18.4	-2	10	24.6
	20	193	29	32.4	1	55	27.8		5	267	06	51.3	2	12	54.4
	21	195	09	24.5	1	52	39.8		6	268	37	04.1	2	15	02.5
	22	196	49	57.9	1	49	19.3		7	270	06	53.3	2	16	47.4
	23	198	30	59.5	1	45	29.6		8	271	36	15.0	2	18	07.5
	24	200	12	18.2	1	41	14.0		9	273	05	04.2	2	19	01.3
	25	201	53	45.0	+1	36	35.3		10	274	33	15.0	-2	19	27.1
	26	203	35	12.2	1	31	36.0		11	276	00	40.6	2	19	22.8
	27	205	16	33.7	1	26	18.7		12	277	27	12.5	2	18	46.6
	28	206	57	44.5	1	20	45.5		13	278	52	41.2	2	17	36.1
	29	208	38	40.5	1	14	58.4		14	280	16	55.1	2	15	49.1
	30	210	19	18.6	1	8	59.2		15	281	39	41.0	2	13	23.0
	31	211	59	36.2	+1	2	49.8		16	283	00	43.3	-2	10	15.1
Nov.	1	213	39	31.7	0	56	31.6		17	284	19	43.9	2	6	22.4
	2	215	19	03.6	0	50	06.0		18	285	36	21.7	2	1	42.0
	3	216	58	11.3	0	43	34.4		19	286	50	12.5	1	56	10.7
	4	218	36	54.2	0	36	58.0		20	288	00	48.6	1	49	44.9
	5	220	15	12.3	0	30	17.9		21	289	07	38.2	1	42	21.5
	6	221	53	05.7	+0	23	35.2		22	290	10	05.5	-1	33	56.8
	7	223	30	34.8	0	16	50.8		23	291	07	30.1	1	24	27.7
	8	225	07	40.1	0	10	05.6		24	291	59	07.4	1	13	51.2
	9	226	44	23.4	+0	3	20.6		25	292	44	08.7	1	2	04.7
	10	228	20	42.8	-0	3	23.8		26	293	21	41.8	0	49	06.4
	11	229	56	41.2	0	10	06.4		27	293	50	52.5	0	34	55.9
	12	231	32	19.0	-0	16	46.5		28	294	10	46.4	-0	19	34.2
	13	233	07	37.2	0	23	23.5		29	294	20	31.2	-0	3	04.5
	14	234	42	36.6	0	29	56.7		30	294	19	20.9	+0	14	27.3
	15	236	17	18.2	0	36	25.4		31	294	06	39.9	0	32	51.9
	16	237	51	43.0	-0	42	49.0		32	293	42	08.4	+0	51	56.0

MERCURY, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	19	56	41.06	-22	40	49.9	1.162 784	7.56	2.89	13	19	18
	1	20	02	42.75	22	18	27.3	1.141 556	7.70	2.94	13	21	17
	2	20	08	33.24	21	54	57.1	1.119 477	7.86	3.00	13	23	04
	3	20	14	10.83	21	30	26.5	1.096 566	8.02	3.06	13	24	37
	4	20	19	33.61	21	05	03.7	1.072 856	8.20	3.13	13	25	54
	5	20	24	39.45	20	38	59.0	1.048 395	8.39	3.20	13	26	53
	6	20	29	25.96	-20	12	23.9	1.023 247	8.59	3.28	13	27	31
	7	20	33	50.53	19	45	32.1	0.997 498	8.82	3.37	13	27	46
	8	20	37	50.33	19	18	39.2	0.971 258	9.05	3.46	13	27	34
	9	20	41	22.30	18	52	02.5	0.944 659	9.31	3.56	13	26	52
	10	20	44	23.22	18	26	01.5	0.917 865	9.58	3.66	13	25	38
	11	20	46	49.77	18	00	57.2	0.891 068	9.87	3.77	13	23	47
	12	20	48	38.67	-17	37	12.1	0.864 490	10.17	3.89	13	21	18
	13	20	49	46.80	17	15	09.1	0.838 380	10.49	4.01	13	18	06
	14	20	50	11.39	16	55	11.1	0.813 013	10.82	4.13	13	14	09
	15	20	49	50.29	16	37	40.0	0.788 684	11.15	4.26	13	09	27
	16	20	48	42.21	16	22	55.3	0.765 700	11.49	4.39	13	03	58
	17	20	46	47.00	16	11	12.8	0.744 367	11.81	4.51	12	57	43
	18	20	44	05.94	-16	02	43.4	0.724 985	12.13	4.63	12	50	44
	19	20	40	41.95	15	57	32.2	0.707 827	12.42	4.75	12	43	05
	20	20	36	39.66	15	55	37.5	0.693 129	12.69	4.85	12	34	51
	21	20	32	05.39	15	56	50.9	0.681 078	12.91	4.93	12	26	10
	22	20	27	06.93	16	00	57.7	0.671 800	13.09	5.00	12	17	09
	23	20	21	53.13	16	07	38.1	0.665 354	13.22	5.05	12	07	58
	24	20	16	33.41	-16	16	28.9	0.661 731	13.29	5.08	11	58	46
	25	20	11	17.13	16	27	05.0	0.660 857	13.31	5.08	11	49	41
	26	20	06	13.05	16	39	01.4	0.662 600	13.27	5.07	11	40	53
	27	20	01	28.85	16	51	54.5	0.666 783	13.19	5.04	11	32	27
	28	19	57	10.84	17	05	22.7	0.673 193	13.06	4.99	11	24	29
	29	19	53	23.80	17	19	07.6	0.681 597	12.90	4.93	11	17	04
	30	19	50	10.96	-17	32	53.3	0.691 756	12.71	4.86	11	10	13
	31	19	47	34.21	17	46	26.6	0.703 430	12.50	4.78	11	03	58
Feb.	1	19	45	34.21	17	59	36.8	0.716 390	12.28	4.69	10	58	20
	2	19	44	10.68	18	12	15.0	0.730 422	12.04	4.60	10	53	17
	3	19	43	22.62	18	24	13.9	0.745 328	11.80	4.51	10	48	49
	4	19	43	08.51	18	35	27.4	0.760 933	11.56	4.42	10	44	53
	5	19	43	26.53	-18	45	50.5	0.777 079	11.32	4.32	10	41	29
	6	19	44	14.62	18	55	19.0	0.793 630	11.08	4.23	10	38	34
	7	19	45	30.68	19	03	49.4	0.810 468	10.85	4.15	10	36	05
	8	19	47	12.58	19	11	18.6	0.827 489	10.63	4.06	10	34	01
	9	19	49	18.28	19	17	44.0	0.844 606	10.41	3.98	10	32	20
	10	19	51	45.81	19	23	03.4	0.861 745	10.21	3.90	10	31	00
	11	19	54	33.30	-19	27	14.9	0.878 844	10.01	3.82	10	29	60
	12	19	57	39.03	19	30	16.7	0.895 850	9.82	3.75	10	29	16
	13	20	01	01.41	19	32	07.5	0.912 721	9.64	3.68	10	28	49
	14	20	04	38.97	19	32	46.1	0.929 419	9.46	3.62	10	28	36
	15	20	08	30.35	-19	32	11.3	0.945 915	9.30	3.55	10	28	37

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	20	08	30.35	-19	32	11.3	0.945 915	9.30	3.55	10	28	37
	16	20	12	34.35	19	30	22.3	0.962 186	9.14	3.49	10	28	49
	17	20	16	49.84	19	27	18.4	0.978 210	8.99	3.43	10	29	13
	18	20	21	15.81	19	22	58.9	0.993 973	8.85	3.38	10	29	47
	19	20	25	51.36	19	17	23.3	1.009 461	8.71	3.33	10	30	30
	20	20	30	35.64	19	10	31.1	1.024 666	8.58	3.28	10	31	21
	21	20	35	27.91	-19	02	22.0	1.039 579	8.46	3.23	10	32	20
	22	20	40	27.48	18	52	55.8	1.054 194	8.34	3.19	10	33	26
	23	20	45	33.76	18	42	12.2	1.068 508	8.23	3.14	10	34	39
	24	20	50	46.17	18	30	11.3	1.082 517	8.12	3.10	10	35	57
	25	20	56	04.22	18	16	52.9	1.096 218	8.02	3.07	10	37	21
	26	21	01	27.46	18	02	17.0	1.109 612	7.93	3.03	10	38	50
	27	21	06	55.47	-17	46	23.7	1.122 696	7.83	2.99	10	40	23
	28	21	12	27.88	17	29	13.1	1.135 470	7.74	2.96	10	42	01
Mar.	1	21	18	04.37	17	10	45.3	1.147 935	7.66	2.93	10	43	43
	2	21	23	44.64	16	51	00.5	1.160 089	7.58	2.90	10	45	29
	3	21	29	28.44	16	29	58.8	1.171 934	7.50	2.87	10	47	17
	4	21	35	15.54	16	07	40.5	1.183 468	7.43	2.84	10	49	10
	5	21	41	05.75	-15	44	05.7	1.194 692	7.36	2.81	10	51	05
	6	21	46	58.89	15	19	14.7	1.205 604	7.29	2.79	10	53	03
	7	21	52	54.84	14	53	07.7	1.216 203	7.23	2.76	10	55	04
	8	21	58	53.46	14	25	45.1	1.226 486	7.17	2.74	10	57	07
	9	22	04	54.66	13	57	07.1	1.236 451	7.11	2.72	10	59	13
	10	22	10	58.38	13	27	14.0	1.246 094	7.06	2.70	11	01	21
	11	22	17	04.54	-12	56	06.1	1.255 409	7.01	2.68	11	03	32
	12	22	23	13.13	12	23	43.8	1.264 390	6.96	2.66	11	05	46
	13	22	29	24.11	11	50	07.4	1.273 030	6.91	2.64	11	08	01
	14	22	35	37.50	11	15	17.4	1.281 320	6.86	2.62	11	10	20
	15	22	41	53.31	10	39	14.1	1.289 250	6.82	2.61	11	12	40
	16	22	48	11.58	10	01	58.0	1.296 806	6.78	2.59	11	15	03
	17	22	54	32.35	-9	23	29.6	1.303 975	6.74	2.58	11	17	29
	18	23	00	55.69	8	43	49.4	1.310 740	6.71	2.56	11	19	57
	19	23	07	21.69	8	02	58.1	1.317 082	6.68	2.55	11	22	28
	20	23	13	50.43	7	20	56.2	1.322 981	6.65	2.54	11	25	02
	21	23	20	22.01	6	37	44.7	1.328 413	6.62	2.53	11	27	39
	22	23	26	56.56	5	53	24.4	1.333 350	6.60	2.52	11	30	19
	23	23	33	34.18	-5	07	56.4	1.337 762	6.57	2.51	11	33	02
	24	23	40	15.01	4	21	21.9	1.341 617	6.55	2.50	11	35	48
	25	23	46	59.16	3	33	42.6	1.344 878	6.54	2.50	11	38	37
	26	23	53	46.77	2	45	00.0	1.347 504	6.53	2.49	11	41	30
	27	0	00	37.94	1	55	16.3	1.349 452	6.52	2.49	11	44	27
	28	0	07	32.80	1	04	33.9	1.350 675	6.51	2.49	11	47	28
	29	0	14	31.45	-0	12	55.6	1.351 121	6.51	2.49	11	50	32
	30	0	21	33.96	+0	39	35.4	1.350 737	6.51	2.49	11	53	40
	31	0	28	40.38	1	32	55.1	1.349 466	6.52	2.49	11	56	53
Apr.	1	0	35	50.74	2	26	59.0	1.347 247	6.53	2.49	12	00	09
	2	0	43	05.01	+3	21	42.1	1.344 020	6.54	2.50	12	03	29

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	0	35	50.74	+2	26	59.0	1.347 247	6.53	2.49	12	00	09
	2	0	43	05.01	3	21	42.1	1.344 020	6.54	2.50	12	03	29
	3	0	50	23.11	4	16	58.3	1.339 724	6.56	2.51	12	06	53
	4	0	57	44.88	5	12	40.9	1.334 298	6.59	2.52	12	10	20
	5	1	05	10.10	6	08	42.0	1.327 683	6.62	2.53	12	13	51
	6	1	12	38.45	7	04	53.1	1.319 827	6.66	2.55	12	17	25
	7	1	20	09.52	+8	01	04.5	1.310 681	6.71	2.56	12	21	01
	8	1	27	42.76	8	57	05.7	1.300 210	6.76	2.58	12	24	39
	9	1	35	17.54	9	52	45.3	1.288 385	6.83	2.61	12	28	18
	10	1	42	53.08	10	47	51.2	1.275 197	6.90	2.63	12	31	58
	11	1	50	28.50	11	42	10.8	1.260 650	6.98	2.67	12	35	37
	12	1	58	02.81	12	35	31.1	1.244 768	7.06	2.70	12	39	14
	13	2	05	34.92	+13	27	39.1	1.227 591	7.16	2.74	12	42	49
	14	2	13	03.65	14	18	22.0	1.209 183	7.27	2.78	12	46	19
	15	2	20	27.77	15	07	27.6	1.189 622	7.39	2.82	12	49	44
	16	2	27	46.02	15	54	44.5	1.169 004	7.52	2.87	12	53	03
	17	2	34	57.10	16	40	02.4	1.147 441	7.66	2.93	12	56	13
	18	2	41	59.77	17	23	12.1	1.125 053	7.82	2.99	12	59	15
	19	2	48	52.78	+18	04	06.1	1.101 969	7.98	3.05	13	02	06
	20	2	55	34.93	18	42	37.9	1.078 320	8.16	3.12	13	04	45
	21	3	02	05.09	19	18	42.7	1.054 241	8.34	3.19	13	07	12
	22	3	08	22.19	19	52	17.0	1.029 861	8.54	3.26	13	09	25
	23	3	14	25.24	20	23	18.4	1.005 306	8.75	3.34	13	11	24
	24	3	20	13.29	20	51	45.5	0.980 695	8.97	3.43	13	13	07
	25	3	25	45.48	+21	17	38.2	0.956 141	9.20	3.51	13	14	33
	26	3	31	01.00	21	40	56.7	0.931 746	9.44	3.61	13	15	43
	27	3	35	59.12	22	01	42.2	0.907 605	9.69	3.70	13	16	35
	28	3	40	39.13	22	19	55.9	0.883 805	9.95	3.80	13	17	08
	29	3	45	00.40	22	35	39.7	0.860 424	10.22	3.91	13	17	22
	30	3	49	02.32	22	48	55.7	0.837 534	10.50	4.01	13	17	16
May	1	3	52	44.35	+22	59	45.7	0.815 200	10.79	4.12	13	16	51
	2	3	56	06.00	23	08	12.2	0.793 480	11.08	4.23	13	16	04
	3	3	59	06.82	23	14	17.1	0.772 429	11.39	4.35	13	14	57
	4	4	01	46.43	23	18	02.6	0.752 096	11.69	4.47	13	13	28
	5	4	04	04.55	23	19	31.0	0.732 527	12.01	4.59	13	11	38
	6	4	06	00.96	23	18	44.4	0.713 767	12.32	4.71	13	09	26
	7	4	07	35.56	+23	15	45.1	0.695 856	12.64	4.83	13	06	52
	8	4	08	48.37	23	10	35.7	0.678 831	12.95	4.95	13	03	57
	9	4	09	39.54	23	03	18.8	0.662 731	13.27	5.07	13	00	41
	10	4	10	09.40	22	53	57.8	0.647 591	13.58	5.19	12	57	03
	11	4	10	18.45	22	42	36.3	0.633 444	13.88	5.30	12	53	06
	12	4	10	07.39	22	29	18.9	0.620 321	14.18	5.42	12	48	48
	13	4	09	37.12	+22	14	11.0	0.608 254	14.46	5.52	12	44	13
	14	4	08	48.78	21	57	19.2	0.597 271	14.72	5.63	12	39	20
	15	4	07	43.72	21	38	51.3	0.587 395	14.97	5.72	12	34	11
	16	4	06	23.54	21	18	56.5	0.578 650	15.20	5.81	12	28	48
	17	4	04	50.01	+20	57	45.3	0.571 056	15.40	5.88	12	23	13

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	4	04	50.01	+20	57	45.3	0.571 056	15.40	5.88	12	23	13
	18	4	03	05.13	20	35	30.0	0.564 625	15.58	5.95	12	17	28
	19	4	01	11.04	20	12	23.8	0.559 370	15.72	6.01	12	11	35
	20	3	59	10.00	19	48	41.5	0.555 295	15.84	6.05	12	05	37
	21	3	57	04.37	19	24	38.8	0.552 401	15.92	6.08	11	59	34
	22	3	54	56.53	19	00	32.0	0.550 683	15.97	6.10	11	53	31
	23	3	52	48.85	+18	36	37.8	0.550 132	15.99	6.11	11	47	30
	24	3	50	43.63	18	13	13.0	0.550 733	15.97	6.10	11	41	31
	25	3	48	43.10	17	50	33.8	0.552 465	15.92	6.08	11	35	39
	26	3	46	49.32	17	28	55.7	0.555 307	15.84	6.05	11	29	54
	27	3	45	04.17	17	08	33.2	0.559 229	15.73	6.01	11	24	18
	28	3	43	29.37	16	49	39.1	0.564 202	15.59	5.96	11	18	53
	29	3	42	06.40	+16	32	24.8	0.570 193	15.42	5.89	11	13	41
	30	3	40	56.55	16	16	59.7	0.577 166	15.24	5.82	11	08	42
	31	3	40	00.89	16	03	31.6	0.585 085	15.03	5.74	11	03	58
June	1	3	39	20.29	15	52	06.3	0.593 914	14.81	5.66	10	59	28
	2	3	38	55.44	15	42	47.9	0.603 615	14.57	5.57	10	55	15
	3	3	38	46.85	15	35	38.8	0.614 152	14.32	5.47	10	51	18
	4	3	38	54.89	+15	30	39.7	0.625 490	14.06	5.37	10	47	38
	5	3	39	19.79	15	27	50.3	0.637 592	13.79	5.27	10	44	14
	6	3	40	01.68	15	27	08.8	0.650 427	13.52	5.17	10	41	07
	7	3	41	00.60	15	28	32.5	0.663 961	13.24	5.06	10	38	18
	8	3	42	16.53	15	31	57.7	0.678 163	12.97	4.95	10	35	45
	9	3	43	49.38	15	37	20.0	0.693 005	12.69	4.85	10	33	29
	10	3	45	39.03	15	44	34.6	0.708 458	12.41	4.74	10	31	29
	11	3	47	45.34	+15	53	35.9	0.724 494	12.14	4.64	10	29	47
	12	3	50	08.16	16	04	18.2	0.741 089	11.87	4.53	10	28	20
	13	3	52	47.33	16	16	35.3	0.758 215	11.60	4.43	10	27	10
	14	3	55	42.71	16	30	20.8	0.775 849	11.33	4.33	10	26	16
	15	3	58	54.16	16	45	28.1	0.793 966	11.08	4.23	10	25	37
	16	4	02	21.55	+17	01	50.4	0.812 539	10.82	4.14	10	25	15
	17	4	06	04.78	17	19	20.7	0.831 543	10.58	4.04	10	25	09
	18	4	10	03.78	17	37	51.7	0.850 951	10.33	3.95	10	25	18
	19	4	14	18.49	17	57	16.2	0.870 734	10.10	3.86	10	25	43
	20	4	18	48.87	18	17	26.6	0.890 862	9.87	3.77	10	26	24
	21	4	23	34.94	18	38	15.1	0.911 301	9.65	3.69	10	27	20
	22	4	28	36.69	+18	59	33.9	0.932 015	9.44	3.61	10	28	32
	23	4	33	54.17	19	21	14.5	0.952 964	9.23	3.53	10	30	00
	24	4	39	27.40	19	43	08.6	0.974 104	9.03	3.45	10	31	44
	25	4	45	16.45	20	05	07.3	0.995 385	8.83	3.38	10	33	43
	26	4	51	21.34	20	27	01.2	1.016 752	8.65	3.30	10	35	59
	27	4	57	42.09	20	48	40.8	1.038 144	8.47	3.24	10	38	30
	28	5	04	18.70	+21	09	55.9	1.059 492	8.30	3.17	10	41	18
	29	5	11	11.10	21	30	36.1	1.080 721	8.14	3.11	10	44	21
	30	5	18	19.18	21	50	30.5	1.101 749	7.98	3.05	10	47	40
July	1	5	25	42.73	22	09	27.5	1.122 484	7.83	2.99	10	51	14
	2	5	33	21.44	+22	27	15.8	1.142 830	7.70	2.94	10	55	04

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	5	25	42.73	+22	09	27.5	1.122 484	7.83	2.99	10	51	14
	2	5	33	21.44	22	27	15.8	1.142 830	7.70	2.94	10	55	04
	3	5	41	14.88	22	43	43.2	1.162 682	7.56	2.89	10	59	08
	4	5	49	22.46	22	58	37.9	1.181 932	7.44	2.84	11	03	26
	5	5	57	43.47	23	11	48.1	1.200 468	7.33	2.80	11	07	57
	6	6	06	16.99	23	23	02.2	1.218 177	7.22	2.76	11	12	41
	7	6	15	01.93	+23	32	09.2	1.234 947	7.12	2.72	11	17	35
	8	6	23	57.05	23	38	59.2	1.250 672	7.03	2.69	11	22	39
	9	6	33	00.91	23	43	23.3	1.265 254	6.95	2.66	11	27	51
	10	6	42	11.96	23	45	13.9	1.278 604	6.88	2.63	11	33	09
	11	6	51	28.53	23	44	25.3	1.290 651	6.81	2.60	11	38	33
	12	7	00	48.88	23	40	53.6	1.301 337	6.76	2.58	11	43	59
	13	7	10	11.23	+23	34	36.6	1.310 624	6.71	2.56	11	49	26
	14	7	19	33.82	23	25	34.4	1.318 494	6.67	2.55	11	54	53
	15	7	28	54.98	23	13	48.7	1.324 945	6.64	2.54	12	00	17
	16	7	38	13.12	22	59	23.0	1.329 993	6.61	2.53	12	05	38
	17	7	47	26.78	22	42	22.4	1.333 673	6.59	2.52	12	10	54
	18	7	56	34.66	22	22	53.0	1.336 028	6.58	2.51	12	16	03
	19	8	05	35.64	+22	01	02.3	1.337 116	6.58	2.51	12	21	04
	20	8	14	28.77	21	36	58.5	1.337 002	6.58	2.51	12	25	57
	21	8	23	13.26	21	10	50.1	1.335 754	6.58	2.52	12	30	42
	22	8	31	48.51	20	42	46.0	1.333 448	6.60	2.52	12	35	16
	23	8	40	14.03	20	12	55.2	1.330 155	6.61	2.53	12	39	41
	24	8	48	29.51	19	41	26.6	1.325 950	6.63	2.53	12	43	55
	25	8	56	34.73	+19	08	28.9	1.320 905	6.66	2.54	12	47	59
	26	9	04	29.58	18	34	10.6	1.315 086	6.69	2.55	12	51	52
	27	9	12	14.04	17	58	39.8	1.308 559	6.72	2.57	12	55	35
	28	9	19	48.15	17	22	04.1	1.301 384	6.76	2.58	12	59	08
	29	9	27	12.02	16	44	30.8	1.293 616	6.80	2.60	13	02	30
	30	9	34	25.79	16	06	06.8	1.285 306	6.84	2.61	13	05	42
	31	9	41	29.65	+15	26	58.6	1.276 502	6.89	2.63	13	08	44
Aug.	1	9	48	23.79	14	47	12.1	1.267 244	6.94	2.65	13	11	37
	2	9	55	08.44	14	06	53.0	1.257 573	6.99	2.67	13	14	20
	3	10	01	43.82	13	26	06.7	1.247 520	7.05	2.69	13	16	54
	4	10	08	10.16	12	44	58.0	1.237 118	7.11	2.72	13	19	20
	5	10	14	27.70	12	03	31.8	1.226 394	7.17	2.74	13	21	36
	6	10	20	36.65	+11	21	52.4	1.215 371	7.24	2.76	13	23	44
	7	10	26	37.22	10	40	03.9	1.204 072	7.30	2.79	13	25	43
	8	10	32	29.63	9	58	10.3	1.192 515	7.37	2.82	13	27	35
	9	10	38	14.04	9	16	15.3	1.180 716	7.45	2.85	13	29	19
	10	10	43	50.63	8	34	22.6	1.168 692	7.52	2.88	13	30	54
	11	10	49	19.56	7	52	35.6	1.156 453	7.60	2.91	13	32	23
	12	10	54	40.94	+7	10	57.5	1.144 012	7.69	2.94	13	33	43
	13	10	59	54.90	6	29	31.5	1.131 378	7.77	2.97	13	34	57
	14	11	05	01.51	5	48	20.8	1.118 560	7.86	3.00	13	36	03
	15	11	10	00.86	5	07	28.5	1.105 565	7.95	3.04	13	37	01
	16	11	14	52.97	+4	26	57.4	1.092 400	8.05	3.08	13	37	53

MERCURY, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	11	14	52.97	+4	26	57.4	1.092 400	8.05	3.08	13	37	53
	17	11	19	37.86	3	46	50.8	1.079 070	8.15	3.11	13	38	37
	18	11	24	15.52	3	07	11.7	1.065 581	8.25	3.15	13	39	14
	19	11	28	45.89	2	28	03.1	1.051 937	8.36	3.19	13	39	44
	20	11	33	08.88	1	49	28.4	1.038 143	8.47	3.24	13	40	06
	21	11	37	24.39	1	11	30.8	1.024 205	8.59	3.28	13	40	20
	22	11	41	32.25	+0	34	13.7	1.010 127	8.71	3.33	13	40	27
	23	11	45	32.27	-0	02	19.3	0.995 915	8.83	3.37	13	40	26
	24	11	49	24.21	0	38	04.2	0.981 575	8.96	3.42	13	40	17
	25	11	53	07.78	1	12	57.3	0.967 113	9.09	3.47	13	39	59
	26	11	56	42.66	1	46	54.0	0.952 539	9.23	3.53	13	39	32
	27	12	00	08.46	2	19	50.0	0.937 861	9.38	3.58	13	38	56
	28	12	03	24.76	-2	51	40.1	0.923 091	9.53	3.64	13	38	10
	29	12	06	31.06	3	22	19.2	0.908 241	9.68	3.70	13	37	14
	30	12	09	26.81	3	51	41.4	0.893 326	9.84	3.76	13	36	07
	31	12	12	11.41	4	19	40.5	0.878 366	10.01	3.83	13	34	49
Sept.	1	12	14	44.18	4	46	09.7	0.863 381	10.19	3.89	13	33	18
	2	12	17	04.38	5	11	01.6	0.848 395	10.37	3.96	13	31	34
	3	12	19	11.22	-5	34	08.1	0.833 439	10.55	4.03	13	29	37
	4	12	21	03.82	5	55	20.4	0.818 545	10.74	4.10	13	27	25
	5	12	22	41.26	6	14	29.1	0.803 753	10.94	4.18	13	24	57
	6	12	24	02.59	6	31	23.8	0.789 110	11.14	4.26	13	22	12
	7	12	25	06.77	6	45	53.7	0.774 667	11.35	4.34	13	19	10
	8	12	25	52.81	6	57	46.8	0.760 484	11.56	4.42	13	15	50
	9	12	26	19.67	-7	06	50.9	0.746 630	11.78	4.50	13	12	10
	10	12	26	26.39	7	12	53.1	0.733 184	11.99	4.58	13	08	09
	11	12	26	12.07	7	15	40.4	0.720 233	12.21	4.67	13	03	47
	12	12	25	35.96	7	14	59.8	0.707 877	12.42	4.75	12	59	04
	13	12	24	37.49	7	10	38.9	0.696 225	12.63	4.83	12	53	57
	14	12	23	16.37	7	02	26.5	0.685 399	12.83	4.90	12	48	29
	15	12	21	32.65	-6	50	13.5	0.675 531	13.02	4.97	12	42	38
	16	12	19	26.86	6	33	53.7	0.666 764	13.19	5.04	12	36	26
	17	12	17	00.02	6	13	25.1	0.659 251	13.34	5.10	12	29	54
	18	12	14	13.81	5	48	51.0	0.653 148	13.46	5.14	12	23	04
	19	12	11	10.55	5	20	21.1	0.648 618	13.56	5.18	12	15	59
	20	12	07	53.33	4	48	12.4	0.645 819	13.62	5.20	12	08	42
	21	12	04	25.93	-4	12	50.5	0.644 907	13.64	5.21	12	01	17
	22	12	00	52.77	3	34	48.8	0.646 021	13.61	5.20	11	53	48
	23	11	57	18.86	2	54	48.7	0.649 285	13.54	5.17	11	46	22
	24	11	53	49.55	2	13	38.2	0.654 795	13.43	5.13	11	39	03
	25	11	50	30.39	1	32	10.1	0.662 620	13.27	5.07	11	31	56
	26	11	47	26.85	0	51	19.3	0.672 791	13.07	4.99	11	25	07
	27	11	44	44.10	-0	12	00.9	0.685 302	12.83	4.90	11	18	41
	28	11	42	26.82	+0	24	53.2	0.700 108	12.56	4.80	11	12	42
	29	11	40	38.97	0	58	35.7	0.717 122	12.26	4.69	11	07	13
	30	11	39	23.68	1	28	26.3	0.736 221	11.94	4.56	11	02	18
Oct.	1	11	38	43.20	+1	53	52.6	0.757 247	11.61	4.44	10	57	59

MERCURY, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	11	38	43.20	+1	53	52.6	0.757 247	11.61	4.44	10	57	59
	2	11	38	38.87	2	14	30.1	0.780 012	11.27	4.31	10	54	15
	3	11	39	11.13	2	30	02.9	0.804 301	10.93	4.18	10	51	07
	4	11	40	19.64	2	40	23.0	0.829 881	10.60	4.05	10	48	36
	5	11	42	03.35	2	45	29.3	0.856 506	10.27	3.92	10	46	38
	6	11	44	20.62	2	45	26.8	0.883 925	9.95	3.80	10	45	14
	7	11	47	09.38	+2	40	25.9	0.911 884	9.64	3.68	10	44	19
	8	11	50	27.21	2	30	40.9	0.940 139	9.35	3.57	10	43	53
	9	11	54	11.50	2	16	29.6	0.968 458	9.08	3.47	10	43	51
	10	11	58	19.53	1	58	11.9	0.996 623	8.82	3.37	10	44	12
	11	12	02	48.58	1	36	09.1	1.024 441	8.58	3.28	10	44	54
	12	12	07	36.02	1	10	43.3	1.051 740	8.36	3.19	10	45	52
	13	12	12	39.35	+0	42	16.7	1.078 374	8.16	3.12	10	47	05
	14	12	17	56.23	+0	11	11.0	1.104 223	7.96	3.04	10	48	31
	15	12	23	24.57	-0	22	13.0	1.129 188	7.79	2.98	10	50	07
	16	12	29	02.45	0	57	35.5	1.153 196	7.63	2.91	10	51	53
	17	12	34	48.22	1	34	38.1	1.176 193	7.48	2.86	10	53	45
	18	12	40	40.42	2	13	03.8	1.198 143	7.34	2.80	10	55	43
	19	12	46	37.81	-2	52	37.3	1.219 026	7.21	2.76	10	57	46
	20	12	52	39.34	3	33	04.5	1.238 834	7.10	2.71	10	59	53
	21	12	58	44.13	4	14	12.8	1.257 571	6.99	2.67	11	02	03
	22	13	04	51.44	4	55	51.1	1.275 248	6.90	2.63	11	04	15
	23	13	11	00.69	5	37	49.3	1.291 882	6.81	2.60	11	06	28
	24	13	17	11.41	6	19	58.5	1.307 497	6.73	2.57	11	08	43
	25	13	23	23.22	-7	02	11.0	1.322 118	6.65	2.54	11	10	59
	26	13	29	35.83	7	44	19.8	1.335 773	6.58	2.52	11	13	16
	27	13	35	49.02	8	26	18.9	1.348 491	6.52	2.49	11	15	33
	28	13	42	02.64	9	08	02.7	1.360 301	6.46	2.47	11	17	50
	29	13	48	16.57	9	49	26.5	1.371 235	6.41	2.45	11	20	08
	30	13	54	30.75	10	30	26.2	1.381 320	6.37	2.43	11	22	26
	31	14	00	45.15	-11	10	57.8	1.390 585	6.32	2.42	11	24	44
Nov.	1	14	06	59.76	11	50	58.1	1.399 057	6.29	2.40	11	27	02
	2	14	13	14.61	12	30	24.0	1.406 762	6.25	2.39	11	29	21
	3	14	19	29.72	13	09	12.9	1.413 724	6.22	2.38	11	31	40
	4	14	25	45.15	13	47	22.2	1.419 966	6.19	2.37	11	33	59
	5	14	32	00.97	14	24	49.9	1.425 510	6.17	2.36	11	36	19
	6	14	38	17.26	-15	01	33.7	1.430 373	6.15	2.35	11	38	39
	7	14	44	34.08	15	37	32.0	1.434 575	6.13	2.34	11	41	00
	8	14	50	51.52	16	12	42.7	1.438 132	6.11	2.34	11	43	21
	9	14	57	09.74	16	47	04.7	1.441 059	6.10	2.33	11	45	44
	10	15	03	28.64	17	20	36.1	1.443 368	6.09	2.33	11	48	07
	11	15	09	48.44	17	53	15.2	1.445 071	6.09	2.33	11	50	31
	12	15	16	09.18	-18	25	00.9	1.446 180	6.08	2.32	11	52	56
	13	15	22	30.93	18	55	51.6	1.446 702	6.08	2.32	11	55	22
	14	15	28	53.76	19	25	46.0	1.446 646	6.08	2.32	11	57	49
	15	15	35	17.73	19	54	42.7	1.446 017	6.08	2.32	12	00	17
	16	15	41	42.88	-20	22	40.4	1.444 822	6.09	2.33	12	02	46

MERCURY, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	15	41	42.88	-20	22	40.4	1.444 822	6.09	2.33	12	02	46
	17	15	48	09.28	20	49	37.8	1.443 063	6.09	2.33	12	05	17
	18	15	54	36.95	21	15	33.4	1.440 745	6.10	2.33	12	07	49
	19	16	01	05.92	21	40	26.1	1.437 867	6.12	2.34	12	10	22
	20	16	07	36.20	22	04	14.3	1.434 432	6.13	2.34	12	12	57
	21	16	14	07.81	22	26	56.9	1.430 438	6.15	2.35	12	15	33
	22	16	20	40.74	22	48	32.3	1.425 884	6.17	2.36	12	18	10
	23	16	27	14.96	-23	08	59.4	1.420 767	6.19	2.36	12	20	49
	24	16	33	50.43	23	28	16.7	1.415 084	6.21	2.37	12	23	29
	25	16	40	27.11	23	46	22.9	1.408 831	6.24	2.38	12	26	10
	26	16	47	04.91	24	03	16.6	1.402 001	6.27	2.40	12	28	52
	27	16	53	43.73	-24	18	56.4	1.394 590	6.31	2.41	12	31	35
	28	17	00	23.47	-24	33	21.0	1.386 589	6.34	2.42	12	34	19
	29	17	07	03.98	24	46	29.0	1.377 991	6.38	2.44	12	37	04
	30	17	13	45.11	24	58	19.1	1.368 787	6.42	2.45	12	39	49
Dec.	1	17	20	26.67	25	08	49.9	1.358 968	6.47	2.47	12	42	34
	2	17	27	08.43	25	18	00.2	1.348 523	6.52	2.49	12	45	20
	3	17	33	50.17	25	25	48.8	1.337 441	6.58	2.51	12	48	05
	4	17	40	31.60	-25	32	14.5	1.325 711	6.63	2.53	12	50	50
	5	17	47	12.39	25	37	16.3	1.313 320	6.70	2.56	12	53	34
	6	17	53	52.19	25	40	53.1	1.300 255	6.76	2.58	12	56	17
	7	18	00	30.56	25	43	04.2	1.286 503	6.84	2.61	12	58	58
	8	18	07	07.04	25	43	48.8	1.272 050	6.91	2.64	13	01	37
	9	18	13	41.10	25	43	06.4	1.256 884	7.00	2.67	13	04	13
	10	18	20	12.11	-25	40	56.7	1.240 992	7.09	2.71	13	06	46
	11	18	26	39.40	25	37	19.6	1.224 362	7.18	2.74	13	09	15
	12	18	33	02.18	25	32	15.2	1.206 983	7.29	2.78	13	11	38
	13	18	39	19.57	25	25	44.2	1.188 846	7.40	2.83	13	13	56
	14	18	45	30.57	25	17	47.6	1.169 946	7.52	2.87	13	16	06
	15	18	51	34.05	25	08	26.8	1.150 281	7.65	2.92	13	18	09
	16	18	57	28.72	-24	57	44.0	1.129 853	7.78	2.97	13	20	02
	17	19	03	13.16	24	45	41.8	1.108 670	7.93	3.03	13	21	43
	18	19	08	45.71	24	32	23.9	1.086 748	8.09	3.09	13	23	12
	19	19	14	04.54	24	17	54.6	1.064 113	8.26	3.16	13	24	26
	20	19	19	07.59	24	02	19.4	1.040 801	8.45	3.23	13	25	22
	21	19	23	52.53	23	45	44.9	1.016 864	8.65	3.30	13	25	59
	22	19	28	16.79	-23	28	18.9	0.992 370	8.86	3.39	13	26	14
	23	19	32	17.54	23	10	10.5	0.967 405	9.09	3.47	13	26	04
	24	19	35	51.66	22	51	30.4	0.942 079	9.33	3.57	13	25	25
	25	19	38	55.81	22	32	30.5	0.916 529	9.60	3.67	13	24	15
	26	19	41	26.47	22	13	24.0	0.890 918	9.87	3.77	13	22	29
	27	19	43	20.01	21	54	25.4	0.865 442	10.16	3.88	13	20	04
	28	19	44	32.86	-21	35	49.8	0.840 327	10.47	4.00	13	16	56
	29	19	45	01.65	21	17	52.8	0.815 832	10.78	4.12	13	13	04
	30	19	44	43.49	21	00	49.7	0.792 244	11.10	4.24	13	08	23
	31	19	43	36.26	20	44	55.0	0.769 873	11.42	4.36	13	02	53
	32	19	41	38.98	-20	30	21.3	0.749 045	11.74	4.49	12	56	34

VENUS, 2022
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ' "	° ' "			° ' "	° ' "	
Jan. 1	95 43 17.8	+1 05 51.1	0.719 3753	Apr. 3	244 20 34.0	+0 44 16.0	0.725 1850
3	98 57 27.6	1 16 38.2	0.719 2197	5	247 31 27.8	0 33 09.1	0.725 4344
5	102 11 43.8	1 27 11.0	0.719 0772	7	250 42 13.2	0 21 56.5	0.725 6771
7	105 26 06.3	1 37 27.2	0.718 9482	9	253 52 50.4	0 10 40.3	0.725 9124
9	108 40 34.6	1 47 25.0	0.718 8332	11	257 03 20.2	+0 00 37.4	0.726 1395
11	111 55 08.5	1 57 02.3	0.718 7324	13	260 13 43.0	-0 11 54.6	0.726 3579
13	115 09 47.7	+2 06 17.3	0.718 6463	15	263 23 59.3	-0 23 09.2	0.726 5668
15	118 24 31.7	2 15 08.1	0.718 5752	17	266 34 09.7	0 34 19.1	0.726 7656
17	121 39 20.0	2 23 33.0	0.718 5192	19	269 44 14.8	0 45 22.4	0.726 9536
19	124 54 12.2	2 31 30.4	0.718 4785	21	272 54 15.1	0 56 17.1	0.727 1304
21	128 09 07.9	2 38 58.6	0.718 4533	23	276 04 11.1	1 07 01.2	0.727 2953
23	131 24 06.3	2 45 56.2	0.718 4436	25	279 14 03.7	1 17 32.7	0.727 4479
25	134 39 07.0	+2 52 21.9	0.718 4495	27	282 23 53.2	-1 27 49.7	0.727 5878
27	137 54 09.4	2 58 14.3	0.718 4710	29	285 33 40.2	1 37 50.6	0.727 7144
29	141 09 12.8	3 03 32.4	0.718 5079	May 1	288 43 25.4	1 47 33.3	0.727 8274
31	144 24 16.5	3 08 15.0	0.718 5601	3	291 53 09.2	1 56 56.2	0.727 9265
Feb. 2	147 39 19.9	3 12 21.3	0.718 6276	5	295 02 52.2	2 05 57.7	0.728 0114
4	150 54 22.4	3 15 50.5	0.718 7100	7	298 12 34.9	2 14 36.0	0.728 0818
6	154 09 23.1	+3 18 41.9	0.718 8070	9	301 22 17.9	-2 22 49.7	0.728 1375
8	157 24 21.5	3 20 55.0	0.718 9185	11	304 32 01.5	2 30 37.2	0.728 1784
10	160 39 16.7	3 22 29.4	0.719 0439	13	307 41 46.3	2 37 57.3	0.728 2043
12	163 54 08.1	3 23 24.8	0.719 1829	15	310 51 32.7	2 44 48.5	0.728 2152
14	167 08 55.0	3 23 41.2	0.719 3351	17	314 01 21.1	2 51 09.6	0.728 2109
16	170 23 36.8	3 23 18.4	0.719 4998	19	317 11 11.9	2 56 59.4	0.728 1917
18	173 38 12.7	+3 22 16.6	0.719 6767	21	320 21 05.4	-3 02 17.0	0.728 1574
20	176 52 42.1	3 20 36.1	0.719 8651	23	323 31 02.0	3 07 01.3	0.728 1082
22	180 07 04.5	3 18 17.3	0.720 0645	25	326 41 01.9	3 11 11.4	0.728 0443
24	183 21 19.2	3 15 20.6	0.720 2741	27	329 51 05.6	3 14 46.6	0.727 9659
26	186 35 25.7	3 11 46.7	0.720 4933	29	333 01 13.1	3 17 46.3	0.727 8731
28	189 49 23.5	3 07 36.5	0.720 7214	31	336 11 24.8	3 20 09.7	0.727 7663
Mar. 2	193 03 12.2	+3 02 50.6	0.720 9576	June 2	339 21 40.9	-3 21 56.5	0.727 6458
4	196 16 51.3	2 57 30.3	0.721 2013	4	342 32 01.6	3 23 06.3	0.727 5120
6	199 30 20.5	2 51 36.4	0.721 4515	6	345 42 27.0	3 23 38.8	0.727 3652
8	202 43 39.4	2 45 10.3	0.721 7076	8	348 52 57.3	3 23 33.9	0.727 2060
10	205 56 47.9	2 38 13.2	0.721 9687	10	352 03 32.6	3 22 51.6	0.727 0347
12	209 09 45.7	2 30 46.5	0.722 2340	12	355 14 13.1	3 21 31.9	0.726 8520
14	212 22 32.6	+2 22 51.8	0.722 5027	14	358 24 58.9	-3 19 35.1	0.726 6583
16	215 35 08.6	2 14 30.5	0.722 7738	16	1 35 50.1	3 17 01.4	0.726 4543
18	218 47 33.7	2 05 44.3	0.723 0465	18	4 46 46.8	3 13 51.2	0.726 2405
20	221 59 47.9	1 56 35.0	0.723 3201	20	7 57 49.1	3 10 05.1	0.726 0177
22	225 11 51.2	1 47 04.2	0.723 5935	22	11 08 57.0	3 05 43.7	0.725 7865
24	228 23 43.7	1 37 13.9	0.723 8660	24	14 20 10.8	3 00 47.7	0.725 5476
26	231 35 25.8	+1 27 05.9	0.724 1368	26	17 31 30.3	-2 55 18.0	0.725 3018
28	234 46 57.6	1 16 42.1	0.724 4048	28	20 42 55.8	2 49 15.5	0.725 0497
30	237 58 19.3	1 06 04.5	0.724 6695	30	23 54 27.2	2 42 41.4	0.724 7922
Apr. 1	241 09 31.4	0 55 15.1	0.724 9298	July 2	27 06 04.7	2 35 36.6	0.724 5301
3	244 20 34.0	+0 44 16.0	0.725 1850	4	30 17 48.4	-2 28 02.6	0.724 2642

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME

MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
July 2	27 06 04.7	-2 35 36.6	0.724 5301	Oct. 2	175 45 11.6	+3 21 15.7	0.719 8032
4	30 17 48.4	2 28 02.6	0.724 2642	4	178 59 36.3	3 19 10.1	0.719 9988
6	33 29 38.4	2 20 00.6	0.723 9952	6	182 13 53.6	3 16 26.6	0.720 2049
8	36 41 34.6	2 11 32.1	0.723 7241	8	185 28 02.9	3 13 05.7	0.720 4208
10	39 53 37.4	2 02 38.7	0.723 4516	10	188 42 03.6	3 09 08.0	0.720 6458
12	43 05 46.6	1 53 21.8	0.723 1786	12	191 55 55.4	3 04 34.5	0.720 8792
14	46 18 02.4	-1 43 43.4	0.722 9061	14	195 09 37.7	+2 59 26.0	0.721 1203
16	49 30 24.9	1 33 45.0	0.722 6347	16	198 23 10.2	2 53 43.7	0.721 3683
18	52 42 54.2	1 23 28.5	0.722 3654	18	201 36 32.6	2 47 28.7	0.721 6224
20	55 55 30.4	1 12 55.9	0.722 0990	20	204 49 44.6	2 40 42.3	0.721 8818
22	59 08 13.5	1 02 09.0	0.721 8364	22	208 02 46.1	2 33 25.8	0.722 1456
24	62 21 03.7	0 51 10.0	0.721 5783	24	211 15 36.7	2 25 40.7	0.722 4131
26	65 34 00.9	-0 40 00.9	0.721 3257	26	214 28 16.4	+2 17 28.5	0.722 6834
28	68 47 05.3	0 28 43.7	0.721 0792	28	217 40 45.2	2 08 50.8	0.722 9557
30	72 00 16.8	0 17 20.6	0.720 8397	30	220 53 03.1	1 59 49.4	0.723 2290
Aug. 1	75 13 35.5	-0 05 53.8	0.720 6080	Nov. 1	224 05 10.0	1 50 25.9	0.723 5025
3	78 27 01.4	+0 05 34.5	0.720 3848	3	227 17 06.2	1 40 42.2	0.723 7754
5	81 40 34.5	0 17 02.3	0.720 1707	5	230 28 51.8	1 30 40.2	0.724 0469
7	84 54 14.7	+0 28 27.2	0.719 9666	7	233 40 27.1	+1 20 21.6	0.724 3160
9	88 08 02.0	0 39 47.0	0.719 7730	9	236 51 52.2	1 09 48.7	0.724 5819
11	91 21 56.2	0 50 59.6	0.719 5905	11	240 03 07.5	0 59 03.2	0.724 8438
13	94 35 57.3	1 02 02.8	0.719 4199	13	243 14 13.3	0 48 07.2	0.725 1010
15	97 50 05.1	1 12 54.4	0.719 2615	15	246 25 10.1	0 37 02.8	0.725 3525
17	101 04 19.3	1 23 32.4	0.719 1159	17	249 35 58.2	0 25 52.0	0.725 5977
19	104 18 39.7	+1 33 54.6	0.718 9836	19	252 46 38.1	+0 14 36.8	0.725 8357
21	107 33 06.1	1 43 59.0	0.718 8651	21	255 57 10.4	+0 03 19.4	0.726 0659
23	110 47 38.2	1 53 43.6	0.718 7607	23	259 07 35.4	-0 07 58.2	0.726 2875
25	114 02 15.6	2 03 06.6	0.718 6707	25	262 17 53.8	0 19 13.9	0.726 4999
27	117 16 57.9	2 12 06.1	0.718 5954	27	265 28 06.1	0 30 25.7	0.726 7023
29	120 31 44.7	2 20 40.2	0.718 5351	29	268 38 12.8	0 41 31.6	0.726 8943
31	123 46 35.6	+2 28 47.3	0.718 4901	Dec. 1	271 48 14.6	-0 52 29.5	0.727 0751
Sept. 2	127 01 29.9	2 36 25.9	0.718 4603	3	274 58 12.0	1 03 17.5	0.727 2443
4	130 16 27.3	2 43 34.3	0.718 4460	5	278 08 05.5	1 13 53.6	0.727 4014
6	133 31 27.2	2 50 11.3	0.718 4472	7	281 17 55.9	1 24 15.9	0.727 5458
8	136 46 28.8	2 56 15.4	0.718 4639	9	284 27 43.6	1 34 22.6	0.727 6772
10	140 01 31.8	3 01 45.5	0.718 4959	11	287 37 29.2	1 44 11.9	0.727 7951
12	143 16 35.3	+3 06 40.6	0.718 5434	13	290 47 13.3	-1 53 41.9	0.727 8991
14	146 31 38.7	3 10 59.7	0.718 6059	15	293 56 56.3	2 02 51.1	0.727 9891
16	149 46 41.3	3 14 41.9	0.718 6835	17	297 06 38.9	2 11 37.6	0.728 0646
18	153 01 42.6	3 17 46.5	0.718 7758	19	300 16 21.6	2 20 00.1	0.728 1255
20	156 16 41.6	3 20 13.1	0.718 8825	21	303 26 04.8	2 27 57.0	0.728 1716
22	159 31 37.8	3 22 01.0	0.719 0033	23	306 35 48.9	2 35 26.8	0.728 2027
24	162 46 30.4	+3 23 10.1	0.719 1378	25	309 45 34.6	-2 42 28.2	0.728 2188
26	166 01 18.8	3 23 40.0	0.719 2855	27	312 55 22.0	2 48 59.9	0.728 2198
28	169 16 02.2	3 23 30.9	0.719 4460	29	316 05 11.7	2 55 00.8	0.728 2057
30	172 30 40.0	3 22 42.7	0.719 6188	31	319 15 04.1	3 00 29.8	0.728 1765
Oct. 2	175 45 11.6	+3 21 15.7	0.719 8032	33	322 24 59.4	-3 05 25.8	0.728 1324

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude °	′	″	Apparent Geocentric Latitude °	′	″	Date		Apparent Geocentric Longitude °	′	″	Apparent Geocentric Latitude °	′	″
Jan.	0	293	45	57.5	+2	37	23.8	Feb.	15	285	58	54.4	+5	43	23.4
	1	293	17	42.7	2	53	03.6		16	286	32	13.1	5	37	28.7
	2	292	47	41.8	3	8	39.7		17	287	06	56.0	5	31	26.4
	3	292	16	04.9	3	24	08.3		18	287	43	00.0	5	25	17.2
	4	291	43	03.3	3	39	25.4		19	288	20	22.0	5	19	01.8
	5	291	08	49.2	3	54	27.1		20	288	58	59.0	5	12	40.8
	6	290	33	35.7	+4	9	09.3		21	289	38	48.0	+5	6	14.9
	7	289	57	37.0	4	23	28.2		22	290	19	46.3	4	59	44.5
	8	289	21	07.7	4	37	19.8		23	291	01	51.1	4	53	10.2
	9	288	44	23.0	4	50	40.6		24	291	44	59.6	4	46	32.5
	10	288	07	38.4	5	3	27.2		25	292	29	09.2	4	39	51.9
	11	287	31	09.3	5	15	36.4		26	293	14	17.3	4	33	08.8
	12	286	55	11.2	+5	27	05.7		27	294	00	21.5	+4	26	23.6
	13	286	19	59.0	5	37	52.7		28	294	47	19.4	4	19	36.7
	14	285	45	47.0	5	47	55.5	Mar.	1	295	35	08.6	4	12	48.4
	15	285	12	48.9	5	57	12.6		2	296	23	46.9	4	5	59.1
	16	284	41	17.4	6	5	43.2		3	297	13	12.3	3	59	09.1
	17	284	11	24.3	6	13	26.4		4	298	03	22.9	3	52	18.6
	18	283	43	20.1	+6	20	22.4		5	298	54	16.9	+3	45	28.0
	19	283	17	14.2	6	26	31.1		6	299	45	52.6	3	38	37.4
	20	282	53	14.8	6	31	53.2		7	300	38	08.4	3	31	47.1
	21	282	31	28.7	6	36	29.7		8	301	31	02.7	3	24	57.5
	22	282	12	01.7	6	40	21.6		9	302	24	34.2	3	18	08.6
	23	281	54	58.2	6	43	30.3		10	303	18	41.4	3	11	20.6
	24	281	40	21.6	+6	45	57.4		11	304	13	23.0	+3	4	33.9
	25	281	28	14.1	6	47	44.6		12	305	08	37.8	2	57	48.6
	26	281	18	37.0	6	48	53.7		13	306	04	24.6	2	51	04.9
	27	281	11	30.6	6	49	26.6		14	307	00	42.2	2	44	23.0
	28	281	06	54.3	6	49	25.3		15	307	57	29.6	2	37	43.1
	29	281	04	46.8	6	48	51.6		16	308	54	45.8	2	31	05.3
	30	281	05	06.3	+6	47	47.5		17	309	52	29.7	+2	24	29.9
	31	281	07	50.2	6	46	14.8		18	310	50	40.4	2	17	56.9
Feb.	1	281	12	55.6	6	44	15.3		19	311	49	17.2	2	11	26.7
	2	281	20	19.4	6	41	50.8		20	312	48	19.1	2	4	59.3
	3	281	29	58.2	6	39	02.9		21	313	47	45.2	1	58	34.9
	4	281	41	48.5	6	35	53.1		22	314	47	34.9	1	52	13.7
	5	281	55	46.6	+6	32	23.1		23	315	47	47.4	+1	45	55.8
	6	282	11	48.7	6	28	34.1		24	316	48	21.6	1	39	41.4
	7	282	29	51.3	6	24	27.6		25	317	49	17.0	1	33	30.6
	8	282	49	50.4	6	20	04.9		26	318	50	32.6	1	27	23.6
	9	283	11	42.3	6	15	27.0		27	319	52	07.6	1	21	20.4
	10	283	35	23.3	6	10	35.3		28	320	54	01.3	1	15	21.3
	11	284	00	49.5	+6	5	30.7		29	321	56	12.9	+1	9	26.3
	12	284	27	57.3	6	0	14.3		30	322	58	41.7	1	3	35.5
	13	284	56	43.1	5	54	47.0		31	324	01	27.1	0	57	49.1
	14	285	27	03.3	5	49	09.8	Apr.	1	325	04	28.5	0	52	07.1
	15	285	58	54.4	+5	43	23.4		2	326	07	45.3	+0	46	29.7

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	325	04	28.5	+0	52	07.1	May	17	16	27	56.1	-1	51	40.7
	2	326	07	45.3	0	46	29.7		18	17	37	29.6	1	52	54.2
	3	327	11	16.9	0	40	56.8		19	18	47	07.4	1	54	01.8
	4	328	15	02.9	0	35	28.7		20	19	56	49.4	1	55	03.5
	5	329	19	02.8	0	30	05.3		21	21	06	35.6	1	55	59.3
	6	330	23	16.2	0	24	46.8		22	22	16	25.6	1	56	49.3
	7	331	27	42.5	+0	19	33.2		23	23	26	19.5	-1	57	33.5
	8	332	32	21.4	0	14	24.7		24	24	36	17.2	1	58	11.9
	9	333	37	12.5	0	9	21.2		25	25	46	18.5	1	58	44.6
	10	334	42	15.4	+0	4	23.0		26	26	56	23.4	1	59	11.6
	11	335	47	29.8	-0	0	30.1		27	28	06	31.8	1	59	33.0
	12	336	52	55.3	0	5	17.9		28	29	16	43.5	1	59	48.9
	13	337	58	31.7	-0	10	00.2		29	30	26	58.5	-1	59	59.3
	14	339	04	18.7	0	14	37.2		30	31	37	16.6	2	0	04.3
	15	340	10	16.0	0	19	08.6		31	32	47	37.9	2	0	03.9
	16	341	16	23.5	0	23	34.5	June	1	33	58	02.1	1	59	58.2
	17	342	22	40.8	0	27	54.8		2	35	08	29.2	1	59	47.3
	18	343	29	07.8	0	32	09.3		3	36	18	59.1	1	59	31.2
	19	344	35	44.3	-0	36	18.2		4	37	29	31.7	-1	59	10.0
	20	345	42	30.1	0	40	21.2		5	38	40	07.1	1	58	43.8
	21	346	49	24.8	0	44	18.4		6	39	50	45.0	1	58	12.6
	22	347	56	28.1	0	48	09.7		7	41	01	25.6	1	57	36.5
	23	349	03	39.8	0	51	55.0		8	42	12	08.7	1	56	55.6
	24	350	10	59.5	0	55	34.4		9	43	22	54.4	1	56	09.9
	25	351	18	26.9	-0	59	07.8		10	44	33	42.7	-1	55	19.5
	26	352	26	01.8	1	2	35.1		11	45	44	33.6	1	54	24.6
	27	353	33	43.9	1	5	56.4		12	46	55	27.1	1	53	25.1
	28	354	41	33.0	1	9	11.6		13	48	06	23.4	1	52	21.2
	29	355	49	28.7	1	12	20.7		14	49	17	22.4	1	51	12.8
	30	356	57	30.9	1	15	23.7		15	50	28	24.2	1	50	00.2
May	1	358	05	39.5	-1	18	20.6		16	51	39	28.6	-1	48	43.4
	2	359	13	54.1	1	21	11.4		17	52	50	35.8	1	47	22.4
	3	0	22	14.5	1	23	56.0		18	54	01	45.6	1	45	57.4
	4	1	30	40.7	1	26	34.6		19	55	12	58.1	1	44	28.4
	5	2	39	12.4	1	29	07.0		20	56	24	13.3	1	42	55.5
	6	3	47	49.4	1	31	33.3		21	57	35	31.0	1	41	18.9
	7	4	56	31.6	-1	33	53.5		22	58	46	51.4	-1	39	38.7
	8	6	05	18.8	1	36	07.5		23	59	58	14.3	1	37	54.8
	9	7	14	11.0	1	38	15.5		24	61	09	39.8	1	36	07.6
	10	8	23	08.0	1	40	17.3		25	62	21	07.8	1	34	16.9
	11	9	32	09.7	1	42	13.1		26	63	32	38.3	1	32	23.0
	12	10	41	16.1	1	44	02.8		27	64	44	11.2	1	30	25.9
	13	11	50	27.0	-1	45	46.5		28	65	55	46.5	-1	28	25.8
	14	12	59	42.5	1	47	24.0		29	67	07	24.0	1	26	22.7
	15	14	09	02.5	1	48	55.6		30	68	19	03.9	1	24	16.9
	16	15	18	27.1	1	50	21.1	July	1	69	30	45.9	1	22	08.2
	17	16	27	56.1	-1	51	40.7		2	70	42	30.2	-1	19	57.0

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	69	30	45.9	-1	22	08.2	Aug.	16	125	10	20.3	+0	34	54.4
	2	70	42	30.2	1	19	57.0		17	126	23	50.3	0	37	11.2
	3	71	54	16.5	1	17	43.2		18	127	37	22.7	0	39	25.8
	4	73	06	05.0	1	15	27.0		19	128	50	57.6	0	41	38.0
	5	74	17	55.7	1	13	08.5		20	130	04	34.9	0	43	47.8
	6	75	29	48.4	1	10	47.7		21	131	18	14.5	0	45	55.1
	7	76	41	43.3	-1	8	24.9		22	132	31	56.4	+0	47	59.8
	8	77	53	40.3	1	6	00.1		23	133	45	40.5	0	50	01.9
	9	79	05	39.6	1	3	33.4		24	134	59	26.9	0	52	01.2
	10	80	17	41.1	1	1	04.9		25	136	13	15.5	0	53	57.7
	11	81	29	45.0	0	58	34.7		26	137	27	06.1	0	55	51.3
	12	82	41	51.2	0	56	02.9		27	138	40	58.7	0	57	41.9
	13	83	53	59.7	-0	53	29.6		28	139	54	53.4	+0	59	29.5
	14	85	06	10.6	0	50	55.0		29	141	08	50.0	1	1	14.0
	15	86	18	23.9	0	48	19.1		30	142	22	48.6	1	2	55.4
	16	87	30	39.6	0	45	42.0		31	143	36	49.0	1	4	33.6
	17	88	42	57.8	0	43	03.9	Sept.	1	144	50	51.3	1	6	08.5
	18	89	55	18.4	0	40	24.9		2	146	04	55.5	1	7	40.1
	19	91	07	41.6	-0	37	45.1		3	147	19	01.5	+1	9	08.3
	20	92	20	07.3	0	35	04.6		4	148	33	09.3	1	10	33.1
	21	93	32	35.5	0	32	23.4		5	149	47	18.9	1	11	54.4
	22	94	45	06.2	0	29	41.8		6	151	01	30.2	1	13	12.2
	23	95	57	39.5	0	26	59.9		7	152	15	43.2	1	14	26.5
	24	97	10	15.2	0	24	17.7		8	153	29	57.9	1	15	37.2
	25	98	22	53.4	-0	21	35.4		9	154	44	14.2	+1	16	44.2
	26	99	35	33.9	0	18	53.1		10	155	58	32.2	1	17	47.6
	27	100	48	16.8	0	16	10.8		11	157	12	51.9	1	18	47.2
	28	102	01	02.0	0	13	28.8		12	158	27	13.4	1	19	43.1
	29	103	13	49.5	0	10	47.1		13	159	41	36.7	1	20	35.3
	30	104	26	39.2	0	8	05.8		14	160	56	01.8	1	21	23.6
	31	105	39	31.1	-0	5	25.0		15	162	10	28.8	+1	22	08.1
Aug.	1	106	52	25.2	0	2	44.9		16	163	24	57.5	1	22	48.7
	2	108	05	21.4	-0	0	05.4		17	164	39	28.0	1	23	25.4
	3	109	18	19.8	+0	2	33.1		18	165	54	00.3	1	23	58.2
	4	110	31	20.4	0	5	10.8		19	167	08	34.2	1	24	27.1
	5	111	44	23.1	0	7	47.4		20	168	23	09.7	1	24	52.0
	6	112	57	28.0	+0	10	22.8		21	169	37	46.9	+1	25	13.0
	7	114	10	35.2	0	12	57.0		22	170	52	25.5	1	25	30.0
	8	115	23	44.5	0	15	30.0		23	172	07	05.6	1	25	43.1
	9	116	36	56.1	0	18	01.5		24	173	21	47.1	1	25	52.2
	10	117	50	09.9	0	20	31.4		25	174	36	29.9	1	25	57.3
	11	119	03	25.9	0	22	59.8		26	175	51	14.1	1	25	58.4
	12	120	16	44.2	+0	25	26.5		27	177	05	59.5	+1	25	55.6
	13	121	30	04.7	0	27	51.4		28	178	20	46.1	1	25	48.9
	14	122	43	27.5	0	30	14.4		29	179	35	34.0	1	25	38.2
	15	123	56	52.7	0	32	35.4		30	180	50	23.0	1	25	23.6
	16	125	10	20.3	+0	34	54.4	Oct.	1	182	05	13.0	+1	25	05.1

VENUS, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	182	05	13.0	+1	25	05.1	Nov.	16	239	40	40.4	+0	13	26.9
	2	183	20	04.1	1	24	42.8		17	240	55	57.1	0	11	04.1
	3	184	34	56.2	1	24	16.6		18	242	11	14.1	0	8	40.6
	4	185	49	49.1	1	23	46.5		19	243	26	31.3	0	6	16.6
	5	187	04	42.9	1	23	12.7		20	244	41	48.8	0	3	52.0
	6	188	19	37.4	1	22	35.1		21	245	57	06.5	+0	1	27.0
	7	189	34	32.8	+1	21	53.8		22	247	12	24.5	-0	0	58.3
	8	190	49	29.0	1	21	08.8		23	248	27	42.7	0	3	23.8
	9	192	04	26.1	1	20	20.1		24	249	43	01.1	0	5	49.4
	10	193	19	24.0	1	19	27.8		25	250	58	19.7	0	8	15.0
	11	194	34	22.9	1	18	31.8		26	252	13	38.3	0	10	40.5
	12	195	49	22.7	1	17	32.3		27	253	28	56.9	0	13	05.7
	13	197	04	23.5	+1	16	29.3		28	254	44	15.4	-0	15	30.6
	14	198	19	25.2	1	15	22.8		29	255	59	33.7	0	17	55.1
	15	199	34	27.9	1	14	12.9		30	257	14	51.8	0	20	19.0
	16	200	49	31.4	1	12	59.6	Dec.	1	258	30	09.7	0	22	42.3
	17	202	04	35.8	1	11	43.0		2	259	45	27.3	0	25	04.9
	18	203	19	41.1	1	10	23.1		3	261	00	44.7	0	27	26.6
	19	204	34	47.1	+1	8	59.9		4	262	16	01.9	-0	29	47.4
	20	205	49	53.9	1	7	33.7		5	263	31	18.9	0	32	07.2
	21	207	05	01.4	1	6	04.3		6	264	46	35.8	0	34	25.9
	22	208	20	09.6	1	4	32.0		7	266	01	52.5	0	36	43.3
	23	209	35	18.5	1	2	56.6		8	267	17	09.1	0	38	59.4
	24	210	50	28.1	1	1	18.3		9	268	32	25.6	0	41	14.1
	25	212	05	38.2	+0	59	37.2		10	269	47	42.0	-0	43	27.3
	26	213	20	48.9	0	57	53.4		11	271	02	58.2	0	45	38.9
	27	214	36	00.2	0	56	06.9		12	272	18	14.3	0	47	48.8
	28	215	51	11.9	0	54	17.8		13	273	33	30.2	0	49	57.0
	29	217	06	24.0	0	52	26.2		14	274	48	46.0	0	52	03.2
	30	218	21	36.5	0	50	32.2		15	276	04	01.7	0	54	07.5
	31	219	36	49.2	+0	48	35.9		16	277	19	17.2	-0	56	09.7
Nov.	1	220	52	02.1	0	46	37.4		17	278	34	32.7	0	58	09.8
	2	222	07	15.1	0	44	36.6		18	279	49	48.1	1	0	07.6
	3	223	22	28.3	0	42	33.8		19	281	05	03.3	1	2	03.0
	4	224	37	41.6	0	40	29.0		20	282	20	18.5	1	3	56.1
	5	225	52	55.1	0	38	22.2		21	283	35	33.6	1	5	46.6
	6	227	08	08.7	+0	36	13.7		22	284	50	48.6	-1	7	34.5
	7	228	23	22.6	0	34	03.3		23	286	06	03.4	1	9	19.7
	8	229	38	36.7	0	31	51.4		24	287	21	17.9	1	11	02.2
	9	230	53	51.2	0	29	37.8		25	288	36	32.0	1	12	41.7
	10	232	09	05.9	0	27	22.8		26	289	51	45.7	1	14	18.4
	11	233	24	20.9	0	25	06.4		27	291	06	58.7	1	15	52.0
	12	234	39	36.2	+0	22	48.7		28	292	22	11.1	-1	17	22.5
	13	235	54	51.9	0	20	29.8		29	293	37	22.8	1	18	49.9
	14	237	10	07.8	0	18	09.8		30	294	52	33.9	1	20	14.0
	15	238	25	24.0	0	15	48.8		31	296	07	44.2	1	21	34.8
	16	239	40	40.4	+0	13	26.9		32	297	22	53.8	-1	22	52.3

VENUS, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	19	40	38.79	-18	45	44.9	0.276 005	31.86	30.22	12	58	49
	1	19	38	30.27	18	35	02.1	0.273 751	32.12	30.47	12	52	41
	2	19	36	14.75	18	24	34.0	0.271 767	32.36	30.69	12	46	27
	3	19	33	53.01	18	14	21.6	0.270 058	32.56	30.88	12	40	08
	4	19	31	25.87	18	04	25.9	0.268 630	32.74	31.05	12	33	43
	5	19	28	54.23	17	54	48.1	0.267 488	32.88	31.18	12	27	15
	6	19	26	19.04	-17	45	29.3	0.266 636	32.98	31.28	12	20	43
	7	19	23	41.30	17	36	30.7	0.266 077	33.05	31.34	12	14	10
	8	19	21	02.06	17	27	53.6	0.265 815	33.08	31.38	12	07	36
	9	19	18	22.38	17	19	39.1	0.265 849	33.08	31.37	12	01	01
	10	19	15	43.33	17	11	48.5	0.266 181	33.04	31.33	11	54	28
	11	19	13	05.99	17	04	22.9	0.266 810	32.96	31.26	11	47	57
	12	19	10	31.41	-16	57	23.5	0.267 734	32.85	31.15	11	41	30
	13	19	08	00.60	16	50	51.1	0.268 951	32.70	31.01	11	35	06
	14	19	05	34.54	16	44	46.8	0.270 457	32.52	30.84	11	28	48
	15	19	03	14.13	16	39	11.3	0.272 248	32.30	30.63	11	22	36
	16	19	01	00.21	16	34	05.2	0.274 318	32.06	30.40	11	16	30
	17	18	58	53.57	16	29	28.8	0.276 660	31.79	30.15	11	10	32
	18	18	56	54.89	-16	25	22.5	0.279 269	31.49	29.86	11	04	42
	19	18	55	04.78	16	21	46.2	0.282 136	31.17	29.56	10	59	01
	20	18	53	23.76	16	18	39.8	0.285 254	30.83	29.24	10	53	29
	21	18	51	52.26	16	16	02.8	0.288 613	30.47	28.90	10	48	06
	22	18	50	30.66	16	13	54.8	0.292 206	30.10	28.54	10	42	54
	23	18	49	19.22	16	12	14.8	0.296 024	29.71	28.17	10	37	51
	24	18	48	18.13	-16	11	01.9	0.300 057	29.31	27.79	10	32	59
	25	18	47	27.54	16	10	15.1	0.304 295	28.90	27.41	10	28	18
	26	18	46	47.51	16	09	53.0	0.308 731	28.48	27.01	10	23	47
	27	18	46	18.03	16	09	54.4	0.313 355	28.06	26.62	10	19	26
	28	18	45	59.06	16	10	17.7	0.318 158	27.64	26.21	10	15	16
	29	18	45	50.49	16	11	01.3	0.323 131	27.22	25.81	10	11	16
	30	18	45	52.18	-16	12	03.7	0.328 267	26.79	25.41	10	07	26
	31	18	46	03.95	16	13	23.2	0.333 556	26.36	25.00	10	03	46
Feb.	1	18	46	25.61	16	14	58.0	0.338 992	25.94	24.60	10	00	15
	2	18	46	56.94	16	16	46.4	0.344 567	25.52	24.20	9	56	54
	3	18	47	37.69	16	18	46.7	0.350 275	25.11	23.81	9	53	43
	4	18	48	27.63	16	20	57.0	0.356 108	24.70	23.42	9	50	40
	5	18	49	26.51	-16	23	15.7	0.362 061	24.29	23.03	9	47	47
	6	18	50	34.07	16	25	41.0	0.368 129	23.89	22.66	9	45	01
	7	18	51	50.07	16	28	11.1	0.374 304	23.49	22.28	9	42	24
	8	18	53	14.25	16	30	44.4	0.380 582	23.11	21.91	9	39	56
	9	18	54	46.34	16	33	19.1	0.386 958	22.73	21.55	9	37	34
	10	18	56	26.09	16	35	53.7	0.393 426	22.35	21.20	9	35	21
	11	18	58	13.25	-16	38	26.5	0.399 982	21.99	20.85	9	33	15
	12	19	00	07.55	16	40	56.0	0.406 621	21.63	20.51	9	31	15
	13	19	02	08.76	16	43	20.5	0.413 339	21.28	20.18	9	29	23
	14	19	04	16.62	16	45	38.6	0.420 132	20.93	19.85	9	27	37
	15	19	06	30.89	-16	47	48.9	0.426 995	20.60	19.53	9	25	57

VENUS, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	19	06	30.89	-16	47	48.9	0.426 995	20.60	19.53	9	25	57
	16	19	08	51.34	16	49	49.9	0.433 926	20.27	19.22	9	24	23
	17	19	11	17.73	16	51	40.2	0.440 919	19.95	18.92	9	22	56
	18	19	13	49.84	16	53	18.6	0.447 971	19.63	18.62	9	21	33
	19	19	16	27.43	16	54	43.8	0.455 080	19.32	18.33	9	20	17
	20	19	19	10.31	16	55	54.4	0.462 241	19.03	18.04	9	19	05
	21	19	21	58.26	-16	56	49.5	0.469 451	18.73	17.77	9	17	58
	22	19	24	51.05	16	57	27.9	0.476 707	18.45	17.50	9	16	56
	23	19	27	48.51	16	57	48.4	0.484 007	18.17	17.23	9	15	59
	24	19	30	50.41	16	57	50.3	0.491 347	17.90	16.97	9	15	06
	25	19	33	56.56	16	57	32.5	0.498 724	17.63	16.72	9	14	17
	26	19	37	06.76	16	56	54.2	0.506 137	17.38	16.48	9	13	32
	27	19	40	20.83	-16	55	54.7	0.513 582	17.12	16.24	9	12	51
	28	19	43	38.57	16	54	33.1	0.521 059	16.88	16.01	9	12	14
Mar.	1	19	46	59.81	16	52	48.8	0.528 563	16.64	15.78	9	11	40
	2	19	50	24.37	16	50	41.2	0.536 095	16.40	15.56	9	11	09
	3	19	53	52.10	16	48	09.7	0.543 652	16.18	15.34	9	10	42
	4	19	57	22.82	16	45	13.6	0.551 234	15.95	15.13	9	10	17
	5	20	00	56.41	-16	41	52.7	0.558 838	15.74	14.92	9	09	55
	6	20	04	32.70	16	38	06.3	0.566 463	15.52	14.72	9	09	36
	7	20	08	11.58	16	33	54.0	0.574 108	15.32	14.53	9	09	19
	8	20	11	52.91	16	29	15.6	0.581 773	15.12	14.34	9	09	05
	9	20	15	36.56	16	24	10.7	0.589 455	14.92	14.15	9	08	53
	10	20	19	22.41	16	18	38.9	0.597 154	14.73	13.97	9	08	43
	11	20	23	10.35	-16	12	40.1	0.604 869	14.54	13.79	9	08	35
	12	20	27	00.26	16	06	14.0	0.612 599	14.36	13.61	9	08	29
	13	20	30	52.05	15	59	20.3	0.620 343	14.18	13.44	9	08	25
	14	20	34	45.59	15	51	59.0	0.628 099	14.00	13.28	9	08	23
	15	20	38	40.80	15	44	09.9	0.635 867	13.83	13.12	9	08	22
	16	20	42	37.58	15	35	52.9	0.643 645	13.66	12.96	9	08	23
	17	20	46	35.83	-15	27	07.9	0.651 434	13.50	12.80	9	08	25
	18	20	50	35.48	15	17	54.8	0.659 231	13.34	12.65	9	08	28
	19	20	54	36.43	15	08	13.7	0.667 035	13.18	12.50	9	08	33
	20	20	58	38.61	14	58	04.5	0.674 846	13.03	12.36	9	08	39
	21	21	02	41.94	14	47	27.3	0.682 663	12.88	12.22	9	08	47
	22	21	06	46.34	14	36	22.1	0.690 483	12.74	12.08	9	08	55
	23	21	10	51.74	-14	24	49.2	0.698 307	12.59	11.94	9	09	04
	24	21	14	58.06	14	12	48.6	0.706 132	12.45	11.81	9	09	14
	25	21	19	05.23	14	00	20.6	0.713 959	12.32	11.68	9	09	25
	26	21	23	13.18	13	47	25.3	0.721 785	12.18	11.55	9	09	37
	27	21	27	21.83	13	34	03.2	0.729 610	12.05	11.43	9	09	49
	28	21	31	31.12	13	20	14.4	0.737 433	11.93	11.31	9	10	02
	29	21	35	41.00	-13	05	59.2	0.745 254	11.80	11.19	9	10	16
	30	21	39	51.39	12	51	18.1	0.753 071	11.68	11.07	9	10	30
	31	21	44	02.24	12	36	11.3	0.760 885	11.56	10.96	9	10	44
Apr.	1	21	48	13.52	12	20	39.2	0.768 694	11.44	10.85	9	10	59
	2	21	52	25.16	-12	04	42.2	0.776 498	11.33	10.74	9	11	14

VENUS, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	21	48	13.52	-12	20	39.2	0.768 694	11.44	10.85	9	10	59
	2	21	52	25.16	12	04	42.2	0.776 498	11.33	10.74	9	11	14
	3	21	56	37.14	11	48	20.8	0.784 298	11.21	10.63	9	11	30
	4	22	00	49.40	11	31	35.3	0.792 092	11.10	10.53	9	11	46
	5	22	05	01.93	11	14	26.2	0.799 880	10.99	10.43	9	12	02
	6	22	09	14.68	10	56	54.0	0.807 662	10.89	10.33	9	12	18
	7	22	13	27.63	-10	38	59.0	0.815 438	10.78	10.23	9	12	34
	8	22	17	40.74	10	20	41.7	0.823 207	10.68	10.13	9	12	51
	9	22	21	54.01	10	02	02.7	0.830 970	10.58	10.04	9	13	08
	10	22	26	07.40	9	43	02.4	0.838 725	10.49	9.94	9	13	25
	11	22	30	20.89	9	23	41.3	0.846 472	10.39	9.85	9	13	42
	12	22	34	34.48	9	03	59.9	0.854 211	10.30	9.76	9	13	59
	13	22	38	48.15	-8	43	58.6	0.861 941	10.20	9.68	9	14	16
	14	22	43	01.90	8	23	38.1	0.869 663	10.11	9.59	9	14	33
	15	22	47	15.70	8	02	58.7	0.877 376	10.02	9.51	9	14	50
	16	22	51	29.57	7	42	01.0	0.885 078	9.94	9.42	9	15	08
	17	22	55	43.50	7	20	45.6	0.892 770	9.85	9.34	9	15	25
	18	22	59	57.49	6	59	12.8	0.900 451	9.77	9.26	9	15	43
	19	23	04	11.54	-6	37	23.3	0.908 121	9.68	9.18	9	16	00
	20	23	08	25.64	6	15	17.6	0.915 777	9.60	9.11	9	16	18
	21	23	12	39.81	5	52	56.4	0.923 420	9.52	9.03	9	16	35
	22	23	16	54.03	5	30	20.1	0.931 049	9.45	8.96	9	16	53
	23	23	21	08.31	5	07	29.4	0.938 662	9.37	8.88	9	17	11
	24	23	25	22.65	4	44	25.0	0.946 260	9.29	8.81	9	17	28
	25	23	29	37.04	-4	21	07.4	0.953 841	9.22	8.74	9	17	46
	26	23	33	51.49	3	57	37.3	0.961 406	9.15	8.67	9	18	04
	27	23	38	06.02	3	33	55.3	0.968 952	9.08	8.61	9	18	22
	28	23	42	20.62	3	10	02.1	0.976 481	9.01	8.54	9	18	40
	29	23	46	35.31	2	45	58.3	0.983 991	8.94	8.48	9	18	59
	30	23	50	50.10	2	21	44.5	0.991 483	8.87	8.41	9	19	17
May	1	23	55	04.99	-1	57	21.3	0.998 955	8.80	8.35	9	19	35
	2	23	59	20.02	1	32	49.5	1.006 408	8.74	8.29	9	19	54
	3	0	03	35.18	1	08	09.7	1.013 842	8.67	8.23	9	20	12
	4	0	07	50.50	0	43	22.4	1.021 256	8.61	8.17	9	20	31
	5	0	12	05.99	-0	18	28.4	1.028 649	8.55	8.11	9	20	50
	6	0	16	21.68	+0	06	31.7	1.036 023	8.49	8.05	9	21	09
	7	0	20	37.57	+0	31	37.3	1.043 376	8.43	7.99	9	21	29
	8	0	24	53.70	0	56	47.7	1.050 709	8.37	7.94	9	21	49
	9	0	29	10.09	1	22	02.3	1.058 021	8.31	7.88	9	22	08
	10	0	33	26.75	1	47	20.5	1.065 312	8.25	7.83	9	22	29
	11	0	37	43.71	2	12	41.6	1.072 582	8.20	7.78	9	22	49
	12	0	42	01.00	2	38	05.0	1.079 831	8.14	7.72	9	23	10
	13	0	46	18.65	+3	03	30.0	1.087 058	8.09	7.67	9	23	31
	14	0	50	36.68	3	28	56.2	1.094 262	8.04	7.62	9	23	53
	15	0	54	55.13	3	54	22.7	1.101 444	7.98	7.57	9	24	15
	16	0	59	14.03	4	19	49.2	1.108 604	7.93	7.52	9	24	38
	17	1	03	33.40	+4	45	14.8	1.115 739	7.88	7.47	9	25	01

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	1	03	33.40	+4	45	14.8	1.115 739	7.88	7.47	9	25	01
	18	1	07	53.28	5	10	39.0	1.122 851	7.83	7.43	9	25	24
	19	1	12	13.68	5	36	01.1	1.129 938	7.78	7.38	9	25	48
	20	1	16	34.64	6	01	20.5	1.136 999	7.73	7.34	9	26	13
	21	1	20	56.17	6	26	36.4	1.144 033	7.69	7.29	9	26	38
	22	1	25	18.31	6	51	48.2	1.151 040	7.64	7.25	9	27	04
	23	1	29	41.08	+7	16	55.3	1.158 020	7.59	7.20	9	27	30
	24	1	34	04.49	7	41	56.8	1.164 970	7.55	7.16	9	27	58
	25	1	38	28.58	8	06	52.1	1.171 892	7.50	7.12	9	28	25
	26	1	42	53.37	8	31	40.5	1.178 783	7.46	7.08	9	28	54
	27	1	47	18.88	8	56	21.4	1.185 645	7.42	7.03	9	29	23
	28	1	51	45.15	9	20	54.0	1.192 476	7.37	6.99	9	29	53
	29	1	56	12.18	+9	45	17.7	1.199 276	7.33	6.95	9	30	24
	30	2	00	40.01	10	09	31.7	1.206 045	7.29	6.92	9	30	56
	31	2	05	08.65	10	33	35.3	1.212 782	7.25	6.88	9	31	28
June	1	2	09	38.13	10	57	27.9	1.219 487	7.21	6.84	9	32	01
	2	2	14	08.47	11	21	08.7	1.226 161	7.17	6.80	9	32	35
	3	2	18	39.69	11	44	37.0	1.232 802	7.13	6.77	9	33	10
	4	2	23	11.80	+12	07	52.2	1.239 411	7.10	6.73	9	33	46
	5	2	27	44.84	12	30	53.6	1.245 987	7.06	6.69	9	34	23
	6	2	32	18.81	12	53	40.4	1.252 530	7.02	6.66	9	35	01
	7	2	36	53.74	13	16	12.0	1.259 040	6.98	6.62	9	35	40
	8	2	41	29.65	13	38	27.6	1.265 517	6.95	6.59	9	36	20
	9	2	46	06.56	14	00	26.6	1.271 961	6.91	6.56	9	37	00
	10	2	50	44.49	+14	22	08.3	1.278 371	6.88	6.52	9	37	42
	11	2	55	23.45	14	43	32.1	1.284 748	6.85	6.49	9	38	25
	12	3	00	03.48	15	04	37.2	1.291 091	6.81	6.46	9	39	09
	13	3	04	44.57	15	25	23.1	1.297 399	6.78	6.43	9	39	54
	14	3	09	26.76	15	45	49.0	1.303 673	6.75	6.40	9	40	40
	15	3	14	10.04	16	05	54.3	1.309 912	6.71	6.37	9	41	27
	16	3	18	54.44	+16	25	38.3	1.316 115	6.68	6.34	9	42	16
	17	3	23	39.96	16	45	00.3	1.322 282	6.65	6.31	9	43	05
	18	3	28	26.61	17	03	59.6	1.328 411	6.62	6.28	9	43	56
	19	3	33	14.38	17	22	35.6	1.334 503	6.59	6.25	9	44	47
	20	3	38	03.29	17	40	47.5	1.340 556	6.56	6.22	9	45	40
	21	3	42	53.33	17	58	34.6	1.346 570	6.53	6.19	9	46	34
	22	3	47	44.50	+18	15	56.3	1.352 544	6.50	6.17	9	47	29
	23	3	52	36.81	18	32	52.0	1.358 478	6.47	6.14	9	48	25
	24	3	57	30.24	18	49	20.8	1.364 370	6.45	6.11	9	49	23
	25	4	02	24.79	19	05	22.3	1.370 221	6.42	6.09	9	50	21
	26	4	07	20.44	19	20	55.7	1.376 031	6.39	6.06	9	51	21
	27	4	12	17.19	19	36	00.4	1.381 798	6.36	6.04	9	52	22
	28	4	17	15.02	+19	50	35.8	1.387 522	6.34	6.01	9	53	23
	29	4	22	13.91	20	04	41.2	1.393 204	6.31	5.99	9	54	26
	30	4	27	13.84	20	18	16.2	1.398 843	6.29	5.96	9	55	30
July	1	4	32	14.79	20	31	19.9	1.404 438	6.26	5.94	9	56	35
	2	4	37	16.73	+20	43	52.0	1.409 990	6.24	5.91	9	57	41

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	4	32	14.79	+20	31	19.9	1.404 438	6.26	5.94	9	56	35
	2	4	37	16.73	20	43	52.0	1.409 990	6.24	5.91	9	57	41
	3	4	42	19.65	20	55	51.8	1.415 499	6.21	5.89	9	58	47
	4	4	47	23.52	21	07	18.8	1.420 963	6.19	5.87	9	59	55
	5	4	52	28.30	21	18	12.4	1.426 384	6.17	5.85	10	01	04
	6	4	57	33.98	21	28	32.2	1.431 760	6.14	5.82	10	02	13
	7	5	02	40.52	+21	38	17.6	1.437 093	6.12	5.80	10	03	24
	8	5	07	47.89	21	47	28.2	1.442 382	6.10	5.78	10	04	35
	9	5	12	56.07	21	56	03.5	1.447 626	6.07	5.76	10	05	47
	10	5	18	05.02	22	04	03.1	1.452 826	6.05	5.74	10	06	60
	11	5	23	14.69	22	11	26.7	1.457 982	6.03	5.72	10	08	13
	12	5	28	25.07	22	18	13.8	1.463 094	6.01	5.70	10	09	27
	13	5	33	36.10	+22	24	24.0	1.468 161	5.99	5.68	10	10	42
	14	5	38	47.75	22	29	57.2	1.473 183	5.97	5.66	10	11	58
	15	5	43	59.98	22	34	52.8	1.478 159	5.95	5.64	10	13	14
	16	5	49	12.73	22	39	10.6	1.483 090	5.93	5.62	10	14	30
	17	5	54	25.97	22	42	50.3	1.487 974	5.91	5.60	10	15	47
	18	5	59	39.65	22	45	51.7	1.492 811	5.89	5.59	10	17	04
	19	6	04	53.72	+22	48	14.4	1.497 600	5.87	5.57	10	18	22
	20	6	10	08.14	22	49	58.2	1.502 341	5.85	5.55	10	19	40
	21	6	15	22.85	22	51	03.0	1.507 033	5.84	5.53	10	20	59
	22	6	20	37.81	22	51	28.7	1.511 675	5.82	5.52	10	22	17
	23	6	25	52.96	22	51	15.1	1.516 268	5.80	5.50	10	23	36
	24	6	31	08.25	22	50	22.1	1.520 811	5.78	5.48	10	24	55
	25	6	36	23.63	+22	48	49.7	1.525 304	5.77	5.47	10	26	14
	26	6	41	39.03	22	46	37.8	1.529 746	5.75	5.45	10	27	32
	27	6	46	54.41	22	43	46.4	1.534 136	5.73	5.44	10	28	51
	28	6	52	09.70	22	40	15.5	1.538 476	5.72	5.42	10	30	10
	29	6	57	24.87	22	36	05.2	1.542 764	5.70	5.41	10	31	29
	30	7	02	39.85	22	31	15.6	1.547 001	5.68	5.39	10	32	47
	31	7	07	54.58	+22	25	46.7	1.551 186	5.67	5.38	10	34	05
Aug.	1	7	13	09.03	22	19	38.8	1.555 319	5.65	5.36	10	35	23
	2	7	18	23.15	22	12	51.8	1.559 401	5.64	5.35	10	36	41
	3	7	23	36.87	22	05	26.1	1.563 431	5.62	5.33	10	37	58
	4	7	28	50.17	21	57	21.9	1.567 410	5.61	5.32	10	39	14
	5	7	34	03.00	21	48	39.4	1.571 337	5.60	5.31	10	40	30
	6	7	39	15.32	+21	39	18.8	1.575 213	5.58	5.29	10	41	46
	7	7	44	27.08	21	29	20.5	1.579 038	5.57	5.28	10	43	01
	8	7	49	38.25	21	18	44.8	1.582 812	5.56	5.27	10	44	15
	9	7	54	48.79	21	07	32.1	1.586 535	5.54	5.26	10	45	29
	10	7	59	58.67	20	55	42.6	1.590 207	5.53	5.24	10	46	42
	11	8	05	07.86	20	43	16.9	1.593 828	5.52	5.23	10	47	54
	12	8	10	16.31	+20	30	15.3	1.597 399	5.51	5.22	10	49	06
	13	8	15	24.01	20	16	38.1	1.600 918	5.49	5.21	10	50	17
	14	8	20	30.93	20	02	25.8	1.604 386	5.48	5.20	10	51	27
	15	8	25	37.05	19	47	38.9	1.607 802	5.47	5.19	10	52	36
	16	8	30	42.35	+19	32	17.8	1.611 166	5.46	5.18	10	53	45

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	8	30	42.35	+19	32	17.8	1.611 166	5.46	5.18	10	53	45
	17	8	35	46.80	19	16	23.0	1.614 478	5.45	5.17	10	54	52
	18	8	40	50.39	18	59	54.9	1.617 737	5.44	5.16	10	55	59
	19	8	45	53.10	18	42	54.2	1.620 943	5.43	5.15	10	57	05
	20	8	50	54.92	18	25	21.4	1.624 095	5.41	5.14	10	58	10
	21	8	55	55.82	18	07	17.0	1.627 193	5.40	5.13	10	59	14
	22	9	00	55.81	+17	48	41.6	1.630 238	5.39	5.12	11	00	17
	23	9	05	54.86	17	29	35.8	1.633 228	5.38	5.11	11	01	19
	24	9	10	52.96	17	10	00.3	1.636 164	5.37	5.10	11	02	20
	25	9	15	50.12	16	49	55.6	1.639 046	5.37	5.09	11	03	20
	26	9	20	46.32	16	29	22.3	1.641 873	5.36	5.08	11	04	19
	27	9	25	41.56	16	08	21.1	1.644 646	5.35	5.07	11	05	18
	28	9	30	35.84	+15	46	52.7	1.647 364	5.34	5.06	11	06	15
	29	9	35	29.17	15	24	57.6	1.650 027	5.33	5.05	11	07	11
	30	9	40	21.54	15	02	36.6	1.652 636	5.32	5.05	11	08	07
	31	9	45	12.97	14	39	50.3	1.655 191	5.31	5.04	11	09	01
Sept.	1	9	50	03.47	14	16	39.4	1.657 692	5.31	5.03	11	09	55
	2	9	54	53.04	13	53	04.6	1.660 139	5.30	5.02	11	10	47
	3	9	59	41.70	+13	29	06.5	1.662 533	5.29	5.02	11	11	39
	4	10	04	29.47	13	04	45.9	1.664 873	5.28	5.01	11	12	30
	5	10	09	16.36	12	40	03.5	1.667 161	5.27	5.00	11	13	20
	6	10	14	02.38	12	14	60.0	1.669 396	5.27	5.00	11	14	09
	7	10	18	47.57	11	49	36.0	1.671 579	5.26	4.99	11	14	57
	8	10	23	31.93	11	23	52.3	1.673 711	5.25	4.98	11	15	45
	9	10	28	15.49	+10	57	49.6	1.675 791	5.25	4.98	11	16	31
	10	10	32	58.28	10	31	28.5	1.677 819	5.24	4.97	11	17	17
	11	10	37	40.33	10	04	49.7	1.679 796	5.24	4.96	11	18	03
	12	10	42	21.67	9	37	54.0	1.681 722	5.23	4.96	11	18	47
	13	10	47	02.32	9	10	41.9	1.683 597	5.22	4.95	11	19	31
	14	10	51	42.33	8	43	14.3	1.685 420	5.22	4.95	11	20	14
	15	10	56	21.72	+8	15	31.7	1.687 191	5.21	4.94	11	20	57
	16	11	01	00.52	7	47	35.0	1.688 911	5.21	4.94	11	21	39
	17	11	05	38.77	7	19	24.8	1.690 579	5.20	4.93	11	22	20
	18	11	10	16.49	6	51	01.8	1.692 195	5.20	4.93	11	23	01
	19	11	14	53.73	6	22	26.9	1.693 758	5.19	4.92	11	23	41
	20	11	19	30.50	5	53	40.6	1.695 270	5.19	4.92	11	24	21
	21	11	24	06.85	+5	24	43.8	1.696 729	5.18	4.92	11	25	01
	22	11	28	42.81	4	55	37.1	1.698 136	5.18	4.91	11	25	40
	23	11	33	18.41	4	26	21.4	1.699 490	5.17	4.91	11	26	19
	24	11	37	53.70	3	56	57.3	1.700 793	5.17	4.90	11	26	58
	25	11	42	28.69	3	27	25.6	1.702 043	5.17	4.90	11	27	36
	26	11	47	03.45	2	57	47.0	1.703 240	5.16	4.90	11	28	14
	27	11	51	37.99	+2	28	02.2	1.704 386	5.16	4.89	11	28	52
	28	11	56	12.37	1	58	12.1	1.705 480	5.16	4.89	11	29	30
	29	12	00	46.61	1	28	17.3	1.706 523	5.15	4.89	11	30	08
	30	12	05	20.76	0	58	18.5	1.707 514	5.15	4.88	11	30	45
Oct.	1	12	09	54.87	+0	28	16.6	1.708 454	5.15	4.88	11	31	23

VENUS, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	12	09	54.87	+0	28	16.6	1.708 454	5.15	4.88	11	31	23
	2	12	14	28.95	-0	01	47.7	1.709 344	5.14	4.88	11	32	00
	3	12	19	03.06	0	31	53.7	1.710 184	5.14	4.88	11	32	38
	4	12	23	37.24	1	02	00.6	1.710 975	5.14	4.87	11	33	16
	5	12	28	11.52	1	32	07.7	1.711 717	5.14	4.87	11	33	53
	6	12	32	45.94	2	02	14.2	1.712 411	5.14	4.87	11	34	31
	7	12	37	20.54	-2	32	19.4	1.713 056	5.13	4.87	11	35	10
	8	12	41	55.38	3	02	22.5	1.713 654	5.13	4.87	11	35	48
	9	12	46	30.49	3	32	22.9	1.714 205	5.13	4.87	11	36	27
	10	12	51	05.93	4	02	19.8	1.714 709	5.13	4.86	11	37	06
	11	12	55	41.72	4	32	12.4	1.715 166	5.13	4.86	11	37	45
	12	13	00	17.93	5	02	00.2	1.715 577	5.13	4.86	11	38	25
	13	13	04	54.59	-5	31	42.2	1.715 941	5.12	4.86	11	39	06
	14	13	09	31.73	6	01	17.8	1.716 258	5.12	4.86	11	39	46
	15	13	14	09.41	6	30	46.1	1.716 529	5.12	4.86	11	40	28
	16	13	18	47.66	7	00	06.6	1.716 753	5.12	4.86	11	41	10
	17	13	23	26.52	7	29	18.2	1.716 931	5.12	4.86	11	41	52
	18	13	28	06.03	7	58	20.4	1.717 062	5.12	4.86	11	42	36
	19	13	32	46.22	-8	27	12.3	1.717 147	5.12	4.86	11	43	20
	20	13	37	27.13	8	55	53.1	1.717 185	5.12	4.86	11	44	05
	21	13	42	08.80	9	24	22.0	1.717 177	5.12	4.86	11	44	50
	22	13	46	51.27	9	52	38.2	1.717 122	5.12	4.86	11	45	36
	23	13	51	34.56	10	20	41.1	1.717 020	5.12	4.86	11	46	24
	24	13	56	18.71	10	48	29.7	1.716 872	5.12	4.86	11	47	12
	25	14	01	03.75	-11	16	03.2	1.716 677	5.12	4.86	11	48	01
	26	14	05	49.72	11	43	20.9	1.716 437	5.12	4.86	11	48	51
	27	14	10	36.65	12	10	21.9	1.716 149	5.12	4.86	11	49	41
	28	14	15	24.55	12	37	05.5	1.715 817	5.13	4.86	11	50	33
	29	14	20	13.47	13	03	30.7	1.715 438	5.13	4.86	11	51	26
	30	14	25	03.41	13	29	36.9	1.715 014	5.13	4.86	11	52	20
	31	14	29	54.41	-13	55	23.1	1.714 546	5.13	4.86	11	53	15
Nov.	1	14	34	46.49	14	20	48.6	1.714 034	5.13	4.87	11	54	11
	2	14	39	39.66	14	45	52.5	1.713 477	5.13	4.87	11	55	08
	3	14	44	33.95	15	10	34.1	1.712 878	5.13	4.87	11	56	07
	4	14	49	29.37	15	34	52.5	1.712 236	5.14	4.87	11	57	06
	5	14	54	25.95	15	58	46.9	1.711 553	5.14	4.87	11	58	07
	6	14	59	23.70	-16	22	16.6	1.710 827	5.14	4.87	11	59	09
	7	15	04	22.65	16	45	20.7	1.710 060	5.14	4.88	12	00	12
	8	15	09	22.81	17	07	58.6	1.709 252	5.15	4.88	12	01	16
	9	15	14	24.19	17	30	09.4	1.708 403	5.15	4.88	12	02	21
	10	15	19	26.79	17	51	52.4	1.707 514	5.15	4.88	12	03	28
	11	15	24	30.63	18	13	06.8	1.706 584	5.15	4.89	12	04	36
	12	15	29	35.70	-18	33	51.8	1.705 614	5.16	4.89	12	05	45
	13	15	34	42.01	18	54	06.6	1.704 604	5.16	4.89	12	06	56
	14	15	39	49.56	19	13	50.6	1.703 553	5.16	4.90	12	08	07
	15	15	44	58.34	19	33	02.9	1.702 462	5.17	4.90	12	09	20
	16	15	50	08.34	-19	51	42.8	1.701 331	5.17	4.90	12	10	34

VENUS, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	15	50	08.34	-19	51	42.8	1.701 331	5.17	4.90	12	10	34
	17	15	55	19.55	20	09	49.5	1.700 159	5.17	4.91	12	11	50
	18	16	00	31.97	20	27	22.4	1.698 948	5.18	4.91	12	13	06
	19	16	05	45.57	20	44	20.7	1.697 695	5.18	4.91	12	14	24
	20	16	11	00.34	21	00	43.7	1.696 403	5.18	4.92	12	15	43
	21	16	16	16.26	21	16	30.7	1.695 069	5.19	4.92	12	17	03
	22	16	21	33.30	-21	31	41.0	1.693 696	5.19	4.92	12	18	24
	23	16	26	51.44	21	46	14.0	1.692 281	5.20	4.93	12	19	46
	24	16	32	10.65	22	00	09.1	1.690 826	5.20	4.93	12	21	10
	25	16	37	30.88	22	13	25.6	1.689 330	5.21	4.94	12	22	34
	26	16	42	52.11	22	26	03.0	1.687 793	5.21	4.94	12	23	59
	27	16	48	14.28	22	38	00.7	1.686 216	5.22	4.95	12	25	25
	28	16	53	37.35	-22	49	18.1	1.684 600	5.22	4.95	12	26	52
	29	16	59	01.27	22	59	54.7	1.682 943	5.23	4.96	12	28	20
	30	17	04	26.00	23	09	50.0	1.681 247	5.23	4.96	12	29	49
Dec.	1	17	09	51.48	23	19	03.5	1.679 513	5.24	4.97	12	31	18
	2	17	15	17.66	23	27	34.8	1.677 740	5.24	4.97	12	32	48
	3	17	20	44.50	23	35	23.4	1.675 929	5.25	4.98	12	34	19
	4	17	26	11.94	-23	42	29.1	1.674 081	5.25	4.98	12	35	50
	5	17	31	39.93	23	48	51.4	1.672 195	5.26	4.99	12	37	22
	6	17	37	08.42	23	54	30.1	1.670 273	5.27	4.99	12	38	54
	7	17	42	37.33	23	59	24.9	1.668 314	5.27	5.00	12	40	27
	8	17	48	06.62	24	03	35.6	1.666 318	5.28	5.01	12	41	60
	9	17	53	36.23	24	07	01.9	1.664 287	5.28	5.01	12	43	33
	10	17	59	06.08	-24	09	43.7	1.662 219	5.29	5.02	12	45	07
	11	18	04	36.11	24	11	40.8	1.660 115	5.30	5.02	12	46	40
	12	18	10	06.27	24	12	53.1	1.657 975	5.30	5.03	12	48	14
	13	18	15	36.48	24	13	20.5	1.655 799	5.31	5.04	12	49	48
	14	18	21	06.69	24	13	03.0	1.653 587	5.32	5.04	12	51	22
	15	18	26	36.81	24	12	00.6	1.651 339	5.33	5.05	12	52	55
	16	18	32	06.80	-24	10	13.1	1.649 054	5.33	5.06	12	54	29
	17	18	37	36.59	24	07	40.8	1.646 733	5.34	5.06	12	56	02
	18	18	43	06.11	24	04	23.7	1.644 376	5.35	5.07	12	57	35
	19	18	48	35.30	24	00	22.0	1.641 982	5.36	5.08	12	59	07
	20	18	54	04.10	23	55	35.6	1.639 550	5.36	5.09	13	00	39
	21	18	59	32.45	23	50	05.0	1.637 082	5.37	5.09	13	02	11
	22	19	05	00.28	-23	43	50.3	1.634 576	5.38	5.10	13	03	42
	23	19	10	27.53	23	36	51.7	1.632 032	5.39	5.11	13	05	12
	24	19	15	54.13	23	29	09.7	1.629 451	5.40	5.12	13	06	42
	25	19	21	20.03	23	20	44.5	1.626 831	5.41	5.13	13	08	11
	26	19	26	45.16	23	11	36.5	1.624 174	5.41	5.13	13	09	39
	27	19	32	09.47	23	01	46.1	1.621 479	5.42	5.14	13	11	07
	28	19	37	32.90	-22	51	13.7	1.618 746	5.43	5.15	13	12	33
	29	19	42	55.40	22	39	59.8	1.615 976	5.44	5.16	13	13	59
	30	19	48	16.92	22	28	04.8	1.613 168	5.45	5.17	13	15	23
	31	19	53	37.43	22	15	29.2	1.610 325	5.46	5.18	13	16	47
	32	19	58	56.89	-22	02	13.6	1.607 444	5.47	5.19	13	18	09

MARS, 2022

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Jan. 1	235 58 08.9	-0 12 04.5	1.536 6332	Apr. 3	287 02 46.7	-1 33 25.1	1.423 9111
3	236 59 46.9	0 14 03.1	1.534 0590	5	288 14 35.3	1 34 38.9	1.421 9409
5	238 01 37.4	0 16 01.8	1.531 4769	7	289 26 35.8	1 35 50.5	1.420 0071
7	239 03 40.5	0 18 00.5	1.528 8879	9	290 38 48.1	1 36 59.7	1.418 1107
9	240 05 56.2	0 19 59.4	1.526 2928	11	291 51 12.0	1 38 06.5	1.416 2524
11	241 08 24.7	0 21 58.2	1.523 6923	13	293 03 47.3	1 39 10.9	1.414 4334
13	242 11 06.0	-0 23 57.1	1.521 0873	15	294 16 33.7	-1 40 12.8	1.412 6545
15	243 14 00.3	0 25 55.8	1.518 4787	17	295 29 31.1	1 41 12.1	1.410 9166
17	244 17 07.6	0 27 54.5	1.515 8673	19	296 42 39.2	1 42 08.9	1.409 2206
19	245 20 28.0	0 29 52.9	1.513 2541	21	297 55 57.9	1 43 03.0	1.407 5674
21	246 24 01.6	0 31 51.2	1.510 6398	23	299 09 26.8	1 43 54.3	1.405 9578
23	247 27 48.5	0 33 49.3	1.508 0254	25	300 23 05.7	1 44 43.0	1.404 3926
25	248 31 48.6	-0 35 47.0	1.505 4118	27	301 36 54.5	-1 45 28.9	1.402 8727
27	249 36 02.2	0 37 44.4	1.502 7998	29	302 50 52.8	1 46 11.9	1.401 3989
29	250 40 29.3	0 39 41.4	1.500 1905	May 1	304 05 00.3	1 46 52.1	1.399 9719
31	251 45 09.9	0 41 38.0	1.497 5847	3	305 19 16.8	1 47 29.4	1.398 5926
Feb. 2	252 50 04.0	0 43 34.1	1.494 9834	5	306 33 42.0	1 48 03.7	1.397 2616
4	253 55 11.8	0 45 29.7	1.492 3875	7	307 48 15.6	1 48 35.1	1.395 9797
6	255 00 33.2	-0 47 24.6	1.489 7980	9	309 02 57.3	-1 49 03.4	1.394 7475
8	256 06 08.3	0 49 19.0	1.487 2158	11	310 17 46.8	1 49 28.7	1.393 5658
10	257 11 57.2	0 51 12.7	1.484 6419	13	311 32 43.9	1 49 50.9	1.392 4352
12	258 17 59.8	0 53 05.6	1.482 0772	15	312 47 48.0	1 50 10.0	1.391 3563
14	259 24 16.2	0 54 57.7	1.479 5228	17	314 02 59.1	1 50 26.0	1.390 3297
16	260 30 46.3	0 56 49.0	1.476 9797	19	315 18 16.6	1 50 38.8	1.389 3560
18	261 37 30.3	-0 58 39.4	1.474 4488	21	316 33 40.4	-1 50 48.5	1.388 4357
20	262 44 28.1	1 00 28.9	1.471 9311	23	317 49 10.0	1 50 55.0	1.387 5693
22	263 51 39.7	1 02 17.3	1.469 4276	25	319 04 45.0	1 50 58.2	1.386 7574
24	264 59 05.1	1 04 04.7	1.466 9394	27	320 20 25.3	1 50 58.3	1.386 0003
26	266 06 44.2	1 05 50.9	1.464 4674	29	321 36 10.3	1 50 55.1	1.385 2986
28	267 14 37.2	1 07 36.0	1.462 0127	31	322 51 59.7	1 50 48.7	1.384 6525
Mar. 2	268 22 43.8	-1 09 19.8	1.459 5763	June 2	324 07 53.2	-1 50 39.0	1.384 0626
4	269 31 04.2	1 11 02.3	1.457 1591	4	325 23 50.3	1 50 26.1	1.383 5290
6	270 39 38.2	1 12 43.5	1.454 7623	6	326 39 50.8	1 50 10.0	1.383 0522
8	271 48 25.8	1 14 23.3	1.452 3868	8	327 55 54.2	1 49 50.6	1.382 6324
10	272 57 27.0	1 16 01.6	1.450 0337	10	329 12 00.2	1 49 28.0	1.382 2698
12	274 06 41.6	1 17 38.3	1.447 7040	12	330 28 08.3	1 49 02.1	1.381 9647
14	275 16 09.7	-1 19 13.5	1.445 3986	14	331 44 18.3	-1 48 33.1	1.381 7172
16	276 25 51.1	1 20 47.0	1.443 1187	16	333 00 29.6	1 48 00.8	1.381 5275
18	277 35 45.7	1 22 18.9	1.440 8653	18	334 16 42.0	1 47 25.3	1.381 3957
20	278 45 53.5	1 23 48.9	1.438 6393	20	335 32 54.9	1 46 46.7	1.381 3218
22	279 56 14.4	1 25 17.2	1.436 4418	22	336 49 08.2	1 46 04.9	1.381 3059
24	281 06 48.2	1 26 43.5	1.434 2738	24	338 05 21.3	1 45 20.0	1.381 3481
26	282 17 34.7	-1 28 08.0	1.432 1363	26	339 21 33.9	-1 44 31.9	1.381 4482
28	283 28 34.0	1 29 30.4	1.430 0303	28	340 37 45.5	1 43 40.9	1.381 6063
30	284 39 45.9	1 30 50.7	1.427 9568	30	341 53 55.9	1 42 46.7	1.381 8223
Apr. 1	285 51 10.1	1 32 09.0	1.425 9167	July 2	343 10 04.5	1 41 49.6	1.382 0959
3	287 02 46.7	-1 33 25.1	1.423 9111	4	344 26 11.1	-1 40 49.5	1.382 4272

MARS, 2022

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
July 2	343 10 04.5	-1 41 49.6	1.382 0959	Oct. 2	39 26 51.3	-0 19 49.2	1.448 8179
4	344 26 11.1	1 40 49.5	1.382 4272	4	40 35 57.6	0 17 37.3	1.451 1609
6	345 42 15.2	1 39 46.5	1.382 8158	6	41 44 50.5	0 15 25.3	1.453 5268
8	346 58 16.5	1 38 40.6	1.383 2616	8	42 53 29.9	0 13 13.4	1.455 9146
10	348 14 14.6	1 37 31.8	1.383 7644	10	44 01 55.7	0 11 01.6	1.458 3233
12	349 30 09.1	1 36 20.3	1.384 3237	12	45 10 07.9	0 08 50.0	1.460 7519
14	350 45 59.6	-1 35 06.0	1.384 9394	14	46 18 06.4	-0 06 38.6	1.463 1993
16	352 01 45.9	1 33 49.0	1.385 6110	16	47 25 51.2	0 04 27.5	1.465 6646
18	353 17 27.4	1 32 29.3	1.386 3382	18	48 33 22.4	-0 02 16.7	1.468 1466
20	354 33 03.9	1 31 07.0	1.387 1206	20	49 40 39.8	+0 00 06.4	1.470 6445
22	355 48 35.0	1 29 42.2	1.387 9577	22	50 47 43.5	0 02 03.6	1.473 1571
24	357 04 00.4	1 28 14.9	1.388 8490	24	51 54 33.4	0 04 13.0	1.475 6834
26	358 19 19.7	-1 26 45.2	1.389 7942	26	53 01 09.5	+0 06 21.9	1.478 2225
28	359 34 32.5	1 25 13.1	1.390 7926	28	54 07 32.0	0 08 30.2	1.480 7734
30	0 49 38.7	1 23 38.8	1.391 8437	30	55 13 40.7	0 10 37.9	1.483 3351
Aug. 1	2 04 37.7	1 22 02.1	1.392 9468	Nov. 1	56 19 35.8	0 12 44.9	1.485 9065
3	3 19 29.4	1 20 23.3	1.394 1015	3	57 25 17.1	0 14 51.2	1.488 4868
5	4 34 13.4	1 18 42.4	1.395 3071	5	58 30 44.9	0 16 56.7	1.491 0748
7	5 48 49.3	-1 16 59.4	1.396 5628	7	59 35 59.0	+0 19 01.4	1.493 6698
9	7 03 17.0	1 15 14.5	1.397 8681	9	60 40 59.5	0 21 05.3	1.496 2706
11	8 17 36.1	1 13 27.6	1.399 2222	11	61 45 46.5	0 23 08.3	1.498 8764
13	9 31 46.3	1 11 38.9	1.400 6244	13	62 50 20.1	0 25 10.4	1.501 4861
15	10 45 47.3	1 09 48.4	1.402 0740	15	63 54 40.2	0 27 11.5	1.504 0990
17	11 59 38.9	1 07 56.3	1.403 5701	17	64 58 47.0	0 29 11.7	1.506 7140
19	13 13 20.9	-1 06 02.5	1.405 1120	19	66 02 40.4	+0 31 10.7	1.509 3302
21	14 26 52.9	1 04 07.1	1.406 6989	21	67 06 20.7	0 33 08.8	1.511 9467
23	15 40 14.7	1 02 10.2	1.408 3299	23	68 09 47.7	0 35 05.8	1.514 5627
25	16 53 26.1	1 00 11.9	1.410 0043	25	69 13 01.7	0 37 01.6	1.517 1772
27	18 06 26.9	0 58 12.3	1.411 7210	27	70 16 02.7	0 38 56.4	1.519 7893
29	19 19 16.8	0 56 11.4	1.413 4794	29	71 18 50.8	0 40 49.9	1.522 3982
31	20 31 55.6	-0 54 09.3	1.415 2784	Dec. 1	72 21 26.1	+0 42 42.3	1.525 0030
Sept. 2	21 44 23.2	0 52 06.1	1.417 1171	3	73 23 48.5	0 44 33.4	1.527 6029
4	22 56 39.3	0 50 01.7	1.418 9947	5	74 25 58.4	0 46 23.2	1.530 1970
6	24 08 43.7	0 47 56.5	1.420 9102	7	75 27 55.6	0 48 11.8	1.532 7846
8	25 20 36.4	0 45 50.3	1.422 8626	9	76 29 40.5	0 49 59.1	1.535 3647
10	26 32 16.9	0 43 43.2	1.424 8511	11	77 31 12.9	0 51 45.0	1.537 9365
12	27 43 45.4	-0 41 35.4	1.426 8745	13	78 32 33.2	+0 53 29.6	1.540 4994
14	28 55 01.5	0 39 26.9	1.428 9321	15	79 33 41.2	0 55 12.9	1.543 0524
16	30 06 05.2	0 37 17.7	1.431 0227	17	80 34 37.3	0 56 54.8	1.545 5949
18	31 16 56.3	0 35 07.9	1.433 1454	19	81 35 21.4	0 58 35.2	1.548 1260
20	32 27 34.6	0 32 57.7	1.435 2991	21	82 35 53.7	1 00 14.3	1.550 6450
22	33 38 00.1	0 30 47.0	1.437 4830	23	83 36 14.3	1 01 51.9	1.553 1512
24	34 48 12.6	-0 28 35.9	1.439 6959	25	84 36 23.3	+1 03 28.1	1.555 6438
26	35 58 12.1	0 26 24.5	1.441 9369	27	85 36 20.9	1 05 02.8	1.558 1222
28	37 07 58.5	0 24 12.9	1.444 2049	29	86 36 07.2	1 06 36.0	1.560 5855
30	38 17 31.5	0 22 01.1	1.446 4989	31	87 35 42.3	1 08 07.7	1.563 0332
Oct. 2	39 26 51.3	-0 19 49.2	1.448 8179	33	88 35 06.2	+1 09 37.9	1.565 4644

MARS, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	252	23	16.7	-0	7	15.6	Feb.	15	285	42	01.7	-0	39	40.7
	1	253	05	54.8	0	7	55.2		16	286	26	16.8	0	40	25.2
	2	253	48	35.3	0	8	34.8		17	287	10	33.7	0	41	09.7
	3	254	31	18.1	0	9	14.7		18	287	54	52.6	0	41	54.3
	4	255	14	03.0	0	9	54.6		19	288	39	13.3	0	42	39.0
	5	255	56	50.1	0	10	34.7		20	289	23	36.0	0	43	23.6
	6	256	39	39.2	-0	11	14.9		21	290	08	00.7	-0	44	08.4
	7	257	22	30.4	0	11	55.3		22	290	52	27.3	0	44	53.1
	8	258	05	23.8	0	12	35.7		23	291	36	55.9	0	45	37.9
	9	258	48	19.2	0	13	16.3		24	292	21	26.4	0	46	22.8
	10	259	31	16.8	0	13	57.0		25	293	05	58.8	0	47	07.6
	11	260	14	16.6	0	14	37.9		26	293	50	33.1	0	47	52.4
	12	260	57	18.6	-0	15	18.9		27	294	35	09.1	-0	48	37.3
	13	261	40	22.8	0	16	00.0		28	295	19	46.7	0	49	22.1
	14	262	23	29.2	0	16	41.2	Mar.	1	296	04	25.9	0	50	06.9
	15	263	06	37.9	0	17	22.6		2	296	49	06.5	0	50	51.7
	16	263	49	48.8	0	18	04.1		3	297	33	48.7	0	51	36.5
	17	264	33	01.9	0	18	45.7		4	298	18	32.2	0	52	21.2
	18	265	16	17.3	-0	19	27.5		5	299	03	17.2	-0	53	05.9
	19	265	59	34.9	0	20	09.4		6	299	48	03.5	0	53	50.6
	20	266	42	54.8	0	20	51.4		7	300	32	51.2	0	54	35.3
	21	267	26	16.9	0	21	33.6		8	301	17	40.3	0	55	19.9
	22	268	09	41.2	0	22	15.9		9	302	02	30.8	0	56	04.4
	23	268	53	07.9	0	22	58.3		10	302	47	22.6	0	56	48.9
	24	269	36	36.8	-0	23	40.9		11	303	32	15.7	-0	57	33.4
	25	270	20	08.1	0	24	23.5		12	304	17	10.1	0	58	17.8
	26	271	03	41.6	0	25	06.3		13	305	02	05.7	0	59	02.2
	27	271	47	17.5	0	25	49.3		14	305	47	02.6	0	59	46.5
	28	272	30	55.7	0	26	32.3		15	306	32	00.8	1	0	30.7
	29	273	14	36.1	0	27	15.4		16	307	17	00.2	1	1	14.9
	30	273	58	18.6	-0	27	58.6		17	308	02	00.8	-1	1	58.9
	31	274	42	03.3	0	28	41.9		18	308	47	02.7	1	2	43.0
Feb.	1	275	25	49.9	0	29	25.3		19	309	32	05.8	1	3	26.9
	2	276	09	38.4	0	30	08.8		20	310	17	10.2	1	4	10.7
	3	276	53	28.9	0	30	52.4		21	311	02	16.0	1	4	54.5
	4	277	37	21.2	0	31	36.0		22	311	47	23.0	1	5	38.1
	5	278	21	15.4	-0	32	19.7		23	312	32	31.3	-1	6	21.6
	6	279	05	11.4	0	33	03.5		24	313	17	40.9	1	7	05.0
	7	279	49	09.4	0	33	47.4		25	314	02	51.6	1	7	48.2
	8	280	33	09.3	0	34	31.3		26	314	48	03.4	1	8	31.3
	9	281	17	11.0	0	35	15.3		27	315	33	16.2	1	9	14.2
	10	282	01	14.7	0	35	59.4		28	316	18	29.9	1	9	57.0
	11	282	45	20.3	-0	36	43.5		29	317	03	44.4	-1	10	39.6
	12	283	29	27.8	0	37	27.7		30	317	48	59.6	1	11	22.0
	13	284	13	37.2	0	38	12.0		31	318	34	15.4	1	12	04.2
	14	284	57	48.5	0	38	56.3	Apr.	1	319	19	31.9	1	12	46.3
	15	285	42	01.7	-0	39	40.7		2	320	04	49.0	-1	13	28.1

MARS, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	319	19	31.9	-1	12	46.3	May	17	354	02	18.7	-1	39	45.5
	2	320	04	49.0	1	13	28.1		18	354	47	17.0	1	40	11.1
	3	320	50	06.7	1	14	09.8		19	355	32	13.8	1	40	36.3
	4	321	35	24.8	1	14	51.2		20	356	17	09.0	1	41	00.9
	5	322	20	43.5	1	15	32.4		21	357	02	02.5	1	41	25.0
	6	323	06	02.5	1	16	13.5		22	357	46	54.2	1	41	48.5
	7	323	51	22.0	-1	16	54.3		23	358	31	43.9	-1	42	11.4
	8	324	36	41.7	1	17	34.8		24	359	16	31.6	1	42	33.8
	9	325	22	01.8	1	18	15.2		25	0	01	17.2	1	42	55.6
	10	326	07	22.2	1	18	55.3		26	0	46	00.6	1	43	16.8
	11	326	52	42.7	1	19	35.2		27	1	30	41.7	1	43	37.5
	12	327	38	03.5	1	20	14.8		28	2	15	20.4	1	43	57.5
	13	328	23	24.5	-1	20	54.2		29	2	59	56.6	-1	44	17.0
	14	329	08	45.6	1	21	33.4		30	3	44	30.2	1	44	35.9
	15	329	54	06.9	1	22	12.2		31	4	29	01.2	1	44	54.2
	16	330	39	28.5	1	22	50.8	June	1	5	13	29.3	1	45	11.9
	17	331	24	50.2	1	23	29.1		2	5	57	54.6	1	45	29.0
	18	332	10	12.2	1	24	07.2		3	6	42	16.8	1	45	45.5
	19	332	55	34.4	-1	24	44.9		4	7	26	36.0	-1	46	01.4
	20	333	40	56.8	1	25	22.3		5	8	10	52.1	1	46	16.7
	21	334	26	19.3	1	25	59.4		6	8	55	04.9	1	46	31.4
	22	335	11	41.8	1	26	36.1		7	9	39	14.4	1	46	45.4
	23	335	57	04.3	1	27	12.5		8	10	23	20.6	1	46	58.9
	24	336	42	26.5	1	27	48.5		9	11	07	23.5	1	47	11.7
	25	337	27	48.5	-1	28	24.2		10	11	51	22.9	-1	47	23.8
	26	338	13	10.1	1	28	59.5		11	12	35	19.0	1	47	35.3
	27	338	58	31.2	1	29	34.4		12	13	19	11.7	1	47	46.1
	28	339	43	51.8	1	30	08.9		13	14	03	01.0	1	47	56.3
	29	340	29	11.8	1	30	43.1		14	14	46	46.9	1	48	05.8
	30	341	14	31.2	1	31	16.8		15	15	30	29.2	1	48	14.6
May	1	341	59	49.8	-1	31	50.2		16	16	14	08.0	-1	48	22.7
	2	342	45	07.6	1	32	23.1		17	16	57	43.0	1	48	30.0
	3	343	30	24.5	1	32	55.7		18	17	41	14.2	1	48	36.7
	4	344	15	40.5	1	33	27.8		19	18	24	41.5	1	48	42.7
	5	345	00	55.5	1	33	59.5		20	19	08	04.6	1	48	47.9
	6	345	46	09.4	1	34	30.8		21	19	51	23.6	1	48	52.4
	7	346	31	22.2	-1	35	01.7		22	20	34	38.3	-1	48	56.1
	8	347	16	33.7	1	35	32.1		23	21	17	48.5	1	48	59.2
	9	348	01	44.0	1	36	02.1		24	22	00	54.2	1	49	01.5
	10	348	46	53.0	1	36	31.7		25	22	43	55.3	1	49	03.1
	11	349	32	00.7	1	37	00.8		26	23	26	51.5	1	49	04.0
	12	350	17	07.1	1	37	29.4		27	24	09	42.9	1	49	04.1
	13	351	02	12.0	-1	37	57.6		28	24	52	29.1	-1	49	03.5
	14	351	47	15.7	1	38	25.3		29	25	35	10.1	1	49	02.2
	15	352	32	18.0	1	38	52.5		30	26	17	45.8	1	49	00.2
	16	353	17	19.0	1	39	19.2	July	1	27	00	16.1	1	48	57.4
	17	354	02	18.7	-1	39	45.5		2	27	42	40.7	-1	48	53.9

MARS, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	27	00	16.1	-1	48	57.4	Aug.	16	57	25	44.8	-1	32	04.4
	2	27	42	40.7	1	48	53.9		17	58	01	42.3	1	31	21.2
	3	28	24	59.7	1	48	49.6		18	58	37	27.6	1	30	36.9
	4	29	07	12.8	1	48	44.6		19	59	13	00.2	1	29	51.6
	5	29	49	20.1	1	48	38.8		20	59	48	20.0	1	29	05.4
	6	30	31	21.4	1	48	32.3		21	60	23	26.5	1	28	18.1
	7	31	13	16.7	-1	48	25.0		22	60	58	19.4	-1	27	29.8
	8	31	55	05.9	1	48	17.0		23	61	32	58.5	1	26	40.5
	9	32	36	49.0	1	48	08.1		24	62	07	23.4	1	25	50.1
	10	33	18	26.1	1	47	58.5		25	62	41	33.7	1	24	58.8
	11	33	59	56.9	1	47	48.1		26	63	15	29.3	1	24	06.3
	12	34	41	21.5	1	47	36.9		27	63	49	09.6	1	23	12.9
	13	35	22	39.8	-1	47	24.8		28	64	22	34.5	-1	22	18.3
	14	36	03	51.6	1	47	11.9		29	64	55	43.7	1	21	22.7
	15	36	44	56.8	1	46	58.2		30	65	28	36.8	1	20	25.9
	16	37	25	55.3	1	46	43.6		31	66	01	13.6	1	19	28.1
	17	38	06	46.9	1	46	28.2	Sept.	1	66	33	33.8	1	18	29.1
	18	38	47	31.6	1	46	12.0		2	67	05	37.2	1	17	28.9
	19	39	28	09.1	-1	45	54.9		3	67	37	23.5	-1	16	27.6
	20	40	08	39.3	1	45	36.9		4	68	08	52.4	1	15	25.0
	21	40	49	02.0	1	45	18.2		5	68	40	03.6	1	14	21.3
	22	41	29	17.1	1	44	58.5		6	69	10	56.9	1	13	16.2
	23	42	09	24.4	1	44	38.1		7	69	41	31.9	1	12	09.9
	24	42	49	23.7	1	44	16.8		8	70	11	48.3	1	11	02.4
	25	43	29	14.8	-1	43	54.7		9	70	41	45.7	-1	9	53.5
	26	44	08	57.5	1	43	31.7		10	71	11	23.7	1	8	43.3
	27	44	48	31.6	1	43	07.9		11	71	40	42.1	1	7	31.7
	28	45	27	56.9	1	42	43.3		12	72	09	40.4	1	6	18.8
	29	46	07	13.2	1	42	17.8		13	72	38	18.2	1	5	04.6
	30	46	46	20.4	1	41	51.4		14	73	06	35.0	1	3	48.9
	31	47	25	18.2	-1	41	24.2		15	73	34	30.3	-1	2	31.9
Aug.	1	48	04	06.5	1	40	56.1		16	74	02	03.5	1	1	13.6
	2	48	42	45.2	1	40	27.2		17	74	29	14.2	0	59	53.8
	3	49	21	14.2	1	39	57.4		18	74	56	01.8	0	58	32.6
	4	49	59	33.3	1	39	26.7		19	75	22	25.7	0	57	09.9
	5	50	37	42.4	1	38	55.1		20	75	48	25.3	0	55	45.8
	6	51	15	41.4	-1	38	22.5		21	76	14	00.1	-0	54	20.2
	7	51	53	30.1	1	37	49.1		22	76	39	09.3	0	52	53.2
	8	52	31	08.6	1	37	14.7		23	77	03	52.5	0	51	24.6
	9	53	08	36.6	1	36	39.3		24	77	28	09.0	0	49	54.5
	10	53	45	54.0	1	36	03.0		25	77	51	58.3	0	48	22.8
	11	54	23	00.6	1	35	25.7		26	78	15	19.7	0	46	49.5
	12	54	59	56.2	-1	34	47.5		27	78	38	12.7	-0	45	14.6
	13	55	36	40.6	1	34	08.2		28	79	00	36.7	0	43	38.0
	14	56	13	13.7	1	33	27.9		29	79	22	31.2	0	41	59.7
	15	56	49	35.1	1	32	46.7		30	79	43	55.6	0	40	19.7
	16	57	25	44.8	-1	32	04.4	Oct.	1	80	04	49.3	-0	38	38.0

MARS, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	80	04	49.3	-0	38	38.0	Nov.	16	83	39	12.5	+1	15	03.9
	2	80	25	11.7	0	36	54.4		17	83	24	38.1	1	18	09.0
	3	80	45	02.4	0	35	09.0		18	83	09	16.7	1	21	14.0
	4	81	04	20.6	0	33	21.8		19	82	53	09.8	1	24	18.7
	5	81	23	05.8	0	31	32.6		20	82	36	18.8	1	27	23.0
	6	81	41	17.3	0	29	41.5		21	82	18	45.4	1	30	26.6
	7	81	58	54.5	-0	27	48.5		22	82	00	31.6	+1	33	29.2
	8	82	15	56.7	0	25	53.4		23	81	41	39.3	1	36	30.8
	9	82	32	23.3	0	23	56.4		24	81	22	10.8	1	39	31.0
	10	82	48	13.5	0	21	57.4		25	81	02	08.6	1	42	29.7
	11	83	03	26.6	0	19	56.3		26	80	41	34.9	1	45	26.6
	12	83	18	01.8	0	17	53.2		27	80	20	32.6	1	48	21.4
	13	83	31	58.2	-0	15	48.0		28	79	59	04.3	+1	51	14.1
	14	83	45	15.1	0	13	40.8		29	79	37	12.9	1	54	04.2
	15	83	57	51.5	0	11	31.5		30	79	15	01.2	1	56	51.7
	16	84	09	46.6	0	9	20.1	Dec.	1	78	52	32.3	1	59	36.3
	17	84	20	59.4	0	7	06.6		2	78	29	48.9	2	2	17.7
	18	84	31	29.2	0	4	50.9		3	78	06	54.3	2	4	55.8
	19	84	41	15.1	-0	2	33.2		4	77	43	51.3	+2	7	30.4
	20	84	50	16.2	-0	0	13.3		5	77	20	43.0	2	10	01.2
	21	84	58	31.7	+0	2	08.7		6	76	57	32.3	2	12	28.1
	22	85	06	00.8	0	4	32.9		7	76	34	22.3	2	14	50.9
	23	85	12	42.8	0	6	59.2		8	76	11	15.8	2	17	09.4
	24	85	18	36.9	0	9	27.7		9	75	48	15.8	2	19	23.4
	25	85	23	42.4	+0	11	58.3		10	75	25	25.1	+2	21	33.0
	26	85	27	58.8	0	14	31.1		11	75	02	46.5	2	23	37.8
	27	85	31	25.4	0	17	06.0		12	74	40	22.9	2	25	37.9
	28	85	34	01.8	0	19	43.1		13	74	18	17.0	2	27	33.2
	29	85	35	47.6	0	22	22.3		14	73	56	31.4	2	29	23.5
	30	85	36	42.2	0	25	03.6		15	73	35	08.7	2	31	08.9
	31	85	36	45.3	+0	27	47.0		16	73	14	11.4	+2	32	49.3
Nov.	1	85	35	56.5	0	30	32.4		17	72	53	42.0	2	34	24.7
	2	85	34	15.7	0	33	19.9		18	72	33	42.8	2	35	55.1
	3	85	31	42.6	0	36	09.3		19	72	14	16.1	2	37	20.5
	4	85	28	17.0	0	39	00.5		20	71	55	24.1	2	38	40.9
	5	85	23	58.8	0	41	53.6		21	71	37	08.6	2	39	56.5
	6	85	18	47.9	+0	44	48.4		22	71	19	31.8	+2	41	07.2
	7	85	12	44.3	0	47	44.7		23	71	02	35.3	2	42	13.2
	8	85	05	48.1	0	50	42.6		24	70	46	20.8	2	43	14.5
	9	84	57	59.3	0	53	41.9		25	70	30	49.7	2	44	11.2
	10	84	49	18.2	0	56	42.4		26	70	16	03.4	2	45	03.5
	11	84	39	44.8	0	59	44.1		27	70	02	02.9	2	45	51.4
	12	84	29	19.7	+1	2	46.7		28	69	48	49.3	+2	46	35.1
	13	84	18	03.3	1	5	50.2		29	69	36	23.3	2	47	14.7
	14	84	05	56.1	1	8	54.3		30	69	24	45.7	2	47	50.3
	15	83	52	58.9	1	11	59.0		31	69	13	56.9	2	48	21.9
	16	83	39	12.5	+1	15	03.9		32	69	03	57.2	+2	48	49.9

MARS, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	16	43	35.41	-22	23	53.8	2.346 424	3.75	1.99	10	04	39
	1	16	46	38.06	22	29	59.6	2.341 196	3.76	2.00	10	03	45
	2	16	49	41.14	22	35	53.0	2.335 934	3.76	2.00	10	02	52
	3	16	52	44.64	22	41	33.9	2.330 640	3.77	2.01	10	01	59
	4	16	55	48.54	22	47	02.3	2.325 315	3.78	2.01	10	01	07
	5	16	58	52.84	22	52	17.9	2.319 958	3.79	2.02	10	00	15
	6	17	01	57.51	-22	57	20.6	2.314 572	3.80	2.02	9	59	23
	7	17	05	02.56	23	02	10.4	2.309 157	3.81	2.03	9	58	32
	8	17	08	07.98	23	06	47.1	2.303 714	3.82	2.03	9	57	41
	9	17	11	13.75	23	11	10.7	2.298 244	3.83	2.04	9	56	50
	10	17	14	19.88	23	15	21.0	2.292 747	3.84	2.04	9	55	60
	11	17	17	26.35	23	19	18.0	2.287 225	3.84	2.05	9	55	10
	12	17	20	33.16	-23	23	01.6	2.281 677	3.85	2.05	9	54	20
	13	17	23	40.30	23	26	31.8	2.276 106	3.86	2.06	9	53	31
	14	17	26	47.76	23	29	48.4	2.270 511	3.87	2.06	9	52	42
	15	17	29	55.52	23	32	51.4	2.264 892	3.88	2.07	9	51	53
	16	17	33	03.59	23	35	40.7	2.259 252	3.89	2.07	9	51	05
	17	17	36	11.95	23	38	16.3	2.253 589	3.90	2.08	9	50	17
	18	17	39	20.59	-23	40	38.0	2.247 905	3.91	2.08	9	49	29
	19	17	42	29.50	23	42	45.9	2.242 200	3.92	2.09	9	48	42
	20	17	45	38.67	23	44	39.8	2.236 474	3.93	2.09	9	47	54
	21	17	48	48.09	23	46	19.7	2.230 728	3.94	2.10	9	47	07
	22	17	51	57.75	23	47	45.5	2.224 962	3.95	2.10	9	46	21
	23	17	55	07.63	23	48	57.2	2.219 176	3.96	2.11	9	45	34
	24	17	58	17.74	-23	49	54.6	2.213 371	3.97	2.11	9	44	48
	25	18	01	28.05	23	50	37.9	2.207 546	3.98	2.12	9	44	02
	26	18	04	38.56	23	51	06.8	2.201 703	3.99	2.13	9	43	16
	27	18	07	49.26	23	51	21.4	2.195 840	4.00	2.13	9	42	30
	28	18	11	00.13	23	51	21.6	2.189 959	4.02	2.14	9	41	44
	29	18	14	11.16	23	51	07.5	2.184 059	4.03	2.14	9	40	59
	30	18	17	22.32	-23	50	38.9	2.178 142	4.04	2.15	9	40	14
	31	18	20	33.61	23	49	56.0	2.172 207	4.05	2.15	9	39	28
Feb.	1	18	23	45.01	23	48	58.6	2.166 255	4.06	2.16	9	38	43
	2	18	26	56.49	23	47	46.7	2.160 288	4.07	2.17	9	37	58
	3	18	30	08.04	23	46	20.4	2.154 305	4.08	2.17	9	37	13
	4	18	33	19.66	23	44	39.5	2.148 308	4.09	2.18	9	36	28
	5	18	36	31.32	-23	42	44.1	2.142 297	4.11	2.18	9	35	44
	6	18	39	43.02	23	40	34.2	2.136 273	4.12	2.19	9	34	59
	7	18	42	54.75	23	38	09.9	2.130 238	4.13	2.20	9	34	14
	8	18	46	06.49	23	35	31.0	2.124 191	4.14	2.20	9	33	29
	9	18	49	18.24	23	32	37.7	2.118 135	4.15	2.21	9	32	44
	10	18	52	29.98	23	29	29.9	2.112 068	4.16	2.22	9	31	60
	11	18	55	41.71	-23	26	07.8	2.105 993	4.18	2.22	9	31	15
	12	18	58	53.41	23	22	31.3	2.099 909	4.19	2.23	9	30	30
	13	19	02	05.06	23	18	40.4	2.093 817	4.20	2.24	9	29	45
	14	19	05	16.67	23	14	35.3	2.087 718	4.21	2.24	9	29	00
	15	19	08	28.21	-23	10	15.9	2.081 613	4.22	2.25	9	28	15

MARS, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	19	08	28.21	-23	10	15.9	2.081 613	4.22	2.25	9	28	15
	16	19	11	39.68	23	05	42.2	2.075 501	4.24	2.25	9	27	30
	17	19	14	51.07	23	00	54.4	2.069 383	4.25	2.26	9	26	45
	18	19	18	02.36	22	55	52.4	2.063 259	4.26	2.27	9	25	59
	19	19	21	13.55	22	50	36.3	2.057 130	4.27	2.28	9	25	14
	20	19	24	24.64	22	45	06.1	2.050 996	4.29	2.28	9	24	29
	21	19	27	35.60	-22	39	21.9	2.044 857	4.30	2.29	9	23	43
	22	19	30	46.44	22	33	23.7	2.038 713	4.31	2.30	9	22	57
	23	19	33	57.14	22	27	11.7	2.032 564	4.33	2.30	9	22	11
	24	19	37	07.69	22	20	45.8	2.026 410	4.34	2.31	9	21	25
	25	19	40	18.09	22	14	06.2	2.020 252	4.35	2.32	9	20	39
	26	19	43	28.31	22	07	12.9	2.014 090	4.37	2.32	9	19	53
	27	19	46	38.34	-22	00	06.1	2.007 923	4.38	2.33	9	19	06
	28	19	49	48.18	21	52	45.8	2.001 753	4.39	2.34	9	18	19
Mar.	1	19	52	57.80	21	45	12.1	1.995 580	4.41	2.35	9	17	32
	2	19	56	07.19	21	37	25.2	1.989 403	4.42	2.35	9	16	45
	3	19	59	16.35	21	29	25.1	1.983 225	4.43	2.36	9	15	58
	4	20	02	25.26	21	21	11.8	1.977 046	4.45	2.37	9	15	10
	5	20	05	33.92	-21	12	45.6	1.970 865	4.46	2.37	9	14	22
	6	20	08	42.31	21	04	06.5	1.964 685	4.48	2.38	9	13	34
	7	20	11	50.44	20	55	14.6	1.958 505	4.49	2.39	9	12	45
	8	20	14	58.30	20	46	10.0	1.952 327	4.50	2.40	9	11	57
	9	20	18	05.88	20	36	52.9	1.946 151	4.52	2.40	9	11	07
	10	20	21	13.17	20	27	23.5	1.939 977	4.53	2.41	9	10	18
	11	20	24	20.17	-20	17	41.7	1.933 807	4.55	2.42	9	09	28
	12	20	27	26.88	20	07	47.8	1.927 641	4.56	2.43	9	08	39
	13	20	30	33.28	19	57	41.9	1.921 478	4.58	2.44	9	07	48
	14	20	33	39.38	19	47	24.0	1.915 321	4.59	2.44	9	06	58
	15	20	36	45.16	19	36	54.4	1.909 168	4.61	2.45	9	06	07
	16	20	39	50.63	19	26	13.1	1.903 021	4.62	2.46	9	05	16
	17	20	42	55.78	-19	15	20.3	1.896 880	4.64	2.47	9	04	24
	18	20	46	00.62	19	04	16.1	1.890 744	4.65	2.48	9	03	32
	19	20	49	05.13	18	53	00.6	1.884 615	4.67	2.48	9	02	40
	20	20	52	09.33	18	41	34.0	1.878 492	4.68	2.49	9	01	48
	21	20	55	13.20	18	29	56.3	1.872 375	4.70	2.50	9	00	55
	22	20	58	16.75	18	18	07.6	1.866 265	4.71	2.51	9	00	02
	23	21	01	19.98	-18	06	08.3	1.860 160	4.73	2.52	8	59	09
	24	21	04	22.88	17	53	58.3	1.854 061	4.74	2.52	8	58	15
	25	21	07	25.45	17	41	37.9	1.847 969	4.76	2.53	8	57	21
	26	21	10	27.68	17	29	07.3	1.841 882	4.77	2.54	8	56	26
	27	21	13	29.56	17	16	26.5	1.835 801	4.79	2.55	8	55	32
	28	21	16	31.10	17	03	35.8	1.829 727	4.81	2.56	8	54	36
	29	21	19	32.28	-16	50	35.3	1.823 658	4.82	2.57	8	53	41
	30	21	22	33.10	16	37	25.3	1.817 597	4.84	2.57	8	52	45
	31	21	25	33.56	16	24	05.8	1.811 542	4.85	2.58	8	51	49
Apr.	1	21	28	33.65	16	10	37.0	1.805 495	4.87	2.59	8	50	52
	2	21	31	33.39	-15	56	59.1	1.799 456	4.89	2.60	8	49	56

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	21	28	33.65	-16	10	37.0	1.805 495	4.87	2.59	8	50	52
	2	21	31	33.39	15	56	59.1	1.799 456	4.89	2.60	8	49	56
	3	21	34	32.76	15	43	12.3	1.793 425	4.90	2.61	8	48	58
	4	21	37	31.77	15	29	16.7	1.787 402	4.92	2.62	8	48	01
	5	21	40	30.42	15	15	12.6	1.781 389	4.94	2.63	8	47	03
	6	21	43	28.71	15	00	60.0	1.775 386	4.95	2.64	8	46	04
	7	21	46	26.64	-14	46	39.2	1.769 393	4.97	2.64	8	45	06
	8	21	49	24.21	14	32	10.4	1.763 411	4.99	2.65	8	44	06
	9	21	52	21.42	14	17	33.7	1.757 440	5.00	2.66	8	43	07
	10	21	55	18.28	14	02	49.3	1.751 480	5.02	2.67	8	42	07
	11	21	58	14.78	13	47	57.3	1.745 531	5.04	2.68	8	41	07
	12	22	01	10.94	13	32	58.0	1.739 595	5.06	2.69	8	40	07
	13	22	04	06.74	-13	17	51.5	1.733 670	5.07	2.70	8	39	06
	14	22	07	02.20	13	02	38.0	1.727 758	5.09	2.71	8	38	05
	15	22	09	57.33	12	47	17.6	1.721 858	5.11	2.72	8	37	03
	16	22	12	52.12	12	31	50.4	1.715 970	5.12	2.73	8	36	01
	17	22	15	46.59	12	16	16.7	1.710 095	5.14	2.74	8	34	59
	18	22	18	40.75	12	00	36.5	1.704 232	5.16	2.75	8	33	57
	19	22	21	34.59	-11	44	50.1	1.698 380	5.18	2.76	8	32	54
	20	22	24	28.12	11	28	57.5	1.692 540	5.20	2.77	8	31	51
	21	22	27	21.35	11	12	59.1	1.686 711	5.21	2.77	8	30	47
	22	22	30	14.27	10	56	55.0	1.680 893	5.23	2.78	8	29	44
	23	22	33	06.89	10	40	45.4	1.675 086	5.25	2.79	8	28	40
	24	22	35	59.20	10	24	30.5	1.669 289	5.27	2.80	8	27	35
	25	22	38	51.21	-10	08	10.5	1.663 503	5.29	2.81	8	26	31
	26	22	41	42.91	9	51	45.5	1.657 726	5.30	2.82	8	25	26
	27	22	44	34.31	9	35	15.8	1.651 960	5.32	2.83	8	24	21
	28	22	47	25.41	9	18	41.6	1.646 204	5.34	2.84	8	23	15
	29	22	50	16.21	9	02	03.0	1.640 458	5.36	2.85	8	22	09
	30	22	53	06.72	8	45	20.3	1.634 724	5.38	2.86	8	21	03
May	1	22	55	56.94	-8	28	33.6	1.628 999	5.40	2.87	8	19	57
	2	22	58	46.88	8	11	43.1	1.623 286	5.42	2.88	8	18	50
	3	23	01	36.54	7	54	49.1	1.617 585	5.44	2.89	8	17	43
	4	23	04	25.92	7	37	51.6	1.611 894	5.46	2.90	8	16	36
	5	23	07	15.02	7	20	51.0	1.606 216	5.48	2.91	8	15	29
	6	23	10	03.86	7	03	47.3	1.600 549	5.49	2.92	8	14	21
	7	23	12	52.43	-6	46	40.9	1.594 894	5.51	2.93	8	13	13
	8	23	15	40.74	6	29	31.8	1.589 252	5.53	2.94	8	12	05
	9	23	18	28.80	6	12	20.2	1.583 622	5.55	2.96	8	10	56
	10	23	21	16.60	5	55	06.4	1.578 005	5.57	2.97	8	09	47
	11	23	24	04.16	5	37	50.4	1.572 400	5.59	2.98	8	08	38
	12	23	26	51.49	5	20	32.5	1.566 807	5.61	2.99	8	07	29
	13	23	29	38.59	-5	03	12.8	1.561 227	5.63	3.00	8	06	19
	14	23	32	25.47	4	45	51.4	1.555 660	5.65	3.01	8	05	10
	15	23	35	12.14	4	28	28.6	1.550 105	5.67	3.02	8	03	60
	16	23	37	58.61	4	11	04.4	1.544 561	5.69	3.03	8	02	50
	17	23	40	44.89	-3	53	39.0	1.539 029	5.71	3.04	8	01	39

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	23	40	44.89	-3	53	39.0	1.539 029	5.71	3.04	8	01	39
	18	23	43	30.98	3	36	12.6	1.533 507	5.73	3.05	8	00	29
	19	23	46	16.88	3	18	45.3	1.527 997	5.76	3.06	7	59	18
	20	23	49	02.60	3	01	17.4	1.522 495	5.78	3.07	7	58	08
	21	23	51	48.14	2	43	49.1	1.517 003	5.80	3.09	7	56	56
	22	23	54	33.50	2	26	20.5	1.511 520	5.82	3.10	7	55	45
	23	23	57	18.68	-2	08	51.9	1.506 045	5.84	3.11	7	54	34
	24	0	00	03.69	1	51	23.4	1.500 579	5.86	3.12	7	53	22
	25	0	02	48.52	1	33	55.2	1.495 120	5.88	3.13	7	52	11
	26	0	05	33.19	1	16	27.5	1.489 669	5.90	3.14	7	50	59
	27	0	08	17.68	0	59	00.6	1.484 225	5.93	3.15	7	49	47
	28	0	11	02.02	0	41	34.5	1.478 789	5.95	3.16	7	48	35
	29	0	13	46.19	-0	24	09.4	1.473 361	5.97	3.18	7	47	22
	30	0	16	30.21	-0	06	45.6	1.467 939	5.99	3.19	7	46	10
	31	0	19	14.06	+0	10	36.7	1.462 526	6.01	3.20	7	44	57
June	1	0	21	57.77	0	27	57.4	1.457 120	6.04	3.21	7	43	44
	2	0	24	41.32	0	45	16.3	1.451 721	6.06	3.22	7	42	31
	3	0	27	24.72	1	02	33.3	1.446 330	6.08	3.24	7	41	18
	4	0	30	07.98	+1	19	48.0	1.440 946	6.10	3.25	7	40	05
	5	0	32	51.09	1	37	00.5	1.435 570	6.13	3.26	7	38	51
	6	0	35	34.05	1	54	10.4	1.430 202	6.15	3.27	7	37	38
	7	0	38	16.89	2	11	17.7	1.424 841	6.17	3.28	7	36	24
	8	0	40	59.59	2	28	22.2	1.419 488	6.20	3.30	7	35	10
	9	0	43	42.16	2	45	23.7	1.414 142	6.22	3.31	7	33	56
	10	0	46	24.62	+3	02	22.1	1.408 803	6.24	3.32	7	32	42
	11	0	49	06.96	3	19	17.4	1.403 471	6.27	3.33	7	31	28
	12	0	51	49.20	3	36	09.2	1.398 147	6.29	3.35	7	30	14
	13	0	54	31.33	3	52	57.6	1.392 828	6.31	3.36	7	28	59
	14	0	57	13.37	4	09	42.4	1.387 515	6.34	3.37	7	27	45
	15	0	59	55.32	4	26	23.5	1.382 208	6.36	3.39	7	26	30
	16	1	02	37.18	+4	43	00.6	1.376 905	6.39	3.40	7	25	15
	17	1	05	18.94	4	59	33.7	1.371 606	6.41	3.41	7	24	01
	18	1	08	00.61	5	16	02.5	1.366 310	6.44	3.43	7	22	46
	19	1	10	42.19	5	32	27.0	1.361 017	6.46	3.44	7	21	31
	20	1	13	23.67	5	48	46.8	1.355 726	6.49	3.45	7	20	16
	21	1	16	05.05	6	05	01.9	1.350 436	6.51	3.47	7	19	01
	22	1	18	46.34	+6	21	12.1	1.345 147	6.54	3.48	7	17	45
	23	1	21	27.52	6	37	17.3	1.339 859	6.56	3.49	7	16	30
	24	1	24	08.61	6	53	17.2	1.334 571	6.59	3.51	7	15	15
	25	1	26	49.59	7	09	11.7	1.329 284	6.62	3.52	7	13	59
	26	1	29	30.47	7	25	00.7	1.323 996	6.64	3.53	7	12	44
	27	1	32	11.24	7	40	44.0	1.318 709	6.67	3.55	7	11	28
	28	1	34	51.90	+7	56	21.5	1.313 421	6.70	3.56	7	10	12
	29	1	37	32.44	8	11	52.9	1.308 133	6.72	3.58	7	08	56
	30	1	40	12.86	8	27	18.2	1.302 845	6.75	3.59	7	07	40
July	1	1	42	53.16	8	42	37.2	1.297 556	6.78	3.61	7	06	24
	2	1	45	33.33	+8	57	49.8	1.292 267	6.81	3.62	7	05	07

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	1	42	53.16	+8	42	37.2	1.297 556	6.78	3.61	7	06	24
	2	1	45	33.33	8	57	49.8	1.292 267	6.81	3.62	7	05	07
	3	1	48	13.37	9	12	55.8	1.286 977	6.83	3.64	7	03	51
	4	1	50	53.27	9	27	55.2	1.281 687	6.86	3.65	7	02	34
	5	1	53	33.04	9	42	47.7	1.276 396	6.89	3.67	7	01	17
	6	1	56	12.68	9	57	33.3	1.271 104	6.92	3.68	7	00	00
	7	1	58	52.17	+10	12	11.9	1.265 812	6.95	3.70	6	58	43
	8	2	01	31.54	10	26	43.3	1.260 519	6.98	3.71	6	57	26
	9	2	04	10.76	10	41	07.6	1.255 224	7.01	3.73	6	56	09
	10	2	06	49.85	10	55	24.6	1.249 928	7.04	3.74	6	54	52
	11	2	09	28.81	11	09	34.2	1.244 631	7.07	3.76	6	53	34
	12	2	12	07.62	11	23	36.4	1.239 331	7.10	3.78	6	52	16
	13	2	14	46.29	+11	37	31.1	1.234 029	7.13	3.79	6	50	58
	14	2	17	24.82	11	51	18.1	1.228 723	7.16	3.81	6	49	40
	15	2	20	03.18	12	04	57.5	1.223 413	7.19	3.83	6	48	22
	16	2	22	41.39	12	18	29.0	1.218 099	7.22	3.84	6	47	04
	17	2	25	19.42	12	31	52.5	1.212 779	7.25	3.86	6	45	45
	18	2	27	57.28	12	45	07.9	1.207 452	7.28	3.88	6	44	27
	19	2	30	34.95	+12	58	15.2	1.202 120	7.32	3.89	6	43	08
	20	2	33	12.42	13	11	14.2	1.196 780	7.35	3.91	6	41	49
	21	2	35	49.69	13	24	04.9	1.191 433	7.38	3.93	6	40	29
	22	2	38	26.74	13	36	47.1	1.186 078	7.41	3.95	6	39	10
	23	2	41	03.56	13	49	20.7	1.180 715	7.45	3.96	6	37	50
	24	2	43	40.13	14	01	45.7	1.175 344	7.48	3.98	6	36	30
	25	2	46	16.46	+14	14	01.9	1.169 964	7.52	4.00	6	35	10
	26	2	48	52.51	14	26	09.3	1.164 577	7.55	4.02	6	33	50
	27	2	51	28.28	14	38	07.8	1.159 181	7.59	4.04	6	32	29
	28	2	54	03.75	14	49	57.3	1.153 776	7.62	4.06	6	31	08
	29	2	56	38.91	15	01	37.8	1.148 363	7.66	4.08	6	29	46
	30	2	59	13.75	15	13	09.2	1.142 942	7.69	4.09	6	28	25
	31	3	01	48.25	+15	24	31.4	1.137 513	7.73	4.11	6	27	02
Aug.	1	3	04	22.39	15	35	44.4	1.132 075	7.77	4.13	6	25	40
	2	3	06	56.18	15	46	48.1	1.126 629	7.81	4.15	6	24	17
	3	3	09	29.59	15	57	42.5	1.121 175	7.84	4.17	6	22	54
	4	3	12	02.62	16	08	27.7	1.115 713	7.88	4.19	6	21	31
	5	3	14	35.25	16	19	03.5	1.110 242	7.92	4.22	6	20	07
	6	3	17	07.48	+16	29	30.0	1.104 764	7.96	4.24	6	18	42
	7	3	19	39.29	16	39	47.2	1.099 278	8.00	4.26	6	17	17
	8	3	22	10.67	16	49	55.1	1.093 784	8.04	4.28	6	15	52
	9	3	24	41.61	16	59	53.8	1.088 281	8.08	4.30	6	14	27
	10	3	27	12.10	17	09	43.1	1.082 769	8.12	4.32	6	13	00
	11	3	29	42.12	17	19	23.2	1.077 248	8.16	4.34	6	11	34
	12	3	32	11.65	+17	28	54.0	1.071 717	8.21	4.37	6	10	07
	13	3	34	40.67	17	38	15.5	1.066 177	8.25	4.39	6	08	39
	14	3	37	09.18	17	47	27.7	1.060 625	8.29	4.41	6	07	11
	15	3	39	37.14	17	56	30.6	1.055 063	8.34	4.44	6	05	43
	16	3	42	04.54	+18	05	24.1	1.049 488	8.38	4.46	6	04	13

MARS, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	3	42	04.54	+18	05	24.1	1.049 488	8.38	4.46	6	04	13
	17	3	44	31.37	18	14	08.3	1.043 902	8.42	4.48	6	02	44
	18	3	46	57.58	18	22	43.3	1.038 304	8.47	4.51	6	01	13
	19	3	49	23.17	18	31	08.9	1.032 694	8.52	4.53	5	59	42
	20	3	51	48.10	18	39	25.3	1.027 072	8.56	4.56	5	58	10
	21	3	54	12.35	18	47	32.4	1.021 438	8.61	4.58	5	56	38
	22	3	56	35.89	+18	55	30.3	1.015 792	8.66	4.61	5	55	05
	23	3	58	58.70	19	03	19.0	1.010 134	8.71	4.63	5	53	31
	24	4	01	20.73	19	10	58.5	1.004 464	8.76	4.66	5	51	56
	25	4	03	41.98	19	18	28.9	0.998 784	8.80	4.69	5	50	21
	26	4	06	02.41	19	25	50.3	0.993 092	8.86	4.71	5	48	45
	27	4	08	21.99	19	33	02.6	0.987 389	8.91	4.74	5	47	08
	28	4	10	40.69	+19	40	06.0	0.981 676	8.96	4.77	5	45	30
	29	4	12	58.49	19	47	00.4	0.975 954	9.01	4.80	5	43	51
	30	4	15	15.36	19	53	46.1	0.970 222	9.06	4.82	5	42	11
	31	4	17	31.28	20	00	23.1	0.964 481	9.12	4.85	5	40	30
Sept.	1	4	19	46.22	20	06	51.5	0.958 732	9.17	4.88	5	38	49
	2	4	22	00.16	20	13	11.4	0.952 975	9.23	4.91	5	37	06
	3	4	24	13.08	+20	19	23.0	0.947 211	9.28	4.94	5	35	22
	4	4	26	24.94	20	25	26.4	0.941 439	9.34	4.97	5	33	37
	5	4	28	35.73	20	31	21.7	0.935 661	9.40	5.00	5	31	52
	6	4	30	45.41	20	37	09.0	0.929 876	9.46	5.03	5	30	05
	7	4	32	53.95	20	42	48.5	0.924 085	9.52	5.06	5	28	16
	8	4	35	01.33	20	48	20.4	0.918 288	9.58	5.10	5	26	27
	9	4	37	07.52	+20	53	44.6	0.912 485	9.64	5.13	5	24	37
	10	4	39	12.49	20	59	01.4	0.906 676	9.70	5.16	5	22	45
	11	4	41	16.20	21	04	10.9	0.900 860	9.76	5.20	5	20	52
	12	4	43	18.62	21	09	13.1	0.895 039	9.83	5.23	5	18	58
	13	4	45	19.71	21	14	08.3	0.889 212	9.89	5.26	5	17	02
	14	4	47	19.44	21	18	56.5	0.883 380	9.96	5.30	5	15	05
	15	4	49	17.76	+21	23	37.9	0.877 542	10.02	5.33	5	13	07
	16	4	51	14.63	21	28	12.7	0.871 700	10.09	5.37	5	11	07
	17	4	53	10.02	21	32	41.0	0.865 854	10.16	5.41	5	09	05
	18	4	55	03.86	21	37	03.0	0.860 004	10.23	5.44	5	07	03
	19	4	56	56.12	21	41	18.8	0.854 152	10.30	5.48	5	04	58
	20	4	58	46.74	21	45	28.6	0.848 298	10.37	5.52	5	02	52
	21	5	00	35.69	+21	49	32.6	0.842 443	10.44	5.56	5	00	44
	22	5	02	22.91	21	53	30.9	0.836 589	10.51	5.59	4	58	35
	23	5	04	08.36	21	57	23.6	0.830 736	10.59	5.63	4	56	24
	24	5	05	51.99	22	01	11.1	0.824 885	10.66	5.67	4	54	10
	25	5	07	33.74	22	04	53.4	0.819 039	10.74	5.71	4	51	55
	26	5	09	13.58	22	08	30.8	0.813 197	10.81	5.76	4	49	39
	27	5	10	51.46	+22	12	03.5	0.807 362	10.89	5.80	4	47	20
	28	5	12	27.33	22	15	31.6	0.801 534	10.97	5.84	4	44	59
	29	5	14	01.15	22	18	55.4	0.795 716	11.05	5.88	4	42	36
	30	5	15	32.88	22	22	15.2	0.789 909	11.13	5.92	4	40	11
Oct.	1	5	17	02.46	+22	25	31.2	0.784 114	11.22	5.97	4	37	44

MARS, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	5	17	02.46	+22	25	31.2	0.784 114	11.22	5.97	4	37	44
	2	5	18	29.86	22	28	43.5	0.778 334	11.30	6.01	4	35	14
	3	5	19	55.03	22	31	52.5	0.772 568	11.38	6.06	4	32	43
	4	5	21	17.91	22	34	58.3	0.766 819	11.47	6.10	4	30	09
	5	5	22	38.47	22	38	01.2	0.761 087	11.55	6.15	4	27	33
	6	5	23	56.65	22	41	01.4	0.755 375	11.64	6.20	4	24	54
	7	5	25	12.41	+22	43	59.0	0.749 683	11.73	6.24	4	22	13
	8	5	26	25.69	22	46	54.3	0.744 013	11.82	6.29	4	19	30
	9	5	27	36.44	22	49	47.4	0.738 367	11.91	6.34	4	16	44
	10	5	28	44.60	22	52	38.6	0.732 744	12.00	6.39	4	13	56
	11	5	29	50.12	22	55	28.0	0.727 148	12.09	6.44	4	11	04
	12	5	30	52.94	22	58	15.8	0.721 579	12.19	6.49	4	08	11
	13	5	31	52.99	+23	01	02.1	0.716 040	12.28	6.54	4	05	14
	14	5	32	50.21	23	03	47.3	0.710 533	12.38	6.59	4	02	15
	15	5	33	44.54	23	06	31.4	0.705 058	12.47	6.64	3	59	12
	16	5	34	35.90	23	09	14.7	0.699 620	12.57	6.69	3	56	07
	17	5	35	24.23	23	11	57.2	0.694 220	12.67	6.74	3	52	59
	18	5	36	09.47	23	14	39.1	0.688 860	12.77	6.79	3	49	47
	19	5	36	51.54	+23	17	20.7	0.683 544	12.87	6.85	3	46	33
	20	5	37	30.39	23	20	01.8	0.678 273	12.97	6.90	3	43	15
	21	5	38	05.95	23	22	42.9	0.673 052	13.07	6.95	3	39	54
	22	5	38	38.15	23	25	23.8	0.667 882	13.17	7.01	3	36	29
	23	5	39	06.95	23	28	04.7	0.662 768	13.27	7.06	3	33	02
	24	5	39	32.29	23	30	45.8	0.657 711	13.37	7.12	3	29	30
	25	5	39	54.11	+23	33	27.0	0.652 717	13.47	7.17	3	25	56
	26	5	40	12.36	23	36	08.5	0.647 787	13.58	7.22	3	22	18
	27	5	40	27.00	23	38	50.3	0.642 926	13.68	7.28	3	18	36
	28	5	40	38.00	23	41	32.5	0.638 137	13.78	7.33	3	14	50
	29	5	40	45.30	23	44	15.1	0.633 424	13.88	7.39	3	11	01
	30	5	40	48.89	23	46	58.1	0.628 790	13.99	7.44	3	07	08
	31	5	40	48.72	+23	49	41.5	0.624 239	14.09	7.50	3	03	12
Nov.	1	5	40	44.77	23	52	25.3	0.619 773	14.19	7.55	2	59	11
	2	5	40	37.01	23	55	09.3	0.615 398	14.29	7.60	2	55	07
	3	5	40	25.43	23	57	53.5	0.611 115	14.39	7.66	2	50	59
	4	5	40	10.01	24	00	37.6	0.606 929	14.49	7.71	2	46	48
	5	5	39	50.74	24	03	21.6	0.602 842	14.59	7.76	2	42	32
	6	5	39	27.60	+24	06	05.3	0.598 859	14.68	7.81	2	38	13
	7	5	39	00.60	24	08	48.5	0.594 983	14.78	7.87	2	33	50
	8	5	38	29.73	24	11	30.8	0.591 217	14.87	7.92	2	29	23
	9	5	37	55.00	24	14	12.2	0.587 566	14.97	7.97	2	24	52
	10	5	37	16.41	24	16	52.3	0.584 033	15.06	8.01	2	20	17
	11	5	36	33.98	24	19	30.9	0.580 622	15.15	8.06	2	15	39
	12	5	35	47.73	+24	22	07.5	0.577 337	15.23	8.11	2	10	56
	13	5	34	57.70	24	24	42.0	0.574 184	15.32	8.15	2	06	10
	14	5	34	03.92	24	27	13.8	0.571 164	15.40	8.19	2	01	21
	15	5	33	06.44	24	29	42.7	0.568 284	15.47	8.24	1	56	27
	16	5	32	05.33	+24	32	08.3	0.565 548	15.55	8.28	1	51	31

MARS, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	5	32	05.33	+24	32	08.3	0.565 548	15.55	8.28	1	51	31
	17	5	31	00.66	24	34	30.1	0.562 958	15.62	8.31	1	46	30
	18	5	29	52.52	24	36	47.7	0.560 521	15.69	8.35	1	41	26
	19	5	28	41.01	24	39	00.8	0.558 240	15.75	8.38	1	36	19
	20	5	27	26.23	24	41	08.9	0.556 120	15.81	8.42	1	31	09
	21	5	26	08.31	24	43	11.7	0.554 164	15.87	8.45	1	25	55
	22	5	24	47.39	+24	45	08.7	0.552 378	15.92	8.47	1	20	39
	23	5	23	23.63	24	46	59.5	0.550 764	15.97	8.50	1	15	19
	24	5	21	57.18	24	48	43.9	0.549 326	16.01	8.52	1	09	57
	25	5	20	28.22	24	50	21.6	0.548 069	16.05	8.54	1	04	33
	26	5	18	56.94	24	51	52.2	0.546 996	16.08	8.56	0	59	06
	27	5	17	23.54	24	53	15.5	0.546 109	16.10	8.57	0	53	37
	28	5	15	48.22	+24	54	31.2	0.545 411	16.12	8.58	0	48	07
	29	5	14	11.19	24	55	39.1	0.544 905	16.14	8.59	0	42	34
	30	5	12	32.66	24	56	39.1	0.544 592	16.15	8.59	0	37	01
Dec.	1	5	10	52.87	24	57	30.9	0.544 475	16.15	8.60	0	31	26
	2	5	09	12.02	24	58	14.5	0.544 555	16.15	8.59	0	25	49
	3	5	07	30.36	24	58	49.8	0.544 833	16.14	8.59	0	20	13
	4	5	05	48.09	+24	59	16.7	0.545 311	16.13	8.58	0	14	35
	5	5	04	05.46	24	59	35.5	0.545 989	16.11	8.57	0	08	57
	6	5	02	22.68	24	59	46.0	0.546 868	16.08	8.56	0	03	19
	7	5	00	39.97	24	59	48.4	0.547 949	16.05	8.54	23	52	04
	8	4	58	57.56	24	59	43.0	0.549 232	16.01	8.52	23	46	26
	9	4	57	15.66	24	59	29.8	0.550 717	15.97	8.50	23	40	50
	10	4	55	34.49	+24	59	09.3	0.552 405	15.92	8.47	23	35	14
	11	4	53	54.26	24	58	41.6	0.554 295	15.87	8.44	23	29	40
	12	4	52	15.17	24	58	07.1	0.556 386	15.81	8.41	23	24	07
	13	4	50	37.43	24	57	26.1	0.558 680	15.74	8.38	23	18	36
	14	4	49	01.24	24	56	39.2	0.561 174	15.67	8.34	23	13	06
	15	4	47	26.78	24	55	46.6	0.563 868	15.60	8.30	23	07	38
	16	4	45	54.25	+24	54	49.0	0.566 760	15.52	8.26	23	02	12
	17	4	44	23.83	24	53	46.7	0.569 851	15.43	8.21	22	56	48
	18	4	42	55.67	24	52	40.4	0.573 137	15.34	8.17	22	51	27
	19	4	41	29.96	24	51	30.5	0.576 618	15.25	8.12	22	46	09
	20	4	40	06.83	24	50	17.6	0.580 291	15.15	8.06	22	40	53
	21	4	38	46.45	24	49	02.4	0.584 154	15.05	8.01	22	35	40
	22	4	37	28.95	+24	47	45.4	0.588 206	14.95	7.96	22	30	29
	23	4	36	14.46	24	46	27.2	0.592 444	14.84	7.90	22	25	22
	24	4	35	03.08	24	45	08.4	0.596 864	14.73	7.84	22	20	19
	25	4	33	54.93	24	43	49.6	0.601 464	14.62	7.78	22	15	18
	26	4	32	50.10	24	42	31.3	0.606 241	14.51	7.72	22	10	21
	27	4	31	48.66	24	41	13.9	0.611 190	14.39	7.66	22	05	27
	28	4	30	50.68	+24	39	58.1	0.616 309	14.27	7.59	22	00	37
	29	4	29	56.22	24	38	44.1	0.621 593	14.15	7.53	21	55	50
	30	4	29	05.32	24	37	32.6	0.627 039	14.02	7.46	21	51	07
	31	4	28	18.01	24	36	23.7	0.632 644	13.90	7.40	21	46	27
	32	4	27	34.31	+24	35	18.0	0.638 402	13.78	7.33	21	41	51

JUPITER, 2022

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector	Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector
Jan. 1	339 14 16.2	-1 06 40.7	4.992 749	Apr. 3	347 33 50.5	-1 11 52.8	4.975 501
3	339 25 05.5	1 06 48.3	4.992 330	5	347 44 44.4	1 11 58.6	4.975 173
5	339 35 54.9	1 06 56.0	4.991 913	7	347 55 38.3	1 12 04.4	4.974 848
7	339 46 44.5	1 07 03.6	4.991 498	9	348 06 32.3	1 12 10.1	4.974 525
9	339 57 34.1	1 07 11.1	4.991 084	11	348 17 26.4	1 12 15.8	4.974 204
11	340 08 23.9	1 07 18.7	4.990 673	13	348 28 20.6	1 12 21.5	4.973 885
13	340 19 13.7	-1 07 26.2	4.990 263	15	348 39 14.9	-1 12 27.1	4.973 567
15	340 30 03.7	1 07 33.6	4.989 855	17	348 50 09.3	1 12 32.6	4.973 253
17	340 40 53.8	1 07 41.0	4.989 450	19	349 01 03.7	1 12 38.2	4.972 940
19	340 51 44.0	1 07 48.4	4.989 046	21	349 11 58.2	1 12 43.6	4.972 629
21	341 02 34.2	1 07 55.7	4.988 644	23	349 22 52.8	1 12 49.1	4.972 320
23	341 13 24.6	1 08 03.1	4.988 244	25	349 33 47.5	1 12 54.5	4.972 014
25	341 24 15.1	-1 08 10.3	4.987 846	27	349 44 42.2	-1 12 59.8	4.971 710
27	341 35 05.7	1 08 17.5	4.987 450	29	349 55 37.1	1 13 05.1	4.971 407
29	341 45 56.4	1 08 24.7	4.987 056	May 1	350 06 32.0	1 13 10.4	4.971 107
31	341 56 47.2	1 08 31.8	4.986 664	3	350 17 27.0	1 13 15.6	4.970 809
Feb. 2	342 07 38.1	1 08 38.9	4.986 274	5	350 28 22.1	1 13 20.7	4.970 513
4	342 18 29.1	1 08 46.0	4.985 885	7	350 39 17.3	1 13 25.9	4.970 219
6	342 29 20.2	-1 08 53.0	4.985 499	9	350 50 12.5	-1 13 31.0	4.969 928
8	342 40 11.5	1 08 60.0	4.985 115	11	351 01 07.8	1 13 36.0	4.969 638
10	342 51 02.8	1 09 06.9	4.984 733	13	351 12 03.2	1 13 41.0	4.969 351
12	343 01 54.2	1 09 13.8	4.984 352	15	351 22 58.7	1 13 46.0	4.969 066
14	343 12 45.7	1 09 20.7	4.983 974	17	351 33 54.2	1 13 50.9	4.968 783
16	343 23 37.3	1 09 27.5	4.983 598	19	351 44 49.8	1 13 55.7	4.968 502
18	343 34 29.0	-1 09 34.2	4.983 224	21	351 55 45.5	-1 14 00.5	4.968 223
20	343 45 20.8	1 09 41.0	4.982 851	23	352 06 41.3	1 14 05.3	4.967 946
22	343 56 12.7	1 09 47.7	4.982 481	25	352 17 37.2	1 14 10.0	4.967 672
24	344 07 04.7	1 09 54.3	4.982 113	27	352 28 33.1	1 14 14.7	4.967 399
26	344 17 56.8	1 10 00.9	4.981 746	29	352 39 29.1	1 14 19.3	4.967 129
28	344 28 49.0	1 10 07.5	4.981 382	31	352 50 25.1	1 14 24.0	4.966 861
Mar. 2	344 39 41.3	-1 10 14.0	4.981 020	June 2	353 01 21.3	-1 14 28.5	4.966 595
4	344 50 33.7	1 10 20.5	4.980 660	4	353 12 17.5	1 14 33.0	4.966 331
6	345 01 26.1	1 10 27.0	4.980 301	6	353 23 13.7	1 14 37.5	4.966 070
8	345 12 18.7	1 10 33.4	4.979 945	8	353 34 10.1	1 14 41.9	4.965 810
10	345 23 11.4	1 10 39.7	4.979 591	10	353 45 06.5	1 14 46.3	4.965 553
12	345 34 04.2	1 10 46.1	4.979 239	12	353 56 03.0	1 14 50.6	4.965 298
14	345 44 57.0	-1 10 52.3	4.978 889	14	354 06 59.5	-1 14 54.9	4.965 045
16	345 55 49.9	1 10 58.6	4.978 541	16	354 17 56.1	1 14 59.1	4.964 794
18	346 06 43.0	1 11 04.8	4.978 195	18	354 28 52.8	1 15 03.3	4.964 546
20	346 17 36.1	1 11 10.9	4.977 851	20	354 39 49.6	1 15 07.4	4.964 300
22	346 28 29.3	1 11 17.0	4.977 509	22	354 50 46.4	1 15 11.5	4.964 056
24	346 39 22.7	1 11 23.1	4.977 169	24	355 01 43.2	1 15 15.6	4.963 814
26	346 50 16.0	-1 11 29.1	4.976 831	26	355 12 40.2	-1 15 19.6	4.963 574
28	347 01 09.5	1 11 35.1	4.976 496	28	355 23 37.2	1 15 23.6	4.963 336
30	347 12 03.1	1 11 41.1	4.976 162	30	355 34 34.2	1 15 27.5	4.963 101
Apr. 1	347 22 56.8	1 11 47.0	4.975 830	July 2	355 45 31.4	1 15 31.4	4.962 868
3	347 33 50.5	-1 11 52.8	4.975 501	4	355 56 28.6	-1 15 35.2	4.962 637

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
July 2	355 45 31.4	-1 15 31.4	4.962 868	Oct. 2	4 10 16.4	-1 17 39.5	4.954 562
4	355 56 28.6	1 15 35.2	4.962 637	4	4 21 15.8	1 17 41.2	4.954 435
6	356 07 25.8	1 15 39.0	4.962 408	6	4 32 15.2	1 17 42.8	4.954 310
8	356 18 23.1	1 15 42.7	4.962 181	8	4 43 14.7	1 17 44.4	4.954 188
10	356 29 20.5	1 15 46.4	4.961 957	10	4 54 14.2	1 17 45.9	4.954 067
12	356 40 17.9	1 15 50.0	4.961 735	12	5 05 13.7	1 17 47.4	4.953 949
14	356 51 15.4	-1 15 53.6	4.961 515	14	5 16 13.2	-1 17 48.9	4.953 834
16	357 02 13.0	1 15 57.2	4.961 297	16	5 27 12.8	1 17 50.3	4.953 721
18	357 13 10.6	1 16 00.7	4.961 082	18	5 38 12.4	1 17 51.6	4.953 609
20	357 24 08.3	1 16 04.2	4.960 869	20	5 49 12.1	1 17 52.9	4.953 501
22	357 35 06.0	1 16 07.6	4.960 658	22	6 00 11.7	1 17 54.2	4.953 394
24	357 46 03.7	1 16 11.0	4.960 449	24	6 11 11.4	1 17 55.4	4.953 290
26	357 57 01.6	-1 16 14.3	4.960 242	26	6 22 11.1	-1 17 56.5	4.953 189
28	358 07 59.4	1 16 17.6	4.960 038	28	6 33 10.9	1 17 57.7	4.953 089
30	358 18 57.4	1 16 20.8	4.959 836	30	6 44 10.6	1 17 58.7	4.952 992
Aug. 1	358 29 55.4	1 16 24.0	4.959 636	Nov. 1	6 55 10.5	1 17 59.7	4.952 897
3	358 40 53.4	1 16 27.1	4.959 438	3	7 06 10.3	1 18 00.7	4.952 805
5	358 51 51.5	1 16 30.2	4.959 243	5	7 17 10.1	1 18 01.6	4.952 714
7	359 02 49.7	-1 16 33.2	4.959 050	7	7 28 10.0	-1 18 02.5	4.952 627
9	359 13 47.9	1 16 36.3	4.958 859	9	7 39 09.9	1 18 03.3	4.952 541
11	359 24 46.1	1 16 39.2	4.958 670	11	7 50 09.8	1 18 04.1	4.952 458
13	359 35 44.5	1 16 42.1	4.958 484	13	8 01 09.7	1 18 04.8	4.952 377
15	359 46 42.8	1 16 45.0	4.958 300	15	8 12 09.7	1 18 05.5	4.952 298
17	359 57 41.2	1 16 47.8	4.958 118	17	8 23 09.7	1 18 06.1	4.952 222
19	360 08 39.6	-1 16 50.5	4.957 938	19	8 34 09.7	-1 18 06.7	4.952 148
21	0 19 38.1	1 16 53.3	4.957 761	21	8 45 09.7	1 18 07.2	4.952 077
23	0 30 36.7	1 16 55.9	4.957 586	23	8 56 09.8	1 18 07.7	4.952 007
25	0 41 35.3	1 16 58.6	4.957 413	25	9 07 09.8	1 18 08.2	4.951 940
27	0 52 33.9	1 17 01.2	4.957 243	27	9 18 09.9	1 18 08.6	4.951 876
29	1 03 32.6	1 17 03.7	4.957 074	29	9 29 10.0	1 18 08.9	4.951 813
31	1 14 31.3	-1 17 06.2	4.956 908	Dec. 1	9 40 10.1	-1 18 09.2	4.951 753
Sept. 2	1 25 30.1	1 17 08.6	4.956 744	3	9 51 10.2	1 18 09.4	4.951 696
4	1 36 28.9	1 17 11.0	4.956 583	5	10 02 10.4	1 18 09.7	4.951 640
6	1 47 27.7	1 17 13.3	4.956 424	7	10 13 10.5	1 18 09.8	4.951 587
8	1 58 26.6	1 17 15.6	4.956 267	9	10 24 10.7	1 18 09.9	4.951 537
10	2 09 25.6	1 17 17.9	4.956 112	11	10 35 10.9	1 18 09.9	4.951 488
12	2 20 24.5	-1 17 20.1	4.955 960	13	10 46 11.1	-1 18 10.0	4.951 442
14	2 31 23.5	1 17 22.2	4.955 810	15	10 57 11.3	1 18 09.9	4.951 399
16	2 42 22.6	1 17 24.3	4.955 662	17	11 08 11.5	1 18 09.8	4.951 357
18	2 53 21.7	1 17 26.4	4.955 517	19	11 19 11.7	1 18 09.7	4.951 318
20	3 04 20.8	1 17 28.4	4.955 373	21	11 30 11.9	1 18 09.5	4.951 282
22	3 15 20.0	1 17 30.4	4.955 232	23	11 41 12.2	1 18 09.3	4.951 247
24	3 26 19.2	-1 17 32.3	4.955 094	25	11 52 12.5	-1 18 09.0	4.951 215
26	3 37 18.5	1 17 34.2	4.954 957	27	12 03 12.7	1 18 08.7	4.951 186
28	3 48 17.8	1 17 36.0	4.954 823	29	12 14 13.0	1 18 08.3	4.951 158
30	3 59 17.0	1 17 37.8	4.954 692	31	12 25 13.2	1 18 07.9	4.951 133
Oct. 2	4 10 16.4	-1 17 39.5	4.954 562	33	12 36 13.5	-1 18 07.4	4.951 110

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	330	21	04.2	-0	59	52.4	Feb.	15	340	29	54.3	-0	58	16.6
	1	330	32	44.9	0	59	48.0		16	340	44	12.8	0	58	17.0
	2	330	44	31.2	0	59	43.6		17	340	58	32.5	0	58	17.6
	3	330	56	23.1	0	59	39.3		18	341	12	53.5	0	58	18.3
	4	331	08	20.4	0	59	35.2		19	341	27	15.7	0	58	19.2
	5	331	20	23.0	0	59	31.1		20	341	41	39.0	0	58	20.1
	6	331	32	30.7	-0	59	27.2		21	341	56	03.4	-0	58	21.2
	7	331	44	43.4	0	59	23.3		22	342	10	28.9	0	58	22.3
	8	331	57	01.1	0	59	19.5		23	342	24	55.3	0	58	23.6
	9	332	09	23.6	0	59	15.9		24	342	39	22.6	0	58	25.0
	10	332	21	50.8	0	59	12.3		25	342	53	50.8	0	58	26.5
	11	332	34	22.7	0	59	08.9		26	343	08	19.8	0	58	28.1
	12	332	46	59.2	-0	59	05.5		27	343	22	49.3	-0	58	29.9
	13	332	59	40.2	0	59	02.3		28	343	37	19.4	0	58	31.7
	14	333	12	25.5	0	58	59.1	Mar.	1	343	51	49.9	0	58	33.6
	15	333	25	15.1	0	58	56.1		2	344	06	20.6	0	58	35.7
	16	333	38	08.9	0	58	53.2		3	344	20	51.6	0	58	37.9
	17	333	51	06.7	0	58	50.4		4	344	35	22.8	0	58	40.2
	18	334	04	08.4	-0	58	47.7		5	344	49	53.9	-0	58	42.8
	19	334	17	14.0	0	58	45.1		6	345	04	24.8	0	58	45.3
	20	334	30	23.4	0	58	42.6		7	345	18	55.9	0	58	47.7
	21	334	43	36.4	0	58	40.2		8	345	33	27.0	0	58	50.3
	22	334	56	53.0	0	58	38.0		9	345	47	57.8	0	58	53.1
	23	335	10	13.2	0	58	35.8		10	346	02	28.4	0	58	56.0
	24	335	23	36.8	-0	58	33.8		11	346	16	58.6	-0	58	59.1
	25	335	37	03.8	0	58	31.9		12	346	31	28.3	0	59	02.2
	26	335	50	34.1	0	58	30.1		13	346	45	57.4	0	59	05.5
	27	336	04	07.8	0	58	28.4		14	347	00	25.9	0	59	08.9
	28	336	17	44.6	0	58	26.8		15	347	14	53.6	0	59	12.4
	29	336	31	24.5	0	58	25.3		16	347	29	20.6	0	59	16.1
	30	336	45	07.4	-0	58	24.0		17	347	43	46.7	-0	59	19.8
	31	336	58	53.2	0	58	22.7		18	347	58	11.9	0	59	23.7
Feb.	1	337	12	41.7	0	58	21.5		19	348	12	36.0	0	59	27.7
	2	337	26	32.8	0	58	20.5		20	348	26	59.2	0	59	31.8
	3	337	40	26.3	0	58	19.5		21	348	41	21.4	0	59	36.0
	4	337	54	22.3	0	58	18.7		22	348	55	42.4	0	59	40.4
	5	338	08	20.6	-0	58	17.9		23	349	10	02.4	-0	59	44.9
	6	338	22	21.1	0	58	17.3		24	349	24	21.1	0	59	49.4
	7	338	36	23.9	0	58	16.8		25	349	38	38.5	0	59	54.1
	8	338	50	28.8	0	58	16.4		26	349	52	54.4	0	59	59.0
	9	339	04	35.6	0	58	16.1		27	350	07	08.9	1	0	03.9
	10	339	18	44.5	0	58	15.9		28	350	21	21.7	1	0	08.9
	11	339	32	55.1	-0	58	15.8		29	350	35	32.8	-1	0	14.1
	12	339	47	07.5	0	58	15.8		30	350	49	42.0	1	0	19.3
	13	340	01	21.6	0	58	15.9		31	351	03	49.4	1	0	24.7
	14	340	15	37.2	0	58	16.2	Apr.	1	351	17	54.8	1	0	30.2
	15	340	29	54.3	-0	58	16.6		2	351	31	58.2	-1	0	35.8

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	351	17	54.8	-1	0	30.2	May	17	1	08	47.8	-1	6	57.1
	2	351	31	58.2	1	0	35.8		18	1	19	53.5	1	7	08.6
	3	351	45	59.6	1	0	41.6		19	1	30	53.4	1	7	20.1
	4	351	59	58.8	1	0	47.4		20	1	41	47.5	1	7	31.8
	5	352	13	55.7	1	0	53.4		21	1	52	35.5	1	7	43.6
	6	352	27	50.4	1	0	59.5		22	2	03	17.3	1	7	55.6
	7	352	41	42.6	-1	1	05.7		23	2	13	53.0	-1	8	07.7
	8	352	55	32.3	1	1	12.0		24	2	24	22.3	1	8	19.8
	9	353	09	19.5	1	1	18.5		25	2	34	45.1	1	8	32.2
	10	353	23	04.0	1	1	25.1		26	2	45	01.5	1	8	44.6
	11	353	36	45.7	1	1	31.8		27	2	55	11.3	1	8	57.2
	12	353	50	24.5	1	1	38.6		28	3	05	14.4	1	9	09.9
	13	354	04	00.5	-1	1	45.6		29	3	15	10.7	-1	9	22.7
	14	354	17	33.5	1	1	52.6		30	3	25	00.1	1	9	35.7
	15	354	31	03.4	1	1	59.9		31	3	34	42.5	1	9	48.8
	16	354	44	30.3	1	2	07.2	June	1	3	44	17.8	1	10	02.0
	17	354	57	54.0	1	2	14.7		2	3	53	45.9	1	10	15.4
	18	355	11	14.6	1	2	22.3		3	4	03	06.7	1	10	28.9
	19	355	24	32.0	-1	2	30.0		4	4	12	20.0	-1	10	42.5
	20	355	37	46.2	1	2	37.8		5	4	21	25.7	1	10	56.3
	21	355	50	57.0	1	2	45.8		6	4	30	23.8	1	11	10.2
	22	356	04	04.3	1	2	53.9		7	4	39	14.1	1	11	24.2
	23	356	17	08.0	1	3	02.1		8	4	47	56.6	1	11	38.3
	24	356	30	08.0	1	3	10.4		9	4	56	31.2	1	11	52.6
	25	356	43	04.2	-1	3	18.9		10	5	04	57.9	-1	12	07.0
	26	356	55	56.5	1	3	27.4		11	5	13	16.4	1	12	21.6
	27	357	08	44.8	1	3	36.1		12	5	21	27.0	1	12	36.2
	28	357	21	29.1	1	3	44.9		13	5	29	29.3	1	12	51.0
	29	357	34	09.2	1	3	53.9		14	5	37	23.4	1	13	05.9
	30	357	46	45.2	1	4	02.9		15	5	45	09.2	1	13	20.9
May	1	357	59	16.8	-1	4	12.1		16	5	52	46.4	-1	13	36.0
	2	358	11	44.2	1	4	21.5		17	6	00	15.0	1	13	51.3
	3	358	24	07.0	1	4	30.9		18	6	07	34.9	1	14	06.6
	4	358	36	25.4	1	4	40.5		19	6	14	45.8	1	14	22.1
	5	358	48	39.0	1	4	50.2		20	6	21	47.8	1	14	37.6
	6	359	00	48.0	1	5	00.0		21	6	28	40.7	1	14	53.3
	7	359	12	52.0	-1	5	10.0		22	6	35	24.4	-1	15	09.1
	8	359	24	51.1	1	5	20.1		23	6	41	58.8	1	15	25.0
	9	359	36	45.2	1	5	30.4		24	6	48	23.9	1	15	41.0
	10	359	48	34.2	1	5	40.7		25	6	54	39.5	1	15	57.1
	11	0	00	17.9	1	5	51.3		26	7	00	45.6	1	16	13.2
	12	0	11	56.4	1	6	01.9		27	7	06	42.0	1	16	29.5
	13	0	23	29.5	-1	6	12.7		28	7	12	28.6	-1	16	45.9
	14	0	34	57.3	1	6	23.6		29	7	18	05.3	1	17	02.4
	15	0	46	19.6	1	6	34.6		30	7	23	31.9	1	17	19.0
	16	0	57	36.5	1	6	45.8	July	1	7	28	48.5	1	17	35.7
	17	1	08	47.8	-1	6	57.1		2	7	33	54.8	-1	17	52.5

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	7	28	48.5	-1	17	35.7	Aug.	16	8	10	49.0	-1	30	49.7
	2	7	33	54.8	1	17	52.5		17	8	07	12.8	1	31	05.3
	3	7	38	50.8	1	18	09.4		18	8	03	25.6	1	31	20.6
	4	7	43	36.4	1	18	26.3		19	7	59	27.6	1	31	35.7
	5	7	48	11.5	1	18	43.4		20	7	55	18.9	1	31	50.7
	6	7	52	36.1	1	19	00.5		21	7	50	59.6	1	32	05.4
	7	7	56	50.0	-1	19	17.7		22	7	46	29.8	-1	32	19.8
	8	8	00	53.4	1	19	35.0		23	7	41	49.6	1	32	34.1
	9	8	04	46.0	1	19	52.3		24	7	36	59.3	1	32	48.1
	10	8	08	27.9	1	20	09.7		25	7	31	58.9	1	33	01.8
	11	8	11	59.0	1	20	27.2		26	7	26	48.6	1	33	15.3
	12	8	15	19.3	1	20	44.7		27	7	21	28.7	1	33	28.5
	13	8	18	28.6	-1	21	02.2		28	7	15	59.3	-1	33	41.4
	14	8	21	26.8	1	21	19.8		29	7	10	20.6	1	33	54.0
	15	8	24	13.9	1	21	37.5		30	7	04	33.0	1	34	06.3
	16	8	26	49.7	1	21	55.1		31	6	58	36.6	1	34	18.3
	17	8	29	14.1	1	22	12.8	Sept.	1	6	52	31.7	1	34	30.0
	18	8	31	27.2	1	22	30.6		2	6	46	18.6	1	34	41.3
	19	8	33	28.7	-1	22	48.3		3	6	39	57.6	-1	34	52.3
	20	8	35	18.8	1	23	06.0		4	6	33	29.0	1	35	03.0
	21	8	36	57.3	1	23	23.8		5	6	26	52.9	1	35	13.3
	22	8	38	24.3	1	23	41.6		6	6	20	09.7	1	35	23.2
	23	8	39	39.6	1	23	59.4		7	6	13	19.6	1	35	32.7
	24	8	40	43.1	1	24	17.1		8	6	06	22.8	1	35	41.9
	25	8	41	34.9	-1	24	34.9		9	5	59	19.7	-1	35	50.6
	26	8	42	14.9	1	24	52.6		10	5	52	10.4	1	35	59.0
	27	8	42	43.1	1	25	10.4		11	5	44	55.3	1	36	06.9
	28	8	42	59.3	1	25	28.1		12	5	37	34.7	1	36	14.5
	29	8	43	03.6	1	25	45.8		13	5	30	09.0	1	36	21.6
	30	8	42	55.9	1	26	03.4		14	5	22	38.4	1	36	28.3
	31	8	42	36.3	-1	26	21.0		15	5	15	03.2	-1	36	34.6
Aug.	1	8	42	04.8	1	26	38.6		16	5	07	23.9	1	36	40.4
	2	8	41	21.3	1	26	56.1		17	4	59	40.7	1	36	45.8
	3	8	40	26.0	1	27	13.5		18	4	51	54.0	1	36	50.8
	4	8	39	18.8	1	27	30.8		19	4	44	04.0	1	36	55.4
	5	8	37	59.9	1	27	48.1		20	4	36	11.1	1	36	59.5
	6	8	36	29.3	-1	28	05.3		21	4	28	15.7	-1	37	03.1
	7	8	34	47.0	1	28	22.3		22	4	20	18.1	1	37	06.3
	8	8	32	53.2	1	28	39.3		23	4	12	18.6	1	37	09.1
	9	8	30	47.7	1	28	56.1		24	4	04	17.7	1	37	11.4
	10	8	28	30.8	1	29	12.8		25	3	56	15.7	1	37	13.2
	11	8	26	02.3	1	29	29.4		26	3	48	13.1	1	37	14.6
	12	8	23	22.3	-1	29	45.8		27	3	40	10.2	-1	37	15.5
	13	8	20	31.0	1	30	02.0		28	3	32	07.5	1	37	16.0
	14	8	17	28.2	1	30	18.1		29	3	24	05.4	1	37	16.0
	15	8	14	14.2	1	30	34.0		30	3	16	04.2	1	37	15.6
	16	8	10	49.0	-1	30	49.7	Oct.	1	3	08	04.4	-1	37	14.6

JUPITER, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	3	08	04.4	-1	37	14.6	Nov.	16	358	54	31.6	-1	29	38.8
	2	3	00	06.4	1	37	13.2		17	358	52	58.5	1	29	22.9
	3	2	52	10.4	1	37	11.4		18	358	51	37.7	1	29	06.8
	4	2	44	16.8	1	37	09.1		19	358	50	29.3	1	28	50.7
	5	2	36	26.0	1	37	06.3		20	358	49	33.2	1	28	34.5
	6	2	28	38.2	1	37	03.0		21	358	48	49.7	1	28	18.2
	7	2	20	53.8	-1	36	59.3		22	358	48	18.6	-1	28	01.8
	8	2	13	13.2	1	36	55.2		23	358	48	00.2	1	27	45.4
	9	2	05	36.8	1	36	50.6		24	358	47	54.3	1	27	28.8
	10	1	58	04.8	1	36	45.6		25	358	48	01.2	1	27	12.3
	11	1	50	37.6	1	36	40.1		26	358	48	20.6	1	26	55.6
	12	1	43	15.5	1	36	34.2		27	358	48	52.6	1	26	38.9
	13	1	35	58.9	-1	36	27.9		28	358	49	37.1	-1	26	22.2
	14	1	28	48.1	1	36	21.2		29	358	50	34.0	1	26	05.5
	15	1	21	43.4	1	36	14.1		30	358	51	43.4	1	25	48.7
	16	1	14	45.1	1	36	06.6	Dec.	1	358	53	05.1	1	25	31.9
	17	1	07	53.4	1	35	58.7		2	358	54	39.1	1	25	15.0
	18	1	01	08.7	1	35	50.4		3	358	56	25.4	1	24	58.2
	19	0	54	31.2	-1	35	41.7		4	358	58	24.0	-1	24	41.4
	20	0	48	01.3	1	35	32.7		5	359	00	34.8	1	24	24.6
	21	0	41	39.2	1	35	23.3		6	359	02	57.7	1	24	07.8
	22	0	35	25.2	1	35	13.5		7	359	05	32.7	1	23	51.0
	23	0	29	19.6	1	35	03.4		8	359	08	19.7	1	23	34.3
	24	0	23	22.7	1	34	53.0		9	359	11	18.6	1	23	17.6
	25	0	17	34.7	-1	34	42.2		10	359	14	29.4	-1	23	00.9
	26	0	11	56.1	1	34	31.1		11	359	17	51.9	1	22	44.3
	27	0	06	27.0	1	34	19.7		12	359	21	26.0	1	22	27.7
	28	0	01	07.7	1	34	08.0		13	359	25	11.8	1	22	11.2
	29	359	55	58.4	1	33	56.0		14	359	29	09.0	1	21	54.8
	30	359	50	59.2	1	33	43.6		15	359	33	17.6	1	21	38.4
	31	359	46	10.5	-1	33	31.0		16	359	37	37.6	-1	21	22.1
Nov.	1	359	41	32.2	1	33	18.2		17	359	42	08.9	1	21	05.9
	2	359	37	04.5	1	33	05.0		18	359	46	51.3	1	20	49.7
	3	359	32	47.7	1	32	51.6		19	359	51	45.0	1	20	33.6
	4	359	28	41.8	1	32	38.0		20	359	56	49.8	1	20	17.6
	5	359	24	47.0	1	32	24.1		21	0	02	05.6	1	20	01.7
	6	359	21	03.4	-1	32	10.0		22	0	07	32.3	-1	19	45.9
	7	359	17	31.3	1	31	55.7		23	0	13	09.9	1	19	30.1
	8	359	14	10.6	1	31	41.1		24	0	18	58.3	1	19	14.4
	9	359	11	01.6	1	31	26.4		25	0	24	57.2	1	18	58.9
	10	359	08	04.4	1	31	11.5		26	0	31	06.5	1	18	43.4
	11	359	05	19.0	1	30	56.4		27	0	37	26.1	1	18	28.0
	12	359	02	45.4	-1	30	41.2		28	0	43	55.8	-1	18	12.8
	13	359	00	23.9	1	30	25.8		29	0	50	35.6	1	17	57.6
	14	358	58	14.3	1	30	10.2		30	0	57	25.4	1	17	42.5
	15	358	56	16.9	1	29	54.6		31	1	04	25.0	1	17	27.6
	16	358	54	31.6	-1	29	38.8		32	1	11	34.4	-1	17	12.7

JUPITER, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	22	11	08.28	-12	16	52.1	5.555 229	1.58	16.57	15	30	30
	1	22	11	52.87	12	12	39.9	5.567 306	1.58	16.54	15	27	19
	2	22	12	37.80	12	08	25.3	5.579 239	1.58	16.50	15	24	08
	3	22	13	23.06	12	04	08.5	5.591 026	1.57	16.47	15	20	57
	4	22	14	08.65	11	59	49.4	5.602 663	1.57	16.43	15	17	47
	5	22	14	54.55	11	55	28.2	5.614 148	1.57	16.40	15	14	37
	6	22	15	40.76	-11	51	04.7	5.625 480	1.56	16.36	15	11	27
	7	22	16	27.26	11	46	39.2	5.636 655	1.56	16.33	15	08	18
	8	22	17	14.06	11	42	11.5	5.647 673	1.56	16.30	15	05	09
	9	22	18	01.14	11	37	41.7	5.658 531	1.55	16.27	15	01	60
	10	22	18	48.51	11	33	09.9	5.669 228	1.55	16.24	14	58	51
	11	22	19	36.14	11	28	36.1	5.679 762	1.55	16.21	14	55	43
	12	22	20	24.05	-11	24	00.2	5.690 132	1.55	16.18	14	52	35
	13	22	21	12.21	11	19	22.5	5.700 336	1.54	16.15	14	49	27
	14	22	22	00.63	11	14	42.7	5.710 372	1.54	16.12	14	46	19
	15	22	22	49.30	11	10	01.1	5.720 239	1.54	16.09	14	43	12
	16	22	23	38.21	11	05	17.7	5.729 937	1.53	16.07	14	40	05
	17	22	24	27.35	11	00	32.4	5.739 462	1.53	16.04	14	36	58
	18	22	25	16.73	-10	55	45.4	5.748 815	1.53	16.01	14	33	51
	19	22	26	06.32	10	50	56.6	5.757 993	1.53	15.99	14	30	45
	20	22	26	56.13	10	46	06.1	5.766 996	1.52	15.96	14	27	39
	21	22	27	46.14	10	41	13.9	5.775 822	1.52	15.94	14	24	33
	22	22	28	36.36	10	36	20.1	5.784 470	1.52	15.92	14	21	27
	23	22	29	26.78	10	31	24.6	5.792 938	1.52	15.89	14	18	21
	24	22	30	17.39	-10	26	27.5	5.801 224	1.52	15.87	14	15	16
	25	22	31	08.20	10	21	28.8	5.809 328	1.51	15.85	14	12	11
	26	22	31	59.19	10	16	28.5	5.817 248	1.51	15.83	14	09	06
	27	22	32	50.37	10	11	26.6	5.824 982	1.51	15.80	14	06	01
	28	22	33	41.72	10	06	23.2	5.832 529	1.51	15.78	14	02	56
	29	22	34	33.25	10	01	18.3	5.839 887	1.51	15.76	13	59	51
	30	22	35	24.94	-9	56	12.0	5.847 054	1.50	15.74	13	56	47
	31	22	36	16.79	9	51	04.3	5.854 030	1.50	15.73	13	53	43
Feb.	1	22	37	08.79	9	45	55.3	5.860 812	1.50	15.71	13	50	39
	2	22	38	00.92	9	40	44.9	5.867 400	1.50	15.69	13	47	35
	3	22	38	53.19	9	35	33.3	5.873 792	1.50	15.67	13	44	31
	4	22	39	45.59	9	30	20.4	5.879 987	1.50	15.66	13	41	27
	5	22	40	38.11	-9	25	06.3	5.885 985	1.49	15.64	13	38	24
	6	22	41	30.75	9	19	51.0	5.891 785	1.49	15.63	13	35	20
	7	22	42	23.51	9	14	34.5	5.897 386	1.49	15.61	13	32	17
	8	22	43	16.37	9	09	17.0	5.902 787	1.49	15.60	13	29	14
	9	22	44	09.34	9	03	58.3	5.907 989	1.49	15.58	13	26	11
	10	22	45	02.41	8	58	38.6	5.912 991	1.49	15.57	13	23	07
	11	22	45	55.57	-8	53	17.9	5.917 793	1.49	15.56	13	20	05
	12	22	46	48.82	8	47	56.2	5.922 393	1.48	15.54	13	17	02
	13	22	47	42.15	8	42	33.6	5.926 793	1.48	15.53	13	13	59
	14	22	48	35.56	8	37	10.2	5.930 991	1.48	15.52	13	10	56
	15	22	49	29.04	-8	31	45.8	5.934 987	1.48	15.51	13	07	53

JUPITER, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	22	49	29.04	-8	31	45.8	5.934 987	1.48	15.51	13	07	53
	16	22	50	22.58	8	26	20.7	5.938 781	1.48	15.50	13	04	51
	17	22	51	16.19	8	20	54.7	5.942 372	1.48	15.49	13	01	48
	18	22	52	09.85	8	15	28.0	5.945 761	1.48	15.48	12	58	46
	19	22	53	03.56	8	10	00.6	5.948 947	1.48	15.48	12	55	43
	20	22	53	57.33	8	04	32.4	5.951 930	1.48	15.47	12	52	41
	21	22	54	51.14	-7	59	03.5	5.954 708	1.48	15.46	12	49	39
	22	22	55	45.00	7	53	34.0	5.957 283	1.48	15.45	12	46	36
	23	22	56	38.90	7	48	03.8	5.959 652	1.48	15.45	12	43	34
	24	22	57	32.83	7	42	33.0	5.961 816	1.48	15.44	12	40	32
	25	22	58	26.80	7	37	01.6	5.963 774	1.47	15.44	12	37	30
	26	22	59	20.80	7	31	29.7	5.965 526	1.47	15.43	12	34	28
	27	23	00	14.82	-7	25	57.3	5.967 070	1.47	15.43	12	31	25
	28	23	01	08.85	7	20	24.5	5.968 407	1.47	15.42	12	28	23
Mar.	1	23	02	02.89	7	14	51.2	5.969 536	1.47	15.42	12	25	21
	2	23	02	56.93	7	09	17.7	5.970 457	1.47	15.42	12	22	19
	3	23	03	50.97	7	03	43.8	5.971 170	1.47	15.42	12	19	17
	4	23	04	45.00	6	58	09.6	5.971 675	1.47	15.42	12	16	15
	5	23	05	39.01	-6	52	35.3	5.971 971	1.47	15.42	12	13	13
	6	23	06	32.99	6	47	00.8	5.972 060	1.47	15.42	12	10	10
	7	23	07	26.96	6	41	25.7	5.971 942	1.47	15.42	12	07	08
	8	23	08	20.92	6	35	50.6	5.971 617	1.47	15.42	12	04	06
	9	23	09	14.84	6	30	15.3	5.971 085	1.47	15.42	12	01	04
	10	23	10	08.74	6	24	40.1	5.970 347	1.47	15.42	11	58	01
	11	23	11	02.59	-6	19	04.8	5.969 405	1.47	15.42	11	54	59
	12	23	11	56.40	6	13	29.5	5.968 257	1.47	15.42	11	51	57
	13	23	12	50.16	6	07	54.2	5.966 905	1.47	15.43	11	48	54
	14	23	13	43.87	6	02	19.1	5.965 350	1.47	15.43	11	45	52
	15	23	14	37.52	5	56	44.0	5.963 592	1.47	15.44	11	42	49
	16	23	15	31.11	5	51	09.2	5.961 631	1.48	15.44	11	39	47
	17	23	16	24.63	-5	45	34.5	5.959 470	1.48	15.45	11	36	44
	18	23	17	18.08	5	40	00.0	5.957 107	1.48	15.45	11	33	41
	19	23	18	11.45	5	34	25.8	5.954 543	1.48	15.46	11	30	38
	20	23	19	04.76	5	28	51.8	5.951 780	1.48	15.47	11	27	36
	21	23	19	57.98	5	23	18.1	5.948 817	1.48	15.48	11	24	33
	22	23	20	51.13	5	17	44.7	5.945 656	1.48	15.48	11	21	30
	23	23	21	44.20	-5	12	11.6	5.942 295	1.48	15.49	11	18	26
	24	23	22	37.18	5	06	38.9	5.938 736	1.48	15.50	11	15	23
	25	23	23	30.07	5	01	06.6	5.934 978	1.48	15.51	11	12	20
	26	23	24	22.86	4	55	34.8	5.931 023	1.48	15.52	11	09	16
	27	23	25	15.55	4	50	03.5	5.926 870	1.48	15.53	11	06	13
	28	23	26	08.13	4	44	32.7	5.922 520	1.48	15.54	11	03	09
	29	23	27	00.59	-4	39	02.5	5.917 974	1.49	15.56	11	00	05
	30	23	27	52.94	4	33	33.0	5.913 231	1.49	15.57	10	57	02
	31	23	28	45.15	4	28	04.1	5.908 294	1.49	15.58	10	53	58
Apr.	1	23	29	37.24	4	22	35.9	5.903 162	1.49	15.60	10	50	53
	2	23	30	29.20	-4	17	08.4	5.897 837	1.49	15.61	10	47	49

JUPITER, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	23	29	37.24	-4	22	35.9	5.903 162	1.49	15.60	10	50	53
	2	23	30	29.20	4	17	08.4	5.897 837	1.49	15.61	10	47	49
	3	23	31	21.02	4	11	41.7	5.892 320	1.49	15.62	10	44	45
	4	23	32	12.70	4	06	15.8	5.886 612	1.49	15.64	10	41	40
	5	23	33	04.24	4	00	50.8	5.880 714	1.50	15.65	10	38	36
	6	23	33	55.63	3	55	26.6	5.874 628	1.50	15.67	10	35	31
	7	23	34	46.87	-3	50	03.3	5.868 355	1.50	15.69	10	32	26
	8	23	35	37.94	3	44	41.1	5.861 896	1.50	15.70	10	29	21
	9	23	36	28.85	3	39	19.8	5.855 253	1.50	15.72	10	26	15
	10	23	37	19.60	3	33	59.6	5.848 427	1.50	15.74	10	23	10
	11	23	38	10.16	3	28	40.4	5.841 420	1.51	15.76	10	20	04
	12	23	39	00.55	3	23	22.4	5.834 232	1.51	15.78	10	16	58
	13	23	39	50.76	-3	18	05.6	5.826 867	1.51	15.80	10	13	52
	14	23	40	40.78	3	12	49.9	5.819 324	1.51	15.82	10	10	46
	15	23	41	30.61	3	07	35.5	5.811 605	1.51	15.84	10	07	40
	16	23	42	20.25	3	02	22.3	5.803 712	1.52	15.86	10	04	33
	17	23	43	09.69	2	57	10.3	5.795 646	1.52	15.88	10	01	26
	18	23	43	58.94	2	51	59.7	5.787 408	1.52	15.91	9	58	19
	19	23	44	47.99	-2	46	50.3	5.778 999	1.52	15.93	9	55	12
	20	23	45	36.84	2	41	42.3	5.770 420	1.52	15.95	9	52	05
	21	23	46	25.48	2	36	35.6	5.761 672	1.53	15.98	9	48	57
	22	23	47	13.90	2	31	30.4	5.752 757	1.53	16.00	9	45	49
	23	23	48	02.10	2	26	26.7	5.743 675	1.53	16.03	9	42	41
	24	23	48	50.08	2	21	24.5	5.734 428	1.53	16.05	9	39	33
	25	23	49	37.82	-2	16	23.8	5.725 016	1.54	16.08	9	36	25
	26	23	50	25.32	2	11	24.8	5.715 441	1.54	16.11	9	33	16
	27	23	51	12.57	2	06	27.4	5.705 705	1.54	16.13	9	30	07
	28	23	51	59.58	2	01	31.7	5.695 809	1.54	16.16	9	26	58
	29	23	52	46.34	1	56	37.7	5.685 754	1.55	16.19	9	23	48
	30	23	53	32.84	1	51	45.5	5.675 543	1.55	16.22	9	20	38
May	1	23	54	19.07	-1	46	55.0	5.665 177	1.55	16.25	9	17	28
	2	23	55	05.05	1	42	06.4	5.654 658	1.56	16.28	9	14	18
	3	23	55	50.75	1	37	19.7	5.643 989	1.56	16.31	9	11	08
	4	23	56	36.17	1	32	34.8	5.633 171	1.56	16.34	9	07	57
	5	23	57	21.31	1	27	51.9	5.622 206	1.56	16.37	9	04	46
	6	23	58	06.16	1	23	11.0	5.611 097	1.57	16.41	9	01	34
	7	23	58	50.72	-1	18	32.2	5.599 846	1.57	16.44	8	58	23
	8	23	59	34.97	1	13	55.4	5.588 454	1.57	16.47	8	55	11
	9	0	00	18.92	1	09	20.8	5.576 925	1.58	16.51	8	51	58
	10	0	01	02.56	1	04	48.4	5.565 259	1.58	16.54	8	48	46
	11	0	01	45.88	1	00	18.1	5.553 460	1.58	16.58	8	45	33
	12	0	02	28.89	0	55	50.0	5.541 529	1.59	16.61	8	42	20
	13	0	03	11.56	-0	51	24.3	5.529 469	1.59	16.65	8	39	06
	14	0	03	53.92	0	47	00.7	5.517 282	1.59	16.69	8	35	52
	15	0	04	35.94	0	42	39.5	5.504 969	1.60	16.72	8	32	38
	16	0	05	17.64	0	38	20.6	5.492 533	1.60	16.76	8	29	23
	17	0	05	58.99	-0	34	04.0	5.479 975	1.60	16.80	8	26	08

JUPITER, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	0	05	58.99	-0	34	04.0	5.479 975	1.60	16.80	8	26	08
	18	0	06	40.01	0	29	49.9	5.467 298	1.61	16.84	8	22	53
	19	0	07	20.68	0	25	38.1	5.454 502	1.61	16.88	8	19	38
	20	0	08	00.99	0	21	28.8	5.441 590	1.62	16.92	8	16	22
	21	0	08	40.93	0	17	22.1	5.428 564	1.62	16.96	8	13	05
	22	0	09	20.51	0	13	18.0	5.415 425	1.62	17.00	8	09	49
	23	0	09	59.70	-0	09	16.4	5.402 175	1.63	17.04	8	06	32
	24	0	10	38.52	0	05	17.6	5.388 817	1.63	17.08	8	03	14
	25	0	11	16.94	-0	01	21.4	5.375 352	1.64	17.13	7	59	57
	26	0	11	54.97	+0	02	32.0	5.361 784	1.64	17.17	7	56	38
	27	0	12	32.60	0	06	22.7	5.348 114	1.64	17.21	7	53	20
	28	0	13	09.83	0	10	10.5	5.334 345	1.65	17.26	7	50	01
	29	0	13	46.65	+0	13	55.5	5.320 480	1.65	17.30	7	46	41
	30	0	14	23.05	0	17	37.6	5.306 522	1.66	17.35	7	43	21
	31	0	14	59.02	0	21	16.8	5.292 473	1.66	17.39	7	40	01
June	1	0	15	34.57	0	24	52.9	5.278 336	1.67	17.44	7	36	41
	2	0	16	09.68	0	28	26.1	5.264 114	1.67	17.49	7	33	19
	3	0	16	44.35	0	31	56.2	5.249 811	1.68	17.54	7	29	58
	4	0	17	18.56	+0	35	23.1	5.235 428	1.68	17.58	7	26	36
	5	0	17	52.32	0	38	46.9	5.220 969	1.68	17.63	7	23	13
	6	0	18	25.61	0	42	07.6	5.206 436	1.69	17.68	7	19	50
	7	0	18	58.43	0	45	24.9	5.191 834	1.69	17.73	7	16	27
	8	0	19	30.78	0	48	39.0	5.177 164	1.70	17.78	7	13	03
	9	0	20	02.65	0	51	49.8	5.162 430	1.70	17.83	7	09	39
	10	0	20	34.04	+0	54	57.3	5.147 635	1.71	17.88	7	06	14
	11	0	21	04.94	0	58	01.5	5.132 781	1.71	17.94	7	02	49
	12	0	21	35.35	1	01	02.3	5.117 871	1.72	17.99	6	59	23
	13	0	22	05.27	1	03	59.7	5.102 909	1.72	18.04	6	55	57
	14	0	22	34.68	1	06	53.7	5.087 896	1.73	18.09	6	52	30
	15	0	23	03.59	1	09	44.2	5.072 836	1.73	18.15	6	49	02
	16	0	23	31.99	+1	12	31.3	5.057 730	1.74	18.20	6	45	35
	17	0	23	59.85	1	15	14.8	5.042 582	1.74	18.26	6	42	06
	18	0	24	27.19	1	17	54.7	5.027 394	1.75	18.31	6	38	37
	19	0	24	53.99	1	20	30.9	5.012 169	1.75	18.37	6	35	08
	20	0	25	20.24	1	23	03.4	4.996 909	1.76	18.42	6	31	38
	21	0	25	45.93	1	25	32.2	4.981 618	1.77	18.48	6	28	08
	22	0	26	11.07	+1	27	57.3	4.966 300	1.77	18.54	6	24	37
	23	0	26	35.65	1	30	18.6	4.950 956	1.78	18.59	6	21	05
	24	0	26	59.66	1	32	36.0	4.935 591	1.78	18.65	6	17	33
	25	0	27	23.09	1	34	49.6	4.920 208	1.79	18.71	6	14	00
	26	0	27	45.94	1	36	59.2	4.904 811	1.79	18.77	6	10	27
	27	0	28	08.20	1	39	05.0	4.889 404	1.80	18.83	6	06	53
	28	0	28	29.86	+1	41	06.7	4.873 989	1.80	18.89	6	03	18
	29	0	28	50.92	1	43	04.4	4.858 571	1.81	18.95	5	59	43
	30	0	29	11.38	1	44	58.1	4.843 154	1.82	19.01	5	56	07
July	1	0	29	31.21	1	46	47.6	4.827 741	1.82	19.07	5	52	31
	2	0	29	50.42	+1	48	33.0	4.812 336	1.83	19.13	5	48	54

JUPITER, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	0	29	31.21	+1	46	47.6	4.827 741	1.82	19.07	5	52	31
	2	0	29	50.42	1	48	33.0	4.812 336	1.83	19.13	5	48	54
	3	0	30	09.00	1	50	14.2	4.796 944	1.83	19.19	5	45	17
	4	0	30	26.95	1	51	51.3	4.781 567	1.84	19.25	5	41	38
	5	0	30	44.26	1	53	24.1	4.766 211	1.85	19.32	5	37	60
	6	0	31	00.92	1	54	52.6	4.750 878	1.85	19.38	5	34	20
	7	0	31	16.94	+1	56	16.9	4.735 573	1.86	19.44	5	30	40
	8	0	31	32.30	1	57	36.9	4.720 299	1.86	19.50	5	26	59
	9	0	31	47.02	1	58	52.6	4.705 060	1.87	19.57	5	23	18
	10	0	32	01.08	2	00	04.0	4.689 860	1.88	19.63	5	19	36
	11	0	32	14.48	2	01	11.1	4.674 702	1.88	19.69	5	15	53
	12	0	32	27.21	2	02	13.9	4.659 591	1.89	19.76	5	12	10
	13	0	32	39.28	+2	03	12.3	4.644 529	1.89	19.82	5	08	25
	14	0	32	50.67	2	04	06.3	4.629 520	1.90	19.89	5	04	41
	15	0	33	01.37	2	04	55.8	4.614 567	1.91	19.95	5	00	55
	16	0	33	11.39	2	05	40.9	4.599 674	1.91	20.01	4	57	09
	17	0	33	20.71	2	06	21.5	4.584 845	1.92	20.08	4	53	22
	18	0	33	29.33	2	06	57.6	4.570 083	1.92	20.14	4	49	35
	19	0	33	37.25	+2	07	29.1	4.555 393	1.93	20.21	4	45	47
	20	0	33	44.46	2	07	56.1	4.540 778	1.94	20.27	4	41	58
	21	0	33	50.97	2	08	18.6	4.526 242	1.94	20.34	4	38	08
	22	0	33	56.77	2	08	36.4	4.511 791	1.95	20.40	4	34	18
	23	0	34	01.85	2	08	49.7	4.497 428	1.96	20.47	4	30	27
	24	0	34	06.21	2	08	58.4	4.483 157	1.96	20.53	4	26	35
	25	0	34	09.86	+2	09	02.4	4.468 984	1.97	20.60	4	22	43
	26	0	34	12.77	2	09	01.8	4.454 913	1.97	20.66	4	18	50
	27	0	34	14.96	2	08	56.6	4.440 948	1.98	20.73	4	14	56
	28	0	34	16.42	2	08	46.7	4.427 093	1.99	20.79	4	11	01
	29	0	34	17.15	2	08	32.1	4.413 355	1.99	20.86	4	07	06
	30	0	34	17.15	2	08	12.9	4.399 736	2.00	20.92	4	03	10
	31	0	34	16.41	+2	07	49.0	4.386 241	2.00	20.99	3	59	13
Aug.	1	0	34	14.93	2	07	20.5	4.372 876	2.01	21.05	3	55	16
	2	0	34	12.73	2	06	47.3	4.359 644	2.02	21.12	3	51	18
	3	0	34	09.79	2	06	09.6	4.346 550	2.02	21.18	3	47	19
	4	0	34	06.13	2	05	27.2	4.333 599	2.03	21.24	3	43	19
	5	0	34	01.74	2	04	40.3	4.320 794	2.04	21.31	3	39	19
	6	0	33	56.64	+2	03	48.8	4.308 141	2.04	21.37	3	35	17
	7	0	33	50.82	2	02	52.9	4.295 642	2.05	21.43	3	31	16
	8	0	33	44.28	2	01	52.5	4.283 302	2.05	21.49	3	27	13
	9	0	33	37.03	2	00	47.7	4.271 126	2.06	21.55	3	23	10
	10	0	33	29.08	1	59	38.5	4.259 116	2.06	21.61	3	19	06
	11	0	33	20.41	1	58	24.8	4.247 277	2.07	21.68	3	15	01
	12	0	33	11.04	+1	57	06.8	4.235 612	2.08	21.73	3	10	56
	13	0	33	00.96	1	55	44.4	4.224 126	2.08	21.79	3	06	50
	14	0	32	50.18	1	54	17.7	4.212 822	2.09	21.85	3	02	43
	15	0	32	38.70	1	52	46.7	4.201 704	2.09	21.91	2	58	36
	16	0	32	26.54	+1	51	11.4	4.190 776	2.10	21.97	2	54	28

JUPITER, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	0	32	26.54	+1	51	11.4	4.190 776	2.10	21.97	2	54	28
	17	0	32	13.70	1	49	32.0	4.180 044	2.10	22.02	2	50	19
	18	0	32	00.18	1	47	48.4	4.169 510	2.11	22.08	2	46	10
	19	0	31	45.99	1	46	00.8	4.159 179	2.11	22.13	2	41	60
	20	0	31	31.15	1	44	09.1	4.149 056	2.12	22.19	2	37	49
	21	0	31	15.64	1	42	13.4	4.139 144	2.12	22.24	2	33	37
	22	0	30	59.49	+1	40	13.8	4.129 449	2.13	22.29	2	29	25
	23	0	30	42.70	1	38	10.3	4.119 974	2.13	22.34	2	25	13
	24	0	30	25.28	1	36	02.9	4.110 723	2.14	22.40	2	20	59
	25	0	30	07.24	1	33	51.9	4.101 701	2.14	22.44	2	16	45
	26	0	29	48.59	1	31	37.2	4.092 912	2.15	22.49	2	12	31
	27	0	29	29.34	1	29	18.9	4.084 359	2.15	22.54	2	08	16
	28	0	29	09.50	+1	26	57.0	4.076 047	2.16	22.59	2	04	00
	29	0	28	49.09	1	24	31.8	4.067 979	2.16	22.63	1	59	44
	30	0	28	28.12	1	22	03.3	4.060 159	2.17	22.67	1	55	27
	31	0	28	06.61	1	19	31.6	4.052 591	2.17	22.72	1	51	10
Sept.	1	0	27	44.57	1	16	56.8	4.045 278	2.17	22.76	1	46	52
	2	0	27	22.03	1	14	19.1	4.038 223	2.18	22.80	1	42	34
	3	0	26	58.99	+1	11	38.5	4.031 429	2.18	22.84	1	38	15
	4	0	26	35.47	1	08	55.1	4.024 898	2.18	22.87	1	33	55
	5	0	26	11.49	1	06	09.2	4.018 635	2.19	22.91	1	29	36
	6	0	25	47.07	1	03	20.8	4.012 640	2.19	22.94	1	25	15
	7	0	25	22.21	1	00	29.9	4.006 917	2.19	22.98	1	20	55
	8	0	24	56.94	0	57	36.7	4.001 467	2.20	23.01	1	16	34
	9	0	24	31.27	+0	54	41.3	3.996 294	2.20	23.04	1	12	12
	10	0	24	05.21	0	51	43.9	3.991 398	2.20	23.06	1	07	50
	11	0	23	38.79	0	48	44.5	3.986 783	2.21	23.09	1	03	28
	12	0	23	12.03	0	45	43.2	3.982 450	2.21	23.12	0	59	06
	13	0	22	44.94	0	42	40.3	3.978 402	2.21	23.14	0	54	43
	14	0	22	17.54	0	39	35.7	3.974 641	2.21	23.16	0	50	20
	15	0	21	49.85	+0	36	29.8	3.971 169	2.21	23.18	0	45	56
	16	0	21	21.90	0	33	22.5	3.967 988	2.22	23.20	0	41	33
	17	0	20	53.70	0	30	14.1	3.965 100	2.22	23.22	0	37	09
	18	0	20	25.27	0	27	04.6	3.962 507	2.22	23.23	0	32	44
	19	0	19	56.64	0	23	54.2	3.960 211	2.22	23.25	0	28	20
	20	0	19	27.82	0	20	43.1	3.958 213	2.22	23.26	0	23	55
	21	0	18	58.83	+0	17	31.3	3.956 515	2.22	23.27	0	19	31
	22	0	18	29.69	0	14	19.0	3.955 119	2.22	23.28	0	15	06
	23	0	18	00.44	0	11	06.4	3.954 024	2.22	23.28	0	10	41
	24	0	17	31.08	0	07	53.5	3.953 233	2.22	23.29	0	06	16
	25	0	17	01.65	0	04	40.7	3.952 747	2.22	23.29	0	01	51
	26	0	16	32.16	+0	01	27.9	3.952 565	2.22	23.29	23	53	00
	27	0	16	02.65	-0	01	44.5	3.952 688	2.22	23.29	23	48	35
	28	0	15	33.14	0	04	56.5	3.953 117	2.22	23.29	23	44	10
	29	0	15	03.65	0	08	07.8	3.953 851	2.22	23.28	23	39	44
	30	0	14	34.21	0	11	18.4	3.954 891	2.22	23.28	23	35	19
Oct.	1	0	14	04.84	-0	14	28.0	3.956 235	2.22	23.27	23	30	54

JUPITER, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	0	14	04.84	-0	14	28.0	3.956 235	2.22	23.27	23	30	54
	2	0	13	35.57	0	17	36.6	3.957 883	2.22	23.26	23	26	29
	3	0	13	06.41	0	20	43.9	3.959 834	2.22	23.25	23	22	05
	4	0	12	37.38	0	23	49.8	3.962 086	2.22	23.24	23	17	40
	5	0	12	08.51	0	26	54.3	3.964 640	2.22	23.22	23	13	16
	6	0	11	39.82	0	29	57.1	3.967 493	2.22	23.20	23	08	51
	7	0	11	11.33	-0	32	58.2	3.970 643	2.21	23.19	23	04	27
	8	0	10	43.05	0	35	57.4	3.974 090	2.21	23.17	23	00	04
	9	0	10	15.01	0	38	54.5	3.977 833	2.21	23.14	22	55	40
	10	0	09	47.24	0	41	49.5	3.981 868	2.21	23.12	22	51	17
	11	0	09	19.75	0	44	42.3	3.986 196	2.21	23.09	22	46	54
	12	0	08	52.56	0	47	32.6	3.990 815	2.20	23.07	22	42	31
	13	0	08	25.70	-0	50	20.3	3.995 722	2.20	23.04	22	38	09
	14	0	07	59.17	0	53	05.4	4.000 916	2.20	23.01	22	33	47
	15	0	07	33.01	0	55	47.7	4.006 396	2.20	22.98	22	29	25
	16	0	07	07.23	0	58	27.1	4.012 159	2.19	22.95	22	25	04
	17	0	06	41.85	1	01	03.5	4.018 203	2.19	22.91	22	20	43
	18	0	06	16.88	1	03	36.8	4.024 527	2.19	22.87	22	16	23
	19	0	05	52.34	-1	06	06.9	4.031 127	2.18	22.84	22	12	03
	20	0	05	28.26	1	08	33.7	4.038 002	2.18	22.80	22	07	44
	21	0	05	04.64	1	10	57.0	4.045 148	2.17	22.76	22	03	25
	22	0	04	41.51	1	13	16.8	4.052 564	2.17	22.72	21	59	06
	23	0	04	18.88	1	15	32.9	4.060 246	2.17	22.67	21	54	48
	24	0	03	56.78	1	17	45.3	4.068 191	2.16	22.63	21	50	31
	25	0	03	35.21	-1	19	53.8	4.076 395	2.16	22.58	21	46	14
	26	0	03	14.21	1	21	58.3	4.084 856	2.15	22.54	21	41	58
	27	0	02	53.78	1	23	58.7	4.093 570	2.15	22.49	21	37	42
	28	0	02	33.94	1	25	54.9	4.102 533	2.14	22.44	21	33	27
	29	0	02	14.70	1	27	46.9	4.111 741	2.14	22.39	21	29	13
	30	0	01	56.08	1	29	34.6	4.121 189	2.13	22.34	21	24	59
	31	0	01	38.09	-1	31	17.9	4.130 874	2.13	22.29	21	20	46
Nov.	1	0	01	20.72	1	32	56.8	4.140 792	2.12	22.23	21	16	33
	2	0	01	04.01	1	34	31.2	4.150 937	2.12	22.18	21	12	21
	3	0	00	47.94	1	36	01.1	4.161 307	2.11	22.12	21	08	10
	4	0	00	32.54	1	37	26.4	4.171 895	2.11	22.07	21	03	59
	5	0	00	17.81	1	38	47.0	4.182 699	2.10	22.01	20	59	49
	6	0	00	03.76	-1	40	03.0	4.193 714	2.10	21.95	18	27	41
	7	23	59	50.40	1	41	14.2	4.204 935	2.09	21.89	23	35	20
	8	23	59	37.74	1	42	20.7	4.216 360	2.09	21.83	20	47	23
	9	23	59	25.79	1	43	22.4	4.227 983	2.08	21.77	20	43	16
	10	23	59	14.56	1	44	19.2	4.239 800	2.07	21.71	20	39	10
	11	23	59	04.04	1	45	11.2	4.251 808	2.07	21.65	20	35	04
	12	23	58	54.24	-1	45	58.2	4.264 003	2.06	21.59	20	30	59
	13	23	58	45.17	1	46	40.4	4.276 379	2.06	21.53	20	26	55
	14	23	58	36.84	1	47	17.7	4.288 934	2.05	21.46	20	22	51
	15	23	58	29.24	1	47	50.0	4.301 662	2.04	21.40	20	18	48
	16	23	58	22.38	-1	48	17.4	4.314 559	2.04	21.34	20	14	46

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	23	58	22.38	-1	48	17.4	4.314 559	2.04	21.34	20	14	46
	17	23	58	16.26	1	48	39.8	4.327 622	2.03	21.27	20	10	45
	18	23	58	10.89	1	48	57.3	4.340 845	2.03	21.21	20	06	44
	19	23	58	06.28	1	49	09.7	4.354 224	2.02	21.14	20	02	44
	20	23	58	02.42	1	49	17.1	4.367 754	2.01	21.08	19	58	45
	21	23	57	59.32	1	49	19.5	4.381 432	2.01	21.01	19	54	47
	22	23	57	56.99	-1	49	16.8	4.395 251	2.00	20.95	19	50	49
	23	23	57	55.42	1	49	09.1	4.409 208	1.99	20.88	19	46	52
	24	23	57	54.63	1	48	56.2	4.423 297	1.99	20.81	19	42	56
	25	23	57	54.60	1	48	38.3	4.437 514	1.98	20.75	19	39	01
	26	23	57	55.35	1	48	15.3	4.451 852	1.98	20.68	19	35	06
	27	23	57	56.87	1	47	47.3	4.466 308	1.97	20.61	19	31	13
	28	23	57	59.14	-1	47	14.2	4.480 875	1.96	20.55	19	27	19
	29	23	58	02.18	1	46	36.2	4.495 549	1.96	20.48	19	23	27
	30	23	58	05.98	1	45	53.2	4.510 324	1.95	20.41	19	19	36
Dec.	1	23	58	10.53	1	45	05.3	4.525 197	1.94	20.34	19	15	45
	2	23	58	15.84	1	44	12.5	4.540 161	1.94	20.28	19	11	55
	3	23	58	21.89	1	43	14.8	4.555 213	1.93	20.21	19	08	06
	4	23	58	28.70	-1	42	12.2	4.570 347	1.92	20.14	19	04	17
	5	23	58	36.25	1	41	04.7	4.585 560	1.92	20.08	19	00	29
	6	23	58	44.55	1	39	52.5	4.600 846	1.91	20.01	18	56	42
	7	23	58	53.59	1	38	35.4	4.616 202	1.91	19.94	18	52	56
	8	23	59	03.36	1	37	13.6	4.631 624	1.90	19.88	18	49	10
	9	23	59	13.86	1	35	47.1	4.647 106	1.89	19.81	18	45	25
	10	23	59	25.09	-1	34	16.0	4.662 645	1.89	19.74	18	41	41
	11	23	59	37.03	1	32	40.2	4.678 237	1.88	19.68	18	37	58
	12	23	59	49.69	1	30	59.8	4.693 877	1.87	19.61	18	34	15
	13	0	00	03.06	1	29	14.9	4.709 562	1.87	19.55	18	30	33
	14	0	00	17.13	1	27	25.4	4.725 287	1.86	19.48	18	26	51
	15	0	00	31.91	1	25	31.5	4.741 048	1.85	19.42	18	23	11
	16	0	00	47.38	-1	23	33.1	4.756 841	1.85	19.35	18	19	31
	17	0	01	03.54	1	21	30.4	4.772 661	1.84	19.29	18	15	51
	18	0	01	20.39	1	19	23.2	4.788 505	1.84	19.23	18	12	13
	19	0	01	37.92	1	17	11.6	4.804 368	1.83	19.16	18	08	35
	20	0	01	56.13	1	14	55.7	4.820 245	1.82	19.10	18	04	58
	21	0	02	15.03	1	12	35.5	4.836 134	1.82	19.04	18	01	21
	22	0	02	34.59	-1	10	11.0	4.852 028	1.81	18.97	17	57	45
	23	0	02	54.82	1	07	42.3	4.867 924	1.81	18.91	17	54	10
	24	0	03	15.71	1	05	09.4	4.883 817	1.80	18.85	17	50	35
	25	0	03	37.25	1	02	32.4	4.899 702	1.79	18.79	17	47	01
	26	0	03	59.42	0	59	51.3	4.915 575	1.79	18.73	17	43	28
	27	0	04	22.23	0	57	06.2	4.931 432	1.78	18.67	17	39	55
	28	0	04	45.66	-0	54	17.2	4.947 269	1.78	18.61	17	36	23
	29	0	05	09.71	0	51	24.3	4.963 081	1.77	18.55	17	32	51
	30	0	05	34.37	0	48	27.5	4.978 865	1.77	18.49	17	29	20
	31	0	05	59.64	0	45	26.9	4.994 616	1.76	18.43	17	25	50
	32	0	06	25.50	-0	42	22.6	5.010 332	1.76	18.37	17	22	20

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
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Date		Heliocentric Longitude ° ′ ″	Heliocentric Latitude ° ′ ″	Radius Vector
Jan.	1	314 52 20.0	-0 53 31.6	9.919 852
	3	314 56 03.0	0 53 40.6	9.919 434
	5	314 59 46.1	0 53 49.7	9.919 015
	7	315 03 29.2	0 53 58.7	9.918 595
	9	315 07 12.4	0 54 07.7	9.918 175
	11	315 10 55.5	0 54 16.7	9.917 755
	13	315 14 38.7	-0 54 25.7	9.917 334
	15	315 18 21.9	0 54 34.7	9.916 913
	17	315 22 05.1	0 54 43.7	9.916 491
	19	315 25 48.3	0 54 52.7	9.916 068
	21	315 29 31.6	0 55 01.7	9.915 645
	23	315 33 14.8	0 55 10.7	9.915 222
	25	315 36 58.1	-0 55 19.7	9.914 798
	27	315 40 41.4	0 55 28.7	9.914 374
	29	315 44 24.7	0 55 37.7	9.913 949
	31	315 48 08.1	0 55 46.7	9.913 523
Feb.	2	315 51 51.4	0 55 55.6	9.913 097
	4	315 55 34.8	0 56 04.6	9.912 671
	6	315 59 18.2	-0 56 13.6	9.912 244
	8	316 03 01.6	0 56 22.5	9.911 817
	10	316 06 45.1	0 56 31.5	9.911 389
	12	316 10 28.5	0 56 40.5	9.910 960
	14	316 14 12.0	0 56 49.4	9.910 532
	16	316 17 55.5	0 56 58.4	9.910 102
	18	316 21 39.0	-0 57 07.3	9.909 672
	20	316 25 22.5	0 57 16.3	9.909 242
	22	316 29 06.1	0 57 25.2	9.908 811
	24	316 32 49.7	0 57 34.1	9.908 380
	26	316 36 33.3	0 57 43.1	9.907 948
	28	316 40 16.9	0 57 52.0	9.907 516
Mar.	2	316 44 00.5	-0 58 01.0	9.907 083
	4	316 47 44.2	0 58 09.9	9.906 649
	6	316 51 27.8	0 58 18.8	9.906 216
	8	316 55 11.5	0 58 27.7	9.905 781
	10	316 58 55.3	0 58 36.7	9.905 346
	12	317 02 39.0	0 58 45.6	9.904 911
	14	317 06 22.8	-0 58 54.5	9.904 475
	16	317 10 06.5	0 59 03.4	9.904 039
	18	317 13 50.3	0 59 12.3	9.903 602
	20	317 17 34.1	0 59 21.2	9.903 165
	22	317 21 18.0	0 59 30.1	9.902 727
	24	317 25 01.8	0 59 39.0	9.902 289
	26	317 28 45.7	-0 59 47.9	9.901 850
	28	317 32 29.6	0 59 56.8	9.901 411
	30	317 36 13.5	1 00 05.6	9.900 971
Apr.	1	317 39 57.4	1 00 14.5	9.900 531
	3	317 43 41.4	-1 00 23.4	9.900 090

Date		Heliocentric Longitude ° ′ ″	Heliocentric Latitude ° ′ ″	Radius Vector
Apr.	3	317 43 41.4	-1 00 23.4	9.900 090
	5	317 47 25.3	1 00 32.3	9.899 649
	7	317 51 09.4	1 00 41.1	9.899 207
	9	317 54 53.4	1 00 50.0	9.898 765
	11	317 58 37.4	1 00 58.9	9.898 323
	13	318 02 21.4	1 01 07.7	9.897 879
	15	318 06 05.5	-1 01 16.6	9.897 436
	17	318 09 49.6	1 01 25.5	9.896 992
	19	318 13 33.7	1 01 34.3	9.896 547
	21	318 17 17.9	1 01 43.1	9.896 102
	23	318 21 02.0	1 01 52.0	9.895 656
	25	318 24 46.2	1 02 00.8	9.895 210
	27	318 28 30.4	-1 02 09.7	9.894 764
	29	318 32 14.6	1 02 18.5	9.894 317
May	1	318 35 58.9	1 02 27.3	9.893 869
	3	318 39 43.1	1 02 36.1	9.893 421
	5	318 43 27.4	1 02 45.0	9.892 973
	7	318 47 11.7	1 02 53.8	9.892 524
	9	318 50 56.0	-1 03 02.6	9.892 074
	11	318 54 40.4	1 03 11.4	9.891 624
	13	318 58 24.7	1 03 20.2	9.891 174
	15	319 02 09.1	1 03 29.0	9.890 723
	17	319 05 53.5	1 03 37.8	9.890 272
	19	319 09 37.9	1 03 46.6	9.889 820
	21	319 13 22.4	-1 03 55.4	9.889 367
	23	319 17 06.9	1 04 04.2	9.888 915
	25	319 20 51.4	1 04 13.0	9.888 461
	27	319 24 35.8	1 04 21.7	9.888 008
	29	319 28 20.4	1 04 30.5	9.887 553
	31	319 32 04.9	1 04 39.3	9.887 098
June	2	319 35 49.5	-1 04 48.0	9.886 643
	4	319 39 34.1	1 04 56.8	9.886 188
	6	319 43 18.7	1 05 05.6	9.885 731
	8	319 47 03.3	1 05 14.3	9.885 275
	10	319 50 48.0	1 05 23.1	9.884 818
	12	319 54 32.7	1 05 31.8	9.884 360
	14	319 58 17.4	-1 05 40.6	9.883 902
	16	320 02 02.1	1 05 49.3	9.883 443
	18	320 05 46.8	1 05 58.1	9.882 984
	20	320 09 31.6	1 06 06.8	9.882 525
	22	320 13 16.3	1 06 15.5	9.882 065
	24	320 17 01.1	1 06 24.3	9.881 604
	26	320 20 46.0	-1 06 33.0	9.881 143
	28	320 24 30.8	1 06 41.7	9.880 682
	30	320 28 15.7	1 06 50.4	9.880 220
July	2	320 32 00.6	1 06 59.1	9.879 758
	4	320 35 45.5	-1 07 07.8	9.879 295

SATURN, 2022

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ' "	° ' "			° ' "	° ' "	
July 2	320 32 00.6	-1 06 59.1	9.879 758	Oct. 2	323 24 48.3	-1 13 35.3	9.857 999
4	320 35 45.5	1 07 07.8	9.879 295	4	323 28 34.2	1 13 43.8	9.857 515
6	320 39 30.4	1 07 16.5	9.878 832	6	323 32 20.1	1 13 52.3	9.857 031
8	320 43 15.3	1 07 25.2	9.878 368	8	323 36 06.0	1 14 00.8	9.856 547
10	320 47 00.3	1 07 33.9	9.877 904	10	323 39 52.0	1 14 09.4	9.856 062
12	320 50 45.3	1 07 42.6	9.877 439	12	323 43 38.0	1 14 17.8	9.855 577
14	320 54 30.3	-1 07 51.3	9.876 974	14	323 47 24.0	-1 14 26.3	9.855 092
16	320 58 15.3	1 07 60.0	9.876 508	16	323 51 10.0	1 14 34.8	9.854 606
18	321 02 00.4	1 08 08.7	9.876 042	18	323 54 56.1	1 14 43.3	9.854 119
20	321 05 45.4	1 08 17.3	9.875 576	20	323 58 42.1	1 14 51.8	9.853 633
22	321 09 30.5	1 08 26.0	9.875 109	22	324 02 28.2	1 15 00.2	9.853 145
24	321 13 15.7	1 08 34.7	9.874 641	24	324 06 14.4	1 15 08.7	9.852 658
26	321 17 00.8	-1 08 43.3	9.874 173	26	324 10 00.5	-1 15 17.2	9.852 169
28	321 20 46.0	1 08 52.0	9.873 705	28	324 13 46.7	1 15 25.6	9.851 681
30	321 24 31.1	1 09 00.6	9.873 236	30	324 17 32.8	1 15 34.1	9.851 192
Aug. 1	321 28 16.3	1 09 09.3	9.872 767	Nov. 1	324 21 19.1	1 15 42.5	9.850 702
3	321 32 01.5	1 09 17.9	9.872 297	3	324 25 05.3	1 15 51.0	9.850 213
5	321 35 46.8	1 09 26.6	9.871 827	5	324 28 51.5	1 15 59.4	9.849 722
7	321 39 32.1	-1 09 35.2	9.871 357	7	324 32 37.8	-1 16 07.9	9.849 232
9	321 43 17.3	1 09 43.8	9.870 885	9	324 36 24.1	1 16 16.3	9.848 741
11	321 47 02.7	1 09 52.5	9.870 414	11	324 40 10.4	1 16 24.7	9.848 249
13	321 50 48.0	1 10 01.1	9.869 942	13	324 43 56.8	1 16 33.1	9.847 757
15	321 54 33.3	1 10 09.7	9.869 470	15	324 47 43.2	1 16 41.5	9.847 265
17	321 58 18.7	1 10 18.3	9.868 997	17	324 51 29.5	1 16 50.0	9.846 772
19	322 02 04.1	-1 10 27.0	9.868 523	19	324 55 15.9	-1 16 58.4	9.846 279
21	322 05 49.5	1 10 35.5	9.868 050	21	324 59 02.4	1 17 06.8	9.845 785
23	322 09 35.0	1 10 44.1	9.867 575	23	325 02 48.8	1 17 15.2	9.845 291
25	322 13 20.4	1 10 52.7	9.867 101	25	325 06 35.3	1 17 23.6	9.844 797
27	322 17 05.9	1 11 01.3	9.866 626	27	325 10 21.8	1 17 32.0	9.844 302
29	322 20 51.4	1 11 09.9	9.866 150	29	325 14 08.3	1 17 40.3	9.843 807
31	322 24 36.9	-1 11 18.5	9.865 674	Dec. 1	325 17 54.9	-1 17 48.7	9.843 311
Sept. 2	322 28 22.5	1 11 27.1	9.865 198	3	325 21 41.5	1 17 57.1	9.842 815
4	322 32 08.1	1 11 35.7	9.864 721	5	325 25 28.0	1 18 05.4	9.842 318
6	322 35 53.6	1 11 44.3	9.864 244	7	325 29 14.7	1 18 13.8	9.841 821
8	322 39 39.3	1 11 52.8	9.863 766	9	325 33 01.3	1 18 22.2	9.841 324
10	322 43 24.9	1 12 01.4	9.863 288	11	325 36 48.0	1 18 30.5	9.840 826
12	322 47 10.5	-1 12 10.0	9.862 809	13	325 40 34.7	-1 18 38.9	9.840 328
14	322 50 56.2	1 12 18.5	9.862 330	15	325 44 21.4	1 18 47.2	9.839 829
16	322 54 41.9	1 12 27.1	9.861 851	17	325 48 08.1	1 18 55.6	9.839 330
18	322 58 27.6	1 12 35.6	9.861 371	19	325 51 54.8	1 19 03.9	9.838 831
20	323 02 13.4	1 12 44.2	9.860 890	21	325 55 41.6	1 19 12.2	9.838 331
22	323 05 59.1	1 12 52.7	9.860 409	23	325 59 28.4	1 19 20.6	9.837 830
24	323 09 44.9	-1 13 01.2	9.859 928	25	326 03 15.2	-1 19 28.9	9.837 330
26	323 13 30.7	1 13 09.8	9.859 446	27	326 07 02.1	1 19 37.2	9.836 829
28	323 17 16.5	1 13 18.3	9.858 964	29	326 10 49.0	1 19 45.5	9.836 327
30	323 21 02.4	1 13 26.8	9.858 482	31	326 14 35.9	1 19 53.8	9.835 825
Oct. 2	323 24 48.3	-1 13 35.3	9.857 999	33	326 18 22.8	-1 20 02.1	9.835 323

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	′	″	°	′	″			°	′	″	°	′	″
Jan.	0	311	47	41.5	-0	49	22.9	Feb.	15	317	09	37.7	-0	51	48.1
	1	311	54	09.7	0	49	24.6		16	317	16	45.6	0	51	52.9
	2	312	00	40.5	0	49	26.4		17	317	23	52.7	0	51	57.8
	3	312	07	13.7	0	49	28.2		18	317	30	58.9	0	52	02.8
	4	312	13	49.1	0	49	30.1		19	317	38	04.2	0	52	07.8
	5	312	20	26.8	0	49	32.0		20	317	45	08.5	0	52	12.9
	6	312	27	06.5	-0	49	34.0		21	317	52	11.9	-0	52	18.1
	7	312	33	48.2	0	49	36.1		22	317	59	14.2	0	52	23.4
	8	312	40	31.9	0	49	38.2		23	318	06	15.4	0	52	28.7
	9	312	47	17.5	0	49	40.3		24	318	13	15.5	0	52	34.2
	10	312	54	05.0	0	49	42.6		25	318	20	14.4	0	52	39.7
	11	313	00	54.3	0	49	44.9		26	318	27	11.9	0	52	45.2
	12	313	07	45.4	-0	49	47.2		27	318	34	08.1	-0	52	50.9
	13	313	14	38.1	0	49	49.7		28	318	41	02.7	0	52	56.6
	14	313	21	32.4	0	49	52.1	Mar.	1	318	47	55.7	0	53	02.4
	15	313	28	28.3	0	49	54.7		2	318	54	47.0	0	53	08.3
	16	313	35	25.6	0	49	57.3		3	319	01	36.6	0	53	14.2
	17	313	42	24.3	0	50	00.0		4	319	08	24.3	0	53	20.2
	18	313	49	24.3	-0	50	02.7		5	319	15	10.2	-0	53	26.3
	19	313	56	25.5	0	50	05.6		6	319	21	54.1	0	53	32.5
	20	314	03	27.8	0	50	08.5		7	319	28	36.1	0	53	38.7
	21	314	10	31.2	0	50	11.4		8	319	35	16.1	0	53	45.0
	22	314	17	35.6	0	50	14.4		9	319	41	54.0	0	53	51.4
	23	314	24	41.0	0	50	17.5		10	319	48	29.7	0	53	57.9
	24	314	31	47.3	-0	50	20.7		11	319	55	03.2	-0	54	04.5
	25	314	38	54.5	0	50	23.9		12	320	01	34.4	0	54	11.1
	26	314	46	02.5	0	50	27.2		13	320	08	03.2	0	54	17.8
	27	314	53	11.3	0	50	30.6		14	320	14	29.6	0	54	24.6
	28	315	00	20.9	0	50	34.1		15	320	20	53.4	0	54	31.4
	29	315	07	31.0	0	50	37.6		16	320	27	14.6	0	54	38.4
	30	315	14	41.7	-0	50	41.2		17	320	33	33.2	-0	54	45.4
	31	315	21	52.8	0	50	44.8		18	320	39	49.1	0	54	52.5
Feb.	1	315	29	04.3	0	50	48.6		19	320	46	02.2	0	54	59.7
	2	315	36	15.9	0	50	52.4		20	320	52	12.6	0	55	06.9
	3	315	43	27.7	0	50	56.3		21	320	58	20.2	0	55	14.3
	4	315	50	39.6	0	51	00.4		22	321	04	24.9	0	55	21.7
	5	315	57	51.1	-0	51	04.6		23	321	10	26.7	-0	55	29.2
	6	316	05	02.8	0	51	08.4		24	321	16	25.6	0	55	36.7
	7	316	12	14.6	0	51	12.4		25	321	22	21.4	0	55	44.4
	8	316	19	26.2	0	51	16.6		26	321	28	14.1	0	55	52.1
	9	316	26	37.6	0	51	20.9		27	321	34	03.5	0	55	59.9
	10	316	33	48.8	0	51	25.2		28	321	39	49.6	0	56	07.7
	11	316	40	59.6	-0	51	29.6		29	321	45	32.3	-0	56	15.6
	12	316	48	10.0	0	51	34.1		30	321	51	11.5	0	56	23.6
	13	316	55	19.8	0	51	38.7		31	321	56	47.1	0	56	31.7
	14	317	02	29.1	0	51	43.4	Apr.	1	322	02	19.2	0	56	39.8
	15	317	09	37.7	-0	51	48.1		2	322	07	47.7	-0	56	48.1

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	322	02	19.2	-0	56	39.8	May	17	324	57	36.3	-1	4	05.1
	2	322	07	47.7	0	56	48.1		18	324	59	24.3	1	4	16.0
	3	322	13	12.6	0	56	56.3		19	325	01	06.6	1	4	27.0
	4	322	18	33.7	0	57	04.7		20	325	02	43.2	1	4	37.9
	5	322	23	51.1	0	57	13.1		21	325	04	14.0	1	4	48.9
	6	322	29	04.6	0	57	21.6		22	325	05	39.0	1	4	59.9
	7	322	34	14.3	-0	57	30.2		23	325	06	58.1	-1	5	11.0
	8	322	39	20.0	0	57	38.9		24	325	08	11.3	1	5	22.0
	9	322	44	21.7	0	57	47.6		25	325	09	18.6	1	5	33.1
	10	322	49	19.3	0	57	56.4		26	325	10	20.1	1	5	44.2
	11	322	54	12.7	0	58	05.2		27	325	11	15.7	1	5	55.3
	12	322	59	02.0	0	58	14.2		28	325	12	05.4	1	6	06.5
	13	323	03	46.9	-0	58	23.2		29	325	12	49.2	-1	6	17.6
	14	323	08	27.6	0	58	32.3		30	325	13	27.2	1	6	28.7
	15	323	13	03.9	0	58	41.4		31	325	13	59.3	1	6	39.9
	16	323	17	35.8	0	58	50.6	June	1	325	14	25.4	1	6	51.1
	17	323	22	03.3	0	58	59.9		2	325	14	45.7	1	7	02.3
	18	323	26	26.5	0	59	09.3		3	325	15	00.0	1	7	13.4
	19	323	30	45.2	-0	59	18.7		4	325	15	08.4	-1	7	24.6
	20	323	34	59.4	0	59	28.2		5	325	15	10.8	1	7	35.8
	21	323	39	09.0	0	59	37.7		6	325	15	07.3	1	7	47.0
	22	323	43	14.0	0	59	47.3		7	325	14	57.8	1	7	58.2
	23	323	47	14.2	0	59	57.0		8	325	14	42.5	1	8	09.4
	24	323	51	09.7	1	0	06.7		9	325	14	21.3	1	8	20.5
	25	323	55	00.2	-1	0	16.5		10	325	13	54.3	-1	8	31.7
	26	323	58	45.8	1	0	26.3		11	325	13	21.4	1	8	42.9
	27	324	02	26.4	1	0	36.2		12	325	12	42.9	1	8	54.0
	28	324	06	02.0	1	0	46.2		13	325	11	58.7	1	9	05.1
	29	324	09	32.5	1	0	56.2		14	325	11	08.8	1	9	16.2
	30	324	12	58.0	1	1	06.3		15	325	10	13.2	1	9	27.3
May	1	324	16	18.4	-1	1	16.4		16	325	09	12.0	-1	9	38.3
	2	324	19	33.6	1	1	26.6		17	325	08	05.0	1	9	49.3
	3	324	22	43.7	1	1	36.8		18	325	06	52.3	1	10	00.3
	4	324	25	48.5	1	1	47.1		19	325	05	34.0	1	10	11.2
	5	324	28	48.0	1	1	57.4		20	325	04	09.9	1	10	22.1
	6	324	31	42.2	1	2	07.8		21	325	02	40.3	1	10	33.0
	7	324	34	31.0	-1	2	18.3		22	325	01	05.0	-1	10	43.8
	8	324	37	14.4	1	2	28.7		23	324	59	24.3	1	10	54.5
	9	324	39	52.3	1	2	39.3		24	324	57	38.2	1	11	05.2
	10	324	42	24.7	1	2	49.9		25	324	55	46.7	1	11	15.9
	11	324	44	51.6	1	3	00.5		26	324	53	49.9	1	11	26.5
	12	324	47	12.9	1	3	11.2		27	324	51	47.7	1	11	37.0
	13	324	49	28.7	-1	3	21.9		28	324	49	40.4	-1	11	47.5
	14	324	51	38.9	1	3	32.6		29	324	47	27.8	1	11	58.0
	15	324	53	43.6	1	3	43.4		30	324	45	10.1	1	12	08.3
	16	324	55	42.8	1	3	54.3	July	1	324	42	47.3	1	12	18.6
	17	324	57	36.3	-1	4	05.1		2	324	40	19.4	-1	12	28.9

SATURN, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	324	42	47.3	-1	12	18.6	Aug.	16	321	48	14.0	-1	18	15.5
	2	324	40	19.4	1	12	28.9		17	321	43	44.2	1	18	19.9
	3	324	37	46.6	1	12	39.0		18	321	39	14.7	1	18	24.2
	4	324	35	08.9	1	12	49.1		19	321	34	45.7	1	18	28.3
	5	324	32	26.4	1	12	59.1		20	321	30	17.3	1	18	32.2
	6	324	29	39.1	1	13	09.0		21	321	25	49.6	1	18	36.0
	7	324	26	47.3	-1	13	18.9		22	321	21	22.8	-1	18	39.6
	8	324	23	50.9	1	13	28.7		23	321	16	56.9	1	18	43.1
	9	324	20	50.2	1	13	38.3		24	321	12	32.2	1	18	46.4
	10	324	17	45.1	1	13	47.9		25	321	08	08.6	1	18	49.5
	11	324	14	35.9	1	13	57.4		26	321	03	46.5	1	18	52.5
	12	324	11	22.5	1	14	06.8		27	320	59	25.9	1	18	55.3
	13	324	08	05.1	-1	14	16.1		28	320	55	06.9	-1	18	58.0
	14	324	04	43.7	1	14	25.3		29	320	50	49.7	1	19	00.5
	15	324	01	18.3	1	14	34.3		30	320	46	34.5	1	19	02.9
	16	323	57	49.0	1	14	43.3		31	320	42	21.4	1	19	05.1
	17	323	54	15.9	1	14	52.1	Sept.	1	320	38	10.5	1	19	07.1
	18	323	50	39.1	-1	15	00.9		2	320	34	02.2	1	19	09.0
	19	323	46	58.7	-1	15	09.5		3	320	29	56.3	-1	19	10.7
	20	323	43	14.9	1	15	18.0		4	320	25	53.2	1	19	12.3
	21	323	39	27.8	1	15	26.3		5	320	21	52.9	1	19	13.7
	22	323	35	37.5	1	15	34.6		6	320	17	55.5	1	19	15.0
	23	323	31	44.0	1	15	42.7		7	320	14	01.1	1	19	16.1
	24	323	27	47.6	1	15	50.7		8	320	10	09.7	1	19	17.0
	25	323	23	48.3	-1	15	58.6		9	320	06	21.5	-1	19	17.9
	26	323	19	46.3	1	16	06.3		10	320	02	36.6	1	19	18.5
	27	323	15	41.6	1	16	13.9		11	319	58	55.0	1	19	19.0
	28	323	11	34.4	1	16	21.4		12	319	55	16.9	1	19	19.4
	29	323	07	24.7	1	16	28.7		13	319	51	42.5	1	19	19.6
	30	323	03	12.8	1	16	35.9		14	319	48	11.9	1	19	19.7
	31	322	58	58.6	-1	16	43.0		15	319	44	45.1	-1	19	19.7
Aug.	1	322	54	42.5	1	16	49.9		16	319	41	22.4	1	19	19.5
	2	322	50	24.4	1	16	56.7		17	319	38	03.7	1	19	19.2
	3	322	46	04.6	1	17	03.3		18	319	34	49.3	1	19	18.7
	4	322	41	43.2	1	17	09.8		19	319	31	39.1	1	19	18.1
	5	322	37	20.5	1	17	16.1		20	319	28	33.2	1	19	17.5
	6	322	32	56.4	-1	17	22.3		21	319	25	31.8	-1	19	16.6
	7	322	28	31.3	1	17	28.3		22	319	22	34.9	1	19	15.7
	8	322	24	05.2	1	17	34.2		23	319	19	42.6	1	19	14.6
	9	322	19	38.2	1	17	39.9		24	319	16	55.0	1	19	13.5
	10	322	15	10.5	1	17	45.5		25	319	14	12.2	1	19	12.2
	11	322	10	42.1	1	17	50.9		26	319	11	34.3	1	19	10.8
	12	322	06	13.1	-1	17	56.1		27	319	09	01.5	-1	19	09.3
	13	322	01	43.6	1	18	01.2		28	319	06	33.7	1	19	07.7
	14	321	57	13.8	1	18	06.1		29	319	04	11.2	1	19	06.0
	15	321	52	43.9	1	18	10.9		30	319	01	54.0	1	19	04.1
	16	321	48	14.0	-1	18	15.5	Oct.	1	318	59	42.1	-1	19	02.2

SATURN, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Oct.	1	318	59	42.1	-1	19	02.2
	2	318	57	35.7	1	19	00.2
	3	318	55	34.7	1	18	58.1
	4	318	53	39.2	1	18	55.9
	5	318	51	49.2	1	18	53.6
	6	318	50	04.7	1	18	51.2
	7	318	48	25.8	-1	18	48.7
	8	318	46	52.4	1	18	46.2
	9	318	45	24.8	1	18	43.5
	10	318	44	02.9	1	18	40.8
	11	318	42	46.8	1	18	38.0
	12	318	41	36.6	1	18	35.2
	13	318	40	32.3	-1	18	32.3
	14	318	39	33.9	1	18	29.3
	15	318	38	41.5	1	18	26.2
	16	318	37	55.0	1	18	23.1
	17	318	37	14.6	1	18	20.0
	18	318	36	40.1	1	18	16.8
	19	318	36	11.7	-1	18	13.5
	20	318	35	49.3	1	18	10.2
	21	318	35	32.9	1	18	06.9
	22	318	35	22.7	1	18	03.5
	23	318	35	18.5	1	18	00.1
	24	318	35	20.5	1	17	56.6
	25	318	35	28.8	-1	17	53.1
	26	318	35	43.2	1	17	49.6
	27	318	36	03.9	1	17	46.0
	28	318	36	30.9	1	17	42.5
	29	318	37	04.1	1	17	38.9
	30	318	37	43.6	1	17	35.2
	31	318	38	29.2	-1	17	31.6
Nov.	1	318	39	21.0	1	17	27.9
	2	318	40	18.8	1	17	24.3
	3	318	41	22.7	1	17	20.6
	4	318	42	32.7	1	17	16.9
	5	318	43	48.7	1	17	13.2
	6	318	45	10.8	-1	17	09.4
	7	318	46	38.9	1	17	05.7
	8	318	48	13.2	1	17	02.0
	9	318	49	53.4	1	16	58.3
	10	318	51	39.7	1	16	54.6
	11	318	53	32.0	1	16	50.9
	12	318	55	30.2	-1	16	47.2
	13	318	57	34.4	1	16	43.5
	14	318	59	44.4	1	16	39.8
	15	319	02	00.3	1	16	36.2
	16	319	04	21.9	-1	16	32.6

Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Nov.	16	319	04	21.9	-1	16	32.6
	17	319	06	49.3	1	16	29.0
	18	319	09	22.5	1	16	25.4
	19	319	12	01.4	1	16	21.9
	20	319	14	46.0	1	16	18.4
	21	319	17	36.3	1	16	14.9
	22	319	20	32.3	-1	16	11.4
	23	319	23	33.9	1	16	08.0
	24	319	26	41.2	1	16	04.6
	25	319	29	54.1	1	16	01.3
	26	319	33	12.5	1	15	57.9
	27	319	36	36.3	1	15	54.7
	28	319	40	05.5	-1	15	51.4
	29	319	43	40.0	1	15	48.2
	30	319	47	19.6	1	15	45.1
Dec.	1	319	51	04.4	1	15	42.0
	2	319	54	54.3	1	15	38.9
	3	319	58	49.3	1	15	35.9
	4	320	02	49.3	-1	15	32.9
	5	320	06	54.4	1	15	30.0
	6	320	11	04.4	1	15	27.1
	7	320	15	19.3	1	15	24.3
	8	320	19	39.0	1	15	21.6
	9	320	24	03.6	1	15	18.9
	10	320	28	32.8	-1	15	16.3
	11	320	33	06.7	1	15	13.7
	12	320	37	45.1	1	15	11.2
	13	320	42	28.0	1	15	08.8
	14	320	47	15.4	1	15	06.4
	15	320	52	07.2	1	15	04.1
	16	320	57	03.3	-1	15	01.9
	17	321	02	03.8	1	14	59.7
	18	321	07	08.4	1	14	57.6
	19	321	12	17.3	1	14	55.6
	20	321	17	30.4	1	14	53.7
	21	321	22	47.7	1	14	51.8
	22	321	28	09.1	-1	14	50.0
	23	321	33	34.4	1	14	48.3
	24	321	39	03.7	1	14	46.7
	25	321	44	36.8	1	14	45.1
	26	321	50	13.5	1	14	43.6
	27	321	55	53.9	1	14	42.2
	28	322	01	37.8	-1	14	40.8
	29	322	07	25.2	1	14	39.6
	30	322	13	15.9	1	14	38.4
	31	322	19	10.1	1	14	37.3
	32	322	25	07.6	-1	14	36.3

SATURN, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	20	57	58.88	-18	02	24.9	10.737 373	0.82	6.88	14	17	20
	1	20	58	25.05	18	00	38.1	10.746 100	0.82	6.87	14	13	50
	2	20	58	51.38	17	58	50.6	10.754 600	0.82	6.86	14	10	20
	3	20	59	17.86	17	57	02.2	10.762 871	0.82	6.86	14	06	51
	4	20	59	44.50	17	55	13.1	10.770 910	0.82	6.85	14	03	22
	5	21	00	11.27	17	53	23.2	10.778 716	0.82	6.85	13	59	52
	6	21	00	38.17	-17	51	32.5	10.786 286	0.82	6.84	13	56	23
	7	21	01	05.20	17	49	41.1	10.793 619	0.81	6.84	13	52	54
	8	21	01	32.35	17	47	49.0	10.800 713	0.81	6.83	13	49	26
	9	21	01	59.63	17	45	56.1	10.807 568	0.81	6.83	13	45	57
	10	21	02	27.02	17	44	02.5	10.814 181	0.81	6.83	13	42	28
	11	21	02	54.52	17	42	08.3	10.820 552	0.81	6.82	13	38	60
	12	21	03	22.13	-17	40	13.3	10.826 680	0.81	6.82	13	35	31
	13	21	03	49.85	17	38	17.8	10.832 562	0.81	6.81	13	32	03
	14	21	04	17.66	17	36	21.6	10.838 200	0.81	6.81	13	28	35
	15	21	04	45.57	17	34	24.7	10.843 590	0.81	6.81	13	25	07
	16	21	05	13.57	17	32	27.4	10.848 733	0.81	6.80	13	21	39
	17	21	05	41.66	17	30	29.4	10.853 627	0.81	6.80	13	18	11
	18	21	06	09.82	-17	28	30.9	10.858 272	0.81	6.80	13	14	43
	19	21	06	38.05	17	26	32.0	10.862 667	0.81	6.80	13	11	15
	20	21	07	06.36	17	24	32.5	10.866 810	0.81	6.79	13	07	47
	21	21	07	34.72	17	22	32.5	10.870 701	0.81	6.79	13	04	20
	22	21	08	03.15	17	20	32.1	10.874 339	0.81	6.79	13	00	52
	23	21	08	31.63	17	18	31.2	10.877 723	0.81	6.79	12	57	25
	24	21	09	00.16	-17	16	29.8	10.880 852	0.81	6.78	12	53	57
	25	21	09	28.74	17	14	28.0	10.883 725	0.81	6.78	12	50	30
	26	21	09	57.37	17	12	25.8	10.886 342	0.81	6.78	12	47	02
	27	21	10	26.04	17	10	23.2	10.888 701	0.81	6.78	12	43	35
	28	21	10	54.75	17	08	20.1	10.890 801	0.81	6.78	12	40	08
	29	21	11	23.49	17	06	16.8	10.892 642	0.81	6.78	12	36	40
	30	21	11	52.26	-17	04	13.1	10.894 223	0.81	6.78	12	33	13
	31	21	12	21.06	17	02	09.1	10.895 543	0.81	6.78	12	29	46
Feb.	1	21	12	49.86	17	00	04.9	10.896 602	0.81	6.77	12	26	19
	2	21	13	18.67	16	58	00.5	10.897 400	0.81	6.77	12	22	51
	3	21	13	47.48	16	55	55.9	10.897 936	0.81	6.77	12	19	24
	4	21	14	16.29	16	53	51.2	10.898 211	0.81	6.77	12	15	57
	5	21	14	45.06	-16	51	46.4	10.898 224	0.81	6.77	12	12	30
	6	21	15	13.83	16	49	41.0	10.897 977	0.81	6.77	12	09	02
	7	21	15	42.60	16	47	35.4	10.897 469	0.81	6.77	12	05	35
	8	21	16	11.36	16	45	29.9	10.896 702	0.81	6.77	12	02	08
	9	21	16	40.09	16	43	24.2	10.895 676	0.81	6.78	11	58	40
	10	21	17	08.79	16	41	18.5	10.894 390	0.81	6.78	11	55	13
	11	21	17	37.46	-16	39	12.7	10.892 847	0.81	6.78	11	51	46
	12	21	18	06.10	16	37	06.9	10.891 047	0.81	6.78	11	48	18
	13	21	18	34.69	16	35	01.1	10.888 990	0.81	6.78	11	44	51
	14	21	19	03.24	16	32	55.3	10.886 678	0.81	6.78	11	41	23
	15	21	19	31.73	-16	30	49.6	10.884 111	0.81	6.78	11	37	55

SATURN, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	21	19	31.73	-16	30	49.6	10.884 111	0.81	6.78	11	37	55
	16	21	20	00.17	16	28	44.0	10.881 289	0.81	6.78	11	34	28
	17	21	20	28.55	16	26	38.4	10.878 214	0.81	6.79	11	31	00
	18	21	20	56.86	16	24	33.0	10.874 886	0.81	6.79	11	27	32
	19	21	21	25.10	16	22	27.6	10.871 307	0.81	6.79	11	24	04
	20	21	21	53.26	16	20	22.5	10.867 476	0.81	6.79	11	20	37
	21	21	22	21.36	-16	18	17.4	10.863 395	0.81	6.80	11	17	09
	22	21	22	49.38	16	16	12.5	10.859 064	0.81	6.80	11	13	41
	23	21	23	17.32	16	14	07.8	10.854 484	0.81	6.80	11	10	12
	24	21	23	45.17	16	12	03.3	10.849 656	0.81	6.80	11	06	44
	25	21	24	12.94	16	09	59.1	10.844 580	0.81	6.81	11	03	16
	26	21	24	40.61	16	07	55.1	10.839 257	0.81	6.81	10	59	47
	27	21	25	08.19	-16	05	51.4	10.833 689	0.81	6.81	10	56	19
	28	21	25	35.65	16	03	48.1	10.827 876	0.81	6.82	10	52	50
Mar.	1	21	26	03.00	16	01	45.2	10.821 820	0.81	6.82	10	49	21
	2	21	26	30.23	15	59	42.7	10.815 522	0.81	6.83	10	45	53
	3	21	26	57.34	15	57	40.5	10.808 983	0.81	6.83	10	42	24
	4	21	27	24.32	15	55	38.8	10.802 206	0.81	6.83	10	38	54
	5	21	27	51.17	-15	53	37.6	10.795 192	0.81	6.84	10	35	25
	6	21	28	17.89	15	51	36.8	10.787 943	0.82	6.84	10	31	56
	7	21	28	44.47	15	49	36.5	10.780 461	0.82	6.85	10	28	26
	8	21	29	10.91	15	47	36.7	10.772 749	0.82	6.85	10	24	57
	9	21	29	37.21	15	45	37.4	10.764 808	0.82	6.86	10	21	27
	10	21	30	03.36	15	43	38.7	10.756 641	0.82	6.86	10	17	57
	11	21	30	29.35	-15	41	40.7	10.748 250	0.82	6.87	10	14	27
	12	21	30	55.19	15	39	43.2	10.739 637	0.82	6.87	10	10	56
	13	21	31	20.87	15	37	46.4	10.730 805	0.82	6.88	10	07	26
	14	21	31	46.38	15	35	50.3	10.721 755	0.82	6.89	10	03	55
	15	21	32	11.71	15	33	55.0	10.712 490	0.82	6.89	10	00	25
	16	21	32	36.88	15	32	00.3	10.703 013	0.82	6.90	9	56	54
	17	21	33	01.86	-15	30	06.4	10.693 325	0.82	6.90	9	53	23
	18	21	33	26.65	15	28	13.3	10.683 429	0.82	6.91	9	49	51
	19	21	33	51.27	15	26	20.9	10.673 326	0.82	6.92	9	46	20
	20	21	34	15.69	15	24	29.3	10.663 021	0.82	6.92	9	42	48
	21	21	34	39.93	15	22	38.6	10.652 513	0.83	6.93	9	39	16
	22	21	35	03.97	15	20	48.6	10.641 806	0.83	6.94	9	35	44
	23	21	35	27.82	-15	18	59.5	10.630 901	0.83	6.94	9	32	12
	24	21	35	51.47	15	17	11.3	10.619 801	0.83	6.95	9	28	39
	25	21	36	14.92	15	15	24.0	10.608 507	0.83	6.96	9	25	07
	26	21	36	38.16	15	13	37.7	10.597 024	0.83	6.97	9	21	34
	27	21	37	01.18	15	11	52.3	10.585 351	0.83	6.97	9	18	01
	28	21	37	23.98	15	10	08.0	10.573 493	0.83	6.98	9	14	27
	29	21	37	46.55	-15	08	24.7	10.561 452	0.83	6.99	9	10	54
	30	21	38	08.89	15	06	42.4	10.549 230	0.83	7.00	9	07	20
	31	21	38	30.99	15	05	01.3	10.536 831	0.83	7.01	9	03	46
Apr.	1	21	38	52.86	15	03	21.2	10.524 259	0.84	7.01	9	00	12
	2	21	39	14.49	-15	01	42.2	10.511 515	0.84	7.02	8	56	37

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	21	38	52.86	-15	03	21.2	10.524 259	0.84	7.01	9	00	12
	2	21	39	14.49	15	01	42.2	10.511 515	0.84	7.02	8	56	37
	3	21	39	35.87	15	00	04.4	10.498 604	0.84	7.03	8	53	03
	4	21	39	57.01	14	58	27.7	10.485 528	0.84	7.04	8	49	28
	5	21	40	17.90	14	56	52.2	10.472 292	0.84	7.05	8	45	53
	6	21	40	38.54	14	55	17.9	10.458 899	0.84	7.06	8	42	17
	7	21	40	58.92	-14	53	44.9	10.445 352	0.84	7.07	8	38	41
	8	21	41	19.04	14	52	13.1	10.431 655	0.84	7.08	8	35	05
	9	21	41	38.90	14	50	42.6	10.417 811	0.84	7.09	8	31	29
	10	21	41	58.48	14	49	13.4	10.403 824	0.85	7.10	8	27	53
	11	21	42	17.80	14	47	45.6	10.389 697	0.85	7.11	8	24	16
	12	21	42	36.83	14	46	19.1	10.375 434	0.85	7.11	8	20	39
	13	21	42	55.59	-14	44	54.0	10.361 038	0.85	7.12	8	17	01
	14	21	43	14.06	14	43	30.3	10.346 513	0.85	7.13	8	13	24
	15	21	43	32.25	14	42	08.0	10.331 862	0.85	7.14	8	09	46
	16	21	43	50.15	14	40	47.1	10.317 088	0.85	7.16	8	06	08
	17	21	44	07.77	14	39	27.6	10.302 196	0.85	7.17	8	02	29
	18	21	44	25.09	14	38	09.6	10.287 187	0.85	7.18	7	58	50
	19	21	44	42.12	-14	36	53.0	10.272 066	0.86	7.19	7	55	11
	20	21	44	58.87	14	35	37.8	10.256 836	0.86	7.20	7	51	32
	21	21	45	15.31	14	34	24.2	10.241 499	0.86	7.21	7	47	52
	22	21	45	31.45	14	33	12.2	10.226 060	0.86	7.22	7	44	12
	23	21	45	47.28	14	32	01.7	10.210 521	0.86	7.23	7	40	32
	24	21	46	02.79	14	30	52.8	10.194 887	0.86	7.24	7	36	52
	25	21	46	17.99	-14	29	45.6	10.179 160	0.86	7.25	7	33	11
	26	21	46	32.87	14	28	40.0	10.163 345	0.87	7.26	7	29	29
	27	21	46	47.41	14	27	36.0	10.147 446	0.87	7.27	7	25	48
	28	21	47	01.64	14	26	33.7	10.131 467	0.87	7.29	7	22	06
	29	21	47	15.53	14	25	33.1	10.115 412	0.87	7.30	7	18	24
	30	21	47	29.10	14	24	34.1	10.099 286	0.87	7.31	7	14	41
May	1	21	47	42.33	-14	23	36.9	10.083 092	0.87	7.32	7	10	58
	2	21	47	55.23	14	22	41.3	10.066 835	0.87	7.33	7	07	15
	3	21	48	07.79	14	21	47.6	10.050 520	0.87	7.34	7	03	32
	4	21	48	20.01	14	20	55.5	10.034 150	0.88	7.36	6	59	48
	5	21	48	31.89	14	20	05.3	10.017 731	0.88	7.37	6	56	04
	6	21	48	43.43	14	19	16.9	10.001 267	0.88	7.38	6	52	19
	7	21	48	54.61	-14	18	30.3	9.984 762	0.88	7.39	6	48	34
	8	21	49	05.44	14	17	45.5	9.968 221	0.88	7.41	6	44	49
	9	21	49	15.92	14	17	02.6	9.951 647	0.88	7.42	6	41	03
	10	21	49	26.04	14	16	21.5	9.935 046	0.89	7.43	6	37	18
	11	21	49	35.81	14	15	42.4	9.918 421	0.89	7.44	6	33	31
	12	21	49	45.21	14	15	05.1	9.901 778	0.89	7.46	6	29	45
	13	21	49	54.25	-14	14	29.6	9.885 119	0.89	7.47	6	25	58
	14	21	50	02.94	14	13	56.0	9.868 450	0.89	7.48	6	22	10
	15	21	50	11.26	14	13	24.4	9.851 774	0.89	7.49	6	18	23
	16	21	50	19.23	14	12	54.5	9.835 095	0.89	7.51	6	14	34
	17	21	50	26.83	-14	12	26.6	9.818 417	0.90	7.52	6	10	46

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	21	50	26.83	-14	12	26.6	9.818 417	0.90	7.52	6	10	46
	18	21	50	34.08	14	12	00.6	9.801 745	0.90	7.53	6	06	57
	19	21	50	40.96	14	11	36.5	9.785 081	0.90	7.54	6	03	08
	20	21	50	47.46	14	11	14.3	9.768 431	0.90	7.56	5	59	18
	21	21	50	53.60	14	10	54.2	9.751 798	0.90	7.57	5	55	29
	22	21	50	59.35	14	10	36.0	9.735 187	0.90	7.58	5	51	38
	23	21	51	04.73	-14	10	19.8	9.718 602	0.90	7.60	5	47	48
	24	21	51	09.72	14	10	05.6	9.702 047	0.91	7.61	5	43	57
	25	21	51	14.34	14	09	53.4	9.685 528	0.91	7.62	5	40	05
	26	21	51	18.57	14	09	43.1	9.669 048	0.91	7.63	5	36	13
	27	21	51	22.43	14	09	34.8	9.652 613	0.91	7.65	5	32	21
	28	21	51	25.90	14	09	28.5	9.636 228	0.91	7.66	5	28	29
	29	21	51	29.00	-14	09	24.2	9.619 897	0.91	7.67	5	24	36
	30	21	51	31.72	14	09	21.9	9.603 626	0.92	7.69	5	20	42
	31	21	51	34.05	14	09	21.6	9.587 418	0.92	7.70	5	16	49
June	1	21	51	36.00	14	09	23.3	9.571 280	0.92	7.71	5	12	55
	2	21	51	37.57	14	09	27.0	9.555 215	0.92	7.73	5	09	00
	3	21	51	38.76	14	09	32.7	9.539 228	0.92	7.74	5	05	06
	4	21	51	39.56	-14	09	40.4	9.523 325	0.92	7.75	5	01	10
	5	21	51	39.97	14	09	50.2	9.507 510	0.92	7.76	4	57	15
	6	21	51	40.01	14	10	01.9	9.491 787	0.93	7.78	4	53	19
	7	21	51	39.66	14	10	15.6	9.476 161	0.93	7.79	4	49	22
	8	21	51	38.92	14	10	31.3	9.460 637	0.93	7.80	4	45	26
	9	21	51	37.81	14	10	49.0	9.445 219	0.93	7.82	4	41	29
	10	21	51	36.32	-14	11	08.6	9.429 911	0.93	7.83	4	37	31
	11	21	51	34.45	14	11	30.1	9.414 718	0.93	7.84	4	33	33
	12	21	51	32.21	14	11	53.6	9.399 643	0.94	7.85	4	29	35
	13	21	51	29.61	14	12	18.9	9.384 691	0.94	7.87	4	25	37
	14	21	51	26.63	14	12	46.1	9.369 866	0.94	7.88	4	21	38
	15	21	51	23.29	14	13	15.3	9.355 171	0.94	7.89	4	17	38
	16	21	51	19.58	-14	13	46.3	9.340 611	0.94	7.90	4	13	39
	17	21	51	15.50	14	14	19.2	9.326 190	0.94	7.92	4	09	39
	18	21	51	11.05	14	14	54.0	9.311 911	0.94	7.93	4	05	38
	19	21	51	06.23	14	15	30.8	9.297 779	0.95	7.94	4	01	37
	20	21	51	01.04	14	16	09.3	9.283 798	0.95	7.95	3	57	36
	21	21	50	55.48	14	16	49.7	9.269 973	0.95	7.96	3	53	35
	22	21	50	49.57	-14	17	31.9	9.256 309	0.95	7.98	3	49	33
	23	21	50	43.29	14	18	15.9	9.242 808	0.95	7.99	3	45	31
	24	21	50	36.67	14	19	01.6	9.229 477	0.95	8.00	3	41	28
	25	21	50	29.69	14	19	49.1	9.216 320	0.95	8.01	3	37	25
	26	21	50	22.36	14	20	38.3	9.203 340	0.96	8.02	3	33	22
	27	21	50	14.69	14	21	29.2	9.190 543	0.96	8.03	3	29	18
	28	21	50	06.68	-14	22	21.9	9.177 932	0.96	8.04	3	25	15
	29	21	49	58.32	14	23	16.2	9.165 513	0.96	8.05	3	21	10
	30	21	49	49.64	14	24	12.1	9.153 289	0.96	8.06	3	17	06
July	1	21	49	40.62	14	25	09.7	9.141 264	0.96	8.08	3	13	01
	2	21	49	31.27	-14	26	08.9	9.129 442	0.96	8.09	3	08	55

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	21	49	40.62	-14	25	09.7	9.141 264	0.96	8.08	3	13	01
	2	21	49	31.27	14	26	08.9	9.129 442	0.96	8.09	3	08	55
	3	21	49	21.59	14	27	09.7	9.117 828	0.96	8.10	3	04	50
	4	21	49	11.60	14	28	12.0	9.106 425	0.97	8.11	3	00	44
	5	21	49	01.28	14	29	15.9	9.095 237	0.97	8.12	2	56	38
	6	21	48	50.66	14	30	21.2	9.084 268	0.97	8.13	2	52	31
	7	21	48	39.74	-14	31	27.9	9.073 520	0.97	8.14	2	48	24
	8	21	48	28.52	14	32	36.0	9.062 997	0.97	8.15	2	44	17
	9	21	48	17.01	14	33	45.5	9.052 703	0.97	8.15	2	40	10
	10	21	48	05.22	14	34	56.3	9.042 641	0.97	8.16	2	36	02
	11	21	47	53.15	14	36	08.3	9.032 812	0.97	8.17	2	31	54
	12	21	47	40.81	14	37	21.6	9.023 221	0.97	8.18	2	27	46
	13	21	47	28.20	-14	38	36.2	9.013 871	0.98	8.19	2	23	38
	14	21	47	15.33	14	39	51.9	9.004 762	0.98	8.20	2	19	29
	15	21	47	02.19	14	41	08.9	8.995 900	0.98	8.21	2	15	20
	16	21	46	48.80	14	42	27.0	8.987 286	0.98	8.21	2	11	11
	17	21	46	35.15	14	43	46.2	8.978 923	0.98	8.22	2	07	01
	18	21	46	21.26	14	45	06.4	8.970 815	0.98	8.23	2	02	51
	19	21	46	07.13	-14	46	27.7	8.962 964	0.98	8.24	1	58	41
	20	21	45	52.77	14	47	50.0	8.955 373	0.98	8.24	1	54	31
	21	21	45	38.19	14	49	13.2	8.948 046	0.98	8.25	1	50	21
	22	21	45	23.39	14	50	37.2	8.940 985	0.98	8.26	1	46	10
	23	21	45	08.39	14	52	02.1	8.934 193	0.98	8.26	1	41	59
	24	21	44	53.18	14	53	27.8	8.927 673	0.99	8.27	1	37	48
	25	21	44	37.79	-14	54	54.3	8.921 427	0.99	8.27	1	33	37
	26	21	44	22.21	14	56	21.6	8.915 458	0.99	8.28	1	29	26
	27	21	44	06.45	14	57	49.5	8.909 768	0.99	8.29	1	25	14
	28	21	43	50.51	14	59	18.1	8.904 360	0.99	8.29	1	21	02
	29	21	43	34.42	15	00	47.3	8.899 236	0.99	8.30	1	16	50
	30	21	43	18.16	15	02	17.1	8.894 397	0.99	8.30	1	12	38
	31	21	43	01.76	-15	03	47.4	8.889 846	0.99	8.30	1	08	26
Aug.	1	21	42	45.22	15	05	18.2	8.885 583	0.99	8.31	1	04	14
	2	21	42	28.55	15	06	49.4	8.881 612	0.99	8.31	1	00	01
	3	21	42	11.75	15	08	20.9	8.877 932	0.99	8.31	0	55	49
	4	21	41	54.85	15	09	52.7	8.874 546	0.99	8.32	0	51	36
	5	21	41	37.85	15	11	24.7	8.871 453	0.99	8.32	0	47	23
	6	21	41	20.76	-15	12	57.0	8.868 656	0.99	8.32	0	43	10
	7	21	41	03.59	15	14	29.4	8.866 154	0.99	8.33	0	38	57
	8	21	40	46.35	15	16	01.9	8.863 948	0.99	8.33	0	34	44
	9	21	40	29.04	15	17	34.4	8.862 039	0.99	8.33	0	30	31
	10	21	40	11.68	15	19	07.0	8.860 426	0.99	8.33	0	26	18
	11	21	39	54.26	15	20	39.6	8.859 111	0.99	8.33	0	22	05
	12	21	39	36.80	-15	22	12.2	8.858 094	0.99	8.33	0	17	51
	13	21	39	19.31	15	23	44.7	8.857 374	0.99	8.33	0	13	38
	14	21	39	01.78	15	25	17.1	8.856 953	0.99	8.33	0	09	25
	15	21	38	44.24	15	26	49.3	8.856 830	0.99	8.33	0	05	11
	16	21	38	26.68	-15	28	21.2	8.857 007	0.99	8.33	0	00	58

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		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	21	38	26.68	-15	28	21.2	8.857 007	0.99	8.33	0	00	58
	17	21	38	09.13	15	29	52.8	8.857 482	0.99	8.33	23	52	31
	18	21	37	51.59	15	31	24.1	8.858 258	0.99	8.33	23	48	18
	19	21	37	34.08	15	32	55.0	8.859 334	0.99	8.33	23	44	05
	20	21	37	16.59	15	34	25.5	8.860 709	0.99	8.33	23	39	51
	21	21	36	59.15	15	35	55.5	8.862 385	0.99	8.33	23	35	38
	22	21	36	41.75	-15	37	25.0	8.864 360	0.99	8.33	23	31	25
	23	21	36	24.41	15	38	54.0	8.866 634	0.99	8.33	23	27	12
	24	21	36	07.14	15	40	22.4	8.869 207	0.99	8.32	23	22	59
	25	21	35	49.94	15	41	50.2	8.872 078	0.99	8.32	23	18	46
	26	21	35	32.82	15	43	17.4	8.875 246	0.99	8.32	23	14	33
	27	21	35	15.79	15	44	43.8	8.878 711	0.99	8.31	23	10	20
	28	21	34	58.86	-15	46	09.5	8.882 471	0.99	8.31	23	06	08
	29	21	34	42.05	15	47	34.3	8.886 524	0.99	8.31	23	01	55
	30	21	34	25.36	15	48	58.3	8.890 870	0.99	8.30	22	57	43
	31	21	34	08.79	15	50	21.4	8.895 506	0.99	8.30	22	53	31
Sept.	1	21	33	52.37	15	51	43.5	8.900 431	0.99	8.29	22	49	19
	2	21	33	36.11	15	53	04.6	8.905 643	0.99	8.29	22	45	07
	3	21	33	20.00	-15	54	24.7	8.911 139	0.99	8.28	22	40	55
	4	21	33	04.07	15	55	43.7	8.916 917	0.99	8.28	22	36	43
	5	21	32	48.31	15	57	01.6	8.922 975	0.99	8.27	22	32	32
	6	21	32	32.74	15	58	18.4	8.929 311	0.98	8.27	22	28	21
	7	21	32	17.36	15	59	34.1	8.935 922	0.98	8.26	22	24	10
	8	21	32	02.17	16	00	48.6	8.942 805	0.98	8.25	22	19	59
	9	21	31	47.18	-16	02	01.9	8.949 958	0.98	8.25	22	15	48
	10	21	31	32.40	16	03	13.9	8.957 378	0.98	8.24	22	11	38
	11	21	31	17.84	16	04	24.7	8.965 063	0.98	8.23	22	07	28
	12	21	31	03.50	16	05	34.1	8.973 012	0.98	8.23	22	03	18
	13	21	30	49.40	16	06	42.2	8.981 220	0.98	8.22	21	59	08
	14	21	30	35.54	16	07	48.9	8.989 686	0.98	8.21	21	54	58
	15	21	30	21.93	-16	08	54.2	8.998 408	0.98	8.20	21	50	49
	16	21	30	08.57	16	09	58.0	9.007 382	0.98	8.20	21	46	40
	17	21	29	55.49	16	11	00.4	9.016 606	0.98	8.19	21	42	32
	18	21	29	42.67	16	12	01.3	9.026 077	0.97	8.18	21	38	23
	19	21	29	30.13	16	13	00.7	9.035 792	0.97	8.17	21	34	15
	20	21	29	17.87	16	13	58.6	9.045 749	0.97	8.16	21	30	07
	21	21	29	05.90	-16	14	54.9	9.055 943	0.97	8.15	21	25	60
	22	21	28	54.22	16	15	49.7	9.066 371	0.97	8.14	21	21	52
	23	21	28	42.84	16	16	42.9	9.077 031	0.97	8.13	21	17	45
	24	21	28	31.77	16	17	34.4	9.087 918	0.97	8.12	21	13	39
	25	21	28	21.01	16	18	24.3	9.099 029	0.97	8.11	21	09	33
	26	21	28	10.57	16	19	12.5	9.110 360	0.97	8.10	21	05	27
	27	21	28	00.46	-16	19	59.0	9.121 907	0.96	8.09	21	01	21
	28	21	27	50.68	16	20	43.8	9.133 665	0.96	8.08	20	57	16
	29	21	27	41.24	16	21	26.7	9.145 631	0.96	8.07	20	53	11
	30	21	27	32.14	16	22	07.9	9.157 801	0.96	8.06	20	49	06
Oct.	1	21	27	23.40	-16	22	47.3	9.170 168	0.96	8.05	20	45	02

SATURN, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	21	27	23.40	-16	22	47.3	9.170 168	0.96	8.05	20	45	02
	2	21	27	15.01	16	23	24.9	9.182 730	0.96	8.04	20	40	58
	3	21	27	06.98	16	24	00.8	9.195 482	0.96	8.03	20	36	54
	4	21	26	59.31	16	24	34.8	9.208 418	0.96	8.02	20	32	51
	5	21	26	52.00	16	25	07.0	9.221 535	0.95	8.01	20	28	48
	6	21	26	45.06	16	25	37.4	9.234 828	0.95	7.99	20	24	45
	7	21	26	38.47	-16	26	05.9	9.248 293	0.95	7.98	20	20	43
	8	21	26	32.26	16	26	32.6	9.261 926	0.95	7.97	20	16	41
	9	21	26	26.41	16	26	57.4	9.275 721	0.95	7.96	20	12	40
	10	21	26	20.95	16	27	20.4	9.289 676	0.95	7.95	20	08	39
	11	21	26	15.86	16	27	41.4	9.303 785	0.95	7.93	20	04	38
	12	21	26	11.16	16	28	00.5	9.318 046	0.94	7.92	20	00	38
	13	21	26	06.85	-16	28	17.8	9.332 452	0.94	7.91	19	56	38
	14	21	26	02.93	16	28	33.1	9.347 001	0.94	7.90	19	52	39
	15	21	25	59.40	16	28	46.5	9.361 688	0.94	7.89	19	48	40
	16	21	25	56.26	16	28	58.0	9.376 508	0.94	7.87	19	44	41
	17	21	25	53.52	16	29	07.6	9.391 457	0.94	7.86	19	40	43
	18	21	25	51.18	16	29	15.2	9.406 530	0.93	7.85	19	36	45
	19	21	25	49.23	-16	29	21.0	9.421 724	0.93	7.84	19	32	47
	20	21	25	47.68	16	29	24.9	9.437 032	0.93	7.82	19	28	50
	21	21	25	46.53	16	29	26.8	9.452 451	0.93	7.81	19	24	53
	22	21	25	45.77	16	29	26.8	9.467 975	0.93	7.80	19	20	57
	23	21	25	45.43	16	29	24.8	9.483 600	0.93	7.78	19	17	01
	24	21	25	45.49	16	29	20.9	9.499 320	0.93	7.77	19	13	06
	25	21	25	45.95	-16	29	15.0	9.515 131	0.92	7.76	19	09	11
	26	21	25	46.83	16	29	07.1	9.531 027	0.92	7.75	19	05	16
	27	21	25	48.12	16	28	57.3	9.547 003	0.92	7.73	19	01	21
	28	21	25	49.82	16	28	45.4	9.563 054	0.92	7.72	18	57	28
	29	21	25	51.94	16	28	31.6	9.579 174	0.92	7.71	18	53	34
	30	21	25	54.47	16	28	15.9	9.595 358	0.92	7.69	18	49	41
	31	21	25	57.40	-16	27	58.2	9.611 601	0.91	7.68	18	45	48
Nov.	1	21	26	00.74	16	27	38.7	9.627 898	0.91	7.67	18	41	56
	2	21	26	04.48	16	27	17.2	9.644 243	0.91	7.65	18	38	04
	3	21	26	08.62	16	26	53.8	9.660 631	0.91	7.64	18	34	13
	4	21	26	13.16	16	26	28.5	9.677 059	0.91	7.63	18	30	22
	5	21	26	18.10	16	26	01.3	9.693 521	0.91	7.62	18	26	31
	6	21	26	23.44	-16	25	32.2	9.710 012	0.91	7.60	18	22	41
	7	21	26	29.18	16	25	01.1	9.726 529	0.90	7.59	18	18	51
	8	21	26	35.32	16	24	28.2	9.743 065	0.90	7.58	18	15	01
	9	21	26	41.86	16	23	53.3	9.759 618	0.90	7.56	18	11	12
	10	21	26	48.79	16	23	16.6	9.776 182	0.90	7.55	18	07	23
	11	21	26	56.12	16	22	38.0	9.792 753	0.90	7.54	18	03	35
	12	21	27	03.84	-16	21	57.5	9.809 327	0.90	7.53	17	59	47
	13	21	27	11.95	16	21	15.2	9.825 898	0.89	7.51	17	55	60
	14	21	27	20.45	16	20	31.1	9.842 463	0.89	7.50	17	52	12
	15	21	27	29.33	16	19	45.2	9.859 016	0.89	7.49	17	48	26
	16	21	27	38.60	-16	18	57.4	9.875 554	0.89	7.48	17	44	39

SATURN, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	21	27	38.60	-16	18	57.4	9.875 554	0.89	7.48	17	44	39
	17	21	27	48.24	16	18	07.9	9.892 071	0.89	7.46	17	40	53
	18	21	27	58.27	16	17	16.5	9.908 563	0.89	7.45	17	37	08
	19	21	28	08.66	16	16	23.3	9.925 025	0.89	7.44	17	33	22
	20	21	28	19.44	16	15	28.3	9.941 452	0.88	7.43	17	29	37
	21	21	28	30.59	16	14	31.6	9.957 839	0.88	7.41	17	25	53
	22	21	28	42.11	-16	13	33.0	9.974 183	0.88	7.40	17	22	09
	23	21	28	54.00	16	12	32.6	9.990 476	0.88	7.39	17	18	25
	24	21	29	06.27	16	11	30.4	10.006 716	0.88	7.38	17	14	41
	25	21	29	18.90	16	10	26.5	10.022 896	0.88	7.37	17	10	58
	26	21	29	31.89	16	09	20.9	10.039 013	0.88	7.35	17	07	15
	27	21	29	45.24	16	08	13.5	10.055 060	0.87	7.34	17	03	33
	28	21	29	58.95	-16	07	04.5	10.071 033	0.87	7.33	16	59	51
	29	21	30	12.99	16	05	53.8	10.086 929	0.87	7.32	16	56	09
	30	21	30	27.38	16	04	41.4	10.102 742	0.87	7.31	16	52	28
Dec.	1	21	30	42.10	16	03	27.4	10.118 468	0.87	7.30	16	48	47
	2	21	30	57.16	16	02	11.8	10.134 103	0.87	7.28	16	45	06
	3	21	31	12.55	16	00	54.5	10.149 644	0.87	7.27	16	41	26
	4	21	31	28.27	-15	59	35.6	10.165 086	0.87	7.26	16	37	46
	5	21	31	44.32	15	58	15.0	10.180 425	0.86	7.25	16	34	06
	6	21	32	00.68	15	56	52.9	10.195 658	0.86	7.24	16	30	27
	7	21	32	17.37	15	55	29.2	10.210 781	0.86	7.23	16	26	48
	8	21	32	34.38	15	54	03.9	10.225 790	0.86	7.22	16	23	09
	9	21	32	51.70	15	52	37.1	10.240 682	0.86	7.21	16	19	30
	10	21	33	09.32	-15	51	08.8	10.255 453	0.86	7.20	16	15	52
	11	21	33	27.25	15	49	39.0	10.270 099	0.86	7.19	16	12	14
	12	21	33	45.47	15	48	07.8	10.284 617	0.86	7.18	16	08	37
	13	21	34	03.98	15	46	35.1	10.299 004	0.85	7.17	16	04	59
	14	21	34	22.79	15	45	00.9	10.313 254	0.85	7.16	16	01	22
	15	21	34	41.88	15	43	25.3	10.327 366	0.85	7.15	15	57	46
	16	21	35	01.25	-15	41	48.2	10.341 335	0.85	7.14	15	54	09
	17	21	35	20.90	15	40	09.8	10.355 157	0.85	7.13	15	50	33
	18	21	35	40.82	15	38	29.9	10.368 829	0.85	7.12	15	46	57
	19	21	36	01.02	15	36	48.6	10.382 347	0.85	7.11	15	43	21
	20	21	36	21.49	15	35	05.9	10.395 707	0.85	7.10	15	39	46
	21	21	36	42.22	15	33	21.9	10.408 906	0.84	7.09	15	36	11
	22	21	37	03.22	-15	31	36.5	10.421 940	0.84	7.08	15	32	36
	23	21	37	24.48	15	29	49.7	10.434 805	0.84	7.07	15	29	01
	24	21	37	46.00	15	28	01.7	10.447 497	0.84	7.07	15	25	27
	25	21	38	07.75	15	26	12.4	10.460 013	0.84	7.06	15	21	53
	26	21	38	29.75	15	24	21.8	10.472 350	0.84	7.05	15	18	19
	27	21	38	51.97	15	22	30.1	10.484 505	0.84	7.04	15	14	45
	28	21	39	14.42	-15	20	37.1	10.496 473	0.84	7.03	15	11	12
	29	21	39	37.09	15	18	43.0	10.508 254	0.84	7.02	15	07	39
	30	21	39	59.98	15	16	47.6	10.519 843	0.84	7.02	15	04	06
	31	21	40	23.09	15	14	51.1	10.531 238	0.84	7.01	15	00	33
	32	21	40	46.41	-15	12	53.5	10.542 437	0.83	7.00	14	57	00

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Jan. 1	43 25 09.9	-0 23 40.0	19.722 73	Apr. 3	44 26 43.7	-0 22 57.1	19.709 73
3	43 26 30.1	0 23 39.0	19.722 45	5	44 28 04.1	0 22 56.2	19.709 45
5	43 27 50.4	0 23 38.1	19.722 17	7	44 29 24.4	0 22 55.2	19.709 16
7	43 29 10.6	0 23 37.2	19.721 89	9	44 30 44.8	0 22 54.3	19.708 88
9	43 30 30.9	0 23 36.2	19.721 60	11	44 32 05.2	0 22 53.3	19.708 59
11	43 31 51.1	0 23 35.3	19.721 32	13	44 33 25.6	0 22 52.4	19.708 31
13	43 33 11.4	-0 23 34.4	19.721 04	15	44 34 45.9	-0 22 51.5	19.708 02
15	43 34 31.6	0 23 33.5	19.720 76	17	44 36 06.3	0 22 50.5	19.707 74
17	43 35 51.9	0 23 32.6	19.720 48	19	44 37 26.7	0 22 49.6	19.707 45
19	43 37 12.1	0 23 31.6	19.720 20	21	44 38 47.1	0 22 48.6	19.707 17
21	43 38 32.4	0 23 30.7	19.719 92	23	44 40 07.5	0 22 47.7	19.706 88
23	43 39 52.7	0 23 29.8	19.719 64	25	44 41 27.9	0 22 46.8	19.706 60
25	43 41 12.9	-0 23 28.8	19.719 36	27	44 42 48.3	-0 22 45.8	19.706 31
27	43 42 33.3	0 23 27.9	19.719 08	29	44 44 08.6	0 22 44.9	19.706 02
29	43 43 53.5	0 23 27.0	19.718 79	May 1	44 45 29.1	0 22 43.9	19.705 74
31	43 45 13.8	0 23 26.0	19.718 51	3	44 46 49.5	0 22 43.0	19.705 45
Feb. 2	43 46 34.1	0 23 25.1	19.718 23	5	44 48 09.9	0 22 42.0	19.705 17
4	43 47 54.4	0 23 24.2	19.717 95	7	44 49 30.3	0 22 41.1	19.704 88
6	43 49 14.6	-0 23 23.3	19.717 67	9	44 50 50.7	-0 22 40.2	19.704 59
8	43 50 34.9	0 23 22.3	19.717 39	11	44 52 11.1	0 22 39.2	19.704 31
10	43 51 55.2	0 23 21.4	19.717 10	13	44 53 31.5	0 22 38.3	19.704 02
12	43 53 15.5	0 23 20.4	19.716 82	15	44 54 51.9	0 22 37.3	19.703 73
14	43 54 35.8	0 23 19.5	19.716 54	17	44 56 12.3	0 22 36.4	19.703 45
16	43 55 56.1	0 23 18.6	19.716 26	19	44 57 32.8	0 22 35.4	19.703 16
18	43 57 16.4	-0 23 17.6	19.715 97	21	44 58 53.2	-0 22 34.5	19.702 87
20	43 58 36.7	0 23 16.7	19.715 69	23	45 00 13.7	0 22 33.5	19.702 58
22	43 59 57.0	0 23 15.8	19.715 41	25	45 01 34.1	0 22 32.6	19.702 30
24	44 01 17.3	0 23 14.9	19.715 13	27	45 02 54.5	0 22 31.7	19.702 01
26	44 02 37.7	0 23 13.9	19.714 84	29	45 04 15.0	0 22 30.7	19.701 72
28	44 03 58.0	0 23 13.0	19.714 56	31	45 05 35.4	0 22 29.8	19.701 44
Mar. 2	44 05 18.3	-0 23 12.0	19.714 28	June 2	45 06 55.8	-0 22 28.8	19.701 15
4	44 06 38.6	0 23 11.1	19.713 99	4	45 08 16.3	0 22 27.9	19.700 86
6	44 07 58.9	0 23 10.2	19.713 71	6	45 09 36.7	0 22 27.0	19.700 57
8	44 09 19.2	0 23 09.3	19.713 43	8	45 10 57.2	0 22 26.0	19.700 28
10	44 10 39.6	0 23 08.3	19.713 14	10	45 12 17.6	0 22 25.0	19.700 00
12	44 11 59.9	0 23 07.4	19.712 86	12	45 13 38.1	0 22 24.1	19.699 71
14	44 13 20.2	-0 23 06.4	19.712 58	14	45 14 58.6	-0 22 23.2	19.699 42
16	44 14 40.6	0 23 05.5	19.712 29	16	45 16 19.0	0 22 22.2	19.699 13
18	44 16 00.9	0 23 04.6	19.712 01	18	45 17 39.5	0 22 21.3	19.698 84
20	44 17 21.2	0 23 03.6	19.711 72	20	45 18 60.0	0 22 20.3	19.698 55
22	44 18 41.6	0 23 02.7	19.711 44	22	45 20 20.4	0 22 19.4	19.698 27
24	44 20 02.0	0 23 01.8	19.711 16	24	45 21 40.9	0 22 18.4	19.697 98
26	44 21 22.3	-0 23 00.8	19.710 87	26	45 23 01.4	-0 22 17.5	19.697 69
28	44 22 42.6	0 22 59.9	19.710 59	28	45 24 21.8	0 22 16.5	19.697 40
30	44 24 03.0	0 22 58.9	19.710 30	30	45 25 42.3	0 22 15.6	19.697 11
Apr. 1	44 25 23.4	0 22 58.0	19.710 02	July 2	45 27 02.8	0 22 14.6	19.696 82
3	44 26 43.7	-0 22 57.1	19.709 73	4	45 28 23.3	-0 22 13.7	19.696 53

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector
		° ′ ″	° ′ ″				° ′ ″	° ′ ″	
July	2	45 27 02.8	-0 22 14.6	19.696 82	Oct.	2	46 28 48.2	-0 21 30.7	19.683 39
	4	45 28 23.3	0 22 13.7	19.696 53		4	46 30 08.8	0 21 29.8	19.683 10
	6	45 29 43.8	0 22 12.7	19.696 24		6	46 31 29.4	0 21 28.8	19.682 80
	8	45 31 04.3	0 22 11.8	19.695 95		8	46 32 50.0	0 21 27.9	19.682 51
	10	45 32 24.8	0 22 10.8	19.695 66		10	46 34 10.7	0 21 26.9	19.682 21
	12	45 33 45.3	0 22 09.9	19.695 37		12	46 35 31.3	0 21 25.9	19.681 92
	14	45 35 05.8	-0 22 08.9	19.695 08		14	46 36 51.9	-0 21 25.0	19.681 62
	16	45 36 26.3	0 22 08.0	19.694 79		16	46 38 12.5	0 21 24.0	19.681 33
	18	45 37 46.8	0 22 07.0	19.694 50		18	46 39 33.2	0 21 23.0	19.681 03
	20	45 39 07.3	0 22 06.1	19.694 21		20	46 40 53.8	0 21 22.1	19.680 74
	22	45 40 27.9	0 22 05.1	19.693 92		22	46 42 14.5	0 21 21.1	19.680 44
	24	45 41 48.3	0 22 04.2	19.693 63		24	46 43 35.1	0 21 20.1	19.680 15
	26	45 43 08.9	-0 22 03.2	19.693 34		26	46 44 55.7	-0 21 19.2	19.679 85
	28	45 44 29.4	0 22 02.3	19.693 05		28	46 46 16.4	0 21 18.2	19.679 56
	30	45 45 49.9	0 22 01.3	19.692 76		30	46 47 37.0	0 21 17.3	19.679 26
Aug.	1	45 47 10.5	0 22 00.4	19.692 47	Nov.	1	46 48 57.7	0 21 16.3	19.678 96
	3	45 48 31.0	0 21 59.4	19.692 18		3	46 50 18.4	0 21 15.3	19.678 67
	5	45 49 51.5	0 21 58.5	19.691 88		5	46 51 39.0	0 21 14.4	19.678 37
	7	45 51 12.1	-0 21 57.5	19.691 59		7	46 52 59.7	-0 21 13.4	19.678 08
	9	45 52 32.6	0 21 56.6	19.691 30		9	46 54 20.3	0 21 12.4	19.677 78
	11	45 53 53.1	0 21 55.6	19.691 01		11	46 55 41.0	0 21 11.5	19.677 48
	13	45 55 13.7	0 21 54.7	19.690 72		13	46 57 01.7	0 21 10.5	19.677 19
	15	45 56 34.2	0 21 53.7	19.690 43		15	46 58 22.3	0 21 09.6	19.676 89
	17	45 57 54.8	0 21 52.7	19.690 14		17	46 59 43.0	0 21 08.6	19.676 59
	19	45 59 15.3	-0 21 51.8	19.689 84		19	47 01 03.7	-0 21 07.6	19.676 30
	21	46 00 35.9	0 21 50.8	19.689 55		21	47 02 24.4	0 21 06.7	19.676 00
	23	46 01 56.5	0 21 49.9	19.689 26		23	47 03 45.1	0 21 05.7	19.675 70
	25	46 03 17.0	0 21 48.9	19.688 97		25	47 05 05.7	0 21 04.7	19.675 40
	27	46 04 37.6	0 21 48.0	19.688 67		27	47 06 26.4	0 21 03.8	19.675 11
	29	46 05 58.1	0 21 47.0	19.688 38		29	47 07 47.1	0 21 02.8	19.674 81
	31	46 07 18.7	-0 21 46.0	19.688 09	Dec.	1	47 09 07.8	-0 21 01.8	19.674 51
Sept.	2	46 08 39.3	0 21 45.1	19.687 80		3	47 10 28.5	0 21 00.9	19.674 21
	4	46 09 59.9	0 21 44.1	19.687 50		5	47 11 49.2	0 20 59.9	19.673 92
	6	46 11 20.4	0 21 43.2	19.687 21		7	47 13 09.9	0 20 59.0	19.673 62
	8	46 12 41.0	0 21 42.3	19.686 92		9	47 14 30.6	0 20 58.0	19.673 32
	10	46 14 01.6	0 21 41.3	19.686 62		11	47 15 51.3	0 20 57.0	19.673 02
	12	46 15 22.2	-0 21 40.3	19.686 33		13	47 17 12.1	-0 20 56.0	19.672 72
	14	46 16 42.8	0 21 39.4	19.686 04		15	47 18 32.8	0 20 55.1	19.672 43
	16	46 18 03.3	0 21 38.4	19.685 74		17	47 19 53.5	0 20 54.1	19.672 13
	18	46 19 23.9	0 21 37.4	19.685 45		19	47 21 14.2	0 20 53.1	19.671 83
	20	46 20 44.6	0 21 36.5	19.685 16		21	47 22 34.9	0 20 52.2	19.671 53
	22	46 22 05.2	0 21 35.5	19.684 86		23	47 23 55.7	0 20 51.2	19.671 23
	24	46 23 25.7	-0 21 34.6	19.684 57		25	47 25 16.4	-0 20 50.2	19.670 93
	26	46 24 46.3	0 21 33.6	19.684 28		27	47 26 37.1	0 20 49.3	19.670 63
	28	46 26 07.0	0 21 32.7	19.683 98		29	47 27 57.8	0 20 48.3	19.670 33
	30	46 27 27.6	0 21 31.7	19.683 69		31	47 29 18.6	0 20 47.3	19.670 04
Oct.	2	46 28 48.2	-0 21 30.7	19.683 39		33	47 30 39.3	-0 20 46.3	19.669 74

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	′	″	°	′	″
Jan.	0	40	58	05.4	-0	24	19.9
	1	40	57	09.9	0	24	18.3
	2	40	56	17.3	0	24	16.7
	3	40	55	27.7	0	24	15.1
	4	40	54	41.0	0	24	13.5
	5	40	53	57.2	0	24	11.8
	6	40	53	16.4	-0	24	10.2
	7	40	52	38.6	0	24	08.5
	8	40	52	03.8	0	24	06.9
	9	40	51	32.1	0	24	05.2
	10	40	51	03.4	0	24	03.5
	11	40	50	37.9	0	24	01.8
	12	40	50	15.4	-0	24	00.2
	13	40	49	56.2	0	23	58.5
	14	40	49	40.1	0	23	56.8
	15	40	49	27.1	0	23	55.1
	16	40	49	17.3	0	23	53.4
	17	40	49	10.6	0	23	51.7
	18	40	49	07.1	-0	23	49.9
	19	40	49	06.6	0	23	48.2
	20	40	49	09.3	0	23	46.5
	21	40	49	15.0	0	23	44.8
	22	40	49	23.9	0	23	43.1
	23	40	49	35.9	0	23	41.4
	24	40	49	51.0	-0	23	39.7
	25	40	50	09.4	0	23	38.0
	26	40	50	30.9	0	23	36.3
	27	40	50	55.6	0	23	34.6
	28	40	51	23.6	0	23	32.9
	29	40	51	54.7	0	23	31.2
	30	40	52	29.1	-0	23	29.5
	31	40	53	06.6	0	23	27.8
Feb.	1	40	53	47.1	0	23	26.1
	2	40	54	30.8	0	23	24.4
	3	40	55	17.5	0	23	22.7
	4	40	56	07.2	0	23	21.0
	5	40	57	00.0	-0	23	19.3
	6	40	57	55.9	0	23	17.6
	7	40	58	54.9	0	23	16.0
	8	40	59	57.0	0	23	14.3
	9	41	01	02.1	0	23	12.6
	10	41	02	10.3	0	23	11.0
	11	41	03	21.4	-0	23	09.3
	12	41	04	35.6	0	23	07.7
	13	41	05	52.7	0	23	06.0
	14	41	07	12.7	0	23	04.4
	15	41	08	35.5	-0	23	02.8

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	′	″	°	′	″
Feb.	15	41	08	35.5	-0	23	02.8
	16	41	10	01.2	0	23	01.2
	17	41	11	29.8	0	22	59.5
	18	41	13	01.1	0	22	58.0
	19	41	14	35.1	0	22	56.4
	20	41	16	12.0	0	22	54.8
	21	41	17	51.6	-0	22	53.2
	22	41	19	34.0	0	22	51.7
	23	41	21	19.2	0	22	50.1
	24	41	23	07.1	0	22	48.6
	25	41	24	57.8	0	22	47.1
	26	41	26	51.1	0	22	45.6
	27	41	28	47.1	-0	22	44.1
	28	41	30	45.6	0	22	42.6
Mar.	1	41	32	46.6	0	22	41.1
	2	41	34	50.1	0	22	39.6
	3	41	36	56.1	0	22	38.1
	4	41	39	04.5	0	22	36.7
	5	41	41	15.3	-0	22	35.2
	6	41	43	28.6	0	22	33.8
	7	41	45	44.2	0	22	32.4
	8	41	48	02.2	0	22	31.0
	9	41	50	22.6	0	22	29.6
	10	41	52	45.2	0	22	28.2
	11	41	55	10.1	-0	22	26.8
	12	41	57	37.2	0	22	25.5
	13	42	00	06.5	0	22	24.2
	14	42	02	37.8	0	22	22.8
	15	42	05	11.1	0	22	21.5
	16	42	07	46.5	0	22	20.2
	17	42	10	23.8	-0	22	18.9
	18	42	13	03.1	0	22	17.7
	19	42	15	44.2	0	22	16.4
	20	42	18	27.3	0	22	15.2
	21	42	21	12.2	0	22	14.0
	22	42	23	59.1	0	22	12.8
	23	42	26	47.8	-0	22	11.6
	24	42	29	38.3	0	22	10.4
	25	42	32	30.6	0	22	09.3
	26	42	35	24.6	0	22	08.2
	27	42	38	20.2	0	22	07.0
	28	42	41	17.3	0	22	05.9
	29	42	44	16.0	-0	22	04.8
	30	42	47	16.2	0	22	03.7
	31	42	50	17.9	0	22	02.7
Apr.	1	42	53	20.9	0	22	01.6
	2	42	56	25.4	-0	22	00.6

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Apr.	1	42	53	20.9	-0	22	01.6
	2	42	56	25.4	0	22	00.6
	3	42	59	31.3	0	21	59.6
	4	43	02	38.6	0	21	58.5
	5	43	05	47.2	0	21	57.6
	6	43	08	57.0	0	21	56.6
	7	43	12	08.1	-0	21	55.6
	8	43	15	20.4	0	21	54.7
	9	43	18	33.8	0	21	53.8
	10	43	21	48.2	0	21	52.9
	11	43	25	03.6	0	21	52.0
	12	43	28	20.0	0	21	51.1
	13	43	31	37.3	-0	21	50.2
	14	43	34	55.4	0	21	49.4
	15	43	38	14.4	0	21	48.6
	16	43	41	34.2	0	21	47.8
	17	43	44	54.8	0	21	47.0
	18	43	48	16.2	0	21	46.3
	19	43	51	38.4	-0	21	45.5
	20	43	55	01.3	0	21	44.8
	21	43	58	25.0	0	21	44.1
	22	44	01	49.2	0	21	43.4
	23	44	05	14.0	0	21	42.7
	24	44	08	39.2	0	21	42.0
	25	44	12	04.9	-0	21	41.4
	26	44	15	31.0	0	21	40.8
	27	44	18	57.4	0	21	40.1
	28	44	22	24.1	0	21	39.5
	29	44	25	51.2	0	21	38.9
	30	44	29	18.6	0	21	38.4
May	1	44	32	46.2	-0	21	37.8
	2	44	36	14.1	0	21	37.3
	3	44	39	42.2	0	21	36.8
	4	44	43	10.4	0	21	36.4
	5	44	46	38.9	0	21	36.5
	6	44	50	06.0	0	21	35.6
	7	44	53	34.4	-0	21	34.9
	8	44	57	02.6	0	21	34.5
	9	45	00	30.6	0	21	34.0
	10	45	03	58.3	0	21	33.6
	11	45	07	25.8	0	21	33.2
	12	45	10	53.0	0	21	32.9
	13	45	14	19.9	-0	21	32.5
	14	45	17	46.6	0	21	32.2
	15	45	21	12.9	0	21	31.9
	16	45	24	38.8	0	21	31.6
	17	45	28	04.5	-0	21	31.4
May	17	45	28	04.5	-0	21	31.4
	18	45	31	29.7	0	21	31.1
	19	45	34	54.5	0	21	30.9
	20	45	38	18.7	0	21	30.6
	21	45	41	42.3	0	21	30.4
	22	45	45	05.2	0	21	30.2
	23	45	48	27.4	-0	21	30.0
	24	45	51	48.9	0	21	29.9
	25	45	55	09.6	0	21	29.7
	26	45	58	29.6	0	21	29.6
	27	46	01	48.8	0	21	29.5
	28	46	05	07.1	0	21	29.3
	29	46	08	24.6	-0	21	29.3
	30	46	11	41.2	0	21	29.2
	31	46	14	56.9	0	21	29.1
June	1	46	18	11.6	0	21	29.1
	2	46	21	25.2	0	21	29.0
	3	46	24	37.7	0	21	29.0
	4	46	27	49.1	-0	21	29.0
	5	46	30	59.3	0	21	29.0
	6	46	34	08.2	0	21	29.1
	7	46	37	15.8	0	21	29.1
	8	46	40	22.1	0	21	29.2
	9	46	43	27.1	0	21	29.3
	10	46	46	30.7	-0	21	29.4
	11	46	49	33.0	0	21	29.5
	12	46	52	33.9	0	21	29.6
	13	46	55	33.4	0	21	29.8
	14	46	58	31.5	0	21	29.9
	15	47	01	28.2	0	21	30.1
	16	47	04	23.3	-0	21	30.3
	17	47	07	16.8	0	21	30.5
	18	47	10	08.7	0	21	30.7
	19	47	12	58.8	0	21	30.9
	20	47	15	47.2	0	21	31.1
	21	47	18	33.8	0	21	31.4
	22	47	21	18.7	-0	21	31.6
	23	47	24	01.8	0	21	31.9
	24	47	26	43.2	0	21	32.1
	25	47	29	22.7	0	21	32.4
	26	47	32	00.4	0	21	32.7
	27	47	34	36.1	0	21	33.0
	28	47	37	10.0	-0	21	33.4
	29	47	39	41.8	0	21	33.7
	30	47	42	11.7	0	21	34.1
July	1	47	44	39.4	0	21	34.4
	2	47	47	05.0	-0	21	34.8

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	′	″	°	′	″			°	′	″	°	′	″
July	1	47	44	39.4	-0	21	34.4	Aug.	16	48	53	24.6	-0	21	59.9
	2	47	47	05.0	0	21	34.8		17	48	53	48.7	0	22	00.6
	3	47	49	28.5	0	21	35.2		18	48	54	09.9	0	22	01.2
	4	47	51	49.7	0	21	35.6		19	48	54	28.1	0	22	01.8
	5	47	54	08.8	0	21	36.0		20	48	54	43.4	0	22	02.5
	6	47	56	25.6	0	21	36.4		21	48	54	55.7	0	22	03.1
	7	47	58	40.2	-0	21	36.9		22	48	55	05.1	-0	22	03.7
	8	48	00	52.5	0	21	37.3		23	48	55	11.4	0	22	04.4
	9	48	03	02.5	0	21	37.8		24	48	55	14.7	0	22	05.0
	10	48	05	10.4	0	21	38.2		25	48	55	14.9	0	22	05.6
	11	48	07	15.9	0	21	38.7		26	48	55	12.1	0	22	06.3
	12	48	09	19.2	0	21	39.2		27	48	55	06.2	0	22	06.9
	13	48	11	20.1	-0	21	39.7		28	48	54	57.3	-0	22	07.5
	14	48	13	18.5	0	21	40.2		29	48	54	45.4	0	22	08.2
	15	48	15	14.5	0	21	40.7		30	48	54	30.4	0	22	08.8
	16	48	17	08.0	0	21	41.2		31	48	54	12.5	0	22	09.4
	17	48	18	58.9	0	21	41.7	Sept.	1	48	53	51.6	0	22	10.0
	18	48	20	47.3	0	21	42.2		2	48	53	27.8	0	22	10.6
	19	48	22	33.1	-0	21	42.8		3	48	53	01.1	-0	22	11.2
	20	48	24	16.3	0	21	43.3		4	48	52	31.6	0	22	11.8
	21	48	25	57.1	0	21	43.9		5	48	51	59.2	0	22	12.4
	22	48	27	35.2	0	21	44.4		6	48	51	23.8	0	22	12.9
	23	48	29	10.7	0	21	45.0		7	48	50	45.6	0	22	13.5
	24	48	30	43.7	0	21	45.5		8	48	50	04.5	0	22	14.1
	25	48	32	14.0	-0	21	46.1		9	48	49	20.4	-0	22	14.6
	26	48	33	41.5	0	21	46.7		10	48	48	33.5	0	22	15.2
	27	48	35	06.4	0	21	47.3		11	48	47	43.6	0	22	15.7
	28	48	36	28.5	0	21	47.9		12	48	46	51.0	0	22	16.2
	29	48	37	47.8	0	21	48.5		13	48	45	55.6	0	22	16.7
	30	48	39	04.3	0	21	49.1		14	48	44	57.4	0	22	17.2
	31	48	40	17.9	-0	21	49.7		15	48	43	56.6	-0	22	17.7
Aug.	1	48	41	28.6	0	21	50.3		16	48	42	53.1	0	22	18.2
	2	48	42	36.5	0	21	50.9		17	48	41	46.9	0	22	18.6
	3	48	43	41.6	0	21	51.6		18	48	40	38.0	0	22	19.1
	4	48	44	43.7	0	21	52.2		19	48	39	26.5	0	22	19.5
	5	48	45	43.1	0	21	52.8		20	48	38	12.3	0	22	19.9
	6	48	46	39.6	-0	21	53.5		21	48	36	55.5	-0	22	20.4
	7	48	47	33.3	0	21	54.1		22	48	35	36.1	0	22	20.8
	8	48	48	24.1	0	21	54.8		23	48	34	14.1	0	22	21.2
	9	48	49	12.0	0	21	55.4		24	48	32	49.5	0	22	21.6
	10	48	49	57.1	0	21	56.0		25	48	31	22.4	0	22	21.9
	11	48	50	39.2	0	21	56.7		26	48	29	52.8	0	22	22.3
	12	48	51	18.3	-0	21	57.3		27	48	28	20.8	-0	22	22.6
	13	48	51	54.3	0	21	58.0		28	48	26	46.4	0	22	23.0
	14	48	52	27.4	0	21	58.6		29	48	25	09.8	0	22	23.3
	15	48	52	57.5	0	21	59.3		30	48	23	30.9	0	22	23.6
	16	48	53	24.6	-0	21	59.9	Oct.	1	48	21	49.8	-0	22	23.9

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	48	21	49.8	-0	22	23.9	Nov.	16	46	38	07.8	-0	22	15.8
	2	48	20	06.6	0	22	24.1		17	46	35	40.2	0	22	15.1
	3	48	18	21.2	0	22	24.4		18	46	33	13.1	0	22	14.4
	4	48	16	33.7	0	22	24.6		19	46	30	46.6	0	22	13.7
	5	48	14	44.1	0	22	24.8		20	46	28	20.6	0	22	13.0
	6	48	12	52.4	0	22	25.0		21	46	25	55.3	0	22	12.2
	7	48	10	58.6	-0	22	25.2		22	46	23	30.8	-0	22	11.4
	8	48	09	02.9	0	22	25.4		23	46	21	07.1	0	22	10.6
	9	48	07	05.2	0	22	25.5		24	46	18	44.4	0	22	09.8
	10	48	05	05.7	0	22	25.6		25	46	16	22.8	0	22	08.9
	11	48	03	04.4	0	22	25.7		26	46	14	02.2	0	22	08.1
	12	48	01	01.4	0	22	25.8		27	46	11	42.7	0	22	07.2
	13	47	58	56.8	-0	22	25.9		28	46	09	24.3	-0	22	06.3
	14	47	56	50.5	0	22	25.9		29	46	07	07.1	0	22	05.3
	15	47	54	42.7	0	22	26.0		30	46	04	51.1	0	22	04.4
	16	47	52	33.3	0	22	26.0	Dec.	1	46	02	36.3	0	22	03.4
	17	47	50	22.4	0	22	26.0		2	46	00	23.0	0	22	02.4
	18	47	48	10.0	0	22	25.9		3	45	58	11.0	0	22	01.4
	19	47	45	56.1	-0	22	25.9		4	45	56	00.6	-0	22	00.3
	20	47	43	40.9	0	22	25.8		5	45	53	51.8	0	21	59.3
	21	47	41	24.4	0	22	25.7		6	45	51	44.7	0	21	58.2
	22	47	39	06.5	0	22	25.6		7	45	49	39.3	0	21	57.1
	23	47	36	47.5	0	22	25.5		8	45	47	35.6	0	21	56.0
	24	47	34	27.4	0	22	25.3		9	45	45	33.7	0	21	54.9
	25	47	32	06.2	-0	22	25.2		10	45	43	33.7	-0	21	53.7
	26	47	29	44.0	0	22	25.0		11	45	41	35.5	0	21	52.6
	27	47	27	21.0	0	22	24.8		12	45	39	39.3	0	21	51.4
	28	47	24	57.3	0	22	24.5		13	45	37	45.0	0	21	50.2
	29	47	22	32.7	0	22	24.3		14	45	35	52.6	0	21	49.0
	30	47	20	07.5	0	22	24.0		15	45	34	02.3	0	21	47.8
	31	47	17	41.6	-0	22	23.7		16	45	32	14.1	-0	21	46.5
Nov.	1	47	15	15.1	0	22	23.4		17	45	30	28.1	0	21	45.3
	2	47	12	48.0	0	22	23.1		18	45	28	44.3	0	21	44.0
	3	47	10	20.4	0	22	22.7		19	45	27	02.8	0	21	42.7
	4	47	07	52.3	0	22	22.3		20	45	25	23.6	0	21	41.4
	5	47	05	23.9	0	22	21.9		21	45	23	46.9	0	21	40.1
	6	47	02	55.1	-0	22	21.4		22	45	22	12.6	-0	21	38.8
	7	47	00	26.2	0	22	21.0		23	45	20	40.9	0	21	37.4
	8	46	57	57.2	0	22	20.5		24	45	19	11.7	0	21	36.1
	9	46	55	28.1	0	22	20.0		25	45	17	45.1	0	21	34.7
	10	46	52	59.0	0	22	19.4		26	45	16	21.0	0	21	33.3
	11	46	50	30.1	0	22	18.9		27	45	14	59.4	0	21	32.0
	12	46	48	01.2	-0	22	18.3		28	45	13	40.4	-0	21	30.5
	13	46	45	32.5	0	22	17.7		29	45	12	24.1	0	21	29.1
	14	46	43	04.0	0	22	17.1		30	45	11	10.5	0	21	27.7
	15	46	40	35.7	0	22	16.5		31	45	09	59.6	0	21	26.2
	16	46	38	07.8	-0	22	15.8		32	45	08	51.6	-0	21	24.8

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	2	34	41.70	+14	43	51.3	19.191 922	0.46	1.82	19	52	49
	1	2	34	38.03	14	43	35.6	19.206 634	0.46	1.82	19	48	50
	2	2	34	34.55	14	43	20.8	19.221 503	0.46	1.82	19	44	50
	3	2	34	31.26	14	43	06.9	19.236 523	0.46	1.82	19	40	51
	4	2	34	28.17	14	42	54.0	19.251 690	0.46	1.82	19	36	52
	5	2	34	25.27	14	42	42.0	19.266 998	0.46	1.82	19	32	54
	6	2	34	22.56	+14	42	30.9	19.282 441	0.46	1.82	19	28	55
	7	2	34	20.05	14	42	20.7	19.298 014	0.46	1.81	19	24	57
	8	2	34	17.73	14	42	11.5	19.313 712	0.46	1.81	19	20	59
	9	2	34	15.61	14	42	03.3	19.329 529	0.45	1.81	19	17	01
	10	2	34	13.70	14	41	55.9	19.345 459	0.45	1.81	19	13	04
	11	2	34	11.99	14	41	49.6	19.361 498	0.45	1.81	19	09	06
	12	2	34	10.49	+14	41	44.2	19.377 640	0.45	1.81	19	05	09
	13	2	34	09.19	14	41	39.8	19.393 880	0.45	1.81	19	01	12
	14	2	34	08.10	14	41	36.4	19.410 213	0.45	1.80	18	57	15
	15	2	34	07.21	14	41	34.0	19.426 633	0.45	1.80	18	53	18
	16	2	34	06.53	14	41	32.5	19.443 137	0.45	1.80	18	49	22
	17	2	34	06.06	14	41	32.1	19.459 717	0.45	1.80	18	45	26
	18	2	34	05.79	+14	41	32.7	19.476 371	0.45	1.80	18	41	30
	19	2	34	05.72	14	41	34.2	19.493 091	0.45	1.80	18	37	34
	20	2	34	05.86	14	41	36.7	19.509 874	0.45	1.79	18	33	38
	21	2	34	06.20	14	41	40.1	19.526 715	0.45	1.79	18	29	43
	22	2	34	06.74	14	41	44.5	19.543 608	0.45	1.79	18	25	48
	23	2	34	07.49	14	41	49.9	19.560 549	0.45	1.79	18	21	53
	24	2	34	08.45	+14	41	56.3	19.577 532	0.45	1.79	18	17	58
	25	2	34	09.61	14	42	03.6	19.594 553	0.45	1.79	18	14	03
	26	2	34	10.98	14	42	11.9	19.611 606	0.45	1.79	18	10	09
	27	2	34	12.57	14	42	21.2	19.628 686	0.45	1.78	18	06	15
	28	2	34	14.36	14	42	31.5	19.645 787	0.45	1.78	18	02	21
	29	2	34	16.37	14	42	42.8	19.662 905	0.45	1.78	17	58	27
	30	2	34	18.58	+14	42	55.1	19.680 034	0.45	1.78	17	54	33
	31	2	34	21.00	14	43	08.4	19.697 168	0.45	1.78	17	50	40
Feb.	1	2	34	23.62	14	43	22.7	19.714 301	0.45	1.78	17	46	47
	2	2	34	26.44	14	43	37.9	19.731 428	0.45	1.77	17	42	54
	3	2	34	29.46	14	43	54.1	19.748 543	0.45	1.77	17	39	01
	4	2	34	32.69	14	44	11.2	19.765 641	0.44	1.77	17	35	09
	5	2	34	36.11	+14	44	29.2	19.782 716	0.44	1.77	17	31	16
	6	2	34	39.74	14	44	48.2	19.799 763	0.44	1.77	17	27	24
	7	2	34	43.57	14	45	08.1	19.816 775	0.44	1.77	17	23	32
	8	2	34	47.60	14	45	28.9	19.833 750	0.44	1.77	17	19	40
	9	2	34	51.83	14	45	50.7	19.850 680	0.44	1.76	17	15	49
	10	2	34	56.26	14	46	13.4	19.867 562	0.44	1.76	17	11	57
	11	2	35	00.89	+14	46	37.1	19.884 390	0.44	1.76	17	08	06
	12	2	35	05.71	14	47	01.7	19.901 160	0.44	1.76	17	04	15
	13	2	35	10.73	14	47	27.1	19.917 867	0.44	1.76	17	00	24
	14	2	35	15.94	14	47	53.5	19.934 507	0.44	1.76	16	56	34
	15	2	35	21.34	+14	48	20.8	19.951 074	0.44	1.76	16	52	43

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	2	35	21.34	+14	48	20.8	19.951 074	0.44	1.76	16	52	43
	16	2	35	26.92	14	48	48.9	19.967 564	0.44	1.75	16	48	53
	17	2	35	32.69	14	49	17.9	19.983 973	0.44	1.75	16	45	03
	18	2	35	38.64	14	49	47.7	20.000 297	0.44	1.75	16	41	13
	19	2	35	44.78	14	50	18.3	20.016 531	0.44	1.75	16	37	24
	20	2	35	51.10	14	50	49.8	20.032 670	0.44	1.75	16	33	34
	21	2	35	57.60	+14	51	22.1	20.048 711	0.44	1.75	16	29	45
	22	2	36	04.28	14	51	55.2	20.064 650	0.44	1.75	16	25	56
	23	2	36	11.15	14	52	29.2	20.080 481	0.44	1.74	16	22	07
	24	2	36	18.20	14	53	03.9	20.096 200	0.44	1.74	16	18	18
	25	2	36	25.42	14	53	39.5	20.111 803	0.44	1.74	16	14	29
	26	2	36	32.83	14	54	16.0	20.127 285	0.44	1.74	16	10	41
	27	2	36	40.41	+14	54	53.2	20.142 642	0.44	1.74	16	06	53
	28	2	36	48.15	14	55	31.2	20.157 869	0.44	1.74	16	03	05
Mar.	1	2	36	56.06	14	56	09.9	20.172 961	0.44	1.74	15	59	17
	2	2	37	04.14	14	56	49.4	20.187 915	0.44	1.73	15	55	29
	3	2	37	12.38	14	57	29.6	20.202 724	0.44	1.73	15	51	41
	4	2	37	20.78	14	58	10.6	20.217 385	0.43	1.73	15	47	54
	5	2	37	29.34	+14	58	52.2	20.231 894	0.43	1.73	15	44	07
	6	2	37	38.06	14	59	34.5	20.246 247	0.43	1.73	15	40	19
	7	2	37	46.94	15	00	17.5	20.260 439	0.43	1.73	15	36	32
	8	2	37	55.97	15	01	01.2	20.274 467	0.43	1.73	15	32	46
	9	2	38	05.16	15	01	45.6	20.288 328	0.43	1.73	15	28	59
	10	2	38	14.51	15	02	30.6	20.302 016	0.43	1.72	15	25	12
	11	2	38	24.00	+15	03	16.4	20.315 530	0.43	1.72	15	21	26
	12	2	38	33.64	15	04	02.7	20.328 866	0.43	1.72	15	17	40
	13	2	38	43.42	15	04	49.7	20.342 020	0.43	1.72	15	13	54
	14	2	38	53.33	15	05	37.3	20.354 990	0.43	1.72	15	10	08
	15	2	39	03.39	15	06	25.5	20.367 772	0.43	1.72	15	06	22
	16	2	39	13.57	15	07	14.2	20.380 363	0.43	1.72	15	02	36
	17	2	39	23.89	+15	08	03.5	20.392 760	0.43	1.72	14	58	51
	18	2	39	34.34	15	08	53.4	20.404 961	0.43	1.72	14	55	05
	19	2	39	44.91	15	09	43.7	20.416 963	0.43	1.72	14	51	20
	20	2	39	55.61	15	10	34.6	20.428 763	0.43	1.71	14	47	35
	21	2	40	06.44	15	11	26.0	20.440 359	0.43	1.71	14	43	50
	22	2	40	17.39	15	12	17.9	20.451 747	0.43	1.71	14	40	05
	23	2	40	28.47	+15	13	10.3	20.462 924	0.43	1.71	14	36	20
	24	2	40	39.67	15	14	03.3	20.473 889	0.43	1.71	14	32	35
	25	2	40	50.99	15	14	56.7	20.484 637	0.43	1.71	14	28	51
	26	2	41	02.42	15	15	50.6	20.495 167	0.43	1.71	14	25	06
	27	2	41	13.96	15	16	45.0	20.505 474	0.43	1.71	14	21	22
	28	2	41	25.60	15	17	39.8	20.515 557	0.43	1.71	14	17	38
	29	2	41	37.35	+15	18	35.1	20.525 412	0.43	1.71	14	13	53
	30	2	41	49.19	15	19	30.7	20.535 036	0.43	1.71	14	10	09
	31	2	42	01.14	15	20	26.7	20.544 427	0.43	1.70	14	06	25
Apr.	1	2	42	13.18	15	21	23.0	20.553 583	0.43	1.70	14	02	42
	2	2	42	25.32	+15	22	19.7	20.562 501	0.43	1.70	13	58	58

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		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	2	42	13.18	+15	21	23.0	20.553 583	0.43	1.70	14	02	42
	2	2	42	25.32	15	22	19.7	20.562 501	0.43	1.70	13	58	58
	3	2	42	37.55	15	23	16.8	20.571 178	0.43	1.70	13	55	14
	4	2	42	49.88	15	24	14.2	20.579 612	0.43	1.70	13	51	30
	5	2	43	02.29	15	25	12.0	20.587 802	0.43	1.70	13	47	47
	6	2	43	14.79	15	26	10.0	20.595 746	0.43	1.70	13	44	04
	7	2	43	27.38	+15	27	08.4	20.603 442	0.43	1.70	13	40	20
	8	2	43	40.04	15	28	07.1	20.610 889	0.43	1.70	13	36	37
	9	2	43	52.78	15	29	06.1	20.618 084	0.43	1.70	13	32	54
	10	2	44	05.59	15	30	05.4	20.625 027	0.43	1.70	13	29	11
	11	2	44	18.47	15	31	04.8	20.631 716	0.43	1.70	13	25	28
	12	2	44	31.41	15	32	04.6	20.638 150	0.43	1.70	13	21	45
	13	2	44	44.42	+15	33	04.5	20.644 329	0.43	1.70	13	18	02
	14	2	44	57.48	15	34	04.6	20.650 250	0.43	1.70	13	14	19
	15	2	45	10.61	15	35	04.8	20.655 913	0.43	1.70	13	10	36
	16	2	45	23.79	15	36	05.3	20.661 318	0.43	1.69	13	06	53
	17	2	45	37.03	15	37	05.9	20.666 462	0.43	1.69	13	03	10
	18	2	45	50.32	15	38	06.6	20.671 346	0.43	1.69	12	59	28
	19	2	46	03.67	+15	39	07.5	20.675 969	0.43	1.69	12	55	45
	20	2	46	17.07	15	40	08.6	20.680 328	0.43	1.69	12	52	03
	21	2	46	30.51	15	41	09.8	20.684 424	0.43	1.69	12	48	20
	22	2	46	44.00	15	42	11.2	20.688 256	0.43	1.69	12	44	38
	23	2	46	57.53	15	43	12.6	20.691 821	0.43	1.69	12	40	55
	24	2	47	11.09	15	44	14.2	20.695 119	0.42	1.69	12	37	13
	25	2	47	24.68	+15	45	15.8	20.698 150	0.42	1.69	12	33	30
	26	2	47	38.30	15	46	17.5	20.700 911	0.42	1.69	12	29	48
	27	2	47	51.95	15	47	19.1	20.703 403	0.42	1.69	12	26	06
	28	2	48	05.62	15	48	20.8	20.705 624	0.42	1.69	12	22	23
	29	2	48	19.32	15	49	22.5	20.707 573	0.42	1.69	12	18	41
	30	2	48	33.04	15	50	24.2	20.709 251	0.42	1.69	12	14	59
May	1	2	48	46.78	+15	51	25.9	20.710 658	0.42	1.69	12	11	17
	2	2	49	00.53	15	52	27.6	20.711 792	0.42	1.69	12	07	34
	3	2	49	14.31	15	53	29.3	20.712 653	0.42	1.69	12	03	52
	4	2	49	28.10	15	54	30.9	20.713 243	0.42	1.69	12	00	10
	5	2	49	41.92	15	55	32.0	20.713 560	0.42	1.69	11	56	28
	6	2	49	55.62	15	56	33.6	20.713 606	0.42	1.69	11	52	46
	7	2	50	09.43	+15	57	35.4	20.713 380	0.42	1.69	11	49	03
	8	2	50	23.22	15	58	36.8	20.712 884	0.42	1.69	11	45	21
	9	2	50	37.00	15	59	38.1	20.712 117	0.42	1.69	11	41	39
	10	2	50	50.77	16	00	39.3	20.711 081	0.42	1.69	11	37	57
	11	2	51	04.52	16	01	40.3	20.709 776	0.42	1.69	11	34	15
	12	2	51	18.26	16	02	41.1	20.708 202	0.42	1.69	11	30	32
	13	2	51	31.99	+16	03	41.8	20.706 362	0.42	1.69	11	26	50
	14	2	51	45.69	16	04	42.2	20.704 255	0.42	1.69	11	23	08
	15	2	51	59.38	16	05	42.5	20.701 883	0.42	1.69	11	19	26
	16	2	52	13.05	16	06	42.7	20.699 246	0.42	1.69	11	15	43
	17	2	52	26.70	+16	07	42.6	20.696 345	0.42	1.69	11	12	01

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	2	52	26.70	+16	07	42.6	20.696 345	0.42	1.69	11	12	01
	18	2	52	40.33	16	08	42.4	20.693 181	0.42	1.69	11	08	18
	19	2	52	53.92	16	09	42.0	20.689 755	0.43	1.69	11	04	36
	20	2	53	07.49	16	10	41.4	20.686 067	0.43	1.69	11	00	54
	21	2	53	21.01	16	11	40.5	20.682 118	0.43	1.69	10	57	11
	22	2	53	34.49	16	12	39.4	20.677 909	0.43	1.69	10	53	29
	23	2	53	47.93	+16	13	38.0	20.673 439	0.43	1.69	10	49	46
	24	2	54	01.32	16	14	36.4	20.668 711	0.43	1.69	10	46	03
	25	2	54	14.66	16	15	34.4	20.663 725	0.43	1.69	10	42	21
	26	2	54	27.96	16	16	32.1	20.658 481	0.43	1.70	10	38	38
	27	2	54	41.20	16	17	29.6	20.652 982	0.43	1.70	10	34	55
	28	2	54	54.40	16	18	26.7	20.647 228	0.43	1.70	10	31	12
	29	2	55	07.53	+16	19	23.5	20.641 221	0.43	1.70	10	27	30
	30	2	55	20.62	16	20	19.9	20.634 962	0.43	1.70	10	23	47
	31	2	55	33.64	16	21	16.1	20.628 454	0.43	1.70	10	20	04
June	1	2	55	46.60	16	22	11.9	20.621 697	0.43	1.70	10	16	21
	2	2	55	59.49	16	23	07.3	20.614 695	0.43	1.70	10	12	38
	3	2	56	12.31	16	24	02.4	20.607 448	0.43	1.70	10	08	54
	4	2	56	25.05	+16	24	57.1	20.599 959	0.43	1.70	10	05	11
	5	2	56	37.72	16	25	51.4	20.592 230	0.43	1.70	10	01	28
	6	2	56	50.30	16	26	45.3	20.584 263	0.43	1.70	9	57	44
	7	2	57	02.81	16	27	38.7	20.576 061	0.43	1.70	9	54	01
	8	2	57	15.22	16	28	31.7	20.567 626	0.43	1.70	9	50	17
	9	2	57	27.55	16	29	24.3	20.558 960	0.43	1.70	9	46	34
	10	2	57	39.80	+16	30	16.4	20.550 066	0.43	1.70	9	42	50
	11	2	57	51.95	16	31	08.0	20.540 946	0.43	1.70	9	39	06
	12	2	58	04.02	16	31	59.2	20.531 603	0.43	1.71	9	35	22
	13	2	58	15.99	16	32	49.9	20.522 039	0.43	1.71	9	31	38
	14	2	58	27.88	16	33	40.2	20.512 257	0.43	1.71	9	27	54
	15	2	58	39.67	16	34	30.0	20.502 259	0.43	1.71	9	24	10
	16	2	58	51.35	+16	35	19.3	20.492 046	0.43	1.71	9	20	25
	17	2	59	02.93	16	36	08.2	20.481 622	0.43	1.71	9	16	41
	18	2	59	14.41	16	36	56.6	20.470 987	0.43	1.71	9	12	56
	19	2	59	25.76	16	37	44.4	20.460 146	0.43	1.71	9	09	12
	20	2	59	37.01	16	38	31.7	20.449 098	0.43	1.71	9	05	27
	21	2	59	48.14	16	39	18.4	20.437 848	0.43	1.71	9	01	42
	22	2	59	59.16	+16	40	04.5	20.426 397	0.43	1.71	8	57	57
	23	3	00	10.05	16	40	50.1	20.414 748	0.43	1.72	8	54	12
	24	3	00	20.84	16	41	35.2	20.402 904	0.43	1.72	8	50	27
	25	3	00	31.50	16	42	19.6	20.390 868	0.43	1.72	8	46	41
	26	3	00	42.04	16	43	03.6	20.378 642	0.43	1.72	8	42	56
	27	3	00	52.45	16	43	46.9	20.366 230	0.43	1.72	8	39	10
	28	3	01	02.74	+16	44	29.7	20.353 635	0.43	1.72	8	35	24
	29	3	01	12.90	16	45	11.8	20.340 860	0.43	1.72	8	31	39
	30	3	01	22.92	16	45	53.4	20.327 908	0.43	1.72	8	27	53
July	1	3	01	32.80	16	46	34.4	20.314 784	0.43	1.72	8	24	06
	2	3	01	42.55	+16	47	14.7	20.301 490	0.43	1.72	8	20	20

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	3	01	32.80	+16	46	34.4	20.314 784	0.43	1.72	8	24	06
	2	3	01	42.55	16	47	14.7	20.301 490	0.43	1.72	8	20	20
	3	3	01	52.15	16	47	54.4	20.288 030	0.43	1.73	8	16	34
	4	3	02	01.60	16	48	33.5	20.274 408	0.43	1.73	8	12	47
	5	3	02	10.91	16	49	11.9	20.260 627	0.43	1.73	8	09	01
	6	3	02	20.07	16	49	49.6	20.246 691	0.43	1.73	8	05	14
	7	3	02	29.08	+16	50	26.6	20.232 605	0.43	1.73	8	01	27
	8	3	02	37.94	16	51	03.0	20.218 371	0.43	1.73	7	57	40
	9	3	02	46.65	16	51	38.7	20.203 993	0.44	1.73	7	53	52
	10	3	02	55.21	16	52	13.7	20.189 476	0.44	1.73	7	50	05
	11	3	03	03.63	16	52	48.0	20.174 823	0.44	1.74	7	46	17
	12	3	03	11.89	16	53	21.7	20.160 038	0.44	1.74	7	42	29
	13	3	03	19.99	+16	53	54.8	20.145 124	0.44	1.74	7	38	42
	14	3	03	27.93	16	54	27.2	20.130 084	0.44	1.74	7	34	53
	15	3	03	35.70	16	54	58.9	20.114 922	0.44	1.74	7	31	05
	16	3	03	43.31	16	55	29.8	20.099 642	0.44	1.74	7	27	17
	17	3	03	50.75	16	56	00.1	20.084 246	0.44	1.74	7	23	28
	18	3	03	58.01	16	56	29.5	20.068 739	0.44	1.75	7	19	40
	19	3	04	05.11	+16	56	58.3	20.053 123	0.44	1.75	7	15	51
	20	3	04	12.04	16	57	26.3	20.037 403	0.44	1.75	7	12	02
	21	3	04	18.80	16	57	53.5	20.021 583	0.44	1.75	7	08	12
	22	3	04	25.38	16	58	20.1	20.005 666	0.44	1.75	7	04	23
	23	3	04	31.79	16	58	45.9	19.989 656	0.44	1.75	7	00	33
	24	3	04	38.03	16	59	10.9	19.973 558	0.44	1.75	6	56	44
	25	3	04	44.09	+16	59	35.2	19.957 376	0.44	1.75	6	52	54
	26	3	04	49.97	16	59	58.8	19.941 115	0.44	1.76	6	49	04
	27	3	04	55.67	17	00	21.6	19.924 778	0.44	1.76	6	45	13
	28	3	05	01.18	17	00	43.6	19.908 370	0.44	1.76	6	41	23
	29	3	05	06.51	17	01	04.9	19.891 897	0.44	1.76	6	37	32
	30	3	05	11.65	17	01	25.4	19.875 361	0.44	1.76	6	33	41
	31	3	05	16.59	+17	01	45.1	19.858 769	0.44	1.76	6	29	50
Aug.	1	3	05	21.35	17	02	04.0	19.842 125	0.44	1.76	6	25	59
	2	3	05	25.91	17	02	22.0	19.825 434	0.44	1.77	6	22	08
	3	3	05	30.28	17	02	39.3	19.808 700	0.44	1.77	6	18	16
	4	3	05	34.47	17	02	55.7	19.791 927	0.44	1.77	6	14	24
	5	3	05	38.46	17	03	11.4	19.775 122	0.44	1.77	6	10	32
	6	3	05	42.26	+17	03	26.2	19.758 288	0.45	1.77	6	06	40
	7	3	05	45.87	17	03	40.3	19.741 431	0.45	1.77	6	02	48
	8	3	05	49.29	17	03	53.6	19.724 554	0.45	1.78	5	58	55
	9	3	05	52.52	17	04	06.1	19.707 662	0.45	1.78	5	55	02
	10	3	05	55.55	17	04	17.9	19.690 760	0.45	1.78	5	51	09
	11	3	05	58.39	17	04	28.8	19.673 851	0.45	1.78	5	47	16
	12	3	06	01.02	+17	04	39.0	19.656 940	0.45	1.78	5	43	23
	13	3	06	03.45	17	04	48.3	19.640 032	0.45	1.78	5	39	29
	14	3	06	05.68	17	04	56.8	19.623 130	0.45	1.78	5	35	36
	15	3	06	07.71	17	05	04.4	19.606 238	0.45	1.79	5	31	42
	16	3	06	09.54	+17	05	11.2	19.589 361	0.45	1.79	5	27	47

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	3	06	09.54	+17	05	11.2	19.589 361	0.45	1.79	5	27	47
	17	3	06	11.17	17	05	17.2	19.572 504	0.45	1.79	5	23	53
	18	3	06	12.60	17	05	22.4	19.555 671	0.45	1.79	5	19	59
	19	3	06	13.84	17	05	26.7	19.538 866	0.45	1.79	5	16	04
	20	3	06	14.88	17	05	30.3	19.522 096	0.45	1.79	5	12	09
	21	3	06	15.72	17	05	33.0	19.505 363	0.45	1.80	5	08	14
	22	3	06	16.36	+17	05	35.0	19.488 674	0.45	1.80	5	04	19
	23	3	06	16.79	17	05	36.1	19.472 034	0.45	1.80	5	00	23
	24	3	06	17.02	17	05	36.4	19.455 446	0.45	1.80	4	56	27
	25	3	06	17.05	17	05	35.9	19.438 917	0.45	1.80	4	52	31
	26	3	06	16.87	17	05	34.6	19.422 452	0.45	1.80	4	48	35
	27	3	06	16.49	17	05	32.4	19.406 055	0.45	1.80	4	44	39
	28	3	06	15.90	+17	05	29.4	19.389 731	0.45	1.81	4	40	42
	29	3	06	15.11	17	05	25.6	19.373 486	0.45	1.81	4	36	46
	30	3	06	14.12	17	05	20.9	19.357 325	0.45	1.81	4	32	49
	31	3	06	12.93	17	05	15.4	19.341 253	0.45	1.81	4	28	52
Sept.	1	3	06	11.54	17	05	09.1	19.325 275	0.46	1.81	4	24	54
	2	3	06	09.96	17	05	02.0	19.309 396	0.46	1.81	4	20	57
	3	3	06	08.18	+17	04	54.1	19.293 620	0.46	1.82	4	16	59
	4	3	06	06.21	17	04	45.4	19.277 953	0.46	1.82	4	13	01
	5	3	06	04.05	17	04	36.0	19.262 399	0.46	1.82	4	09	03
	6	3	06	01.69	17	04	25.8	19.246 962	0.46	1.82	4	05	05
	7	3	05	59.13	17	04	14.8	19.231 647	0.46	1.82	4	01	06
	8	3	05	56.38	17	04	03.1	19.216 459	0.46	1.82	3	57	08
	9	3	05	53.44	+17	03	50.5	19.201 400	0.46	1.82	3	53	09
	10	3	05	50.30	17	03	37.2	19.186 477	0.46	1.83	3	49	10
	11	3	05	46.97	17	03	23.1	19.171 691	0.46	1.83	3	45	10
	12	3	05	43.45	17	03	08.1	19.157 049	0.46	1.83	3	41	11
	13	3	05	39.74	17	02	52.5	19.142 554	0.46	1.83	3	37	11
	14	3	05	35.85	17	02	36.0	19.128 211	0.46	1.83	3	33	12
	15	3	05	31.78	+17	02	18.8	19.114 024	0.46	1.83	3	29	12
	16	3	05	27.53	17	02	00.9	19.099 997	0.46	1.83	3	25	11
	17	3	05	23.10	17	01	42.3	19.086 135	0.46	1.83	3	21	11
	18	3	05	18.49	17	01	22.9	19.072 443	0.46	1.84	3	17	11
	19	3	05	13.71	17	01	02.8	19.058 925	0.46	1.84	3	13	10
	20	3	05	08.74	17	00	42.1	19.045 586	0.46	1.84	3	09	09
	21	3	05	03.60	+17	00	20.6	19.032 430	0.46	1.84	3	05	08
	22	3	04	58.29	16	59	58.4	19.019 461	0.46	1.84	3	01	07
	23	3	04	52.80	16	59	35.4	19.006 685	0.46	1.84	2	57	05
	24	3	04	47.14	16	59	11.8	18.994 106	0.46	1.84	2	53	04
	25	3	04	41.30	16	58	47.5	18.981 728	0.46	1.84	2	49	02
	26	3	04	35.31	16	58	22.5	18.969 555	0.46	1.85	2	45	00
	27	3	04	29.15	+16	57	56.8	18.957 593	0.46	1.85	2	40	58
	28	3	04	22.84	16	57	30.4	18.945 844	0.46	1.85	2	36	56
	29	3	04	16.37	16	57	03.4	18.934 314	0.46	1.85	2	32	54
	30	3	04	09.75	16	56	35.8	18.923 007	0.46	1.85	2	28	51
Oct.	1	3	04	02.99	+16	56	07.6	18.911 925	0.47	1.85	2	24	48

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	3	04	02.99	+16	56	07.6	18.911 925	0.47	1.85	2	24	48
	2	3	03	56.08	16	55	38.8	18.901 073	0.47	1.85	2	20	46
	3	3	03	49.03	16	55	09.4	18.890 454	0.47	1.85	2	16	43
	4	3	03	41.84	16	54	39.4	18.880 072	0.47	1.85	2	12	40
	5	3	03	34.50	16	54	08.9	18.869 930	0.47	1.86	2	08	36
	6	3	03	27.02	16	53	37.8	18.860 030	0.47	1.86	2	04	33
	7	3	03	19.41	+16	53	06.2	18.850 376	0.47	1.86	2	00	30
	8	3	03	11.67	16	52	34.0	18.840 971	0.47	1.86	1	56	26
	9	3	03	03.79	16	52	01.2	18.831 817	0.47	1.86	1	52	22
	10	3	02	55.80	16	51	27.9	18.822 918	0.47	1.86	1	48	18
	11	3	02	47.69	16	50	54.1	18.814 276	0.47	1.86	1	44	14
	12	3	02	39.46	16	50	19.8	18.805 894	0.47	1.86	1	40	10
	13	3	02	31.12	+16	49	45.0	18.797 776	0.47	1.86	1	36	06
	14	3	02	22.68	16	49	09.8	18.789 924	0.47	1.86	1	32	02
	15	3	02	14.13	16	48	34.2	18.782 341	0.47	1.86	1	27	57
	16	3	02	05.47	16	47	58.1	18.775 030	0.47	1.87	1	23	53
	17	3	01	56.72	16	47	21.6	18.767 994	0.47	1.87	1	19	48
	18	3	01	47.86	16	46	44.7	18.761 236	0.47	1.87	1	15	43
	19	3	01	38.91	+16	46	07.4	18.754 758	0.47	1.87	1	11	39
	20	3	01	29.87	16	45	29.8	18.748 563	0.47	1.87	1	07	34
	21	3	01	20.74	16	44	51.7	18.742 654	0.47	1.87	1	03	29
	22	3	01	11.53	16	44	13.3	18.737 033	0.47	1.87	0	59	24
	23	3	01	02.23	16	43	34.5	18.731 703	0.47	1.87	0	55	19
	24	3	00	52.87	16	42	55.4	18.726 666	0.47	1.87	0	51	13
	25	3	00	43.43	+16	42	15.9	18.721 924	0.47	1.87	0	47	08
	26	3	00	33.93	16	41	36.2	18.717 479	0.47	1.87	0	43	03
	27	3	00	24.38	16	40	56.2	18.713 333	0.47	1.87	0	38	57
	28	3	00	14.77	16	40	16.0	18.709 488	0.47	1.87	0	34	52
	29	3	00	05.11	16	39	35.6	18.705 946	0.47	1.87	0	30	46
	30	2	59	55.41	16	38	55.0	18.702 706	0.47	1.87	0	26	41
	31	2	59	45.67	+16	38	14.2	18.699 771	0.47	1.87	0	22	35
Nov.	1	2	59	35.88	16	37	33.3	18.697 141	0.47	1.87	0	18	29
	2	2	59	26.05	16	36	52.2	18.694 818	0.47	1.87	0	14	24
	3	2	59	16.19	16	36	10.9	18.692 800	0.47	1.87	0	10	18
	4	2	59	06.30	16	35	29.5	18.691 090	0.47	1.87	0	06	12
	5	2	58	56.39	16	34	48.0	18.689 687	0.47	1.87	0	02	07
	6	2	58	46.45	+16	34	06.4	18.688 592	0.47	1.87	23	53	55
	7	2	58	36.51	16	33	24.7	18.687 804	0.47	1.87	23	49	49
	8	2	58	26.56	16	32	42.9	18.687 325	0.47	1.87	23	45	43
	9	2	58	16.61	16	32	01.1	18.687 155	0.47	1.87	23	41	38
	10	2	58	06.66	16	31	19.3	18.687 294	0.47	1.87	23	37	32
	11	2	57	56.72	16	30	37.6	18.687 742	0.47	1.87	23	33	26
	12	2	57	46.78	+16	29	55.8	18.688 499	0.47	1.87	23	29	20
	13	2	57	36.86	16	29	14.2	18.689 566	0.47	1.87	23	25	14
	14	2	57	26.94	16	28	32.5	18.690 942	0.47	1.87	23	21	09
	15	2	57	17.05	16	27	51.0	18.692 628	0.47	1.87	23	17	03
	16	2	57	07.18	+16	27	09.5	18.694 622	0.47	1.87	23	12	57

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	2	57	07.18	+16	27	09.5	18.694 622	0.47	1.87	23	12	57
	17	2	56	57.34	16	26	28.2	18.696 926	0.47	1.87	23	08	52
	18	2	56	47.52	16	25	46.9	18.699 539	0.47	1.87	23	04	46
	19	2	56	37.74	16	25	05.8	18.702 460	0.47	1.87	23	00	40
	20	2	56	28.00	16	24	24.8	18.705 689	0.47	1.87	22	56	35
	21	2	56	18.31	16	23	44.0	18.709 225	0.47	1.87	22	52	29
	22	2	56	08.67	+16	23	03.4	18.713 067	0.47	1.87	22	48	24
	23	2	55	59.10	16	22	23.1	18.717 214	0.47	1.87	22	44	18
	24	2	55	49.58	16	21	43.0	18.721 666	0.47	1.87	22	40	13
	25	2	55	40.14	16	21	03.2	18.726 419	0.47	1.87	22	36	08
	26	2	55	30.76	16	20	23.7	18.731 474	0.47	1.87	22	32	03
	27	2	55	21.46	16	19	44.5	18.736 827	0.47	1.87	22	27	58
	28	2	55	12.23	+16	19	05.7	18.742 477	0.47	1.87	22	23	53
	29	2	55	03.08	16	18	27.2	18.748 422	0.47	1.87	22	19	48
	30	2	54	54.01	16	17	49.1	18.754 658	0.47	1.87	22	15	43
Dec.	1	2	54	45.03	16	17	11.3	18.761 184	0.47	1.87	22	11	38
	2	2	54	36.14	16	16	33.9	18.767 997	0.47	1.87	22	07	33
	3	2	54	27.35	16	15	56.9	18.775 095	0.47	1.87	22	03	29
	4	2	54	18.65	+16	15	20.3	18.782 474	0.47	1.86	21	59	24
	5	2	54	10.07	16	14	44.2	18.790 132	0.47	1.86	21	55	20
	6	2	54	01.60	16	14	08.5	18.798 067	0.47	1.86	21	51	16
	7	2	53	53.24	16	13	33.3	18.806 276	0.47	1.86	21	47	12
	8	2	53	45.00	16	12	58.6	18.814 755	0.47	1.86	21	43	08
	9	2	53	36.87	16	12	24.5	18.823 504	0.47	1.86	21	39	04
	10	2	53	28.87	+16	11	50.9	18.832 517	0.47	1.86	21	35	00
	11	2	53	21.00	16	11	17.8	18.841 794	0.47	1.86	21	30	56
	12	2	53	13.25	16	10	45.3	18.851 331	0.47	1.86	21	26	53
	13	2	53	05.63	16	10	13.4	18.861 124	0.47	1.86	21	22	50
	14	2	52	58.14	16	09	42.1	18.871 172	0.47	1.86	21	18	46
	15	2	52	50.79	16	09	11.3	18.881 470	0.47	1.85	21	14	43
	16	2	52	43.58	+16	08	41.1	18.892 017	0.47	1.85	21	10	40
	17	2	52	36.51	16	08	11.6	18.902 807	0.47	1.85	21	06	37
	18	2	52	29.59	16	07	42.6	18.913 838	0.46	1.85	21	02	35
	19	2	52	22.82	16	07	14.4	18.925 107	0.46	1.85	20	58	32
	20	2	52	16.21	16	06	46.8	18.936 610	0.46	1.85	20	54	30
	21	2	52	09.76	16	06	19.9	18.948 343	0.46	1.85	20	50	28
	22	2	52	03.48	+16	05	53.7	18.960 302	0.46	1.85	20	46	26
	23	2	51	57.37	16	05	28.3	18.972 483	0.46	1.85	20	42	24
	24	2	51	51.42	16	05	03.6	18.984 881	0.46	1.84	20	38	22
	25	2	51	45.64	16	04	39.7	18.997 493	0.46	1.84	20	34	21
	26	2	51	40.03	16	04	16.6	19.010 313	0.46	1.84	20	30	19
	27	2	51	34.59	16	03	54.2	19.023 336	0.46	1.84	20	26	18
	28	2	51	29.32	+16	03	32.6	19.036 558	0.46	1.84	20	22	17
	29	2	51	24.22	16	03	11.7	19.049 974	0.46	1.84	20	18	16
	30	2	51	19.31	16	02	51.6	19.063 578	0.46	1.84	20	14	16
	31	2	51	14.58	16	02	32.3	19.077 367	0.46	1.84	20	10	15
	32	2	51	10.03	+16	02	13.9	19.091 335	0.46	1.83	20	06	15

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MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector	Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector
Jan. 1	352 26 52.1	-1 08 48.3	29.920 30	Apr. 3	353 00 31.8	-1 09 35.2	29.918 46
3	352 27 36.0	1 08 49.3	29.920 26	5	353 01 15.8	1 09 36.2	29.918 42
5	352 28 20.0	1 08 50.3	29.920 22	7	353 01 59.7	1 09 37.2	29.918 38
7	352 29 03.9	1 08 51.3	29.920 18	9	353 02 43.6	1 09 38.2	29.918 34
9	352 29 47.8	1 08 52.4	29.920 14	11	353 03 27.5	1 09 39.2	29.918 29
11	352 30 31.7	1 08 53.4	29.920 10	13	353 04 11.4	1 09 40.2	29.918 25
13	352 31 15.6	-1 08 54.4	29.920 06	15	353 04 55.3	-1 09 41.3	29.918 21
15	352 31 59.5	1 08 55.4	29.920 02	17	353 05 39.2	1 09 42.3	29.918 17
17	352 32 43.4	1 08 56.5	29.919 98	19	353 06 23.1	1 09 43.3	29.918 13
19	352 33 27.3	1 08 57.5	29.919 94	21	353 07 07.0	1 09 44.3	29.918 09
21	352 34 11.2	1 08 58.5	29.919 90	23	353 07 51.0	1 09 45.3	29.918 05
23	352 34 55.1	1 08 59.5	29.919 86	25	353 08 34.9	1 09 46.3	29.918 01
25	352 35 39.0	-1 09 00.6	29.919 82	27	353 09 18.8	-1 09 47.3	29.917 97
27	352 36 22.9	1 09 01.6	29.919 78	29	353 10 02.7	1 09 48.3	29.917 93
29	352 37 06.8	1 09 02.6	29.919 74	May 1	353 10 46.6	1 09 49.4	29.917 89
31	352 37 50.7	1 09 03.6	29.919 70	3	353 11 30.5	1 09 50.4	29.917 84
Feb. 2	352 38 34.6	1 09 04.6	29.919 66	5	353 12 14.4	1 09 51.4	29.917 80
4	352 39 18.5	1 09 05.7	29.919 62	7	353 12 58.3	1 09 52.4	29.917 76
6	352 40 02.4	-1 09 06.7	29.919 58	9	353 13 42.3	-1 09 53.4	29.917 72
8	352 40 46.3	1 09 07.7	29.919 54	11	353 14 26.2	1 09 54.4	29.917 68
10	352 41 30.2	1 09 08.7	29.919 51	13	353 15 10.1	1 09 55.4	29.917 64
12	352 42 14.1	1 09 09.7	29.919 47	15	353 15 54.0	1 09 56.4	29.917 60
14	352 42 58.0	1 09 10.8	29.919 43	17	353 16 37.9	1 09 57.5	29.917 56
16	352 43 41.9	1 09 11.8	29.919 39	19	353 17 21.8	1 09 58.5	29.917 51
18	352 44 25.8	-1 09 12.8	29.919 34	21	353 18 05.7	-1 09 59.5	29.917 47
20	352 45 09.8	1 09 13.8	29.919 30	23	353 18 49.6	1 10 00.5	29.917 43
22	352 45 53.7	1 09 14.8	29.919 26	25	353 19 33.6	1 10 01.5	29.917 39
24	352 46 37.6	1 09 15.8	29.919 22	27	353 20 17.5	1 10 02.5	29.917 35
26	352 47 21.5	1 09 16.9	29.919 18	29	353 21 01.4	1 10 03.5	29.917 31
28	352 48 05.4	1 09 17.9	29.919 14	31	353 21 45.3	1 10 04.5	29.917 26
Mar. 2	352 48 49.3	-1 09 18.9	29.919 10	June 2	353 22 29.3	-1 10 05.6	29.917 22
4	352 49 33.2	1 09 19.9	29.919 06	4	353 23 13.2	1 10 06.6	29.917 18
6	352 50 17.1	1 09 20.9	29.919 02	6	353 23 57.1	1 10 07.6	29.917 14
8	352 51 01.0	1 09 21.9	29.918 98	8	353 24 41.0	1 10 08.6	29.917 10
10	352 51 44.9	1 09 23.0	29.918 94	10	353 25 24.9	1 10 09.6	29.917 06
12	352 52 28.8	1 09 24.0	29.918 90	12	353 26 08.8	1 10 10.6	29.917 01
14	352 53 12.7	-1 09 25.0	29.918 86	14	353 26 52.7	-1 10 11.6	29.916 97
16	352 53 56.6	1 09 26.0	29.918 82	16	353 27 36.6	1 10 12.6	29.916 93
18	352 54 40.6	1 09 27.0	29.918 78	18	353 28 20.6	1 10 13.6	29.916 89
20	352 55 24.5	1 09 28.1	29.918 74	20	353 29 04.5	1 10 14.6	29.916 85
22	352 56 08.4	1 09 29.1	29.918 70	22	353 29 48.4	1 10 15.6	29.916 80
24	352 56 52.3	1 09 30.1	29.918 66	24	353 30 32.3	1 10 16.6	29.916 76
26	352 57 36.2	-1 09 31.1	29.918 62	26	353 31 16.3	-1 10 17.6	29.916 72
28	352 58 20.1	1 09 32.1	29.918 58	28	353 32 00.2	1 10 18.6	29.916 68
30	352 59 04.0	1 09 33.2	29.918 54	30	353 32 44.1	1 10 19.6	29.916 64
Apr. 1	352 59 47.9	1 09 34.2	29.918 50	July 2	353 33 28.0	1 10 20.6	29.916 59
3	353 00 31.8	-1 09 35.2	29.918 46	4	353 34 11.9	-1 10 21.6	29.916 55

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MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector
		° ′ ″	° ′ ″				° ′ ″	° ′ ″	
July	2	353 33 28.0	-1 10 20.6	29.916 59	Oct.	2	354 07 08.4	-1 11 06.8	29.914 61
	4	353 34 11.9	1 10 21.6	29.916 55		4	354 07 52.3	1 11 07.8	29.914 56
	6	353 34 55.8	1 10 22.7	29.916 51		6	354 08 36.2	1 11 08.7	29.914 52
	8	353 35 39.8	1 10 23.7	29.916 47		8	354 09 20.2	1 11 09.7	29.914 48
	10	353 36 23.7	1 10 24.7	29.916 42		10	354 10 04.1	1 11 10.8	29.914 43
	12	353 37 07.6	1 10 25.7	29.916 38		12	354 10 48.0	1 11 11.8	29.914 39
	14	353 37 51.5	-1 10 26.7	29.916 34		14	354 11 31.9	-1 11 12.8	29.914 34
	16	353 38 35.4	1 10 27.7	29.916 30		16	354 12 15.8	1 11 13.7	29.914 30
	18	353 39 19.3	1 10 28.7	29.916 25		18	354 12 59.8	1 11 14.7	29.914 26
	20	353 40 03.3	1 10 29.7	29.916 21		20	354 13 43.7	1 11 15.7	29.914 21
	22	353 40 47.2	1 10 30.7	29.916 17		22	354 14 27.6	1 11 16.8	29.914 17
	24	353 41 31.1	1 10 31.7	29.916 13		24	354 15 11.5	1 11 17.7	29.914 12
	26	353 42 15.0	-1 10 32.7	29.916 08		26	354 15 55.5	-1 11 18.7	29.914 08
	28	353 42 59.0	1 10 33.7	29.916 04		28	354 16 39.4	1 11 19.7	29.914 03
	30	353 43 42.9	1 10 34.7	29.916 00		30	354 17 23.3	1 11 20.7	29.913 99
Aug.	1	353 44 26.8	1 10 35.7	29.915 95	Nov.	1	354 18 07.2	1 11 21.7	29.913 95
	3	353 45 10.7	1 10 36.7	29.915 91		3	354 18 51.2	1 11 22.7	29.913 90
	5	353 45 54.7	1 10 37.7	29.915 87		5	354 19 35.1	1 11 23.7	29.913 86
	7	353 46 38.6	-1 10 38.7	29.915 83		7	354 20 19.0	-1 11 24.7	29.913 81
	9	353 47 22.5	1 10 39.8	29.915 78		9	354 21 02.9	1 11 25.7	29.913 77
	11	353 48 06.4	1 10 40.8	29.915 74		11	354 21 46.9	1 11 26.7	29.913 72
	13	353 48 50.3	1 10 41.8	29.915 70		13	354 22 30.8	1 11 27.7	29.913 68
	15	353 49 34.3	1 10 42.8	29.915 65		15	354 23 14.7	1 11 28.7	29.913 63
	17	353 50 18.2	1 10 43.8	29.915 61		17	354 23 58.6	1 11 29.7	29.913 59
	19	353 51 02.1	-1 10 44.7	29.915 57		19	354 24 42.6	-1 11 30.7	29.913 54
	21	353 51 46.0	1 10 45.8	29.915 52		21	354 25 26.5	1 11 31.7	29.913 50
	23	353 52 29.9	1 10 46.8	29.915 48		23	354 26 10.4	1 11 32.7	29.913 46
	25	353 53 13.8	1 10 47.8	29.915 44		25	354 26 54.3	1 11 33.6	29.913 41
	27	353 53 57.8	1 10 48.8	29.915 39		27	354 27 38.3	1 11 34.6	29.913 37
	29	353 54 41.7	1 10 49.8	29.915 35		29	354 28 22.2	1 11 35.6	29.913 32
	31	353 55 25.6	-1 10 50.8	29.915 31	Dec.	1	354 29 06.1	-1 11 36.6	29.913 28
Sept.	2	353 56 09.5	1 10 51.8	29.915 26		3	354 29 50.0	1 11 37.6	29.913 23
	4	353 56 53.4	1 10 52.8	29.915 22		5	354 30 34.0	1 11 38.6	29.913 19
	6	353 57 37.4	1 10 53.8	29.915 18		7	354 31 17.9	1 11 39.6	29.913 14
	8	353 58 21.3	1 10 54.8	29.915 13		9	354 32 01.8	1 11 40.6	29.913 10
	10	353 59 05.2	1 10 55.8	29.915 09		11	354 32 45.7	1 11 41.6	29.913 05
	12	353 59 49.1	-1 10 56.8	29.915 05		13	354 33 29.7	-1 11 42.6	29.913 01
	14	354 00 33.1	1 10 57.8	29.915 00		15	354 34 13.6	1 11 43.5	29.912 96
	16	354 01 17.0	1 10 58.8	29.914 96		17	354 34 57.5	1 11 44.6	29.912 92
	18	354 02 00.9	1 10 59.8	29.914 92		19	354 35 41.4	1 11 45.6	29.912 87
	20	354 02 44.8	1 11 00.8	29.914 87		21	354 36 25.4	1 11 46.5	29.912 82
	22	354 03 28.8	1 11 01.8	29.914 83		23	354 37 09.3	1 11 47.5	29.912 78
	24	354 04 12.7	-1 11 02.8	29.914 78		25	354 37 53.2	-1 11 48.5	29.912 73
	26	354 04 56.6	1 11 03.8	29.914 74		27	354 38 37.1	1 11 49.5	29.912 69
	28	354 05 40.5	1 11 04.8	29.914 70		29	354 39 21.1	1 11 50.5	29.912 64
	30	354 06 24.5	1 11 05.8	29.914 65		31	354 40 05.0	1 11 51.5	29.912 60
Oct.	2	354 07 08.4	-1 11 06.8	29.914 61		33	354 40 48.9	-1 11 52.5	29.912 55

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	350	39	07.6	-1	8	06.6	Feb.	15	351	53	39.5	-1	7	11.8
	1	350	40	08.8	1	8	04.9		16	351	55	45.6	1	7	11.3
	2	350	41	11.9	1	8	03.2		17	351	57	52.5	1	7	10.8
	3	350	42	17.0	1	8	01.6		18	352	00	00.1	1	7	10.4
	4	350	43	23.9	1	7	59.9		19	352	02	08.3	1	7	10.0
	5	350	44	32.6	1	7	58.3		20	352	04	17.3	1	7	09.6
	6	350	45	43.1	-1	7	56.6		21	352	06	27.0	-1	7	09.3
	7	350	46	55.4	1	7	55.0		22	352	08	37.3	1	7	09.0
	8	350	48	09.4	1	7	53.4		23	352	10	48.3	1	7	08.8
	9	350	49	25.1	1	7	51.9		24	352	13	00.0	1	7	08.6
	10	350	50	42.7	1	7	50.3		25	352	15	12.3	1	7	08.4
	11	350	52	02.0	1	7	48.8		26	352	17	25.1	1	7	08.3
	12	350	53	23.0	-1	7	47.3		27	352	19	38.4	-1	7	08.2
	13	350	54	45.8	1	7	45.8		28	352	21	52.2	1	7	08.1
	14	350	56	10.3	1	7	44.3	Mar.	1	352	24	06.3	1	7	08.1
	15	350	57	36.5	1	7	42.8		2	352	26	20.8	1	7	08.1
	16	350	59	04.3	1	7	41.4		3	352	28	35.6	1	7	08.1
	17	351	00	33.8	1	7	40.0		4	352	30	50.7	1	7	08.2
	18	351	02	04.8	-1	7	38.6		5	352	33	06.0	-1	7	08.3
	19	351	03	37.4	1	7	37.3		6	352	35	21.7	1	7	08.5
	20	351	05	11.4	1	7	36.0		7	352	37	37.6	1	7	08.7
	21	351	06	46.9	1	7	34.7		8	352	39	53.7	1	7	08.9
	22	351	08	23.9	1	7	33.4		9	352	42	10.1	1	7	09.2
	23	351	10	02.4	1	7	32.2		10	352	44	26.6	1	7	09.5
	24	351	11	42.3	-1	7	31.0		11	352	46	43.3	-1	7	09.8
	25	351	13	23.7	1	7	29.8		12	352	49	00.1	1	7	10.3
	26	351	15	06.5	1	7	28.6		13	352	51	16.8	1	7	10.9
	27	351	16	50.7	1	7	27.5		14	352	53	33.2	1	7	11.3
	28	351	18	36.4	1	7	26.4		15	352	55	49.9	1	7	11.6
	29	351	20	23.5	1	7	25.3		16	352	58	06.5	1	7	12.1
	30	351	22	12.0	-1	7	24.3		17	353	00	23.0	-1	7	12.6
	31	351	24	01.7	1	7	23.2		18	353	02	39.4	1	7	13.2
Feb.	1	351	25	52.6	1	7	22.3		19	353	04	55.6	1	7	13.8
	2	351	27	44.7	1	7	21.3		20	353	07	11.6	1	7	14.5
	3	351	29	37.9	1	7	20.4		21	353	09	27.5	1	7	15.2
	4	351	31	32.2	1	7	19.5		22	353	11	43.2	1	7	16.0
	5	351	33	27.7	-1	7	18.6		23	353	13	58.7	-1	7	16.8
	6	351	35	24.2	1	7	17.8		24	353	16	14.0	1	7	17.6
	7	351	37	21.9	1	7	17.0		25	353	18	29.0	1	7	18.4
	8	351	39	20.6	1	7	16.2		26	353	20	43.7	1	7	19.3
	9	351	41	20.5	1	7	15.5		27	353	22	58.0	1	7	20.3
	10	351	43	21.3	1	7	14.8		28	353	25	11.9	1	7	21.2
	11	351	45	23.1	-1	7	14.1		29	353	27	25.3	-1	7	22.2
	12	351	47	25.9	1	7	13.5		30	353	29	38.1	1	7	23.3
	13	351	49	29.6	1	7	12.9		31	353	31	50.4	1	7	24.4
	14	351	51	34.1	1	7	12.3	Apr.	1	353	34	02.2	1	7	25.5
	15	351	53	39.5	-1	7	11.8		2	353	36	13.4	-1	7	26.6

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	353	34	02.2	-1	7	25.5	May	17	354	57	56.2	-1	8	51.4
	2	353	36	13.4	1	7	26.6		18	354	59	14.4	1	8	53.9
	3	353	38	24.1	1	7	27.8		19	355	00	31.1	1	8	56.4
	4	353	40	34.1	1	7	29.0		20	355	01	46.0	1	8	59.0
	5	353	42	43.6	1	7	30.3		21	355	02	59.2	1	9	01.6
	6	353	44	52.5	1	7	31.5		22	355	04	10.7	1	9	04.1
	7	353	47	00.6	-1	7	32.9		23	355	05	20.4	-1	9	06.7
	8	353	49	08.1	1	7	34.2		24	355	06	28.3	1	9	09.3
	9	353	51	14.8	1	7	35.6		25	355	07	34.4	1	9	12.0
	10	353	53	20.6	1	7	37.0		26	355	08	38.8	1	9	14.6
	11	353	55	25.7	1	7	38.5		27	355	09	41.4	1	9	17.3
	12	353	57	29.8	1	7	40.0		28	355	10	42.2	1	9	20.0
	13	353	59	33.0	-1	7	41.5		29	355	11	41.3	-1	9	22.7
	14	354	01	35.4	1	7	43.1		30	355	12	38.6	1	9	25.4
	15	354	03	36.7	1	7	44.7		31	355	13	34.1	1	9	28.1
	16	354	05	37.1	1	7	46.3	June	1	355	14	27.8	1	9	30.8
	17	354	07	36.6	1	7	48.0		2	355	15	19.6	1	9	33.6
	18	354	09	35.2	1	7	49.7		3	355	16	09.6	1	9	36.4
	19	354	11	32.8	-1	7	51.4		4	355	16	57.7	-1	9	39.1
	20	354	13	29.4	1	7	53.2		5	355	17	43.8	1	9	41.9
	21	354	15	25.0	1	7	55.0		6	355	18	28.0	1	9	44.7
	22	354	17	19.6	1	7	56.8		7	355	19	10.3	1	9	47.5
	23	354	19	13.0	1	7	58.6		8	355	19	50.6	1	9	50.4
	24	354	21	05.2	1	8	00.5		9	355	20	29.0	1	9	53.2
	25	354	22	56.3	-1	8	02.4		10	355	21	05.5	-1	9	56.0
	26	354	24	46.0	1	8	04.4		11	355	21	40.2	1	9	58.9
	27	354	26	34.5	1	8	06.4		12	355	22	12.9	1	10	01.7
	28	354	28	21.8	1	8	08.4		13	355	22	43.8	1	10	04.6
	29	354	30	07.8	1	8	10.4		14	355	23	12.8	1	10	07.5
	30	354	31	52.5	1	8	12.4		15	355	23	40.0	1	10	10.3
May	1	354	33	36.0	-1	8	14.5		16	355	24	05.2	-1	10	13.2
	2	354	35	18.1	1	8	16.6		17	355	24	28.5	1	10	16.1
	3	354	36	59.0	1	8	18.8		18	355	24	49.7	1	10	19.0
	4	354	38	38.5	1	8	20.9		19	355	25	08.9	1	10	21.8
	5	354	40	16.6	1	8	23.1		20	355	25	26.1	1	10	24.7
	6	354	41	53.2	1	8	25.3		21	355	25	41.3	1	10	27.6
	7	354	43	28.5	-1	8	27.6		22	355	25	54.6	-1	10	30.5
	8	354	45	02.2	1	8	29.9		23	355	26	05.9	1	10	33.4
	9	354	46	34.4	1	8	32.2		24	355	26	15.2	1	10	36.2
	10	354	48	05.1	1	8	34.5		25	355	26	22.6	1	10	39.1
	11	354	49	34.2	1	8	36.8		26	355	26	28.1	1	10	42.0
	12	354	51	01.8	1	8	39.2		27	355	26	31.7	1	10	44.9
	13	354	52	27.7	-1	8	41.6		28	355	26	33.3	-1	10	47.7
	14	354	53	52.2	1	8	44.0		29	355	26	33.0	1	10	50.6
	15	354	55	15.0	1	8	46.5		30	355	26	30.7	1	10	53.5
	16	354	56	36.4	1	8	48.9	July	1	355	26	26.4	1	10	56.3
	17	354	57	56.2	-1	8	51.4		2	355	26	20.1	-1	10	59.2

NEPTUNE, 2022
GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	355	26	26.4	-1	10	56.3	Aug.	16	354	51	09.5	-1	12	49.5
	2	355	26	20.1	1	10	59.2		17	354	49	48.4	1	12	51.3
	3	355	26	11.9	1	11	02.0		18	354	48	26.2	1	12	53.1
	4	355	26	01.7	1	11	04.8		19	354	47	03.0	1	12	54.8
	5	355	25	49.5	1	11	07.7		20	354	45	38.8	1	12	56.5
	6	355	25	35.4	1	11	10.5		21	354	44	13.6	1	12	58.2
	7	355	25	19.3	-1	11	13.3		22	354	42	47.4	-1	12	59.8
	8	355	25	01.4	1	11	16.1		23	354	41	20.2	1	13	01.4
	9	355	24	41.6	1	11	18.9		24	354	39	52.2	1	13	02.9
	10	355	24	20.1	1	11	21.7		25	354	38	23.2	1	13	04.4
	11	355	23	56.7	1	11	24.4		26	354	36	53.3	1	13	05.9
	12	355	23	31.5	1	11	27.2		27	354	35	22.6	1	13	07.3
	13	355	23	04.5	-1	11	29.9		28	354	33	51.0	-1	13	08.7
	14	355	22	35.7	1	11	32.6		29	354	32	18.7	1	13	10.0
	15	355	22	04.9	1	11	35.3		30	354	30	45.6	1	13	11.4
	16	355	21	32.3	1	11	38.0		31	354	29	11.9	1	13	12.6
	17	355	20	57.9	1	11	40.7	Sept.	1	354	27	37.6	1	13	13.8
	18	355	20	21.5	1	11	43.3		2	354	26	02.7	1	13	15.0
	19	355	19	43.4	-1	11	46.0		3	354	24	27.3	-1	13	16.1
	20	355	19	03.5	1	11	48.6		4	354	22	51.5	1	13	17.2
	21	355	18	21.9	1	11	51.2		5	354	21	15.2	1	13	18.3
	22	355	17	38.6	1	11	53.7		6	354	19	38.5	1	13	19.3
	23	355	16	53.6	1	11	56.3		7	354	18	01.4	1	13	20.2
	24	355	16	06.9	1	11	58.8		8	354	16	23.8	1	13	21.1
	25	355	15	18.6	-1	12	01.3		9	354	14	45.9	-1	13	22.0
	26	355	14	28.6	1	12	03.8		10	354	13	07.6	1	13	22.8
	27	355	13	36.9	1	12	06.3		11	354	11	28.9	1	13	23.6
	28	355	12	43.6	1	12	08.7		12	354	09	50.0	1	13	24.3
	29	355	11	48.6	1	12	11.1		13	354	08	11.0	1	13	25.0
	30	355	10	52.0	1	12	13.5		14	354	06	31.8	1	13	25.6
	31	355	09	53.8	-1	12	15.8		15	354	04	52.5	-1	13	26.2
Aug.	1	355	08	54.0	1	12	18.2		16	354	03	13.2	1	13	26.8
	2	355	07	52.7	1	12	20.5		17	354	01	33.9	1	13	27.3
	3	355	06	49.8	1	12	22.8		18	353	59	54.6	1	13	27.7
	4	355	05	45.5	1	12	25.0		19	353	58	15.3	1	13	28.1
	5	355	04	39.7	1	12	27.2		20	353	56	36.0	1	13	28.5
	6	355	03	32.6	-1	12	29.4		21	353	54	56.9	-1	13	28.8
	7	355	02	24.2	1	12	31.6		22	353	53	17.9	1	13	29.1
	8	355	01	14.4	1	12	33.7		23	353	51	39.0	1	13	29.3
	9	355	00	03.4	1	12	35.8		24	353	50	00.2	1	13	29.5
	10	354	58	51.0	1	12	37.9		25	353	48	21.8	1	13	29.6
	11	354	57	37.3	1	12	39.9		26	353	46	43.6	1	13	29.7
	12	354	56	22.3	-1	12	41.9		27	353	45	05.7	-1	13	29.8
	13	354	55	06.0	1	12	43.8		28	353	43	28.3	1	13	29.8
	14	354	53	48.3	1	12	45.7		29	353	41	51.4	1	13	29.8
	15	354	52	29.5	1	12	47.6		30	353	40	14.9	1	13	29.7
	16	354	51	09.5	-1	12	49.5	Oct.	1	353	38	39.1	-1	13	29.5

NEPTUNE, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	353	38	39.1	-1	13	29.5	Nov.	16	352	44	10.7	-1	12	41.5
	2	353	37	03.9	1	13	29.4		17	352	43	35.6	1	12	39.7
	3	353	35	29.2	1	13	29.2		18	352	43	02.3	1	12	37.9
	4	353	33	55.2	1	13	28.9		19	352	42	31.0	1	12	36.1
	5	353	32	21.8	1	13	28.6		20	352	42	01.5	1	12	34.3
	6	353	30	49.0	1	13	28.2		21	352	41	34.0	1	12	32.5
	7	353	29	16.9	-1	13	27.8		22	352	41	08.5	-1	12	30.7
	8	353	27	45.5	1	13	27.4		23	352	40	45.0	1	12	28.8
	9	353	26	14.9	1	13	26.9		24	352	40	23.7	1	12	26.9
	10	353	24	45.1	1	13	26.4		25	352	40	04.3	1	12	25.1
	11	353	23	16.2	1	13	25.8		26	352	39	47.1	1	12	23.2
	12	353	21	48.3	1	13	25.2		27	352	39	31.9	1	12	21.2
	13	353	20	21.4	-1	13	24.5		28	352	39	18.7	-1	12	19.3
	14	353	18	55.4	1	13	23.8		29	352	39	07.5	1	12	17.4
	15	353	17	30.5	1	13	23.1		30	352	38	58.2	1	12	15.4
	16	353	16	06.6	1	13	22.3	Dec.	1	352	38	51.0	1	12	13.5
	17	353	14	43.8	1	13	21.5		2	352	38	45.8	1	12	11.5
	18	353	13	22.1	1	13	20.7		3	352	38	42.6	1	12	09.5
	19	353	12	01.5	-1	13	19.8		4	352	38	41.5	-1	12	07.5
	20	353	10	42.0	1	13	18.9		5	352	38	42.6	1	12	05.6
	21	353	09	23.7	1	13	17.9		6	352	38	45.7	1	12	03.6
	22	353	08	06.6	1	13	16.9		7	352	38	51.0	1	12	01.6
	23	353	06	50.8	1	13	15.9		8	352	38	58.4	1	11	59.6
	24	353	05	36.2	1	13	14.8		9	352	39	07.9	1	11	57.5
	25	353	04	23.0	-1	13	13.7		10	352	39	19.4	-1	11	55.5
	26	353	03	11.3	1	13	12.5		11	352	39	33.1	1	11	53.5
	27	353	02	01.0	1	13	11.4		12	352	39	48.7	1	11	51.5
	28	353	00	52.2	1	13	10.2		13	352	40	06.5	1	11	49.5
	29	352	59	44.9	1	13	08.9		14	352	40	26.3	1	11	47.5
	30	352	58	39.1	1	13	07.6		15	352	40	48.1	1	11	45.5
	31	352	57	34.9	-1	13	06.3		16	352	41	11.9	-1	11	43.5
Nov.	1	352	56	32.2	1	13	05.0		17	352	41	37.9	1	11	41.5
	2	352	55	30.9	1	13	03.6		18	352	42	05.8	1	11	39.5
	3	352	54	31.3	1	13	02.2		19	352	42	35.9	1	11	37.5
	4	352	53	33.1	1	13	00.8		20	352	43	08.1	1	11	35.5
	5	352	52	36.6	1	12	59.3		21	352	43	42.5	1	11	33.6
	6	352	51	41.8	-1	12	57.8		22	352	44	18.9	-1	11	31.6
	7	352	50	48.7	1	12	56.3		23	352	44	57.5	1	11	29.6
	8	352	49	57.3	1	12	54.7		24	352	45	38.1	1	11	27.7
	9	352	49	07.6	1	12	53.2		25	352	46	20.8	1	11	25.7
	10	352	48	19.8	1	12	51.6		26	352	47	05.4	1	11	23.8
	11	352	47	33.8	1	12	49.9		27	352	47	52.0	1	11	21.9
	12	352	46	49.5	-1	12	48.3		28	352	48	40.5	-1	11	19.9
	13	352	46	07.1	1	12	46.6		29	352	49	30.9	1	11	18.0
	14	352	45	26.5	1	12	44.9		30	352	50	23.3	1	11	16.1
	15	352	44	47.7	1	12	43.2		31	352	51	17.7	1	11	14.2
	16	352	44	10.7	-1	12	41.5		32	352	52	14.0	-1	11	12.4

NEPTUNE, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	23	27	26.24	-4	44	52.1	30.223 651	0.29	1.11	16	46	10
	1	23	27	29.96	4	44	26.4	30.240 033	0.29	1.11	16	42	18
	2	23	27	33.79	4	43	60.0	30.256 314	0.29	1.11	16	38	26
	3	23	27	37.75	4	43	32.8	30.272 489	0.29	1.11	16	34	34
	4	23	27	41.82	4	43	05.0	30.288 551	0.29	1.11	16	30	42
	5	23	27	46.00	4	42	36.4	30.304 496	0.29	1.11	16	26	50
	6	23	27	50.29	-4	42	07.2	30.320 319	0.29	1.10	16	22	59
	7	23	27	54.69	4	41	37.2	30.336 016	0.29	1.10	16	19	07
	8	23	27	59.20	4	41	06.6	30.351 580	0.29	1.10	16	15	16
	9	23	28	03.81	4	40	35.3	30.367 008	0.29	1.10	16	11	25
	10	23	28	08.54	4	40	03.4	30.382 296	0.29	1.10	16	07	33
	11	23	28	13.37	4	39	30.7	30.397 439	0.29	1.10	16	03	42
	12	23	28	18.31	-4	38	57.4	30.412 432	0.29	1.10	15	59	52
	13	23	28	23.36	4	38	23.4	30.427 273	0.29	1.10	15	56	01
	14	23	28	28.52	4	37	48.8	30.441 956	0.29	1.10	15	52	10
	15	23	28	33.78	4	37	13.5	30.456 477	0.29	1.10	15	48	19
	16	23	28	39.14	4	36	37.6	30.470 834	0.29	1.10	15	44	29
	17	23	28	44.60	4	36	01.0	30.485 022	0.29	1.10	15	40	38
	18	23	28	50.15	-4	35	23.9	30.499 037	0.29	1.10	15	36	48
	19	23	28	55.81	4	34	46.2	30.512 875	0.29	1.10	15	32	58
	20	23	29	01.55	4	34	07.9	30.526 533	0.29	1.10	15	29	08
	21	23	29	07.39	4	33	29.1	30.540 007	0.29	1.10	15	25	18
	22	23	29	13.32	4	32	49.7	30.553 293	0.29	1.10	15	21	28
	23	23	29	19.33	4	32	09.8	30.566 388	0.29	1.10	15	17	38
	24	23	29	25.44	-4	31	29.3	30.579 287	0.29	1.10	15	13	48
	25	23	29	31.64	4	30	48.2	30.591 988	0.29	1.10	15	09	58
	26	23	29	37.92	4	30	06.6	30.604 487	0.29	1.09	15	06	09
	27	23	29	44.30	4	29	24.5	30.616 779	0.29	1.09	15	02	19
	28	23	29	50.76	4	28	41.8	30.628 861	0.29	1.09	14	58	30
	29	23	29	57.32	4	27	58.5	30.640 729	0.29	1.09	14	54	40
	30	23	30	03.95	-4	27	14.8	30.652 379	0.29	1.09	14	50	51
	31	23	30	10.66	4	26	30.6	30.663 808	0.29	1.09	14	47	02
Feb.	1	23	30	17.45	4	25	46.0	30.675 012	0.29	1.09	14	43	13
	2	23	30	24.31	4	25	00.9	30.685 988	0.29	1.09	14	39	24
	3	23	30	31.24	4	24	15.4	30.696 732	0.29	1.09	14	35	35
	4	23	30	38.24	4	23	29.5	30.707 241	0.29	1.09	14	31	46
	5	23	30	45.31	-4	22	43.2	30.717 513	0.29	1.09	14	27	57
	6	23	30	52.45	4	21	56.4	30.727 545	0.29	1.09	14	24	08
	7	23	30	59.66	4	21	09.3	30.737 333	0.29	1.09	14	20	20
	8	23	31	06.93	4	20	21.7	30.746 877	0.29	1.09	14	16	31
	9	23	31	14.27	4	19	33.7	30.756 173	0.29	1.09	14	12	42
	10	23	31	21.67	4	18	45.4	30.765 219	0.29	1.09	14	08	54
	11	23	31	29.14	-4	17	56.7	30.774 013	0.29	1.09	14	05	06
	12	23	31	36.66	4	17	07.7	30.782 553	0.29	1.09	14	01	17
	13	23	31	44.24	4	16	18.3	30.790 837	0.29	1.09	13	57	29
	14	23	31	51.87	4	15	28.6	30.798 864	0.29	1.09	13	53	40
	15	23	31	59.55	-4	14	38.6	30.806 631	0.29	1.09	13	49	52

NEPTUNE, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	23	31	59.55	-4	14	38.6	30.806 631	0.29	1.09	13	49	52
	16	23	32	07.29	4	13	48.4	30.814 137	0.29	1.09	13	46	04
	17	23	32	15.07	4	12	57.9	30.821 379	0.29	1.09	13	42	16
	18	23	32	22.89	4	12	07.1	30.828 357	0.29	1.09	13	38	28
	19	23	32	30.75	4	11	16.1	30.835 069	0.29	1.09	13	34	40
	20	23	32	38.66	4	10	24.9	30.841 513	0.29	1.09	13	30	52
	21	23	32	46.62	-4	09	33.4	30.847 687	0.29	1.09	13	27	04
	22	23	32	54.61	4	08	41.6	30.853 590	0.29	1.09	13	23	16
	23	23	33	02.65	4	07	49.6	30.859 219	0.28	1.09	13	19	28
	24	23	33	10.73	4	06	57.4	30.864 574	0.28	1.09	13	15	40
	25	23	33	18.84	4	06	05.0	30.869 653	0.28	1.09	13	11	52
	26	23	33	26.99	4	05	12.4	30.874 453	0.28	1.09	13	08	04
	27	23	33	35.17	-4	04	19.6	30.878 974	0.28	1.08	13	04	17
	28	23	33	43.38	4	03	26.7	30.883 214	0.28	1.08	13	00	29
Mar.	1	23	33	51.62	4	02	33.7	30.887 172	0.28	1.08	12	56	41
	2	23	33	59.87	4	01	40.6	30.890 846	0.28	1.08	12	52	54
	3	23	34	08.14	4	00	47.4	30.894 236	0.28	1.08	12	49	06
	4	23	34	16.44	3	59	54.1	30.897 340	0.28	1.08	12	45	18
	5	23	34	24.75	-3	59	00.7	30.900 159	0.28	1.08	12	41	31
	6	23	34	33.08	3	58	07.2	30.902 691	0.28	1.08	12	37	43
	7	23	34	41.42	3	57	13.6	30.904 936	0.28	1.08	12	33	55
	8	23	34	49.78	3	56	20.0	30.906 895	0.28	1.08	12	30	08
	9	23	34	58.16	3	55	26.3	30.908 567	0.28	1.08	12	26	20
	10	23	35	06.54	3	54	32.6	30.909 953	0.28	1.08	12	22	33
	11	23	35	14.94	-3	53	38.9	30.911 051	0.28	1.08	12	18	45
	12	23	35	23.34	3	52	45.2	30.911 864	0.28	1.08	12	14	58
	13	23	35	31.75	3	51	51.7	30.912 390	0.28	1.08	12	11	10
	14	23	35	40.13	3	50	58.2	30.912 631	0.28	1.08	12	07	23
	15	23	35	48.52	3	50	04.4	30.912 586	0.28	1.08	12	03	35
	16	23	35	56.92	3	49	10.8	30.912 257	0.28	1.08	11	59	47
	17	23	36	05.31	-3	48	17.3	30.911 643	0.28	1.08	11	55	60
	18	23	36	13.69	3	47	23.9	30.910 746	0.28	1.08	11	52	12
	19	23	36	22.06	3	46	30.6	30.909 566	0.28	1.08	11	48	25
	20	23	36	30.42	3	45	37.4	30.908 103	0.28	1.08	11	44	37
	21	23	36	38.78	3	44	44.3	30.906 358	0.28	1.08	11	40	49
	22	23	36	47.12	3	43	51.2	30.904 331	0.28	1.08	11	37	02
	23	23	36	55.45	-3	42	58.3	30.902 023	0.28	1.08	11	33	14
	24	23	37	03.78	3	42	05.5	30.899 435	0.28	1.08	11	29	27
	25	23	37	12.08	3	41	12.9	30.896 566	0.28	1.08	11	25	39
	26	23	37	20.37	3	40	20.4	30.893 418	0.28	1.08	11	21	51
	27	23	37	28.63	3	39	28.1	30.889 991	0.28	1.08	11	18	04
	28	23	37	36.86	3	38	36.0	30.886 286	0.28	1.08	11	14	16
	29	23	37	45.07	-3	37	44.1	30.882 304	0.28	1.08	11	10	28
	30	23	37	53.24	3	36	52.5	30.878 046	0.28	1.08	11	06	40
	31	23	38	01.39	3	36	01.1	30.873 513	0.28	1.09	11	02	52
Apr.	1	23	38	09.50	3	35	10.0	30.868 706	0.28	1.09	10	59	05
	2	23	38	17.57	-3	34	19.0	30.863 628	0.28	1.09	10	55	17

NEPTUNE, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	23	38	09.50	-3	35	10.0	30.868 706	0.28	1.09	10	59	05
	2	23	38	17.57	3	34	19.0	30.863 628	0.28	1.09	10	55	17
	3	23	38	25.62	3	33	28.4	30.858 280	0.28	1.09	10	51	29
	4	23	38	33.63	3	32	38.0	30.852 663	0.29	1.09	10	47	41
	5	23	38	41.60	3	31	47.8	30.846 780	0.29	1.09	10	43	53
	6	23	38	49.53	3	30	58.0	30.840 633	0.29	1.09	10	40	05
	7	23	38	57.43	-3	30	08.4	30.834 225	0.29	1.09	10	36	17
	8	23	39	05.28	3	29	19.2	30.827 556	0.29	1.09	10	32	29
	9	23	39	13.08	3	28	30.3	30.820 630	0.29	1.09	10	28	40
	10	23	39	20.83	3	27	41.8	30.813 449	0.29	1.09	10	24	52
	11	23	39	28.54	3	26	53.6	30.806 015	0.29	1.09	10	21	04
	12	23	39	36.19	3	26	05.8	30.798 331	0.29	1.09	10	17	16
	13	23	39	43.79	-3	25	18.4	30.790 400	0.29	1.09	10	13	27
	14	23	39	51.33	3	24	31.3	30.782 223	0.29	1.09	10	09	39
	15	23	39	58.81	3	23	44.7	30.773 803	0.29	1.09	10	05	50
	16	23	40	06.23	3	22	58.5	30.765 143	0.29	1.09	10	02	02
	17	23	40	13.60	3	22	12.7	30.756 245	0.29	1.09	9	58	13
	18	23	40	20.91	3	21	27.2	30.747 112	0.29	1.09	9	54	25
	19	23	40	28.17	-3	20	42.2	30.737 745	0.29	1.09	9	50	36
	20	23	40	35.36	3	19	57.6	30.728 148	0.29	1.09	9	46	47
	21	23	40	42.50	3	19	13.4	30.718 322	0.29	1.09	9	42	58
	22	23	40	49.57	3	18	29.7	30.708 270	0.29	1.09	9	39	09
	23	23	40	56.57	3	17	46.4	30.697 994	0.29	1.09	9	35	20
	24	23	41	03.50	3	17	03.7	30.687 497	0.29	1.09	9	31	31
	25	23	41	10.35	-3	16	21.4	30.676 781	0.29	1.09	9	27	42
	26	23	41	17.13	3	15	39.7	30.665 850	0.29	1.09	9	23	53
	27	23	41	23.84	3	14	58.5	30.654 705	0.29	1.09	9	20	04
	28	23	41	30.46	3	14	17.8	30.643 351	0.29	1.09	9	16	14
	29	23	41	37.01	3	13	37.6	30.631 791	0.29	1.09	9	12	25
	30	23	41	43.48	3	12	58.0	30.620 027	0.29	1.09	9	08	35
May	1	23	41	49.88	-3	12	18.9	30.608 064	0.29	1.09	9	04	46
	2	23	41	56.20	3	11	40.3	30.595 904	0.29	1.09	9	00	56
	3	23	42	02.43	3	11	02.3	30.583 552	0.29	1.10	8	57	06
	4	23	42	08.59	3	10	24.8	30.571 011	0.29	1.10	8	53	17
	5	23	42	14.66	3	09	47.9	30.558 286	0.29	1.10	8	49	27
	6	23	42	20.64	3	09	11.6	30.545 379	0.29	1.10	8	45	37
	7	23	42	26.53	-3	08	35.9	30.532 295	0.29	1.10	8	41	47
	8	23	42	32.34	3	08	00.8	30.519 037	0.29	1.10	8	37	56
	9	23	42	38.05	3	07	26.4	30.505 610	0.29	1.10	8	34	06
	10	23	42	43.67	3	06	52.5	30.492 018	0.29	1.10	8	30	16
	11	23	42	49.19	3	06	19.3	30.478 264	0.29	1.10	8	26	25
	12	23	42	54.62	3	05	46.8	30.464 353	0.29	1.10	8	22	35
	13	23	42	59.95	-3	05	14.9	30.450 287	0.29	1.10	8	18	44
	14	23	43	05.18	3	04	43.6	30.436 072	0.29	1.10	8	14	53
	15	23	43	10.33	3	04	13.0	30.421 711	0.29	1.10	8	11	03
	16	23	43	15.38	3	03	43.0	30.407 207	0.29	1.10	8	07	12
	17	23	43	20.33	-3	03	13.6	30.392 565	0.29	1.10	8	03	21

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	23	43	20.33	-3	03	13.6	30.392 565	0.29	1.10	8	03	21
	18	23	43	25.19	3	02	44.8	30.377 788	0.29	1.10	7	59	30
	19	23	43	29.95	3	02	16.8	30.362 879	0.29	1.10	7	55	38
	20	23	43	34.61	3	01	49.4	30.347 842	0.29	1.10	7	51	47
	21	23	43	39.17	3	01	22.7	30.332 681	0.29	1.10	7	47	56
	22	23	43	43.61	3	00	56.7	30.317 400	0.29	1.10	7	44	04
	23	23	43	47.95	-3	00	31.4	30.302 002	0.29	1.11	7	40	13
	24	23	43	52.18	3	00	06.9	30.286 492	0.29	1.11	7	36	21
	25	23	43	56.30	2	59	43.1	30.270 873	0.29	1.11	7	32	29
	26	23	44	00.32	2	59	20.0	30.255 151	0.29	1.11	7	28	37
	27	23	44	04.22	2	58	57.6	30.239 329	0.29	1.11	7	24	45
	28	23	44	08.02	2	58	35.9	30.223 412	0.29	1.11	7	20	53
	29	23	44	11.71	-2	58	14.9	30.207 405	0.29	1.11	7	17	00
	30	23	44	15.29	2	57	54.7	30.191 312	0.29	1.11	7	13	08
	31	23	44	18.77	2	57	35.1	30.175 138	0.29	1.11	7	09	16
June	1	23	44	22.13	2	57	16.3	30.158 888	0.29	1.11	7	05	23
	2	23	44	25.37	2	56	58.3	30.142 566	0.29	1.11	7	01	30
	3	23	44	28.51	2	56	41.0	30.126 178	0.29	1.11	6	57	37
	4	23	44	31.53	-2	56	24.5	30.109 728	0.29	1.11	6	53	45
	5	23	44	34.43	2	56	08.7	30.093 220	0.29	1.11	6	49	51
	6	23	44	37.21	2	55	53.8	30.076 660	0.29	1.11	6	45	58
	7	23	44	39.87	2	55	39.6	30.060 053	0.29	1.11	6	42	05
	8	23	44	42.42	2	55	26.1	30.043 402	0.29	1.12	6	38	12
	9	23	44	44.85	2	55	13.5	30.026 714	0.29	1.12	6	34	18
	10	23	44	47.16	-2	55	01.6	30.009 991	0.29	1.12	6	30	24
	11	23	44	49.35	2	54	50.5	29.993 240	0.29	1.12	6	26	31
	12	23	44	51.44	2	54	40.1	29.976 465	0.29	1.12	6	22	37
	13	23	44	53.40	2	54	30.5	29.959 669	0.29	1.12	6	18	43
	14	23	44	55.26	2	54	21.6	29.942 857	0.29	1.12	6	14	49
	15	23	44	57.00	2	54	13.4	29.926 034	0.29	1.12	6	10	54
	16	23	44	58.62	-2	54	06.1	29.909 203	0.29	1.12	6	07	00
	17	23	45	00.12	2	53	59.5	29.892 369	0.29	1.12	6	03	06
	18	23	45	01.50	2	53	53.7	29.875 536	0.29	1.12	5	59	11
	19	23	45	02.75	2	53	48.7	29.858 708	0.29	1.12	5	55	16
	20	23	45	03.88	2	53	44.5	29.841 890	0.29	1.12	5	51	22
	21	23	45	04.89	2	53	41.1	29.825 086	0.29	1.12	5	47	27
	22	23	45	05.78	-2	53	38.5	29.808 302	0.30	1.12	5	43	32
	23	23	45	06.54	2	53	36.7	29.791 541	0.30	1.12	5	39	36
	24	23	45	07.19	2	53	35.6	29.774 810	0.30	1.13	5	35	41
	25	23	45	07.72	2	53	35.3	29.758 112	0.30	1.13	5	31	46
	26	23	45	08.14	2	53	35.8	29.741 452	0.30	1.13	5	27	50
	27	23	45	08.43	2	53	37.0	29.724 837	0.30	1.13	5	23	55
	28	23	45	08.60	-2	53	39.0	29.708 270	0.30	1.13	5	19	59
	29	23	45	08.66	2	53	41.7	29.691 757	0.30	1.13	5	16	03
	30	23	45	08.60	2	53	45.3	29.675 302	0.30	1.13	5	12	07
July	1	23	45	08.41	2	53	49.6	29.658 911	0.30	1.13	5	08	11
	2	23	45	08.10	-2	53	54.7	29.642 588	0.30	1.13	5	04	15

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	23	45	08.41	-2	53	49.6	29.658 911	0.30	1.13	5	08	11
	2	23	45	08.10	2	53	54.7	29.642 588	0.30	1.13	5	04	15
	3	23	45	07.67	2	54	00.6	29.626 339	0.30	1.13	5	00	18
	4	23	45	07.12	2	54	07.2	29.610 168	0.30	1.13	4	56	22
	5	23	45	06.45	2	54	14.7	29.594 080	0.30	1.13	4	52	25
	6	23	45	05.66	2	54	22.9	29.578 080	0.30	1.13	4	48	28
	7	23	45	04.75	-2	54	31.8	29.562 172	0.30	1.13	4	44	32
	8	23	45	03.73	2	54	41.5	29.546 361	0.30	1.13	4	40	35
	9	23	45	02.59	2	54	51.9	29.530 651	0.30	1.13	4	36	38
	10	23	45	01.34	2	55	03.0	29.515 047	0.30	1.14	4	32	40
	11	23	44	59.98	2	55	14.8	29.499 552	0.30	1.14	4	28	43
	12	23	44	58.51	2	55	27.4	29.484 172	0.30	1.14	4	24	46
	13	23	44	56.93	-2	55	40.6	29.468 909	0.30	1.14	4	20	48
	14	23	44	55.24	2	55	54.5	29.453 768	0.30	1.14	4	16	50
	15	23	44	53.43	2	56	09.2	29.438 753	0.30	1.14	4	12	53
	16	23	44	51.50	2	56	24.6	29.423 868	0.30	1.14	4	08	55
	17	23	44	49.46	2	56	40.8	29.409 117	0.30	1.14	4	04	57
	18	23	44	47.31	2	56	57.6	29.394 504	0.30	1.14	4	00	59
	19	23	44	45.04	-2	57	15.1	29.380 033	0.30	1.14	3	57	01
	20	23	44	42.67	2	57	33.4	29.365 708	0.30	1.14	3	53	02
	21	23	44	40.19	2	57	52.3	29.351 535	0.30	1.14	3	49	04
	22	23	44	37.60	2	58	11.8	29.337 517	0.30	1.14	3	45	06
	23	23	44	34.91	2	58	32.0	29.323 660	0.30	1.14	3	41	07
	24	23	44	32.12	2	58	52.8	29.309 966	0.30	1.14	3	37	08
	25	23	44	29.23	-2	59	14.3	29.296 441	0.30	1.14	3	33	09
	26	23	44	26.23	2	59	36.4	29.283 090	0.30	1.14	3	29	11
	27	23	44	23.13	2	59	59.2	29.269 915	0.30	1.14	3	25	12
	28	23	44	19.93	3	00	22.6	29.256 923	0.30	1.15	3	21	12
	29	23	44	16.62	3	00	46.6	29.244 116	0.30	1.15	3	17	13
	30	23	44	13.22	3	01	11.3	29.231 499	0.30	1.15	3	13	14
	31	23	44	09.72	-3	01	36.6	29.219 076	0.30	1.15	3	09	14
Aug.	1	23	44	06.11	3	02	02.4	29.206 851	0.30	1.15	3	05	15
	2	23	44	02.42	3	02	28.9	29.194 828	0.30	1.15	3	01	15
	3	23	43	58.63	3	02	55.9	29.183 010	0.30	1.15	2	57	16
	4	23	43	54.74	3	03	23.5	29.171 402	0.30	1.15	2	53	16
	5	23	43	50.78	3	03	51.6	29.160 006	0.30	1.15	2	49	16
	6	23	43	46.72	-3	04	20.3	29.148 826	0.30	1.15	2	45	16
	7	23	43	42.59	3	04	49.4	29.137 865	0.30	1.15	2	41	16
	8	23	43	38.37	3	05	19.0	29.127 126	0.30	1.15	2	37	16
	9	23	43	34.07	3	05	49.1	29.116 613	0.30	1.15	2	33	16
	10	23	43	29.69	3	06	19.8	29.106 327	0.30	1.15	2	29	15
	11	23	43	25.23	3	06	50.9	29.096 272	0.30	1.15	2	25	15
	12	23	43	20.69	-3	07	22.4	29.086 451	0.30	1.15	2	21	15
	13	23	43	16.06	3	07	54.5	29.076 866	0.30	1.15	2	17	14
	14	23	43	11.36	3	08	27.1	29.067 520	0.30	1.15	2	13	14
	15	23	43	06.58	3	09	00.1	29.058 416	0.30	1.15	2	09	13
	16	23	43	01.72	-3	09	33.5	29.049 556	0.30	1.15	2	05	12

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	23	43	01.72	-3	09	33.5	29.049 556	0.30	1.15	2	05	12
	17	23	42	56.80	3	10	07.4	29.040 945	0.30	1.15	2	01	11
	18	23	42	51.81	3	10	41.6	29.032 585	0.30	1.15	1	57	10
	19	23	42	46.76	3	11	16.2	29.024 478	0.30	1.15	1	53	10
	20	23	42	41.64	3	11	51.2	29.016 629	0.30	1.15	1	49	09
	21	23	42	36.47	3	12	26.5	29.009 039	0.30	1.15	1	45	07
	22	23	42	31.23	-3	13	02.1	29.001 711	0.30	1.16	1	41	06
	23	23	42	25.93	3	13	38.2	28.994 649	0.30	1.16	1	37	05
	24	23	42	20.57	3	14	14.5	28.987 855	0.30	1.16	1	33	04
	25	23	42	15.16	3	14	51.2	28.981 331	0.30	1.16	1	29	03
	26	23	42	09.69	3	15	28.2	28.975 080	0.30	1.16	1	25	01
	27	23	42	04.17	3	16	05.5	28.969 104	0.30	1.16	1	20	60
	28	23	41	58.59	-3	16	43.1	28.963 406	0.30	1.16	1	16	58
	29	23	41	52.97	3	17	20.9	28.957 987	0.30	1.16	1	12	57
	30	23	41	47.30	3	17	59.0	28.952 850	0.30	1.16	1	08	55
	31	23	41	41.59	3	18	37.3	28.947 996	0.30	1.16	1	04	54
Sept.	1	23	41	35.84	3	19	15.8	28.943 427	0.30	1.16	1	00	52
	2	23	41	30.06	3	19	54.5	28.939 144	0.30	1.16	0	56	51
	3	23	41	24.24	-3	20	33.4	28.935 149	0.30	1.16	0	52	49
	4	23	41	18.40	3	21	12.4	28.931 442	0.30	1.16	0	48	47
	5	23	41	12.53	3	21	51.5	28.928 026	0.30	1.16	0	44	45
	6	23	41	06.63	3	22	30.7	28.924 899	0.30	1.16	0	40	44
	7	23	41	00.70	3	23	10.1	28.922 064	0.30	1.16	0	36	42
	8	23	40	54.74	3	23	49.6	28.919 521	0.30	1.16	0	32	40
	9	23	40	48.76	-3	24	29.3	28.917 271	0.30	1.16	0	28	38
	10	23	40	42.76	3	25	09.0	28.915 314	0.30	1.16	0	24	36
	11	23	40	36.73	3	25	48.8	28.913 651	0.30	1.16	0	20	34
	12	23	40	30.69	3	26	28.7	28.912 283	0.30	1.16	0	16	32
	13	23	40	24.63	3	27	08.5	28.911 211	0.30	1.16	0	12	30
	14	23	40	18.57	3	27	48.4	28.910 435	0.30	1.16	0	08	28
	15	23	40	12.50	-3	28	28.3	28.909 956	0.30	1.16	0	04	27
	16	23	40	06.42	3	29	08.2	28.909 774	0.30	1.16	0	00	25
	17	23	40	00.35	3	29	48.0	28.909 891	0.30	1.16	23	52	21
	18	23	39	54.27	3	30	27.8	28.910 307	0.30	1.16	23	48	19
	19	23	39	48.19	3	31	07.5	28.911 022	0.30	1.16	23	44	17
	20	23	39	42.12	3	31	47.1	28.912 037	0.30	1.16	23	40	15
	21	23	39	36.05	-3	32	26.7	28.913 351	0.30	1.16	23	36	13
	22	23	39	29.99	3	33	06.2	28.914 965	0.30	1.16	23	32	11
	23	23	39	23.93	3	33	45.6	28.916 879	0.30	1.16	23	28	09
	24	23	39	17.88	3	34	24.9	28.919 093	0.30	1.16	23	24	07
	25	23	39	11.85	3	35	04.0	28.921 606	0.30	1.16	23	20	05
	26	23	39	05.83	3	35	43.0	28.924 418	0.30	1.16	23	16	03
	27	23	38	59.83	-3	36	21.8	28.927 529	0.30	1.16	23	12	02
	28	23	38	53.86	3	37	00.4	28.930 936	0.30	1.16	23	07	60
	29	23	38	47.91	3	37	38.7	28.934 640	0.30	1.16	23	03	58
	30	23	38	42.00	3	38	16.8	28.938 640	0.30	1.16	22	59	56
Oct.	1	23	38	36.11	-3	38	54.7	28.942 933	0.30	1.16	22	55	54

NEPTUNE, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	23	38	36.11	-3	38	54.7	28.942 933	0.30	1.16	22	55	54
	2	23	38	30.27	3	39	32.2	28.947 518	0.30	1.16	22	51	53
	3	23	38	24.46	3	40	09.5	28.952 394	0.30	1.16	22	47	51
	4	23	38	18.69	3	40	46.5	28.957 559	0.30	1.16	22	43	49
	5	23	38	12.95	3	41	23.2	28.963 011	0.30	1.16	22	39	48
	6	23	38	07.25	3	41	59.6	28.968 748	0.30	1.16	22	35	46
	7	23	38	01.59	-3	42	35.7	28.974 768	0.30	1.16	22	31	45
	8	23	37	55.97	3	43	11.5	28.981 070	0.30	1.16	22	27	43
	9	23	37	50.40	3	43	46.9	28.987 652	0.30	1.16	22	23	42
	10	23	37	44.88	3	44	22.0	28.994 511	0.30	1.16	22	19	41
	11	23	37	39.42	3	44	56.7	29.001 647	0.30	1.16	22	15	39
	12	23	37	34.01	3	45	30.9	29.009 056	0.30	1.15	22	11	38
	13	23	37	28.66	-3	46	04.7	29.016 738	0.30	1.15	22	07	37
	14	23	37	23.37	3	46	38.1	29.024 690	0.30	1.15	22	03	36
	15	23	37	18.14	3	47	11.0	29.032 911	0.30	1.15	21	59	35
	16	23	37	12.97	3	47	43.5	29.041 398	0.30	1.15	21	55	34
	17	23	37	07.87	3	48	15.5	29.050 149	0.30	1.15	21	51	33
	18	23	37	02.84	3	48	47.1	29.059 161	0.30	1.15	21	47	32
	19	23	36	57.87	-3	49	18.2	29.068 433	0.30	1.15	21	43	31
	20	23	36	52.97	3	49	48.8	29.077 962	0.30	1.15	21	39	31
	21	23	36	48.14	3	50	18.9	29.087 745	0.30	1.15	21	35	30
	22	23	36	43.38	3	50	48.5	29.097 780	0.30	1.15	21	31	29
	23	23	36	38.70	3	51	17.5	29.108 062	0.30	1.15	21	27	29
	24	23	36	34.10	3	51	46.1	29.118 591	0.30	1.15	21	23	28
	25	23	36	29.58	-3	52	14.0	29.129 361	0.30	1.15	21	19	28
	26	23	36	25.15	3	52	41.3	29.140 370	0.30	1.15	21	15	28
	27	23	36	20.80	3	53	08.1	29.151 615	0.30	1.15	21	11	28
	28	23	36	16.55	3	53	34.2	29.163 090	0.30	1.15	21	07	28
	29	23	36	12.39	3	53	59.6	29.174 793	0.30	1.15	21	03	28
	30	23	36	08.32	-3	54	24.5	29.186 720	0.30	1.15	20	59	28
	31	23	36	04.35	-3	54	48.7	29.198 866	0.30	1.15	20	55	28
Nov.	1	23	36	00.46	3	55	12.3	29.211 228	0.30	1.15	20	51	28
	2	23	35	56.67	3	55	35.2	29.223 800	0.30	1.15	20	47	29
	3	23	35	52.97	3	55	57.6	29.236 580	0.30	1.15	20	43	29
	4	23	35	49.37	3	56	19.2	29.249 562	0.30	1.15	20	39	30
	5	23	35	45.86	3	56	40.2	29.262 743	0.30	1.14	20	35	31
	6	23	35	42.46	-3	57	00.5	29.276 119	0.30	1.14	20	31	31
	7	23	35	39.16	3	57	20.2	29.289 686	0.30	1.14	20	27	32
	8	23	35	35.96	3	57	39.1	29.303 439	0.30	1.14	20	23	33
	9	23	35	32.87	3	57	57.2	29.317 375	0.30	1.14	20	19	34
	10	23	35	29.90	3	58	14.7	29.331 490	0.30	1.14	20	15	36
	11	23	35	27.03	3	58	31.4	29.345 780	0.30	1.14	20	11	37
	12	23	35	24.27	-3	58	47.4	29.360 240	0.30	1.14	20	07	38
	13	23	35	21.62	3	59	02.6	29.374 867	0.30	1.14	20	03	40
	14	23	35	19.09	3	59	17.1	29.389 655	0.30	1.14	19	59	41
	15	23	35	16.66	3	59	30.9	29.404 602	0.30	1.14	19	55	43
	16	23	35	14.35	-3	59	43.9	29.419 702	0.30	1.14	19	51	45

NEPTUNE, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	23	35	14.35	-3	59	43.9	29.419 702	0.30	1.14	19	51	45
	17	23	35	12.14	3	59	56.2	29.434 952	0.30	1.14	19	47	47
	18	23	35	10.06	4	00	07.7	29.450 345	0.30	1.14	19	43	49
	19	23	35	08.08	4	00	18.5	29.465 879	0.30	1.14	19	39	51
	20	23	35	06.23	4	00	28.5	29.481 547	0.30	1.14	19	35	54
	21	23	35	04.49	4	00	37.7	29.497 346	0.30	1.14	19	31	56
	22	23	35	02.88	-4	00	46.0	29.513 269	0.30	1.14	19	27	59
	23	23	35	01.39	4	00	53.6	29.529 313	0.30	1.13	19	24	02
	24	23	35	00.03	4	01	00.3	29.545 471	0.30	1.13	19	20	04
	25	23	34	58.79	4	01	06.2	29.561 739	0.30	1.13	19	16	07
	26	23	34	57.68	4	01	11.3	29.578 110	0.30	1.13	19	12	10
	27	23	34	56.70	4	01	15.6	29.594 580	0.30	1.13	19	08	14
	28	23	34	55.84	-4	01	19.0	29.611 142	0.30	1.13	19	04	17
	29	23	34	55.10	4	01	21.7	29.627 791	0.30	1.13	19	00	20
	30	23	34	54.48	4	01	23.6	29.644 522	0.30	1.13	18	56	24
Dec.	1	23	34	53.98	4	01	24.6	29.661 330	0.30	1.13	18	52	28
	2	23	34	53.61	4	01	24.9	29.678 208	0.30	1.13	18	48	32
	3	23	34	53.36	4	01	24.3	29.695 152	0.30	1.13	18	44	35
	4	23	34	53.25	-4	01	22.9	29.712 156	0.30	1.13	18	40	40
	5	23	34	53.26	4	01	20.7	29.729 217	0.30	1.13	18	36	44
	6	23	34	53.40	4	01	17.6	29.746 327	0.30	1.13	18	32	48
	7	23	34	53.67	4	01	13.6	29.763 484	0.30	1.13	18	28	53
	8	23	34	54.07	4	01	08.9	29.780 680	0.30	1.12	18	24	57
	9	23	34	54.60	4	01	03.3	29.797 912	0.30	1.12	18	21	02
	10	23	34	55.25	-4	00	56.9	29.815 175	0.29	1.12	18	17	07
	11	23	34	56.04	4	00	49.6	29.832 463	0.29	1.12	18	13	12
	12	23	34	56.95	4	00	41.6	29.849 772	0.29	1.12	18	09	17
	13	23	34	57.98	4	00	32.7	29.867 096	0.29	1.12	18	05	22
	14	23	34	59.14	4	00	23.1	29.884 431	0.29	1.12	18	01	27
	15	23	35	00.43	4	00	12.6	29.901 770	0.29	1.12	17	57	33
	16	23	35	01.84	-4	00	01.3	29.919 109	0.29	1.12	17	53	38
	17	23	35	03.38	3	59	49.3	29.936 444	0.29	1.12	17	49	44
	18	23	35	05.04	3	59	36.4	29.953 767	0.29	1.12	17	45	50
	19	23	35	06.84	3	59	22.6	29.971 075	0.29	1.12	17	41	56
	20	23	35	08.76	3	59	08.1	29.988 361	0.29	1.12	17	38	02
	21	23	35	10.81	3	58	52.7	30.005 620	0.29	1.12	17	34	08
	22	23	35	13.00	-3	58	36.5	30.022 847	0.29	1.12	17	30	14
	23	23	35	15.31	3	58	19.4	30.040 036	0.29	1.12	17	26	21
	24	23	35	17.76	3	58	01.5	30.057 181	0.29	1.11	17	22	28
	25	23	35	20.32	3	57	42.9	30.074 277	0.29	1.11	17	18	34
	26	23	35	23.01	3	57	23.5	30.091 317	0.29	1.11	17	14	41
	27	23	35	25.82	3	57	03.3	30.108 297	0.29	1.11	17	10	48
	28	23	35	28.74	-3	56	42.3	30.125 211	0.29	1.11	17	06	55
	29	23	35	31.79	3	56	20.6	30.142 054	0.29	1.11	17	03	02
	30	23	35	34.95	3	55	58.2	30.158 820	0.29	1.11	16	59	10
	31	23	35	38.24	3	55	35.0	30.175 505	0.29	1.11	16	55	17
	32	23	35	41.64	-3	55	11.0	30.192 105	0.29	1.11	16	51	25

PLUTO, 2022

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector
		° ' "	° ' "				° ' "	° ' "	
Jan.	1	296 22 48.1	-1 46 32.6	34.433 79	July	5	297 16 54.7	-2 02 57.6	34.557 06
	6	296 24 16.2	1 46 59.3	34.437 11		10	297 18 22.1	2 03 24.1	34.560 39
	11	296 25 44.2	1 47 26.1	34.440 44		15	297 19 49.5	2 03 50.6	34.563 73
	16	296 27 12.2	1 47 52.8	34.443 77		20	297 21 16.9	2 04 17.1	34.567 07
	21	296 28 40.2	1 48 19.5	34.447 10		25	297 22 44.2	2 04 43.5	34.570 41
	26	296 30 08.2	1 48 46.2	34.450 42		30	297 24 11.6	2 05 10.0	34.573 74
	31	296 31 36.2	-1 49 12.9	34.453 75	Aug.	4	297 25 38.9	-2 05 36.5	34.577 08
Feb.	5	296 33 04.1	1 49 39.6	34.457 08		9	297 27 06.2	2 06 03.0	34.580 42
	10	296 34 32.1	1 50 06.3	34.460 41		14	297 28 33.5	2 06 29.4	34.583 76
	15	296 35 60.0	1 50 33.0	34.463 74		19	297 30 00.8	2 06 55.9	34.587 10
	20	296 37 27.9	1 50 59.7	34.467 07		24	297 31 28.0	2 07 22.3	34.590 44
	25	296 38 55.8	1 51 26.3	34.470 40		29	297 32 55.3	2 07 48.7	34.593 78
Mar.	2	296 40 23.6	-1 51 53.0	34.473 72	Sept.	3	297 34 22.5	-2 08 15.2	34.597 12
	7	296 41 51.5	1 52 19.7	34.477 05		8	297 35 49.7	2 08 41.6	34.600 46
	12	296 43 19.3	1 52 46.3	34.480 39		13	297 37 16.9	2 09 08.0	34.603 80
	17	296 44 47.1	1 53 13.0	34.483 72		18	297 38 44.1	2 09 34.4	34.607 14
	22	296 46 14.9	1 53 39.6	34.487 05		23	297 40 11.2	2 10 00.8	34.610 48
	27	296 47 42.7	1 54 06.2	34.490 38		28	297 41 38.4	2 10 27.2	34.613 82
Apr.	1	296 49 10.5	-1 54 32.9	34.493 71	Oct.	3	297 43 05.5	-2 10 53.6	34.617 16
	6	296 50 38.2	1 54 59.5	34.497 04		8	297 44 32.6	2 11 20.0	34.620 51
	11	296 52 05.9	1 55 26.1	34.500 37		13	297 45 59.7	2 11 46.4	34.623 85
	16	296 53 33.6	1 55 52.7	34.503 71		18	297 47 26.7	2 12 12.7	34.627 19
	21	296 55 01.3	1 56 19.3	34.507 04		23	297 48 53.8	2 12 39.1	34.630 54
	26	296 56 29.0	1 56 45.9	34.510 37		28	297 50 20.8	2 13 05.4	34.633 88
May	1	296 57 56.7	-1 57 12.5	34.513 70	Nov.	2	297 51 47.8	-2 13 31.8	34.637 22
	6	296 59 24.3	1 57 39.1	34.517 04		7	297 53 14.8	2 13 58.1	34.640 57
	11	297 00 52.0	1 58 05.7	34.520 37		12	297 54 41.8	2 14 24.5	34.643 91
	16	297 02 19.6	1 58 32.2	34.523 71		17	297 56 08.7	2 14 50.8	34.647 26
	21	297 03 47.1	1 58 58.8	34.527 04		22	297 57 35.7	2 15 17.1	34.650 60
	26	297 05 14.7	1 59 25.4	34.530 37		27	297 59 02.6	2 15 43.5	34.653 95
	31	297 06 42.3	-1 59 51.9	34.533 71	Dec.	2	298 00 29.5	-2 16 09.8	34.657 29
June	5	297 08 09.8	2 00 18.4	34.537 04		7	298 01 56.4	2 16 36.1	34.660 64
	10	297 09 37.3	2 00 45.0	34.540 38		12	298 03 23.3	2 17 02.4	34.663 99
	15	297 11 04.8	2 01 11.5	34.543 71		17	298 04 50.1	2 17 28.7	34.667 33
	20	297 12 32.3	2 01 38.0	34.547 05		22	298 06 17.0	2 17 54.9	34.670 68
	25	297 13 59.8	2 02 04.6	34.550 38		27	298 07 43.8	2 18 21.2	34.674 03
	30	297 15 27.2	-2 02 31.1	34.553 72		32	298 09 10.6	-2 18 47.5	34.677 38
July	5	297 16 54.7	-2 02 57.6	34.557 06		37	298 10 37.4	-2 19 13.8	34.680 72

N.B: Pluto is now classified as a dwarf planet as per resolution of IAU

PLUTO, 2022

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	1	295	56	04.4	-1	43	40.6	July	5	297	42	40.7	-2	6	32.6
	6	296	05	47.7	1	44	03.2		10	297	35	42.6	2	7	04.0
	11	296	15	37.4	1	44	27.0		15	297	28	37.8	2	7	33.7
	16	296	25	31.6	1	44	52.3		20	297	21	27.8	2	8	01.8
	21	296	35	26.0	1	45	18.5		25	297	14	17.9	2	8	28.2
	26	296	45	17.0	1	45	46.1		30	297	07	11.9	2	8	53.0
	31	296	55	02.5	-1	46	15.1	Aug.	4	297	00	12.9	-2	9	16.0
Feb.	5	297	04	37.1	1	46	45.4		9	296	53	26.5	2	9	37.4
	10	297	13	57.9	1	47	17.0		14	296	46	55.6	2	9	57.2
	15	297	23	02.1	1	47	49.9		19	296	40	42.8	2	10	15.3
	20	297	31	45.5	1	48	24.0		24	296	34	53.0	2	10	31.9
	25	297	40	06.3	1	48	59.4		29	296	29	28.5	2	10	47.1
Mar.	2	297	48	01.4	-1	49	35.9	Sept.	3	296	24	32.9	-2	11	00.9
	7	297	55	26.6	1	50	13.5		8	296	20	10.0	2	11	13.4
	12	298	02	20.8	1	50	52.1		13	296	16	20.5	2	11	24.7
	17	298	08	41.0	1	51	31.7		18	296	13	07.8	2	11	35.0
	22	298	14	24.8	1	52	12.2		23	296	10	33.7	2	11	44.3
	27	298	19	32.0	1	52	53.5		28	296	08	39.4	2	11	52.9
Apr.	1	298	23	59.0	-1	53	35.6	Oct.	3	296	07	27.9	-2	12	00.8
	6	298	27	45.0	1	54	18.2		8	296	06	59.1	2	12	08.2
	11	298	30	49.3	1	55	01.3		13	296	07	13.1	2	12	15.1
	16	298	33	10.3	1	55	44.9		18	296	08	11.7	2	12	21.9
	21	298	34	48.8	1	56	28.7		23	296	09	53.6	2	12	28.5
	26	298	35	44.1	1	57	12.7		28	296	12	19.6	2	12	35.3
May	1	298	35	55.1	-1	57	56.7	Nov.	2	296	15	29.6	-2	12	42.2
	6	298	35	23.7	1	58	40.6		7	296	19	20.9	2	12	49.5
	11	298	34	09.8	1	59	24.2		12	296	23	53.6	2	12	57.2
	16	298	32	14.5	2	0	07.5		17	296	29	05.9	2	13	05.6
	21	298	29	40.6	2	0	50.3		22	296	34	55.4	2	13	14.7
	26	298	26	27.5	2	1	32.5		27	296	41	21.9	2	13	24.7
	31	298	22	38.3	-2	2	13.9	Dec.	2	296	48	21.5	-2	13	35.7
June	5	298	18	15.3	2	2	54.4		7	296	55	51.7	2	13	47.7
	10	298	13	20.3	2	3	33.9		12	297	03	50.6	2	14	00.9
	15	298	07	57.4	2	4	12.3		17	297	12	14.3	2	14	15.5
	20	298	02	08.9	2	4	49.4		22	297	21	00.8	2	14	31.4
	25	297	55	57.2	2	5	25.3		27	297	30	07.3	2	14	48.8
	30	297	49	26.9	-2	5	59.7		32	297	39	28.5	-2	15	07.6
July	5	297	42	40.7	-2	6	32.6		37	297	49	02.5	-2	15	28.0

N.B : Pluto is now classified as a dwarf planet as per resolution of I.A.U

PLUTO, 2022

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Red. To Astrom. (J 2000.0)	Apparent Declination			Red. To Astrom. (J 2000.0)	True Distance from the Earth	Hor. Parallax	Ephemeris Transit	
		h	m	s	s	°	'	"	"		"	h	m
Jan.	1	19	53	05.92	+76.10	-22	39	21.5	-197.57	35.380 370	0.25	13	09
	6	19	53	47.58	76.15	22	37	53.7	198.77	35.403 162	0.25	12	50
	11	19	54	29.71	76.14	22	36	25.1	199.92	35.418 685	0.25	12	31
	16	19	55	12.15	76.18	22	34	56.3	201.15	35.426 893	0.25	12	12
	21	19	55	54.61	76.21	22	33	28.0	202.48	35.427 782	0.25	11	53
	26	19	56	36.83	76.23	22	32	01.0	203.76	35.421 375	0.25	11	34
	31	19	57	18.67	+76.32	-22	30	35.7	-205.27	35.407 713	0.25	11	15
Feb.	5	19	57	59.75	76.37	22	29	13.5	206.38	35.386 902	0.25	10	56
	10	19	58	39.84	76.42	22	27	54.3	207.77	35.359 151	0.25	10	37
	15	19	59	18.78	76.52	22	26	39.2	209.12	35.324 733	0.25	10	18
	20	19	59	56.26	76.59	22	25	29.1	210.21	35.283 946	0.25	9	59
	25	20	00	32.13	76.68	22	24	23.9	211.64	35.237 095	0.25	9	40
Mar.	2	20	01	06.21	+76.81	-22	23	24.8	-212.82	35.184 515	0.25	9	21
	7	20	01	38.18	76.88	22	22	32.2	213.93	35.126 619	0.25	9	01
	12	20	02	07.98	77.01	22	21	46.5	215.27	35.063 897	0.25	8	42
	17	20	02	35.38	77.14	22	21	08.5	216.28	34.996 862	0.25	8	23
	22	20	03	00.23	77.24	22	20	38.3	217.35	34.926 023	0.25	8	04
	27	20	03	22.50	77.41	22	20	16.1	218.56	34.851 883	0.25	7	45
Apr.	1	20	03	41.95	+77.54	-22	20	02.9	-219.36	34.774 982	0.25	7	25
	6	20	03	58.51	77.67	22	19	58.3	220.41	34.695 927	0.25	7	06
	11	20	04	12.14	77.85	22	20	02.7	221.32	34.615 354	0.25	6	46
	16	20	04	22.73	77.99	22	20	16.4	221.94	34.533 880	0.25	6	27
	21	20	04	30.31	78.16	22	20	38.9	222.90	34.452 093	0.26	6	07
	26	20	04	34.87	78.35	22	21	10.6	223.46	34.370 566	0.26	5	48
May	1	20	04	36.29	+78.49	-22	21	51.3	-223.97	34.289 915	0.26	5	28
	6	20	04	34.73	78.69	22	22	40.5	224.62	34.210 784	0.26	5	08
	11	20	04	30.17	78.87	22	23	38.6	224.87	34.133 792	0.26	4	49
	16	20	04	22.67	79.02	22	24	44.5	225.18	34.059 513	0.26	4	29
	21	20	04	12.45	79.24	22	25	57.9	225.54	33.988 463	0.26	4	09
	26	20	03	59.46	79.40	22	27	18.8	225.44	33.921 160	0.26	3	49
	31	20	03	43.89	+79.57	-22	28	46.0	-225.60	33.858 143	0.26	3	29
June	5	20	03	25.92	79.77	22	30	19.4	225.52	33.799 928	0.26	3	09
	10	20	03	05.67	79.91	22	31	58.3	225.14	33.746 973	0.26	2	49
	15	20	02	43.42	80.09	22	33	41.3	225.08	33.699 659	0.26	2	29
	20	20	02	19.36	80.27	22	35	28.5	224.57	33.658 317	0.26	2	09
	25	20	01	53.60	80.39	22	37	18.7	224.09	33.623 283	0.26	1	49
	30	20	01	26.51	+80.55	-22	39	10.9	-223.66	33.594 880	0.26	1	29
July	5	20	00	58.26	80.68	22	41	04.9	222.86	33.573 366	0.26	1	09
	10	20	00	29.13	80.78	22	42	59.2	222.17	33.558 916	0.26	0	49
	15	19	59	59.49	80.94	22	44	53.1	221.52	33.551 625	0.26	0	29
	20	19	59	29.45	81.01	22	46	46.2	220.50	33.551 559	0.26	0	08
	25	19	58	59.37	81.10	22	48	37.0	219.77	33.558 782	0.26	23	44
	30	19	58	29.54	+81.19	-22	50	25.4	-218.82	33.573 306	0.26	23	24
Aug.	4	19	58	00.18	81.22	22	52	10.3	217.73	33.595 061	0.26	23	04
	9	19	57	31.66	81.28	22	53	50.7	216.99	33.623 889	0.26	22	44
	14	19	57	04.21	81.33	22	55	26.5	215.88	33.659 573	0.26	22	24
	19	19	56	38.01	+81.32	-22	56	56.7	-214.94	33.701 895	0.26	22	04

N.B: Pluto is now classified as a dwarf planet as per resolution of I A U

PLUTO, 2022
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Red. To Astrom. (J 2000.0)	Apparent Declination			Red. To Astrom. (J 2000.0)	True Distance from the Earth	Hor. Parallax	Ephemeris Transit	
		h	m	s	s	°	'	"	"		"	h	m
Aug.	19	19	56	38.01	+81.32	-22	56	56.7	-214.94	33.701 895	0.26	22	04
	24	19	56	13.42	81.35	22	58	20.7	214.14	33.750 614	0.26	21	44
	29	19	55	50.59	81.33	22	59	38.4	213.05	33.805 424	0.26	21	24
Sept.	3	19	55	29.79	81.29	23	00	48.8	212.27	33.865 936	0.26	21	04
	8	19	55	11.29	81.30	23	01	51.6	211.55	33.931 693	0.26	20	44
	13	19	54	55.14	81.23	23	02	46.8	210.65	34.002 227	0.26	20	24
	18	19	54	41.58	+81.18	-23	03	33.6	-210.17	34.077 082	0.26	20	04
	23	19	54	30.77	81.14	23	04	12.2	209.52	34.155 766	0.26	19	44
	28	19	54	22.76	81.03	23	04	42.5	208.92	34.237 728	0.26	19	24
Oct.	3	19	54	17.79	80.98	23	05	03.7	208.76	34.322 356	0.26	19	04
	8	19	54	15.84	80.91	23	05	16.6	208.29	34.409 019	0.26	18	45
	13	19	54	16.93	80.80	23	05	20.6	208.17	34.497 116	0.25	18	25
	18	19	54	21.19	+80.74	-23	05	16.0	-208.21	34.586 063	0.25	18	06
	23	19	54	28.53	80.64	23	05	03.2	208.05	34.675 243	0.25	17	46
	28	19	54	38.99	80.53	23	04	41.8	208.33	34.764 004	0.25	17	27
Nov.	2	19	54	52.60	80.49	23	04	12.3	208.63	34.851 669	0.25	17	07
	7	19	55	09.13	80.37	23	03	35.2	208.85	34.937 605	0.25	16	48
	12	19	55	28.61	80.30	23	02	50.2	209.53	35.021 235	0.25	16	28
	17	19	55	50.91	+80.24	-23	01	58.5	-210.01	35.101 993	0.25	16	09
	22	19	56	15.87	80.14	23	00	59.9	210.59	35.179 304	0.25	15	50
	27	19	56	43.44	80.10	22	59	54.7	211.59	35.252 584	0.25	15	31
Dec.	2	19	57	13.39	80.05	22	58	44.1	212.26	35.321 281	0.25	15	12
	7	19	57	45.50	79.98	22	57	27.9	213.28	35.384 932	0.25	14	52
	12	19	58	19.66	79.97	22	56	07.0	214.38	35.443 129	0.25	14	33
	17	19	58	55.59	+79.92	-22	54	42.3	-215.26	35.495 481	0.25	14	14
	22	19	59	33.13	79.88	22	53	13.6	216.54	35.541 608	0.25	13	55
	27	20	00	12.10	79.91	22	51	42.2	217.74	35.581 156	0.25	13	36
	32	20	00	52.13	79.88	22	50	08.7	218.85	35.613 853	0.25	13	17
	37	20	01	33.07	+79.89	-22	48	33.4	-220.30	35.639 525	0.25	12	58

N.B: Pluto is now classified as a dwarf planet as per resolution of I A U

MAJOR PLANETS, 2022

HELIOCENTRIC OSCULATING ORBITAL ELEMENTS

REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date		Julian Date 245	Inclina-tion i	Longitude Asc. Node Ω	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
					MERCURY				
			°	°	°		°		°
Nov'21	2	9520.5	7.0037	48.304	77.49080758	0.387 100	4.092 32	0.205 636	130.6990
Dec' 21	12	9560.5	7.0037	48.303	77.49098156	0.387 097	4.092 36	0.205 636	294.3948
Jan' 22	21	9600.5	7.0037	48.303	77.49115553	0.387 102	4.092 29	0.205 636	98.0855
Mar	2	9640.5	7.0037	48.303	77.4913295	0.387 095	4.092 40	0.205 636	261.7804
Apr	11	9680.5	7.0037	48.303	77.49150347	0.387 101	4.092 30	0.205 636	65.4743
May	21	9720.5	7.0037	48.303	77.49167745	0.387 096	4.092 39	0.205 636	229.1664
Jun	30	9760.5	7.0036	48.303	77.49185142	0.387 099	4.092 34	0.205 636	32.8629
Aug	9	9800.5	7.0036	48.303	77.49202539	0.387 099	4.092 33	0.205 636	196.5530
Sep	18	9840.5	7.0036	48.302	77.49219936	0.387 097	4.092 36	0.205 636	0.2492
Oct	28	9880.5	7.0036	48.302	77.49237333	0.387 101	4.092 29	0.205 636	163.9396
Dec	7	9920.5	7.0036	48.302	77.49254731	0.387 098	4.092 35	0.205 636	327.6343
Jan'23	16	9960.5	7.0036	48.302	77.49272128	0.387 101	4.092 31	0.205 636	131.3259
					VENUS				
Nov'21	2	9520.5	3.3945	76.619	131.5647014	0.723 346	1.602 09	0.006 761	359.7752
Dec' 21	12	9560.5	3.3945	76.619	131.5647061	0.723 342	1.602 10	0.006 761	63.8580
Jan' 22	21	9600.5	3.3945	76.619	131.5647107	0.723 334	1.602 13	0.006 761	127.9425
Mar	2	9640.5	3.3945	76.618	131.5647154	0.723 339	1.602 11	0.006 761	192.0271
Apr	11	9680.5	3.3945	76.618	131.5647201	0.723 340	1.602 10	0.006 761	256.1105
May	21	9720.5	3.3945	76.618	131.5647247	0.723 318	1.602 18	0.006 761	320.1948
Jun	30	9760.5	3.3945	76.617	131.5647294	0.723 305	1.602 22	0.006 761	24.2822
Aug	9	9800.5	3.3945	76.617	131.564734	0.723 321	1.602 17	0.006 761	88.3709
Sep	18	9840.5	3.3945	76.617	131.5647387	0.723 340	1.602 10	0.006 761	152.4569
Oct	28	9880.5	3.3945	76.616	131.5647433	0.723 350	1.602 07	0.006 761	216.5390
Dec	7	9920.5	3.3945	76.616	131.564748	0.723 341	1.602 10	0.006 761	280.6209
Jan'23	16	9960.5	3.3945	76.616	131.5647526	0.723 315	1.602 19	0.006 761	344.7063
					EARTH*				
Nov'21	2	9520.5	0.0029	174.821	103.0077896	1.000 016	0.985 59	0.016 699	41.1890
Dec' 21	12	9560.5	0.0029	174.820	103.008143	1.000 018	0.985 58	0.016 699	80.6123
Jan' 22	21	9600.5	0.0029	174.820	103.0084963	0.999 998	0.985 61	0.016 699	120.0361
Mar	2	9640.5	0.0029	174.820	103.0088496	0.999 971	0.985 65	0.016 699	159.4618
Apr	11	9680.5	0.0029	174.819	103.0092029	0.999 961	0.985 67	0.016 699	198.8887
May	21	9720.5	0.0029	174.819	103.0095563	0.999 976	0.985 65	0.016 699	238.3151
Jun	30	9760.5	0.0029	174.819	103.0099096	0.999 999	0.985 61	0.016 699	277.7401
Aug	9	9800.5	0.0030	174.819	103.0102629	1.000 018	0.985 58	0.016 699	317.1638
Sep	18	9840.5	0.0030	174.818	103.0106162	1.000 030	0.985 56	0.016 699	356.5868
Oct	28	9880.5	0.0030	174.818	103.0109696	1.000 039	0.985 55	0.016 699	36.0091
Dec	7	9920.5	0.0030	174.818	103.0113229	1.000 037	0.985 55	0.016 699	75.4309
Jan'23	16	9960.5	0.0030	174.818	103.0116762	1.000 013	0.985 59	0.016 699	114.8534

* Values labelled for the Earth are actually for the Earth/ Moon barycenter

FORMULAS

Mean anomaly, $M = L - \varpi$

Argument of perihelion, measured from node, $\omega = \varpi - \Omega$

True anomaly, $\nu = M + (2e - e^3/4)\sin M + (5e^2/4)\sin 2M + (13\, e^3/12)\sin 3M + \ldots$ in radians

True distance, $r = a\,(1 - e^2)/(1 + e\cos\nu)$

Heliocentric rectangular co- ordinates, referred to the ecliptic of date, may be computed from:

$x = r\{\cos(\nu + \omega)\cos\Omega - \sin(\nu + \omega)\cos i\,\sin\Omega\}$

$y = r\{\cos(\nu + \omega)\sin\Omega + \sin(\nu + \omega)\cos i\,\cos\Omega\}$

$z = r\sin(\nu + \omega)\sin i$

MAJOR PLANETS, 2022

HELIOCENTRIC OSCULATING ORBITAL ELEMENTS
REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date		Julian Date 245	Inclination i	Longitude Asc. Node Ω	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
			MARS						
			°	°	°		°		°
Nov'21	2	9520.5	1.8479	49.494	336.1571549	1.523 708	0.524 02	0.093 420	214.8734
Dec' 21	12	9560.5	1.8479	49.493	336.1576409	1.523 746	0.524 00	0.093 421	235.8323
Jan' 22	21	9600.5	1.8479	49.493	336.158127	1.523 761	0.524 00	0.093 421	256.7901
Mar	2	9640.5	1.8479	49.493	336.158613	1.523 749	0.524 00	0.093 421	277.7479
Apr	11	9680.5	1.8479	49.492	336.1590991	1.523 717	0.524 02	0.093 421	298.7065
May	21	9720.5	1.8479	49.492	336.1595851	1.523 678	0.524 04	0.093 421	319.6666
Jun	30	9760.5	1.8479	49.492	336.1600712	1.523 647	0.524 06	0.093 421	340.6282
Aug	9	9800.5	1.8479	49.491	336.1605572	1.523 636	0.524 06	0.093 421	1.5909
Sep	18	9840.5	1.8479	49.491	336.1610433	1.523 647	0.524 06	0.093 421	22.5540
Oct	28	9880.5	1.8479	49.491	336.1615293	1.523 675	0.524 04	0.093 421	43.5168
Dec	7	9920.5	1.8479	49.490	336.1620154	1.523 705	0.524 03	0.093 421	64.4787
Jan'23	16	9960.5	1.8478	49.490	336.1625014	1.523 722	0.524 02	0.093 421	85.4399
			JUPITER						
Nov'21	2	9520.5	1.3028	100.503	14.37830185	5.202 038	0.083 11	0.048 534	337.0844
Dec' 21	12	9560.5	1.3028	100.503	14.37853823	5.202 131	0.083 11	0.048 534	340.4090
Jan' 22	21	9600.5	1.3028	100.503	14.3787746	5.202 229	0.083 10	0.048 534	343.7335
Mar	2	9640.5	1.3028	100.504	14.37901098	5.202 332	0.083 10	0.048 534	347.0579
Apr	11	9680.5	1.3028	100.504	14.37924735	5.202 439	0.083 10	0.048 534	350.3820
May	21	9720.5	1.3028	100.504	14.37948373	5.202 550	0.083 10	0.048 534	353.7060
Jun	30	9760.5	1.3028	100.504	14.37972011	5.202 663	0.083 09	0.048 535	357.0298
Aug	9	9800.5	1.3028	100.504	14.37995649	5.202 779	0.083 09	0.048 535	0.3534
Sep	18	9840.5	1.3028	100.505	14.38019288	5.202 895	0.083 09	0.048 535	3.6768
Oct	28	9880.5	1.3028	100.505	14.38042926	5.203 013	0.083 09	0.048 535	7.0000
Dec	7	9920.5	1.3028	100.505	14.38066565	5.203 129	0.083 08	0.048 535	10.3230
Jan'23	16	9960.5	1.3028	100.505	14.38090204	5.203 245	0.083 08	0.048 536	13.6459
			SATURN						
Nov'21	2	9520.5	2.4894	113.609	93.18097115	9.536 603	0.033 47	0.055 472	316.9039
Dec' 21	12	9560.5	2.4894	113.609	93.18159184	9.536 482	0.033 47	0.055 472	318.2458
Jan' 22	21	9600.5	2.4894	113.609	93.18221254	9.536 356	0.033 47	0.055 472	319.5877
Mar	2	9640.5	2.4894	113.609	93.18283324	9.536 225	0.033 47	0.055 471	320.9296
Apr	11	9680.5	2.4894	113.608	93.18345394	9.536 089	0.033 47	0.055 471	322.2715
May	21	9720.5	2.4894	113.608	93.18407464	9.535 950	0.033 47	0.055 471	323.6134
Jun	30	9760.5	2.4895	113.608	93.18469534	9.535 808	0.033 48	0.055 470	324.9554
Aug	9	9800.5	2.4895	113.607	93.18531605	9.535 663	0.033 48	0.055 470	326.2973
Sep	18	9840.5	2.4895	113.607	93.18593675	9.535 515	0.033 48	0.055 469	327.6393
Oct	28	9880.5	2.4895	113.607	93.18655746	9.535 365	0.033 48	0.055 469	328.9813
Dec	7	9920.5	2.4895	113.607	93.18717816	9.535 215	0.033 48	0.055 469	330.3233
Jan'23	16	9960.5	2.4895	113.606	93.18779887	9.535 063	0.033 48	0.055 468	331.6653
			URANUS						
Nov'21	2	9520.5	0.7728	74.022	173.0247905	19.175 235	0.011 74	0.046 375	46.5985
Jan'22	21	9600.5	0.7728	74.022	173.024986	19.175 267	0.011 74	0.046 375	47.5375
Apr'22	11	9680.5	0.7728	74.022	173.0251816	19.175 283	0.011 74	0.046 375	48.4765
Jun	30	9760.5	0.7728	74.023	173.0253771	19.175 279	0.011 74	0.046 375	49.4155
Sep	18	9840.5	0.7728	74.023	173.0255727	19.175 250	0.011 74	0.046 375	50.3544
Dec'22	7	9920.5	0.7728	74.023	173.0257682	19.175 192	0.011 74	0.046 375	51.2933
Feb'23	25	10000.5	0.7728	74.023	173.0259637	19.175 103	0.011 74	0.046 375	52.2323
			NEPTUNE						
Nov'21	2	9520.5	1.77000	131.783	48.12665228	30.081 592	0.005 97	0.009 457	352.6899
Jan'22	21	9600.5	1.77000	131.783	48.12671628	30.081 984	0.005 97	0.009 457	353.1695
Apr'22	11	9680.5	1.77000	131.783	48.12678029	30.082 316	0.005 97	0.009 457	353.6491
Jun	30	9760.5	1.77000	131.783	48.12684429	30.082 586	0.005 97	0.009 457	354.1288
Sep	18	9840.5	1.77000	131.783	48.12690829	30.082 796	0.005 97	0.009 457	354.6084
Dec'22	7	9920.5	1.77000	131.783	48.12697229	30.082 946	0.005 97	0.009 457	355.0879
Feb'23	25	10000.5	1.77000	131.783	48.1270363	30.083 036	0.005 97	0.009 457	355.5675

Distances are in astronomical units.

CENTRE OF MASS OF THE SOLAR SYSTEM, 2022

HELIOCENTRIC RECTANGULAR CO-ORDINATES
EQUATORIAL RECTANGULAR CO-ORDINATES OF THE BARYCENTRES S_4
(SUN TO MARS) AND S_9 (SUN TO PLUTO) REFERRED TO THE MEAN
EQUINOX AND EQUATOR OF J 2000.0

Date		Barycentre S_4 (In units of 10^{-10} a.u)			Centre of Mass of the Solar System Barycentre S_9 (In units of 10^{-9} a.u)		
		x	y	z	X	Y	Z
Jan.	0	+85758997	-30061736	-14917170	+8576770	-3010118	-1493453
	10	86080264	29282528	14594725	8609876	2931992	1461153
	20	86391220	28503728	14272291	8641902	2853684	1428753
	30	86693573	27725222	13949959	8672930	2775196	1396261
Feb.	9	86988561	26945962	13627294	8703018	2696483	1363658
	19	87276621	26164838	13303769	8732185	2617498	1330921
Mar.	1	+87557797	-25380893	-12978930	+8760430	-2538201	-1298031
	11	87831882	24593247	12652343	8787739	2458556	1264969
	21	88098390	23801100	12323620	8814085	2378531	1231720
	31	88356530	23003858	11992432	8839426	2298104	1198270
Apr.	10	88605303	22201347	11658662	8863709	2217275	1164617
	20	88844070	21393828	11322460	8886900	2136065	1130772
	30	+89072728	-20581207	-10983820	+8908991	-2054478	-1096738
May	10	89290642	19762992	10642468	8929948	1972497	1062505
	20	89496716	18939125	10298278	8949715	1890128	1028070
	30	89689851	18109933	09951336	8968234	1807395	0993441
June	9	89869126	17276021	09601837	8985458	1724338	0958631
	19	90033736	16438129	09250088	9001345	1641001	0923659
	29	+90183020	-15597235	-08896507	+9015860	-1557442	-0888550
July	9	90316587	14754622	08541672	9028983	1473734	0853336
	19	90434870	13911709	08186332	9040734	1389956	0818058
	29	90538966	13069092	07830878	9051167	1306146	0782740
Aug.	8	90629455	12226878	07475336	9060310	1222319	0747386
	18	90706679	11385241	07119794	9068180	1138491	0712004
	28	+90770983	-10544390	-06764362	+9074793	-1054682	-0676604
Sept.	7	90822735	09704425	06409095	9080168	0970905	0641192
	17	90862197	08865367	06054004	9084317	0887170	0605772
	27	90889462	08027243	05699108	9087245	0803487	0570349
Oct.	7	90904605	07190341	05344563	9088956	0719879	0534934
	17	90908301	06354900	04990585	9089484	0636366	0499542
	27	+90901236	-05520373	-04636957	+9088864	-0552930	-0464166
Nov.	6	90883260	04686074	04283296	9087089	0469545	0428790
	16	90853829	03851670	03929368	9084132	0386203	0393406
	26	90812330	03017103	03575075	9079964	0302909	0358013
Dec.	6	90758117	02182560	03220420	9074554	0219682	0322615
	16	90690500	01348386	02865479	9067868	0136547	0287219
	26	+90608799	-00515268	-02510506	+9059874	-0053547	-0251842
	36	+90512674	+00315649	-02156001	+9050556	+0029252	-0216512

The heliocentric equatorial rectangular co-ordinates of the barycentre of the solar system referred to the mean equator and equinox of J 2022.5 are given by $\mathbf{r} = P\mathbf{r_0}$, where $\mathbf{r}$ and $\mathbf{r_0}$ are the column vectors of the co-ordinates X,Y, Z and X_0,Y_0, Z_0 referred to J 2022.5 and J 2000.0 respectively.

PART - II

STARS

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^{d}.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude	Annual Variation	Annual Proper Motion	Latitude	Annual Variation	Annual Proper Motion
				° ′ ″	″	″	° ′ ″	″	″
35	280	α Sculptoris	4.31	0 48 32.40	50.32	+0.025	-32 30 46.76	+0.030	-0.007
9	74	ι Ceti	3.56	1 13 50.70	50.27	-0.028	-10 01 17.61	+0.010	-0.028
82	674	φ Eridani	3.56	1 19 10.40	50.40	+0.110	-58 59 09.19	-0.040	-0.082
902	9072	ω Piscium	4.01	2 53 53.48	50.39	+0.095	+6 21 44.16	-0.130	-0.167
22	188	β Ceti	2.04	2 54 01.47	50.53	+0.242	-20 47 00.92	-0.030	-0.068
783	7957	η Cephei	3.43	4 59 52.87	52.65	+2.354	+71 46 57.27	+0.410	+0.369
156	1336	α Reticuli	3.35	7 50 06.50	50.57	+0.298	-78 02 23.81	+0.030	-0.015
869	8762	*o* Andromedae	3.62	8 05 28.65	50.32	+0.022	+43 45 02.75	+0.030	-0.017
848	8585	α Lacertae	3.77	8 27 18.42	50.50	+0.200	+53 17 26.80	-0.030	-0.070
7	39	γ Pegasi	2.83	9 28 11.13	50.30	+0.001	+12 36 01.91	+0.020	-0.011
40	334	η Ceti	3.45	12 05 00.82	50.45	+0.151	-16 07 08.03	-0.180	-0.213
803	8162	α Cephei	2.44	13 05 15.45	50.66	+0.340	+68 54 50.23	-0.060	-0.100
836	8465	ζ Cephei	3.35	14 16 21.01	50.34	+0.028	+61 08 52.92	+0.030	-0.008
1	15	α Andromedae*	2.06	14 37 18.84	50.35	+0.056	+25 40 48.36	-0.170	-0.207
47	402	θ Ceti	3.6	16 32 24.55	50.13	-0.163	-15 46 02.86	-0.130	-0.171
723	7310	δ Draconis	3.07	17 27 35.48	51.13	+0.757	+82 53 12.44	-0.060	-0.093
59	509	τ Ceti	3.5	18 07 32.25	48.93	-1.371	-24 48 20.16	+1.510	+1.463
890	8961	λ Andromedae	3.82v	18 35 52.88	50.18	-0.133	+43 46 27.31	-0.400	-0.441
1075	794	ι Eridani	4.11	19 05 24.94	50.45	+0.169	-51 42 49.84	-0.060	-0.095
71	585	ν Ceti	4	19 44 40.66	50.42	+0.134	-31 02 00.22	-0.040	-0.076
1033	361	ζ Piscium*	5.24	20 11 33.28	50.41	+0.112	-0 12 46.50	-0.070	-0.106
20	165	δ Andromedae	3.27	22 07 38.31	50.40	+0.092	24 21 03.96	-0.100	-0.141
62	539	ζ Ceti	3.73	22 15 55.92	50.31	+0.025	-20 20 01.00	-0.020	-0.051
106	897	θ Eridani p	3.25	23 35 23.19	50.23	-0.051	-53 44 19.13	+0.070	+0.038
101	841	β Fornacis	4.46	26 33 09.97	50.49	+0.212	-45 51 14.19	+0.140	+0.103
1154	2015	δ Doradus	4.35	26 50 03.94	49.43	-0.279	-88 15 07.70	+0.060	+0.030
50	437	η Piscium	3.62	27 07 48.74	50.32	+0.024	+5 22 44.49	+0.020	-0.015
33	269	μ Andromedae	3.87	29 29 21.76	50.48	+0.173	+29 39 36.36	0.000	-0.038
42	337	β Andromedae	2.06	30 43 09.33	50.44	+0.126	+25 56 37.95	-0.140	-0.178
863	8694	ι Cephei	3.52	33 32 55.91	50.03	-0.304	+62 37 03.66	+0.020	-0.017
66	553	β Arietis*	2.64	34 17 03.46	50.35	+0.051	+8 29 17.39	-0.100	-0.138
1085	919	τ^3 Eridani	4.09	34 50 58.17	50.08	-0.198	-38 54 15.19	+0.040	+0.001
17	153	ζ Cassiopeiae	3.66	35 22 39.23	50.33	+0.016	+44 43 17.40	+0.010	-0.018
2	21	β Cassiopeiae	2.27	35 25 52.45	50.79	+0.463	+51 12 49.79	-0.440	-0.472
809	8238	β Cephei	3.23	35 51 16.54	50.40	+0.028	+71 09 16.43	+0.020	-0.008
64	544	α Trianguli	3.41	37 10 26.78	50.23	-0.079	+16 48 03.64	-0.190	-0.223
91	779	δ Ceti	4.07	37 53 10.61	50.30	+0.013	-14 27 35.48	+0.020	-0.008
74	617	α Arietis	2	37 58 38.10	50.43	+0.130	+9 57 56.70	-0.170	-0.204
21	168	α Cassiopeiae	2.23	38 05 45.99	50.36	+0.036	+46 37 25.49	-0.030	-0.056
171	1465	α Doradus	3.27	38 09 07.47	50.36	+0.155	-74 34 48.30	0.000	-0.031
104	874	η Eridani	3.89	39 03 54.95	50.29	+0.008	-24 32 46.47	-0.200	-0.233

* **No. 1 : *Alpheratz,* Uttara Bhadrapada - 2** **No. 66 : *Sheratan,* Asvini**
No. 1033 : Revati

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^{d}.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
75	622	β Trianguli	3	42	40	01.29	50.44	+0.134	+20	34	55.90	-0.070	-0.091
79	664	γ Trianguli	4.01	43	49	55.17	50.34	+0.028	+18	56	59.97	-0.030	-0.064
32	264	γ Cassiopeiae	var.	44	14	36.64	50.35	+0.027	+48	49	00.86	+0.010	-0.019
73	603	γ Andromed. p	2.26	44	32	20.26	50.34	+0.024	+27	48	28.63	-0.040	-0.065
107	911	α Ceti	2.53	44	38	04.82	50.26	-0.032	-12	35	02.07	-0.040	-0.072
155	1326	α Horologii	3.86	46	08	28.07	50.17	-0.073	-61	43	47.98	-0.180	-0.211
48	403	δ Cassiopeiae	2.68	48	14	40.47	50.65	+0.323	+46	24	16.01	-0.180	-0.202
127	1084	ε Eridani	3.73	48	28	35.06	49.23	-1.054	-27	42	42.23	+0.310	+0.280
100	838	41 Arietis*	3.63	48	31	03.81	50.33	+0.029	+10	27	04.10	-0.100	-0.132
135	1136	δ Eridani	3.54	51	10	40.71	50.39	+0.113	-28	40	09.81	+0.770	+0.744
121	1030	*ο* Tauri	3.6	51	28	39.65	50.21	-0.084	-9	19	56.20	-0.040	-0.059
123	1038	ξ Tauri	3.74	52	13	36.82	50.34	+0.049	-8	47	47.69	-0.020	-0.052
212	1922	β Doradus	3.48v	52	27	16.00	50.00	+0.072	-85	02	30.54	+0.030	+0.007
149	1231	γ Eridani	2.95	54	10	58.83	50.32	+0.039	-33	12	01.77	-0.100	-0.123
63	542	ε Cassiopeiae	3.38	55	04	35.65	50.36	+0.024	+47	33	01.60	-0.010	-0.034
109	921	ρ Persei	var.	55	13	30.90	50.41	+0.099	+20	34	34.35	-0.110	-0.139
1129	1502	α Caeli	4.45	56	27	46.06	49.89	-0.346	-62	59	09.31	-0.010	-0.032
111	936	β Persei	var.	56	28	53.00	50.31	+0.003	+22	25	51.69	+0.020	-0.002
103	854	τ Persei	3.95	58	13	30.95	50.32	-0.003	+34	22	25.56	+0.010	-0.005
99	834	η Persei	3.76	59	00	55.07	50.33	+0.013	+37	29	03.43	0.000	-0.019
136	1142	17 Tauri	3.7	59	43	34.30	50.31	+0.009	+4	11	31.51	-0.030	-0.049
170	1464	ν^{2} Eridani	3.82	60	12	02.28	50.18	-0.076	-51	48	52.79	+0.020	-0.002
151	1251	ν Tauri	3.91	60	14	01.71	50.29	+0.005	-14	26	56.97	+0.010	-0.004
139	1165	η Tauri*	2.87	60	18	24.04	50.31	+0.008	+4	03	11.45	-0.030	-0.049
108	915	γ Persei	2.93	60	20	05.95	50.32	-0.002	+34	31	57.96	+0.020	-0.004
893	8974	γ Cephei	3.21	60	24	24.38	50.63	+0.268	+64	40	23.54	+0.130	+0.119
150	1239	λ Tauri	3.47v	60	56	56.26	50.29	-0.009	-7	57	26.28	+0.010	-0.011
120	1017	α Persei	1.79	62	23	41.10	50.34	+0.018	+30	07	40.49	-0.010	-0.030
144	1203	ζ Persei	2.85	63	26	16.78	50.30	+0.004	+11	20	09.73	+0.010	-0.011
134	1135	ν Persei	3.77	64	08	13.15	50.30	-0.015	+22	09	22.41	+0.020	+0.002
131	1122	δ Persei	3.01	65	06	57.72	50.34	+0.021	+27	18	15.04	-0.030	-0.040
148	1228	ξ Persei	4.04	65	17	11.52	50.31	+0.002	+14	56	47.26	+0.020	0.000
147	1220	ε Persei	2.89	65	59	30.74	50.32	+0.013	+19	07	01.33	-0.010	-0.029
159	1346	γ Tauri	3.65	66	07	15.14	50.40	+0.110	-5	43	47.62	-0.030	-0.044
162	1373	δ Tauri	3.76	67	11	08.63	50.40	+0.101	-3	58	01.68	-0.030	-0.046
164	1409	ε Tauri	3.54	68	46	48.08	50.40	+0.100	-2	33	53.32	-0.040	-0.054
168	1457	α Tauri*	0.85	70	06	13.68	50.32	+0.036	-5	27	57.08	-0.180	-0.197
1134	1543	π^{3} Orionis	3.19	72	14	32.05	50.77	+0.481	-15	22	54.25	-0.040	-0.046
186	1654	ε Leporis	3.19	72	22	14.40	50.28	+0.021	-44	57	44.47	-0.060	-0.076
179	1552	π^{4} Orionis	3.69	72	24	55.14	50.28	-0.001	-16	46	08.97	+0.020	+0.001
180	1567	π^{5} Orionis	3.72	72	48	19.13	50.29	0.000	-20	00	08.43	+0.010	0.000

* **No. 100 : Bharani** **No. 168 : *Aldebaran,* Rohini**

No. 139 : *Alcyone*, Krittika.

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^{d}.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
188	1666	β Eridani	2.79	75	35	22.88	50.16	-0.116	-27	51	33.97	-0.060	-0.071
1144	1702	μ Leporis	3.31v	75	42	33.30	50.32	+0.051	-39	02	50.95	-0.020	-0.030
695	6927	χ Draconis	3.57	76	12	24.62	45.13	+3.499	+83	34	18.07	+0.160	-0.501
181	1577	ι Aurigae	2.69	76	57	13.39	50.31	+0.001	+10	27	25.80	-0.010	-0.018
194	1713	β Orionis	0.12	77	08	38.88	50.27	0.000	-31	07	12.01	+0.010	-0.001
195	1735	τ Orionis	3.6	78	09	41.77	50.25	-0.018	-29	50	05.69	+0.010	-0.007
1137	1612	ζ Aurigae	3.75	78	56	51.60	50.31	+0.007	+18	12	17.82	-0.020	-0.023
183	1605	ε Aurigae	var.	79	09	20.26	50.31	-0.001	+20	56	49.72	0.000	-0.004
185	1641	η Aurigae	3.17	79	45	38.03	50.33	+0.024	+18	17	10.32	-0.060	-0.070
204	1829	β Leporis	2.84	79	59	12.68	50.24	-0.015	-43	54	44.30	-0.080	-0.088
201	1790	γ Orionis	1.64	81	15	38.74	50.28	-0.010	-16	48	48.10	0.000	-0.013
178	1542	α Camelopardi	4.29	81	17	37.59	50.34	+0.001	+43	25	18.31	+0.010	+0.006
182	1603	β Camelopardi	4.03	81	34	55.02	50.32	-0.010	+37	26	01.47	-0.010	-0.015
207	1865	α Leporis	2.58	81	41	41.95	50.26	+0.001	-41	03	17.96	0.000	+0.002
193	1708	α Aurigae	0.08	82	10	20.86	50.36	+0.046	+22	51	51.97	-0.430	-0.429
215	1956	α Columbae	2.64	82	29	01.84	50.24	+0.009	-57	22	21.33	-0.030	-0.027
206	1852	δ Orionis	2.23	82	42	39.07	50.28	+0.002	-22	57	10.18	0.000	-0.002
202	1791	β Tauri	1.65	82	53	21.57	50.31	+0.012	+5	23	12.42	-0.170	-0.176
209	1899	ι Orionis	2.77	83	18	42.73	50.27	0.000	-29	11	49.87	0.000	+0.001
210	1903	ε Orionis	1.7	83	46	40.76	50.27	+0.001	-24	30	12.99	+0.010	-0.002
(GC)	1879	λ Orionis*	3.56	84	01	16.19	50.28	-0.001	-13	21	59.93	0.000	-0.002
211	1910	ζ Tauri	3	85	05	56.21	50.30	0.000	-2	11	34.66	-0.020	-0.021
217	1983	γ Leporis	3.6	85	09	27.34	49.81	-0.440	-45	49	03.58	-0.360	-0.359
219	1998	ζ Leporis	3.55	86	18	01.76	50.24	-0.020	-38	12	46.89	0.000	0.000
220	2004	κ Orionis	2.06	86	42	46.47	50.27	+0.002	-33	04	04.38	0.000	-0.002
223	2040	β Columbae	3.12	86	44	04.33	50.37	+0.136	-59	10	27.39	+0.400	+0.400
222	2035	δ Leporis	3.81	87	28	59.82	50.56	+0.301	-44	17	54.10	-0.650	-0.653
907	424	α Ursae Mins.	2.02	88	52	57.18	50.42	+0.037	+66	06	14.49	-0.040	-0.036
224	2061	α Orionis*	var.	89	04	08.58	50.31	+0.027	-16	01	26.99	+0.010	+0.009
226	2085	η Leporis	3.71	89	12	49.86	50.22	-0.052	-37	35	59.70	+0.140	+0.140
229	2120	η Columbae	3.96	89	55	31.93	50.25	+0.055	-66	15	05.45	-0.010	-0.014
227	2088	β Aurigae	1.9	90	13	27.88	50.25	-0.062	+21	30	39.58	0.000	0.000
225	2077	δ Aurigae	3.72	90	14	04.96	50.41	+0.095	+30	50	50.91	-0.120	-0.125
1168	2219	κ Aurigae	4.35	93	40	43.04	50.24	-0.066	+6	06	17.21	-0.260	-0.264
241	2286	μ Geminorum	2.88	95	36	59.62	50.35	+0.059	-0	49	05.04	-0.120	-0.109
244	2298	8ε Monocerotis	4.44	96	34	08.08	50.26	-0.019	-18	42	52.91	0.000	+0.010
1173	2343	ν Geminorum	4.15	97	07	00.05	50.29	-0.007	-3	03	13.35	-0.020	-0.014
243	2294	β Canis Maj.	1.98	97	30	05.78	50.26	-0.008	-41	15	03.54	-0.010	0.000
240	2282	ζ Canis Maj.	3.02	97	41	28.27	50.26	+0.015	-53	22	11.81	0.000	+0.003
251	2421	γ Geminorum	1.93	99	25	09.16	50.33	+0.045	-6	44	24.13	-0.050	-0.039
254	2473	ε Geminorum	2.98	100	15	11.21	50.29	-0.005	+2	04	21.23	-0.020	-0.014

* **No. GC : *Mrgasiras*.** **No. 224 : *Betelgeuse*, Mag. 0.4 to 1.3 Ardra.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^d.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
261	2540	θ Geminorum	3.6	101	26	16.48	50.31	+0.003	+11	01	57.16	-0.050	-0.048
256	2484	ξ Geminorum	3.36	101	31	21.90	50.18	-0.101	-10	06	10.06	-0.210	-0.200
257	2491	α Canis Maj cg	-1.46	104	23	29.43	49.71	-0.552	-39	36	37.60	-1.270	-1.256
245	2326	α Carinae	-0.72	105	16	17.65	50.22	+0.075	-75	49	16.02	+0.010	+0.024
269	2650	ζ Geminorum	3.79v	105	18	15.99	50.28	-0.009	-2	02	10.41	-0.010	-0.002
252	2451	ν Puppis	3.17	107	27	35.64	50.21	+0.008	-66	04	17.96	-0.020	-0.006
279	2777	δ Geminorum	3.53	108	50	00.39	50.28	-0.024	-0	10	33.37	-0.020	-0.016
1180	2538	κ Canis Maj.	3.96	108	52	43.75	50.23	-0.013	-55	08	41.86	-0.010	+0.003
277	2763	λ Geminorum	3.58	109	05	33.96	50.25	-0.042	-5	37	58.53	-0.050	-0.043
282	2821	ι Geminorum	3.79	109	16	15.73	50.19	-0.109	+5	45	36.74	-0.120	-0.103
1187	2714	22 δ Monoceroti	4.15	109	42	30.34	50.28	-0.002	-21	44	32.70	-0.010	+0.005
287	2891	α Gemino. *Cg**	1.95	110	33	15.08	50.14	-0.156	+10	05	52.01	-0.140	-0.126
268	2618	ε Canis Maj.	1.5	111	04	32.47	50.25	+0.006	-51	21	27.57	-0.010	+0.003
270	2653	o^2 Canis Maj.	3.02	111	18	56.63	50.25	-0.007	-46	07	40.30	-0.020	+0.002
1183	2646	σ Canis Maj.	3.47	111	52	07.79	50.24	-0.009	-50	13	23.95	-0.010	+0.004
285	2845	β Canis Min.	2.9	112	30	19.53	50.24	-0.047	-13	29	06.06	-0.060	-0.046
317	3323	*o* Ursae Maj.	3.36	113	18	37.88	50.20	-0.121	+40	14	41.97	-0.160	-0.145
295	2990	β Geminorum	1.14	113	31	34.63	49.69	-0.614	+6	41	08.40	-0.180	-0.158
273	2693	δ Canis Maj.	1.86	113	42	31.57	50.25	-0.006	-48	27	02.58	-0.010	+0.004
294	2985	κ Geminorum	3.57	113	58	48.01	50.27	-0.024	+3	04	50.26	-0.070	-0.057
291	2943	α C. Min. *cg*	0.38	116	05	45.69	49.74	-0.541	-16	01	27.30	-1.150	-1.132
263	2553	τ Puppis	2.93	118	02	13.63	50.37	+0.188	-72	51	04.61	-0.070	-0.056
293	2970	26 α Monocerot	3.93	119	35	37.91	50.20	-0.078	-30	27	05.22	-0.050	-0.033
283	2827	η Canis Maj.	2.45	119	50	55.63	50.24	-0.008	-50	36	23.16	-0.020	+0.004
278	2773	π Puppis	2.7	120	36	44.02	50.22	-0.019	-58	31	21.63	-0.020	+0.002
335	3569	ι Ursae Maj.	3.14	123	06	45.55	49.91	-0.399	+29	34	30.43	-0.380	-0.358
341	3594	κ Ursae Maj.	3.6	124	15	07.00	50.30	-0.015	+28	58	52.71	-0.080	-0.062
312	3249	β Cancri	3.52	124	34	16.17	50.26	-0.032	-10	17	08.86	-0.090	-0.058
321	3366	η Cancri	5.33	125	43	18.73	50.26	-0.035	+1	34	23.31	-0.070	-0.054
1204	3045	ξ Puppis	3.34	126	21	14.88	50.26	-0.003	-44	56	14.57	-0.030	-0.003
368	3888	*ν* Ursae Maj.	3.8	126	34	55.85	50.07	-0.261	+42	39	09.98	-0.290	-0.269
328	3475	ι Cancri	4.02	126	39	38.52	50.29	-0.013	+10	25	41.92	-0.070	-0.047
358	3775	θ Ursae Maj.	3.17	127	34	28.54	49.50	-0.820	+34	53	33.70	-0.890	-0.862
1228	3449	γ Cancri	4.66	127	51	08.28	50.21	-0.092	+3	11	31.65	-0.090	-0.066
1194	2878	ρ Puppis	3.25	128	59	58.01	49.97	-0.262	-63	46	17.55	+0.130	+0.157
326	3461	δ Cancri*	3.94	129	02	11.72	50.34	+0.043	+0	04	39.95	-0.250	-0.225
1223	3410	δ Hydrae	4.16	130	37	04.32	50.23	-0.064	-12	23	26.72	-0.050	-0.024
433	4434	λ Draconis	3.84	130	39	03.86	50.32	-0.026	+57	14	34.49	-0.070	-0.040
1224	3418	σ Hydrae	4.44	131	31	24.70	50.28	-0.013	-14	36	00.26	-0.050	-0.022
308	3185	ρ Puppis	2.81	131	42	01.67	50.14	-0.128	-43	16	04.83	0.000	+0.023
352	3705	α Lyncis	3.13	132	09	21.86	50.08	-0.227	+17	57	56.13	-0.080	-0.054

* **No. 287 : *Castor*, Punarvasu-2, Mag. 1.95 & 2.95.** **No. 326 : Pusya.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY $2^d.625$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude °	′	″	Annual Variation ″	Annual Proper Motion ″	Latitude °	′	″	Annual Variation ″	Annual Proper Motion ″
1239	3627	ξ Cancri	5.14	133	31	30.95	50.29	0.000	+5	25	32.87	-0.020	+0.005
550	5563	β Ursae Min.	2.08	133	38	25.89	50.35	-0.044	+72	59	21.42	-0.060	-0.031
337	3572	α Cancri	4.25	133	57	21.77	50.33	+0.041	-5	04	43.31	-0.050	-0.020
334	3547	ζ Hydrae	3.11	134	53	20.31	50.18	-0.101	-10	58	04.38	-0.040	-0.014
417	4301	α Ursae Maj.	1.79	135	30	49.91	50.24	-0.087	+49	40	52.31	-0.150	-0.125
(329)	3482	ε Hydrae m*	3.38	136	24	01.90	50.06	-0.228	-23	26	07.42	-0.130	-0.1(
472	4787	κ Draconis	3.87v	136	34	27.86	50.25	-0.090	+61	45	49.35	-0.070	-0.042
306	3165	ζ Puppis	2.25	138	51	40.09	50.20	-0.057	-58	20	46.17	-0.030	0.000
416	4295	β Ursae Maj.	2.37	139	45	06.44	50.39	+0.071	+45	08	06.22	+0.040	+0.073
383	4033	λ Ursae Maj.	3.45	139	51	52.34	50.16	-0.155	+29	53	10.69	-0.140	-0.103
347	3665	θ Hydrae	3.88	140	36	13.26	50.52	+0.224	-13	03	07.90	-0.280	-0.255
367	3873	ε Leonis	2.98	141	01	09.66	50.26	-0.040	+9	43	00.35	-0.060	-0.026
386	4069	μ Ursae Maj.	3.05	141	32	59.76	50.20	-0.101	+28	59	58.61	-0.030	-0.003
371	3905	μ Leonis	3.88	141	44	37.38	50.11	-0.188	+12	20	58.51	-0.160	-0.127
569	5735	γ Ursae Min.	3.05	141	55	15.40	50.31	-0.080	+75	14	33.14	-0.050	-0.019
262	2550	α Pictoris	3.27	144	23	51.50	48.17	-1.937	-83	02	14.94	+0.120	+0.148
365	3852	ο Leonis	3.52	144	33	37.75	50.17	-0.122	-3	45	22.63	-0.110	-0.081
327	3468	α Pyxidis	3.68	146	48	42.65	50.25	-0.022	-48	55	17.51	-0.030	+0.006
354	3748	α Hydrae	1.98	147	35	32.60	50.26	-0.026	-22	22	51.51	0.000	+0.026
309	3207	γ^2 Velorum	1.78	147	39	31.43	50.23	-0.015	-64	27	46.38	-0.030	+0.004
384	4031	ζ Leonis	3.44	147	52	49.59	50.32	+0.020	+11	51	58.79	-0.030	0.000
1250	3845	ι Hydrae	3.91	147	57	21.52	50.36	+0.070	-14	16	34.57	-0.080	-0.044
379	3975	η Leonis	3.52	148	13	10.75	50.29	-0.001	+4	52	01.05	-0.040	-0.001
420	4335	ψ Ursae Maj.	3.01	149	07	43.85	50.26	-0.054	+35	32	19.02	-0.090	-0.055
380	3982	α Leonis*	1.35	150	08	31.35	50.06	-0.235	+0	27	55.81	-0.120	-0.082
447	4554	γ Ursae Maj.	2.44	150	47	40.92	50.42	+0.104	+47	08	35.05	+0.030	+0.065
303	3117	χ Carinae	3.47	151	02	07.93	50.14	-0.105	-70	19	31.85	-0.040	+0.001
456	4660	δ Ursae Maj.	3.31	151	22	59.38	50.44	+0.119	+51	39	29.85	+0.030	+0.074
364	3849	κ Hydrae	5.06	152	59	23.01	50.27	-0.020	-26	35	55.12	-0.070	-0.028
1243	3718	θ Pyxidis	4.72	153	22	17.06	50.27	-0.008	-39	02	00.53	-0.050	-0.012
441	4518	χ Ursae Maj.	3.71	153	58	32.45	50.14	-0.177	+41	32	40.60	-0.080	-0.048
396	4133	ρ Leonis	3.85	156	42	11.65	50.29	-0.005	+0	09	02.05	-0.040	-0.005
425	4377	ν Ursae Maj.	3.48	156	58	08.58	50.27	-0.040	+26	09	48.25	-0.020	+0.014
521	5291	α Draconis	3.65	157	46	33.53	50.22	-0.111	+66	21	45.67	-0.070	-0.037
1261	3970	ν^2 Hydrae	4.6	158	38	16.10	50.24	-0.045	-23	10	37.46	-0.040	+0.003
483	4905	ε Ursae Maj.	1.77	159	15	08.95	50.46	+0.150	+54	19	12.04	+0.030	+0.070
381	3994	λ Hydrae	3.61	159	40	45.11	50.12	-0.165	-22	00	51.21	-0.200	-0.159
1270	4116	δ Sextantis	5.21	160	25	12.65	50.25	-0.040	-11	20	42.81	-0.070	-0.031
345	3634	λ Velorum	2.21	161	29	51.98	50.24	-0.040	-55	52	12.56	-0.040	+0.001
422	4357	δ Leonis*	2.56	161	37	58.02	50.49	+0.188	+14	20	01.74	-0.100	-0.062
423	4359	θ Leonis	3.34	163	44	15.60	50.27	-0.025	+9	40	27.21	-0.130	-0.096

* **No. 329 : Aslesa.** **No. 422 : *Zosma*, Purva Phalguni-1.**
No. 380 : *Regulus*, Magha.

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY $2^{d}.625$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
1227	3447	ο Velorum	3.62	165	02	30.34	50.20	-0.073	-66	16	33.31	-0.030	+0.001
389	4094	μ Hydrae	3.81	165	20	56.32	50.20	-0.093	-24	40	18.53	-0.160	-0.125
497	5054	ζ Ursae Maj. pr	2.27	166	01	11.23	50.50	+0.188	+56	22	47.25	+0.020	+0.067
1304	4527	93 Leonis*	4.53v	169	17	19.10	50.16	-0.140	+17	18	33.14	-0.100	-0.065
410	4232	ν Hydrae	3.11	170	40	45.48	50.30	+0.004	-21	47	47.30	+0.180	+0.221
444	4534	β Leonis	2.14	171	55	47.58	49.88	-0.417	+12	15	54.35	-0.340	-0.306
392	4104	α Antliae	4.25	172	45	08.78	50.20	-0.089	-37	25	39.32	-0.060	-0.025
315	3307	ε Carinae	1.86	173	26	02.94	50.19	-0.093	-72	40	47.88	-0.050	-0.012
1283	4287	α Crateris	4.08	173	59	57.89	49.78	-0.512	-22	43	00.32	-0.110	-0.074
485	4915	α CVn sq	2.9	174	52	53.51	50.00	-0.302	+40	07	14.21	-0.110	-0.069
426	4382	δ Crateris	3.56	176	59	56.90	50.08	-0.206	-17	34	18.23	+0.100	+0.139
509	5191	η Ursae Maj.	1.86	177	15	01.45	50.14	-0.156	+54	23	14.58	-0.120	-0.083
445	4540	β Virginis	3.61	177	29	00.55	51.09	0.789	+0	41	39.81	+0.010	+0.047
353	3734	κ Velorum	2.5	179	12	02.23	50.27	-0.027	-63	43	18.96	-0.040	0.000
531	5404	θ Bootis	4.05	182	55	49.67	50.45	+0.148	+60	06	20.14	-0.490	-0.456
639	6396	ζ Draconis	3.17	183	43	24.19	49.98	-0.288	+84	45	39.70	-0.050	-0.013
361	3803	N Velorum	3.13	184	31	19.20	50.25	-0.056	-64	14	20.63	-0.060	-0.020
460	4689	η Virginis	3.89	184	37	01.69	50.24	-0.051	+2	35	19.79	-0.080	+0.429
492	4983	β Com	4.26	184	40	24.12	48.98	-1.319	+32	30	51.44	+0.390	-0.042
571	5744	ι Draconis	3.29	185	16	18.24	50.22	-0.059	+71	05	34.96	-0.040	+0.004
351	3699	ι Carinae	2.25	185	38	01.94	50.26	-0.048	-67	07	01.12	-0.050	-0.011
1326	4828	ρ Virginis	4.88	185	49	44.54	50.41	+0.116	+13	32	31.61	-0.090	-0.049
375	3940	φVelorum	3.54	186	15	22.00	50.29	-0.019	-59	57	03.86	-0.040	-0.005
434	4450	ξ Hydrae	3.54	188	17	58.38	50.11	-0.193	-31	36	00.08	-0.170	-0.131
488	4932	ε Virginis	2.83	190	15	13.38	50.02	-0.269	+16	12	13.13	-0.130	-0.090
457	4662	γ Corvi	2.59	191	02	17.67	50.14	-0.161	-14	30	07.12	-0.080	-0.045
484	4910	δ Virginis	3.38	191	46	23.04	49.88	-0.415	+8	36	40.09	-0.270	-0.232
453	4630	ε Corvi	3	191	58	41.84	50.23	-0.074	-19	40	28.11	-0.050	-0.018
475	4813	χ Virginis	4.66	192	28	04.47	50.24	-0.060	-3	28	09.61	-0.090	-0.052
465	4757	δ Corvi*	2.95	193	45	52.63	50.16	-0.140	-12	11	54.70	-0.250	-0.211
319	3347	β Volantis	3.77	195	28	46.80	50.89	+0.547	-75	35	12.19	-0.120	-0.082
471	4786	β Corvi	2.65	197	40	53.70	50.33	+0.026	-18	02	45.60	-0.090	-0.048
535	5435	γ Bootis	3.03	197	58	44.86	50.01	-0.268	+49	33	03.49	+0.040	+0.079
513	5235	η Bootis	2.68	199	39	10.37	50.38	+0.095	+28	04	25.33	-0.390	-0.354
281	2803	δ Volantis	3.98	199	43	08.18	50.36	-0.039	-82	28	42.18	-0.040	-0.006
501	5107	ζ Virginis	3.37	202	00	05.82	50.01	-0.284	+9	44	33.02	-0.100	-0.066
534	5429	ρ Bootis	3.58	203	06	04.88	50.09	-0.191	+42	27	03.05	+0.030	+0.066
498	5056	α Virginis*	0.98	204	09	19.64	50.27	-0.028	-2	03	21.97	-0.080	-0.041
526	5340	α Bootis*	-0.04	204	32	51.60	50.01	-0.285	+30	43	14.52	-2.300	-2.265
555	5602	β Bootis	3.5	204	34	04.97	50.23	-0.039	+54	08	57.61	-0.080	-0.044
495	5020	γ Hydrae	3	207	19	57.17	50.38	+0.079	-13	44	39.43	-0.050	-0.017

* **No. 1304 : Uttara Phalguni-2.** **No. 498 : *Spica*, Citra.**
No. 465 : *Algorel*, Hasta. **No. 526 : *Arcturus*, Svati.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^d.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude °	'	"	Annual Variation "	Annual Proper Motion "	Latitude °	'	"	Annual Variation "	Annual Proper Motion "
452	4621	δ Centauri	2.6	207	47	39.20	50.28	-0.033	-44	30	40.91	-0.060	-0.026
406	4199	θ Carinae	2.76	209	29	56.45	50.29	-0.046	-62	08	26.71	-0.050	-0.012
348	3685	β Carinae	1.68	212	16	23.78	49.90	-0.463	-72	14	18.86	-0.170	-0.133
496	5028	ι Centauri	2.75	213	26	24.76	50.00	-0.305	-26	01	09.71	-0.260	-0.219
563	5681	δ Bootis	3.47	213	28	32.04	50.46	+0.189	+48	57	48.13	-0.110	-0.069
525	5338	ι Virginis	4.08	214	06	46.31	50.43	+0.140	+7	11	42.74	-0.440	-0.409
523	5315	κ Virginis	4.19	214	48	28.65	50.26	-0.039	+2	54	43.22	+0.100	+0.135
436	4467	λ Centauri	3.13	214	51	17.31	50.28	-0.045	-56	47	28.67	-0.070	-0.033
455	4656	δ Crucis	2.8	215	58	34.30	50.28	-0.042	-50	25	17.71	-0.070	-0.033
468	4763	γ Crucis	1.63v	217	03	11.43	50.58	+0.257	-47	50	03.69	-0.230	-0.199
1371	5359	λ Virginis	4.52	217	15	58.95	50.27	-0.024	+0	29	20.07	-0.010	+0.023
385	4037	ω Carinae	3.32	217	44	55.19	50.30	-0.054	-67	23	04.28	-0.070	-0.033
519	5287	π Hydrae	3.27	218	56	18.08	50.39	0.092	-13	03	07.97	-0.140	-0.115
572	5747	β Cr. Borealis	3.68	219	25	53.12	49.99	-0.286	+46	03	08.00	-0.020	+0.018
1189	2736	γ^2 Volantis	3.78	220	09	11.16	49.67	-0.682	-82	37	08.47	-0.050	+0.065
545	5487	μ Virginis	3.88	220	26	49.73	50.50	0.203	+9	40	06.16	-0.300	-0.268
442	4520	λ Muscae	3.64	221	18	06.50	50.16	-0.181	-58	30	33.57	-0.090	-0.053
508	5193	μ Centauri	3.04v	221	50	57.83	50.30	-0.015	-28	58	53.33	-0.050	-0.028
481	4853	β Crucis	1.25	221	57	28.05	50.28	-0.046	-48	38	27.95	-0.070	-0.039
462	4730	α Crucis A	1.33	222	10	53.12	50.30	-0.031	-52	52	52.08	-0.060	-0.032
578	5793	α Cr.Borealis	2.23	222	36	47.75	50.47	+0.201	+44	19	16.32	-0.070	-0.044
520	5288	θ Centauri	2.06	222	37	12.52	49.99	-0.317	-22	05	10.45	-0.700	-0.672
608	6092	τ Herculis	3.89	224	42	08.71	50.16	-0.065	+65	49	40.68	+0.010	+0.032
512	5231	ζ Centauri	2.55	225	15	48.70	50.27	-0.040	-32	56	45.25	-0.090	-0.062
548	5531	α^2 Librae*	2.75	225	23	47.40	50.22	-0.082	+0	19	49.08	-0.120	-0.095
504	5132	ε Centauri	2.3	225	52	02.97	50.30	-0.023	-39	35	18.11	-0.050	-0.028
297	3024	ζ Volantis	3.95	226	03	51.15	50.30	-0.031	-79	23	22.40	-0.010	+0.034
391	4102	I Carinae	4	228	23	41.10	50.42	+0.052	-67	53	07.80	-0.050	-0.027
564	5685	β Librae	2.61	229	41	08.67	50.21	-0.089	+8	29	36.09	-0.070	-0.043
583	5867	β Serpentis	3.67	230	15	52.21	50.37	+0.093	+34	19	27.12	-0.050	-0.026
537	5440	η Centauri	2.31	230	33	44.44	50.28	-0.023	-25	30	56.31	-0.070	-0.044
474	4798	α Muscae	2.69	230	41	08.41	50.30	-0.044	-56	33	34.61	-0.060	-0.043
556	5603	σ Librae	3.29	231	00	03.64	50.24	-0.059	-7	38	49.92	-0.090	-0.062
559	5652	ι Librae	4.54	231	19	07.82	50.28	-0.024	-1	51	07.90	-0.080	-0.047
582	5854	α Serpentis	2.65	232	23	27.95	50.41	+0.134	+25	30	22.15	+0.050	+0.079
591	5933	γ Serpentis	3.85	233	06	05.20	51.03	+0.758	+35	11	09.86	-1.190	-1.164
541	5469	α Lupi	2.3	233	49	01.94	50.29	-0.016	-30	01	42.29	-0.040	-0.024
518	5267	β Centauri	0.61	234	06	18.00	50.30	-0.026	-44	08	24.88	-0.050	-0.032
469	4773	γ Muscae	3.87	234	19	46.90	50.28	-0.069	-58	52	24.04	-0.060	-0.045
588	5892	ε Serpentis	3.71	234	38	48.25	50.41	+0.121	+24	00	17.50	+0.070	+0.091
553	5576	κ Centauri	3.13	235	06	30.23	50.30	-0.011	-24	02	02.63	-0.050	-0.029

* **No. 548 : *Zuben el Genubi*, Visakha.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^{d}.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude °	'	"	Annual Variation "	Annual Proper Motion "	Latitude °	'	"	Annual Variation "	Annual Proper Motion "
552	5571	β Lupi	2.68	235	20	20.75	50.28	-0.023	-25	02	56.10	-0.070	-0.048
577	5787	γ Librae	3.91	235	27	10.29	50.35	+0.061	+4	23	00.97	0.000	+0.024
585	5881	μ Serpentis	3.54	236	15	12.05	50.21	-0.082	+16	14	07.66	-0.070	-0.042
487	4923	δ Muscae	3.62	236	30	16.21	50.71	+0.360	-56	46	37.33	+0.140	+0.163
566	5705	φ' Lupi	3.56	237	48	27.71	50.24	-0.067	-17	10	53.23	-0.120	-0.105
1413	5838	κ Librae	4.74	238	04	17.79	50.28	-0.013	-0	01	21.06	-0.130	-0.109
579	5794	ν Librae	3.58	238	55	24.68	50.29	-0.010	-8	30	35.93	-0.020	+0.001
1402	5695	δ Lupi	3.22	238	58	14.46	50.30	-0.008	-21	25	43.21	-0.050	-0.029
626	6220	η Herculis	3.53	239	06	17.73	50.35	+0.116	+60	17	12.80	-0.090	-0.070
609	6095	γ Herculis	3.75	239	31	45.69	50.20	-0.072	+40	00	19.48	+0.010	+0.032
538	5460	α Centauri cg	var.	239	45	40.37	45.43	-4.887	-42	36	14.90	-0.890	-0.860
401	4174	γ Chamaeleontis	4.11	240	43	56.85	50.34	-0.049	-68	05	13.24	-0.060	-0.040
558	5649	ζ Lupi	3.41	241	04	14.14	50.22	-0.099	-32	50	05.15	-0.130	-0.104
618	6148	β Herculis	2.77	241	24	21.14	50.14	-0.126	+42	41	58.53	-0.050	-0.034
613	6117	ω Herculis	4.57	241	53	27.27	50.33	+0.067	+35	09	55.67	-0.070	-0.050
603	6056	δ Ophiuchi	2.74	242	37	00.12	50.27	-0.018	+17	14	15.61	-0.170	-0.149
539	5463	α Circini	3.19	242	40	30.75	50.23	-0.104	-46	12	25.22	-0.310	-0.292
594	5953	δ Scorpii*	2.32	242	53	07.89	50.30	-0.001	-1	59	20.06	-0.060	-0.038
592	5944	π Scorpii	2.89	243	15	14.75	50.29	-0.006	-5	28	41.33	-0.050	-0.027
597	5984	β Scorpii pr	2.62	243	30	15.70	50.29	-0.002	+1	00	18.20	-0.030	-0.020
605	6075	ε Ophiuchi	3.24	243	49	30.67	50.37	+0.079	+16	26	14.69	+0.040	+0.055
459	4674	β Chamaeleontis	4.26	245	44	59.16	50.28	-0.083	-63	35	49.68	-0.050	-0.034
411	4234	δ^2 Chamaeleonti	4.45	245	58	04.95	50.36	-0.030	-67	47	37.17	-0.070	-0.048
607	6084	σ Scorpii	2.89	248	06	49.83	50.29	-0.007	-4	02	24.84	-0.040	-0.022
634	6324	ε Herculis	3.92	248	38	30.82	50.16	-0.085	+53	14	44.76	0.000	+0.019
622	6175	ζ Ophiuchi	2.56	249	32	37.51	50.30	+0.010	+11	23	19.60	+0.010	+0.028
560	5671	γ Tr. Austrini	2.89	249	42	23.02	50.25	-0.082	-48	06	21.48	-0.070	-0.056
616	6134	α Scorpii cg*	var.	250	04	35.22	50.29	-0.006	-4	34	22.08	-0.030	-0.022
620	6165	τ Scorpii	2.82	251	46	16.21	50.30	-0.005	-6	07	23.91	-0.040	-0.023
633	6299	κ Ophiuchi	3.2	252	08	02.75	49.93	-0.339	+31	49	59.28	-0.050	-0.046
589	5897	β Tr.Australis	2.85	252	09	15.60	50.24	-0.100	-41	57	04.93	-0.440	-0.435
653	6536	β Draconis	2.79	252	16	57.16	50.08	-0.072	+75	16	30.55	-0.010	+0.011
643	6418	π Herculis	3.16	252	22	57.10	50.18	-0.051	+59	32	52.99	-0.020	0.000
542	5470	α Apodis	3.83	254	44	35.88	50.36	-0.002	-58	14	16.06	-0.030	-0.019
641	6410	δ Herculis	3.14	255	04	42.10	50.25	-0.004	+47	40	54.69	-0.170	-0.158
628	6241	ε Scorpii	2.29	255	38	44.61	49.72	-0.588	-11	44	36.14	-0.340	-0.326
1439	6247	μ^1 Scorpii	3.08v	256	28	11.29	50.29	-0.008	-15	25	34.05	-0.030	-0.026
1435	6229	η Arae	3.76	259	13	07.33	50.37	+0.051	-36	16	45.73	-0.030	-0.023
631	6285	ζ Arae	3.13	260	08	16.79	50.30	-0.018	-33	05	40.88	-0.050	-0.038
663	6588	ι Herculis	3.8	260	12	14.66	50.18	-0.015	+69	15	45.92	0.000	+0.005
638	6380	η Scorpii	3.33	261	03	26.98	50.36	+0.052	-20	11	17.12	-0.290	-0.284

* **No. 594 : *Dschubba*, Anuradha** **No. 616 : *Antares*, Jyestha, Mag. 0.9 to 1.8.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^{d}.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude °	'	"	Annual Variation "	Annual Proper Motion "	Latitude °	'	"	Annual Variation "	Annual Proper Motion "
625	6217	α Tr. Austr.	1.92	261	12	36.51	50.37	+0.028	-46	09	15.79	-0.040	-0.031
644	6453	θ Ophiuchi	3.27	261	42	33.08	50.29	-0.002	-1	50	47.13	-0.030	-0.020
656	6556	α Ophiuchi	2.08	262	45	50.70	50.43	+0.163	+35	49	51.68	-0.230	-0.220
611	6102	γ Apodis	3.89	263	00	59.40	50.17	-0.191	-56	00	38.06	-0.110	-0.106
649	6508	ν Scorpii	2.69	264	19	37.31	50.30	0.000	-14	00	40.86	-0.030	-0.031
645	6461	β Arae	2.85	264	31	12.50	50.31	-0.008	-32	16	04.55	-0.030	-0.026
658	6561	ξ Serpentis	3.54	264	51	36.52	50.25	-0.040	+7	55	53.49	-0.070	-0.060
652	6527	λ Scorpii*	1.63	264	54	00.34	50.31	0.000	-13	47	29.20	-0.040	-0.029
671	6688	ξ Draconis	3.75	265	04	22.32	50.58	+0.525	+80	16	48.73	+0.080	+0.085
651	6510	α Arae	2.95	265	14	54.45	50.29	-0.031	-26	33	49.98	-0.070	-0.072
667	6623	μ Herculis	3.42	265	32	09.93	49.80	-0.452	+51	05	46.52	-0.770	-0.762
665	6603	β Ophiuchi	2.77	265	39	02.72	50.23	-0.051	+27	56	16.42	0.160	+0.158
648	6500	δ Arae	3.62	265	52	14.10	50.26	-0.067	-37	21	33.68	-0.110	-0.099
654	6553	θ Scorpii	1.87	265	54	50.15	50.32	+0.016	-19	38	52.62	-0.010	-0.001
660	6580	κ Scorpii	2.41	266	47	01.61	50.30	-0.005	-15	38	50.50	-0.030	-0.027
668	6629	γ Ophiuchi	3.75	266	56	48.11	50.26	-0.023	+26	06	28.47	-0.070	-0.074
666	6615	ι^1 Scorpii	3.03	267	50	12.83	50.31	0.000	-16	43	02.32	-0.010	-0.008
669	6630	*G* Scorpii	3.21	268	13	57.35	50.36	+0.049	-13	37	29.74	+0.040	+0.034
676	6705	γ Draconis	2.23	268	16	56.05	50.12	-0.028	+74	55	09.54	-0.020	-0.020
661	6582	η Pavonis	3.62	268	17	15.96	50.32	-0.017	-41	18	46.01	-0.050	-0.055
672	6695	θ Herculis	3.86	268	47	27.73	50.24	+0.009	+60	40	55.53	0.000	+0.006
674	6703	ξ Herculis	3.7	269	30	38.26	50.38	+0.139	+52	40	57.80	-0.020	-0.017
673	6698	ν Ophiuchi	3.34	270	04	02.77	50.28	-0.007	+13	39	42.88	-0.110	-0.116
1471	6743	θ Arae	3.66	271	30	15.91	50.30	-0.012	-26	39	43.18	-0.020	-0.014
679	6746	γ Sagittarii	2.99	271	34	31.70	50.24	-0.056	-6	59	42.37	-0.180	-0.185
680	6771	72 Ophiuchi	3.73	272	28	26.37	50.20	-0.070	+32	59	13.47	+0.080	+0.081
681	6779	*o* Herculis	3.83	273	00	37.31	50.24	+0.002	+52	10	53.08	+0.010	+0.009
682	6812	μ Sagittarii	3.86	273	31	40.22	50.30	+0.002	+2	20	21.50	+0.010	+0.001
683	6832	η Sagittarii	3.11	273	56	28.88	50.17	-0.137	-13	22	54.12	-0.160	-0.162
687	6859	δ Sagittarii*	2.7	274	53	43.88	50.33	+0.034	-6	28	30.86	-0.020	-0.029
691	6897	α Telescopii	3.51	275	23	16.79	50.30	-0.021	-22	39	03.45	-0.050	-0.053
689	6879	ε Sagittarii	1.85	275	23	33.81	50.26	-0.045	-11	03	19.32	-0.120	-0.122
688	6869	η Serpentis	3.26	275	59	22.02	49.67	-0.614	+20	25	42.61	-0.670	-0.677
692	6913	λ Sagittarii	2.81	276	37	52.09	50.24	-0.053	-2	08	22.32	-0.180	-0.183
697	6951	θ Coronae Aust.	4.64	276	51	31.50	50.34	+0.031	-19	03	58.41	-0.020	-0.024
1482	6973	α Scuti	3.85	279	19	49.68	50.25	-0.037	+14	54	55.75	-0.300	-0.310
214	1953	γ Mensae	5.19	279	52	56.60	50.36	1.083	-79	59	20.29	-0.290	+0.239
1487	7039	φ Sagittarii	3.17	280	29	45.86	50.35	+0.053	-3	57	24.30	+0.010	-0.004
1489	7063	β Scuti	4.22	282	41	38.78	50.28	-0.006	+18	10	59.57	0.000	-0.016
706	7121	σ Sagittarii*	2.02	282	41	59.12	50.30	+0.008	-3	27	09.20	-0.040	-0.055
710	7150	ξ^2 Sagittarii	3.51	283	45	56.26	50.32	+0.032	+1	39	30.51	0.000	-0.015

* **No. 652 : *Schaula*, Mula.** **No. 706 : *Nunki*, Uttarasadha.**

No. 687 : Purvasadha-1.

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY 2^d.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
1496	7234	τ Sagittarii	3.32	285	08	53.51	50.22	-0.083	-5	05	34.92	-0.230	-0.243
699	7001	α Lyrae	0.03	285	37	55.12	50.73	+0.505	+61	43	54.48	+0.270	+0.256
720	7264	π Sagittarii	2.89	286	33	57.96	50.29	-0.004	+1	26	03.19	-0.020	-0.035
717	7236	λ Aquilae	3.44	287	38	46.18	50.26	-0.029	+17	33	45.40	-0.070	-0.087
754	7665	δ Pavonis	3.56	287	56	08.82	51.49	+1.142	-44	42	39.64	-1.430	-1.445
712	7176	ε Aquilae	4.02	288	34	30.29	50.19	-0.075	+37	33	51.59	-0.050	-0.066
705	7106	β Lyrae	var.	289	11	46.99	50.24	+0.005	+55	58	53.64	+0.010	-0.003
810	8254	ν Octantis	3.76	290	00	13.08	50.15	-0.212	-57	46	59.80	-0.210	-0.217
716	7235	ζ Aquilae	2.99	290	06	33.60	50.25	-0.023	+36	10	57.18	-0.080	-0.094
713	7178	γ Lyrae	3.24	292	14	05.34	50.24	-0.003	+55	00	37.72	+0.020	+0.003
775	7913	β Pavonis	3.42	292	48	34.19	50.27	-0.055	-45	57	24.92	+0.040	+0.028
730	7377	δ Aquilae	3.36	293	57	11.79	50.57	+0.294	+24	48	53.43	+0.060	+0.040
764	7790	α Pavonis	1.94	294	07	57.51	50.30	-0.025	-36	16	14.32	-0.070	-0.087
751	7623	θ^1 Sagittarii	4.37	295	11	05.02	50.31	+0.001	-14	23	17.93	-0.010	-0.027
785	7986	β Indi	3.65	298	06	04.47	50.33	+0.008	-39	09	34.58	-0.010	-0.030
769	7869	α Indi	3.11	299	25	11.57	50.40	+0.078	-27	45	20.45	0.070	+0.048
1508	7405	α Vulpeculae	4.44	299	49	08.27	50.05	-0.209	+45	51	19.94	-0.060	-0.076
746	7570	η Aquilae	var.	300	44	50.97	50.29	+0.010	+21	31	15.34	+0.010	-0.009
741	7525	γ Aquilae	2.72	301	15	08.69	50.29	+0.020	+31	14	28.59	+0.010	-0.005
11	98	β Hydri	2.8	301	18	20.72	53.02	+2.666	-64	47	56.98	-1.920	-1.954
1513	7488	β Sagittae	4.37	301	31	08.52	50.28	+0.003	+38	12	56.38	-0.010	-0.033
732	7417	β Cygni *p*	3.08	301	33	50.99	50.26	+0.002	+48	57	55.48	+0.020	-0.002
745	7557	α Aquilae*	0.77	302	05	39.01	50.98	+0.697	+29	18	10.36	+0.280	+0.262
749	7602	β Aquilae	3.71	302	44	12.26	50.22	-0.064	+26	39	14.05	-0.460	-0.481
743	7536	δ Sagittae	3.82	303	42	00.73	50.27	+0.011	+38	54	38.39	+0.030	+0.006
761	7754	α^2 Capricorni	3.57	304	10	23.25	50.35	+0.063	+6	55	40.53	+0.010	-0.011
762	7776	β Capricorni	3.08	304	21	42.65	50.33	+0.042	+4	35	11.14	+0.020	-0.008
756	7710	θ Aquilae	3.23	305	37	34.64	50.33	+0.041	+20	19	29.74	+0.020	-0.005
752	7635	γ Sagittae	3.47	307	21	25.13	50.36	+0.090	+39	11	17.48	+0.030	+0.006
1550	8039	γ Microscopii	4.67	308	44	46.73	50.31	0.000	-14	40	02.30	+0.030	+0.006
841	8502	α Tucanae	2.86	309	59	13.09	50.21	-0.120	-45	24	20.78	+0.020	0.000
146	1208	γ Hydri	3.24	310	47	52.95	50.84	+0.537	-76	45	33.75	-0.050	-0.010
781	7950	ε Aquarii	3.77	312	02	14.70	50.31	+0.024	+8	04	42.12	-0.020	-0.042
1547	7990	μ Aquarii	4.73	313	22	20.45	50.32	+0.035	+8	14	16.30	-0.010	-0.041
768	7852	ε Delphini	4.03	314	22	27.32	50.28	+0.007	+29	04	16.23	+0.010	-0.024
726	7328	κ Cygni	3.77	315	13	39.40	50.59	+0.396	+73	48	03.48	+0.110	+0.080
829	8425	α Gruis	1.74	316	13	23.43	50.38	+0.064	-32	54	58.48	-0.160	-0.191
(771)	7882	β Delphini m*	3.64	316	39	17.05	50.35	+0.070	+31	54	56.79	-0.040	-0.069
806	8204	ζ Capricorni	3.74	317	15	05.68	50.30	+0.008	-6	59	33.13	+0.050	+0.022
774	7906	α Delphini	3.77	317	41	38.13	50.35	+0.074	+33	01	13.56	+0.010	-0.022
822	8353	γ Gruis	3.01	317	44	06.70	50.40	+0.095	-23	03	08.52	-0.030	-0.058

* **No. 745 : *Altair*, Sravana.** **No. 771 : *Rotanev*, Dhanistha-1.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2022.5

MEAN PLACES FOR JULY $2^{d}.625$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude °	'	"	Annual Variation "	Annual Proper Motion "	Latitude °	'	"	Annual Variation "	Annual Proper Motion "
733	7420	ι Cygni	3.79	318	16	39.81	50.47	+0.252	+71	27	00.14	+0.140	+0.104
778	7928	δ Delphini	4.43	318	25	44.27	50.24	-0.037	+31	56	30.20	-0.010	-0.035
1541	7948	γ Delphini sq	4.27	319	40	50.55	50.17	-0.109	+32	41	58.46	-0.140	-0.177
860	8675	ε Gruis	3.49	321	02	48.18	50.40	+0.077	-39	47	24.34	-0.090	-0.115
846	8556	δ^1 Gruis	3.97	321	55	06.36	50.34	+0.027	-31	20	56.68	+0.010	-0.017
812	8278	γ Capricorni	3.68	322	06	22.67	50.47	+0.172	-2	33	33.71	-0.060	-0.084
856	8636	β Gruis	2.11v	322	38	39.30	50.45	+0.145	-35	26	02.66	-0.040	-0.071
800	8131	α Equulei	3.92	323	25	51.20	50.32	+0.029	+20	07	11.04	-0.070	-0.102
808	8232	β Aquarii	2.91	323	42	33.01	50.31	+0.017	+8	36	48.42	+0.020	-0.015
819	8322	δ Capricorni	2.87	323	51	28.60	50.45	+0.149	-2	36	19.58	-0.340	-0.368
1569	8264	ξ Aquarii	4.69	324	25	59.69	50.39	+0.103	+5	57	21.09	-0.030	-0.062
765	7796	γ Cygni	2.2	325	09	07.67	50.27	+0.007	+57	07	22.87	+0.030	-0.001
780	7949	ε Cygni	2.46	328	03	41.13	50.98	+0.705	+49	25	19.02	+0.190	+0.155
815	8308	ε Pegasi	var.	332	11	54.24	50.32	+0.031	+22	05	55.30	+0.020	-0.011
849	8592	ν Aquarii	5.2	332	51	29.57	50.45	+0.154	-10	54	12.13	-0.180	-0.218
797	8115	ζ Cygni	3.2	333	21	11.06	50.25	-0.031	+43	41	36.14	-0.020	-0.051
827	8414	α Aquarii	2.96	333	53	53.79	50.31	+0.015	+11	15	29.81	+0.020	-0.016
867	8728	α PsA	1.16	334	10	37.97	50.56	+0.253	-21	08	18.36	-0.250	-0.287
777	7924	α Cygni	1.25	335	38	20.56	50.27	+0.007	+59	54	18.86	+0.040	+0.001
842	8518	γ Aquarii	3.84	337	01	43.60	50.42	+0.126	+8	14	02.49	0.000	-0.042
834	8450	θ Pegasi	3.53	337	08	54.15	50.56	+0.278	+16	20	21.37	-0.040	-0.077
861	8679	τ Aquarii	4.01	338	54	36.70	50.27	-0.026	-5	39	55.76	+0.010	-0.030
866	8709	δ Aquarii	3.27	339	11	16.48	50.25	-0.047	-8	11	31.78	+0.030	-0.008
3	25	ε Phoenicis	3.88	339	57	53.75	50.32	+0.011	-41	57	29.41	-0.180	-0.220
850	8597	η Aquarii	4.02	340	48	23.30	50.36	+0.064	+8	21	48.62	-0.050	-0.087
792	8079	ξ Cygni	3.72	341	06	35.28	50.29	+0.014	+56	34	52.81	+0.040	-0.003
864	8698	λ Aquarii*	3.74	341	53	26.13	50.32	+0.025	-0	23	13.47	+0.070	+0.030
72	591	α Hydri	2.86	342	26	26.62	50.74	+0.420	-64	14	38.31	-0.160	-0.194
831	8430	ι Pegasi	3.76	344	43	23.79	50.63	+0.339	+34	15	15.53	-0.060	-0.104
54	472	α Eridani	0.46	345	37	51.25	50.40	+0.084	-59	22	44.98	-0.060	-0.092
12	99	α Phoenicis	2.39	345	48	36.52	50.26	-0.042	-40	38	10.75	-0.400	-0.444
855	8634	ζ Pegasi	3.4	346	27	55.97	50.37	+0.072	+17	40	43.50	-0.010	-0.043
141	1175	β Reticuli	3.85	351	43	31.65	51.11	+0.796	-76	05	23.46	-0.220	-0.260
878	8852	γ Piscium	3.69	351	46	17.97	51.00	+0.713	+7	15	18.56	-0.240	-0.285
871	8781	α Pegasi	2.49	353	47	57.20	50.34	+0.043	+19	24	19.97	-0.020	-0.065
1044	440	δ Phoenicis	3.95	353	56	31.84	50.63	+0.337	-52	34	56.95	+0.080	+0.035
862	8684	μ Pegasi	3.48	354	41	58.21	50.42	+0.130	+29	23	10.40	-0.070	-0.102
857	8650	η Pegasi	2.94	356	01	32.27	50.30	+0.002	+35	06	28.97	+0.010	-0.029
68	566	χ Eridani	3.7	356	34	27.01	51.60	+1.308	-57	01	07.16	-0.170	-0.210
49	429	γ Phoenicis	3.41	358	27	35.14	50.11	-0.186	-47	35	09.33	-0.130	-0.167
870	8775	β Pegasi*	2.42v	359	41	18.74	50.56	+0.270	+31	08	27.55	+0.080	+0.037

* **No. 864 : Satabhisaj.** **No. 870 : *Scheat*, Purva Bhadrapada-2.**

BS = Bright Star Catalogue HR = Havard Revised Catalogue FK5 = Fifth Fundamental Catalogue

MEAN PLACES OF STARS, J 2022.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1	15	α Andromedae*	2.06	B9p Hg Mn	0	09	33.3	3.117	+104	+29	12	52.51	+19.86	-163
2	21	β Cassiopeiae*	2.27	F2 III	0	10	23.6	3.246	+685	+59	16	25.64	19.84	-181
3	25	ε Phoenicis	3.88	K0 III	0	10	32.8	3.024	+118	-45	37	24.34	19.84	-181
7	39	γ Pegasi*	2.83	B2 IV	0	14	23.8	3.099	+2	+15	18	30.66	19.99	-12
9	74	ι Ceti	3.56	K1 IIIb	0	20	34.4	3.056	-9	-8	41	57.72	19.92	-36
11	98	β Hydri	2.80	G1 IV	0	26	54.1	3.053	+6627	-77	07	40.14	20.23	+324
12	99	α Phoenicis	2.39	K0 III b	0	27	23.4	2.949	+183	-42	11	02.85	+19.50	-396
17	153	ζ Cassiopeiae	3.66	B2 IV	0	38	14.3	3.383	+22	+54	01	13.61	19.75	-9
20	165	δ Andromedae	3.27	K3 III	0	40	32.2	3.227	+106	+30	59	01.49	19.64	-92
21	168	α Cassiopeiae*	2.23	K0$^-$ IIIa	0	41	47.9	3.450	+64	+56	39	37.44	19.68	-32
22	188	β Ceti*	2.04	G9 III CH-1 CN 0.5 Ca 1	0	44	43.1	3.008	+164	-17	51	48.48	19.69	+32
33	269	μ Andromedae	3.87	A5 IV-V	0	58	00.6	3.356	+130	+38	37	15.22	19.44	+33
32	264	γ Cassiopeiae*	2.47	B0 IVnpe(shell)	0	58	05.1	3.679	+36	+60	50	16.95	+19.40	-5
35	280	α Sculptoris	4.31	B4 Vp	0	59	41.3	2.884	+17	-29	14	10.79	19.37	+4
40	334	η Ceti	3.45	K2$^-$III CN0.5	1	09	43.3	3.019	+147	-10	03	48.71	18.98	-138
42	337	β Andromedae*	2.06	M0$^-$IIIa	1	10	60.0	3.383	+146	+35	44	21.25	18.97	-114
1033	361	ζ Piscium*	5.24	F0Vn	1	14	54.6	3.143	+97	+7	41	37.35	18.92	-56
47	402	θ Ceti	3.60	K0 IIIb	1	25	08.9	3.001	-53	-8	04	04.62	18.46	-218
48	403	δ Cassiopeiae	2.68	A5 IV	1	27	18.5	3.988	+401	+60	21	04.97	+18.55	-52
49	429	γ Phoenicis	3.41	M0$^-$ IIIa	1	29	20.4	2.597	-13	-43	12	12.87	18.33	-208
1044	440	δ Phoenicis	3.95	G9 III	1	32	11.2	2.489	+144	-48	57	23.05	18.59	+151
50	437	η Piscium	3.62	G7 IIIa	1	32	41.5	3.223	+19	+15	27	39.72	18.42	-6
54	472	α Eridani*	0.46	B3Vnp(shell)	1	38	33.0	2.225	+117	-57	07	22.72	18.18	-35
52	464	51 Andromedae	3.57	K3$^-$ III	1	39	23.2	3.722	+65	+48	44	28.78	18.07	-113
59	509	τ Ceti	3.50	G8 V	1	45	06.8	2.789	-1190	-15	49	10.80	+18.83	+858
62	539	ζ Ceti	3.73	K0 III	1	52	34.3	2.964	+28	-10	13	28.93	17.63	-39
64	544	α Trianguli	3.41	F6 IV	1	54	22.3	3.441	+8	+29	41	15.09	17.36	-235
66	553	β Arietis*	2.64	A4 V	1	55	53.3	3.330	+68	+20	55	01.43	17.42	-111
63	542	ε Cassiopeiae	3.38	B3 IV:p(shell)	1	56	02.3	4.396	+48	+63	46	46.96	17.51	-21
68	566	χ Eridani	3.70	G8 III-IVCN-0.5Hδ0.5	1	56	49.9	2.329	+730	-51	29	51.40	17.78	+291
72	591	α Hydri	2.86	F0n III-IV	1	59	28.7	1.889	+368	-61	27	39.44	+17.41	+26
71	585	ν Ceti	4.00	M0 IIIb	2	01	03.9	2.827	+97	-20	58	10.74	17.29	-24
73	603	γ Andromed.* p	2.26	K3$^-$ Iib	2	05	17.4	3.714	+40	+42	26	11.76	17.07	-52
70	580	50 Cassiopeiae	3.98	A1 Va	2	05	24.2	5.274	-99	+72	31	43.31	17.14	+22
74	617	α Arietis*	2.00	K2 IIIab	2	08	26.8	3.399	+138	+23	34	03.94	16.83	-149
75	622	β Trianguli	3.00	A5 IV	2	10	53.4	3.595	+122	+35	05	33.43	16.82	-41
82	674	φ Eridani	3.56	B8 V	2	17	18.8	2.141	+102	-51	24	31.80	+16.52	-27
79	664	γ Trianguli	4.01	A0 IV-Vn	2	18	39.6	3.591	+38	+33	57	00.50	16.43	-51
91	779	δ Ceti	4.07	B2 IV	2	40	38.3	3.083	+9	+0	25	27.86	+15.31	-4

* **No. 1 : *Alpheratz,* Uttara Bhadrapada - 2**
No. 2 : *Caph*
No. 7 : *Algenib,* Uttara Bhadrapada - 1
No. 21 : *Schedar*. Mag. 2.1 to 2.6
No. 22 : *Deneb Kaitos or Diphda*
No. 32 : *Cih*. Mag. 1.6 to 3.2
No. 42 : *Mirach*
No. 1033 : Revati
No. 54 : *Achernar*
No. 66 : *Sheratan,* Asvini
No. 73 : *Almach,* Mag. f. 5.1
No. 74 : *Hamal*

MEAN PLACES OF STARS, J 2022.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1075	794	ι Eridani	4.11	K0.5 IIIb Fe-0.5	2	41	33.3	2.367	+119	-39	45	36.22	+15.23	-32
94	801	35 Arietis	4.66	B3 V	2	44	46.7	3.540	+6	+27	48	05.60	15.07	-12
101	841	β Fornacis	4.46	G8.5 III Fe-0.5	2	50	01.9	2.512	+71	-32	18	44.85	14.93	+155
100	838	41 Arietis*	3.63	B8 Vn	2	51	18.9	3.550	+50	+27	21	06.77	14.58	-118
99	834	η Persei	3.76	K3$^-$Ib-IIa	2	52	21.3	4.430	+20	+55	59	13.92	14.62	-14
103	854	τ Persei	3.95	G5 III + A4 V	2	55	52.1	4.300	+0	+52	51	10.49	14.42	-5
104	874	η Eridani	3.89	K1 IIIb	2	57	31.7	2.936	+53	-8	48	35.29	+14.10	-220
106	897	θ Eridani* p	3.25	A5 IV	2	59	06.9	2.276	-39	-40	12	55.84	14.25	+19
907	424	α Ursae Mins.*	2.02	F5-8 Ib	3	00	42.1	87.843	+2152	+89	21	28.35	14.11	-20
1085	919	τ^{3} Eridani	4.09	A4 V	3	03	23.1	2.647	-105	-23	32	14.37	13.91	-53
107	911	α Ceti*	2.53	M1.5 IIIa	3	03	27.5	3.145	-6	+4	10	36.03	13.88	-78
108	915	γ Persei	2.93	G5 III + A2 V	3	06	26.5	4.392	+0	+53	35	34.14	13.76	-5
109	921	ρ Persei*	3.39	M4 II	3	06	37.6	3.871	+111	+38	55	33.18	+13.65	-106
111	936	β Persei*	2.12	B8 V + F:	3	09	38.5	3.932	+3	+41	02	26.65	13.56	-1
120	1017	α Persei*	1.79	F5 Ib	3	25	56.5	4.321	+25	+49	56	21.84	12.46	-25
121	1030	ο Tauri	3.60	G6 IIIa Fe-1	3	26	01.6	3.239	-45	+9	06	23.73	12.40	-78
123	1038	ξ Tauri	3.74	B9 Vn	3	28	23.5	3.262	+40	+9	48	34.82	12.27	-39
127	1084	ε Eridani	3.73	K2 V	3	33	59.6	2.832	-658	-9	23	00.14	11.94	+23
135	1136	δ Eridani	3.54	K0 IV	3	44	19.7	2.880	-61	-9	41	18.98	+11.93	+745
131	1122	δ Persei	3.01	B5 III	3	44	32.2	4.304	+28	+47	51	27.14	11.13	-34
141	1175	β Reticuli	3.85	K2 III	3	44	29.3	0.774	+490	-64	44	11.77	11.25	+75
136	1142	17 Tauri	3.70	B6 III	3	46	13.0	3.577	+14	+24	10	56.61	11.00	-46
134	1135	ν Persei	3.77	F5 II	3	46	43.9	4.102	-13	+42	38	51.62	11.01	-2
146	1208	γ Hydri	3.24	M2 III	3	46	54.9	-0.853	+116	-74	10	10.58	11.11	+114
139	1165	η Tauri*	2.87	B7 IIIn	3	48	49.6	3.581	+14	+24	10	22.69	+10.81	-46
142	1178	27 Tauri	3.63	B8 III	3	50	30.3	3.582	+13	+24	07	13.76	10.68	-47
144	1203	ζ Persei	2.85	B1 Ib	3	55	33.1	3.789	+4	+31	56	54.99	10.35	-10
149	1231	γ Eridani	2.95	M0.5 IIIb Ca-1	3	59	04.8	2.804	+42	-13	26	45.29	9.98	-112
147	1220	ε Persei	2.89	B 0.5 IV	3	59	22.3	4.049	+16	+40	04	23.97	10.04	-26
148	1228	ξ Persei	4.04	O 7.5 IIIf	4	00	25.9	3.913	+2	+35	51	13.58	9.99	0
150	1239	λ Tauri	3.47v	B3 V	4	01	55.8	3.334	-4	+12	33	08.21	+9.86	-12
151	1251	ν Tauri	3.91	A1 Va	4	04	21.3	3.200	+3	+6	03	00.45	9.69	-3
152	1273	48 Persei	4.04	B3 Ve	4	10	18.2	4.384	+20	+47	46	13.53	9.20	-31
155	1326	α Horologii	3.86	K2 III	4	14	43.2	0.789	+65	-62	25	04.64	8.93	45
156	1336	α Reticuli	3.35	G8II-III	4	14	44.9	1.992	+41	-42	14	24.14	8.68	-209
159	1346	γ Tauri	3.65	G9.5 IIIab CN 0.5	4	21	04.6	3.424	+80	+15	40	48.65	8.36	-25
162	1373	δ Tauri	3.76	G9.5 III CN 0.5	4	24	14.1	3.470	+75	+17	35	36.47	+8.10	-30
1121	1393	43 Eridani	3.96	K3.5$^-$IIIb	4	24	53.0	2.257	+56	-33	57	57.03	8.13	50
164	1409	ε Tauri	3.54	G9.5 III CN 0.5	4	29	56.0	3.513	+76	+19	13	42.50	7.64	-38
171	1465	α Doradus	3.27	A0p Si	4	34	29.1	1.305	+60	-54	59	57.46	7.30	-4
170	1464	v^{2} Eridani	3.82	G8.5 IIIa	4	36	25.6	2.336	-35	-30	31	03.07	+7.14	-12

* **No. 907 : (Nb) : *Polaris*, Dhruva**
No. 100 : Bharani
No. 106 : Acamar.
No. 107 : *Menkar*
No. 109 : Mag. 3.3 to 4.0.
No. 111 : *Algol*, Mag. 2.1 to 3.4.
No. 120 : *Mirphak.*
No. 139 : *Alcyone*, Krittika.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^{d}.625$ TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
168	1457	α Tauri*	0.85	K5 III	4	37	12.9	3.451	+44	+16	33	09.68	+6.89	-190
172	1481	53 Eridani	3.87	K1.5IIIb	4	39	12.7	2.751	-52	-14	15	40.99	6.76	-155
1129	1502	α Caeli	4.45	F1 V	4	41	17.3	1.937	-126	-41	49	18.94	6.67	-77
1134	1543	π Orionis	3.19	F6 V	4	51	03.8	3.263	+313	+6	59	55.54	5.95	+11
179	1552	π Orionis	3.69	B2 III	4	52	24.4	3.202	-1	+5	38	30.53	5.83	+1
180	1567	π Orionis	3.72	B2 III	4	55	25.5	3.131	0	+2	28	32.83	5.57	0
178	1542	α Camelopardi	4.29	O9.5 Ia	4	56	18.2	6.013	-1	+66	22	39.62	+5.50	+6
181	1577	ι Aurigae	2.69	K3 II	4	58	27.8	3.919	+3	+33	11	58.55	5.30	-18
183	1605	ε Aurigae*	2.99V	A9 Ia	5	03	35.3	4.320	-1	+43	51	15.17	4.88	-4
1137	1612	ζ Aurigae	3.75	K5II + B5 V	5	04	03.3	4.207	+8	+41	06	22.96	4.82	-22
182	1603	β Camelopardi	4.03	G1 Ib-Iia	5	05	25.8	5.367	-9	+60	28	19.97	4.71	-16
186	1654	ε Leporis	3.19	K4 III	5	06	24.9	2.543	+18	-22	20	32.07	4.57	-74
185	1641	η Aurigae	3.17	B3 V	5	08	05.8	4.220	+26	+41	15	45.40	+4.43	-68
188	1666	β Eridani*	2.79	A3 IVn	5	08	57.4	2.954	-63	-5	03	32.38	4.35	-81
1144	1702	μ Leporis	3.31	B9p Hg Mn	5	13	56.6	2.698	+30	-16	10	49.56	3.97	-26
194	1713	β Orionis*	0.12	B8 Ia	5	15	37.2	2.887	+0	-8	10	38.19	3.86	-1
193	1708	α Aurigae*	0.08	6 III + G2 II	5	18	21.3	4.444	+72	+46	01	06.44	3.20	-425
195	1735	τ Orionis	3.60	B5 III	5	18	42.0	2.917	-10	-6	49	18.16	3.58	-8
1147	1765	22 Orionis	4.73	B2 IV-V	5	22	54.7	3.067	+0	-0	21	43.32	+3.23	-1
201	1790	γ Orionis*	1.64	B2 III	5	26	20.3	3.222	-6	+6	22	05.60	2.92	-14
202	1791	β Tauri*	1.65	B7 III	5	27	43.0	3.799	+17	+28	37	27.43	2.64	-175
204	1829	β Leporis	2.84	G5 II	5	29	12.6	2.574	-3	-20	44	34.74	2.60	-89
214	1953	γ Mensae	5.19	K2 III	5	31	00.2	-2.339	+321	-76	19	25.25	2.81	+282
206	1852	δ Orionis*	2.23	O9.5 II	5	33	09.4	3.069	+1	-0	17	03.11	2.34	-2
207	1865	α Leporis*	2.58	F0 Ib	5	33	43.4	2.649	+1	-17	48	27.66	+2.29	+2
212	1922	β Doradus	3.76v	F7-G2 Ib	5	33	49.4	0.528	+3	-62	28	31.69	2.29	+9
(GC)	1879	λ Orionis*	3.54	O8 IIIf	5	36	22.7	3.308	-1	+9	56	50.54	2.06	-2
209	1899	ι Orionis	2.77	O9 III	5	36	32.1	2.938	+0	-5	53	48.42	2.05	+1
210	1903	ε Orionis*	1.70	B0 Ia	5	37	21.4	3.048	+1	-1	11	21.47	1.97	-2
211	1910	ζ Tauri	3.00	B2 IIIpe (shell)	5	38	59.5	3.590	+0	+21	09	15.19	1.81	-21
215	1956	α Columbae*	2.64	B7 IV	5	40	27.9	2.176	+5	-34	03	48.41	+1.68	-26
1154	2015	δ Doradus	4.35	A7 V n	5	44	48.9	0.114	-49	-65	43	37.87	1.34	+8
217	1983	γ Leporis	3.60	F7 V	5	45	24.1	2.503	-212	-22	26	33.00	0.91	-369
219	1998	ζ Leporis	3.55	A2 Van	5	47	58.6	2.721	-11	-14	48	54.48	1.05	-1
220	2004	κ Orionis*	2.06	B0.5 Ia	5	48	49.5	2.848	+1	-9	39	47.77	0.97	-2
223	2040	β Columbae	3.12	K1.5 III	5	51	45.3	2.119	+49	-35	45	40.16	1.12	+401
222	2035	δ Leporis	3.81	K0 III Fe 1.5 CH 0.5	5	52	17.4	2.582	+161	-20	52	43.38	+0.02	-649
224	2061	α Orionis*	0.5	M1 M2 Ia Iab	5	56	23.4	3.251	+17	+7	24	33.85	+0.32	+9

No. 168 : *Aldebaran,* Rohini
* **No. 183 : Mag. 2.9 to 3.8.**
No. 188 : *C ursa* .
No. 194 : *Rigel.*
No. 193 : *Capella* , Brahmahridaya.
No. 201 : *Bellatrix.*
No. 202 : *El Nath* , Agni.
No. 206 : *Mintaka* .
No. 207 : *Arneb* .
No. GC : *Mrgasiras* .
No. 210 : *Alnilam.*
No. 215 : *Phakt* .
No. 220 : *Saiph* .
No. 224 : *Betelgeuse* , Mag. 0.4 to 1.3 Ardra.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^d.625$ TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
226	2085	η Leporis	3.71	F1 V	5	57	25.8	2.735	-28	-14	09	54.67	+0.36	+139
229	2120	η Columbae	3.96	G8/K1 II	5	59	50.2	1.839	+20	-42	48	54.15	0.00	-14
227	2088	β Aurigae*	1.90	A1 IV	6	01	10.8	4.404	-54	+44	56	50.09	-0.10	0
225	2077	δ Aurigae*	3.72	$K0^-$ III	6	01	22.8	4.943	+92	+54	17	01.23	0.25	-126
1163	2134	1 Geminorum	4.16	G5 III-IV	6	05	29.3	3.649	-6	+23	15	36.46	0.58	-100
1168	2219	κ Aurigae	4.35	G9 IIIb	6	16	48.7	3.823	-57	+29	29	15.41	1.73	-262
240	2282	ζ Canis Maj.	3.02	B2.5 V	6	21	10.7	2.306	+7	-30	04	28.96	-1.85	+3
243	2294	β Canis Maj.*	1.98	B1 II-III	6	23	41.5	2.644	-4	-17	58	06.92	2.07	0
241	2286	μ Geminorum	2.88	M3 IIIab	6	24	19.3	3.630	+39	+22	29	59.86	2.23	-111
245	2326	α Carinae*	-0.7	A9 II	6	24	27.1	1.333	+25	-52	42	31.57	2.11	+21
244	2298	8ε Monocerotis	4.44	A6 IV	6	24	57.6	3.181	-12	+4	34	46.64	2.17	+11
1173	2343	ν Geminorum	4.15	B6 III	6	30	17.9	3.562	-5	+20	11	45.10	2.66	-14
252	2451	ν Puppis	3.17	B8 IIIn	6	38	27.0	1.838	+2	-43	13	00.27	-3.35	-6
251	2421	γ Geminorum*	1.93	A1 IVs	6	39	00.7	3.465	+29	+16	22	41.36	3.44	-42
254	2473	ε Geminorum	2.98	G8 Ib	6	45	18.9	3.689	-4	+25	06	24.36	3.95	-13
257	2491	α Canis Maj* cg	-1.5	A0m A1 Va	6	46	08.3	2.643	-387	-16	44	54.31	5.21	-1204
256	2484	ξGeminorum	3.36	F5 IV	6	46	33.1	3.366	-79	+12	52	09.96	4.23	-191
262	2550	α Pictoris	3.27	A6 Vn	6	48	25.2	0.612	-96	-61	57	57.25	3.93	+269
263	2553	τ Puppis	2.93	K1 III	6	50	29.7	1.490	+38	-50	38	32.32	-4.45	-70
1180	2538	κ Canis Maj.	3.96	B1.5 Ive	6	50	40.9	2.243	-5	-32	32	08.61	4.39	+4
261	2540	θ Geminorum	3.60	A3 III-IV	6	54	16.2	3.949	-2	+33	55	54.99	4.75	-48
268	2618	ε Canis Maj.*	1.50	B2 II	6	59	30.6	2.360	+3	-29	00	14.38	5.14	+3
1183	2646	σ Canis Maj.	3.47	K7 IB	7	02	37.0	2.392	-4	-27	58	06.17	5.40	+5
270	2653	o^2 Canis Maj.	3.02	B3 Ia	7	03	57.9	2.507	-3	-23	52	03.23	5.52	+3
269	2650	ζ Geminorum*	3.79v	F9 Ib (var)	7	05	26.5	3.555	-6	+20	32	07.23	-5.65	0
1189	2736	γ^2 Volantis	3.78	G9 III	7	08	33.0	-0.532	+48	-70	32	07.01	5.80	+106
273	2693	δ Canis Maj.	1.86	F8 Ia	7	09	18.4	2.441	-2	-26	25	48.89	5.96	+4
1187	2714	22δ Monocerotis	4.15	A1 III'	7	13	00.8	3.064	-1	-0	31	54.04	6.27	+5
281	2803	δ Volantis	3.98	F9 Ib	7	16	48.8	-0.048	-12	-67	59	54.26	6.59	+5
278	2773	π Puppis	2.70	K3 Ib	7	17	56.3	2.121	-8	-37	08	20.66	6.68	+4
277	2763	λ Geminorum	3.58	A4 IV	7	19	23.1	3.444	-33	+16	29	52.59	-6.84	-36
279	2777	δ Geminorum	3.53	F0 V'	7	21	27.9	3.578	-19	+21	56	20.31	6.99	-12
283	2827	η Canis Maj.	2.45	B5 Ia	7	24	59.1	2.375	-3	-29	20	53.71	7.26	+5
282	2821	ι Geminorum	3.79	G9 IIIb	7	27	07.3	3.719	-93	+27	45	05.00	7.52	-86
285	2845	β Canis Min.*	2.90	B8 V	7	28	22.2	3.251	-35	+8	14	32.15	7.58	-38
1194	2878	ρ Puppis	3.25	K5 III	7	29	56.7	1.905	-50	-43	20	52.91	7.48	187
287	2891	α Gemino.* *cg*	1.95	Alm A2 Va	7	36	02.0	3.820	-135	+31	50	14.13	-8.25	-98
291	2943	α C. Min.* *cg*	0.38	F5 IV-V	7	40	28.7	3.137	-477	+5	09	56.68	9.53	-1021
297	3024	ζ Volantis	3.95	G9 III	7	41	31.8	-0.784	+67	-72	39	34.99	-8.57	+18

* **No. 225 : Prajapati.**
No. 227 : *Menkalinam* .
No. 243 : *Mirzam.*
No. 245 : *Canopus* , Agastya.
No. 251 : *Alhena* .

No. 257 : *Sirius* , Lubdhaka Mag. - 1.46.
No. 268 : *Adhara.*
No. 269 : Mekbuda Mag. 3.7 to 4.1.
No. 285 : *Gomeisa.*
No. 287 : *Castor,* Punarvasu-2, Mag. 1.95 & 2.
No. 291 : *Procyon* , Mag. 0.38 & 11.3.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^d.625$ TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
293	2970	26α Monocerotis	3.93	G9 III Fe-1	7	42	19.3	2.867	-49	-9	36	18.38	-8.67	-19
294	2985	κ Geminorum	3.57	G8 III	7	45	48.2	3.614	-24	+24	20	31.87	8.98	-52
295	2990	β Geminorum*	1.14	K0 IIIb	7	46	41.4	3.662	-474	+27	58	12.03	9.04	-45
1204	3045	ξ Puppis	3.34	G6 Iab-Ib	7	50	14.5	2.525	-2	-24	55	03.17	9.27	-2
301	3080	213 G. Puppis	3.73	K1/2 II + A	7	52	59.5	2.065	-8	-40	38	05.78	9.48	+3
303	3117	χ Carinae	3.47	B3p Si	7	57	21.0	1.524	-32	-53	02	36.41	9.80	+21
306	3165	ζ Puppis	2.25	O5 Iafn	8	04	22.5	2.111	-24	-40	04	03.59	-10.34	+12
308	3185	ρ Puppis	2.81	F5 (Ib-II)p	8	08	30.2	2.557	-61	-24	22	13.35	10.61	+49
309	3207	γ^2 Velorum	1.78	WC8 + O9I:	8	10	13.6	1.850	-4	-47	24	13.86	10.78	+6
312	3249	β Cancri	3.52	K 4 III Ba 0.5	8	17	44.1	3.249	-30	+9	06	52.80	11.38	-49
315	3307	ε Carinae	1.86	K3: III + B2: V	8	22	58.4	1.225	-35	-59	34	57.24	11.69	+14
319	3347	β Volantis	3.77	K2 III	8	25	58.5	0.633	-60	-66	12	44.51	12.07	-155
316	3314	Br 1197 Hydrae	3.90	A0 Va	8	26	47.1	2.996	-44	-3	58	52.25	-12.00	-23
317	3323	*o* Ursae Maj.	3.36	G5 III	8	32	06.9	4.928	-182	+60	38	26.66	12.45	-107
321	3366	η Cancri	5.33	K3 III	8	34	00.4	3.460	-34	+20	21	47.44	12.52	-43
1223	3410	δ Hydrae	4.16	A1 Ivnn	8	38	50.8	3.172	-44	+5	37	26.07	12.81	-7
1224	3418	σ Hydrae	4.44	K1 III	8	39	55.9	3.132	-12	+3	15	39.69	12.90	-18
1227	3447	*o* Velorum	3.62	B3 IV	8	40	56.3	1.719	-24	-53	00	09.45	12.93	+20
1226	3445	53 G. Velorum	3.84	F0 Ia	8	41	22.4	1.994	0	-46	43	46.87	-12.97	+3
327	3468	α Pyxidis	3.68	B1.5 III	8	44	29.9	2.414	-9	-33	16	06.69	13.17	+11
1228	3449	γ Cancri	4.66	A1 Va	8	44	35.1	3.462	-76	21	23	09.88	13.23	-39
326	3461	δ Cancri*	3.94	K0 IIIb	8	45	57.6	3.401	-13	+18	04	12.51	13.51	-228
(329)	3482	ε Hydrae* m	3.38	G5: III ' A:	8	47	57.9	3.170	-155	+6	20	05.99	13.45	-40
328	3475	ι Cancri	4.02	G8 II-III	8	48	03.2	3.616	-19	+28	40	33.90	13.46	-42
336	3571	108 G. Carinae	3.84	B7 II-III	8	55	33.3	1.355	-28	-60	43	52.14	-13.86	+38
334	3547	ζ Hydrae	3.11	G9 IIIa	8	56	34.9	3.167	-66	+5	51	30.97	13.94	+15
337	3572	α Cancri*	4.25	A5m	8	59	42.9	3.275	+23	+11	46	09.47	14.18	-31
335	3569	ι Ursae Maj.	3.14	A7 Ivn	9	00	44.2	4.075	-443	+47	57	06.18	14.44	-225
342	3614	97 G. Velorum	3.75	K2 III	9	04	55.9	2.073	-44	-47	11	17.42	14.49	-13
341	3594	κ Ursae Maj.	3.60	A0 IIIn	9	05	09.1	4.065	-32	+47	03	57.43	14.54	-54
345	3634	λ Velorum	2.21	K4.5 Ib	9	08	49.5	2.212	-17	-43	31	27.45	-14.69	+13
1239	3627	ξ Cancri	5.14	G9 IIIa Fe-0.5 CH-I	9	10	38.9	3.438	+1	+21	57	11.19	14.81	+5
348	3685	β Carinae	1.68	A1 III	9	13	26.2	0.630	-311	-69	48	36.37	14.87	+108
347	3665	θ Hydrae	3.88	B9.5 IV (C II)	9	15	32.0	3.118	+86	+2	13	05.28	15.41	-310
351	3699	ι Carinae	2.25	A7 Ib	9	17	41.5	1.605	-26	-59	22	12.99	15.21	+8
352	3705	α Lyncis	3.13	K7 IIIab	9	22	25.2	3.636	-179	+34	17	45.98	15.47	+19
1243	3718	θ Pyxidis	4.72	M0.5 III	9	22	29.4	2.660	-8	-26	03	43.81	-15.50	-8
353	3734	κ Velorum*	2.50	B2 IV-V	9	22	48.7	1.861	-10	-55	06	26.94	15.50	+9
354	3748	α Hydrae*	1.98	K3 II-III	9	28	41.6	2.948	-9	-8	45	25.93	15.80	+33
361	3803	N Velorum	3.13	K5 III	9	31	54.4	1.826	-39	-57	08	03.39	16.00	+4
355	3757	23 Ursae Maj.	3.67	F0 IV	9	33	16.7	4.655	+160	+62	57	42.70	16.05	+27
358	3775	θ Ursae Maj.	3.17	F6 IV	9	34	20.9	3.973	-1024	+51	34	24.41	-16.66	-530

* **No. 295 : *Pollux*, Punarvasu-1.**
No. 326 : Pusya.
No. 329 : Aslesa.

No. 337 : Acubens. (Aslesa.)
No. 353 : *Markeb*.
No. 354 : *Alphard*.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^d.625$ TERRESTRIAL TIME
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Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1250	3845	ι Hydrae	3.91	K2.5 III	9	41	00.3	3.062	+32	-1	14	45.70	-16.53	-64
364	3849	κ Hydrae	5.06	B5 V	9	41	23.1	2.878	-19	-14	26	07.19	16.51	-20
365	3852	ο Leonis	3.52	F5 II + A5?	9	42	21.0	3.196	-96	+9	47	20.11	16.57	-37
367	3873	ε Leonis	2.98	G1 II	9	47	07.5	3.393	-34	+23	40	10.40	16.78	-11
368	3888	ν Ursae Maj.	3.80	F0 IV	9	52	34.2	4.208	-379	+58	55	53.86	17.17	-151
371	3905	μ Leonis	3.88	K2 III CN I Ca I	9	54	02.3	3.398	-160	+25	53	59.79	17.15	-56
375	3940	φVelorum	3.54	B5 Ib	9	57	39.3	2.115	-12	-54	40	31.89	-17.25	+3
1261	3970	ν´ Hydrae	4.60	B8 V	10	06	13.3	2.924	-25	-13	10	28.45	17.60	+18
379	3975	η Leonis	3.52	A0 Ib	10	08	33.4	3.262	-1	+16	39	07.42	17.72	0
380	3982	α Leonis*	1.35	B7 Vn	10	09	34.1	3.188	-169	+11	51	22.98	17.75	+7
381	3994	λ Hydrae	3.61	K0 III CN 0.5	10	11	41.1	2.927	-138	-12	27	57.73	17.93	-88
385	4037	ω Carinae	3.32	B8 IIIn	10	14	16.2	1.420	-76	-70	08	59.98	17.94	+7
382	4023	191 G.Velorum	3.85	A2 Va	10	15	41.0	2.529	-131	-42	14	02.95	-17.96	+45
1264	4050	187 G. Carinae	3.40	K2.5 II	10	17	50.2	2.013	-34	-61	26	42.83	18.08	+5
384	4031	ζ Leonis	3.44	F0 III	10	17	56.3	3.325	+13	+23	18	15.66	18.09	-7
383	4033	λ Ursae Maj.	3.45	A1 IV	10	18	26.7	3.591	-149	+42	48	04.14	18.14	-38
1268	4080	204 G.Velorum	4.83	K1 III	10	23	17.7	2.585	-20	-41	45	49.96	18.23	+56
386	4069	μ Ursae Maj.	3.05	M0 III	10	23	39.7	3.549	-72	+41	23	07.88	18.26	+35
391	4102	I Carinae	4.00	F2 V	10	24	50.1	1.172	-52	-74	08	46.84	-18.36	-26
389	4094	μ Hydrae	3.81	K4' III	10	27	10.8	2.906	-89	-16	57	06.69	18.50	-80
392	4104	α Antliae	4.25	K4.5 III	10	28	11.1	2.754	-58	-31	10	58.71	18.44	+11
393	4114	196 G. Carinae	3.82	F0 Ib	10	28	42.5	2.216	-17	-58	51	17.43	18.47	0
1270	4116	δ Sextantis	5.21	B9.5 V	10	30	37.3	3.047	-32	-2	51	17.81	18.55	-14
397	4140	203 G. Carinae	3.32	B4 Vne	10	32	49.7	2.148 "Type equation here."	-27	-61	48	05.55	18.60	+9
396	4133	ρ Leonis	3.85	B1 Iab	10	33	59.7	3.154	-4	+9	11	24.46	-18.65	-3
401	4174	γ Chamaeleontis	4.11	M0 III	10	35	42.9	0.652	-143	-78	43	28.36	18.69	+14
406	4199	θ Carinae	2.76	B0.5 Vp	10	43	45.8	2.157	-35	-64	30	45.82	18.93	+10
411	4234	δ´ Chamaeleontis	4.45	B2.5 IV	10	45	57.8	0.477	-201	-80	39	32.04	19.00	+8
410	4232	ν Hydrae	3.11	K1.5 IIIb Hδ-0.5	10	50	44.2	2.966	+66	-16	18	42.94	18.93	+200
412	4247	46 Leonis Min.	3.83	K0' III-IV	10	54	33.8	3.337	+70	+34	05	34.93	19.51	-279
1283	4287	α Crateris	4.08	K0' III	11	00	52.4	2.930	-323	-18	25	08.47	-19.25	+130
416	4295	β Ursae Maj.*	2.37	A1 IV-V	11	03	11.1	3.576	+99	+56	15	40.58	19.39	+34
417	4301	α Ursae Maj.*	1.80	K0^{-} IIIa	11	05	05.9	3.646	-167	+61	37	43.98	19.54	-66
1289	4337	260 G. Carinae	3.91	G4 0-Ia	11	09	33.5	2.587	-9	-59	05	50.11	19.56	0
420	4335	ψ Ursae Maj.	3.01	K1 III	11	10	55.2	3.347	-60	+44	22	33.59	19.61	-28
422	4357	δ Leonis*	2.56	A4 IV	11	15	18.1	3.182	+101	+20	24	00.21	19.79	-130
423	4359	θ Leonis*	3.34	A2 IV (Kvar)	11	15	25.1	3.142	-42	+15	18	22.37	-19.74	-79
425	4377	ν Ursae Maj.	3.48	K3^{-} III	11	19	41.4	3.225	-20	+32	58	16.30	19.70	+28
426	4382	δ Crateris	3.56	G9 IIIb CH 0.2	11	20	28.1	3.006	-84	-14	54	02.22	19.54	+208
433	4434	λ Draconis	3.84	M0 III Ca-1	11	32	42.9	3.486	-73	+69	12	23.88	19.92	-17
434	4450	ξ Hydrae	3.54	G7 III	11	34	06.8	2.965	-162	-31	58	56.35	19.95	-39
436	4467	λ Centauri	3.13	B9.5 Iin	11	36	49.8	2.803	-61	-63	08	39.97	-19.94	-5

* **No. 380 : *Regulus*, Magha.**
No. 416 : *Merak*, Pulaha.
No. 417 : *Dubhe*, Kratu.
No. 422 : *Zosma*, Purva Phalguni-1.
No. 423 : Purva Phalguni-2.

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					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
442	4520	λ Muscae	3.64	A7 IV	11	46	41.0	2.876	-174	-66	51	12.76	-19.97	+37
441	4518	χ Ursae Maj.	3.71	K0.5 IIIb	11	47	13.8	3.143	-136	+47	39	16.38	19.98	+30
1304	4527	93 Leonis*	4.53v	G4 III-IV + A7 V	11	49	08.6	3.088	-106	+20	05	37.66	20.02	-3
444	4534	β Leonis*	2.14	A3 Va	11	50	12.4	3.056	-342	+14	26	46.30	20.14	-114
445	4540	β Virginis	3.61	F9 V	11	51	52.1	3.126	+495	+1	38	16.14	20.30	-271
447	4554	γ Ursae Maj.*	2.44	A0 Van	11	55	00.3	3.126	+107	+53	34	10.58	20.02	+12
452	4621	δ Centauri	2.60	B2 IVne	12	09	32.1	3.140	-36	-50	50	51.53	-20.03	-8
453	4630	ε Corvi	3.00	K2.5 IIIa	12	11	17.1	3.098	-51	-22	44	41.30	20.00	+13
455	4656	δ Crucis	2.80	B2 IV	12	16	21.2	3.228	-53	-58	52	26.16	20.00	-9
456	4660	δ Ursae Maj.*	3.31	A2 Van	12	16	31.8	2.940	+127	56	54	27.78	19.98	9
457	4662	γ Corvi*	2.59	B8p Hg Mn	12	16	58.0	3.096	-112	-17	40	00.24	19.96	+23
459	4674	β Chamaeleontis	4.26	B5 Vn	12	19	42.8	3.673	-174	-79	26	12.93	19.95	+17
460	4689	η Virginis	3.89	AI IV'	12	21	03.5	3.073	-42	-0	47	30.07	-19.97	-18
462	4730	α Crucis*A	1.33	B0.5 IV	12	27	52.0	3.391	-53	-63	13	24.62	19.91	-12
465	4757	δ Corvi*	2.95	B9.5 IV-n	12	31	01.9	3.115	-146	-16	38	25.65	20.00	-138
468	4763	γ Crucis	1.63v	M3.5 III	12	32	25.6	3.371	+29	-57	14	20.02	20.10	-262
469	4773	γ Muscae	3.87	B5 V	12	33	50.4	3.677	-126	-72	15	24.93	19.83	-2
472	4787	κ Draconis	3.87v	B6 IIIpe	12	34	25.9	2.525	-112	+69	39	51.88	19.80	12
471	4786	β Corvi	2.65	G5 IIb	12	35	34.4	3.165	+2	-23	31	15.23	-19.85	-54
474	4798	α Muscae	2.69	B2 IV-V	12	38	33.0	3.657	-90	-69	15	33.05	19.77	-13
475	4813	χ Virginis	4.66	K2 III CN 1.5	12	40	24.6	3.104	-51	-8	07	08.94	19.76	-25
1326	4828	ρ Virginis	4.88	A0 Va(λ Boo)	12	43	01.4	3.037	+57	+10	06	42.87	19.78	-90
481	4853	β Crucis	1.25	B0.5 III	12	49	03.1	3.557	-63	-59	48	40.70	19.60	-14
483	4905	ε Ursae Maj.*	1.77	A0p Cr	12	55	00.8	2.621	+132	+55	50	17.09	19.47	-6
484	4910	δ Virginis*	3.38	M3 'III	12	56	44.3	3.025	-313	+3	16	32.06	-19.48	-54
485	4915	α CVn sq*	2.90	A0p Si Eu	12	57	04.6	2.796	-198	+38	11	50.19	19.37	+56
488	4932	ε Virginis*	2.83	G8 IIIab	13	03	17.8	2.987	-185	+10	50	19.17	19.26	+20
487	4923	δ Muscae	3.62	K2 III	13	03	51.2	4.239	+544	-71	40	10.33	19.29	-20
492	4983	β Com	4.26	F9.5 V	13	12	55.3	2.795	-604	+27	45	52.60	18.15	+881
495	5020	γ Hydrae	3.00	G8 IIIa	13	20	09.0	3.277	+47	-23	17	22.73	18.87	-45
496	5028	ι Centauri	2.75	A2 Va	13	21	52.2	3.397	-284	-36	49	49.16	-18.86	-86
497	5054	ζ Ursae Maj.*pr	2.27	A1 Va'(Si)	13	24	49.7	2.404	+141	+54	48	30.20	18.70	-20
498	5056	α Virginis*	0.98	B1 V	13	26	22.9	3.171	-28	-11	16	41.07	18.66	-28
501	5107	ζ Virginis	3.37	A2 IV-	13	35	50.5	3.063	-190	-0	42	36.99	18.27	42
504	5132	ε Centauri	2.30	B1 III	13	41	19.6	3.847	-32	-53	34	47.55	18.13	-17
509	5191	η Ursae Maj.*	1.86	B3 V	13	48	25.5	2.358	-125	+49	12	05.89	17.85	-11
508	5193	μ Centauri	3.04	B2 IV-Vpne(shell)	13	50	58.9	3.645	-21	-42	35	05.70	-17.76	-20
513	5235	η Bootis	2.68	G0 IV	13	55	45.4	2.857	-44	+18	17	08.51	17.90	-358
512	5231	ζ Centauri	2.55	B2.5 IV	13	56	57.3	3.779	-56	-47	23	53.25	-17.53	-42

* **No. 1304 : Uttara Phalguni-2.**
No. 444 : *Denebola,* Uttara Phalguni-1.
No. 447 : *Phecda or Phad,* Pulastya.
No. 456 : *Megrez,* Atri.
No. 457 : *Minkar.*
No. 462 : *Acrux*.
No. 465 : *Algorel*, Hasta.
No. 483 : *Alioth,* Angira.
No. 484 : Minelauva.
No. 485 : 12 Canum Venaticorum, Mag. *p* 2.9
No. 488 : *Vindemiatrix.*
No. 497 : *Mizar*, Vasista. Mag. *f*. 4.0.
No. 498 : *Spica*, Citra.
No. 509 : *Alkaid, Benetnasch,* Marichi.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^d.625$ TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
521	5291	α Draconis*	3.65	A0 III	14	04	60.0	1.629	-84	+64	16	07.63	-17.12	+18
518	5267	β Centauri*	0.61	B1 III	14	05	25.9	4.299	-43	-60	28	49.13	17.13	-19
519	5287	π Hydrae	3.27	K2$^-$ III Fe-0.5	14	07	39.5	3.435	+33	-26	47	23.09	17.15	-139
520	5288	θ Centauri	2.06	K0$^-$ IIIb	14	08	00.9	3.556	-429	-36	28	46.82	17.51	-520
523	5315	κ Virginis	4.19	K2.5 III Fe-0.5	14	14	06.0	3.211	+5	-10	22	38.86	16.57	+140
526	5340	α Bootis*	-0.04	K1.5 III Fe-0.	14	16	41.3	2.739	-769	+19	03	58.07	18.58	-2000
525	5338	ι Virginis	4.08	F7 III-IV	14	17	11.9	3.156	-2	-6	06	24.94	-16.99	-432
1371	5359	λ Virginis	4.52	A5m:	14	20	19.9	3.258	-11	-13	28	25.03	16.37	+30
531	5404	θ Bootis	4.05	F7 V	14	25	57.7	2.042	-253	+51	44	50.84	16.51	-398
534	5429	ρ Bootis	3.58	K3 III	14	32	48.0	2.585	-77	+30	16	24.83	15.63	+119
535	5435	γ Bootis	3.03	A7 IV'	14	32	59.0	2.415	-97	+38	12	38.48	15.59	+153
537	5440	η Centauri	2.31	B1.5 IVpne(shell)	14	36	56.7	3.840	-31	-42	15	19.34	15.56	-35
538	5460	α Centauri* cg	0.00	K1 V	14	41	08.6	4.129	-4999	-60	55	36.77	-14.60	+691
541	5469	α Lupi	2.30	B1.5 III	14	43	26.2	4.027	-21	-47	28	59.95	15.18	-18
545	5487	μ Virginis	3.88	F2 V	14	44	15.0	3.171	+73	-5	45	17.45	15.43	-316
539	5463	α Circini	3.19	A 7p Sr Eu	14	44	21.1	4.934	-302	-65	04	16.80	15.34	-232
544	5485	371 G.Cen	4.05	K3 IIIb	14	45	02.5	3.693	-52	-35	16	09.31	15.25	-180
547	5511	109 Virginis	3.72	A0 Ivnn	14	47	23.3	3.040	-76	+1	47	56.89	14.96	-27
542	5470	α Apodis	3.83	K3 III CN 0.5	14	50	45.8	7.792	-41	-79	08	14.89	-14.75	-16
550	5563	β Ursae Min.*	2.08	K4$^-$ III	14	50	39.8	-0.103	-76	+74	03	48.49	14.72	+12
548	5531	α^{2}Librae*	2.75	A3 III-IV	14	52	07.6	3.332	-73	-16	08	02.39	14.72	-67
552	5571	β Lupi	2.68	B2 IV	15	00	00.9	3.960	-32	-43	13	23.16	14.21	-39
553	5576	κ Centauri	3.13	B2 V	15	00	38.1	3.932	-17	-42	11	34.93	14.16	-24
555	5602	β Bootis	3.50	G8 IIIa Fe-0.5	15	02	47.6	2.261	-36	+40	18	09.92	14.03	-28
556	5603	σ Librae	3.29	M2.5 III	15	05	23.6	3.528	-54	-25	22	08.31	-13.88	-43
559	5652	ι Librae*	4.54	B9p Si	15	13	30.5	3.434	-25	-19	52	31.61	13.35	-39
558	5649	ζ Lupi	3.41	G8 III	15	13	54.9	4.352	-122	-52	10	59.15	13.36	-73
563	5681	δ Bootis	3.47	G8 III Fe-I	15	16	24.6	2.421	+69	+33	13	54.87	13.23	-112
564	5685	β Librae*	2.61	B8 IIIn	15	18	13.3	3.238	-65	-9	27	52.42	13.02	-19
560	5671	γ Tr. Austrini	2.89	A1 III	15	21	02.6	5.706	-132	-68	45	36.98	12.84	-31
569	5735	γ Ursae Min.	3.05	A 3 III	15	20	42.6	-0.041	-40	+71	45	14.16	-12.81	20
1402	5695	δ Lupi	3.22	B1.5 IVn	15	22	51.4	3.964	-13	-40	43	38.64	12.72	-26
566	5705	φ' Lupi	3.56	K4 III	15	23	14.5	3.830	-74	-36	20	28.97	12.75	-84
571	5744	ι Draconis	3.29	K2 III	15	25	26.0	1.345	-12	+58	53	16.24	12.50	+17
572	5747	β Cr. Borealis	3.68	F0p Cr Eu	15	28	45.4	2.476	-137	+29	01	45.35	12.20	+86
578	5793	α Cr.Borealis*	2.23	A0 IV	15	35	38.5	2.543	+91	+26	38	24.56	11.89	-88
577	5787	γ Librae	3.91	G8.5 III	15	36	47.3	3.367	+45	-14	51	47.01	-11.72	+9
579	5794	ν Librae	3.58	K3.5 III	15	38	23.7	3.659	-7	-28	12	28.42	11.61	+3
1413	5838	κ Librae	4.74	M0$^-$ IIIb	15	43	14.8	3.470	-26	-19	45	00.65	11.36	-103
582	5854	α Serpentis*	2.65	K2 IIIb CN I	15	45	22.7	2.961	+92	+6	21	22.54	-11.06	+47

* **No. 518 : *Agena*.**
No. 521 : *Thuban*.
No. 526 : *Arcturus*, Svati.
No. 538 : Rigil *Kentaurus* Mag. 0.33 & 1.70.
No. 548 : *Zuben el Genubi*, Visakha.
No. 550 : *Kochab*.
No. 559 : Visakha.
No. 564 : *Zuben es Chamali.*
No. 578 : *Margarita, Alphecca.*
No. 582 : *Unukalhaly.*

MEAN PLACES OF STARS, J 2022.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
583	5867	β Serpentis	3.67	A2 IV	15	47	13.6	2.773	+46	+15	21	09.82	-11.02	-45
585	5881	μ Serpentis	3.54	A0 III	15	50	47.8	3.139	-57	-3	29	51.30	10.73	-24
588	5892	ε Serpentis	3.71	A5m	15	51	56.4	2.997	+86	+4	24	41.25	10.56	63
589	5897	β Tr.Australis	2.85	F0 1V	15	57	08.7	5.351	-283	-63	29	51.34	10.63	-398
591	5933	γ Serpentis	3.85	F6 V	15	57	29.6	2.776	+217	+15	35	22.44	11.49	-1281
592	5944	π Scorpii	2.89	B1 V + B2 V	16	00	13.1	3.644	-8	-26	10	37.59	10.03	-26
594	5953	δ Scorpii*	2.32	B0.3 IV	16	01	40.1	3.560	-8	-22	41	02.31	-9.92	-22
597	5984	β Scorpii*pr	2.62	B0.5 V	16	06	44.9	3.500	-4	-19	51	54.94	9.52	-19
603	6056	δ Ophiuchi	2.74	M0.5 III	16	15	31.6	3.151	-29	-3	45	02.33	8.97	-143
605	6075	ε Ophiuchi	3.24	G9.5 IIIb Fe-0.5	16	19	30.9	3.181	+57	-4	44	44.57	8.47	+41
608	6092	τ Herculis	3.89	B5 IV	16	20	25.1	1.808	-11	+46	15	38.67	8.40	+40
607	6084	σ Scorpii	2.89	B1 III	16	22	33.6	3.659	-8	-25	38	41.87	8.29	-21
609	6095	γ Herculis	3.75	A9 IIIbn	16	22	54.8	2.650	-33	+19	06	05.91	-8.20	+43
613	6117	ω Herculis	4.57	B9 p Cr	16	26	27.3	2.773	+30	+13	58	58.48	8.01	-59
616	6134	α Scorpii* cg	0.96	M1.5 Iab-Ib	16	30	47.4	3.690	-7	-26	28	48.00	7.63	-20
618	6148	β Herculis	2.77	G7 III a Fe-0.5	16	31	11.3	2.583	-70	+21	26	30.94	7.59	-15
611	6102	γ Apodis	3.89	G8/K0 III	16	36	58.3	9.424	-452	-78	56	34.43	7.18	-77
620	6165	τ Scorpii	2.82	B0 V	16	37	17.2	3.747	-6	-28	15	38.75	7.10	-22
622	6175	ζ Ophiuchi	2.56	O9.5 Vn	16	38	24.0	3.311	+9	-10	36	39.30	-6.96	26
626	6220	η Herculis	3.53	G7 III Fe-1	16	43	40.1	2.060	+32	+38	52	50.30	6.63	-82
625	6217	α Tr. Austr.*	1.92	K2 IIb-IIIa	16	51	04.0	6.414	+26	-69	03	56.44	5.97	-34
1438	6243	20 Ophiuchi	4.65	F7 III	16	51	04.8	3.326	+65	-10	49	15.74	6.03	-92
628	6241	ε Scorpii	2.29	K2 III	16	51	37.5	3.898	-493	-34	19	55.41	6.15	-257
1435	6229	η Arae	3.76	K5 III	16	51	44.3	5.213	+49	-59	04	43.94	5.91	-28
1439	6247	μ¹ Scorpii	3.08v	B1.5 IVn	16	53	23.9	4.078	-9	-38	05	01.94	-5.77	-25
633	6299	κ Ophiuchi	3.20	K2 III	16	58	44.1	2.844	-197	+9	20	29.72	5.30	-11
631	6285	ζ Arae	3.13	K4 III	17	00	29.4	4.989	-23	-56	01	22.88	5.18	-36
634	6324	ε Herculis	3.92	A0 IV'	17	01	09.1	2.299	-36	+30	53	40.38	5.06	+27
635	6355	60 Herculis	4.91	A4 IV	17	06	25.4	2.786	+35	+12	42	41.34	4.65	-10
639	6396	ζ Draconis	3.17	B6 III	17	08	51.4	0.188	-33	+65	41	13.41	4.41	+22
638	6380	η Scorpii	3.33	F2 V:p(Cr)	17	13	46.1	4.310	+23	-43	15	59.35	-4.30	-287
643	6418	π Herculis	3.16	K3 II	17	15	49.9	2.093	-22	+36	47	05.96	3.83	+4
641	6410	δ Herculis	3.14	A1 Vann	17	15	57.4	2.468	-15	+24	48	50.62	3.98	-157
644	6453	θ Ophiuchi	3.27	B2 IV	17	23	23.6	3.691	-3	-25	01	11.76	3.21	-20
645	6461	β Arae	2.85	K3 Ib-IIa	17	27	10.5	5.002	-9	-55	32	54.37	2.89	-25
1457	6486	44 Ophiuchi	4.17	A9m:	17	27	44.8	3.670	0	-24	11	38.34	2.93	-116
653	6536	β Draconis	2.79	G2 Ib-IIa	17	30	56.5	1.360	-17	+52	17	07.93	-2.52	+15
649	6508	ν Scorpii	2.69	B2 IV	17	32	17.8	4.086	-1	-37	18	41.60	2.45	-31
648	6500	δ Arae	3.62	B8 Vn	17	33	08.1	5.432	-79	-60	41	58.59	2.44	-96
651	6510	α Arae	2.95	B2 Vne	17	33	35.1	4.648	-32	-49	53	29.43	2.38	-70
652	6527	λ Scorpii*	1.63	B1.5 IV	17	35	08.3	4.080	-1	-37	07	04.69	2.20	-29
656	6556	α Ophiuchi*	2.08	A5 Vnn	17	35	58.8	2.788	+83	+12	32	42.85	-2.32	-226

* **No. 594 : *Dschubba*, Anuradha**
No. 597 : *Graffias*, Mag. 2.9, 5.1
No. 616 : *Antares*, Jyestha, Mag. 0.9 to 1.8.
No. 625 : *Atria*.
No. 652 : *Schaula*, Mula.
No. 656 : *Ras Alhague*.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^d.625$ TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
658	6561	ξ Serpentis	3.54	F0 IIIb	17	38	52.6	3.439	-29	-15	24	38.86	-1.90	-58
654	6553	θ Scorpii	1.87	F1 III	17	38	56.3	4.318	+14	-43	00	35.22	1.84	-2
663	6588	ι Herculis	3.80	B3 IV	17	40	06.1	1.697	-5	+45	59	43.29	1.73	+5
660	6580	κ Scorpii	2.41	B1.5 III	17	44	02.8	4.156	-5	-39	02	21.58	1.42	-27
665	6603	β Ophiuchi	2.77	K2 III CN 0.5	17	44	35.1	2.966	-27	+4	33	34.45	1.19	+159
667	6623	μ Herculis	3.42	G5IV	17	47	20.4	2.351	-232	+27	42	31.68	1.86	-752
661	6582	η Pavonis	3.62	K1 IIIa CN I	17	47	56.7	5.900	-21	-64	43	52.87	-1.11	-54
668	6629	γ Ophiuchi	3.75	A0 Van	17	49	01.3	3.011	-14	+2	42	01.82	1.03	-74
666	6615	ι^1 Scorpii	3.03	F2 Ia	17	49	09.6	4.201	0	-40	08	00.41	0.96	-8
669	6630	*G* Scorpii	3.21	K2 III	17	51	23.5	4.087	+41	-37	02	53.55	0.72	+33
671	6688	ξ Draconis	3.75	K2 III	17	53	55.1	1.040	+114	+56	52	11.01	0.45	+80
672	6695	θ Herculis	3.86	K1 IIa CN2	17	57	01.5	2.060	+4	+37	14	55.43	0.25	+6
676	6705	γ Draconis*	2.23	K5 III	17	57	07.8	1.396	-8	+51	29	13.61	-0.27	-19
674	6703	ξ Herculis	3.70	G8.5 III	17	58	38.4	2.334	+64	+29	14	48.55	0.14	-17
673	6698	ν Ophiuchi	3.34	G 9 IIIa	18	00	16.0	3.305	-4	-9	46	28.40	-0.09	-116
677	6714	67 Ophiuchi	3.97	B5 Ib	18	01	46.4	3.007	+1	+2	55	55.79	+0.15	-8
679	6746	γ Sagittarii	2.99	K0' III	18	07	15.2	3.855	-41	-30	25	18.01	0.45	-185
1471	6743	θ Arae	3.66	B2 Ib	18	08	23.0	4.670	-10	-50	05	15.12	0.72	-14
680	6771	72 Ophiuchi	3.73	A5 IV-V	18	08	25.0	2.846	-41	+9	34	07.17	+0.82	+80
681	6779	*o* Herculis	3.83	A0 II-III	18	08	25.3	2.342	+1	+28	46	00.93	0.75	+10
682	6812	μ Sagittarii	3.86	B9 Ia	18	15	06.6	3.589	+1	-21	03	03.37	1.32	+1
683	6832	η Sagittarii	3.11	M3.5 IIIab	18	19	09.0	4.059	-106	-36	45	09.77	1.51	-167
695	6927	χ Draconis	3.57	F7 V	18	20	38.9	-1.088	+1200	+72	44	31.48	1.46	-346
687	6859	δ Sagittarii*	2.70	K2.5 IIIa CN 0.5	18	22	26.1	3.840	+27	-29	48	59.30	1.93	-28
688	6869	η Serpentis	3.26	K0 III-IV	18	22	28.5	3.106	-364	-2	53	28.50	+1.26	-701
690	6895	109 Herculis	3.84	K2 IIIab	18	24	39.5	2.559	+141	+21	46	53.12	1.91	-242
689	6879	ε Sagittarii*	1.85	A0 II¯n(shell)	18	25	39.9	3.980	-31	-34	22	18.59	2.12	-124
691	6897	α Telescopii	3.51	B3 IV	18	28	38.4	4.444	-15	-45	57	13.06	2.44	-54
692	6913	λ Sagittarii	2.81	K1 IIIb	18	29	21.5	3.702	-32	-25	24	26.06	2.38	-185
697	6951	θ Coronae Aust.	4.64	G8 III	18	35	06.5	4.279	+28	-42	17	38.34	3.04	-22
1482	6973	α Scuti	3.85	K3 III	18	36	25.9	3.265	-10	-8	13	35.46	+2.86	-312
699	7001	α Lyrae*	0.03	A0 Va	18	37	42.1	2.033	+172	+38	48	20.72	3.57	+287
1487	7039	φ Sagittarii	3.17	B8 III	18	47	03.7	3.745	+40	-26	57	56.21	4.09	+1
1489	7063	β Scuti	4.22	G4 IIa	18	48	22.1	3.183	-3	-4	43	19.41	4.18	-16
705	7106	β Lyrae*	3.45	B7 Vpe(shell)	18	50	54.7	2.217	+3	+33	23	24.14	4.41	-3
706	7121	σ Sagittarii*	2.02	B3 IV	18	56	39.5	3.716	+10	-26	16	00.43	4.85	-54
710	7150	ξ^2 Sagittarii	3.51	K1 III	18	59	04.3	3.576	+24	-21	04	30.56	+5.10	-12
713	7178	γ Lyrae	3.24	B9 II	18	59	47.1	2.246	-2	+32	43	17.98	5.17	+2
712	7176	ε Aquilae	4.02	K1¯III CN 0.5	19	00	38.6	2.724	-35	+15	06	01.11	5.17	-74
716	7235	ζ Aquilae	2.99	A0 Vann	19	06	26.7	2.758	-3	+13	53	54.21	5.63	-96
717	7236	λ Aquilae	3.44	A0 IVp(wk 4481)	19	07	26.6	3.183	-11	-4	50	49.49	5.72	-90
1496	7234	τ Sagittarii	3.32	K1.5 IIIb	19	08	20.6	3.740	-40	-27	38	08.04	+5.64	-251

No. 676 : *Eltanin.*
No. 687 : Purvasadha-1.
No. 689 : *Kaus Australis*, Purvasadha-2.
No. 699 : *Vega*, Abhijit.
No. 705 : Sheliak Mag. 3.3 to 4.3.
No. 706 : *Nunki*, Uttarasadha.

MEAN PLACES OF STARS, J 2022.5

FOR JULY $2^d.625$ TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
720	7264	π Sagittarii	2.89	F2 II-III	19	11	06.0	3.563	0	-20	59	09.44	+6.08	-35
723	7310	δ Draconis	3.07	G9 III	19	12	33.3	-0.004	+164	+67	42	04.05	6.33	+93
726	7328	κ Cygni	3.77	G9 III	19	17	37.3	1.384	+65	+53	24	38.70	6.78	+125
730	7377	δ Aquilae	3.36	F2 IV-V	19	26	37.9	3.024	+171	+3	09	40.42	7.48	+83
1508	7405	α Vulpeculae	4.44	M0.5 IIIb	19	29	38.5	2.498	-92	+24	42	42.34	7.53	-106
733	7420	ι Cygni	3.79	A4 V	19	30	16.4	1.511	+21	+51	46	42.73	7.82	+130
732	7417	β Cygni**p*	3.08	K3 II + B9.5 V	19	31	37.8	2.421	+2	+28	00	29.50	+7.80	-2
1513	7488	β Sagittae	4.37	G8 IIIa CN 0.5	19	42	03.6	2.695	+7	+17	31	46.38	8.60	-32
741	7525	γ Aquilae	2.72	K3 II	19	47	19.8	2.852	+12	+10	40	10.34	9.04	-2
743	7536	δ Sagittae	3.82	M2 II + A0 V	19	48	23.5	2.676	+5	+18	35	28.06	9.14	+8
745	7557	α Aquilae*	0.77	A7 Vnn	19	51	52.8	2.926	+362	+8	55	45.28	9.79	+387
746	7570	η Aquilae	3.90V	F6-GI Ib	19	53	37.1	3.054	+7	+1	03	53.73	9.53	-7
749	7602	β Aquilae*	3.71	G8 IV	19	56	25.1	2.946	+33	+6	27	51.84	+9.27	-482
752	7635	γ Sagittae	3.47	$M0^-$ III	19	59	45.5	2.669	+46	+19	33	16.53	10.03	+24
751	7623	θ^1 Sagittarii	4.37	B2.5 IV	20	01	11.8	3.890	+5	-35	12	49.06	10.09	-26
754	7665	δ Pavonis	3.56	G6/8 IV	20	10	54.6	5.814	+1998	-66	07	18.85	9.71	-1126
756	7710	θ Aquilae	3.23	B9.5 III'	20	12	27.9	3.093	+26	-0	45	11.79	10.95	+4
757	7735	31 o^2 Cygni	3.79	K2 II+ B4 V	20	14	20.4	1.890	+4	+46	48	37.80	11.09	+3
761	7754	α^2 Capricorni*	3.57	G9III	20	19	18.0	3.322	+44	-12	28	24.83	+11.45	+4
762	7776	β Capricorni	3.08	K0 II: + A5n: V:	20	22	16.4	3.364	+29	-14	42	31.66	11.66	+2
765	7796	γ Cygni	2.20	F8 Ib	20	23	02.2	2.155	+4	+40	19	47.03	11.71	0
764	7790	α Pavonis	1.94	B2.5 V	20	27	24.8	4.701	+9	-56	39	39.31	11.93	-89
768	7852	ε Delphini	4.03	B6 III	20	34	17.3	2.866	+9	+11	22	51.66	12.47	-22
(771)	7882	β Delphini*m	3.64	F5 IV	20	38	36.3	2.814	+81	+14	40	28.19	12.74	-47
769	7869	α Indi	3.11	K0 III CN-1	20	39	08.4	4.190	+52	-47	12	40.56	+12.89	+66
774	7906	α Delphini*	3.77	B9 IV	20	40	41.0	2.787	+46	+15	59	33.35	12.93	-2
777	7924	α Cygni*	1.25	A2 Ia	20	42	12.0	2.048	+3	+45	21	41.95	13.03	+2
778	7928	δ Delphini	4.43	F0m	20	44	30.6	2.801	-13	+15	09	23.27	13.14	-43
783	7957	η Cephei	3.43	K0 IV	20	45	44.6	1.209	119	+61	55	36.16	14.08	+819
775	7913	β Pavonis	3.42	A6 IV^-	20	46	57.5	5.320	-76	-66	07	12.44	13.35	+11
780	7949	ε Cygni	2.46	K0 III	20	47	07.4	2.431	+286	+34	03	20.09	+13.68	329
1541	7948	γ Delphini sq	4.27	K1 IV	20	47	42.1	2.784	-22	+16	12	23.54	13.19	-197
781	7950	ε Aquarii	3.77	A1 III^-	20	48	53.5	3.242	+24	-9	24	43.35	13.43	-34
1547	7990	μ Aquarii	4.73	F2m	20	53	51.9	3.230	+30	-8	53	51.26	13.76	-30
785	7986	β Indi	3.65	K1 II	20	56	33.0	4.634	+21	-58	22	02.79	13.93	-26
1550	8039	γ Microscopii	4.67	G8 III	21	02	39.9	3.662	-2	-32	10	06.20	14.34	+5
792	8079	ξ Cygni	3.72	K4.5 Ib-II	21	05	45.0	2.186	+8	+44	01	06.52	+14.52	+1
797	8115	ζ Cygni	3.20	$G8^+$ III-IIIa Ba 0.5	21	13	53.7	2.557	+1	+30	19	12.78	14.95	-56
800	8131	α Equulei	3.92	G2 II-III + A4 V	21	16	56.9	2.998	+39	+5	20	31.11	15.09	-88
803	8162	α Cephei*	2.44	A7 V' n	21	19	06.9	1.427	+219	+62	40	53.18	15.35	+50
806	8204	ζ Capricorni	3.74	G4 Ib: Ba 2	21	27	56.9	3.413	+1	-22	18	45.77	+15.81	+23

* **No. 732 : *Albireo* ., Mag. *f* . 5.4.**
No. 745 : *Altair* , Sravana.
No. 749 : *Alshain* .
No. 761 : Giedi or Algedi.
No. 771 : *Rotanev* , Dhanistha-1.
No. 774 : *Saulocin,* Dhanistha-2.
No. 777 : *Deneb.*
No. 803 : *Alderamin.*

MEAN PLACES OF STARS, J 2022.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
809	8238	β Cephei	3.23	B1 III	21	28	56.5	0.746	+21	+70	39	35.09	+15.85	+7
808	8232	β Aquarii*	2.91	G0 Ib	21	32	44.5	3.153	+14	-5	28	16.11	16.04	-8
1569	8264	ξ Aquarii	4.69	A5 Vn	21	38	56.9	3.188	+78	-7	45	08.25	16.34	-25
812	8278	γ Capricorni	3.68	A7 m:	21	41	20.1	3.315	+132	-16	33	34.73	16.46	-23
810	8254	ν Octantis	3.76	K0 III	21	43	53.5	6.404	+140	-77	17	17.19	16.37	-240
815	8308	ε Pegasi*	2.34	K2 Ib-II	21	45	17.5	2.947	+21	+9	58	44.57	16.68	-1
819	8322	δ Capricorni	2.87	F2m	21	48	16.8	3.302	+183	-16	01	27.11	+16.52	-296
822	8353	γ Gruis	3.01	B8 IV-Vs	21	55	17.0	3.610	+86	-37	15	28.95	17.13	-21
827	8414	α Aquarii*	2.96	G2 Ib	22	06	56.3	3.079	+13	-0	12	35.05	17.64	-10
831	8430	ι Pegasi	3.76	F5 V	22	08	03.6	2.799	+220	+25	27	20.61	17.72	+25
829	8425	α Gruis*	1.74	B7 Vn	22	09	38.4	3.748	+126	-46	51	03.96	17.61	-151
834	8450	θ Pegasi	3.53	A2m AI IV-V	22	11	20.1	3.026	+185	+6	18	33.56	17.86	+27
836	8465	ζ Cephei	3.35	K1.5 Ib	22	11	38.3	2.092	+19	+58	18	45.71	+17.85	+4
841	8502	α Tucanae	2.86	K3 III	22	20	01.4	4.049	-96	-60	08	47.48	18.12	-43
842	8518	γ Aquarii	3.84	B9.5 III-IV	22	22	49.1	3.096	+88	-1	16	23.74	18.27	+7
846	8556	$δ^{1}$ Gruis	3.97	G6/8 III	22	30	36.3	3.558	+26	-43	22	47.67	18.53	-5
848	8585	α Lacertae	3.77	A1 Va	22	32	13.4	2.486	+144	+50	23	55.41	18.61	19
849	8592	ν Aquarii	5.20	F5 V	22	35	55.3	3.271	+158	-20	35	32.30	18.56	-144
850	8597	η Aquarii	4.02	B9 IV-V:n	22	36	30.7	3.081	+61	0	00	03.32	+18.67	-56
855	8634	ζ Pegasi	3.40	B8.5 III	22	42	35.1	2.995	+55	+10	56	57.67	18.90	-12
856	8636	β Gruis	2.10	M4.5 III	22	44	00.1	3.551	+133	-46	45	58.92	18.94	-8
857	8650	η Pegasi	2.94	G8 II + F0V	22	44	03.6	2.822	+11	+30	20	22.03	18.93	-25
860	8675	ε Gruis	3.49	A2 Va	22	49	54.1	3.587	+115	-51	11	52.72	19.04	-71
863	8694	ι Cephei	3.52	$K0^{-}$ III	22	50	29.2	2.155	-108	+66	19	08.82	19.00	-125
861	8679	τ Aquarii	4.01	M0 III	22	50	46.8	3.170	-8	-13	28	24.11	+19.10	-38
862	8684	μ Pegasi	3.48	$G8^{-}$ III	22	51	05.5	2.904	+108	+24	43	15.16	19.10	-42
864	8698	λ Aquarii*	3.74	M2.5 III Fe-0.5	22	53	47.2	3.126	+8	-7	27	33.84	19.25	+37
866	8709	δ Aquarii	3.27	A3 IV-V	22	55	50.5	3.176	-28	-15	42	02.45	19.24	-25
867	8728	α PsA*	1.16	A3 Va	22	58	53.4	3.300	+255	-29	30	09.11	19.17	-164
869	8762	*o* Andromedae	3.62	B6 pe (shell)	23	02	57.7	2.776	+20	+42	26	50.16	19.42	-6
870	8775	β Pegasi*	2.42	M2.5 II-III	23	04	52.1	2.919	+143	+28	12	18.90	+19.60	138
871	8781	α Pegasi*	2.49	A0 III-IV	23	05	53.0	2.994	+44	+15	19	36.12	19.44	-42
873	8812	88 Aquarii	3.66	K1.5 III	23	10	38.6	3.189	+40	-21	02	59.65	19.61	+31
878	8852	γ Piscium	3.69	G9 III: Fe-2	23	18	20.0	3.112	+509	+3	24	19.87	19.73	+17
890	8961	λ Andromedae	3.82v	G8 III-IV	23	38	40.4	2.960	+157	+46	34	48.85	19.53	-421
893	8974	γ Cephei	3.21	K1 III-IV CN I	23	40	17.4	2.525	-212	+77	45	29.40	20.12	+151
902	9072	ω Piscium	4.01	F4V	0	00	28.1	3.086	+103	+6	59	16.18	+19.93	-115

BS = Bright Star Catalogue HR = Havard Revised Catalogue FK5 = Fifth Fundamental Catalogue

* **No. 808 : *Sadalsuud.***
No. 815 : *Enif*. Mag. 0.7 to 3.5.
No. 827 : *Sadalmelik.*
No. 829 : *Al Nair.*

No. 864 : Satabhisaj.
No. 867 : *Fomalhaut*.
No. 870 : *Scheat*, Purva Bhadrapada-2.
No. 871 : *Markab*, Purva Bhadrapada-1.

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		γ Pegasi						α Phoenicis						β Ceti						β Andromedae					
Mag. Spect.		2.83			B2 IV			2.39			K0 III b			2.04			G9 III CH-1 CN 0.5 Ca 1			2.06			$M0^+IIIa$		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	0	14	21	+15	18	19	0	27	21	-42	11	32	0	44	41	-17	52	11	1	10	57	+35	44	18
	11	0	14	21	15	18	19	0	27	21	42	11	32	0	44	41	17	52	11	1	10	57	35	44	18
	21	0	14	21	15	18	18	0	27	21	42	11	31	0	44	41	17	52	11	1	10	57	35	44	18
	31	0	14	21	15	18	17	0	27	21	42	11	30	0	44	41	17	52	11	1	10	57	35	44	17
Feb.	10	0	14	21	15	18	16	0	27	21	42	11	29	0	44	40	17	52	11	1	10	57	35	44	15
	20	0	14	21	15	18	15	0	27	21	42	11	27	0	44	40	17	52	11	1	10	57	35	44	14
Mar.	2	0	14	21	+15	18	14	0	27	21	-42	11	24	0	44	40	-17	52	10	1	10	56	+35	44	12
	12	0	14	21	15	18	13	0	27	21	42	11	22	0	44	40	17	52	09	1	10	56	35	44	11
	22	0	14	21	15	18	12	0	27	21	42	11	20	0	44	40	17	52	07	1	10	56	35	44	09
Apr.	1	0	14	21	15	18	12	0	27	21	42	11	16	0	44	40	17	52	06	1	10	56	35	44	08
	11	0	14	21	15	18	12	0	27	21	42	11	13	0	44	40	17	52	04	1	10	56	35	44	06
	21	0	14	21	15	18	12	0	27	21	42	11	10	0	44	40	17	52	02	1	10	57	35	44	05
May	1	0	14	21	+15	18	13	0	27	21	-42	11	07	0	44	41	-17	51	59	1	10	57	+35	44	04
	11	0	14	21	15	18	14	0	27	21	42	11	04	0	44	41	17	51	57	1	10	57	35	44	04
	21	0	14	22	15	18	15	0	27	22	42	11	01	0	44	41	17	51	54	1	10	57	35	44	04
	31	0	14	22	15	18	16	0	27	22	42	10	58	0	44	41	17	51	52	1	10	57	35	44	04
June	10	0	14	22	15	18	18	0	27	22	42	10	56	0	44	42	17	51	50	1	10	58	35	44	05
	20	0	14	23	15	18	20	0	27	23	42	10	54	0	44	42	17	51	47	1	10	58	35	44	06
	30	0	14	23	+15	18	22	0	27	23	-42	10	52	0	44	42	-17	51	45	1	10	59	+35	44	07
July	10	0	14	23	15	18	24	0	27	23	42	10	50	0	44	43	17	51	43	1	10	59	35	44	09
	20	0	14	24	15	18	26	0	27	24	42	10	49	0	44	43	17	51	42	1	10	59	35	44	11
	30	0	14	24	15	18	29	0	27	24	42	10	49	0	44	43	17	51	40	1	10	60	35	44	13
Aug.	9	0	14	24	15	18	31	0	27	25	42	10	49	0	44	44	17	51	39	1	10	60	35	44	15
	19	0	14	24	15	18	33	0	27	25	42	10	49	0	44	44	17	51	39	1	11	00	35	44	18
	29	0	14	25	+15	18	35	0	27	25	-42	10	50	0	44	44	-17	51	38	1	11	01	+35	44	20
Sept.	8	0	14	25	15	18	36	0	27	25	42	10	51	0	44	44	17	51	38	1	11	01	35	44	23
	18	0	14	25	15	18	38	0	27	26	42	10	53	0	44	44	17	51	38	1	11	01	35	44	25
	28	0	14	25	15	18	39	0	27	26	42	10	55	0	44	44	17	51	39	1	11	01	35	44	28
Oct.	8	0	14	25	15	18	40	0	27	26	42	10	57	0	44	45	17	51	40	1	11	01	35	44	30
	18	0	14	25	15	18	41	0	27	26	42	10	59	0	44	45	17	51	41	1	11	01	35	44	32
	28	0	14	25	+15	18	42	0	27	26	-42	11	02	0	44	45	-17	51	42	1	11	01	+35	44	34
Nov.	7	0	14	25	15	18	42	0	27	26	42	11	04	0	44	45	17	51	44	1	11	01	35	44	36
	17	0	14	25	15	18	43	0	27	25	42	11	06	0	44	45	17	51	45	1	11	01	35	44	37
	27	0	14	25	15	18	43	0	27	25	42	11	07	0	44	44	17	51	46	1	11	01	35	44	38
Dec.	7	0	14	25	15	18	42	0	27	25	42	11	09	0	44	44	17	51	47	1	11	01	35	44	39
	17	0	14	25	15	18	42	0	27	25	42	11	10	0	44	44	17	51	48	1	11	01	35	44	39
	27	0	14	25	+15	18	42	0	27	25	-42	11	10	0	44	44	-17	51	49	1	11	01	+35	44	40
	37	0	14	24	+15	18	41	0	27	25	-42	11	10	0	44	44	-17	51	50	1	11	01	+35	44	39

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		ζ Ceti						ν Ceti						α Arietis						α Ceti					
Mag. Spect.		3.73			K0 III			4.00			M0 IIIb			2.00			K2 IIIab			2.53			M1.5 IIIa		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	1	52	32	-10	13	46	2	01	02	-20	58	31	2	08	25	+23	33	59	3	03	26	+4	10	28
	11	1	52	32	10	13	46	2	01	02	20	58	31	2	08	25	23	33	59	3	03	26	4	10	27
	21	1	52	32	10	13	47	2	01	02	20	58	32	2	08	24	23	33	59	3	03	26	4	10	27
	31	1	52	32	10	13	47	2	01	02	20	58	32	2	08	24	23	33	58	3	03	26	4	10	26
Feb.	10	1	52	32	10	13	48	2	01	02	20	58	32	2	08	24	23	33	57	3	03	25	4	10	26
	20	1	52	32	10	13	47	2	01	02	20	58	32	2	08	24	23	33	57	3	03	25	4	10	26
Mar.	2	1	52	32	-10	13	47	2	01	02	-20	58	31	2	08	24	+23	33	56	3	03	25	+4	10	25
	12	1	52	32	10	13	46	2	01	01	20	58	30	2	08	24	23	33	55	3	03	25	4	10	25
	22	1	52	32	10	13	46	2	01	01	20	58	29	2	08	24	23	33	54	3	03	25	4	10	25
Apr.	1	1	52	32	10	13	44	2	01	01	20	58	27	2	08	24	23	33	53	3	03	25	4	10	26
	11	1	52	32	10	13	43	2	01	01	20	58	25	2	08	24	23	33	53	3	03	25	4	10	26
	21	1	52	32	10	13	42	2	01	01	20	58	23	2	08	24	23	33	52	3	03	25	4	10	27
May	1	1	52	32	-10	13	40	2	01	01	-20	58	20	2	08	24	+23	33	52	3	03	25	+4	10	27
	11	1	52	32	10	13	38	2	01	02	20	58	18	2	08	24	23	33	52	3	03	25	4	10	29
	21	1	52	32	10	13	36	2	01	02	20	58	15	2	08	24	23	33	53	3	03	25	4	10	30
	31	1	52	32	10	13	33	2	01	02	20	58	13	2	08	24	23	33	53	3	03	25	4	10	31
June	10	1	52	33	10	13	31	2	01	02	20	58	10	2	08	25	23	33	54	3	03	25	4	10	33
	20	1	52	33	10	13	29	2	01	02	20	58	07	2	08	25	23	33	55	3	03	26	4	10	35
	30	1	52	33	-10	13	26	2	01	03	-20	58	05	2	08	25	+23	33	56	3	03	26	+4	10	36
July	10	1	52	33	10	13	24	2	01	03	20	58	03	2	08	26	23	33	58	3	03	26	4	10	38
	20	1	52	34	10	13	22	2	01	03	20	58	01	2	08	26	23	33	59	3	03	26	4	10	40
	30	1	52	34	10	13	20	2	01	04	20	57	59	2	08	26	23	34	01	3	03	27	4	10	42
Aug.	9	1	52	34	10	13	19	2	01	04	20	57	58	2	08	27	23	34	03	3	03	27	4	10	43
	19	1	52	35	10	13	18	2	01	04	20	57	57	2	08	27	23	34	05	3	03	27	4	10	45
	29	1	52	35	-10	13	17	2	01	05	-20	57	56	2	08	27	+23	34	07	3	03	28	+4	10	46
Sept.	8	1	52	35	10	13	16	2	01	05	20	57	56	2	08	27	23	34	09	3	03	28	4	10	47
	18	1	52	35	10	13	16	2	01	05	20	57	56	2	08	28	23	34	10	3	03	28	4	10	48
	28	1	52	36	10	13	17	2	01	05	20	57	57	2	08	28	23	34	12	3	03	28	4	10	48
Oct.	8	1	52	36	10	13	17	2	01	05	20	57	58	2	08	28	23	34	13	3	03	29	4	10	49
	18	1	52	36	10	13	18	2	01	06	20	57	59	2	08	28	23	34	14	3	03	29	4	10	49
	28	1	52	36	-10	13	19	2	01	06	-20	58	01	2	08	28	+23	34	15	3	03	29	+4	10	48
Nov.	7	1	52	36	10	13	20	2	01	06	20	58	03	2	08	28	23	34	17	3	03	29	4	10	48
	17	1	52	36	10	13	21	2	01	06	20	58	04	2	08	28	23	34	17	3	03	29	4	10	48
	27	1	52	36	10	13	22	2	01	06	20	58	06	2	08	28	23	34	18	3	03	29	4	10	47
Dec.	7	1	52	36	10	13	23	2	01	06	20	58	08	2	08	28	23	34	18	3	03	29	4	10	46
	17	1	52	36	10	13	24	2	01	06	20	58	09	2	08	28	23	34	19	3	03	29	4	10	46
	27	1	52	36	-10	13	25	2	01	05	-20	58	10	2	08	28	+23	34	19	3	03	29	+4	10	45
	37	1	52	36	-10	13	26	2	01	05	-20	58	11	2	08	28	+23	34	19	3	03	29	+4	10	44

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		η Tauri						α Tauri						β Eridani						γ Orionis					
Mag. Spect.		2.87			B7 IIIn			0.85			$K5^+III$			2.79			A3 IVn			1.64			B2 III		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	3	48	48	+24	10	22	4	37	11	+16	33	10	5	08	56	-5	03	34	5	26	19	+6	22	07
	11	3	48	48	24	10	22	4	37	11	16	33	10	5	08	56	5	03	35	5	26	19	6	22	06
	21	3	48	48	24	10	23	4	37	11	16	33	10	5	08	56	5	03	36	5	26	19	6	22	05
	31	3	48	48	24	10	22	4	37	11	16	33	09	5	08	56	5	03	37	5	26	19	6	22	05
Feb.	10	3	48	47	24	10	22	4	37	11	16	33	09	5	08	56	5	03	38	5	26	19	6	22	04
	20	3	48	47	24	10	22	4	37	11	16	33	09	5	08	56	5	03	38	5	26	19	6	22	04
Mar.	2	3	48	47	+24	10	22	4	37	11	+16	33	09	5	08	56	-5	03	39	5	26	19	+6	22	04
	12	3	48	47	24	10	21	4	37	11	16	33	09	5	08	56	5	03	39	5	26	19	6	22	04
	22	3	48	47	24	10	21	4	37	10	16	33	08	5	08	56	5	03	39	5	26	18	6	22	04
Apr.	1	3	48	47	24	10	20	4	37	10	16	33	08	5	08	55	5	03	38	5	26	18	6	22	04
	11	3	48	47	24	10	20	4	37	10	16	33	08	5	08	55	5	03	38	5	26	18	6	22	04
	21	3	48	46	24	10	19	4	37	10	16	33	08	5	08	55	5	03	37	5	26	18	6	22	05
May	1	3	48	46	+24	10	19	4	37	10	+16	33	08	5	08	55	-5	03	36	5	26	18	+6	22	05
	11	3	48	47	24	10	19	4	37	10	16	33	09	5	08	55	5	03	35	5	26	18	6	22	06
	21	3	48	47	24	10	19	4	37	10	16	33	09	5	08	55	5	03	33	5	26	18	6	22	07
	31	3	48	47	24	10	19	4	37	10	16	33	09	5	08	55	5	03	32	5	26	18	6	22	07
June	10	3	48	47	24	10	19	4	37	10	16	33	10	5	08	55	5	03	30	5	26	18	6	22	09
	20	3	48	47	24	10	20	4	37	11	16	33	11	5	08	55	5	03	28	5	26	18	6	22	10
	30	3	48	47	+24	10	20	4	37	11	+16	33	11	5	08	55	-5	03	26	5	26	18	+6	22	11
July	10	3	48	48	24	10	21	4	37	11	16	33	12	5	08	56	5	03	25	5	26	18	6	22	12
	20	3	48	48	24	10	22	4	37	11	16	33	13	5	08	56	5	03	23	5	26	19	6	22	13
	30	3	48	48	24	10	23	4	37	12	16	33	14	5	08	56	5	03	21	5	26	19	6	22	15
Aug.	9	3	48	49	24	10	24	4	37	12	16	33	15	5	08	56	5	03	20	5	26	19	6	22	16
	19	3	48	49	24	10	26	4	37	12	16	33	16	5	08	57	5	03	18	5	26	19	6	22	17
	29	3	48	49	+24	10	27	4	37	12	+16	33	17	5	08	57	-5	03	17	5	26	20	+6	22	18
Sept.	8	3	48	50	24	10	28	4	37	13	16	33	18	5	08	57	5	03	16	5	26	20	6	22	18
	18	3	48	50	24	10	29	4	37	13	16	33	19	5	08	58	5	03	16	5	26	20	6	22	18
	28	3	48	50	24	10	30	4	37	13	16	33	19	5	08	58	5	03	16	5	26	21	6	22	19
Oct.	8	3	48	51	24	10	31	4	37	14	16	33	20	5	08	58	5	03	16	5	26	21	6	22	19
	18	3	48	51	24	10	32	4	37	14	16	33	20	5	08	58	5	03	17	5	26	21	6	22	18
	28	3	48	51	+24	10	33	4	37	14	+16	33	20	5	08	59	-5	03	18	5	26	21	+6	22	18
Nov.	7	3	48	51	24	10	33	4	37	14	16	33	20	5	08	59	5	03	19	5	26	22	6	22	17
	17	3	48	51	24	10	34	4	37	15	16	33	20	5	08	59	5	03	20	5	26	22	6	22	16
	27	3	48	52	24	10	34	4	37	15	16	33	20	5	08	59	5	03	22	5	26	22	6	22	15
Dec.	7	3	48	52	24	10	35	4	37	15	16	33	20	5	08	59	5	03	23	5	26	22	6	22	14
	17	3	48	52	24	10	35	4	37	15	16	33	20	5	08	60	5	03	25	5	26	22	6	22	14
	27	3	48	52	+24	10	36	4	37	15	+16	33	20	5	08	60	-5	03	26	5	26	23	+6	22	13
	37	3	48	52	+24	10	36	4	37	15	+16	33	19	5	08	60	-5	03	28	5	26	23	+6	22	12

APPARENT PLACES OF STARS, 2022

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Name		β Leporis						ι Orionis						α Columbae						κ Orionis					
Mag. Spect.		2.84			G5 II			2.77			O9 III			2.64			B7 IV			2.06			B0.5 Ia		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	5	29	12	-20	44	36	5	36	31	-5	53	48	5	40	28	-34	03	50	5	48	49	-9	39	47
	11	5	29	12	20	44	38	5	36	31	5	53	49	5	40	28	34	03	52	5	48	49	9	39	48
	21	5	29	12	20	44	40	5	36	31	5	53	51	5	40	28	34	03	55	5	48	49	9	39	50
	31	5	29	12	20	44	42	5	36	31	5	53	52	5	40	28	34	03	57	5	48	49	9	39	51
Feb.	10	5	29	12	20	44	43	5	36	31	5	53	53	5	40	27	34	03	58	5	48	48	9	39	52
	20	5	29	12	20	44	44	5	36	31	5	53	53	5	40	27	34	03	59	5	48	48	9	39	53
Mar.	2	5	29	11	-20	44	44	5	36	31	-5	53	54	5	40	27	-34	04	00	5	48	48	-9	39	53
	12	5	29	11	20	44	45	5	36	30	5	53	54	5	40	27	34	04	01	5	48	48	9	39	54
	22	5	29	11	20	44	45	5	36	30	5	53	54	5	40	27	34	04	01	5	48	48	9	39	54
Apr.	1	5	29	11	20	44	44	5	36	30	5	53	54	5	40	26	34	03	60	5	48	48	9	39	53
	11	5	29	11	20	44	43	5	36	30	5	53	53	5	40	26	34	03	59	5	48	47	9	39	53
	21	5	29	10	20	44	42	5	36	30	5	53	52	5	40	26	34	03	58	5	48	47	9	39	52
May	1	5	29	10	-20	44	40	5	36	30	-5	53	51	5	40	26	-34	03	56	5	48	47	-9	39	51
	11	5	29	10	20	44	39	5	36	30	5	53	50	5	40	26	34	03	54	5	48	47	9	39	50
	21	5	29	10	20	44	37	5	36	30	5	53	49	5	40	26	34	03	51	5	48	47	9	39	48
	31	5	29	10	20	44	35	5	36	30	5	53	47	5	40	26	34	03	49	5	48	47	9	39	47
June	10	5	29	10	20	44	32	5	36	30	5	53	46	5	40	26	34	03	46	5	48	47	9	39	45
	20	5	29	10	20	44	29	5	36	30	5	53	44	5	40	26	34	03	43	5	48	47	9	39	43
	30	5	29	11	-20	44	27	5	36	30	-5	53	42	5	40	26	-34	03	40	5	48	47	-9	39	41
July	10	5	29	11	20	44	25	5	36	30	5	53	40	5	40	26	34	03	37	5	48	48	9	39	39
	20	5	29	11	20	44	22	5	36	30	5	53	38	5	40	26	34	03	34	5	48	48	9	39	37
	30	5	29	11	20	44	20	5	36	31	5	53	37	5	40	26	34	03	31	5	48	48	9	39	35
Aug.	9	5	29	11	20	44	18	5	36	31	5	53	35	5	40	27	34	03	29	5	48	48	9	39	33
	19	5	29	12	20	44	16	5	36	31	5	53	34	5	40	27	34	03	27	5	48	48	9	39	32
	29	5	29	12	-20	44	15	5	36	31	-5	53	33	5	40	27	-34	03	25	5	48	49	-9	39	31
Sept.	8	5	29	12	20	44	14	5	36	32	5	53	32	5	40	28	34	03	25	5	48	49	9	39	30
	18	5	29	13	20	44	14	5	36	32	5	53	32	5	40	28	34	03	24	5	48	49	9	39	30
	28	5	29	13	20	44	14	5	36	32	5	53	32	5	40	28	34	03	24	5	48	50	9	39	29
Oct.	8	5	29	13	20	44	14	5	36	33	5	53	32	5	40	29	34	03	25	5	48	50	9	39	30
	18	5	29	14	20	44	15	5	36	33	5	53	33	5	40	29	34	03	26	5	48	50	9	39	31
	28	5	29	14	-20	44	17	5	36	33	-5	53	34	5	40	29	-34	03	28	5	48	50	-9	39	32
Nov.	7	5	29	14	20	44	18	5	36	33	5	53	35	5	40	29	34	03	30	5	48	51	9	39	33
	17	5	29	14	20	44	20	5	36	34	5	53	36	5	40	30	34	03	32	5	48	51	9	39	35
	27	5	29	14	20	44	23	5	36	34	5	53	38	5	40	30	34	03	35	5	48	51	9	39	37
Dec.	7	5	29	15	20	44	25	5	36	34	5	53	39	5	40	30	34	03	38	5	48	51	9	39	38
	17	5	29	15	20	44	27	5	36	34	5	53	41	5	40	30	34	03	41	5	48	52	9	39	40
	27	5	29	15	-20	44	30	5	36	34	-5	53	43	5	40	30	-34	03	44	5	48	52	-9	39	42
	37	5	29	15	-20	44	32	5	36	34	-5	53	44	5	40	30	-34	03	47	5	48	52	-9	39	44

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Name		α Orionis						ζ Canis Majoris						α Carinae						γ Geminorum					
Mag. Spect.		0.4 - 1.3			M1 M2 Ia Iab			3.02			B2.5V			-0.72			A9 II			1.93			A1 IVs		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	5	56	22	+7	24	37	6	21	10	-30	04	25	6	24	28	-52	42	28	6	38	59	+16	22	46
	11	5	56	22	7	24	36	6	21	10	30	04	28	6	24	28	52	42	31	6	38	59	16	22	46
	21	5	56	22	7	24	35	6	21	10	30	04	31	6	24	28	52	42	34	6	38	60	16	22	45
	31	5	56	22	7	24	35	6	21	10	30	04	33	6	24	28	52	42	37	6	38	60	16	22	45
Feb.	10	5	56	22	7	24	34	6	21	10	30	04	35	6	24	28	52	42	39	6	38	59	16	22	45
	20	5	56	22	7	24	34	6	21	10	30	04	36	6	24	28	52	42	41	6	38	59	16	22	45
Mar.	2	5	56	22	+7	24	34	6	21	10	-30	04	37	6	24	27	-52	42	43	6	38	59	+16	22	45
	12	5	56	22	7	24	34	6	21	10	30	04	38	6	24	27	52	42	44	6	38	59	16	22	45
	22	5	56	22	7	24	34	6	21	09	30	04	38	6	24	27	52	42	44	6	38	59	16	22	46
Apr.	1	5	56	21	7	24	34	6	21	09	30	04	38	6	24	26	52	42	44	6	38	59	16	22	46
	11	5	56	21	7	24	34	6	21	09	30	04	38	6	24	26	52	42	44	6	38	59	16	22	46
	21	5	56	21	7	24	35	6	21	09	30	04	37	6	24	25	52	42	43	6	38	58	16	22	46
May	1	5	56	21	+7	24	35	6	21	09	-30	04	35	6	24	25	-52	42	41	6	38	58	+16	22	46
	11	5	56	21	7	24	36	6	21	09	30	04	34	6	24	25	52	42	39	6	38	58	16	22	47
	21	5	56	21	7	24	36	6	21	08	30	04	32	6	24	25	52	42	37	6	38	58	16	22	47
	31	5	56	21	7	24	37	6	21	08	30	04	30	6	24	25	52	42	34	6	38	58	16	22	47
June	10	5	56	21	7	24	38	6	21	08	30	04	27	6	24	24	52	42	31	6	38	58	16	22	48
	20	5	56	21	7	24	39	6	21	08	30	04	24	6	24	24	52	42	28	6	38	58	16	22	48
	30	5	56	21	+7	24	40	6	21	09	-30	04	22	6	24	25	-52	42	25	6	38	58	+16	22	48
July	10	5	56	21	7	24	41	6	21	09	30	04	19	6	24	25	52	42	21	6	38	58	16	22	49
	20	5	56	22	7	24	42	6	21	09	30	04	16	6	24	25	52	42	18	6	38	59	16	22	49
	30	5	56	22	7	24	43	6	21	09	30	04	14	6	24	25	52	42	15	6	38	59	16	22	49
Aug.	9	5	56	22	7	24	44	6	21	09	30	04	11	6	24	25	52	42	12	6	38	59	16	22	50
	19	5	56	22	7	24	45	6	21	09	30	04	09	6	24	26	52	42	09	6	38	59	16	22	50
	29	5	56	23	+7	24	46	6	21	10	-30	04	07	6	24	26	-52	42	07	6	38	60	+16	22	50
Sept.	8	5	56	23	7	24	46	6	21	10	30	04	06	6	24	26	52	42	06	6	38	60	16	22	50
	18	5	56	23	7	24	46	6	21	10	30	04	06	6	24	27	52	42	05	6	39	00	16	22	50
	28	5	56	24	7	24	47	6	21	11	30	04	05	6	24	27	52	42	04	6	39	01	16	22	50
Oct.	8	5	56	24	7	24	47	6	21	11	30	04	06	6	24	27	52	42	05	6	39	01	16	22	50
	18	5	56	24	7	24	46	6	21	11	30	04	07	6	24	28	52	42	06	6	39	01	16	22	49
	28	5	56	24	+7	24	45	6	21	12	-30	04	08	6	24	28	-52	42	08	6	39	01	+16	22	49
Nov.	7	5	56	25	7	24	45	6	21	12	30	04	10	6	24	29	52	42	10	6	39	02	16	22	48
	17	5	56	25	7	24	44	6	21	12	30	04	12	6	24	29	52	42	12	6	39	02	16	22	47
	27	5	56	25	7	24	43	6	21	12	30	04	15	6	24	29	52	42	15	6	39	02	16	22	47
Dec.	7	5	56	25	7	24	42	6	21	13	30	04	18	6	24	29	52	42	19	6	39	03	16	22	46
	17	5	56	26	7	24	41	6	21	13	30	04	20	6	24	30	52	42	22	6	39	03	16	22	45
	27	5	56	26	+7	24	40	6	21	13	-30	04	24	6	24	30	-52	42	26	6	39	03	+16	22	45
	37	5	56	26	+7	24	39	6	21	13	-30	04	26	6	24	30	-52	42	29	6	39	03	+16	22	44

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		α Canis Majoris A						o² Canis Majoris						β Canis Minoris						α Canis Minoris A					
Mag. Spect.		-1.46			A0m A1 Va			3.02			B3 Ia			2.90			B8 V			0.38			F5 IV-V		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	6	46	08	-16	44	49	7	03	57	-23	51	55	7	28	21	+8	14	40	7	40	28	+5	10	05
	11	6	46	08	16	44	51	7	03	57	23	51	58	7	28	21	8	14	39	7	40	28	5	10	04
	21	6	46	08	16	44	53	7	03	58	23	52	00	7	28	21	8	14	38	7	40	28	5	10	03
	31	6	46	08	16	44	55	7	03	58	23	52	03	7	28	21	8	14	37	7	40	28	5	10	02
Feb.	10	6	46	08	16	44	56	7	03	57	23	52	05	7	28	21	8	14	37	7	40	28	5	10	01
	20	6	46	08	16	44	58	7	03	57	23	52	06	7	28	21	8	14	37	7	40	28	5	10	01
Mar.	2	6	46	07	-16	44	59	7	03	57	-23	52	08	7	28	21	+8	14	36	7	40	28	+5	10	00
	12	6	46	07	16	44	59	7	03	57	23	52	09	7	28	21	8	14	36	7	40	28	5	10	00
	22	6	46	07	16	44	60	7	03	57	23	52	09	7	28	21	8	14	36	7	40	27	5	10	00
Apr.	1	6	46	07	16	44	60	7	03	57	23	52	09	7	28	21	8	14	36	7	40	27	5	10	00
	11	6	46	07	16	44	59	7	03	56	23	52	09	7	28	21	8	14	37	7	40	27	5	10	00
	21	6	46	07	16	44	59	7	03	56	23	52	09	7	28	20	8	14	37	7	40	27	5	10	01
May	1	6	46	06	-16	44	58	7	03	56	-23	52	08	7	28	20	+8	14	37	7	40	27	+5	10	01
	11	6	46	06	16	44	57	7	03	56	23	52	07	7	28	20	8	14	38	7	40	27	5	10	02
	21	6	46	06	16	44	55	7	03	56	23	52	05	7	28	20	8	14	38	7	40	27	5	10	02
	31	6	46	06	16	44	54	7	03	56	23	52	03	7	28	20	8	14	39	7	40	27	5	10	03
June	10	6	46	06	16	44	51	7	03	56	23	52	01	7	28	20	8	14	40	7	40	27	5	10	04
	20	6	46	06	16	44	50	7	03	56	23	51	59	7	28	20	8	14	40	7	40	27	5	10	04
	30	6	46	06	-16	44	48	7	03	56	-23	51	57	7	28	20	+8	14	41	7	40	27	+5	10	05
July	10	6	46	06	16	44	45	7	03	56	23	51	54	7	28	20	8	14	42	7	40	27	5	10	06
	20	6	46	07	16	44	43	7	03	56	23	51	52	7	28	20	8	14	42	7	40	27	5	10	07
	30	6	46	07	16	44	41	7	03	56	23	51	50	7	28	20	8	14	43	7	40	27	5	10	08
Aug.	9	6	46	07	16	44	40	7	03	56	23	51	47	7	28	21	8	14	44	7	40	27	5	10	08
	19	6	46	07	16	44	38	7	03	56	23	51	45	7	28	21	8	14	44	7	40	27	5	10	09
	29	6	46	07	-16	44	36	7	03	57	-23	51	44	7	28	21	+8	14	44	7	40	28	+5	10	09
Sept.	8	6	46	08	16	44	36	7	03	57	23	51	43	7	28	21	8	14	44	7	40	28	5	10	09
	18	6	46	08	16	44	35	7	03	57	23	51	42	7	28	22	8	14	44	7	40	28	5	10	09
	28	6	46	08	16	44	35	7	03	58	23	51	41	7	28	22	8	14	44	7	40	28	5	10	09
Oct.	8	6	46	09	16	44	35	7	03	58	23	51	41	7	28	22	8	14	44	7	40	29	5	10	08
	18	6	46	09	16	44	36	7	03	58	23	51	42	7	28	22	8	14	43	7	40	29	5	10	08
	28	6	46	09	-16	44	37	7	03	58	-23	51	43	7	28	23	+8	14	42	7	40	29	+5	10	07
Nov.	7	6	46	09	16	44	39	7	03	59	23	51	45	7	28	23	8	14	41	7	40	30	5	10	05
	17	6	46	10	16	44	41	7	03	59	23	51	47	7	28	23	8	14	40	7	40	30	5	10	04
	27	6	46	10	16	44	43	7	03	59	23	51	50	7	28	24	8	14	38	7	40	30	5	10	02
Dec.	7	6	46	10	16	44	46	7	03	60	23	51	52	7	28	24	8	14	37	7	40	30	5	10	01
	17	6	46	10	16	44	48	7	03	60	23	51	55	7	28	24	8	14	36	7	40	31	5	09	59
	27	6	46	11	-16	44	50	7	04	00	-23	51	58	7	28	24	+8	14	34	7	40	31	+5	09	58
	37	6	46	11	-16	44	53	7	04	00	-23	52	00	7	28	25	+8	14	33	7	40	31	+5	09	56

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		β Geminorum						ξ Puppis						ρ Puppis						ζ Hydrae					
Mag. Spect.		1.14			K0 IIIb			3.34			G6 Iab-Ib			2.81			F5 (Ib-II)p			3.11			G9 IIIa		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	7	46	40	+27	58	19	7	50	14	-24	54	51	8	08	30	-24	21	60	8	56	34	+5	51	42
	11	7	46	40	27	58	19	7	50	14	24	54	54	8	08	30	24	22	03	8	56	34	5	51	41
	21	7	46	40	27	58	19	7	50	14	24	54	56	8	08	30	24	22	05	8	56	34	5	51	40
	31	7	46	40	27	58	20	7	50	14	24	54	59	8	08	30	24	22	08	8	56	34	5	51	38
Feb.	10	7	46	40	27	58	20	7	50	14	24	55	01	8	08	30	24	22	10	8	56	34	5	51	38
	20	7	46	40	27	58	21	7	50	14	24	55	03	8	08	30	24	22	12	8	56	34	5	51	37
Mar.	2	7	46	40	+27	58	22	7	50	14	-24	55	05	8	08	30	-24	22	14	8	56	34	+5	51	37
	12	7	46	40	27	58	22	7	50	14	24	55	06	8	08	30	24	22	16	8	56	34	5	51	36
	22	7	46	40	27	58	23	7	50	14	24	55	07	8	08	29	24	22	17	8	56	34	5	51	36
Apr.	1	7	46	40	27	58	24	7	50	13	24	55	08	8	08	29	24	22	17	8	56	34	5	51	37
	11	7	46	40	27	58	24	7	50	13	24	55	08	8	08	29	24	22	18	8	56	34	5	51	37
	21	7	46	40	27	58	24	7	50	13	24	55	08	8	08	29	24	22	18	8	56	34	5	51	37
May	1	7	46	39	+27	58	25	7	50	13	-24	55	07	8	08	29	-24	22	17	8	56	33	+5	51	38
	11	7	46	39	27	58	25	7	50	13	24	55	06	8	08	28	24	22	17	8	56	33	5	51	38
	21	7	46	39	27	58	24	7	50	13	24	55	05	8	08	28	24	22	16	8	56	33	5	51	38
	31	7	46	39	27	58	24	7	50	12	24	55	04	8	08	28	24	22	14	8	56	33	5	51	39
June	10	7	46	39	27	58	24	7	50	12	24	55	02	8	08	28	24	22	12	8	56	33	5	51	40
	20	7	46	39	27	58	24	7	50	12	24	54	60	8	08	28	24	22	11	8	56	33	5	51	40
	30	7	46	39	+27	58	23	7	50	12	-24	54	58	8	08	28	-24	22	09	8	56	33	+5	51	41
July	10	7	46	39	27	58	23	7	50	12	24	54	55	8	08	28	24	22	06	8	56	33	5	51	42
	20	7	46	39	27	58	22	7	50	12	24	54	53	8	08	28	24	22	04	8	56	33	5	51	42
	30	7	46	39	27	58	22	7	50	13	24	54	51	8	08	28	24	22	02	8	56	33	5	51	43
Aug.	9	7	46	40	27	58	21	7	50	13	24	54	49	8	08	28	24	21	60	8	56	33	5	51	43
	19	7	46	40	27	58	21	7	50	13	24	54	47	8	08	29	24	21	58	8	56	33	5	51	43
	29	7	46	40	+27	58	20	7	50	13	-24	54	45	8	08	29	-24	21	56	8	56	34	+5	51	44
Sept.	8	7	46	40	27	58	19	7	50	13	24	54	44	8	08	29	24	21	55	8	56	34	5	51	43
	18	7	46	41	27	58	18	7	50	14	24	54	43	8	08	29	24	21	54	8	56	34	5	51	43
	28	7	46	41	27	58	17	7	50	14	24	54	42	8	08	29	24	21	53	8	56	34	5	51	43
Oct.	8	7	46	41	27	58	16	7	50	14	24	54	42	8	08	30	24	21	53	8	56	34	5	51	42
	18	7	46	42	27	58	15	7	50	14	24	54	43	8	08	30	24	21	53	8	56	35	5	51	41
	28	7	46	42	+27	58	15	7	50	15	-24	54	43	8	08	30	-24	21	54	8	56	35	+5	51	40
Nov.	7	7	46	42	27	58	14	7	50	15	24	54	45	8	08	31	24	21	56	8	56	35	5	51	39
	17	7	46	43	27	58	13	7	50	15	24	54	47	8	08	31	24	21	57	8	56	36	5	51	37
	27	7	46	43	27	58	12	7	50	16	24	54	49	8	08	31	24	21	60	8	56	36	5	51	35
Dec.	7	7	46	43	27	58	12	7	50	16	24	54	52	8	08	32	24	22	02	8	56	36	5	51	33
	17	7	46	44	27	58	11	7	50	16	24	54	54	8	08	32	24	22	05	8	56	37	5	51	32
	27	7	46	44	+27	58	11	7	50	16	-24	54	57	8	08	32	-24	22	08	8	56	37	+5	51	30
	37	7	46	44	+27	58	11	7	50	17	-24	55	00	8	08	32	-24	22	11	8	56	37	+5	51	28

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FOR 0^h TERRESTRIAL TIME

Name		λ Velorum						α Hydrae						α Leonis						α Antliae					
Mag. Spect.		2.21			K4.5 Ib			1.98			K3 II-III			1.35			B7 Vn			4.25			K4.5 III		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	9	08	49	-43	31	05	9	28	40	-8	45	10	10	09	32	+11	51	34	10	28	10	-31	10	35
	11	9	08	49	43	31	09	9	28	41	8	45	12	10	09	33	11	51	33	10	28	10	31	10	38
	21	9	08	49	43	31	12	9	28	41	8	45	15	10	09	33	11	51	31	10	28	10	31	10	41
	31	9	08	50	43	31	16	9	28	41	8	45	17	10	09	33	11	51	30	10	28	10	31	10	44
Feb.	10	9	08	50	43	31	19	9	28	41	8	45	18	10	09	33	11	51	30	10	28	11	31	10	47
	20	9	08	50	43	31	22	9	28	41	8	45	20	10	09	33	11	51	29	10	28	11	31	10	50
Mar.	2	9	08	50	-43	31	25	9	28	41	-8	45	21	10	09	34	+11	51	29	10	28	11	-31	10	52
	12	9	08	49	43	31	28	9	28	41	8	45	22	10	09	34	11	51	29	10	28	11	31	10	55
	22	9	08	49	43	31	30	9	28	41	8	45	23	10	09	33	11	51	30	10	28	11	31	10	57
Apr.	1	9	08	49	43	31	32	9	28	41	8	45	24	10	09	33	11	51	30	10	28	11	31	10	59
	11	9	08	49	43	31	33	9	28	41	8	45	24	10	09	33	11	51	30	10	28	10	31	11	00
	21	9	08	49	43	31	34	9	28	41	8	45	24	10	09	33	11	51	31	10	28	10	31	11	01
May	1	9	08	48	-43	31	34	9	28	40	-8	45	24	10	09	33	+11	51	32	10	28	10	-31	11	02
	11	9	08	48	43	31	34	9	28	40	8	45	24	10	09	33	11	51	32	10	28	10	31	11	03
	21	9	08	48	43	31	34	9	28	40	8	45	23	10	09	33	11	51	33	10	28	10	31	11	03
	31	9	08	48	43	31	33	9	28	40	8	45	22	10	09	33	11	51	33	10	28	10	31	11	03
June	10	9	08	48	43	31	32	9	28	40	8	45	21	10	09	33	11	51	34	10	28	10	31	11	02
	20	9	08	47	43	31	30	9	28	40	8	45	21	10	09	33	11	51	34	10	28	09	31	11	01
	30	9	08	47	-43	31	28	9	28	40	-8	45	19	10	09	33	+11	51	35	10	28	09	-31	10	60
July	10	9	08	47	43	31	26	9	28	40	8	45	18	10	09	32	11	51	35	10	28	09	31	10	58
	20	9	08	47	43	31	23	9	28	40	8	45	17	10	09	32	11	51	35	10	28	09	31	10	57
	30	9	08	47	43	31	20	9	28	40	8	45	16	10	09	32	11	51	35	10	28	09	31	10	55
Aug.	9	9	08	47	43	31	18	9	28	40	8	45	15	10	09	32	11	51	35	10	28	09	31	10	53
	19	9	08	47	43	31	15	9	28	40	8	45	13	10	09	33	11	51	35	10	28	09	31	10	51
	29	9	08	47	-43	31	12	9	28	40	-8	45	13	10	09	33	+11	51	35	10	28	09	-31	10	49
Sept.	8	9	08	48	43	31	10	9	28	40	8	45	12	10	09	33	11	51	34	10	28	09	31	10	47
	18	9	08	48	43	31	08	9	28	40	8	45	11	10	09	33	11	51	33	10	28	09	31	10	45
	28	9	08	48	43	31	07	9	28	41	8	45	11	10	09	33	11	51	32	10	28	09	31	10	44
Oct.	8	9	08	48	43	31	06	9	28	41	8	45	11	10	09	33	11	51	31	10	28	10	31	10	43
	18	9	08	49	43	31	05	9	28	41	8	45	12	10	09	34	11	51	29	10	28	10	31	10	43
	28	9	08	49	-43	31	05	9	28	41	-8	45	13	10	09	34	+11	51	28	10	28	10	-31	10	42
Nov.	7	9	08	49	43	31	06	9	28	42	8	45	14	10	09	34	11	51	26	10	28	11	31	10	43
	17	9	08	50	43	31	08	9	28	42	8	45	16	10	09	34	11	51	24	10	28	11	31	10	44
	27	9	08	50	43	31	10	9	28	42	8	45	18	10	09	35	11	51	22	10	28	11	31	10	46
Dec.	7	9	08	51	43	31	12	9	28	43	8	45	20	10	09	35	11	51	21	10	28	12	31	10	47
	17	9	08	51	43	31	15	9	28	43	8	45	22	10	09	35	11	51	19	10	28	12	31	10	50
	27	9	08	51	-43	31	18	9	28	43	-8	45	25	10	09	36	+11	51	17	10	28	12	-31	10	52
	37	9	08	51	-43	31	21	9	28	44	-8	45	27	10	09	36	+11	51	15	10	28	13	-31	10	55

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FOR 0^h TERRESTRIAL TIME

Name	ν Hydrae						ξ Hydrae						β Leonis						γ Corvi					
Mag. Spect.	3.11			K1.5 IIIb Hδ-0.5			3.54			G7 III			2.14			A3 Va			2.59			B8p Hg Mn		
U.T.	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan. 1	10	50	42	-16	18	23	11	34	05	-31	58	31	11	50	10	+14	26	56	12	16	56	-17	39	40
11	10	50	43	16	18	25	11	34	05	31	58	34	11	50	11	14	26	54	12	16	56	17	39	42
21	10	50	43	16	18	28	11	34	05	31	58	36	11	50	11	14	26	52	12	16	56	17	39	45
31	10	50	43	16	18	31	11	34	06	31	58	39	11	50	11	14	26	51	12	16	57	17	39	47
Feb. 10	10	50	43	16	18	33	11	34	06	31	58	42	11	50	11	14	26	50	12	16	57	17	39	49
20	10	50	44	16	18	35	11	34	06	31	58	45	11	50	12	14	26	50	12	16	57	17	39	52
Mar. 2	10	50	44	-16	18	37	11	34	06	-31	58	48	11	50	12	+14	26	50	12	16	57	-17	39	54
12	10	50	44	16	18	39	11	34	06	31	58	50	11	50	12	14	26	50	12	16	57	17	39	55
22	10	50	44	16	18	40	11	34	06	31	58	53	11	50	12	14	26	50	12	16	57	17	39	57
Apr. 1	10	50	44	16	18	41	11	34	06	31	58	55	11	50	12	14	26	51	12	16	58	17	39	58
11	10	50	44	16	18	42	11	34	06	31	58	57	11	50	12	14	26	51	12	16	58	17	39	59
21	10	50	43	16	18	43	11	34	06	31	58	58	11	50	12	14	26	52	12	16	58	17	40	00
May 1	10	50	43	-16	18	43	11	34	06	-31	58	59	11	50	12	+14	26	53	12	16	57	-17	40	01
11	10	50	43	16	18	43	11	34	06	31	59	00	11	50	12	14	26	54	12	16	57	17	40	01
21	10	50	43	16	18	43	11	34	06	31	59	01	11	50	12	14	26	55	12	16	57	17	40	02
31	10	50	43	16	18	43	11	34	06	31	59	01	11	50	12	14	26	56	12	16	57	17	40	01
June 10	10	50	43	16	18	42	11	34	06	31	59	01	11	50	12	14	26	57	12	16	57	17	40	01
20	10	50	43	16	18	41	11	34	06	31	59	01	11	50	12	14	26	57	12	16	57	17	40	01
30	10	50	43	-16	18	40	11	34	05	-31	58	60	11	50	11	+14	26	58	12	16	57	-17	40	01
July 10	10	50	43	16	18	39	11	34	05	31	58	59	11	50	11	14	26	58	12	16	57	17	39	60
20	10	50	43	16	18	38	11	34	05	31	58	58	11	50	11	14	26	58	12	16	57	17	39	59
30	10	50	43	16	18	37	11	34	05	31	58	56	11	50	11	14	26	58	12	16	57	17	39	58
Aug. 9	10	50	43	16	18	36	11	34	05	31	58	55	11	50	11	14	26	58	12	16	57	17	39	57
19	10	50	43	16	18	34	11	34	05	31	58	53	11	50	11	14	26	58	12	16	57	17	39	56
29	10	50	43	-16	18	33	11	34	05	-31	58	51	11	50	11	+14	26	57	12	16	56	-17	39	55
Sept. 8	10	50	43	16	18	32	11	34	05	31	58	49	11	50	11	14	26	56	12	16	56	17	39	54
18	10	50	43	16	18	31	11	34	05	31	58	48	11	50	11	14	26	55	12	16	56	17	39	53
28	10	50	43	16	18	31	11	34	05	31	58	46	11	50	11	14	26	54	12	16	56	17	39	53
Oct. 8	10	50	43	16	18	30	11	34	05	31	58	45	11	50	11	14	26	52	12	16	57	17	39	52
18	10	50	43	16	18	31	11	34	05	31	58	44	11	50	11	14	26	51	12	16	57	17	39	52
28	10	50	43	-16	18	31	11	34	06	-31	58	44	11	50	12	+14	26	49	12	16	57	-17	39	52
Nov. 7	10	50	44	16	18	32	11	34	06	31	58	44	11	50	12	14	26	47	12	16	57	-17	39	53
17	10	50	44	16	18	33	11	34	06	31	58	44	11	50	12	14	26	44	12	16	57	17	39	54
27	10	50	44	16	18	35	11	34	07	31	58	45	11	50	12	14	26	42	12	16	58	17	39	55
Dec. 7	10	50	45	16	18	37	11	34	07	31	58	47	11	50	13	14	26	40	12	16	58	17	39	57
17	10	50	45	16	18	39	11	34	07	31	58	49	11	50	13	14	26	37	12	16	58	17	39	58
27	10	50	45	-16	18	41	11	34	08	-31	58	51	11	50	13	+14	26	35	12	16	59	-17	40	01
37	10	50	46	-16	18	44	11	34	08	-31	58	53	11	50	14	+14	26	33	12	16	59	-17	40	03

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		β Corvi						δ Virginis						ε Virginis						ι Centauri					
Mag. Spect.		2.65			G5 Iib			3.38			$M3^+III$			2.83			G8 IIIab			2.75			A2 Va		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	12	35	32	-23	30	53	12	56	42	+3	16	44	13	03	15	+10	50	28	13	21	49	-36	49	25
	11	12	35	32	23	30	56	12	56	42	3	16	42	13	03	16	10	50	26	13	21	49	36	49	27
	21	12	35	33	23	30	58	12	56	42	3	16	40	13	03	16	10	50	24	13	21	50	36	49	29
	31	12	35	33	23	31	01	12	56	43	3	16	38	13	03	16	10	50	22	13	21	50	36	49	31
Feb.	10	12	35	33	23	31	03	12	56	43	3	16	36	13	03	17	10	50	21	13	21	50	36	49	33
	20	12	35	33	23	31	05	12	56	43	3	16	35	13	03	17	10	50	20	13	21	51	36	49	36
Mar.	2	12	35	34	-23	31	08	12	56	44	+3	16	34	13	03	17	+10	50	19	13	21	51	-36	49	39
	12	12	35	34	23	31	10	12	56	44	3	16	34	13	03	17	10	50	19	13	21	51	36	49	41
	22	12	35	34	23	31	11	12	56	44	3	16	33	13	03	17	10	50	20	13	21	51	36	49	43
Apr.	1	12	35	34	23	31	13	12	56	44	3	16	33	13	03	18	10	50	20	13	21	52	36	49	46
	11	12	35	34	23	31	15	12	56	44	3	16	33	13	03	18	10	50	20	13	21	52	36	49	48
	21	12	35	34	23	31	16	12	56	44	3	16	34	13	03	18	10	50	21	13	21	52	36	49	50
May	1	12	35	34	-23	31	17	12	56	44	+3	16	34	13	03	18	+10	50	22	13	21	52	-36	49	52
	11	12	35	34	23	31	18	12	56	44	3	16	35	13	03	18	10	50	23	13	21	52	36	49	53
	21	12	35	34	23	31	18	12	56	44	3	16	35	13	03	18	10	50	24	13	21	52	36	49	55
	31	12	35	34	23	31	18	12	56	44	3	16	36	13	03	18	10	50	25	13	21	52	36	49	56
June	10	12	35	34	23	31	18	12	56	44	3	16	37	13	03	17	10	50	26	13	21	52	36	49	56
	20	12	35	34	23	31	18	12	56	44	3	16	37	13	03	17	10	50	27	13	21	52	36	49	57
	30	12	35	33	-23	31	18	12	56	44	+3	16	38	13	03	17	+10	50	28	13	21	51	-36	49	57
July	10	12	35	33	23	31	17	12	56	44	3	16	39	13	03	17	10	50	28	13	21	51	36	49	57
	20	12	35	33	23	31	17	12	56	43	3	16	39	13	03	17	10	50	29	13	21	51	36	49	57
	30	12	35	33	23	31	16	12	56	43	3	16	40	13	03	17	10	50	29	13	21	51	36	49	56
Aug.	9	12	35	33	23	31	15	12	56	43	3	16	40	13	03	17	10	50	29	13	21	51	36	49	55
	19	12	35	33	23	31	13	12	56	43	3	16	40	13	03	17	10	50	29	13	21	51	36	49	54
	29	12	35	33	-23	31	12	12	56	43	+3	16	40	13	03	17	+10	50	28	13	21	51	-36	49	52
Sept.	8	12	35	33	23	31	11	12	56	43	3	16	40	13	03	17	10	50	28	13	21	50	36	49	51
	18	12	35	33	23	31	10	12	56	43	3	16	40	13	03	17	10	50	27	13	21	50	36	49	49
	28	12	35	33	23	31	09	12	56	43	3	16	39	13	03	17	10	50	26	13	21	50	36	49	48
Oct.	8	12	35	33	23	31	08	12	56	43	3	16	38	13	03	17	10	50	25	13	21	50	36	49	46
	18	12	35	33	23	31	08	12	56	43	3	16	37	13	03	17	10	50	23	13	21	50	36	49	45
	28	12	35	33	-23	31	08	12	56	43	+3	16	36	13	03	17	+10	50	22	13	21	50	-36	49	44
Nov.	7	12	35	33	23	31	08	12	56	43	3	16	34	13	03	17	10	50	19	13	21	51	36	49	43
	17	12	35	34	23	31	08	12	56	44	3	16	32	13	03	17	10	50	17	13	21	51	36	49	43
	27	12	35	34	23	31	09	12	56	44	3	16	30	13	03	17	10	50	15	13	21	51	36	49	43
Dec.	7	12	35	34	23	31	10	12	56	44	3	16	28	13	03	18	10	50	13	13	21	52	36	49	43
	17	12	35	35	23	31	12	12	56	45	3	16	26	13	03	18	10	50	10	13	21	52	36	49	44
	27	12	35	35	-23	31	14	12	56	45	+3	16	23	13	03	18	+10	50	08	13	21	52	-36	49	45
	37	12	35	35	-23	31	16	12	56	45	+3	16	21	13	03	19	+10	50	05	13	21	53	-36	49	47

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name	α Virginis						θ Centauri						α^2 Librae						β Lupi					
Mag. Spect.	0.98			B1 V			2.06			K0$^-$ IIIb			2.75			A3 III-IV			2.68			B2 IV		
U.T.	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan. 1	13	26	20	-11	16	26	14	07	57	-36	28	25	14	52	04	-16	07	50	14	59	57	-43	13	04
11	13	26	20	11	16	28	14	07	58	36	28	26	14	52	05	16	07	52	14	59	57	43	13	05
21	13	26	21	11	16	30	14	07	58	36	28	28	14	52	05	16	07	54	14	59	57	43	13	06
31	13	26	21	11	16	32	14	07	58	36	28	30	14	52	05	16	07	55	14	59	58	43	13	07
Feb. 10	13	26	21	11	16	34	14	07	59	36	28	32	14	52	06	16	07	57	14	59	58	43	13	08
20	13	26	22	11	16	36	14	07	59	36	28	34	14	52	06	16	07	59	14	59	59	43	13	10
Mar. 2	13	26	22	-11	16	37	14	07	59	-36	28	36	14	52	06	-16	08	00	14	59	59	-43	13	12
12	13	26	22	11	16	38	14	07	60	36	28	39	14	52	06	16	08	01	14	59	59	43	13	14
22	13	26	22	11	16	40	14	07	60	36	28	41	14	52	07	16	08	02	14	59	60	43	13	16
Apr. 1	13	26	22	11	16	41	14	08	00	36	28	43	14	52	07	16	08	04	14	59	60	43	13	18
11	13	26	22	11	16	41	14	08	00	36	28	45	14	52	07	16	08	04	15	00	00	43	13	20
21	13	26	23	11	16	42	14	08	00	36	28	47	14	52	07	16	08	05	15	00	00	43	13	22
May 1	13	26	23	-11	16	42	14	08	01	-36	28	49	14	52	07	-16	08	05	15	00	01	-43	13	24
11	13	26	23	11	16	42	14	08	01	36	28	50	14	52	07	16	08	06	15	00	01	43	13	26
21	13	26	23	11	16	42	14	08	01	36	28	52	14	52	08	16	08	06	15	00	01	43	13	28
31	13	26	23	11	16	42	14	08	01	36	28	53	14	52	08	16	08	06	15	00	01	43	13	29
June 10	13	26	22	11	16	42	14	08	01	36	28	54	14	52	08	16	08	06	15	00	01	43	13	31
20	13	26	22	11	16	42	14	08	01	36	28	55	14	52	08	16	08	06	15	00	01	43	13	32
30	13	26	22	-11	16	41	14	08	00	-36	28	55	14	52	08	-16	08	06	15	00	01	-43	13	33
July 10	13	26	22	11	16	40	14	08	00	36	28	55	14	52	07	16	08	05	15	00	01	43	13	34
20	13	26	22	11	16	40	14	08	00	36	28	55	14	52	07	16	08	05	15	00	01	43	13	35
30	13	26	22	11	16	40	14	07	60	36	28	55	14	52	07	16	08	05	15	00	00	43	13	35
Aug. 9	13	26	22	11	16	39	14	07	60	36	28	54	14	52	07	16	08	04	15	00	00	43	13	34
19	13	26	22	11	16	38	14	07	60	36	28	53	14	52	07	16	08	04	14	59	60	43	13	34
29	13	26	22	-11	16	38	14	07	59	-36	28	53	14	52	07	-16	08	04	14	59	60	-43	13	34
Sept. 8	13	26	22	11	16	37	14	07	59	36	28	51	14	52	07	16	08	03	14	59	60	43	13	33
18	13	26	22	11	16	37	14	07	59	36	28	50	14	52	07	16	08	03	14	59	59	43	13	31
28	13	26	22	11	16	37	14	07	59	36	28	49	14	52	06	16	08	02	14	59	59	43	13	30
Oct. 8	13	26	22	11	16	37	14	07	59	36	28	47	14	52	06	16	08	02	14	59	59	43	13	29
18	13	26	22	11	16	37	14	07	59	36	28	46	14	52	06	16	08	02	14	59	59	43	13	27
28	13	26	22	-11	16	37	14	07	59	-36	28	45	14	52	06	-16	08	02	14	59	59	-43	13	25
Nov. 7	13	26	22	11	16	38	14	07	59	36	28	44	14	52	06	16	08	02	14	59	59	43	13	24
17	13	26	22	11	16	39	14	07	60	36	28	43	14	52	07	16	08	03	14	59	59	43	13	23
27	13	26	22	11	16	40	14	07	60	36	28	43	14	52	07	16	08	03	14	59	60	43	13	22
Dec. 7	13	26	23	11	16	42	14	08	00	36	28	43	14	52	07	16	08	04	14	59	60	43	13	21
17	13	26	23	11	16	44	14	08	00	36	28	44	14	52	07	16	08	06	15	00	00	43	13	21
27	13	26	23	-11	16	46	14	08	01	-36	28	45	14	52	08	-16	08	07	15	00	01	-43	13	21
37	13	26	24	-11	16	48	14	08	01	-36	28	46	14	52	08	-16	08	08	15	00	01	-43	13	21

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		β Librae						α Serpentis						δ Scorpii						δ Ophiuchi					
Mag. Spect.		2.61			B8 IIIn			2.65			K2 IIIb CN I			2.32			B0.3 IV			2.74			M0.5 III		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	15	18	10	-9	27	44	15	45	19	+6	21	25	16	01	36	-22	40	55	16	15	28	-3	44	60
	11	15	18	10	9	27	46	15	45	20	6	21	22	16	01	36	22	40	56	16	15	28	3	45	02
	21	15	18	10	9	27	48	15	45	20	6	21	20	16	01	37	22	40	57	16	15	29	3	45	03
	31	15	18	11	9	27	49	15	45	20	6	21	18	16	01	37	22	40	58	16	15	29	3	45	05
Feb.	10	15	18	11	9	27	51	15	45	21	6	21	17	16	01	37	22	40	57	16	15	29	3	45	06
	20	15	18	11	9	27	52	15	45	21	6	21	16	16	01	38	22	40	59	16	15	30	3	45	08
Mar.	2	15	18	12	-9	27	54	15	45	21	+6	21	15	16	01	38	-22	41	02	16	15	30	-3	45	09
	12	15	18	12	9	27	54	15	45	21	6	21	14	16	01	38	22	41	01	16	15	30	3	45	09
	22	15	18	12	9	27	55	15	45	22	6	21	14	16	01	39	22	41	02	16	15	30	3	45	10
Apr.	1	15	18	12	9	27	56	15	45	22	6	21	14	16	01	39	22	41	03	16	15	31	3	45	10
	11	15	18	13	9	27	56	15	45	22	6	21	15	16	01	39	22	41	03	16	15	31	3	45	10
	21	15	18	13	9	27	56	15	45	22	6	21	15	16	01	40	22	41	04	16	15	31	3	45	09
May	1	15	18	13	-9	27	56	15	45	23	+6	21	16	16	01	40	-22	41	07	16	15	31	-3	45	09
	11	15	18	13	9	27	56	15	45	23	6	21	17	16	01	40	22	41	05	16	15	32	3	45	08
	21	15	18	13	9	27	56	15	45	23	6	21	19	16	01	40	22	41	06	16	15	32	3	45	08
	31	15	18	13	9	27	56	15	45	23	6	21	20	16	01	40	22	41	06	16	15	32	3	45	07
June	10	15	18	13	9	27	55	15	45	23	6	21	21	16	01	40	22	41	06	16	15	32	3	45	06
	20	15	18	13	9	27	55	15	45	23	6	21	22	16	01	40	22	41	07	16	15	32	3	45	05
	30	15	18	13	-9	27	54	15	45	23	+6	21	23	16	01	40	-22	41	09	16	15	32	-3	45	04
July	10	15	18	13	9	27	54	15	45	23	6	21	25	16	01	40	22	41	07	16	15	32	3	45	04
	20	15	18	13	9	27	54	15	45	23	6	21	25	16	01	40	22	41	07	16	15	32	3	45	03
	30	15	18	13	9	27	53	15	45	23	6	21	26	16	01	40	22	41	07	16	15	32	3	45	03
Aug.	9	15	18	13	9	27	53	15	45	23	6	21	27	16	01	40	22	41	07	16	15	32	3	45	02
	19	15	18	13	9	27	53	15	45	22	6	21	27	16	01	40	22	41	07	16	15	31	3	45	02
	29	15	18	13	-9	27	52	15	45	22	+6	21	27	16	01	40	-22	41	09	16	15	31	-3	45	02
Sept.	8	15	18	13	9	27	52	15	45	22	6	21	27	16	01	40	22	41	06	16	15	31	3	45	01
	18	15	18	12	9	27	52	15	45	22	6	21	27	16	01	39	22	41	06	16	15	31	3	45	01
	28	15	18	12	9	27	52	15	45	22	6	21	26	16	01	39	22	41	05	16	15	31	3	45	02
Oct.	8	15	18	12	9	27	52	15	45	22	6	21	25	16	01	39	22	41	05	16	15	31	3	45	02
	18	15	18	12	9	27	52	15	45	22	6	21	25	16	01	39	22	41	05	16	15	31	3	45	02
	28	15	18	12	-9	27	52	15	45	22	+6	21	24	16	01	39	-22	41	06	16	15	31	-3	45	03
Nov.	7	15	18	12	9	27	53	15	45	22	6	21	22	16	01	39	22	41	04	16	15	31	3	45	04
	17	15	18	12	9	27	54	15	45	22	6	21	20	16	01	39	22	41	04	16	15	31	3	45	05
	27	15	18	12	9	27	55	15	45	22	6	21	18	16	01	39	22	41	04	16	15	31	3	45	06
Dec.	7	15	18	13	9	27	56	15	45	22	6	21	16	16	01	39	22	41	04	16	15	31	3	45	07
	17	15	18	13	9	27	58	15	45	22	6	21	14	16	01	39	22	41	05	16	15	31	3	45	09
	27	15	18	13	-9	27	59	15	45	22	+6	21	12	16	01	40	-22	41	08	16	15	31	-3	45	11
	37	15	18	13	-9	28	01	15	45	23	+6	21	10	16	01	40	-22	41	06	16	15	32	-3	45	12

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		α Scorpii A						ζ Ophiuchi						ε Scorpii						θ Ophiuchi					
Mag. Spect.		0.9 - 1.8			M1.5 Iab-Ib			2.56			O9.5 Vn			2.29			K2 III			3.27			B2 IV		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	16	30	43	-26	28	42	16	38	20	-10	36	37	16	51	33	-34	19	50	17	23	19	-25	01	12
	11	16	30	43	26	28	43	16	38	20	10	36	39	16	51	33	34	19	51	17	23	19	25	01	12
	21	16	30	44	26	28	44	16	38	21	10	36	40	16	51	34	34	19	51	17	23	20	25	01	13
	31	16	30	44	26	28	44	16	38	21	10	36	41	16	51	34	34	19	51	17	23	20	25	01	13
Feb.	10	16	30	45	26	28	45	16	38	21	10	36	42	16	51	34	34	19	51	17	23	20	25	01	14
	20	16	30	45	26	28	46	16	38	22	10	36	44	16	51	35	34	19	52	17	23	21	25	01	14
Mar.	2	16	30	45	-26	28	47	16	38	22	-10	36	45	16	51	35	-34	19	53	17	23	21	-25	01	15
	12	16	30	46	26	28	48	16	38	22	10	36	45	16	51	35	34	19	53	17	23	21	25	01	15
	22	16	30	46	26	28	49	16	38	23	10	36	46	16	51	36	34	19	54	17	23	22	25	01	15
Apr.	1	16	30	46	26	28	50	16	38	23	10	36	46	16	51	36	34	19	55	17	23	22	25	01	16
	11	16	30	46	26	28	50	16	38	23	10	36	46	16	51	36	34	19	56	17	23	22	25	01	16
	21	16	30	47	26	28	51	16	38	23	10	36	46	16	51	37	34	19	57	17	23	23	25	01	16
May	1	16	30	47	-26	28	52	16	38	24	-10	36	46	16	51	37	-34	19	57	17	23	23	-25	01	17
	11	16	30	47	26	28	52	16	38	24	10	36	46	16	51	37	34	19	58	17	23	23	25	01	17
	21	16	30	47	26	28	53	16	38	24	10	36	45	16	51	37	34	19	59	17	23	23	25	01	17
	31	16	30	48	26	28	53	16	38	24	10	36	44	16	51	38	34	20	00	17	23	24	25	01	17
June	10	16	30	48	26	28	54	16	38	24	10	36	44	16	51	38	34	20	01	17	23	24	25	01	17
	20	16	30	48	26	28	54	16	38	24	10	36	44	16	51	38	34	20	02	17	23	24	25	01	18
	30	16	30	48	-26	28	55	16	38	24	-10	36	43	16	51	38	-34	20	03	17	23	24	-25	01	18
July	10	16	30	48	26	28	55	16	38	24	10	36	43	16	51	38	34	20	03	17	23	24	25	01	18
	20	16	30	48	26	28	55	16	38	24	10	36	42	16	51	38	34	20	04	17	23	24	25	01	19
	30	16	30	48	26	28	55	16	38	24	10	36	42	16	51	38	34	20	05	17	23	24	25	01	19
Aug.	9	16	30	47	26	28	55	16	38	24	10	36	42	16	51	38	34	20	05	17	23	24	25	01	19
	19	16	30	47	26	28	56	16	38	24	10	36	41	16	51	37	34	20	06	17	23	24	25	01	19
	29	16	30	47	-26	28	56	16	38	24	-10	36	41	16	51	37	-34	20	06	17	23	24	-25	01	19
Sept.	8	16	30	47	26	28	55	16	38	24	10	36	41	16	51	37	34	20	06	17	23	24	25	01	19
	18	16	30	47	26	28	55	16	38	24	10	36	41	16	51	37	34	20	05	17	23	23	25	01	19
	28	16	30	47	26	28	55	16	38	23	10	36	41	16	51	37	34	20	05	17	23	23	25	01	19
Oct.	8	16	30	47	26	28	54	16	38	23	10	36	41	16	51	37	34	20	05	17	23	23	25	01	19
	18	16	30	46	26	28	54	16	38	23	10	36	41	16	51	36	34	20	04	17	23	23	25	01	19
	28	16	30	46	-26	28	53	16	38	23	-10	36	41	16	51	36	-34	20	03	17	23	23	-25	01	18
Nov.	7	16	30	46	26	28	53	16	38	23	10	36	42	16	51	36	34	20	02	17	23	23	25	01	18
	17	16	30	46	26	28	53	16	38	23	10	36	42	16	51	36	34	20	02	17	23	23	25	01	18
	27	16	30	46	26	28	52	16	38	23	10	36	43	16	51	36	34	20	01	17	23	23	25	01	18
Dec.	7	16	30	47	26	28	52	16	38	23	10	36	44	16	51	36	34	20	00	17	23	23	25	01	18
	17	16	30	47	26	28	52	16	38	23	10	36	45	16	51	37	34	19	60	17	23	23	25	01	18
	27	16	30	47	-26	28	53	16	38	24	-10	36	46	16	51	37	-34	19	59	17	23	23	-25	01	18
	37	16	30	47	-26	28	53	16	38	24	-10	36	47	16	51	37	-34	19	59	17	23	23	-25	01	18

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		λ Scorpii						α Ophiuchi						β Ophiuchi						δ Sagittarii					
Mag. Spect.		1.63			B1.5 IV			2.08			A5 Vnn			2.77			K2 III CN 0.5			2.70			K2.5 IIIa CN 0.5		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	17	35	03	-37	07	05	17	35	55	+12	32	38	17	44	31	+4	33	29	18	22	21	-29	49	05
	11	17	35	04	37	07	05	17	35	55	12	32	35	17	44	32	4	33	27	18	22	22	29	49	05
	21	17	35	04	37	07	04	17	35	56	12	32	33	17	44	32	4	33	26	18	22	22	29	49	05
	31	17	35	04	37	07	04	17	35	56	12	32	31	17	44	32	4	33	24	18	22	22	29	49	04
Feb.	10	17	35	05	37	07	04	17	35	56	12	32	30	17	44	32	4	33	23	18	22	22	29	49	04
	20	17	35	05	37	07	04	17	35	56	12	32	28	17	44	33	4	33	21	18	22	23	29	49	04
Mar.	2	17	35	05	-37	07	04	17	35	57	+12	32	27	17	44	33	+4	33	20	18	22	23	-29	49	04
	12	17	35	06	37	07	04	17	35	57	12	32	27	17	44	33	4	33	20	18	22	23	29	49	04
	22	17	35	06	37	07	05	17	35	57	12	32	26	17	44	34	4	33	20	18	22	24	29	49	04
Apr.	1	17	35	07	37	07	05	17	35	58	12	32	26	17	44	34	4	33	20	18	22	24	29	49	04
	11	17	35	07	37	07	05	17	35	58	12	32	27	17	44	34	4	33	20	18	22	25	29	49	03
	21	17	35	07	37	07	06	17	35	58	12	32	28	17	44	34	4	33	21	18	22	25	29	49	03
May	1	17	35	08	-37	07	07	17	35	58	+12	32	29	17	44	35	+4	33	22	18	22	25	-29	49	03
	11	17	35	08	37	07	07	17	35	59	12	32	31	17	44	35	4	33	23	18	22	25	29	49	03
	21	17	35	08	37	07	08	17	35	59	12	32	33	17	44	35	4	33	25	18	22	26	29	49	03
	31	17	35	08	37	07	09	17	35	59	12	32	35	17	44	35	4	33	26	18	22	26	29	49	03
June	10	17	35	09	37	07	10	17	35	59	12	32	36	17	44	35	4	33	28	18	22	26	29	49	04
	20	17	35	09	37	07	11	17	35	59	12	32	38	17	44	36	4	33	29	18	22	26	29	49	04
	30	17	35	09	-37	07	11	17	35	59	+12	32	40	17	44	36	+4	33	31	18	22	27	-29	49	04
July	10	17	35	09	37	07	12	17	35	59	12	32	42	17	44	36	4	33	32	18	22	27	29	49	05
	20	17	35	09	37	07	13	17	35	59	12	32	43	17	44	36	4	33	33	18	22	27	29	49	05
	30	17	35	09	37	07	14	17	35	59	12	32	45	17	44	36	4	33	35	18	22	27	29	49	06
Aug.	9	17	35	09	37	07	15	17	35	59	12	32	46	17	44	36	4	33	36	18	22	27	29	49	06
	19	17	35	09	37	07	16	17	35	59	12	32	47	17	44	35	4	33	36	18	22	27	29	49	07
	29	17	35	08	-37	07	16	17	35	59	+12	32	47	17	44	35	+4	33	37	18	22	27	-29	49	08
Sept.	8	17	35	08	37	07	16	17	35	59	12	32	48	17	44	35	4	33	37	18	22	26	29	49	08
	18	17	35	08	37	07	16	17	35	59	12	32	48	17	44	35	4	33	37	18	22	26	29	49	08
	28	17	35	08	37	07	16	17	35	58	12	32	48	17	44	35	4	33	37	18	22	26	29	49	09
Oct.	8	17	35	08	37	07	16	17	35	58	12	32	47	17	44	35	4	33	37	18	22	26	29	49	09
	18	17	35	08	37	07	15	17	35	58	12	32	47	17	44	35	4	33	36	18	22	26	29	49	08
	28	17	35	07	-37	07	15	17	35	58	+12	32	46	17	44	34	+4	33	36	18	22	25	-29	49	08
Nov.	7	17	35	07	37	07	14	17	35	58	12	32	44	17	44	34	4	33	34	18	22	25	29	49	08
	17	17	35	07	37	07	13	17	35	58	12	32	43	17	44	34	4	33	33	18	22	25	29	49	08
	27	17	35	07	37	07	12	17	35	58	12	32	41	17	44	34	4	33	32	18	22	25	29	49	07
Dec.	7	17	35	07	37	07	11	17	35	58	12	32	39	17	44	34	4	33	30	18	22	25	29	49	07
	17	17	35	07	37	07	11	17	35	58	12	32	36	17	44	34	4	33	28	18	22	25	29	49	06
	27	17	35	08	-37	07	10	17	35	58	+12	32	34	17	44	35	+4	33	27	18	22	26	-29	49	06
	37	17	35	08	-37	07	09	17	35	58	+12	32	32	17	44	35	+4	33	25	18	22	26	-29	49	05

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		ε Sagittarii						σ Sagittarii						ζ Aquilae						γ Aquilae					
Mag. Spect.		1.85			A0 II-n(shell)			2.02			B3 IV			2.99			A0 Vann			2.72			K3 II		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	18	25	35	-34	22	25	18	56	35	-26	16	10	19	06	23	+13	53	45	19	47	16	+10	39	59
	11	18	25	35	34	22	24	18	56	35	26	16	10	19	06	23	13	53	43	19	47	16	10	39	57
	21	18	25	36	34	22	24	18	56	35	26	16	10	19	06	23	13	53	41	19	47	16	10	39	56
	31	18	25	36	34	22	23	18	56	36	26	16	09	19	06	24	13	53	39	19	47	16	10	39	54
Feb.	10	18	25	36	34	22	23	18	56	36	26	16	09	19	06	24	13	53	37	19	47	17	10	39	52
	20	18	25	36	34	22	23	18	56	36	26	16	09	19	06	24	13	53	35	19	47	17	10	39	51
Mar.	2	18	25	37	-34	22	22	18	56	37	-26	16	09	19	06	24	+13	53	34	19	47	17	+10	39	50
	12	18	25	37	34	22	22	18	56	37	26	16	08	19	06	24	13	53	34	19	47	17	10	39	49
	22	18	25	38	34	22	22	18	56	37	26	16	08	19	06	25	13	53	33	19	47	18	10	39	49
Apr.	1	18	25	38	34	22	22	18	56	38	26	16	08	19	06	25	13	53	33	19	47	18	10	39	49
	11	18	25	38	34	22	21	18	56	38	26	16	07	19	06	25	13	53	34	19	47	18	10	39	49
	21	18	25	39	34	22	21	18	56	38	26	16	06	19	06	26	13	53	35	19	47	18	10	39	50
May	1	18	25	39	-34	22	21	18	56	39	-26	16	06	19	06	26	+13	53	36	19	47	19	+10	39	51
	11	18	25	39	34	22	22	18	56	39	26	16	06	19	06	26	13	53	38	19	47	19	10	39	53
	21	18	25	40	34	22	22	18	56	39	26	16	05	19	06	27	13	53	40	19	47	19	10	39	55
	31	18	25	40	34	22	22	18	56	39	26	16	05	19	06	27	13	53	42	19	47	20	10	39	57
June	10	18	25	40	34	22	23	18	56	40	26	16	05	19	06	27	13	53	44	19	47	20	10	39	59
	20	18	25	40	34	22	23	18	56	40	26	16	05	19	06	27	13	53	46	19	47	20	10	40	01
	30	18	25	41	-34	22	24	18	56	40	-26	16	05	19	06	27	+13	53	48	19	47	20	+10	40	03
July	10	18	25	41	34	22	24	18	56	40	26	16	05	19	06	27	13	53	50	19	47	20	10	40	05
	20	18	25	41	34	22	25	18	56	40	26	16	05	19	06	27	13	53	52	19	47	21	10	40	07
	30	18	25	41	34	22	26	18	56	40	26	16	06	19	06	27	13	53	54	19	47	21	10	40	09
Aug.	9	18	25	41	34	22	27	18	56	40	26	16	06	19	06	27	13	53	56	19	47	21	10	40	11
	19	18	25	41	34	22	28	18	56	40	26	16	07	19	06	27	13	53	57	19	47	21	10	40	12
	29	18	25	40	-34	22	28	18	56	40	-26	16	07	19	06	27	+13	53	58	19	47	21	+10	40	13
Sept.	8	18	25	40	34	22	29	18	56	40	26	16	07	19	06	27	13	53	59	19	47	20	10	40	14
	18	18	25	40	34	22	29	18	56	40	26	16	08	19	06	27	13	53	60	19	47	20	10	40	15
	28	18	25	40	34	22	30	18	56	40	26	16	08	19	06	27	13	53	60	19	47	20	10	40	15
Oct.	8	18	25	40	34	22	30	18	56	40	26	16	09	19	06	27	13	53	60	19	47	20	10	40	15
	18	18	25	40	34	22	29	18	56	39	26	16	09	19	06	26	13	53	60	19	47	20	10	40	15
	28	18	25	39	-34	22	29	18	56	39	-26	16	09	19	06	26	+13	53	59	19	47	20	+10	40	15
Nov.	7	18	25	39	34	22	29	18	56	39	26	16	09	19	06	26	13	53	58	19	47	19	10	40	14
	17	18	25	39	34	22	28	18	56	39	26	16	08	19	06	26	13	53	57	19	47	19	10	40	13
	27	18	25	39	34	22	27	18	56	39	26	16	08	19	06	26	13	53	56	19	47	19	10	40	12
Dec.	7	18	25	39	34	22	27	18	56	39	26	16	08	19	06	26	13	53	54	19	47	19	10	40	11
	17	18	25	39	34	22	26	18	56	39	26	16	08	19	06	26	13	53	52	19	47	19	10	40	09
	27	18	25	39	-34	22	25	18	56	39	-26	16	07	19	06	26	+13	53	50	19	47	19	+10	40	08
	37	18	25	39	-34	22	25	18	56	39	-26	16	07	19	06	26	+13	53	48	19	47	19	+10	40	06

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		α Aquilae						γ Cygni						α Cygni						β Aquarii					
Mag. Spect.		0.77			A7 Vnn			2.20			F8 Ib			1.25			A2 Ia			2.91			G0 Ib		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	19	51	49	+8	55	33	20	22	59	+40	19	39	20	42	08	+45	21	35	21	32	41	-5	28	34
	11	19	51	49	8	55	32	20	22	59	40	19	36	20	42	08	45	21	32	21	32	41	5	28	35
	21	19	51	49	8	55	30	20	22	59	40	19	33	20	42	08	45	21	29	21	32	41	5	28	35
	31	19	51	50	8	55	29	20	22	59	40	19	30	20	42	08	45	21	26	21	32	41	5	28	36
Feb.	10	19	51	50	8	55	27	20	22	59	40	19	28	20	42	09	45	21	23	21	32	41	5	28	36
	20	19	51	50	8	55	26	20	22	59	40	19	25	20	42	09	45	21	20	21	32	41	5	28	36
Mar.	2	19	51	50	+8	55	25	20	22	59	+40	19	23	20	42	09	+45	21	18	21	32	41	-5	28	36
	12	19	51	50	8	55	24	20	22	60	40	19	21	20	42	09	45	21	16	21	32	42	5	28	36
	22	19	51	51	8	55	24	20	22	60	40	19	19	20	42	09	45	21	14	21	32	42	5	28	36
Apr.	1	19	51	51	8	55	24	20	23	00	40	19	19	20	42	10	45	21	13	21	32	42	5	28	35
	11	19	51	51	8	55	25	20	23	00	40	19	18	20	42	10	45	21	13	21	32	42	5	28	34
	21	19	51	51	8	55	26	20	23	01	40	19	19	20	42	10	45	21	13	21	32	43	5	28	33
May	1	19	51	52	+8	55	27	20	23	01	+40	19	20	20	42	11	+45	21	13	21	32	43	-5	28	31
	11	19	51	52	8	55	28	20	23	02	40	19	21	20	42	11	45	21	15	21	32	43	5	28	30
	21	19	51	52	8	55	30	20	23	02	40	19	23	20	42	12	45	21	17	21	32	43	5	28	28
	31	19	51	53	8	55	32	20	23	02	40	19	25	20	42	12	45	21	19	21	32	44	5	28	26
June	10	19	51	53	8	55	34	20	23	03	40	19	28	20	42	12	45	21	21	21	32	44	5	28	25
	20	19	51	53	8	55	36	20	23	03	40	19	31	20	42	13	45	21	24	21	32	44	5	28	23
	30	19	51	53	+8	55	38	20	23	03	+40	19	34	20	42	13	+45	21	27	21	32	45	-5	28	21
July	10	19	51	53	8	55	40	20	23	03	40	19	37	20	42	13	45	21	31	21	32	45	5	28	19
	20	19	51	54	8	55	42	20	23	03	40	19	41	20	42	13	45	21	34	21	32	45	5	28	18
	30	19	51	54	8	55	44	20	23	03	40	19	44	20	42	13	45	21	37	21	32	45	5	28	17
Aug.	9	19	51	54	8	55	45	20	23	03	40	19	47	20	42	13	45	21	41	21	32	45	5	28	16
	19	19	51	54	8	55	47	20	23	03	40	19	50	20	42	13	45	21	44	21	32	46	5	28	15
	29	19	51	54	+8	55	48	20	23	03	+40	19	52	20	42	13	+45	21	46	21	32	46	-5	28	14
Sept.	8	19	51	54	8	55	49	20	23	03	40	19	55	20	42	13	45	21	49	21	32	46	5	28	14
	18	19	51	53	8	55	49	20	23	03	40	19	56	20	42	13	45	21	51	21	32	46	5	28	14
	28	19	51	53	8	55	50	20	23	03	40	19	58	20	42	13	45	21	53	21	32	45	5	28	14
Oct.	8	19	51	53	8	55	50	20	23	03	40	19	59	20	42	12	45	21	54	21	32	45	5	28	14
	18	19	51	53	8	55	50	20	23	02	40	19	60	20	42	12	45	21	56	21	32	45	5	28	14
	28	19	51	53	+8	55	49	20	23	02	+40	19	60	20	42	12	+45	21	56	21	32	45	-5	28	14
Nov.	7	19	51	53	8	55	49	20	23	02	40	19	59	20	42	12	45	21	56	21	32	45	5	28	15
	17	19	51	52	8	55	48	20	23	02	40	19	59	20	42	11	45	21	55	21	32	45	5	28	15
	27	19	51	52	8	55	47	20	23	01	40	19	58	20	42	11	45	21	55	21	32	45	5	28	16
Dec.	7	19	51	52	8	55	46	20	23	01	40	19	56	20	42	11	45	21	53	21	32	45	5	28	17
	17	19	51	52	8	55	44	20	23	01	40	19	54	20	42	11	45	21	51	21	32	45	5	28	17
	27	19	51	52	+8	55	43	20	23	01	+40	19	51	20	42	11	+45	21	49	21	32	44	-5	28	18
	37	19	51	52	+8	55	41	20	23	01	+40	19	49	20	42	11	+45	21	46	21	32	44	-5	28	18

APPARENT PLACES OF STARS, 2022

FOR 0^h TERRESTRIAL TIME

Name		ε Pegasi						α Aquarii						δ Aquarii						α Pegasi					
Mag. Spect.		0.7 - 3.5			K2 Ib-II			2.96			G2 Ib			3.27			A3 IV-V			2.49			A0 III-IV		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	21	45	14	+9	58	30	22	06	53	-0	12	52	22	55	47	-15	42	25	23	05	50	+15	19	23
	11	21	45	14	9	58	29	22	06	53	0	12	53	22	55	47	15	42	25	23	05	50	15	19	22
	21	21	45	14	9	58	28	22	06	53	0	12	54	22	55	47	15	42	25	23	05	50	15	19	21
	31	21	45	14	9	58	27	22	06	00	0	12	55	22	55	47	15	42	25	23	05	50	15	19	20
Feb.	10	21	45	14	9	58	25	22	06	53	0	12	55	22	55	47	15	42	25	23	05	50	15	19	19
	20	21	45	14	9	58	24	22	06	53	0	12	56	22	55	47	15	42	24	23	05	50	15	19	17
Mar.	2	21	45	14	+9	58	23	22	06	53	-0	12	56	22	55	47	-15	42	23	23	05	50	+15	19	16
	12	21	45	15	9	58	23	22	06	53	0	12	56	22	55	47	15	42	22	23	05	50	15	19	16
	22	21	45	15	9	58	22	22	06	53	0	12	56	22	55	48	15	42	21	23	05	50	15	19	15
Apr.	1	21	45	15	9	58	22	22	06	54	0	12	55	22	55	48	15	42	20	23	05	50	15	19	14
	11	21	45	15	9	58	23	22	06	54	0	12	54	22	55	48	15	42	18	23	05	50	15	19	15
	21	21	45	15	9	58	23	22	06	54	0	12	53	22	55	48	15	42	16	23	05	51	15	19	15
May	1	21	45	16	+9	58	24	22	06	54	-0	12	52	22	55	48	-15	42	15	23	05	51	+15	19	15
	11	21	45	16	9	58	26	22	06	55	0	12	51	22	55	49	15	42	12	23	05	51	15	19	17
	21	21	45	16	9	58	28	22	06	55	0	12	49	22	55	49	15	42	10	23	05	51	15	19	18
	31	21	45	17	9	58	29	22	06	55	0	12	47	22	55	49	15	42	08	23	05	52	15	19	20
June	10	21	45	17	9	58	31	22	06	56	0	12	45	22	55	50	15	42	07	23	05	52	15	19	22
	20	21	45	17	9	58	34	22	06	56	0	12	43	22	55	50	15	42	04	23	05	52	15	19	24
	30	21	45	18	+9	58	36	22	06	56	-0	12	41	22	55	50	-15	42	03	23	05	53	+15	19	26
July	10	21	45	18	9	58	38	22	06	57	0	12	39	22	55	51	15	42	01	23	05	53	15	19	28
	20	21	45	18	9	58	40	22	06	57	0	12	37	22	55	51	15	42	00	23	05	53	15	19	31
	30	21	45	18	9	58	42	22	06	57	0	12	36	22	55	51	15	41	59	23	05	53	15	19	33
Aug.	9	21	45	18	9	58	44	22	06	57	0	12	34	22	55	51	15	41	58	23	05	54	15	19	35
	19	21	45	18	9	58	46	22	06	57	0	12	33	22	55	52	15	41	58	23	05	54	15	19	37
	29	21	45	18	+9	58	48	22	06	57	-0	12	32	22	55	52	-15	41	58	23	05	54	+15	19	39
Sept.	8	21	45	18	9	58	49	22	06	57	0	12	31	22	55	52	15	41	58	23	05	54	15	19	41
	18	21	45	18	9	58	50	22	06	57	0	12	31	22	55	52	15	41	58	23	05	54	15	19	43
	28	21	45	18	9	58	51	22	06	57	0	12	31	22	55	52	15	41	59	23	05	54	15	19	44
Oct.	8	21	45	18	9	58	51	22	06	57	0	12	30	22	55	52	15	41	59	23	05	54	15	19	45
	18	21	45	18	9	58	52	22	06	57	0	12	30	22	55	52	15	42	00	23	05	54	15	19	46
	28	21	45	18	+9	58	52	22	06	57	-0	12	31	22	55	52	-15	42	01	23	05	54	+15	19	46
Nov.	7	21	45	18	9	58	51	22	06	57	0	12	31	22	55	52	15	42	02	23	05	54	15	19	46
	17	21	45	18	9	58	51	22	06	57	0	12	31	22	55	51	15	42	03	23	05	54	15	19	47
	27	21	45	18	9	58	51	22	06	57	0	12	32	22	55	51	15	42	03	23	05	54	15	19	46
Dec.	7	21	45	17	9	58	50	22	06	57	0	12	33	22	55	51	15	42	04	23	05	53	15	19	46
	17	21	45	17	9	58	49	22	06	56	0	12	33	22	55	51	15	42	05	23	05	53	15	19	45
	27	21	45	17	+9	58	48	22	06	56	-0	12	34	22	55	51	-15	42	05	23	05	53	+15	19	45
	37	21	45	17	+9	58	47	22	06	56	-0	12	35	22	55	51	-15	42	05	23	05	53	+15	19	43

BESSELIAN DAY NUMBERS, 2022.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Jan.	0	-0.5027	-15.847	-4.108	-3.191	+20.557	-19	-0.292	-0.051
	1	0.5000	15.726	4.075	3.522	20.495	19	0.182	0.099
	2	0.4973	15.587	4.068	3.853	20.425	18	-0.024	0.121
	3	0.4945	15.445	4.093	4.182	20.349	18	+0.141	0.112
	4	0.4918	15.317	4.149	4.509	20.265	18	0.271	0.073
	5	0.4890	15.215	4.222	4.835	20.175	18	0.337	-0.016
	6	-0.4863	-15.142	-4.298	-5.159	+20.078	-17	+0.331	+0.041
	7	0.4836	15.093	4.361	5.481	19.975	17	0.264	0.087
	8	0.4808	15.059	4.405	5.801	19.865	18	0.161	0.111
	9	0.4781	15.031	4.426	6.119	19.749	18	+0.046	0.113
	10	0.4754	14.998	4.427	6.434	19.627	18	-0.058	0.094
	11	0.4726	14.956	4.414	6.747	19.500	18	0.136	0.060
	12	-0.4699	-14.899	-4.392	-7.057	+19.366	-18	-0.177	+0.017
	13	0.4671	14.827	4.370	7.366	19.227	18	0.179	-0.027
	14	0.4644	14.741	4.355	7.671	19.082	18	0.145	0.065
	15	0.4617	14.645	4.351	7.974	18.932	17	0.082	0.091
	16	0.4589	14.542	4.363	8.275	18.776	17	-0.002	0.102
	17	0.4562	14.440	4.394	8.573	18.615	17	+0.078	0.095
	18	-0.4535	-14.343	-4.442	-8.868	+18.448	-17	+0.144	-0.071
	19	0.4507	14.259	4.503	9.161	18.276	17	0.181	-0.034
	20	0.4480	14.191	4.572	9.451	18.098	17	0.178	+0.010
	21	0.4452	14.141	4.641	9.738	17.916	17	0.132	0.053
	22	0.4425	14.107	4.700	10.023	17.728	17	+0.048	0.087
	23	0.4398	14.084	4.743	10.305	17.534	17	-0.061	0.104
	24	-0.4370	-14.063	-4.763	-10.583	+17.336	-17	-0.175	+0.099
	25	0.4343	14.034	4.761	10.859	17.132	17	0.270	0.070
	26	0.4316	13.989	4.741	11.132	16.922	17	0.321	+0.024
	27	0.4288	13.921	4.713	11.402	16.707	17	0.310	-0.032
	28	0.4261	13.826	4.689	11.668	16.487	17	0.232	0.083
	29	0.4233	13.710	4.683	11.931	16.261	17	-0.100	0.115
	30	-0.4206	-13.585	-4.707	-12.190	+16.029	-17	+0.058	-0.119
	31	0.4179	13.465	4.760	12.445	15.792	16	0.202	0.093
Feb.	1	0.4151	13.366	4.837	12.696	15.550	16	0.297	-0.043
	2	0.4124	13.295	4.924	12.942	15.303	16	0.324	+0.016
	3	0.4097	13.251	5.005	13.184	15.050	16	0.282	0.070
	4	0.4069	13.228	5.068	13.421	14.793	16	0.191	0.105
	5	-0.4042	-13.215	-5.106	-13.654	+14.532	-17	+0.077	+0.116
	6	0.4014	13.201	5.121	13.882	14.266	17	-0.033	0.104
	7	0.3987	13.179	5.118	14.105	13.997	17	0.121	0.073
	8	0.3960	13.142	5.103	14.323	13.723	17	0.172	+0.031
	9	0.3932	13.091	5.085	14.537	13.445	17	0.183	-0.014
	10	0.3905	13.025	5.071	14.746	13.164	17	0.156	0.055
	11	-0.3877	-12.948	-5.068	-14.950	+12.879	-17	-0.099	-0.085
	12	0.3850	12.863	5.079	15.150	12.591	17	-0.022	0.101
	13	0.3823	12.776	5.107	15.344	12.299	17	+0.061	0.099
	14	0.3795	12.695	5.153	15.534	12.005	16	0.135	0.079
	15	-0.3768	-12.623	-5.213	-15.719	+11.707	-16	+0.183	-0.045

BESSELIAN DAY NUMBERS, 2022.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Feb.	15	-0.3768	-12.623	-5.213	-15.719	+11.707	-16	+0.183	-0.045
	16	0.3741	12.567	5.282	15.900	11.406	16	0.194	-0.001
	17	0.3713	12.530	5.353	16.076	11.101	16	0.161	+0.044
	18	0.3686	12.509	5.416	16.246	10.794	17	+0.086	0.082
	19	0.3658	12.501	5.462	16.413	10.484	17	-0.019	0.104
	20	0.3631	12.498	5.486	16.574	10.171	17	-0.135	0.104
	21	-0.3604	-12.490	-5.486	-16.731	+9.855	-17	-0.236	+0.081
	22	0.3576	12.466	5.466	16.883	9.536	17	0.298	+0.037
	23	0.3549	12.421	5.435	17.030	9.214	17	0.303	-0.017
	24	0.3522	12.351	5.405	17.172	8.889	17	0.245	0.069
	25	0.3494	12.260	5.389	17.309	8.562	17	-0.133	0.106
	26	0.3467	12.157	5.398	17.441	8.231	17	+0.010	0.119
	27	-0.3439	-12.055	-5.435	-17.567	+7.897	-17	+0.151	-0.103
	28	0.3412	11.967	5.496	17.687	7.561	17	0.259	0.062
Mar.	1	0.3385	11.903	5.571	17.802	7.222	17	0.308	-0.006
	2	0.3357	11.865	5.647	17.911	6.881	17	0.290	+0.050
	3	0.3330	11.851	5.709	18.014	6.538	17	0.216	0.093
	4	0.3303	11.850	5.748	18.111	6.194	17	+0.108	0.115
	5	-0.3275	-11.853	-5.762	-18.202	+5.847	-17	-0.008	+0.111
	6	0.3248	11.849	5.754	18.287	5.499	17	0.106	0.086
	7	0.3220	11.833	5.730	18.366	5.150	17	0.171	0.047
	8	0.3193	11.800	5.700	18.439	4.800	17	0.194	+0.001
	9	0.3166	11.751	5.671	18.507	4.449	18	0.177	-0.043
	10	0.3138	11.689	5.650	18.569	4.098	17	0.126	0.078
	11	-0.3111	-11.618	-5.643	-18.624	+3.746	-17	-0.053	-0.099
	12	0.3084	11.543	5.652	18.675	3.393	17	+0.031	0.103
	13	0.3056	11.471	5.678	18.719	3.040	17	0.109	0.089
	14	0.3029	11.407	5.720	18.758	2.687	17	0.168	0.058
	15	0.3001	11.356	5.773	18.792	2.333	17	0.193	-0.016
	16	0.2974	11.321	5.830	18.820	1.979	17	0.176	+0.031
	17	-0.2947	-11.305	-5.881	-18.843	+1.626	-17	+0.115	+0.073
	18	0.2919	11.303	5.919	18.860	1.272	18	+0.018	0.102
	19	0.2892	11.309	5.934	18.872	0.918	18	-0.098	0.109
	20	0.2864	11.311	5.924	18.879	0.565	18	0.207	0.092
	21	0.2837	11.300	5.891	18.881	+0.211	18	0.281	+0.052
	22	0.2810	11.267	5.843	18.877	-0.143	18	0.298	-0.002
	23	-0.2782	-11.208	-5.793	-18.868	-0.496	-18	-0.252	-0.057
	24	0.2755	11.126	5.756	18.854	0.850	18	0.148	0.099
	25	0.2728	11.031	5.741	18.834	1.204	18	-0.011	0.117
	26	0.2700	10.934	5.754	18.809	1.557	18	+0.130	0.108
	27	0.2673	10.848	5.791	18.778	1.911	18	0.242	0.073
	28	0.2645	10.783	5.844	18.741	2.263	18	0.303	-0.022
	29	-0.2618	-10.742	-5.901	-18.698	-2.616	-18	+0.301	+0.034
	30	0.2591	10.724	5.949	18.649	2.967	18	0.242	0.081
	31	0.2563	10.723	5.977	18.594	3.317	18	0.142	0.110
Apr.	1	0.2536	10.727	5.982	18.533	3.666	18	+0.025	0.115
	2	-0.2509	-10.728	-5.963	-18.467	-4.014	-18	-0.083	+0.097

BESSELIAN DAY NUMBERS, 2022.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Apr.	1	-0.2536	-10.727	-5.982	-18.533	-3.666	-18	+0.025	+0.115
	2	0.2509	10.728	5.963	18.467	4.014	18	-0.083	0.097
	3	0.2481	10.717	5.926	18.395	4.360	19	0.162	0.062
	4	0.2454	10.690	5.878	18.317	4.704	19	0.201	+0.017
	5	0.2426	10.645	5.829	18.233	5.046	19	0.197	-0.029
	6	0.2399	10.586	5.786	18.144	5.386	19	0.155	0.068
	7	-0.2372	-10.515	-5.755	-18.050	-5.723	-19	-0.086	-0.095
	8	0.2344	10.438	5.741	17.951	6.059	19	-0.004	0.105
	9	0.2317	10.361	5.744	17.846	6.391	19	+0.077	0.096
	10	0.2290	10.291	5.763	17.736	6.722	18	0.142	0.071
	11	0.2262	10.231	5.795	17.621	7.050	18	0.179	-0.033
	12	0.2235	10.186	5.834	17.502	7.375	19	0.177	+0.013
	13	-0.2207	-10.158	-5.872	-17.377	-7.697	-19	+0.132	+0.058
	14	0.2180	10.146	5.900	17.248	8.017	19	+0.047	0.094
	15	0.2153	10.143	5.908	17.115	8.334	19	-0.065	0.110
	16	0.2125	10.142	5.891	16.977	8.648	19	0.181	0.102
	17	0.2098	10.130	5.849	16.834	8.959	19	0.271	0.069
	18	0.2070	10.097	5.787	16.687	9.268	19	0.308	+0.017
	19	-0.2043	-10.035	-5.719	-16.536	-9.574	-19	-0.276	-0.042
	20	0.2016	9.947	5.661	16.380	9.877	19	0.179	0.090
	21	0.1988	9.842	5.624	16.220	10.178	19	-0.039	0.117
	22	0.1961	9.732	5.616	16.055	10.477	19	+0.111	0.114
	23	0.1934	9.631	5.635	15.885	10.772	19	0.236	0.084
	24	0.1906	9.550	5.673	15.711	11.065	19	0.310	-0.035
	25	-0.1879	-9.493	-5.718	-15.532	-11.354	-19	+0.322	+0.021
	26	0.1851	9.460	5.756	15.348	11.640	19	0.274	0.071
	27	0.1824	9.444	5.777	15.160	11.923	19	0.181	0.104
	28	0.1797	9.436	5.777	14.967	12.202	19	+0.066	0.116
	29	0.1769	9.427	5.753	14.769	12.477	19	-0.047	0.104
	30	0.1742	9.408	5.710	14.567	12.748	19	0.137	0.074
May	1	-0.1715	-9.374	-5.655	-14.360	-13.015	-19	-0.191	+0.031
	2	0.1687	9.322	5.597	14.150	13.278	19	0.202	-0.015
	3	0.1660	9.254	5.542	13.935	13.537	19	0.172	0.057
	4	0.1632	9.172	5.499	13.716	13.791	19	0.111	0.088
	5	0.1605	9.083	5.471	13.493	14.040	19	-0.032	0.103
	6	0.1578	8.992	5.461	13.267	14.285	19	+0.050	0.101
	7	-0.1550	-8.905	-5.468	-13.037	-14.525	-19	+0.120	-0.081
	8	0.1523	8.828	5.489	12.804	14.761	19	0.164	0.047
	9	0.1496	8.764	5.520	12.567	14.992	19	0.173	-0.004
	10	0.1468	8.717	5.553	12.327	15.218	19	0.141	+0.041
	11	0.1441	8.684	5.580	12.084	15.439	19	+0.069	0.080
	12	0.1413	8.664	5.593	11.838	15.656	19	-0.035	0.105
	13	-0.1386	-8.648	-5.583	-11.589	-15.867	-19	-0.152	+0.107
	14	0.1359	8.627	5.548	11.338	16.075	19	0.257	0.084
	15	0.1331	8.588	5.491	11.083	16.277	19	0.320	+0.038
	16	0.1304	8.522	5.420	10.827	16.475	19	0.315	-0.021
	17	-0.1277	-8.427	-5.353	-10.567	-16.669	-19	-0.237	-0.077

BESSELIAN DAY NUMBERS, 2022.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
May	17	-0.1277	-8.427	-5.353	-10.567	-16.669	-19	-0.237	-0.077
	18	0.1249	8.307	5.305	10.305	16.858	19	-0.099	0.114
	19	0.1222	8.176	5.288	10.040	17.043	19	+0.064	0.121
	20	0.1194	8.052	5.301	9.773	17.223	18	0.211	0.097
	21	0.1167	7.946	5.339	9.502	17.399	18	0.309	-0.050
	22	0.1140	7.866	5.386	9.229	17.571	18	0.341	+0.007
	23	-0.1112	-7.812	-5.431	-8.953	-17.737	-18	+0.307	+0.061
	24	0.1085	7.778	5.460	8.674	17.899	18	0.223	0.099
	25	0.1057	7.754	5.468	8.392	18.055	18	+0.110	0.116
	26	0.1030	7.731	5.454	8.108	18.206	18	-0.006	0.110
	27	0.1003	7.701	5.420	7.821	18.351	18	0.103	0.083
	28	0.0975	7.656	5.373	7.532	18.492	18	0.168	+0.043
	29	-0.0948	-7.595	-5.320	-7.240	-18.626	-18	-0.191	-0.002
	30	0.0921	7.518	5.270	6.947	18.755	18	0.174	0.046
	31	0.0893	7.426	5.230	6.651	18.878	18	0.122	0.080
June	1	0.0866	7.326	5.205	6.354	18.995	18	-0.048	0.100
	2	0.0838	7.222	5.197	6.055	19.107	18	+0.033	0.102
	3	0.0811	7.120	5.207	5.754	19.213	18	0.107	0.088
	4	-0.0784	-7.028	-5.233	-5.453	-19.313	-18	+0.158	-0.058
	5	0.0756	6.948	5.270	5.149	19.407	18	0.175	-0.018
	6	0.0729	6.884	5.311	4.845	19.495	18	0.153	+0.026
	7	0.0702	6.835	5.349	4.540	19.577	18	+0.091	0.067
	8	0.0674	6.800	5.377	4.234	19.654	18	-0.004	0.096
	9	0.0647	6.772	5.386	3.927	19.725	18	0.119	0.107
	10	-0.0619	-6.743	-5.373	-3.620	-19.790	-18	-0.232	+0.094
	11	0.0592	6.702	5.336	3.312	19.850	18	0.316	0.057
	12	0.0565	6.639	5.282	3.004	19.904	18	0.344	+0.003
	13	0.0537	6.547	5.224	2.695	19.953	18	0.299	-0.057
	14	0.0510	6.426	5.178	2.386	19.997	17	0.183	0.104
	15	0.0483	6.286	5.159	2.077	20.036	17	-0.020	0.125
	16	-0.0455	-6.144	-5.174	-1.767	-20.070	-17	+0.148	-0.113
	17	0.0428	6.018	5.220	1.456	20.098	17	0.278	0.071
	18	0.0400	5.918	5.283	1.145	20.122	17	0.341	-0.013
	19	0.0373	5.846	5.347	0.833	20.140	16	0.331	+0.047
	20	0.0346	5.800	5.398	0.521	20.152	17	0.260	0.092
	21	0.0318	5.767	5.427	-0.208	20.159	17	0.153	0.115
	22	-0.0291	-5.739	-5.433	+.106	-20.161	-17	+0.036	+0.114
	23	0.0264	5.705	5.418	0.419	20.156	17	-0.068	0.092
	24	0.0236	5.659	5.388	0.733	20.146	17	0.141	0.055
	25	0.0209	5.597	5.352	1.047	20.129	17	0.174	+0.010
	26	0.0181	5.519	5.316	1.361	20.107	17	0.166	-0.035
	27	0.0154	5.426	5.289	1.674	20.079	17	-0.122	0.072
	28	-0.0127	-5.324	-5.276	+1.987	-20.044	-16	-0.053	-0.095
	29	0.0099	5.218	5.280	2.299	20.004	17	+0.027	0.102
	30	0.0072	5.113	5.302	2.611	19.958	17	0.103	0.091
July	1	0.0044	5.016	5.341	2.922	19.905	17	0.159	0.065
	2	-0.0017	-4.932	-5.391	+3.231	-19.847	-17	+0.185	-0.027

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
July	1	-0.0044	-5.016	-5.341	+2.922	-19.905	-17	+0.159	-0.065
	2	-0.0017	4.932	5.391	3.231	19.847	17	0.185	-0.027
	3	+0.0010	4.863	5.447	3.540	19.783	17	0.172	+0.016
	4	0.0038	4.811	5.502	3.847	19.713	17	0.118	0.057
	5	0.0065	4.772	5.548	4.153	19.637	16	+0.030	0.089
	6	0.0092	4.744	5.579	4.457	19.556	16	-0.082	0.104
	7	+0.0120	-4.717	-5.589	+4.760	-19.469	-16	-0.198	+0.098
	8	0.0147	4.682	5.577	5.061	19.377	16	0.295	0.070
	9	0.0175	4.631	5.546	5.360	19.279	16	0.348	+0.023
	10	0.0202	4.555	5.506	5.658	19.176	16	0.337	-0.034
	11	0.0229	4.450	5.470	5.953	19.069	16	0.255	0.087
	12	0.0257	4.322	5.454	6.247	18.956	16	-0.112	0.121
	13	+0.0284	-4.183	-5.470	+6.539	-18.839	-15	+0.058	-0.124
	14	0.0311	4.051	5.519	6.829	18.717	15	0.212	0.094
	15	0.0339	3.942	5.593	7.117	18.590	15	0.311	-0.039
	16	0.0366	3.862	5.677	7.404	18.458	15	0.335	+0.024
	17	0.0394	3.812	5.751	7.689	18.321	15	0.287	0.079
	18	0.0421	3.782	5.805	7.973	18.180	15	0.189	0.112
	19	+0.0448	-3.760	-5.833	+8.255	-18.033	-15	+0.072	+0.119
	20	0.0476	3.735	5.837	8.535	17.881	15	-0.038	0.102
	21	0.0503	3.699	5.824	8.813	17.723	15	0.119	0.067
	22	0.0530	3.649	5.802	9.088	17.561	15	0.160	+0.022
	23	0.0558	3.582	5.778	9.362	17.393	15	0.160	-0.024
	24	0.0585	3.501	5.761	9.633	17.219	15	-0.123	0.064
	25	+0.0613	-3.409	-5.757	+9.902	-17.041	-15	-0.058	-0.091
	26	0.0640	3.312	5.770	10.167	16.857	15	+0.021	0.101
	27	0.0667	3.216	5.800	10.430	16.668	15	0.100	0.095
	28	0.0695	3.127	5.847	10.690	16.474	15	0.163	0.072
	29	0.0722	3.049	5.907	10.947	16.275	14	0.197	-0.036
	30	0.0749	2.988	5.973	11.201	16.071	14	0.194	+0.007
	31	+0.0777	-2.943	-6.040	+11.451	-15.862	-14	+0.149	+0.049
Aug.	1	0.0804	2.913	6.099	11.698	15.649	15	+0.067	0.084
	2	0.0832	2.894	6.143	11.942	15.431	15	-0.041	0.103
	3	0.0859	2.880	6.167	12.181	15.208	15	0.158	0.102
	4	0.0886	2.861	6.169	12.417	14.981	15	0.262	0.080
	5	0.0914	2.828	6.152	12.649	14.749	15	0.330	+0.038
	6	+0.0941	-2.774	-6.124	+12.878	-14.514	-15	-0.343	-0.016
	7	0.0969	2.694	6.095	13.102	14.275	15	0.291	0.070
	8	0.0996	2.591	6.079	13.323	14.032	15	0.177	0.110
	9	0.1023	2.472	6.089	13.539	13.785	15	-0.024	0.126
	10	0.1051	2.352	6.130	13.752	13.535	14	+0.135	0.109
	11	0.1078	2.246	6.200	13.962	13.282	14	0.258	0.064
	12	+0.1105	-2.168	-6.286	+14.168	-13.025	-14	+0.315	-0.003
	13	0.1133	2.119	6.372	14.370	12.764	14	0.297	+0.058
	14	0.1160	2.096	6.441	14.569	12.501	14	0.217	0.103
	15	0.1188	2.087	6.484	14.764	12.233	14	+0.103	0.121
	16	+0.1215	-2.080	-6.499	+14.956	-11.962	-15	-0.013	+0.112

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Aug.	16	+0.1215	-2.080	-6.499	+14.956	-11.962	-15	-0.013	+0.112
	17	0.1242	2.063	6.492	15.143	11.687	15	0.104	0.081
	18	0.1270	2.031	6.472	15.327	11.408	15	0.157	+0.036
	19	0.1297	1.982	6.448	15.507	11.126	15	0.165	-0.011
	20	0.1324	1.918	6.428	15.683	10.840	15	0.134	0.054
	21	0.1352	1.843	6.420	15.854	10.550	15	-0.072	0.086
	22	+0.1379	-1.761	-6.427	+16.021	-10.257	-15	+0.007	-0.101
	23	0.1407	1.678	6.452	16.184	9.960	14	0.089	0.099
	24	0.1434	1.600	6.494	16.342	9.660	14	0.159	0.079
	25	0.1461	1.534	6.550	16.495	9.357	14	0.203	0.046
	26	0.1489	1.482	6.614	16.643	9.050	14	0.211	-0.003
	27	0.1516	1.447	6.679	16.787	8.741	14	0.177	+0.041
	28	+0.1543	-1.429	-6.738	+16.925	-8.428	-15	+0.104	+0.078
	29	0.1571	1.423	6.782	17.059	8.113	15	+0.000	0.102
	30	0.1598	1.422	6.806	17.187	7.795	15	-0.117	0.106
	31	0.1626	1.419	6.808	17.310	7.474	15	0.226	0.088
Sept.	1	0.1653	1.405	6.789	17.427	7.152	15	0.304	+0.050
	2	0.1680	1.370	6.756	17.540	6.827	15	0.332	-0.001
	3	+0.1708	-1.312	-6.721	+17.647	-6.500	-15	-0.298	-0.055
	4	0.1735	1.230	6.694	17.748	6.172	15	0.206	0.099
	5	0.1762	1.131	6.689	17.845	5.842	15	-0.071	0.122
	6	0.1790	1.028	6.711	17.937	5.511	15	+0.079	0.116
	7	0.1817	0.932	6.761	18.023	5.179	15	0.208	0.082
	8	0.1845	0.858	6.832	18.105	4.845	15	0.286	-0.027
	9	+0.1872	-0.811	-6.908	+18.181	-4.510	-15	+0.295	+0.035
	10	0.1899	0.791	6.975	18.253	4.173	15	0.237	0.087
	11	0.1927	0.790	7.019	18.321	3.836	15	0.133	0.117
	12	0.1954	0.795	7.034	18.383	3.497	15	+0.014	0.119
	13	0.1982	0.794	7.023	18.441	3.156	15	-0.090	0.095
	14	0.2009	0.779	6.993	18.493	2.814	16	0.158	0.054
	15	+0.2036	-0.745	-6.956	+18.541	-2.471	-16	-0.180	+0.005
	16	0.2064	0.695	6.920	18.583	2.126	16	0.158	-0.042
	17	0.2091	0.630	6.893	18.620	1.781	16	0.100	0.079
	18	0.2118	0.557	6.882	18.652	1.434	15	-0.021	0.100
	19	0.2146	0.482	6.887	18.678	1.085	15	+0.064	0.103
	20	0.2173	0.410	6.910	18.699	0.736	15	0.141	0.088
	21	+0.2201	-0.347	-6.948	+18.715	-0.386	-15	+0.195	-0.058
	22	0.2228	0.298	6.996	18.724	-0.036	15	0.215	-0.017
	23	0.2255	0.264	7.048	18.728	+0.315	15	0.195	+0.029
	24	0.2283	0.247	7.094	18.726	0.667	16	0.134	0.070
	25	0.2310	0.244	7.128	18.719	1.019	16	+0.038	0.099
	26	0.2337	0.249	7.143	18.705	1.371	16	-0.077	0.110
	27	+0.2365	-0.253	-7.135	+18.686	+1.723	-16	-0.191	+0.097
	28	0.2392	0.246	7.103	18.661	2.074	16	0.279	0.064
	29	0.2420	0.221	7.056	18.629	2.426	16	0.320	+0.014
	30	0.2447	0.171	7.002	18.592	2.776	16	0.299	-0.042
Oct.	1	+0.2474	-0.096	-6.955	+18.550	+3.125	-16	-0.218	-0.089

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FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Oct.	1	+0.2474	-0.096	-6.955	+18.550	+3.125	-16	-0.218	-0.089
	2	0.2502	-0.004	6.927	18.501	3.474	16	-0.092	0.118
	3	0.2529	+0.096	6.926	18.447	3.821	16	+0.053	0.119
	4	0.2556	0.190	6.951	18.388	4.167	16	0.183	0.092
	5	0.2584	0.267	6.999	18.323	4.511	16	0.270	-0.043
	6	0.2611	0.320	7.055	18.253	4.854	16	0.295	+0.016
	7	+0.2639	+0.348	-7.107	+18.179	+5.195	-16	+0.255	+0.071
	8	0.2666	0.355	7.141	18.099	5.536	16	0.164	0.108
	9	0.2693	0.352	7.149	18.014	5.874	16	+0.046	0.121
	10	0.2721	0.351	7.130	17.924	6.211	16	-0.067	0.106
	11	0.2748	0.362	7.089	17.829	6.547	17	0.151	0.070
	12	0.2775	0.391	7.035	17.729	6.882	17	0.191	+0.023
	13	+0.2803	+0.439	-6.979	+17.624	+7.215	-17	-0.183	-0.027
	14	0.2830	0.504	6.931	17.513	7.547	17	0.135	0.068
	15	0.2858	0.581	6.896	17.398	7.877	17	-0.059	0.096
	16	0.2885	0.662	6.878	17.277	8.205	17	+0.028	0.105
	17	0.2912	0.742	6.879	17.151	8.531	16	0.111	0.096
	18	0.2940	0.815	6.896	17.019	8.856	16	0.174	0.070
	19	+0.2967	+0.876	-6.924	+16.882	+9.179	-16	+0.207	-0.032
	20	0.2995	0.922	6.959	16.740	9.499	16	0.201	+0.012
	21	0.3022	0.952	6.993	16.592	9.817	17	0.153	0.056
	22	0.3049	0.968	7.017	16.439	10.133	17	+0.069	0.091
	23	0.3077	0.974	7.023	16.281	10.446	17	-0.042	0.109
	24	0.3104	0.978	7.008	16.117	10.756	17	0.160	0.105
	25	+0.3131	+0.989	-6.969	+15.948	+11.063	-17	-0.260	+0.078
	26	0.3159	1.018	6.910	15.773	11.366	17	0.316	+0.031
	27	0.3186	1.072	6.841	15.593	11.667	17	0.312	-0.026
	28	0.3214	1.153	6.775	15.408	11.963	17	0.241	0.079
	29	0.3241	1.256	6.727	15.218	12.256	17	-0.118	0.114
	30	0.3268	1.370	6.706	15.024	12.545	17	+0.031	0.122
	31	+0.3296	+1.480	-6.713	+14.824	+12.830	-17	+0.171	-0.101
Nov.	1	0.3323	1.575	6.745	14.620	13.111	16	0.270	-0.056
	2	0.3350	1.646	6.788	14.412	13.387	16	0.308	+0.002
	3	0.3378	1.692	6.830	14.200	13.659	16	0.281	0.058
	4	0.3405	1.717	6.858	13.983	13.928	17	0.200	0.100
	5	0.3433	1.731	6.863	13.763	14.192	17	+0.087	0.119
	6	+0.3460	+1.743	-6.842	+13.539	+14.452	-17	-0.031	+0.112
	7	0.3487	1.764	6.799	13.311	14.708	17	0.127	0.083
	8	0.3515	1.801	6.740	13.078	14.959	17	0.185	+0.039
	9	0.3542	1.857	6.676	12.842	15.207	17	0.195	-0.011
	10	0.3569	1.932	6.617	12.603	15.451	17	0.161	0.056
	11	0.3597	2.022	6.570	12.359	15.691	17	0.093	0.089
	12	+0.3624	+2.118	-6.540	+12.111	+15.926	-17	-0.007	-0.104
	13	0.3652	2.216	6.528	11.860	16.157	16	+0.079	0.102
	14	0.3679	2.308	6.535	11.604	16.384	16	0.150	0.081
	15	0.3706	2.390	6.555	11.345	16.606	16	0.193	0.047
	16	+0.3734	+2.458	-6.584	+11.082	+16.823	-16	+0.199	-0.004

BESSELIAN DAY NUMBERS, 2022.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Nov.	16	+0.3734	+2.458	-6.584	+11.082	+16.823	-16	+0.199	-0.004
	17	0.3761	2.510	6.615	10.815	17.036	16	0.165	+0.040
	18	0.3789	2.548	6.640	10.544	17.244	16	+0.092	0.078
	19	0.3816	2.574	6.651	10.269	17.447	16	-0.011	0.103
	20	0.3843	2.595	6.644	9.991	17.645	17	0.128	0.108
	21	0.3871	2.620	6.613	9.710	17.837	17	0.238	0.090
	22	+0.3898	+2.658	-6.561	+9.424	+18.024	-17	-0.316	+0.050
	23	0.3925	2.720	6.494	9.135	18.206	17	0.337	-0.005
	24	0.3953	2.810	6.425	8.843	18.381	17	0.288	0.063
	25	0.3980	2.926	6.370	8.548	18.551	16	0.173	0.107
	26	0.4008	3.059	6.341	8.250	18.714	16	-0.018	0.125
	27	0.4035	3.194	6.344	7.949	18.871	16	+0.140	0.112
	28	+0.4062	+3.315	-6.375	+7.646	+19.022	-16	+0.262	-0.071
	29	0.4090	3.412	6.423	7.340	19.166	15	0.322	-0.013
	30	0.4117	3.481	6.474	7.033	19.305	15	0.311	+0.046
Dec.	1	0.4144	3.527	6.512	6.723	19.437	15	0.241	0.092
	2	0.4172	3.559	6.529	6.412	19.564	15	0.132	0.117
	3	0.4199	3.586	6.521	6.099	19.684	16	+0.014	0.116
	4	+0.4227	+3.620	-6.490	+5.784	+19.798	-16	-0.090	+0.092
	5	0.4254	3.668	6.443	5.468	19.907	16	0.160	0.052
	6	0.4281	3.734	6.389	5.150	20.010	16	0.185	+0.003
	7	0.4309	3.818	6.338	4.831	20.107	16	0.166	-0.043
	8	0.4336	3.918	6.297	4.510	20.198	15	0.109	0.080
	9	0.4363	4.027	6.272	4.187	20.283	15	-0.029	0.101
	10	+0.4391	+4.139	-6.266	+3.864	+20.363	-15	+0.057	-0.104
	11	0.4418	4.247	6.279	3.538	20.436	15	0.134	0.088
	12	0.4446	4.346	6.308	3.212	20.504	15	0.185	0.058
	13	0.4473	4.430	6.347	2.884	20.565	15	0.201	-0.018
	14	0.4500	4.499	6.390	2.555	20.621	15	0.177	+0.026
	15	0.453	4.553	6.430	2.225	20.670	15	0.115	0.066
	16	+0.4555	+4.594	-6.460	+1.894	+20.713	-15	+0.020	+0.094
	17	0.4582	4.628	6.474	1.561	20.750	15	-0.095	0.106
	18	0.4610	4.661	6.467	1.228	20.780	15	0.210	0.098
	19	0.4637	4.703	6.440	0.894	20.804	15	0.304	0.067
	20	0.4665	4.763	6.395	0.559	20.821	15	0.353	+0.018
	21	0.4692	4.849	6.341	+.224	20.832	15	0.337	-0.040
	22	+0.4719	+4.963	-6.294	-0.112	+20.835	-14	-0.250	-0.092
	23	0.4747	5.100	6.269	0.448	20.832	14	-0.105	0.124
	24	0.4774	5.247	6.275	0.784	20.821	14	+0.066	0.124
	25	0.4802	5.387	6.315	1.120	20.804	14	0.217	0.092
	26	0.4829	5.504	6.380	1.455	20.779	13	0.311	-0.035
	27	0.4856	5.591	6.452	1.790	20.748	13	0.330	+0.028
	28	+0.4884	+5.649	-6.516	-2.123	+20.710	-13	+0.278	+0.082
	29	0.4911	5.688	6.559	2.456	20.665	13	0.177	0.115
	30	0.4938	5.719	6.575	2.787	20.614	13	+0.058	0.120
	31	0.4966	5.755	6.567	3.117	20.557	13	-0.051	0.101
	32	+0.4993	+5.802	-6.542	-3.446	+20.493	-14	-0.129	+0.063

SECOND-ORDER DAY NUMBERS, 2022
J FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2022.5

Date		RIGHT ASCENSION												
		0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan.	-3	0	0	0	-2	0	-1	-1	-1	-1	-1	-1	0	0
	7	-1	-2	-1	-1	-1	0	0	1	0	0	0	-1	-1
	17	-2	-2	-2	-2	-1	0	1	1	1	1	0	-1	-2
	27	-1	-3	-3	-3	-2	-1	0	2	2	2	1	0	-1
Feb.	6	-1	-3	-4	-5	-4	-3	0	2	3	4	3	2	-1
	16	1	-2	-5	-6	-6	-4	-2	1	4	5	5	3	1
	26	3	-1	-4	-7	-7	-6	-4	0	3	6	6	5	3
Mar.	8	5	1	-3	-7	-9	-8	-6	-2	2	6	8	7	5
	18	7	4	-1	-6	-9	-10	-8	-5	0	5	8	9	7
	28	10	6	1	-5	-9	-12	-11	-7	-2	4	8	11	10
Apr.	7	11	8	3	-3	-8	-12	-12	-9	-4	2	7	11	11
	17	12	11	6	0	-7	-12	-13	-12	-7	-1	6	11	12
	27	13	12	9	2	-5	-10	-14	-13	-10	-3	4	9	13
May	7	12	13	11	5	-2	-9	-13	-14	-12	-6	1	8	12
	17	11	13	12	8	1	-6	-12	-14	-13	-9	-2	5	11
	27	9	12	13	10	4	-3	-10	-13	-14	-11	-5	2	9
June	6	6	11	13	11	6	-1	-7	-12	-14	-12	-7	0	6
	16	3	9	12	11	8	2	-4	-10	-13	-12	-9	-3	3
	26	1	6	10	11	9	4	-2	-7	-11	-12	-10	-5	1
July	6	-2	4	8	10	9	6	1	-5	-9	-11	-10	-7	-2
	16	-4	1	5	8	9	7	3	-2	-6	-9	-10	-8	-4
	26	-5	-1	3	6	7	7	4	0	-4	-7	-8	-8	-5
Aug.	5	-6	-3	0	4	6	6	5	2	-1	-5	-7	-7	-6
	15	-6	-4	-2	2	4	5	5	3	1	-3	-5	-6	-6
	25	-5	-5	-3	-1	2	4	4	4	2	0	-3	-5	-5
Sept.	4	-4	-5	-4	-2	0	2	3	4	3	1	-1	-3	-4
	14	-3	-4	-4	-3	-2	0	2	3	3	2	1	-1	-3
	24	-1	-2	-3	-4	-3	-2	0	1	2	3	2	1	-1
Oct.	4	1	-1	-2	-3	-4	-3	-2	0	1	2	3	2	1
	14	2	1	-1	-2	-4	-4	-3	-2	0	1	3	3	2
	24	3	3	1	-1	-3	-4	-4	-4	-2	0	2	3	3
Nov.	3	4	4	3	1	-1	-3	-5	-5	-4	-2	0	2	4
	13	4	5	5	3	1	-2	-5	-6	-6	-4	-2	1	4
	23	3	5	6	5	3	0	-4	-6	-7	-6	-4	-1	3
Dec.	3	1	5	7	7	5	2	-2	-6	-8	-8	-6	-3	1
	13	-2	3	7	8	8	5	1	-4	-8	-9	-9	-6	-2
	23	-4	1	6	9	9	7	3	-2	-7	-10	-10	-8	-4
	33	-7	-2	4	8	10	10	6	1	-5	-9	-11	-11	-7

The second-order day number J given in this table in units of $0^s.00001$

The apparent right ascension of a star is given by:

$\alpha = \alpha_1 + \tau\mu_\alpha/100 + Aa + Bb + Cc + Dd + E + J \tan^2\delta_1$

Where the position (α_1, δ_1) and centennial proper motion in right ascension (μ_α) are referred to the mean equator and equinox of J 2022.5

SECOND-ORDER DAY NUMBERS, 2022
J' FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2022.5

Date		RIGHT ASCENSION												
		0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan.	-3	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0
	7	-2	-1	0	-1	-1	-1	-1	-2	-3	-3	-3	-2	-2
	17	-5	-4	-2	0	0	0	-1	-2	-3	-4	-5	-5	-4
	27	-7	-6	-4	-3	-1	-1	-1	-2	-3	-5	-6	-7	-7
Feb.	6	-9	-8	-7	-4	-2	-1	-1	-1	-3	-5	-7	-9	-9
	16	-11	-11	-9	-7	-4	-2	-1	-1	-3	-5	-8	-10	-11
	26	-13	-13	-12	-9	-6	-3	-1	-1	-2	-5	-8	-11	-13
Mar.	8	-15	-16	-15	-12	-8	-5	-2	-1	-1	-4	-8	-12	-15
	18	-15	-18	-17	-15	-11	-7	-3	-1	-1	-3	-7	-12	-15
	28	-15	-18	-19	-18	-14	-9	-5	-1	-1	-2	-6	-11	-15
Apr.	7	-14	-18	-21	-20	-17	-12	-7	-3	-1	-1	-4	-9	-11
	17	-13	-18	-21	-22	-19	-15	-9	-4	-1	-1	-3	-7	-13
	27	-11	-17	-21	-22	-21	-17	-12	-6	-2	-1	-2	-6	-11
May	7	-9	-14	-19	-22	-22	-19	-14	-8	-3	-1	-1	-4	-9
	17	-7	-12	-17	-21	-22	-20	-16	-10	-5	-2	-1	-2	-7
	27	-5	-10	-15	-19	-21	-20	-17	-12	-7	-2	-1	-1	-5
June	6	-3	-7	-12	-17	-19	-20	-17	-13	-8	-4	-1	-1	-3
	16	-2	-4	-8	-13	-17	-19	-19	-16	-12	-7	-3	-1	-1
	26	-1	-3	-7	-11	-15	-17	-16	-14	-10	-6	-3	-1	-1
July	6	-1	-2	-5	-8	-12	-14	-15	-14	-11	-7	-4	-1	-1
	16	-1	-1	-3	-6	-9	-11	-13	-12	-10	-8	-4	-2	-1
	26	-1	-1	-1	-4	-6	-9	-10	-11	-10	-8	-5	-3	-1
Aug.	5	-2	-1	-1	-2	-4	-6	-8	-9	-9	-8	-6	-3	-2
	15	-2	-1	-1	-1	-2	-4	-5	-7	-7	-7	-5	-4	-2
	25	-3	-2	-1	-1	-1	-2	-3	-5	-6	-6	-5	-4	-3
Sept.	4	-3	-2	-1	-1	-1	-1	-2	-3	-4	-5	-5	-4	-3
	14	-4	-3	-2	-1	-1	-1	-1	-2	-2	-3	-4	-4	-4
	24	-4	-4	-3	-2	-1	-1	-1	-1	-1	-2	-3	-4	-4
Oct.	4	-4	-4	-4	-4	-3	-2	-1	-1	-1	-1	-2	-3	-4
	14	-3	-4	-5	-5	-4	-3	-2	-1	-1	-1	-1	-2	-3
	24	-3	-4	-5	-6	-6	-5	-4	-2	-1	-1	-1	-1	-3
Nov.	3	-2	-3	-5	-7	-7	-7	-6	-5	-3	-1	-1	-1	-2
	13	-1	-3	-5	-7	-9	-9	-9	-7	-5	-3	-1	-1	-1
	23	-1	-2	-4	-7	-10	-11	-11	-10	-7	-5	-2	-1	-1
Dec.	3	-1	-1	-4	-7	-10	-13	-14	-13	-11	-7	-4	-2	-1
	13	-1	-1	-3	-6	-10	-14	-16	-16	-14	-10	-6	-3	-1
	23	-2	-1	-2	-5	-9	-14	-17	-18	-17	-13	-9	-5	-2
	33	-3	-1	-1	-4	-8	-13	-17	-20	-19	-17	-12	-7	-3

The second-order day number J' given in this table in units of 0".0001

The apparent declination of a star is given by:
$\delta = \delta_1 + \tau\mu_\delta/100 + Aa' + Bb' + Cc' + J' \tan\delta_1$

Where the declination (δ_1) and centennial proper motion in declination (μ_δ) are referred to the mean equator and equinox of J 2022.5

SECOND-ORDER DAY NUMBERS, 2022
J FOR SOUTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2022.5

Date	RIGHT ASCENSION												
	0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan. -3	2	12	20	21	17	8	-3	-13	-21	-22	-18	-9	2
7	-2	8	16	19	17	11	1	-9	-17	-20	-18	-12	-2
17	-5	4	12	17	17	12	4	-5	-13	-18	-18	-13	-5
27	-7	1	9	14	15	12	6	-2	-10	-15	-16	-13	-7
Feb. 6	-8	-2	5	10	13	12	7	1	-6	-11	-14	-13	-8
16	-9	-4	2	7	10	10	8	3	-3	-8	-11	-11	-9
26	-8	-5	-1	4	7	9	7	4	0	-5	-8	-10	-8
Mar. 8	-7	-6	-2	1	5	6	6	5	1	-2	-6	-7	-7
18	-6	-5	-3	-1	2	4	5	4	2	0	-3	-5	-6
28	-4	-4	-4	-2	0	2	3	3	3	1	-1	-3	-4
Apr. 7	-2	-3	-3	-3	-1	0	1	2	2	2	0	-1	-3
17	-1	-2	-2	-2	-2	-1	0	1	1	1	1	0	-1
27	0	-1	-1	-2	-2	-2	-1	0	0	1	1	1	0
May 7	1	0	0	-1	-2	-2	-2	-1	-1	0	1	1	1
17	1	1	1	0	-1	-1	-2	-2	-2	-1	0	0	1
27	0	1	1	1	1	0	-1	-2	-2	-2	-2	-1	0
June 6	-1	1	2	2	2	1	0	-2	-3	-3	-3	-2	-1
16	-2	0	2	2	2	1	0	-1	-3	-3	-3	-2	-1
26	-4	-2	0	2	3	4	3	1	-1	-3	-4	-5	-4
July 6	-5	-4	-1	1	4	5	4	3	0	-2	-5	-6	-5
16	-7	-6	-3	0	3	5	6	5	2	-1	-4	-6	-7
26	-7	-7	-5	-2	2	5	6	6	4	1	-3	-6	-7
Aug. 5	-8	-8	-7	-4	0	4	7	7	6	3	-1	-5	-8
15	-7	-9	-9	-6	-2	3	6	8	8	5	1	-4	-7
25	-6	-9	-10	-8	-4	1	5	8	9	7	3	-2	-6
Sept. 4	-4	-9	-10	-10	-7	-2	3	8	9	9	6	1	-4
14	-2	-7	-10	-11	-9	-4	1	6	9	10	8	3	-2
24	0	-5	-9	-11	-10	-7	-1	4	8	10	9	6	0
Oct. 4	3	-3	-8	-11	-11	-8	-4	2	7	10	10	7	3
14	5	0	-5	-9	-11	-10	-6	-1	4	8	10	9	5
24	7	2	-3	-8	-10	-10	-8	-3	2	7	9	9	7
Nov. 3	8	4	-1	-5	-9	-10	-9	-5	0	4	8	9	8
13	8	6	2	-3	-7	-9	-9	-7	-3	2	6	8	8
23	7	6	3	-1	-4	-7	-8	-7	-4	0	3	6	7
Dec. 3	6	6	4	1	-2	-5	-7	-7	-5	-2	1	4	6
13	4	5	4	2	0	-3	-5	-6	-5	-3	-1	2	4
23	2	4	4	3	1	-1	-3	-5	-5	-4	-2	0	2
33	1	2	3	3	2	0	-2	-3	-4	-4	-3	-1	1

The second-order day number J given in this table in units of $0^s.00001$

The apparent right ascension of a star is given by:
$\alpha = \alpha_1 + \tau\mu_\alpha/100 + Aa + Bb + Cc + Dd + E + J \tan^2\delta_1$

Where the position (α_1, δ_1) and centennial proper motion in right ascension (μ_α) are referred to the mean equator and equinox of J 2022.5

SECOND-ORDER DAY NUMBERS, 2022
J' FOR SOUTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2022.5

Date		RIGHT ASCENSION												
		0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan.	-3	-1	-4	-10	-19	-27	-32	-33	-30	-24	-15	-7	-2	-1
	7	-1	-2	-7	-14	-22	-28	-30	-29	-24	-16	-9	-3	-1
	17	-1	-1	-5	-11	-18	-24	-27	-27	-23	-17	-10	-4	-1
	27	-2	-1	-3	-7	-14	-19	-23	-24	-22	-17	-11	-6	-2
Feb.	6	-2	-1	-1	-5	-10	-15	-19	-21	-20	-16	-12	-6	-2
	16	-3	-1	-1	-3	-6	-11	-14	-17	-17	-15	-11	-7	-3
	26	-4	-1	-1	-1	-4	-7	-11	-13	-14	-13	-11	-7	-4
Mar.	8	-4	-2	-1	-1	-2	-4	-7	-10	-11	-11	-10	-7	-4
	18	-5	-3	-1	-1	-1	-2	-4	-6	-8	-8	-8	-7	-5
	28	-5	-3	-2	-1	-1	-1	-2	-4	-5	-6	-6	-6	-5
Apr.	7	-4	-3	-2	-1	-1	-1	-1	-2	-3	-4	-5	-5	-6
	17	-3	-3	-2	-2	-1	-1	-1	-1	-2	-2	-3	-3	-3
	27	-3	-3	-3	-2	-2	-1	-1	-1	-1	-1	-2	-2	-3
May	7	-2	-2	-3	-3	-2	-2	-1	-1	-1	-1	-1	-1	-2
	17	-1	-2	-2	-3	-3	-3	-2	-2	-1	-1	-1	-1	-1
	27	-1	-1	-2	-3	-3	-3	-3	-3	-2	-1	-1	-1	-1
June	6	-1	-1	-1	-2	-3	-4	-4	-4	-4	-3	-2	-1	-1
	16	-1	-1	-1	-2	-3	-4	-4	-4	-4	-3	-2	-1	-1
	26	-2	-1	-1	-1	-3	-4	-6	-7	-7	-6	-5	-3	-2
July	6	-3	-1	-1	-1	-2	-4	-6	-7	-8	-8	-7	-5	-3
	16	-5	-2	-1	-1	-1	-3	-6	-8	-9	-10	-9	-7	-5
	26	-7	-4	-2	-1	-1	-2	-5	-8	-10	-11	-11	-9	-7
Aug.	5	-9	-6	-3	-1	-1	-2	-4	-7	-10	-12	-12	-11	-9
	15	-11	-8	-5	-2	-1	-1	-3	-6	-10	-12	-14	-13	-11
	25	-13	-10	-7	-3	-1	-1	-2	-5	-9	-12	-14	-15	-13
Sept.	4	-15	-13	-9	-5	-2	-1	-1	-3	-7	-11	-14	-16	-15
	14	-16	-15	-11	-7	-3	-1	-1	-2	-6	-10	-13	-16	-16
	24	-17	-16	-13	-9	-5	-2	-1	-1	-4	-8	-12	-15	-17
Oct.	4	-16	-16	-14	-11	-7	-3	-1	-1	-3	-6	-10	-14	-16
	14	-15	-16	-15	-13	-9	-5	-2	-1	-1	-4	-8	-12	-15
	24	-13	-15	-16	-14	-10	-6	-3	-1	-1	-3	-6	-10	-13
Nov.	3	-11	-14	-15	-14	-11	-8	-4	-1	-1	-1	-4	-8	-11
	13	-9	-12	-13	-13	-11	-9	-5	-2	-1	-1	-2	-5	-9
	23	-6	-9	-11	-12	-11	-9	-6	-3	-1	-1	-1	-3	-6
Dec.	3	-4	-7	-9	-10	-10	-9	-7	-4	-2	-1	-1	-2	-4
	13	-3	-5	-7	-8	-9	-8	-7	-5	-3	-1	-1	-1	-3
	23	-1	-3	-5	-6	-7	-7	-6	-5	-3	-2	-1	-1	-1
	33	-1	-1	-3	-4	-5	-6	-6	-5	-4	-2	-1	-1	-1

The second-order day number J' given in this table in units of 0".0001

The apparent declination of a star is given by:
$\delta = \delta_1 + \tau\mu_\delta/100 + Aa' + Bb' + Cc' + J' \tan\delta_1$

Where the declination (δ_1) and centennial proper motion in declination (μ_δ) are referred to the mean equator and equinox of J 2022.5

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Jan.	0	-0.165 986 39	+0.893 618 27	+0.387 568 68	-1727 2311	-259 1709	-112 2516
	1	0.183 233 70	0.890 887 34	0.386 385 81	1722 1344	287 0041	124 3193
	2	0.200 427 13	0.887 878 45	0.385 082 39	1716 4545	314 7605	136 3587
	3	0.217 560 84	0.884 592 46	0.383 658 76	1710 1903	342 4179	148 3593
	4	0.234 629 00	0.881 030 49	0.382 115 37	1703 3468	369 9542	160 3107
	5	0.251 625 88	0.877 193 85	0.380 452 75	1695 9338	397 3494	172 2032
	6	-0.268 545 83	+0.873 084 03	+0.378 671 53	-1687 9646	-424 5880	-184 0284
	7	0.285 383 36	0.868 702 65	0.376 772 42	1679 4531	451 6576	195 7799
	8	0.302 133 13	0.864 051 47	0.374 756 19	1670 4131	478 5496	207 4530
	9	0.318 789 90	0.859 132 28	0.372 623 64	1660 8566	505 2578	219 0443
	10	0.335 348 57	0.853 946 94	0.370 375 59	1650 7943	531 7769	230 5510
	11	0.351 804 13	0.848 497 38	0.368 012 91	1640 2353	558 1026	241 9712
	12	-0.368 151 65	+0.842 785 55	+0.365 536 46	-1629 1871	-584 2305	-253 3026
	13	0.384 386 27	0.836 813 44	0.362 947 16	1617 6574	610 1565	264 5434
	14	0.400 503 21	0.830 583 11	0.360 245 90	1605 6528	635 8768	275 6920
	15	0.416 497 76	0.824 096 61	0.357 433 63	1593 1793	661 3876	286 7469
	16	0.432 365 26	0.817 356 06	0.354 511 28	1580 2427	686 6855	297 7067
	17	0.448 101 09	0.810 363 62	0.351 479 81	1566 8484	711 7675	308 5703
	18	-0.463 700 71	+0.803 121 44	+0.348 340 20	-1553 0004	-736 6309	-319 3369
	19	0.479 159 60	0.795 631 74	0.345 093 40	1538 7022	761 2733	330 0059
	20	0.494 473 26	0.787 896 72	0.341 740 41	1523 9561	785 6920	340 5767
	21	0.509 637 23	0.779 918 65	0.338 282 20	1508 7632	809 8841	351 0487
	22	0.524 647 04	0.771 699 80	0.334 719 76	1493 1232	833 8465	361 4210
	23	0.539 498 20	0.763 242 50	0.331 054 11	1477 0352	857 5747	371 6927
	24	-0.554 186 24	+0.754 549 11	+0.327 286 25	-1460 4968	-881 0635	-381 8625
	25	0.568 706 63	0.745 622 05	0.323 417 21	1443 5049	904 3062	391 9279
	26	0.583 054 82	0.736 463 83	0.319 448 05	1426 0561	927 2943	401 8860
	27	0.597 226 21	0.727 077 05	0.315 379 86	1408 1463	950 0171	411 7331
	28	0.611 216 20	0.717 464 42	0.311 213 78	1389 7727	972 4616	421 4638
	29	0.625 020 12	0.707 628 80	0.306 950 99	1370 9338	994 6120	431 0713
	30	-0.638 633 33	+0.697 573 22	+0.302 592 79	-1351 6312	-1016 4504	-440 5478
	31	0.652 051 21	0.687 300 89	0.298 140 51	1331 8709	1037 9578	449 8844
Feb.	1	0.665 269 25	0.676 815 22	0.293 595 59	1311 6636	1059 1160	459 0722
	2	0.678 283 05	0.666 119 79	0.288 959 58	1291 0242	1079 9091	468 1029
	3	0.691 088 36	0.655 218 30	0.284 234 08	1269 9706	1100 3243	476 9700
	4	0.703 681 14	0.644 114 59	0.279 420 75	1248 5215	1120 3533	485 6685
	5	-0.716 057 53	+0.632 812 54	+0.274 521 28	-1226 6948	-1139 9907	-494 1952
	6	0.728 213 83	0.621 316 09	0.269 537 42	1204 5074	1159 2340	502 5487
	7	0.740 146 52	0.609 629 18	0.264 470 89	1181 9738	1178 0817	510 7276
	8	0.751 852 20	0.597 755 78	0.259 323 45	1159 1065	1196 5331	518 7317
	9	0.763 327 58	0.585 699 84	0.254 096 84	1135 9172	1214 5877	526 5607
	10	0.774 569 50	0.573 465 35	0.248 792 82	1112 4162	1232 2449	534 2144
	11	-0.785 574 90	+0.561 056 27	+0.243 413 14	-1088 6135	-1249 5045	-541 6927
	12	0.796 340 80	0.548 476 59	0.237 959 55	1064 5185	1266 3658	548 9957
	13	0.806 864 32	0.535 730 28	0.232 433 81	1040 1399	1282 8288	556 1235
	14	0.817 142 68	0.522 821 34	0.226 837 66	1015 4861	1298 8940	563 0766
	15	-0.827 173 15	+0.509 753 73	+0.221 172 86	-990 5649	-1314 5621	-569 8556

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Jan.	0	-1401	-485 451	-210 922	+485 447	-1178	-2501	+210 931	+1477	-222
	1	1402	485 585	210 980	485 581	1179	2485	210 990	1461	223
	2	1402	485 741	211 048	485 737	1180	2482	211 057	1457	223
	3	1403	485 900	211 117	485 896	1181	2494	211 126	1469	223
	4	1404	486 043	211 179	486 039	1181	2522	211 188	1495	223
	5	1405	486 157	211 228	486 153	1182	2558	211 238	1531	223
	6	-1405	-486 239	-211 264	+486 235	-1182	-2594	+211 274	+1567	-223
	7	1406	486 293	211 287	486 289	1182	2625	211 298	1598	223
	8	1406	486 331	211 304	486 326	1183	2647	211 314	1619	223
	9	1406	486 362	211 317	486 358	1183	2657	211 328	1629	223
	10	1406	486 398	211 333	486 394	1183	2658	211 344	1630	223
	11	1407	486 446	211 354	486 441	1183	2651	211 364	1623	223
	12	-1407	-486 509	-211 381	+486 505	-1183	-2641	+211 392	+1613	-223
	13	1407	486 589	211 416	486 585	1184	2631	211 426	1602	224
	14	1408	486 685	211 458	486 681	1184	2623	211 468	1594	224
	15	1409	486 793	211 505	486 789	1185	2621	211 515	1592	224
	16	1409	486 908	211 554	486 903	1185	2628	211 565	1598	224
	17	1410	487 023	211 604	487 018	1186	2643	211 614	1612	224
	18	-1410	-487 130	-211 651	+487 126	-1186	-2666	+211 661	+1635	-224
	19	1411	487 224	211 692	487 220	1187	2696	211 702	1665	224
	20	1411	487 300	211 724	487 295	1187	2730	211 735	1698	224
	21	1412	487 356	211 749	487 351	1188	2763	211 760	1731	224
	22	1412	487 394	211 765	487 389	1188	2792	211 777	1760	224
	23	1412	487 420	211 777	487 416	1188	2813	211 788	1780	224
	24	-1412	-487 444	-211 787	+487 439	-1188	-2823	+211 798	+1790	-224
	25	1412	487 475	211 801	487 470	1188	2822	211 812	1789	224
	26	1413	487 525	211 822	487 520	1188	2812	211 834	1780	224
	27	1413	487 602	211 856	487 597	1189	2799	211 867	1766	224
	28	1414	487 708	211 902	487 703	1189	2787	211 913	1754	225
	29	1415	487 837	211 958	487 832	1190	2785	211 969	1751	225
	30	-1415	-487 977	-212 018	+487 972	-1191	-2796	+212 030	+1762	-225
	31	1416	488 110	212 076	488 105	1191	2822	212 088	1787	225
Feb.	1	1417	488 221	212 125	488 216	1192	2860	212 136	1824	225
	2	1417	488 301	212 159	488 296	1192	2902	212 171	1866	225
	3	1418	488 349	212 180	488 344	1192	2942	212 192	1905	225
	4	1418	488 375	212 191	488 370	1193	2972	212 203	1936	225
	5	-1418	-488 390	-212 198	+488 385	-1193	-2991	+212 210	+1954	-225
	6	1418	488 405	212 205	488 400	1193	2998	212 217	1962	225
	7	1418	488 430	212 215	488 425	1193	2997	212 228	1960	225
	8	1418	488 470	212 233	488 465	1193	2990	212 245	1953	225
	9	1419	488 528	212 258	488 522	1193	2981	212 270	1944	225
	10	1419	488 601	212 290	488 596	1194	2974	212 302	1937	225
	11	-1420	-488 688	-212 327	+488 683	-1194	-2973	+212 339	+1935	-225
	12	1420	488 783	212 369	488 777	1195	2978	212 381	1940	226
	13	1421	488 879	212 410	488 874	1195	2992	212 423	1953	226
	14	1421	488 971	212 450	488 965	1195	3014	212 462	1975	226
	15	-1422	-489 050	-212 485	+489 045	-1196	-3044	+212 497	+2004	-226

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Feb.	15	-0.827 173 15	+0.509 753 73	+0.221 172 86	-990 5649	-1314 5621	-569 8556
	16	0.836 953 10	0.496 531 41	0.215 441 13	965 3822	1329 8344	576 4617
	17	0.846 479 94	0.483 158 35	0.209 644 20	939 9432	1344 7117	582 8960
	18	0.855 751 12	0.469 638 49	0.203 783 78	914 2512	1359 1951	589 1595
	19	0.864 764 13	0.455 975 77	0.197 861 57	888 3080	1373 2845	595 2531
	20	0.873 516 45	0.442 174 12	0.191 879 28	862 1142	1386 9785	601 1769
	21	-0.882 005 57	+0.428 237 52	+0.185 838 60	-835 6691	-1400 2741	-606 9305
	22	0.890 228 99	0.414 169 98	0.179 741 24	808 9720	1413 1661	612 5123
	23	0.898 184 17	0.399 975 57	0.173 588 94	782 0225	1425 6475	617 9198
	24	0.905 868 60	0.385 658 43	0.167 383 44	754 8208	1437 7089	623 1495
	25	0.913 279 76	0.371 222 83	0.161 126 56	727 3692	1449 3394	628 1964
	26	0.920 415 17	0.356 673 12	0.154 820 14	699 6722	1460 5264	633 0550
	27	-0.927 272 41	+0.342 013 82	+0.148 466 10	-671 7374	-1471 2569	-637 7192
	28	0.933 849 16	0.327 249 55	0.142 066 43	643 5757	1481 5174	642 1822
Mar.	1	0.940 143 21	0.312 385 08	0.135 623 15	615 2017	1491 2958	646 4379
	2	0.946 152 54	0.297 425 27	0.129 138 38	586 6329	1500 5827	650 4807
	3	0.951 875 29	0.282 375 09	0.122 614 26	557 8890	1509 3712	654 3069
	4	0.957 309 80	0.267 239 52	0.116 052 97	528 9898	1517 6580	657 9139
	5	-0.962 454 63	+0.252 023 60	+0.109 456 71	-499 9549	-1525 4428	-661 3009
	6	0.967 308 51	0.236 732 33	0.102 827 69	470 8021	1532 7274	664 4681
	7	0.971 870 33	0.221 370 71	0.096 168 08	441 5473	1539 5155	667 4167
	8	0.976 139 16	0.205 943 67	0.089 480 07	412 2044	1545 8108	670 1487
	9	0.980 114 17	0.190 456 12	0.082 765 82	382 7859	1551 6177	672 6656
	10	0.983 794 66	0.174 912 93	0.076 027 47	353 3030	1556 9403	674 9697
	11	-0.987 180 05	+0.159 318 91	+0.069 267 13	-323 7663	-1561 7828	-677 0627
	12	0.990 269 84	0.143 678 86	0.062 486 91	294 1857	1566 1492	678 9468
	13	0.993 063 65	0.127 997 50	0.055 688 89	264 5705	1570 0438	680 6241
	14	0.995 561 17	0.112 279 54	0.048 875 11	234 9295	1573 4712	682 0971
	15	0.997 762 18	0.096 529 62	0.042 047 62	205 2707	1576 4367	683 3684
	16	0.999 666 54	0.080 752 33	0.035 208 41	175 6007	1578 9457	684 4409
	17	-1.001 274 17	+0.064 952 21	+0.028 359 45	-145 9244	-1581 0038	-685 3177
	18	1.002 585 02	0.049 133 74	0.021 502 69	116 2453	1582 6161	686 0020
	19	1.003 599 07	0.033 301 36	0.014 640 04	86 5642	1583 7867	686 4965
	20	1.004 316 30	0.017 459 47	0.007 773 39	56 8806	1584 5178	686 8029
	21	1.004 736 67	+0.001 612 47	+0.000 904 61	-27 1932	1584 8092	686 9220
	22	1.004 860 15	-0.014 235 24	-0.005 964 42	+2 4991	1584 6581	686 8531
	23	-1.004 686 67	-0.030 079 20	-0.012 831 82	+32 1969	-1584 0591	-686 5942
	24	1.004 216 20	0.045 914 91	0.019 695 66	61 8978	1583 0047	686 1424
	25	1.003 448 72	0.061 737 75	0.026 554 01	91 5968	1581 4866	685 4933
	26	1.002 384 29	0.077 543 06	0.033 404 86	121 2864	1579 4958	684 6428
	27	1.001 023 06	0.093 326 07	0.040 246 18	150 9554	1577 0239	683 5862
	28	0.999 365 30	0.109 081 91	0.047 075 88	180 5903	1574 0639	682 3198
	29	-0.997 411 42	-0.124 805 70	-0.053 891 86	+210 1752	-1570 6104	-680 8400
	30	0.995 162 02	0.140 492 47	0.060 691 96	239 6925	1566 6603	679 1443
	31	0.992 617 86	0.156 137 25	0.067 474 03	269 1239	1562 2136	677 2319
Apr.	1	0.989 779 89	0.171 735 09	0.074 235 88	298 4512	1557 2719	675 1029
	2	-0.986 649 24	-0.187 281 06	-0.080 975 37	+327 6566	-1551 8402	-672 7584

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Feb.	15	-1422	-489 050	-212 485	+489 045	-1196	-3044	+212 497	+2004	-226
	16	1422	489 113	212 512	489 107	1196	3077	212 524	2038	226
	17	1422	489 155	212 530	489 150	1196	3112	212 543	2072	226
	18	1422	489 178	212 540	489 172	1197	3142	212 553	2102	226
	19	1422	489 187	212 544	489 181	1197	3165	212 557	2125	226
	20	1422	489 190	212 546	489 184	1197	3176	212 559	2137	226
	21	-1422	-489 199	-212 550	+489 194	-1197	-3176	+212 563	+2136	-226
	22	1423	489 225	212 561	489 220	1197	3167	212 574	2127	226
	23	1423	489 276	212 583	489 270	1197	3152	212 596	2111	226
	24	1423	489 354	212 617	489 348	1197	3137	212 630	2097	226
	25	1424	489 456	212 661	489 450	1198	3130	212 674	2089	226
	26	1425	489 571	212 711	489 565	1198	3134	212 724	2093	226
	27	-1425	-489 685	-212 760	+489 679	-1199	-3152	+212 773	+2110	-226
	28	1426	489 783	212 803	489 777	1199	3182	212 816	2140	226
Mar.	1	1426	489 855	212 834	489 849	1200	3219	212 847	2176	227
	2	1427	489 897	212 852	489 891	1200	3256	212 866	2213	227
	3	1427	489 913	212 860	489 907	1200	3286	212 873	2243	227
	4	1427	489 913	212 860	489 907	1200	3305	212 873	2262	227
	5	-1427	-489 910	-212 858	+489 904	-1200	-3311	+212 872	+2269	-227
	6	1427	489 914	212 860	489 908	1200	3307	212 874	2265	227
	7	1427	489 932	212 868	489 926	1200	3296	212 882	2253	227
	8	1427	489 969	212 884	489 963	1200	3281	212 898	2238	227
	9	1427	490 023	212 908	490 018	1201	3267	212 921	2224	227
	10	1428	490 093	212 938	490 087	1201	3257	212 951	2214	227
	11	-1428	-490 172	-212 972	+490 166	-1201	-3254	+212 986	+2210	-227
	12	1429	490 256	213 009	490 250	1202	3258	213 022	2214	227
	13	1429	490 337	213 044	490 331	1202	3271	213 057	2227	227
	14	1430	490 409	213 075	490 403	1203	3292	213 089	2247	227
	15	1430	490 465	213 100	490 459	1203	3317	213 114	2272	227
	16	1430	490 503	213 116	490 497	1203	3345	213 130	2300	227
	17	-1430	-490 522	-213 124	+490 516	-1203	-3370	+213 138	+2325	-227
	18	1430	490 524	213 125	490 518	1203	3388	213 139	2343	227
	19	1430	490 517	213 123	490 511	1203	3396	213 137	2351	227
	20	1430	490 514	213 121	490 508	1203	3391	213 135	2346	227
	21	1430	490 526	213 127	490 520	1203	3375	213 140	2329	227
	22	1430	490 563	213 143	490 557	1203	3352	213 157	2306	227
	23	-1431	-490 629	-213 171	+490 623	-1204	-3328	+213 185	+2282	-227
	24	1431	490 721	213 211	490 715	1204	3310	213 225	2263	227
	25	1432	490 827	213 257	490 821	1205	3303	213 271	2256	227
	26	1433	490 936	213 304	490 930	1205	3309	213 318	2262	228
	27	1433	491 031	213 346	491 025	1206	3327	213 360	2280	228
	28	1434	491 104	213 378	491 098	1206	3353	213 391	2305	228
	29	-1434	-491 150	-213 397	+491 144	-1206	-3381	+213 411	+2333	-228
	30	1434	491 170	213 406	491 163	1206	3404	213 420	2356	228
	31	1434	491 171	213 407	491 165	1206	3418	213 421	2370	228
Apr.	1	1434	491 166	213 405	491 160	1206	3420	213 419	2372	228
	2	-1434	-491 165	-213 404	+491 159	-1206	-3411	+213 418	+2363	-228

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Apr.	1	-0.989 779 89	-0.171 735 09	-0.074 235 88	+298 4512	-1557 2719	-675 1029
	2	0.986 649 24	0.187 281 06	0.080 975 37	327 6566	1551 8402	672 7584
	3	0.983 227 22	0.202 770 28	0.087 690 34	356 7242	1545 9246	670 2010
	4	0.979 515 26	0.218 197 96	0.094 378 69	385 6399	1539 5326	667 4339
	5	0.975 514 97	0.233 559 37	0.101 038 33	414 3910	1532 6727	664 4604
	6	0.971 228 03	0.248 849 88	0.107 667 22	442 9668	1525 3527	661 2845
	7	-0.966 656 25	-0.264 064 92	-0.114 263 36	+471 3575	-1517 5814	-657 9099
	8	0.961 801 52	0.279 200 03	0.120 824 77	499 5544	1509 3668	654 3404
	9	0.956 665 83	0.294 250 81	0.127 349 53	527 5497	1500 7168	650 5799
	10	0.951 251 23	0.309 212 94	0.133 835 74	555 3358	1491 6398	646 6324
	11	0.945 559 83	0.324 082 21	0.140 281 56	582 9061	1482 1439	642 5018
	12	0.939 593 84	0.338 854 45	0.146 685 18	610 2547	1472 2378	638 1923
	13	-0.933 355 49	-0.353 525 62	-0.153 044 83	+637 3771	-1461 9307	-633 7086
	14	0.926 847 06	0.368 091 76	0.159 358 79	664 2705	1451 2315	629 0553
	15	0.920 070 85	0.382 548 98	0.165 625 39	690 9339	1440 1486	624 2370
	16	0.913 029 15	0.396 893 48	0.171 842 99	717 3688	1428 6897	619 2578
	17	0.905 724 23	0.411 121 53	0.178 010 02	743 5786	1416 8596	614 1208
	18	0.898 158 31	0.425 229 44	0.184 124 89	769 5677	1404 6604	608 8278
	19	-0.890 333 59	-0.439 213 51	-0.190 186 05	+795 3398	-1392 0910	-603 3789
	20	0.882 252 23	0.453 070 01	0.196 191 94	820 8967	1379 1467	597 7721
	21	0.873 916 38	0.466 795 17	0.202 140 96	846 2368	1365 8217	592 0045
	22	0.865 328 24	0.480 385 15	0.208 031 48	871 3545	1352 1091	586 0725
	23	0.856 490 06	0.493 836 04	0.213 861 85	896 2406	1338 0027	579 9727
	24	0.847 404 24	0.507 143 88	0.219 630 37	920 8831	1323 4986	573 7021
	25	-0.838 073 26	-0.520 304 68	-0.225 335 32	+945 2680	-1308 5944	-567 2587
	26	0.828 499 79	0.533 314 44	0.230 974 97	969 3800	1293 2908	560 6419
	27	0.818 686 62	0.546 169 17	0.236 547 58	993 2034	1277 5903	553 8515
	28	0.808 636 73	0.558 864 93	0.242 051 42	1016 7229	1261 4975	546 8891
	29	0.798 353 23	0.571 397 84	0.247 484 79	1039 9240	1245 0195	539 7570
	30	0.787 839 36	0.583 764 07	0.252 846 01	1062 7928	1228 1644	532 4583
May	1	-0.777 098 52	-0.595 959 90	-0.258 133 42	+1085 3173	-1210 9416	-524 9970
	2	0.766 134 20	0.607 981 71	0.263 345 42	1107 4867	1193 3617	517 3775
	3	0.754 950 00	0.619 825 98	0.268 480 45	1129 2918	1175 4354	509 6045
	4	0.743 549 60	0.631 489 30	0.273 537 01	1150 7250	1157 1739	501 6832
	5	0.731 936 76	0.642 968 38	0.278 513 64	1171 7797	1138 5882	493 6185
	6	0.720 115 29	0.654 260 02	0.283 408 92	1192 4507	1119 6888	485 4155
	7	-0.708 089 04	-0.665 361 14	-0.288 221 51	+1212 7331	-1100 4865	-477 0791
	8	0.695 861 93	0.676 268 77	0.292 950 08	1232 6232	1080 9922	468 6144
	9	0.683 437 90	0.686 980 05	0.297 593 38	1252 1178	1061 2160	460 0266
	10	0.670 820 90	0.697 492 19	0.302 150 22	1271 2147	1041 1688	451 3207
	11	0.658 014 93	0.707 802 55	0.306 619 42	1289 9127	1020 8615	442 5021
	12	0.645 023 98	0.717 908 59	0.310 999 90	1308 2124	1000 3048	433 5764
	13	-0.631 852 00	-0.727 807 85	-0.315 290 61	+1326 1166	-979 5092	-424 5486
	14	0.618 502 95	0.737 498 01	0.319 490 55	1343 6300	958 4832	415 4237
	15	0.604 980 68	0.746 976 77	0.323 598 77	1360 7592	937 2333	406 2056
	16	0.591 289 02	0.756 241 94	0.327 614 36	1377 5123	915 7629	396 8960
	17	-0.577 431 67	-0.765 291 29	-0.331 536 39	+1393 8962	-894 0711	-387 4954

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Apr.	1	-1434	-491 166	-213 405	+491 160	-1206	-3420	+213 419	+2372	-228
	2	1434	491 165	213 404	491 159	1206	3411	213 418	2363	228
	3	1434	491 177	213 409	491 171	1206	3393	213 424	2345	228
	4	1434	491 207	213 423	491 201	1206	3370	213 437	2321	228
	5	1434	491 257	213 444	491 251	1207	3346	213 458	2297	228
	6	1435	491 324	213 473	491 318	1207	3325	213 487	2276	228
	7	-1435	-491 403	-213 508	+491 397	-1207	-3311	+213 521	+2261	-228
	8	1436	491 489	213 545	491 483	1208	3304	213 559	2254	228
	9	1436	491 575	213 582	491 569	1208	3305	213 596	2255	228
	10	1437	491 654	213 616	491 648	1209	3315	213 630	2264	228
	11	1437	491 720	213 645	491 714	1209	3330	213 659	2280	228
	12	1437	491 770	213 667	491 764	1209	3349	213 681	2298	228
	13	-1438	-491 801	-213 681	+491 795	-1209	-3368	+213 695	+2317	-228
	14	1438	491 815	213 687	491 809	1209	3381	213 701	2330	228
	15	1438	491 818	213 688	491 812	1209	3385	213 702	2334	228
	16	1438	491 819	213 688	491 813	1209	3377	213 702	2326	228
	17	1438	491 832	213 694	491 826	1210	3357	213 708	2306	228
	18	1438	491 869	213 710	491 863	1210	3327	213 724	2276	228
	19	-1438	-491 938	-213 740	+491 932	-1210	-3294	+213 754	+2243	-228
	20	1439	492 036	213 783	492 030	1211	3266	213 796	2214	229
	21	1440	492 154	213 834	492 148	1211	3248	213 847	2196	229
	22	1440	492 277	213 887	492 271	1212	3245	213 901	2192	229
	23	1441	492 389	213 936	492 384	1212	3254	213 950	2201	229
	24	1442	492 480	213 975	492 474	1213	3273	213 989	2219	229
	25	-1442	-492 543	-214 003	+492 537	-1213	-3294	+214 017	+2240	-229
	26	1442	492 581	214 019	492 575	1213	3313	214 033	2259	229
	27	1442	492 599	214 027	492 593	1213	3323	214 041	2269	229
	28	1442	492 607	214 031	492 601	1213	3323	214 045	2269	229
	29	1442	492 618	214 035	492 612	1213	3312	214 049	2258	229
	30	1443	492 638	214 045	492 633	1213	3291	214 058	2237	229
May	1	-1443	-492 676	-214 061	+492 671	-1214	-3265	+214 075	+2210	-229
	2	1443	492 734	214 086	492 728	1214	3236	214 099	2181	229
	3	1444	492 810	214 119	492 805	1214	3210	214 132	2155	229
	4	1444	492 901	214 159	492 895	1215	3189	214 172	2133	229
	5	1445	493 001	214 202	492 995	1215	3176	214 215	2120	229
	6	1445	493 102	214 246	493 097	1216	3171	214 259	2114	230
	7	-1446	-493 199	-214 288	+493 194	-1216	-3174	+214 301	+2118	-230
	8	1446	493 286	214 326	493 280	1217	3185	214 339	2128	230
	9	1447	493 357	214 356	493 351	1217	3200	214 370	2142	230
	10	1447	493 410	214 380	493 405	1217	3216	214 393	2158	230
	11	1447	493 447	214 395	493 441	1217	3229	214 409	2171	230
	12	1447	493 469	214 405	493 463	1218	3235	214 419	2177	230
	13	-1448	-493 486	-214 413	+493 481	-1218	-3231	+214 426	+2173	-230
	14	1448	493 510	214 423	493 504	1218	3214	214 436	2156	230
	15	1448	493 553	214 442	493 547	1218	3187	214 455	2128	230
	16	1448	493 626	214 473	493 620	1218	3153	214 486	2094	230
	17	-1449	-493 733	-214 520	+493 727	-1219	-3120	+214 533	+2061	-230

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
May	17	-0.577 431 67	-0.765 291 29	-0.331 536 39	+1393 8962	-894 0711	-387 4954
	18	0.563 412 31	0.774 122 61	0.335 363 96	1409 9151	872 1539	378 0018
	19	0.549 234 58	0.782 733 60	0.339 096 11	1425 5691	850 0052	368 4121
	20	0.534 902 16	0.791 121 92	0.342 731 86	1440 8532	827 6188	358 7227
	21	0.520 418 78	0.799 285 17	0.346 270 22	1455 7583	804 9906	348 9305
	22	0.505 788 30	0.807 220 92	0.349 710 13	1470 2726	782 1190	339 0336
	23	-0.491 014 68	-0.814 926 74	-0.353 050 54	+1484 3825	-759 0058	-329 0317
	24	0.476 102 04	0.822 400 24	0.356 290 41	1498 0750	735 6552	318 9257
	25	0.461 054 61	0.829 639 08	0.359 428 71	1511 3371	712 0741	308 7176
	26	0.445 876 77	0.836 640 99	0.362 464 44	1524 1574	688 2708	298 4106
	27	0.430 572 97	0.843 403 79	0.365 396 61	1536 5256	664 2551	288 0087
	28	0.415 147 79	0.849 925 42	0.368 224 31	1548 4327	640 0377	277 5160
	29	-0.399 605 88	-0.856 203 91	-0.370 946 64	+1559 8710	-615 6299	-266 9374
	30	0.383 951 96	0.862 237 42	0.373 562 79	1570 8339	591 0437	256 2783
	31	0.368 190 80	0.868 024 23	0.376 071 96	1581 3167	566 2910	245 5438
June	1	0.352 327 24	0.873 562 72	0.378 473 43	1591 3155	541 3839	234 7397
	2	0.336 366 12	0.878 851 43	0.380 766 54	1600 8272	516 3348	223 8715
	3	0.320 312 32	0.883 888 99	0.382 950 67	1609 8507	491 1556	212 9448
	4	-0.304 170 73	-0.888 674 15	-0.385 025 26	+1618 3851	-465 8580	-201 9651
	5	0.287 946 25	0.893 205 79	0.386 989 81	1626 4304	440 4536	190 9379
	6	0.271 643 75	0.897 482 90	0.388 843 87	1633 9876	414 9539	179 8687
	7	0.255 268 12	0.901 504 59	0.390 587 06	1641 0585	389 3701	168 7631
	8	0.238 824 19	0.905 270 06	0.392 219 03	1647 6463	363 7132	157 6265
	9	0.222 316 79	0.908 778 65	0.393 739 51	1653 7555	337 9942	146 4642
	10	-0.205 750 66	-0.912 029 77	-0.395 148 25	+1659 3921	-312 2232	-135 2816
	11	0.189 130 49	0.915 022 96	0.396 445 09	1664 5646	286 4086	124 0832
	12	0.172 460 88	0.917 757 82	0.397 629 87	1669 2829	260 5569	112 8726
	13	0.155 746 31	0.920 233 99	0.398 702 50	1673 5573	234 6707	101 6516
	14	0.138 991 18	0.922 451 12	0.399 662 87	1677 3979	208 7492	90 4200
	15	0.122 199 78	0.924 408 84	0.400 510 86	1680 8115	182 7880	79 1759
	16	-0.105 376 37	-0.926 106 72	-0.401 246 33	+1683 7997	-156 7804	-67 9156
	17	0.088 525 22	0.927 544 27	0.401 869 11	1686 3589	130 7207	56 6354
	18	0.071 650 65	0.928 720 95	0.402 378 97	1688 4812	104 6051	45 3323
	19	0.054 757 09	0.929 636 19	0.402 775 67	1690 1553	78 4336	34 0050
	20	0.037 849 07	0.930 289 45	0.403 058 99	1691 3695	52 2100	22 6542
	21	0.020 931 27	0.930 680 24	0.403 228 68	1692 1128	-25 9416	-11 2816
	22	-0.004 008 42	-0.930 808 16	-0.403 284 56	+1692 3758	+0 3628	+0 1091
	23	+0.012 914 62	0.930 672 90	0.403 226 46	1692 1508	26 6926	11 5137
	24	0.029 832 95	0.930 274 26	0.403 054 26	1691 4319	53 0360	22 9276
	25	0.046 741 60	0.929 612 17	0.402 767 89	1690 2146	79 3817	34 3457
	26	0.063 635 57	0.928 686 66	0.402 367 34	1688 4960	105 7177	45 7628
	27	0.080 509 84	0.927 497 89	0.401 852 66	1686 2738	132 0316	57 1733
	28	+0.097 359 37	-0.926 046 14	-0.401 223 92	+1683 5473	+158 3115	+68 5720
	29	0.114 179 11	0.924 331 81	0.400 481 28	1680 3165	184 5452	79 9531
	30	0.130 964 02	0.922 355 43	0.399 624 93	1676 5824	210 7205	91 3111
July	1	0.147 709 09	0.920 117 64	0.398 655 15	1672 3475	236 8256	102 6402
	2	+0.164 409 31	-0.917 619 19	-0.397 572 24	+1667 6146	+262 8487	+113 9351

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
May	17	-1449	-493 733	-214 520	+493 727	-1219	-3120	+214 533	+2061	-230
	18	1450	493 866	214 578	493 861	1220	3097	214 591	2037	230
	19	1451	494 012	214 641	494 007	1220	3089	214 654	2028	230
	20	1451	494 152	214 702	494 146	1221	3096	214 714	2035	231
	21	1452	494 270	214 753	494 264	1222	3114	214 766	2053	231
	22	1453	494 359	214 792	494 353	1222	3137	214 805	2076	231
	23	-1453	-494 419	-214 818	+494 414	-1222	-3159	+214 831	+2097	-231
	24	1453	494 458	214 835	494 452	1222	3173	214 848	2111	231
	25	1453	494 484	214 846	494 479	1223	3177	214 859	2115	231
	26	1454	494 510	214 857	494 504	1223	3171	214 870	2108	231
	27	1454	494 544	214 872	494 538	1223	3154	214 885	2092	231
	28	1454	494 593	214 893	494 587	1223	3132	214 906	2069	231
	29	-1454	-494 661	-214 923	+494 655	-1223	-3106	+214 936	+2043	-231
	30	1455	494 747	214 960	494 742	1224	3082	214 973	2019	231
	31	1456	494 849	215 005	494 844	1224	3063	215 017	1999	231
June	1	1456	494 962	215 054	494 956	1225	3051	215 066	1986	231
	2	1457	495 078	215 104	495 073	1226	3047	215 116	1982	231
	3	1458	495 191	215 153	495 186	1226	3052	215 165	1987	232
	4	-1458	-495 294	-215 198	+495 289	-1227	-3065	+215 210	+1999	-232
	5	1459	495 383	215 237	495 378	1227	3083	215 249	2017	232
	6	1459	495 455	215 268	495 450	1227	3103	215 280	2037	232
	7	1459	495 509	215 291	495 504	1228	3122	215 304	2055	232
	8	1460	495 549	215 308	495 543	1228	3135	215 321	2068	232
	9	1460	495 580	215 322	495 574	1228	3140	215 335	2073	232
	10	-1460	-495 612	-215 336	+495 606	-1228	-3134	+215 349	+2066	-232
	11	1460	495 657	215 356	495 652	1228	3116	215 368	2049	232
	12	1461	495 727	215 386	495 722	1229	3090	215 399	2023	232
	13	1461	495 830	215 431	495 825	1229	3062	215 443	1994	232
	14	1462	495 965	215 489	495 960	1230	3040	215 502	1971	232
	15	1463	496 121	215 557	496 116	1231	3031	215 569	1962	232
	16	-1464	-496 280	-215 626	+496 274	-1231	-3039	+215 638	+1969	-233
	17	1465	496 421	215 687	496 416	1232	3061	215 700	1991	233
	18	1465	496 533	215 736	496 528	1233	3092	215 749	2021	233
	19	1466	496 613	215 770	496 607	1233	3123	215 783	2052	233
	20	1466	496 665	215 793	496 659	1233	3148	215 806	2076	233
	21	1466	496 701	215 809	496 695	1234	3162	215 822	2090	233
	22	-1467	-496 733	-215 822	+496 727	-1234	-3165	+215 835	+2093	-233
	23	1467	496 770	215 839	496 765	1234	3158	215 852	2086	233
	24	1467	496 822	215 861	496 816	1234	3144	215 874	2072	233
	25	1468	496 891	215 891	496 885	1235	3127	215 904	2054	233
	26	1468	496 978	215 929	496 972	1235	3109	215 942	2036	233
	27	1469	497 081	215 974	497 075	1235	3096	215 986	2023	233
	28	-1469	-497 195	-216 023	+497 189	-1236	-3090	+216 036	+2016	-233
	29	1470	497 314	216 075	497 308	1237	3092	216 087	2018	233
	30	1471	497 430	216 125	497 425	1237	3103	216 138	2028	234
July	1	1471	497 539	216 172	497 533	1238	3122	216 185	2047	234
	2	-1472	-497 633	-216 213	+497 627	-1238	-3147	+216 226	+2071	-234

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
July	1	+0.147 709 09	-0.920 117 64	-0.398 655 15	+1672 3475	+236 8256	+102 6402
	2	0.164 409 31	0.917 619 19	0.397 572 24	1667 6146	262 8487	113 9351
	3	0.181 059 73	0.914 860 98	0.396 376 58	1662 3880	288 7784	125 1902
	4	0.197 655 44	0.911 843 97	0.395 068 59	1656 6728	314 6037	136 3999
	5	0.214 191 58	0.908 569 29	0.393 648 75	1650 4751	340 3137	147 5593
	6	0.230 663 36	0.905 038 12	0.392 117 59	1643 8019	365 8986	158 6632
	7	+0.247 066 06	-0.901 251 76	-0.390 475 69	+1636 6618	+391 3490	+169 7066
	8	0.263 395 07	0.897 211 62	0.388 723 67	1629 0646	416 6561	180 6855
	9	0.279 645 87	0.892 919 14	0.386 862 21	1621 0214	441 8133	191 5960
	10	0.295 814 05	0.888 375 86	0.384 891 99	1612 5448	466 8163	202 4357
	11	0.311 895 36	0.883 583 34	0.382 813 73	1603 6474	491 6634	213 2033
	12	0.327 885 64	0.878 543 11	0.380 628 16	1594 3404	516 3568	223 8997
	13	+0.343 780 83	-0.873 256 69	-0.378 335 97	+1584 6323	+540 9017	+234 5276
	14	0.359 576 96	0.867 725 55	0.375 937 82	1574 5265	565 3047	245 0907
	15	0.375 270 03	0.861 951 05	0.373 434 36	1564 0211	589 5721	255 5931
	16	0.390 856 03	0.855 934 54	0.370 826 16	1553 1094	613 7075	266 0377
	17	0.406 330 84	0.849 677 34	0.368 113 79	1541 7823	637 7103	276 4255
	18	0.421 690 26	0.843 180 79	0.365 297 84	1530 0300	661 5761	286 7558
	19	+0.436 929 99	-0.836 446 31	-0.362 378 88	+1517 8439	+685 2965	+297 0259
	20	0.452 045 67	0.829 475 38	0.359 357 53	1505 2181	708 8613	307 2315
	21	0.467 032 87	0.822 269 64	0.356 234 47	1492 1485	732 2594	317 3683
	22	0.481 887 15	0.814 830 79	0.353 010 41	1478 6332	755 4788	327 4309
	23	0.496 604 05	0.807 160 69	0.349 686 12	1464 6724	778 5080	337 4142
	24	0.511 179 12	0.799 261 30	0.346 262 41	1450 2669	801 3353	347 3132
	25	+0.525 607 91	-0.791 134 70	-0.342 740 16	+1435 4189	+823 9495	+357 1225
	26	0.539 886 03	0.782 783 06	0.339 120 28	1420 1314	846 3394	366 8370
	27	0.554 009 09	0.774 208 70	0.335 403 75	1404 4082	868 4936	376 4516
	28	0.567 972 76	0.765 414 01	0.331 591 60	1388 2541	890 4012	385 9609
	29	0.581 772 75	0.756 401 53	0.327 684 90	1371 6747	912 0514	395 3598
	30	0.595 404 86	0.747 173 88	0.323 684 79	1354 6769	933 4333	404 6431
	31	+0.608 864 92	-0.737 733 79	-0.319 592 44	+1337 2687	+954 5367	+413 8058
Aug.	1	0.622 148 89	0.728 084 11	0.315 409 09	1319 4590	975 3520	422 8430
	2	0.635 252 80	0.718 227 74	0.311 136 01	1301 2581	995 8702	431 7502
	3	0.648 172 79	0.708 167 72	0.306 774 53	1282 6770	1016 0831	440 5232
	4	0.660 905 11	0.697 907 12	0.302 326 01	1263 7280	1035 9840	449 1583
	5	0.673 446 16	0.687 449 10	0.297 791 83	1244 4243	1055 5674	457 6527
	6	+0.685 792 46	-0.676 796 84	-0.293 173 43	+1224 7795	+1074 8296	+466 0042
	7	0.697 940 66	0.665 953 58	0.288 472 23	1204 8078	1093 7692	474 2118
	8	0.709 887 57	0.654 922 53	0.283 689 67	1184 5230	1112 3875	482 2760
	9	0.721 630 12	0.643 706 89	0.278 827 18	1163 9368	1130 6884	490 1985
	10	0.733 165 34	0.632 309 80	0.273 886 16	1143 0579	1148 6781	497 9828
	11	0.744 490 32	0.620 734 34	0.268 867 97	1121 8911	1166 3637	505 6328
	12	+0.755 602 20	-0.608 983 52	-0.263 773 94	+1100 4357	+1183 7517	+513 1527
	13	0.766 498 06	0.597 060 29	0.258 605 34	1078 6872	1200 8460	520 5455
	14	0.777 174 94	0.584 967 58	0.253 363 45	1056 6391	1217 6463	527 8123
	15	0.787 629 82	0.572 708 35	0.248 049 52	1034 2839	1234 1483	534 9525
	16	+0.797 859 58	-0.560 285 63	-0.242 664 83	+1011 6161	+1250 3443	+541 9632

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
July	1	-1471	-497 539	-216 172	+497 533	-1238	-3122	+216 185	+2047	-234
	2	1472	497 633	216 213	497 627	1238	3147	216 226	2071	234
	3	1472	497 709	216 246	497 704	1239	3174	216 260	2098	234
	4	1473	497 768	216 272	497 762	1239	3201	216 285	2125	234
	5	1473	497 811	216 290	497 805	1239	3224	216 304	2147	234
	6	1473	497 843	216 304	497 837	1239	3239	216 318	2162	234
	7	-1473	-497 872	-216 317	+497 867	-1239	-3243	+216 331	+2166	-234
	8	1474	497 910	216 334	497 905	1240	3238	216 347	2161	234
	9	1474	497 967	216 359	497 961	1240	3223	216 372	2146	234
	10	1474	498 052	216 396	498 047	1240	3204	216 409	2126	234
	11	1475	498 169	216 446	498 163	1241	3187	216 459	2108	234
	12	1476	498 312	216 508	498 306	1242	3179	216 521	2100	234
	13	-1477	-498 467	-216 575	+498 461	-1242	-3187	+216 589	+2108	-235
	14	1478	498 615	216 640	498 609	1243	3211	216 653	2131	235
	15	1478	498 737	216 693	498 732	1244	3248	216 706	2167	235
	16	1479	498 826	216 731	498 820	1244	3288	216 745	2207	235
	17	1479	498 882	216 756	498 876	1244	3324	216 770	2243	235
	18	1480	498 916	216 770	498 910	1245	3351	216 784	2269	235
	19	-1480	-498 940	-216 781	+498 934	-1245	-3364	+216 795	+2283	-235
	20	1480	498 967	216 793	498 961	1245	3367	216 807	2285	235
	21	1480	499 007	216 810	499 001	1245	3360	216 824	2278	235
	22	1480	499 063	216 834	499 057	1245	3349	216 848	2267	235
	23	1481	499 138	216 867	499 132	1246	3338	216 881	2256	235
	24	1481	499 228	216 906	499 222	1246	3330	216 920	2247	235
	25	-1482	-499 331	-216 951	+499 325	-1247	-3328	+216 964	+2245	-235
	26	1483	499 439	216 997	499 433	1247	3334	217 011	2251	235
	27	1483	499 546	217 044	499 540	1248	3349	217 058	2265	236
	28	1484	499 646	217 087	499 640	1248	3372	217 101	2287	236
	29	1484	499 732	217 125	499 726	1249	3401	217 139	2316	236
	30	1485	499 801	217 155	499 795	1249	3434	217 169	2349	236
	31	-1485	-499 851	-217 177	+499 845	-1249	-3467	+217 191	+2381	-236
Aug.	1	1485	499 884	217 191	499 878	1249	3495	217 206	2410	236
	2	1485	499 905	217 200	499 898	1250	3517	217 215	2431	236
	3	1486	499 921	217 207	499 915	1250	3528	217 222	2442	236
	4	1486	499 942	217 216	499 936	1250	3529	217 231	2443	236
	5	1486	499 979	217 232	499 972	1250	3521	217 247	2435	236
	6	-1486	-500 039	-217 258	+500 032	-1250	-3508	+217 273	+2421	-236
	7	1487	500 127	217 297	500 121	1251	3494	217 311	2407	236
	8	1487	500 243	217 347	500 236	1251	3486	217 361	2399	236
	9	1488	500 376	217 404	500 369	1252	3491	217 419	2403	236
	10	1489	500 510	217 463	500 503	1253	3512	217 478	2423	237
	11	1490	500 628	217 514	500 621	1253	3546	217 529	2457	237
	12	-1490	-500 716	-217 552	+500 709	-1254	-3588	+217 567	+2499	-237
	13	1491	500 770	217 575	500 763	1254	3630	217 591	2540	237
	14	1491	500 795	217 587	500 788	1254	3663	217 602	2573	237
	15	1491	500 805	217 591	500 798	1254	3684	217 607	2594	237
	16	-1491	-500 813	-217 595	+500 807	-1254	-3691	+217 610	+2601	-237

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Aug.	16	+0.797 859 58	-0.560 285 63	-0.242 664 83	+1011 6161	+1250 3443	+541 9632
	17	0.807 861 09	0.547 702 52	0.237 210 70	988 6327	1266 2249	548 8405
	18	0.817 631 18	0.534 962 22	0.231 688 48	965 3333	1281 7792	555 5800
	19	0.827 166 70	0.522 068 06	0.226 099 58	941 7194	1296 9962	562 1767
	20	0.836 464 53	0.509 023 46	0.220 445 44	917 7947	1311 8657	568 6259
	21	0.845 521 58	0.495 831 94	0.214 727 57	893 5641	1326 3775	574 9229
	22	+0.854 334 81	-0.482 497 13	-0.208 947 50	+869 0334	+1340 5220	+581 0632
	23	0.862 901 27	0.469 022 75	0.203 106 84	844 2090	1354 2901	587 0424
	24	0.871 218 04	0.455 412 61	0.197 207 21	819 0979	1367 6725	592 8561
	25	0.879 282 29	0.441 670 62	0.191 250 28	793 7083	1380 6602	598 5000
	26	0.887 091 30	0.427 800 75	0.185 237 79	768 0489	1393 2446	603 9697
	27	0.894 642 41	0.413 807 10	0.179 171 49	742 1298	1405 4167	609 2608
	28	+0.901 933 07	-0.399 693 82	-0.173 053 18	+715 9622	+1417 1684	+614 3693
	29	0.908 960 86	0.385 465 16	0.166 884 72	689 5588	1428 4926	619 2911
	30	0.915 723 50	0.371 125 42	0.160 667 99	662 9333	1439 3830	624 0228
	31	0.922 218 84	0.356 678 96	0.154 404 91	636 1005	1449 8346	628 5618
Sept.	1	0.928 444 88	0.342 130 20	0.148 097 41	609 0760	1459 8443	632 9062
	2	0.934 399 77	0.327 483 55	0.141 747 44	581 8756	1469 4109	637 0549
	3	+0.940 081 85	-0.312 743 45	-0.135 356 96	+554 5150	+1478 5352	+641 0078
	4	0.945 489 59	0.297 914 31	0.128 927 93	527 0092	1487 2202	644 7664
	5	0.950 621 60	0.283 000 50	0.122 462 27	499 3715	1495 4707	648 3329
	6	0.955 476 62	0.268 006 32	0.115 961 90	471 6133	1503 2935	651 7105
	7	0.960 053 49	0.252 936 03	0.109 428 68	443 7427	1510 6966	654 9038
	8	0.964 351 11	0.237 793 76	0.102 864 42	415 7640	1517 6879	657 9172
	9	+0.968 368 41	-0.222 583 62	-0.096 270 92	+387 6780	+1524 2743	+660 7548
	10	0.972 104 31	0.207 309 61	0.089 649 90	359 4821	1530 4602	663 4197
	11	0.975 557 67	0.191 975 75	0.083 003 09	331 1720	1536 2463	665 9137
	12	0.978 727 35	0.176 586 03	0.076 332 20	302 7436	1541 6300	668 2363
	13	0.981 612 14	0.161 144 51	0.069 638 95	274 1940	1546 6056	670 3855
	14	0.984 210 82	0.145 655 30	0.062 925 08	245 5228	1551 1655	672 3582
	15	+0.986 522 20	-0.130 122 61	-0.056 192 38	+216 7323	+1555 3014	+674 1507
	16	0.988 545 09	0.114 550 72	0.049 442 68	187 8272	1559 0046	675 7591
	17	0.990 278 38	0.098 943 99	0.042 677 83	158 8137	1562 2670	677 1796
	18	0.991 721 03	0.083 306 87	0.035 899 73	129 6994	1565 0817	678 4084
	19	0.992 872 06	0.067 643 87	0.029 110 31	100 4928	1567 4416	679 4424
	20	0.993 730 61	0.051 959 57	0.022 311 54	71 2031	1569 3406	680 2783
	21	+0.994 295 88	-0.036 258 61	-0.015 505 41	+41 8398	+1570 7727	+680 9131
	22	0.994 567 19	0.020 545 69	0.008 693 96	+12 4133	1571 7321	681 3438
	23	0.994 543 97	-0.004 825 57	-0.001 879 23	-17 0653	1572 2131	681 5673
	24	0.994 225 75	+0.010 896 96	+0.004 936 69	46 5839	1572 2104	681 5808
	25	0.993 612 21	0.026 617 01	0.011 751 68	76 1287	1571 7190	681 3813
	26	0.992 703 14	0.042 329 70	0.018 563 60	105 6847	1570 7349	680 9663
	27	+0.991 498 53	+0.058 030 06	+0.025 370 28	-135 2354	+1569 2557	+680 3341
	28	0.989 998 51	0.073 713 16	0.032 169 55	164 7635	1567 2808	679 4838
	29	0.988 203 40	0.089 374 03	0.038 959 23	194 2509	1564 8117	678 4156
	30	0.986 113 68	0.105 007 76	0.045 737 14	223 6803	1561 8529	677 1309
Oct.	1	+0.983 730 04	+0.120 609 48	+0.052 501 14	-253 0353	+1558 4107	+675 6327

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Aug.	16	-1491	-500 813	-217 595	+500 807	-1254	-3691	+217 610	+2601	-237
	17	1491	500 832	217 603	500 825	1254	3688	217 618	2598	237
	18	1491	500 867	217 618	500 860	1254	3678	217 634	2588	237
	19	1491	500 921	217 642	500 915	1255	3667	217 657	2576	237
	20	1492	500 993	217 673	500 986	1255	3657	217 688	2567	237
	21	1492	501 077	217 709	501 071	1255	3653	217 725	2562	237
	22	-1493	-501 169	-217 749	+501 162	-1256	-3657	+217 765	+2566	-237
	23	1493	501 262	217 789	501 255	1256	3669	217 805	2578	237
	24	1494	501 348	217 827	501 341	1257	3690	217 843	2598	237
	25	1494	501 422	217 859	501 415	1257	3717	217 875	2625	237
	26	1495	501 480	217 884	501 473	1257	3748	217 900	2656	237
	27	1495	501 519	217 901	501 512	1258	3780	217 917	2687	237
	28	-1495	-501 540	-217 910	+501 533	-1258	-3809	+217 926	+2716	-237
	29	1495	501 546	217 913	501 539	1258	3830	217 930	2737	238
	30	1495	501 547	217 913	501 539	1258	3842	217 930	2749	238
	31	1495	501 550	217 915	501 543	1258	3843	217 931	2750	238
Sept.	1	1495	501 566	217 922	501 559	1258	3833	217 938	2740	238
	2	1496	501 605	217 939	501 597	1258	3818	217 955	2724	238
	3	-1496	-501 670	-217 967	+501 663	-1258	-3801	+217 983	+2707	-238
	4	1496	501 761	218 006	501 754	1259	3788	218 023	2694	238
	5	1497	501 871	218 054	501 864	1259	3785	218 070	2691	238
	6	1498	501 987	218 104	501 980	1260	3796	218 121	2702	238
	7	1498	502 093	218 151	502 086	1261	3821	218 167	2726	238
	8	1499	502 177	218 187	502 169	1261	3856	218 203	2760	238
	9	-1499	-502 229	-218 210	+502 221	-1261	-3893	+218 226	+2797	-238
	10	1499	502 251	218 219	502 243	1261	3925	218 236	2829	238
	11	1499	502 252	218 220	502 245	1261	3947	218 237	2851	238
	12	1499	502 247	218 217	502 239	1261	3954	218 235	2858	238
	13	1499	502 247	218 218	502 240	1261	3949	218 235	2853	238
	14	1499	502 264	218 225	502 257	1261	3934	218 242	2838	238
	15	-1500	-502 301	-218 241	+502 294	-1262	-3916	+218 258	+2820	-238
	16	1500	502 358	218 266	502 350	1262	3899	218 283	2802	238
	17	1500	502 430	218 297	502 422	1262	3886	218 314	2789	238
	18	1501	502 511	218 332	502 504	1263	3881	218 349	2783	238
	19	1501	502 596	218 369	502 588	1263	3884	218 386	2786	239
	20	1502	502 676	218 404	502 669	1263	3895	218 421	2797	239
	21	-1502	-502 746	-218 435	+502 739	-1264	-3913	+218 452	+2815	-239
	22	1503	502 802	218 459	502 794	1264	3937	218 476	2838	239
	23	1503	502 839	218 475	502 831	1264	3962	218 492	2863	239
	24	1503	502 858	218 483	502 850	1264	3985	218 500	2886	239
	25	1503	502 861	218 485	502 854	1264	4001	218 502	2902	239
	26	1503	502 856	218 482	502 848	1264	4008	218 500	2910	239
	27	-1503	-502 851	-218 480	+502 844	-1264	-4004	+218 498	+2905	-239
	28	1503	502 858	218 484	502 851	1264	3989	218 501	2890	239
	29	1503	502 887	218 496	502 879	1265	3966	218 513	2867	239
	30	1504	502 943	218 520	502 935	1265	3940	218 537	2841	239
Oct.	1	-1504	-503 025	-218 556	+503 018	-1265	-3917	+218 573	+2818	-239

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Oct.	1	+0.983 730 04	+0.120 609 48	+0.052 501 14	-253 0353	+1558 4107	+675 6327
	2	0.981 053 27	0.136 174 39	0.059 249 10	282 3016	1554 4933	673 9247
	3	0.978 084 34	0.151 697 79	0.065 978 95	311 4672	1550 1106	672 0117
	4	0.974 824 30	0.167 175 08	0.072 688 67	340 5232	1545 2729	669 8989
	5	0.971 274 26	0.182 601 77	0.079 376 28	369 4636	1539 9906	667 5919
	6	0.967 435 42	0.197 973 45	0.086 039 87	398 2854	1534 2731	665 0958
	7	+0.963 308 95	+0.213 285 81	+0.092 677 58	-426 9883	+1528 1282	+662 4151
	8	0.958 896 04	0.228 534 60	0.099 287 57	455 5737	1521 5612	659 5533
	9	0.954 197 86	0.243 715 63	0.105 868 05	484 0440	1514 5748	656 5125
	10	0.949 215 54	0.258 824 70	0.112 417 23	512 4013	1507 1688	653 2930
	11	0.943 950 21	0.273 857 60	0.118 933 31	540 6463	1499 3404	649 8943
	12	0.938 402 99	0.288 810 09	0.125 414 51	568 7777	1491 0858	646 3147
	13	+0.932 575 05	+0.303 677 88	+0.131 859 00	-596 7918	+1482 4003	+642 5516
	14	0.926 467 57	0.318 456 64	0.138 264 92	624 6827	1473 2787	638 6030
	15	0.920 081 83	0.333 141 99	0.144 630 43	652 4429	1463 7169	634 4665
	16	0.913 419 17	0.347 729 50	0.150 953 62	680 0638	1453 7113	630 1398
	17	0.906 481 05	0.362 214 72	0.157 232 59	707 5356	1443 2591	625 6215
	18	0.899 268 99	0.376 593 18	0.163 465 41	734 8486	1432 3579	620 9101
	19	+0.891 784 64	+0.390 860 38	+0.169 650 14	-761 9919	+1421 0059	+616 0040
	20	0.884 029 76	0.405 011 79	0.175 784 83	788 9546	1409 2014	610 9021
	21	0.876 006 19	0.419 042 89	0.181 867 53	815 7252	1396 9429	605 6032
	22	0.867 715 94	0.432 949 13	0.187 896 24	842 2906	1384 2291	600 1062
	23	0.859 161 11	0.446 725 96	0.193 868 98	868 6371	1371 0595	594 4098
	24	0.850 343 98	0.460 368 80	0.199 783 77	894 7490	1357 4343	588 5136
	25	+0.841 266 97	+0.473 873 13	+0.205 638 59	-920 6090	+1343 3551	+582 4176
	26	0.831 932 69	0.487 234 41	0.211 431 46	946 1993	1328 8265	576 1228
	27	0.822 343 94	0.500 448 18	0.217 160 39	971 5013	1313 8555	569 6321
	28	0.812 503 69	0.513 510 08	0.222 823 46	996 4978	1298 4523	562 9497
	29	0.802 415 06	0.526 415 83	0.228 418 77	1021 1739	1282 6296	556 0813
	30	0.792 081 32	0.539 161 32	0.233 944 49	1045 5178	1266 4017	549 0336
	31	+0.781 505 84	+0.551 742 56	+0.239 398 87	-1069 5211	+1249 7834	+541 8142
Nov.	1	0.770 692 04	0.564 155 73	0.244 780 22	1093 1794	1232 7894	534 4301
	2	0.759 643 40	0.576 397 14	0.250 086 94	1116 4909	1215 4326	526 8883
	3	0.748 363 38	0.588 463 21	0.255 317 48	1139 4558	1197 7240	519 1946
	4	0.736 855 44	0.600 350 48	0.260 470 35	1162 0761	1179 6728	511 3540
	5	0.725 123 00	0.612 055 55	0.265 544 09	1184 3543	1161 2856	503 3702
	6	+0.713 169 48	+0.623 575 09	+0.270 537 28	-1206 2927	+1142 5670	+495 2458
	7	0.700 998 27	0.634 905 79	0.275 448 54	1227 8931	1123 5194	486 9824
	8	0.688 612 75	0.646 044 38	0.280 276 47	1249 1558	1104 1438	478 5806
	9	0.676 016 29	0.656 987 58	0.285 019 69	1270 0797	1084 4402	470 0400
	10	0.663 212 29	0.667 732 09	0.289 676 81	1290 6616	1064 4079	461 3606
	11	0.650 204 21	0.678 274 64	0.294 246 44	1310 8966	1044 0462	452 5415
	12	+0.636 995 54	+0.688 611 92	+0.298 727 17	-1330 7784	+1023 3550	+443 5820
	13	0.623 589 84	0.698 740 64	0.303 117 61	1350 2997	1002 3348	434 4822
	14	0.609 990 77	0.708 657 52	0.307 416 34	1369 4521	980 9868	425 2415
	15	0.596 202 06	0.718 359 29	0.311 621 97	1388 2270	959 3127	415 8606
	16	+0.582 227 52	+0.727 842 69	+0.315 733 09	-1406 6153	+937 3147	+406 3399

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Oct.	1	-1504	-503 025	-218 556	+503 018	-1265	-3917	+218 573	+2818	-239
	2	1505	503 128	218 601	503 121	1266	3904	218 618	2804	239
	3	1505	503 240	218 649	503 233	1266	3904	218 666	2803	239
	4	1506	503 346	218 695	503 338	1267	3916	218 712	2816	239
	5	1506	503 432	218 733	503 425	1267	3939	218 750	2838	239
	6	1507	503 491	218 758	503 484	1268	3967	218 776	2866	239
	7	-1507	-503 522	-218 772	+503 514	-1268	-3992	+218 789	+2891	-239
	8	1507	503 530	218 775	503 522	1268	4009	218 793	2907	239
	9	1507	503 526	218 774	503 519	1268	4013	218 791	2911	239
	10	1507	503 525	218 773	503 518	1268	4004	218 791	2902	239
	11	1507	503 537	218 779	503 530	1268	3984	218 796	2882	239
	12	1507	503 570	218 793	503 562	1268	3958	218 810	2856	239
	13	-1508	-503 624	-218 816	+503 616	-1268	-3931	+218 833	+2829	-239
	14	1508	503 696	218 848	503 689	1269	3907	218 865	2805	240
	15	1509	503 781	218 885	503 774	1269	3891	218 901	2788	240
	16	1509	503 872	218 924	503 865	1269	3882	218 941	2779	240
	17	1510	503 962	218 963	503 954	1270	3883	218 980	2779	240
	18	1510	504 043	218 998	504 036	1270	3891	219 015	2787	240
	19	-1511	-504 111	-219 028	+504 104	-1271	-3905	+219 045	+2801	-240
	20	1511	504 163	219 050	504 155	1271	3922	219 067	2818	240
	21	1511	504 197	219 065	504 189	1271	3938	219 082	2834	240
	22	1511	504 214	219 073	504 207	1271	3950	219 090	2846	240
	23	1511	504 221	219 076	504 213	1271	3954	219 093	2849	240
	24	1511	504 225	219 077	504 217	1271	3946	219 094	2842	240
	25	-1511	-504 237	-219 083	+504 230	-1271	-3927	+219 100	+2823	-240
	26	1511	504 270	219 097	504 262	1271	3899	219 114	2794	240
	27	1512	504 330	219 123	504 323	1272	3865	219 140	2760	240
	28	1512	504 421	219 163	504 414	1272	3834	219 179	2728	240
	29	1513	504 536	219 212	504 529	1273	3811	219 229	2705	240
	30	1514	504 663	219 268	504 655	1273	3801	219 284	2694	240
	31	-1515	-504 786	-219 321	+504 779	-1274	-3805	+219 338	+2697	-241
Nov.	1	1515	504 892	219 367	504 885	1275	3820	219 384	2712	241
	2	1516	504 972	219 402	504 965	1275	3841	219 418	2733	241
	3	1516	505 023	219 424	505 016	1275	3862	219 441	2754	241
	4	1516	505 051	219 436	505 044	1275	3876	219 453	2767	241
	5	1516	505 066	219 443	505 059	1276	3878	219 460	2770	241
	6	-1516	-505 079	-219 449	+505 072	-1276	-3868	+219 465	+2760	-241
	7	1516	505 102	219 459	505 095	1276	3847	219 475	2739	241
	8	1517	505 144	219 477	505 137	1276	3819	219 493	2710	241
	9	1517	505 207	219 504	505 200	1276	3788	219 521	2679	241
	10	1518	505 291	219 541	505 284	1277	3759	219 557	2650	241
	11	1518	505 390	219 584	505 383	1277	3736	219 600	2627	241
	12	-1519	-505 499	-219 631	+505 492	-1278	-3722	+219 647	+2612	-241
	13	1520	505 608	219 678	505 601	1278	3717	219 694	2606	241
	14	1520	505 711	219 723	505 704	1279	3720	219 739	2609	241
	15	1521	505 803	219 763	505 796	1279	3730	219 779	2619	242
	16	-1521	-505 878	-219 796	+505 871	-1280	-3745	+219 812	+2633	-242

POSITION AND VELOCITY OF THE EARTH, 2022
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Nov.	16	+0.582 227 52	+0.727 842 69	+0.315 733 09	-1406 6153	+937 3147	+406 3399
	17	0.568 071 07	0.737 104 51	0.319 748 30	1424 6075	914 9954	396 6797
	18	0.553 736 73	0.746 141 54	0.323 666 22	1442 1937	892 3578	386 8809
	19	0.539 228 59	0.754 950 62	0.327 485 46	1459 3631	869 4049	376 9441
	20	0.524 550 89	0.763 528 60	0.331 204 65	1476 1038	846 1401	366 8702
	21	0.509 707 99	0.771 872 39	0.334 822 41	1492 4024	822 5680	356 6603
	22	+0.494 704 37	+0.779 978 95	+0.338 337 41	-1508 2441	+798 6947	+346 3163
	23	0.479 544 68	0.787 845 31	0.341 748 30	1523 6128	774 5288	335 8414
	24	0.464 233 74	0.795 468 59	0.345 053 81	1538 4926	750 0822	325 2404
	25	0.448 776 51	0.802 846 07	0.348 252 71	1552 8689	725 3702	314 5199
	26	0.433 178 08	0.809 975 17	0.351 343 84	1566 7302	700 4108	303 6881
	27	0.417 443 64	0.816 853 53	0.354 326 13	1580 0699	675 2239	292 7544
	28	+0.401 578 43	+0.823 478 96	+0.357 198 62	-1592 8855	+649 8287	+281 7285
	29	0.385 587 67	0.829 849 47	0.359 960 43	1605 1789	624 2431	270 6193
	30	0.369 476 58	0.835 963 23	0.362 610 76	1616 9550	598 4819	259 4346
Dec.	1	0.353 250 28	0.841 818 56	0.365 148 89	1628 2195	572 5574	248 1804
	2	0.336 913 87	0.847 413 87	0.367 574 15	1638 9789	546 4789	236 8621
	3	0.320 472 37	0.852 747 65	0.369 885 93	1649 2390	520 2538	225 4830
	4	+0.303 930 74	+0.857 818 47	+0.372 083 62	-1659 0048	+493 8875	+214 0462
	5	0.287 293 91	0.862 624 95	0.374 166 67	1668 2797	467 3844	202 5537
	6	0.270 566 77	0.867 165 72	0.376 134 51	1677 0663	440 7479	191 0070
	7	0.253 754 20	0.871 439 47	0.377 986 63	1685 3657	413 9807	179 4070
	8	0.236 861 08	0.875 444 90	0.379 722 48	1693 1774	387 0855	167 7544
	9	0.219 892 29	0.879 180 76	0.381 341 54	1700 4999	360 0650	156 0503
	10	+0.202 852 72	+0.882 645 79	+0.382 843 31	-1707 3304	+332 9217	+144 2952
	11	0.185 747 33	0.885 838 80	0.384 227 28	1713 6652	305 6595	132 4902
	12	0.168 581 09	0.888 758 60	0.385 492 95	1719 4997	278 2820	120 6363
	13	0.151 359 02	0.891 404 07	0.386 639 85	1724 8292	250 7938	108 7350
	14	0.134 086 21	0.893 774 12	0.387 667 50	1729 6481	223 2000	96 7880
	15	0.116 767 78	0.895 867 73	0.388 575 46	1733 9509	195 5059	84 7968
	16	+0.099 408 93	+0.897 683 93	+0.389 363 30	-1737 7315	+167 7172	+72 7636
	17	0.082 014 91	0.899 221 78	0.390 030 60	1740 9832	139 8400	60 6903
	18	0.064 591 05	0.900 480 45	0.390 576 98	1743 6984	111 8809	48 5792
	19	0.047 142 76	0.901 459 15	0.391 002 07	1745 8683	83 8472	36 4327
	20	0.029 675 54	0.902 157 18	0.391 305 52	1747 4831	55 7479	24 2541
	21	+0.012 194 99	0.902 573 93	0.391 487 05	1748 5318	+27 5940	+12 0477
	22	-0.005 293 17	+0.902 708 92	+0.391 546 41	-1749 0032	-0 5999	-0 1804
	23	0.022 783 12	0.902 561 86	0.391 483 40	1748 8882	28 8161	12 4224
	24	0.040 268 96	0.902 132 60	0.391 297 94	1748 1810	57 0338	24 6688
	25	0.057 744 77	0.901 421 25	0.390 990 05	1746 8808	85 2304	36 9088
	26	0.075 204 62	0.900 428 13	0.390 559 83	1744 9925	113 3846	49 1315
	27	0.092 642 69	0.899 153 76	0.390 007 51	1742 5260	141 4773	61 3275
	28	-0.110 053 25	+0.897 598 84	+0.389 333 39	-1739 4936	-169 4935	-73 4889
	29	0.127 430 72	0.895 764 18	0.388 537 86	1735 9083	197 4221	85 6099
	30	0.144 769 62	0.893 650 72	0.387 621 34	1731 7824	225 2552	97 6863
	31	0.162 064 60	0.891 259 42	0.386 584 29	1727 1268	252 9870	109 7155
	32	-0.179 310 42	+0.888 591 33	+0.385 427 20	-1721 9501	-280 6130	-121 6952

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2022
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Nov.	16	-1521	-505 878	-219 796	+505 871	-1280	-3745	+219 812	+2633	-242
	17	1521	505 937	219 821	505 930	1280	3760	219 837	2647	242
	18	1522	505 979	219 839	505 972	1280	3772	219 856	2659	242
	19	1522	506 008	219 852	506 001	1280	3778	219 868	2665	242
	20	1522	506 032	219 862	506 025	1280	3774	219 879	2662	242
	21	1522	506 059	219 874	506 052	1281	3760	219 890	2647	242
	22	-1522	-506 101	-219 893	+506 094	-1281	-3734	+219 909	+2622	-242
	23	1523	506 170	219 922	506 163	1281	3702	219 938	2589	242
	24	1523	506 270	219 966	506 263	1282	3669	219 982	2555	242
	25	1524	506 400	220 022	506 394	1282	3642	220 038	2528	242
	26	1525	506 549	220 087	506 542	1283	3628	220 103	2513	242
	27	1526	506 700	220 152	506 693	1284	3630	220 168	2515	242
	28	-1527	-506 835	-220 211	+506 829	-1284	-3646	+220 227	+2530	-243
	29	1528	506 944	220 258	506 937	1285	3669	220 274	2553	243
	30	1528	507 021	220 292	507 014	1285	3694	220 308	2577	243
Dec.	1	1528	507 072	220 314	507 065	1286	3713	220 330	2595	243
	2	1529	507 107	220 329	507 100	1286	3721	220 345	2604	243
	3	1529	507 138	220 343	507 131	1286	3717	220 359	2600	243
	4	-1529	-507 176	-220 359	+507 169	-1286	-3703	+220 375	+2585	-243
	5	1529	507 229	220 382	507 222	1286	3680	220 398	2562	243
	6	1530	507 303	220 414	507 296	1287	3654	220 430	2536	243
	7	1530	507 397	220 455	507 390	1287	3629	220 471	2511	243
	8	1531	507 508	220 503	507 502	1288	3610	220 519	2490	243
	9	1532	507 630	220 556	507 624	1288	3598	220 572	2478	243
	10	-1532	-507 755	-220 611	+507 749	-1289	-3595	+220 626	+2475	-243
	11	1533	507 876	220 663	507 869	1290	3602	220 678	2481	244
	12	1534	507 986	220 711	507 979	1290	3616	220 726	2495	244
	13	1534	508 081	220 752	508 074	1291	3635	220 768	2513	244
	14	1535	508 158	220 786	508 151	1291	3656	220 801	2534	244
	15	1535	508 219	220 812	508 212	1291	3676	220 828	2553	244
	16	-1536	-508 265	-220 832	+508 258	-1292	-3690	+220 848	+2568	-244
	17	1536	508 302	220 848	508 295	1292	3697	220 864	2575	244
	18	1536	508 339	220 864	508 332	1292	3694	220 880	2571	244
	19	1536	508 385	220 884	508 378	1292	3681	220 900	2558	244
	20	1537	508 452	220 913	508 445	1293	3659	220 929	2536	244
	21	1537	508 547	220 955	508 541	1293	3634	220 970	2510	244
	22	-1538	-508 675	-221 010	+508 668	-1294	-3611	+221 025	+2487	-244
	23	1539	508 828	221 077	508 822	1295	3599	221 092	2474	244
	24	1540	508 993	221 148	508 986	1295	3602	221 163	2477	245
	25	1541	509 149	221 216	509 142	1296	3622	221 231	2496	245
	26	1542	509 280	221 272	509 273	1297	3654	221 288	2527	245
	27	1542	509 377	221 315	509 370	1297	3689	221 330	2562	245
	28	-1543	-509 442	-221 343	+509 435	-1298	-3720	+221 359	+2592	-245
	29	1543	509 485	221 362	509 478	1298	3741	221 378	2613	245
	30	1543	509 520	221 377	509 513	1298	3749	221 393	2621	245
	31	1543	509 560	221 394	509 552	1298	3745	221 410	2617	245
	32	-1544	-509 612	-221 417	+509 605	-1299	-3733	+221 433	+2605	-245

APPARENT PLACES OF POLARIS, 2022

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris													Mag. 2.02						F5-8 Ib					
	JANUARY						FEBRUARY						MARCH						APRIL					
Date	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
1	3	00	29	+89	21	37	2	59	36	+89	21	42	2	58	43	+89	21	42	2	57	58	+89	21	35
2	3	00	28	+89	21	37	2	59	34	+89	21	42	2	58	41	+89	21	41	2	57	56	+89	21	35
3	3	00	27	+89	21	38	2	59	32	+89	21	43	2	58	39	+89	21	41	2	57	55	+89	21	35
4	3	00	25	+89	21	38	2	59	30	+89	21	43	2	58	37	+89	21	41	2	57	55	+89	21	34
5	3	00	24	+89	21	38	2	59	28	+89	21	43	2	58	35	+89	21	41	2	57	54	+89	21	34
6	3	00	22	+89	21	39	2	59	25	+89	21	43	2	58	33	+89	21	41	2	57	53	+89	21	34
7	3	00	20	+89	21	39	2	59	23	+89	21	43	2	58	31	+89	21	41	2	57	53	+89	21	34
8	3	00	18	+89	21	39	2	59	22	+89	21	43	2	58	30	+89	21	40	2	57	52	+89	21	33
9	3	00	16	+89	21	39	2	59	20	+89	21	43	2	58	28	+89	21	40	2	57	52	+89	21	33
10	3	00	15	+89	21	39	2	59	18	+89	21	42	2	58	27	+89	21	40	2	57	51	+89	21	33
11	3	00	13	+89	21	40	2	59	16	+89	21	42	2	58	26	+89	21	40	2	57	50	+89	21	33
12	3	00	12	+89	21	40	2	59	15	+89	21	42	2	58	24	+89	21	40	2	57	49	+89	21	32
13	3	00	10	+89	21	40	2	59	13	+89	21	42	2	58	23	+89	21	40	2	57	49	+89	21	32
14	3	00	09	+89	21	40	2	59	11	+89	21	43	2	58	21	+89	21	39	2	57	48	+89	21	32
15	3	00	07	+89	21	40	2	59	09	+89	21	43	2	58	20	+89	21	39	2	57	47	+89	21	31
16	3	00	06	+89	21	40	2	59	07	+89	21	43	2	58	18	+89	21	39	2	57	46	+89	21	31
17	3	00	04	+89	21	41	2	59	05	+89	21	43	2	58	16	+89	21	39	2	57	46	+89	21	31
18	3	00	02	+89	21	41	2	59	03	+89	21	42	2	58	15	+89	21	39	2	57	46	+89	21	30
19	3	00	00	+89	21	41	2	59	00	+89	21	42	2	58	13	+89	21	38	2	57	45	+89	21	30
20	2	59	58	+89	21	41	2	58	58	+89	21	42	2	58	11	+89	21	38	2	57	46	+89	21	30
21	2	59	56	+89	21	41	2	58	56	+89	21	42	2	58	10	+89	21	38	2	57	46	+89	21	30
22	2	59	54	+89	21	41	2	58	55	+89	21	42	2	58	09	+89	21	38	2	57	46	+89	21	29
23	2	59	52	+89	21	41	2	58	53	+89	21	42	2	58	08	+89	21	37	2	57	45	+89	21	29
24	2	59	50	+89	21	42	2	58	51	+89	21	42	2	58	07	+89	21	37	2	57	45	+89	21	29
25	2	59	48	+89	21	42	2	58	50	+89	21	42	2	58	06	+89	21	37	2	57	45	+89	21	29
26	2	59	46	+89	21	42	2	58	48	+89	21	42	2	58	05	+89	21	37	2	57	44	+89	21	28
27	2	59	45	+89	21	42	2	58	47	+89	21	42	2	58	04	+89	21	37	2	57	44	+89	21	28
28	2	59	43	+89	21	42	2	58	45	+89	21	42	2	58	03	+89	21	36	2	57	44	+89	21	28
29	2	59	42	+89	21	42							2	58	01	+89	21	36	2	57	43	+89	21	27
30	2	59	40	+89	21	42							2	58	00	+89	21	36	2	57	43	+89	21	27
31	2	59	38	+89	21	42							2	57	59	+89	21	36						

APPARENT PLACES OF POLARIS, 2022

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02								F5-8 Ib				
	MAY						JUNE						JULY						AUGUST					
Date	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
1	2	57	44	+89	21	27	2	58	03	+89	21	18	2	58	48	+89	21	13	2	59	48	+89	21	11
2	2	57	44	+89	21	26	2	58	05	+89	21	18	2	58	50	+89	21	12	2	59	50	+89	21	11
3	2	57	44	+89	21	26	2	58	06	+89	21	17	2	58	51	+89	21	12	2	59	52	+89	21	11
4	2	57	45	+89	21	26	2	58	07	+89	21	17	2	58	53	+89	21	12	2	59	54	+89	21	11
5	2	57	45	+89	21	25	2	58	08	+89	21	17	2	58	54	+89	21	12	2	59	56	+89	21	11
6	2	57	45	+89	21	25	2	58	09	+89	21	17	2	58	56	+89	21	12	2	59	59	+89	21	12
7	2	57	46	+89	21	25	2	58	10	+89	21	17	2	58	58	+89	21	12	3	00	01	+89	21	12
8	2	57	46	+89	21	25	2	58	11	+89	21	16	2	58	60	+89	21	12	3	00	03	+89	21	12
9	2	57	46	+89	21	24	2	58	12	+89	21	16	2	59	02	+89	21	12	3	00	06	+89	21	12
10	2	57	46	+89	21	24	2	58	13	+89	21	16	2	59	04	+89	21	12	3	00	08	+89	21	12
11	2	57	46	+89	21	24	2	58	15	+89	21	16	2	59	06	+89	21	11	3	00	10	+89	21	12
12	2	57	47	+89	21	23	2	58	16	+89	21	15	2	59	08	+89	21	11	3	00	12	+89	21	12
13	2	57	47	+89	21	23	2	58	18	+89	21	15	2	59	11	+89	21	11	3	00	14	+89	21	12
14	2	57	47	+89	21	23	2	58	20	+89	21	15	2	59	13	+89	21	11	3	00	16	+89	21	12
15	2	57	48	+89	21	22	2	58	22	+89	21	15	2	59	15	+89	21	11	3	00	17	+89	21	13
16	2	57	49	+89	21	22	2	58	23	+89	21	15	2	59	16	+89	21	11	3	00	19	+89	21	13
17	2	57	50	+89	21	22	2	58	25	+89	21	15	2	59	18	+89	21	11	3	00	21	+89	21	13
18	2	57	51	+89	21	22	2	58	26	+89	21	15	2	59	20	+89	21	11	3	00	24	+89	21	13
19	2	57	52	+89	21	21	2	58	28	+89	21	14	2	59	21	+89	21	11	3	00	26	+89	21	13
20	2	57	53	+89	21	21	2	58	29	+89	21	14	2	59	23	+89	21	11	3	00	28	+89	21	13
21	2	57	53	+89	21	21	2	58	30	+89	21	14	2	59	25	+89	21	11	3	00	30	+89	21	13
22	2	57	54	+89	21	21	2	58	32	+89	21	14	2	59	28	+89	21	11	3	00	33	+89	21	13
23	2	57	55	+89	21	20	2	58	33	+89	21	14	2	59	30	+89	21	11	3	00	35	+89	21	13
24	2	57	55	+89	21	20	2	58	35	+89	21	13	2	59	32	+89	21	11	3	00	37	+89	21	14
25	2	57	56	+89	21	20	2	58	37	+89	21	13	2	59	34	+89	21	11	3	00	39	+89	21	14
26	2	57	56	+89	21	20	2	58	39	+89	21	13	2	59	37	+89	21	11	3	00	41	+89	21	14
27	2	57	57	+89	21	19	2	58	40	+89	21	13	2	59	39	+89	21	11	3	00	42	+89	21	14
28	2	57	58	+89	21	19	2	58	42	+89	21	13	2	59	41	+89	21	11	3	00	44	+89	21	14
29	2	57	59	+89	21	19	2	58	44	+89	21	13	2	59	43	+89	21	11	3	00	46	+89	21	15
30	2	58	01	+89	21	18	2	58	46	+89	21	13	2	59	45	+89	21	11	3	00	48	+89	21	15
31	2	58	02	+89	21	18							2	59	47	+89	21	11	3	00	50	+89	21	15

APPARENT PLACES OF POLARIS, 2022

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02								F5-8 Ib				
	SEPTEMBER						OCTOBER						NOVEMBER						DECEMBER					
Date	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
1	3	00	52	+89	21	15	3	01	45	+89	21	22	3	02	19	+89	21	33	3	02	22	+89	21	44
2	3	00	54	+89	21	15	3	01	46	+89	21	23	3	02	19	+89	21	34	3	02	22	+89	21	45
3	3	00	56	+89	21	15	3	01	48	+89	21	23	3	02	20	+89	21	34	3	02	21	+89	21	45
4	3	00	58	+89	21	15	3	01	50	+89	21	23	3	02	20	+89	21	34	3	02	20	+89	21	45
5	3	01	00	+89	21	16	3	01	51	+89	21	24	3	02	20	+89	21	35	3	02	20	+89	21	46
6	3	01	03	+89	21	16	3	01	52	+89	21	24	3	02	20	+89	21	35	3	02	20	+89	21	46
7	3	01	04	+89	21	16	3	01	53	+89	21	25	3	02	21	+89	21	35	3	02	19	+89	21	46
8	3	01	06	+89	21	17	3	01	54	+89	21	25	3	02	21	+89	21	36	3	02	19	+89	21	47
9	3	01	08	+89	21	17	3	01	55	+89	21	25	3	02	22	+89	21	36	3	02	19	+89	21	47
10	3	01	09	+89	21	17	3	01	56	+89	21	25	3	02	22	+89	21	36	3	02	18	+89	21	47
11	3	01	11	+89	21	17	3	01	57	+89	21	26	3	02	23	+89	21	37	3	02	17	+89	21	48
12	3	01	13	+89	21	17	3	01	59	+89	21	26	3	02	24	+89	21	37	3	02	17	+89	21	48
13	3	01	14	+89	21	18	3	02	00	+89	21	26	3	02	24	+89	21	38	3	02	16	+89	21	48
14	3	01	16	+89	21	18	3	02	02	+89	21	27	3	02	24	+89	21	38	3	02	15	+89	21	49
15	3	01	18	+89	21	18	3	02	03	+89	21	27	3	02	24	+89	21	38	3	02	14	+89	21	49
16	3	01	20	+89	21	18	3	02	04	+89	21	27	3	02	24	+89	21	39	3	02	13	+89	21	49
17	3	01	22	+89	21	19	3	02	06	+89	21	28	3	02	24	+89	21	39	3	02	11	+89	21	50
18	3	01	24	+89	21	19	3	02	07	+89	21	28	3	02	24	+89	21	40	3	02	10	+89	21	50
19	3	01	26	+89	21	19	3	02	08	+89	21	29	3	02	24	+89	21	40	3	02	09	+89	21	50
20	3	01	28	+89	21	19	3	02	08	+89	21	29	3	02	24	+89	21	40	3	02	08	+89	21	51
21	3	01	29	+89	21	20	3	02	09	+89	21	29	3	02	24	+89	21	41	3	02	08	+89	21	51
22	3	01	31	+89	21	20	3	02	10	+89	21	30	3	02	24	+89	21	41	3	02	07	+89	21	51
23	3	01	32	+89	21	20	3	02	11	+89	21	30	3	02	24	+89	21	41	3	02	06	+89	21	51
24	3	01	34	+89	21	21	3	02	11	+89	21	30	3	02	24	+89	21	42	3	02	05	+89	21	52
25	3	01	35	+89	21	21	3	02	12	+89	21	31	3	02	24	+89	21	42	3	02	04	+89	21	52
26	3	01	36	+89	21	21	3	02	13	+89	21	31	3	02	24	+89	21	42	3	02	03	+89	21	52
27	3	01	38	+89	21	21	3	02	14	+89	21	31	3	02	24	+89	21	43	3	02	02	+89	21	53
28	3	01	39	+89	21	22	3	02	15	+89	21	32	3	02	24	+89	21	43	3	02	00	+89	21	53
29	3	01	41	+89	21	22	3	02	16	+89	21	32	3	02	24	+89	21	44	3	01	58	+89	21	53
30	3	01	43	+89	21	22	3	02	17	+89	21	32	3	02	23	+89	21	44	3	01	57	+89	21	54
31							3	02	18	+89	21	33							3	01	55	+89	21	54
32																			3	01	54	+89	21	54

POLARIS TABLE, 2022

LST	0^h		1^h		2^h		3^h		4^h		5^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	-27.1	+27.5	-33.3	+19.5	-37.2	+10.1	-38.5	0.0	-37.2	-10.1	-33.3	-19.5
3	27.5	27.1	33.6	19.0	37.3	9.6	38.5	-0.5	37.0	10.6	33.0	19.9
6	27.8	26.8	33.8	18.6	37.4	9.1	38.5	1.0	36.9	11.1	32.8	20.4
9	28.2	26.4	34.0	18.1	37.6	8.6	38.5	1.5	36.8	11.6	32.5	20.8
12	28.5	26.0	34.3	17.7	37.7	8.1	38.5	2.1	36.6	12.1	32.2	21.2
15	-28.9	+25.6	-34.5	+17.2	-37.8	+7.6	-38.4	-2.6	-36.4	-12.5	-31.9	-21.6
18	29.2	25.3	34.7	16.8	37.9	7.1	38.4	3.1	36.3	13.0	31.7	22.1
21	29.5	24.9	34.9	16.3	38.0	6.6	38.4	3.6	36.1	13.5	31.4	22.5
24	29.8	24.5	35.2	15.8	38.0	6.1	38.3	4.1	35.9	14.0	31.1	22.9
27	30.2	24.1	35.4	15.4	38.1	5.6	38.2	4.6	35.7	14.5	30.8	23.3
30	-30.5	+23.7	-35.6	+14.9	-38.2	+5.1	-38.2	-5.1	-35.5	-14.9	-30.5	-23.7
33	30.8	23.3	35.7	14.4	38.2	4.6	38.1	5.6	35.3	15.4	30.1	24.1
36	31.1	22.9	35.9	14.0	38.3	4.1	38.0	6.1	35.1	15.9	29.8	24.5
39	31.4	22.5	36.1	13.5	38.4	3.6	38.0	6.6	34.9	16.3	29.5	24.9
42	31.7	22.0	36.3	13.0	38.4	3.1	37.9	7.1	34.7	16.8	29.2	25.3
45	-32.0	+21.6	-36.5	+12.5	-38.4	+2.5	-37.8	-7.6	-34.5	-17.3	-28.8	-25.7
48	32.2	21.2	36.6	12.0	38.5	2.0	37.7	8.1	34.3	17.7	28.5	26.0
51	32.5	20.8	36.8	11.6	38.5	1.5	37.6	8.6	34.0	18.2	28.2	26.4
54	32.8	20.3	36.9	11.1	38.5	1.0	37.4	9.1	33.8	18.6	27.8	26.8
57	33.0	19.9	37.1	10.6	38.5	0.5	37.3	9.6	33.5	19.1	27.5	27.1
60	-33.3	+19.5	-37.2	+10.1	-38.5	+0.0	-37.2	-10.1	-33.3	-19.5	-27.1	-27.5
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	-.1	-.3	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
10	-.1	-.2	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
20	-.1	-.2	.0	-.2	.0	-.1	.0	.0	.0	.1	.0	.2
30	-.1	-.1	.0	-.1	.0	-.1	.0	.0	.0	.1	.0	.1
40	.0	-.1	.0	-.1	.0	.0	.0	.0	.0	.0	.0	.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
62	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
64	.1	.2	.0	.2	.0	.1	.0	.0	.0	-.1	.0	-.2
66	.1	.2	.1	.2	.0	.1	.0	.0	.0	-.1	.1	-.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Feb.	.1	-.1	.2	-.1	.2	.0	.2	.0	.2	.1	.2	.1
Mar.	.1	-.2	.1	-.2	.2	-.2	.2	-.1	.2	-.1	.3	.0
Apr.	-.1	-.3	.0	-.3	.1	-.3	.2	-.3	.2	-.2	.3	-.2
May	-.2	-.3	-.1	-.3	-.1	-.4	.0	-.3	.1	-.3	.2	-.3
June	-.3	-.2	-.3	-.2	-.2	-.3	-.1	-.3	.0	-.4	.1	-.4
July	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.3	-.2	-.3	-.1	-.3
Aug.	-.3	.1	-.3	.0	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2
Sept.	-.1	.2	-.2	.2	-.2	.1	-.3	.1	-.3	.0	-.3	-.1
Oct.	.0	.3	.0	.3	-.1	.3	-.2	.2	-.2	.2	-.3	.1
Nov.	.2	.3	.2	.3	.1	.3	.0	.3	-.1	.3	-.2	.3
Dec.	.4	.2	.3	.3	.3	.4	.2	.4	.0	.4	-.1	.4

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2

Azimuth of *Polaris* = (b_0 + b_1 + b_2)/ cos (latitude)

POLARIS TABLE, 2022

LST	6^h		7^h		8^h		9^h		10^h		11^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	-27.1	-27.5	-19.1	-33.6	-9.7	-37.3	+0.3	-38.5	+10.2	-37.1	+19.5	-33.1
3	26.7	27.9	18.6	33.8	9.2	37.5	0.8	38.5	10.7	36.9	19.9	32.9
6	26.4	28.2	18.2	34.1	8.7	37.6	1.3	38.5	11.2	36.8	20.3	32.6
9	26.0	28.5	17.7	34.3	8.2	37.7	1.8	38.5	11.7	36.6	20.7	32.3
12	25.6	28.9	17.3	34.5	7.8	37.8	2.3	38.4	12.1	36.5	21.2	32.1
15	-25.2	-29.2	-16.8	-34.8	-7.3	-37.9	+2.8	-38.4	+12.6	-36.3	+21.6	-31.8
18	24.9	29.6	16.4	35.0	6.8	38.0	3.3	38.4	13.1	36.1	22.0	31.5
21	24.5	29.9	15.9	35.2	6.3	38.0	3.8	38.3	13.6	36.0	22.4	31.2
24	24.1	30.2	15.4	35.4	5.8	38.1	4.3	38.3	14.0	35.8	22.8	30.9
27	23.7	30.5	15.0	35.6	5.3	38.2	4.8	38.2	14.5	35.6	23.2	30.6
30	-23.3	-30.8	-14.5	-35.8	-4.8	-38.3	+5.3	-38.1	+15.0	-35.4	+23.6	-30.3
33	22.9	31.1	14.0	36.0	4.3	38.3	5.8	38.0	15.4	35.2	24.0	30.0
36	22.5	31.4	13.6	36.1	3.8	38.4	6.3	38.0	15.9	35.0	24.4	29.7
39	22.0	31.7	13.1	36.3	3.3	38.4	6.8	37.9	16.3	34.8	24.8	29.4
42	21.6	32.0	12.6	36.5	2.8	38.4	7.3	37.8	16.8	34.6	25.2	29.0
45	-21.2	-32.3	-12.1	-36.6	-2.3	-38.5	+7.8	-37.7	+17.3	-34.3	+25.6	-28.7
48	20.8	32.5	11.7	36.8	1.7	38.5	8.3	37.6	17.7	34.1	25.9	28.4
51	20.4	32.8	11.2	36.9	1.2	38.5	8.8	37.5	18.1	33.9	26.3	28.0
54	19.9	33.1	10.7	37.1	0.7	38.5	9.2	37.3	18.6	33.6	26.7	27.7
57	19.5	33.3	10.2	37.2	-0.2	38.5	9.7	37.2	19.0	33.4	27.0	27.3
60	-19.1	-33.6	-09.7	-37.3	+0.3	-38.5	+10.2	-37.1	+19.5	-33.1	+27.4	-27.0
Lat. °	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
0	-.1	.3	-.2	.2	-.2	.1	-.3	.0	-.2	-.1	-.2	-.2
10	-.1	.2	-.2	.2	-.2	.1	-.2	.0	-.2	-.1	-.2	-.2
20	-.1	.2	-.1	.2	-.2	.1	-.2	.0	-.2	-.1	-.1	-.2
30	-.1	.1	-.1	.1	-.1	.1	-.1	.0	-.1	-.1	-.1	-.1
40	.0	.1	-.1	.1	-.1	.0	-.1	.0	-.1	.0	-.1	-.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	-.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
60	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
62	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
64	.1	-.2	.1	-.2	.2	-.1	.2	.0	.2	.1	.1	.2
66	.1	-.2	.2	-.2	.2	-.1	.2	.0	.2	.1	.2	.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Feb.	.1	.1	.1	.1	.0	.2	.0	.2	-.1	.2	-.1	.2
Mar.	.2	.1	.2	.1	.2	.2	.1	.2	.1	.2	.0	.3
Apr.	.3	-.1	.3	-.1	.3	.1	.3	.2	.2	.2	.2	.3
May	.3	-.2	.3	-.2	.4	-.1	.4	.0	.3	.1	.3	.2
June	.2	-.3	.2	-.3	.3	-.2	.4	-.1	.4	.0	.4	.1
July	.0	-.3	.1	-.3	.2	-.3	.3	-.2	.3	-.2	.3	-.1
Aug.	-.1	-.3	.0	-.3	.0	-.3	.1	-.3	.2	-.3	.2	-.2
Sept.	-.2	-.1	-.2	-.1	-.1	-.2	-.1	-.3	.0	-.3	.1	-.3
Oct.	-.3	.0	-.3	.0	-.3	-.1	-.2	-.2	-.2	-.2	-.1	-.3
Nov.	-.3	.2	-.3	.2	-.3	.1	-.4	.0	-.3	-.1	-.3	-.2
Dec.	-.2	.4	-.3	.4	-.4	.3	-.4	.2	-.4	.0	-.4	-.1

Latitude = Corrected observed altitude of *Polaris* $+ a_0 + a_1 + a_2$

Azimuth of *Polaris* $= (b_0 + b_1 + b_2)/ \cos$ (latitude)

POLARIS TABLE, 2022

LST	12^h		13^h		14^h		15^h		16^h		17^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+27.4	-27.0	+33.4	-19.0	+37.2	-9.8	+38.5	0.0	+37.2	+09.9	+33.4	+19.0
3	27.7	26.6	33.7	18.6	37.4	9.3	38.5	+0.5	37.1	10.3	33.2	19.5
6	28.1	26.2	33.9	18.2	37.5	8.9	38.5	1.0	36.9	10.8	32.9	19.9
9	28.4	25.9	34.1	17.7	37.6	8.4	38.5	1.5	36.8	11.3	32.6	20.3
12	28.7	25.5	34.4	17.3	37.7	7.9	38.5	2.0	36.7	11.8	32.4	20.8
15	+29.1	-25.1	+34.6	-16.8	+37.8	-7.4	+38.4	+2.5	+36.5	+12.2	+32.1	+21.2
18	29.4	24.8	34.8	16.4	37.9	6.9	38.4	3.0	36.3	12.7	31.8	21.6
21	29.7	24.4	35.0	15.9	38.0	6.4	38.4	3.5	36.2	13.2	31.5	22.0
24	30.0	24.0	35.2	15.5	38.1	5.9	38.3	4.0	36.0	13.6	31.2	22.4
27	30.4	23.6	35.4	15.0	38.1	5.4	38.3	4.5	35.8	14.1	30.9	22.8
30	+30.7	-23.2	+35.6	-14.5	+38.2	-4.9	+38.2	+5.0	+35.6	+14.6	+30.6	+23.2
33	31.0	22.8	35.8	14.1	38.3	4.5	38.1	5.5	35.4	15.0	30.3	23.6
36	31.3	22.4	36.0	13.6	38.3	4.0	38.0	6.0	35.2	15.5	30.0	24.0
39	31.5	22.0	36.2	13.2	38.4	3.5	38.0	6.4	35.0	15.9	29.7	24.4
42	31.8	21.6	36.3	12.7	38.4	3.0	37.9	6.9	34.8	16.4	29.4	24.8
45	+32.1	-21.2	+36.5	-12.2	+38.4	-2.5	+37.8	+7.4	+34.6	+16.8	+29.1	+25.2
48	32.4	20.7	36.7	11.7	38.5	2.0	37.7	7.9	34.4	17.3	28.7	25.5
51	32.7	20.3	36.8	11.3	38.5	1.5	37.6	8.4	34.1	17.7	28.4	25.9
54	32.9	19.9	37.0	10.8	38.5	1.0	37.5	8.9	33.9	18.2	28.1	26.3
57	33.2	19.5	37.1	10.3	38.5	-0.5	37.3	9.4	33.7	18.6	27.7	26.6
60	+33.4	-19.0	+37.2	-09.8	+38.5	0.0	+37.2	+9.9	+33.4	+19.0	+27.4	+27.0
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	-.1	-.3	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
10	-.1	-.2	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
20	-.1	-.2	.0	-.2	.0	-.1	.0	.0	.0	.1	.0	.2
30	-.1	-.1	.0	-.1	.0	-.1	.0	.0	.0	.1	.0	.1
40	.0	-.1	.0	-.1	.0	.0	.0	.0	.0	.0	.0	.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
62	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
64	.1	.2	.0	.2	.0	.1	.0	.0	.0	-.1	.0	-.2
66	.1	.2	.1	.2	.0	.1	.0	.0	.0	-.1	.1	-.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Feb.	-.1	.1	-.2	.1	-.2	.0	-.2	.0	-.2	-.1	-.2	-.1
Mar.	-.1	.2	-.1	.2	-.2	.2	-.2	.1	-.2	.1	-.3	.0
Apr.	.1	.3	.0	.3	-.1	.3	-.2	.3	-.2	.2	-.3	.2
May	.2	.3	.1	.3	.1	.4	.0	.4	-.1	.3	-.2	.3
June	.3	.2	.3	.2	.2	.3	.1	.4	.0	.4	-.1	.4
July	.3	.0	.3	.1	.3	.2	.2	.3	.2	.3	.1	.3
Aug.	.3	-.1	.3	.0	.3	.0	.3	.1	.3	.2	.2	.2
Sept.	.1	-.2	.2	-.2	.2	-.1	.3	-.1	.3	.0	.3	.1
Oct.	.0	-.3	.0	-.3	.1	-.3	.2	-.2	.2	-.2	.3	-.1
Nov.	-.2	-.3	-.2	-.3	-.1	-.3	.0	-.4	.1	-.3	.2	-.3
Dec.	-.4	-.2	-.3	-.3	-.3	-.4	-.2	-.4	.0	-.4	.1	-.4

Latitude = Corrected observed altitude of *Polaris* + $a_0 + a_1 + a_2$
Azimuth of *Polaris* = $(b_0 + b_1 + b_2)$/ cos (latitude)

POLARIS TABLE, 2022

LST	18^h		19^h		20^h		21^h		22^h		23^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+27.4	+27.0	+19.4	+33.1	+10.2	+37.1	+0.2	+38.5	-09.7	+37.3	-19.1	+33.6
3	27.0	27.3	19.0	33.4	9.7	37.2	-0.3	38.5	10.2	37.2	19.5	33.3
6	26.6	27.7	18.6	33.6	9.2	37.3	0.8	38.5	10.7	37.1	19.9	33.1
9	26.3	28.0	18.1	33.9	8.7	37.5	1.3	38.5	11.2	36.9	20.4	32.8
12	25.9	28.4	17.7	34.1	8.2	37.6	1.8	38.5	11.7	36.8	20.8	32.5
15	+25.5	+28.7	+17.2	+34.3	+7.8	+37.7	-2.3	+38.5	-12.2	+36.6	-21.2	+32.3
18	25.2	29.0	16.8	34.6	7.3	37.8	2.8	38.4	12.6	36.5	21.7	32.0
21	24.8	29.4	16.3	34.8	6.8	37.9	3.3	38.4	13.1	36.3	22.1	31.7
24	24.4	29.7	15.9	35.0	6.3	38.0	3.8	38.4	13.6	36.1	22.5	31.4
27	24.0	30.0	15.4	35.2	5.8	38.0	4.3	38.3	14.1	35.9	22.9	31.1
30	+23.6	+30.3	+14.9	+35.4	+5.3	+38.1	-4.8	+38.3	-14.5	+35.8	-23.3	+30.8
33	23.2	30.6	14.5	35.6	4.8	38.2	5.3	38.2	15.0	35.6	23.7	30.5
36	22.8	30.9	14.0	35.8	4.3	38.3	5.8	38.1	15.5	35.4	24.1	30.2
39	22.4	31.2	13.5	36.0	3.8	38.3	6.3	38.0	15.9	35.2	24.5	29.9
42	22.0	31.5	13.1	36.2	3.3	38.4	6.8	38.0	16.4	35.0	24.9	29.5
45	+21.6	+31.8	+12.6	+36.3	+2.8	+38.4	-7.3	+37.9	-16.8	+34.7	-25.3	+29.2
48	21.1	32.1	12.1	36.5	2.3	38.4	7.8	37.8	17.3	34.5	25.6	28.9
51	20.7	32.3	11.6	36.6	1.8	38.5	8.3	37.7	17.7	34.3	26.0	28.5
54	20.3	32.6	11.2	36.8	1.3	38.5	8.8	37.6	18.2	34.1	26.4	28.2
57	19.9	32.9	10.7	36.9	0.7	38.5	9.3	37.5	18.6	33.8	26.8	27.8
60	+19.4	+33.1	+10.2	+37.1	+0.2	+38.5	-9.7	+37.3	-19.1	+33.6	-27.1	+27.5
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	-.1	.3	-.2	.2	-.2	.1	-.3	.0	-.2	-.1	-.2	-.2
10	-.1	.2	-.2	.2	-.2	.1	-.2	.0	-.2	-.1	-.2	-.2
20	-.1	.2	-.1	.2	-.2	.1	-.2	.0	-.2	-.1	-.1	-.2
30	-.1	.1	-.1	.1	-.1	.1	-.1	.0	-.1	-.1	-.1	-.1
40	.0	.1	-.1	.1	-.1	.0	-.1	.0	-.1	.0	-.1	-.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	-.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
60	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
62	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
64	.1	-.2	.1	-.2	.2	-.1	.2	.0	.2	.1	.1	.2
66	.1	-.2	.2	-.2	.2	-.1	.2	.0	.2	.1	.2	.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Feb.	-.1	-.1	-.1	-.2	.0	-.2	.0	-.2	.1	-.2	.1	-.2
Mar.	-.2	-.1	-.2	-.1	-.2	-.2	-.1	-.2	-.1	-.2	.0	-.3
Apr.	-.3	.1	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2	-.2	-.3
May	-.3	.2	-.3	.1	-.4	.1	-.4	.0	-.3	-.1	-.3	-.2
June	-.2	.3	-.2	.3	-.3	.2	-.4	.1	-.4	.0	-.4	-.1
July	.0	.3	-.1	.3	-.2	.3	-.3	.2	-.3	.2	-.3	.1
Aug.	.1	.3	.0	.3	.0	.3	-.1	.3	-.2	.3	-.2	.2
Sept.	.2	.1	.2	.2	.1	.2	.1	.3	.0	.3	-.1	.3
Oct.	.3	.0	.3	.0	.3	.1	.2	.2	.2	.2	.1	.3
Nov.	.3	-.2	.3	-.2	.3	-.1	.4	.0	.3	.1	.3	.2
Dec.	.2	-.4	.3	-.3	.4	-.3	.4	-.2	.4	.0	.4	.1

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2
Azimuth of *Polaris* = (b_0 + b_1 + b_2)/ cos (latitude)

PART - III

SUNRISE, SUNSET AND MOONRISE, MOONSET

SUNRISE, 2022

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 0	5 59	6 16	6 35	6 56	7 08	7 22	7 38	7 59	8 08	8 19	8 31	8 46	9 03
4	6 01	6 18	6 36	6 56	7 08	7 22	7 38	7 58	8 08	8 18	8 30	8 44	9 01
8	6 03	6 19	6 37	6 57	7 09	7 22	7 38	7 57	8 06	8 16	8 28	8 41	8 57
12	6 05	6 21	6 38	6 57	7 08	7 21	7 36	7 55	8 04	8 13	8 25	8 37	8 52
16	6 06	6 21	6 38	6 57	7 07	7 20	7 34	7 52	8 00	8 10	8 20	8 32	8 46
20	6 07	6 22	6 38	6 56	7 06	7 18	7 32	7 49	7 56	8 05	8 15	8 26	8 40
24	6 08	6 22	6 37	6 54	7 04	7 15	7 28	7 44	7 52	8 00	8 09	8 20	8 32
28	6 09	6 23	6 37	6 53	7 02	7 12	7 25	7 39	7 46	7 54	8 03	8 12	8 23
Feb. 1	6 10	6 22	6 36	6 50	6 59	7 09	7 20	7 34	7 40	7 47	7 55	8 04	8 14
5	6 10	6 22	6 34	6 48	6 56	7 05	7 15	7 28	7 34	7 40	7 48	7 56	8 05
9	6 11	6 21	6 32	6 45	6 52	7 01	7 10	7 22	7 27	7 33	7 39	7 47	7 55
13	6 11	6 20	6 30	6 42	6 48	6 56	7 04	7 15	7 19	7 25	7 30	7 37	7 44
17	6 11	6 19	6 28	6 38	6 44	6 51	6 58	7 07	7 12	7 16	7 21	7 27	7 33
21	6 10	6 18	6 26	6 35	6 40	6 45	6 52	7 00	7 04	7 07	7 12	7 17	7 22
25	6 10	6 16	6 23	6 31	6 35	6 40	6 45	6 52	6 55	6 58	7 02	7 06	7 11
Mar. 1	6 09	6 14	6 20	6 26	6 30	6 34	6 39	6 44	6 47	6 49	6 52	6 56	6 59
5	6 08	6 13	6 17	6 22	6 25	6 28	6 31	6 36	6 38	6 40	6 42	6 45	6 48
9	6 07	6 10	6 14	6 17	6 19	6 22	6 24	6 27	6 29	6 30	6 32	6 34	6 36
13	6 06	6 08	6 10	6 13	6 14	6 15	6 17	6 19	6 20	6 20	6 21	6 23	6 24
17	6 05	6 06	6 07	6 08	6 08	6 09	6 09	6 10	6 10	6 11	6 11	6 11	6 12
21	6 04	6 04	6 04	6 03	6 03	6 02	6 02	6 01	6 01	6 01	6 00	6 00	6 00
25	6 03	6 02	6 00	5 58	5 57	5 56	5 55	5 53	5 52	5 51	5 50	5 49	5 48
29	6 02	5 59	5 57	5 53	5 52	5 50	5 47	5 44	5 43	5 41	5 39	5 38	5 35
Apr. 2	6 00	5 57	5 53	5 49	5 46	5 43	5 40	5 35	5 33	5 31	5 29	5 26	5 23

BEGINNING OF MORNING TWILIGHT

Date	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 0	4 44	5 01	5 16	5 30	5 37	5 44	5 52	6 00	6 03	6 06	6 10	6 14	6 18
8	4 48	5 05	5 19	5 32	5 39	5 45	5 52	5 59	6 02	6 05	6 09	6 12	6 16
16	4 52	5 07	5 20	5 33	5 38	5 44	5 50	5 56	5 59	6 01	6 04	6 07	6 10
24	4 56	5 09	5 21	5 31	5 36	5 41	5 46	5 51	5 53	5 55	5 57	5 59	6 01
Feb. 1	4 58	5 10	5 20	5 28	5 32	5 36	5 39	5 42	5 44	5 45	5 46	5 47	5 48
9	5 00	5 10	5 18	5 24	5 27	5 29	5 31	5 32	5 32	5 32	5 32	5 32	5 32
17	5 00	5 08	5 14	5 18	5 19	5 20	5 20	5 19	5 19	5 18	5 17	5 15	5 13
25	5 00	5 06	5 09	5 11	5 11	5 10	5 08	5 05	5 03	5 01	4 58	4 56	4 52
Mar. 5	4 59	5 03	5 04	5 03	5 01	4 58	4 54	4 48	4 46	4 42	4 38	4 34	4 29
13	4 58	4 59	4 57	4 53	4 50	4 45	4 39	4 31	4 27	4 22	4 16	4 10	4 02
21	4 55	4 54	4 50	4 43	4 38	4 32	4 23	4 12	4 06	4 00	3 52	3 44	3 34
29	4 53	4 49	4 43	4 33	4 26	4 17	4 06	3 52	3 44	3 36	3 26	3 15	3 02
Apr. 6	4 50	4 44	4 35	4 22	4 14	4 03	3 49	3 31	3 21	3 11	2 58	2 43	2 25

SUNSET, 2022

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

Date \ Lat.		0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	18 07	17 50	17 31	17 10	16 58	16 44	16 28	16 08	15 58	15 47	15 35	15 20	15 03
	4	18 09	17 52	17 34	17 13	17 01	16 48	16 32	16 12	16 02	15 52	15 40	15 26	15 09
	8	18 10	17 54	17 36	17 16	17 05	16 52	16 36	16 17	16 07	15 57	15 46	15 32	15 17
	12	18 12	17 56	17 39	17 20	17 08	16 56	16 40	16 22	16 13	16 03	15 52	15 40	15 25
	16	18 13	17 58	17 42	17 23	17 12	17 00	16 45	16 28	16 19	16 10	15 59	15 47	15 33
	20	18 15	18 00	17 44	17 26	17 16	17 04	16 51	16 34	16 26	16 17	16 07	15 56	15 43
	24	18 16	18 02	17 47	17 30	17 20	17 09	16 56	16 40	16 33	16 25	16 15	16 05	15 53
	28	18 16	18 03	17 49	17 33	17 24	17 14	17 02	16 47	16 40	16 32	16 24	16 14	16 03
Feb.	1	18 17	18 05	17 52	17 37	17 28	17 19	17 07	16 54	16 47	16 40	16 32	16 24	16 13
	5	18 17	18 06	17 54	17 40	17 32	17 24	17 13	17 01	16 55	16 48	16 41	16 33	16 24
	9	18 18	18 07	17 56	17 44	17 36	17 28	17 19	17 07	17 02	16 56	16 50	16 43	16 35
	13	18 18	18 08	17 58	17 47	17 40	17 33	17 25	17 14	17 10	17 04	16 59	16 52	16 45
	17	18 17	18 09	18 00	17 50	17 44	17 38	17 30	17 21	17 17	17 13	17 08	17 02	16 56
	21	18 17	18 10	18 02	17 53	17 48	17 42	17 36	17 28	17 25	17 21	17 16	17 11	17 06
	25	18 16	18 10	18 03	17 56	17 52	17 47	17 41	17 35	17 32	17 29	17 25	17 21	17 16
Mar.	1	18 16	18 10	18 05	17 59	17 55	17 51	17 47	17 42	17 39	17 36	17 33	17 30	17 27
	5	18 15	18 11	18 06	18 02	17 59	17 56	17 52	17 48	17 46	17 44	17 42	17 39	17 37
	9	18 14	18 11	18 08	18 04	18 02	18 00	17 58	17 55	17 53	17 52	17 50	17 49	17 47
	13	18 13	18 11	18 09	18 07	18 06	18 04	18 03	18 01	18 00	18 00	17 59	17 58	17 57
	17	18 12	18 11	18 10	18 09	18 09	18 09	18 08	18 08	18 07	18 07	18 07	18 07	18 06
	21	18 10	18 11	18 11	18 12	18 12	18 13	18 13	18 14	18 14	18 15	18 15	18 16	18 16
	25	18 09	18 11	18 12	18 14	18 15	18 17	18 18	18 20	18 21	18 22	18 23	18 25	18 26
	29	18 08	18 11	18 13	18 17	18 19	18 21	18 23	18 27	18 28	18 30	18 32	18 34	18 36
Apr.	2	18 07	18 11	18 14	18 19	18 22	18 25	18 29	18 33	18 35	18 37	18 40	18 42	18 46

END OF EVENING TWILIGHT

Date		0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	19 22	19 05	18 50	18 36	18 29	18 22	18 14	18 07	18 03	18 00	17 56	17 52	17 48
	8	19 25	19 09	18 54	18 41	18 35	18 28	18 21	18 14	18 11	18 08	18 05	18 01	17 58
	16	19 27	19 12	18 59	18 47	18 41	18 35	18 30	18 23	18 21	18 18	18 16	18 13	18 10
	24	19 28	19 15	19 03	18 53	18 48	18 43	18 39	18 34	18 32	18 30	18 28	18 26	18 24
Feb.	1	19 29	19 17	19 07	18 59	18 55	18 52	18 48	18 45	18 44	18 43	18 42	18 41	18 40
	9	19 29	19 19	19 11	19 05	19 02	19 00	18 58	18 57	18 57	18 57	18 57	18 57	18 58
	17	19 28	19 20	19 14	19 10	19 09	19 09	19 09	19 10	19 10	19 11	19 13	19 14	19 16
	25	19 26	19 20	19 17	19 16	19 16	19 17	19 19	19 22	19 24	19 26	19 29	19 32	19 36
Mar.	5	19 24	19 21	19 20	19 21	19 23	19 26	19 30	19 36	19 39	19 42	19 46	19 51	19 56
	13	19 22	19 21	19 22	19 26	19 30	19 35	19 41	19 50	19 54	19 59	20 04	20 11	20 19
	21	19 19	19 21	19 24	19 32	19 37	19 44	19 52	20 04	20 10	20 16	20 24	20 33	20 43
	29	19 17	19 21	19 27	19 37	19 44	19 53	20 05	20 20	20 27	20 36	20 45	20 57	21 11
Apr.	6	19 15	19 21	19 30	19 43	19 52	20 03	20 17	20 36	20 46	20 56	21 09	21 25	21 44

SUNRISE, 2022

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING
OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 2	6 00	5 57	5 53	5 49	5 46	5 43	5 40	5 35	5 33	5 31	5 29	5 26	5 23
6	5 59	5 55	5 50	5 44	5 41	5 37	5 32	5 27	5 24	5 21	5 18	5 15	5 11
10	5 58	5 52	5 46	5 39	5 35	5 30	5 25	5 18	5 15	5 12	5 08	5 04	4 59
14	5 57	5 50	5 43	5 35	5 30	5 24	5 18	5 10	5 06	5 02	4 58	4 53	4 47
18	5 56	5 48	5 40	5 30	5 25	5 18	5 11	5 02	4 58	4 53	4 48	4 42	4 36
22	5 55	5 46	5 37	5 26	5 20	5 13	5 04	4 54	4 49	4 44	4 38	4 31	4 24
26	5 54	5 45	5 34	5 22	5 15	5 07	4 58	4 46	4 41	4 35	4 28	4 21	4 13
30	5 54	5 43	5 32	5 18	5 11	5 02	4 51	4 39	4 33	4 26	4 19	4 11	4 02
May 4	5 53	5 42	5 29	5 15	5 07	4 57	4 46	4 32	4 25	4 18	4 10	4 01	3 51
8	5 53	5 41	5 27	5 12	5 03	4 52	4 40	4 25	4 18	4 10	4 02	3 52	3 40
12	5 53	5 40	5 25	5 09	4 59	4 48	4 35	4 19	4 11	4 03	3 54	3 43	3 30
16	5 53	5 39	5 24	5 06	4 56	4 44	4 30	4 13	4 05	3 56	3 46	3 34	3 21
20	5 53	5 38	5 22	5 04	4 53	4 41	4 26	4 08	3 59	3 50	3 39	3 27	3 12
24	5 53	5 38	5 21	5 02	4 51	4 38	4 22	4 03	3 54	3 44	3 33	3 19	3 04
28	5 54	5 38	5 21	5 01	4 49	4 35	4 19	3 59	3 50	3 39	3 27	3 13	2 56
Jun. 1	5 54	5 38	5 20	5 00	4 47	4 33	4 17	3 56	3 46	3 35	3 22	3 08	2 50
5	5 55	5 38	5 20	4 59	4 46	4 32	4 15	3 54	3 43	3 32	3 19	3 03	2 44
9	5 56	5 38	5 20	4 58	4 46	4 31	4 14	3 52	3 41	3 29	3 16	3 00	2 40
13	5 56	5 39	5 20	4 58	4 46	4 31	4 13	3 51	3 40	3 28	3 14	2 57	2 37
17	5 57	5 40	5 21	4 59	4 46	4 31	4 13	3 50	3 39	3 27	3 13	2 56	2 36
21	5 58	5 41	5 22	4 59	4 46	4 31	4 13	3 51	3 40	3 27	3 13	2 56	2 36
25	5 59	5 41	5 22	5 00	4 47	4 32	4 14	3 52	3 41	3 29	3 14	2 58	2 37
29	6 00	5 42	5 24	5 02	4 49	4 34	4 16	3 54	3 43	3 31	3 17	3 00	2 40
July 3	6 01	5 43	5 25	5 03	4 51	4 36	4 18	3 56	3 46	3 34	3 20	3 04	2 44

BEGINNING OF MORNING TWILIGHT

Date	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 6	4 50	4 44	4 35	4 22	4 14	4 03	3 49	3 31	3 21	3 11	2 58	2 43	2 25
14	4 47	4 39	4 28	4 12	4 01	3 48	3 31	3 08	2 57	2 43	2 27	2 07	1 39
22	4 45	4 35	4 21	4 02	3 49	3 33	3 13	2 45	2 31	2 13	1 51	1 20	
30	4 43	4 30	4 14	3 52	3 37	3 19	2 55	2 21	2 03	1 39	1 04		
May 8	4 41	4 27	4 08	3 43	3 27	3 06	2 38	1 56	1 31	0 53			
16	4 40	4 24	4 03	3 36	3 17	2 54	2 21	1 29	0 51				
24	4 40	4 22	4 00	3 29	3 09	2 43	2 06	0 59					
June 1	4 40	4 21	3 57	3 25	3 03	2 35	1 53	0 04					
9	4 41	4 21	3 56	3 23	3 00	2 30	1 44						
17	4 42	4 22	3 57	3 22	2 59	2 28	1 40						
25	4 44	4 24	3 58	3 24	3 00	2 29	1 41						
July 3	4 46	4 26	4 01	3 27	3 04	2 34	1 48						
11	4 48	4 29	4 05	3 32	3 10	2 42	1 59						

SUNSET, 2022

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

Date \ Lat.		0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr.	2	18 07	18 11	18 14	18 19	18 22	18 25	18 29	18 33	18 35	18 37	18 40	18 42	18 46
	6	18 06	18 10	18 16	18 22	18 25	18 29	18 34	18 39	18 42	18 45	18 48	18 51	18 55
	10	18 05	18 10	18 17	18 24	18 28	18 33	18 39	18 46	18 49	18 52	18 56	19 00	19 05
	14	18 04	18 10	18 18	18 26	18 31	18 37	18 44	18 52	18 56	19 00	19 04	19 09	19 15
	18	18 03	18 11	18 19	18 29	18 35	18 41	18 49	18 58	19 02	19 07	19 12	19 18	19 25
	22	18 02	18 11	18 20	18 31	18 38	18 45	18 54	19 04	19 09	19 14	19 20	19 27	19 35
	26	18 01	18 11	18 22	18 34	18 41	18 49	18 59	19 10	19 16	19 22	19 29	19 36	19 45
	30	18 01	18 11	18 23	18 37	18 44	18 53	19 04	19 17	19 23	19 29	19 37	19 45	19 55
May	4	18 00	18 12	18 25	18 39	18 48	18 57	19 09	19 23	19 29	19 37	19 45	19 54	20 05
	8	18 00	18 13	18 26	18 42	18 51	19 01	19 14	19 29	19 36	19 44	19 53	20 03	20 14
	12	18 00	18 13	18 28	18 44	18 54	19 05	19 18	19 35	19 42	19 51	20 01	20 11	20 24
	16	18 00	18 14	18 29	18 47	18 57	19 09	19 23	19 40	19 49	19 58	20 08	20 20	20 34
	20	18 00	18 15	18 31	18 49	19 00	19 13	19 28	19 46	19 55	20 04	20 15	20 28	20 43
	24	18 00	18 16	18 33	18 52	19 03	19 16	19 32	19 51	20 00	20 10	20 22	20 36	20 52
	28	18 01	18 17	18 34	18 54	19 06	19 20	19 36	19 56	20 05	20 16	20 28	20 43	21 00
June	1	18 01	18 18	18 36	18 56	19 09	19 23	19 39	20 00	20 10	20 21	20 34	20 49	21 07
	5	18 02	18 19	18 37	18 58	19 11	19 25	19 43	20 04	20 14	20 26	20 39	20 55	21 14
	9	18 03	18 20	18 39	19 00	19 13	19 28	19 45	20 07	20 18	20 30	20 43	21 00	21 19
	13	18 04	18 21	18 40	19 02	19 15	19 30	19 47	20 10	20 21	20 33	20 47	21 03	21 23
	17	18 05	18 22	18 41	19 03	19 16	19 31	19 49	20 12	20 23	20 35	20 49	21 06	21 26
	21	18 05	18 23	18 42	19 04	19 17	19 32	19 50	20 13	20 24	20 36	20 50	21 07	21 28
	25	18 06	18 24	18 43	19 05	19 18	19 33	19 51	20 13	20 24	20 36	20 51	21 07	21 28
	29	18 07	18 25	18 43	19 05	19 18	19 33	19 51	20 13	20 24	20 36	20 50	21 06	21 26
July	3	18 08	18 25	18 44	19 05	19 18	19 33	19 50	20 12	20 22	20 34	20 48	21 04	21 24

END OF EVENING TWILIGHT

		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr.	6	19 15	19 21	19 30	19 43	19 52	20 03	20 17	20 36	20 46	20 56	21 09	21 25	21 44
	14	19 13	19 22	19 33	19 50	20 00	20 14	20 31	20 54	21 06	21 20	21 37	21 58	22 27
	22	19 12	19 23	19 37	19 56	20 09	20 25	20 46	21 14	21 29	21 47	22 10	22 44	
	30	19 12	19 24	19 41	20 03	20 18	20 37	21 01	21 35	21 55	22 20	22 58		
May	8	19 12	19 27	19 45	20 11	20 27	20 49	21 17	21 59	22 25	23 07			
	16	19 13	19 29	19 50	20 18	20 37	21 00	21 33	22 27	23 08				
	24	19 14	19 32	19 54	20 25	20 45	21 12	21 49	22 59					
June	1	19 16	19 35	19 59	20 31	20 53	21 22	22 04						
	9	19 18	19 38	20 02	20 36	20 59	21 29	22 15						
	17	19 20	19 40	20 05	20 40	21 03	21 34	22 22						
	25	19 21	19 42	20 07	20 41	21 05	21 36	22 24						
July	3	19 23	19 42	20 07	20 41	21 04	21 34	22 19						
	11	19 23	19 42	20 06	20 39	21 00	21 29	22 10						

SUNRISE, 2022

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

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Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 3	6 01	5 43	5 25	5 03	4 51	4 36	4 18	3 56	3 46	3 34	3 20	3 04	2 44
7	6 01	5 44	5 26	5 05	4 53	4 38	4 21	3 59	3 49	3 37	3 24	3 08	2 50
11	6 02	5 45	5 28	5 07	4 55	4 41	4 24	4 03	3 53	3 42	3 29	3 14	2 56
15	6 02	5 46	5 29	5 09	4 57	4 44	4 27	4 07	3 58	3 47	3 35	3 20	3 03
19	6 03	5 47	5 31	5 11	5 00	4 47	4 31	4 12	4 03	3 52	3 41	3 27	3 11
23	6 03	5 48	5 32	5 14	5 03	4 50	4 35	4 17	4 08	3 58	3 47	3 35	3 20
27	6 03	5 49	5 34	5 16	5 05	4 54	4 39	4 22	4 14	4 05	3 54	3 42	3 28
31	6 03	5 50	5 35	5 18	5 08	4 57	4 44	4 28	4 20	4 11	4 02	3 51	3 38
Aug. 4	6 03	5 50	5 36	5 21	5 11	5 01	4 48	4 33	4 26	4 18	4 09	3 59	3 47
8	6 02	5 51	5 38	5 23	5 14	5 05	4 53	4 39	4 32	4 25	4 17	4 07	3 57
12	6 02	5 51	5 39	5 25	5 18	5 08	4 58	4 45	4 39	4 32	4 24	4 16	4 06
16	6 01	5 51	5 40	5 28	5 21	5 12	5 02	4 51	4 45	4 39	4 32	4 25	4 16
20	6 00	5 51	5 41	5 30	5 24	5 16	5 07	4 57	4 52	4 46	4 40	4 33	4 26
24	5 59	5 51	5 42	5 32	5 27	5 20	5 12	5 03	4 58	4 53	4 48	4 42	4 35
28	5 58	5 51	5 43	5 35	5 30	5 24	5 17	5 09	5 05	5 01	4 56	4 51	4 45
Sept. 1	5 57	5 51	5 44	5 37	5 32	5 27	5 22	5 15	5 11	5 08	5 04	4 59	4 54
5	5 56	5 51	5 45	5 39	5 35	5 31	5 26	5 20	5 18	5 15	5 11	5 08	5 04
9	5 54	5 50	5 46	5 41	5 38	5 35	5 31	5 26	5 24	5 22	5 19	5 16	5 13
13	5 53	5 50	5 47	5 43	5 41	5 39	5 36	5 32	5 31	5 29	5 27	5 25	5 22
17	5 51	5 50	5 48	5 45	5 44	5 42	5 41	5 38	5 37	5 36	5 35	5 33	5 32
21	5 50	5 49	5 49	5 48	5 47	5 46	5 45	5 44	5 44	5 43	5 43	5 42	5 41
25	5 49	5 49	5 49	5 50	5 50	5 50	5 50	5 50	5 50	5 50	5 50	5 51	5 51
29	5 47	5 49	5 50	5 52	5 53	5 54	5 55	5 56	5 57	5 58	5 58	5 59	6 00
Oct. 3	5 46	5 49	5 51	5 54	5 56	5 58	6 00	6 03	6 04	6 05	6 06	6 08	6 09

BEGINNING OF MORNING TWILIGHT

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 3	4 46	4 26	4 01	3 27	3 04	2 34	1 48						
11	4 48	4 29	4 05	3 32	3 10	2 42	1 59						
19	4 49	4 31	4 09	3 38	3 18	2 51	2 14	1 03					
27	4 50	4 34	4 13	3 45	3 26	3 02	2 29	1 35	0 52				
Aug. 4	4 51	4 36	4 17	3 52	3 35	3 13	2 45	2 02	1 35	0 51			
12	4 51	4 38	4 21	3 59	3 44	3 25	3 00	2 25	2 06	1 40	0 59		
20	4 50	4 39	4 25	4 05	3 52	3 36	3 15	2 46	2 31	2 13	1 49	1 13	
28	4 48	4 40	4 28	4 11	4 00	3 47	3 29	3 06	2 54	2 39	2 22	2 00	1 29
Sept. 5	4 46	4 40	4 31	4 17	4 08	3 57	3 42	3 23	3 13	3 02	2 49	2 33	2 13
13	4 44	4 40	4 33	4 23	4 15	4 06	3 54	3 39	3 31	3 23	3 12	3 00	2 46
21	4 41	4 40	4 35	4 28	4 22	4 15	4 06	3 54	3 48	3 41	3 33	3 24	3 13
29	4 38	4 39	4 37	4 33	4 29	4 24	4 17	4 08	4 03	3 58	3 52	3 45	3 37
Oct. 7	4 36	4 39	4 39	4 37	4 35	4 32	4 27	4 21	4 18	4 14	4 10	4 05	3 59

SUNSET, 2022

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

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Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 3	18 08	18 25	18 44	19 05	19 18	19 33	19 50	20 12	20 22	20 34	20 48	21 04	21 24
7	18 09	18 25	18 44	19 05	19 17	19 32	19 49	20 10	20 20	20 32	20 45	21 01	21 19
11	18 09	18 26	18 43	19 04	19 16	19 30	19 47	20 07	20 17	20 28	20 41	20 56	21 14
15	18 10	18 26	18 43	19 03	19 14	19 28	19 44	20 04	20 14	20 24	20 37	20 51	21 08
19	18 10	18 25	18 42	19 01	19 12	19 25	19 41	20 00	20 09	20 19	20 31	20 44	21 00
23	18 10	18 25	18 41	18 59	19 10	19 22	19 37	19 55	20 04	20 14	20 25	20 37	20 52
27	18 10	18 24	18 39	18 57	19 07	19 19	19 33	19 50	19 58	20 07	20 18	20 29	20 43
31	18 10	18 23	18 38	18 54	19 04	19 15	19 28	19 44	19 52	20 01	20 10	20 21	20 34
Aug. 4	18 10	18 22	18 36	18 51	19 00	19 11	19 23	19 38	19 45	19 53	20 02	20 12	20 23
8	18 09	18 21	18 33	18 48	18 56	19 06	19 18	19 32	19 38	19 45	19 53	20 03	20 13
12	18 08	18 19	18 31	18 44	18 52	19 01	19 12	19 24	19 30	19 37	19 44	19 53	20 02
16	18 08	18 18	18 28	18 40	18 48	18 56	19 05	19 17	19 22	19 28	19 35	19 43	19 51
20	18 07	18 16	18 25	18 36	18 43	18 50	18 59	19 09	19 14	19 19	19 25	19 32	19 40
24	18 06	18 14	18 22	18 32	18 38	18 44	18 52	19 01	19 06	19 10	19 16	19 21	19 28
28	18 05	18 12	18 19	18 28	18 33	18 38	18 45	18 53	18 57	19 01	19 05	19 11	19 16
Sept. 1	18 03	18 09	18 16	18 23	18 27	18 32	18 38	18 45	18 48	18 51	18 55	19 00	19 04
5	18 02	18 07	18 12	18 18	18 22	18 26	18 30	18 36	18 39	18 42	18 45	18 48	18 52
9	18 01	18 04	18 08	18 13	18 16	18 19	18 23	18 27	18 30	18 32	18 34	18 37	18 40
13	17 59	18 02	18 05	18 08	18 10	18 13	18 15	18 19	18 20	18 22	18 24	18 26	18 28
17	17 58	17 59	18 01	18 03	18 05	18 06	18 08	18 10	18 11	18 12	18 13	18 14	18 16
21	17 56	17 57	17 57	17 58	17 59	17 59	18 00	18 01	18 02	18 02	18 03	18 03	18 04
25	17 55	17 54	17 54	17 53	17 53	17 53	17 53	17 52	17 52	17 52	17 52	17 52	17 52
29	17 54	17 52	17 50	17 48	17 47	17 46	17 45	17 44	17 43	17 42	17 41	17 41	17 40
Oct. 3	17 52	17 50	17 47	17 43	17 42	17 40	17 37	17 35	17 34	17 32	17 31	17 29	17 27

END OF EVENING TWILIGHT

Date	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 3	19 23	19 42	20 07	20 41	21 04	21 34	22 19						
11	19 23	19 42	20 06	20 39	21 00	21 29	22 10						
19	19 24	19 41	20 04	20 34	20 54	21 21	21 58	23 06					
27	19 23	19 39	20 00	20 28	20 46	21 10	21 43	22 35	23 14				
Aug. 4	19 22	19 36	19 55	20 20	20 37	20 58	21 26	22 08	22 33	23 13			
12	19 20	19 32	19 49	20 11	20 26	20 44	21 08	21 43	22 01	22 26	23 03		
20	19 17	19 28	19 42	20 01	20 14	20 30	20 50	21 18	21 33	21 51	22 14	22 47	
28	19 14	19 23	19 34	19 51	20 01	20 15	20 32	20 55	21 07	21 21	21 38	21 59	22 28
Sept. 5	19 11	19 17	19 26	19 40	19 49	20 00	20 14	20 33	20 42	20 53	21 06	21 21	21 41
13	19 08	19 12	19 19	19 29	19 36	19 45	19 56	20 11	20 19	20 28	20 37	20 49	21 03
21	19 05	19 07	19 11	19 18	19 23	19 30	19 39	19 51	19 57	20 04	20 11	20 20	20 31
29	19 02	19 02	19 03	19 08	19 11	19 16	19 23	19 32	19 36	19 41	19 47	19 54	20 01
Oct. 7	19 00	18 57	18 56	18 58	19 00	19 03	19 07	19 14	19 17	19 20	19 24	19 29	19 35

SUNRISE, 2022

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 3	5 46	5 49	5 51	5 54	5 56	5 58	6 00	6 03	6 04	6 05	6 06	6 08	6 09
7	5 45	5 48	5 52	5 57	5 59	6 02	6 05	6 09	6 10	6 12	6 14	6 17	6 19
11	5 44	5 48	5 53	5 59	6 02	6 06	6 10	6 15	6 17	6 20	6 22	6 25	6 29
15	5 43	5 48	5 55	6 02	6 06	6 10	6 15	6 21	6 24	6 27	6 31	6 34	6 39
19	5 42	5 49	5 56	6 04	6 09	6 14	6 20	6 28	6 31	6 35	6 39	6 43	6 48
23	5 41	5 49	5 58	6 07	6 12	6 19	6 26	6 34	6 38	6 42	6 47	6 53	6 58
27	5 41	5 50	5 59	6 10	6 16	6 23	6 31	6 41	6 45	6 50	6 56	7 02	7 09
31	5 40	5 50	6 01	6 13	6 20	6 28	6 37	6 47	6 52	6 58	7 04	7 11	7 19
Nov. 4	5 40	5 51	6 03	6 16	6 23	6 32	6 42	6 54	7 00	7 06	7 13	7 20	7 29
8	5 40	5 52	6 05	6 19	6 27	6 37	6 48	7 01	7 07	7 14	7 21	7 30	7 39
12	5 41	5 53	6 07	6 22	6 31	6 41	6 53	7 07	7 14	7 21	7 30	7 39	7 50
16	5 41	5 55	6 09	6 26	6 35	6 46	6 58	7 14	7 21	7 29	7 38	7 48	8 00
20	5 42	5 56	6 12	6 29	6 39	6 50	7 04	7 20	7 28	7 36	7 46	7 57	8 09
24	5 43	5 58	6 14	6 32	6 43	6 55	7 09	7 26	7 34	7 44	7 54	8 05	8 19
28	5 44	6 00	6 16	6 35	6 47	6 59	7 14	7 32	7 41	7 50	8 01	8 13	8 28
Dec 2	5 46	6 02	6 19	6 39	6 50	7 03	7 19	7 38	7 47	7 57	8 08	8 21	8 36
6	5 47	6 04	6 22	6 42	6 54	7 07	7 23	7 43	7 52	8 02	8 14	8 28	8 44
10	5 49	6 06	6 24	6 45	6 57	7 11	7 27	7 47	7 57	8 07	8 19	8 34	8 50
14	5 51	6 08	6 26	6 47	7 00	7 14	7 30	7 51	8 01	8 11	8 24	8 38	8 56
18	5 53	6 10	6 29	6 50	7 02	7 16	7 33	7 54	8 04	8 15	8 27	8 42	9 00
22	5 55	6 12	6 31	6 52	7 04	7 19	7 35	7 56	8 06	8 17	8 30	8 45	9 02
26	5 57	6 14	6 33	6 54	7 06	7 20	7 37	7 58	8 08	8 19	8 31	8 46	9 03
30	5 59	6 16	6 34	6 55	7 07	7 21	7 38	7 58	8 08	8 19	8 32	8 46	9 03
34	6 01	6 18	6 36	6 56	7 08	7 22	7 38	7 58	8 08	8 19	8 31	8 45	9 01

BEGINNING OF MORNING TWILIGHT

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 7	4 36	4 39	4 39	4 37	4 35	4 32	4 27	4 21	4 18	4 14	4 10	4 05	3 59
15	4 33	4 38	4 41	4 42	4 41	4 40	4 38	4 34	4 32	4 29	4 27	4 23	4 19
23	4 31	4 38	4 44	4 47	4 48	4 48	4 48	4 46	4 45	4 44	4 42	4 41	4 38
31	4 29	4 39	4 46	4 52	4 54	4 56	4 57	4 58	4 58	4 58	4 58	4 57	4 56
Nov. 8	4 29	4 40	4 49	4 57	5 01	5 04	5 07	5 10	5 10	5 11	5 12	5 13	5 13
16	4 29	4 42	4 53	5 03	5 07	5 12	5 16	5 21	5 22	5 24	5 26	5 28	5 29
24	4 29	4 44	4 57	5 08	5 14	5 20	5 25	5 31	5 33	5 36	5 38	5 41	5 44
Dec. 2	4 31	4 47	5 01	5 14	5 20	5 27	5 33	5 40	5 43	5 46	5 49	5 53	5 56
10	4 34	4 51	5 06	5 20	5 26	5 33	5 41	5 48	5 52	5 55	5 59	6 02	6 06
18	4 38	4 55	5 10	5 24	5 31	5 39	5 46	5 54	5 58	6 01	6 05	6 09	6 14
26	4 42	4 59	5 14	5 28	5 35	5 43	5 50	5 58	6 02	6 05	6 09	6 13	6 18
34	4 46	5 02	5 17	5 31	5 38	5 45	5 52	6 00	6 03	6 06	6 10	6 14	6 18
42	4 50	5 06	5 20	5 32	5 39	5 45	5 52	5 59	6 01	6 04	6 08	6 11	6 14

SUNSET, 2022

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 3	17 52	17 50	17 47	17 43	17 42	17 40	17 37	17 35	17 34	17 32	17 31	17 29	17 27
7	17 51	17 47	17 43	17 39	17 36	17 33	17 30	17 26	17 24	17 23	17 20	17 18	17 15
11	17 50	17 45	17 40	17 34	17 31	17 27	17 23	17 18	17 15	17 13	17 10	17 07	17 04
15	17 49	17 43	17 37	17 30	17 26	17 21	17 16	17 10	17 07	17 04	17 00	16 56	16 52
19	17 48	17 41	17 34	17 25	17 21	17 15	17 09	17 01	16 58	16 54	16 50	16 46	16 41
23	17 48	17 40	17 31	17 21	17 16	17 10	17 02	16 54	16 50	16 45	16 41	16 35	16 29
27	17 47	17 38	17 28	17 18	17 11	17 04	16 56	16 46	16 42	16 37	16 31	16 25	16 18
31	17 47	17 37	17 26	17 14	17 07	16 59	16 50	16 39	16 34	16 28	16 22	16 15	16 07
Nov. 4	17 47	17 36	17 24	17 11	17 03	16 55	16 45	16 32	16 27	16 21	16 14	16 06	15 57
8	17 47	17 35	17 22	17 08	17 00	16 50	16 39	16 26	16 20	16 13	16 06	15 57	15 47
12	17 48	17 35	17 21	17 06	16 57	16 47	16 35	16 20	16 14	16 06	15 58	15 49	15 38
16	17 48	17 35	17 20	17 04	16 54	16 43	16 30	16 15	16 08	16 00	15 51	15 41	15 29
20	17 49	17 35	17 19	17 02	16 52	16 40	16 27	16 10	16 03	15 54	15 45	15 34	15 21
24	17 50	17 35	17 19	17 01	16 50	16 38	16 24	16 06	15 58	15 49	15 39	15 27	15 14
28	17 52	17 36	17 19	17 00	16 49	16 36	16 21	16 03	15 55	15 45	15 34	15 22	15 07
Dec. 2	17 53	17 37	17 19	17 00	16 48	16 35	16 20	16 01	15 52	15 42	15 30	15 17	15 02
6	17 55	17 38	17 20	17 00	16 48	16 35	16 19	15 59	15 50	15 39	15 27	15 14	14 58
10	17 56	17 39	17 21	17 01	16 48	16 35	16 18	15 58	15 49	15 38	15 26	15 11	14 55
14	17 58	17 41	17 23	17 02	16 49	16 35	16 19	15 58	15 48	15 37	15 25	15 10	14 53
18	18 00	17 43	17 24	17 03	16 51	16 36	16 20	15 59	15 49	15 38	15 25	15 11	14 53
22	18 02	17 45	17 26	17 05	16 53	16 38	16 21	16 01	15 51	15 40	15 27	15 12	14 55
26	18 04	17 47	17 28	17 07	16 55	16 41	16 24	16 03	15 53	15 42	15 30	15 15	14 57
30	18 06	17 49	17 31	17 10	16 57	16 43	16 27	16 06	15 57	15 46	15 33	15 19	15 02
34	18 08	17 51	17 33	17 12	17 00	16 47	16 30	16 10	16 01	15 50	15 38	15 24	15 07

END OF EVENING TWILIGHT

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 7	19 00	18 57	18 56	18 58	19 00	19 03	19 07	19 14	19 17	19 20	19 24	19 29	19 35
15	18 59	18 53	18 50	18 49	18 50	18 51	18 53	18 57	18 59	19 01	19 04	19 07	19 11
23	18 58	18 50	18 45	18 41	18 40	18 40	18 40	18 42	18 43	18 44	18 45	18 47	18 49
31	18 58	18 48	18 41	18 35	18 33	18 31	18 29	18 28	18 28	18 28	18 29	18 29	18 30
Nov. 8	18 59	18 48	18 38	18 30	18 26	18 23	18 20	18 17	18 16	18 15	18 14	18 14	18 13
16	19 01	18 48	18 36	18 26	18 22	18 17	18 13	18 08	18 06	18 05	18 03	18 01	17 59
24	19 04	18 49	18 36	18 24	18 19	18 13	18 08	18 02	17 59	17 57	17 54	17 52	17 49
Dec. 2	19 07	18 51	18 37	18 24	18 18	18 11	18 05	17 58	17 55	17 52	17 49	17 45	17 42
10	19 11	18 55	18 40	18 26	18 19	18 12	18 05	17 57	17 54	17 50	17 47	17 43	17 39
18	19 15	18 58	18 43	18 29	18 21	18 14	18 07	17 58	17 55	17 51	17 48	17 44	17 39
26	19 19	19 02	18 47	18 33	18 25	18 18	18 11	18 03	17 59	17 56	17 52	17 48	17 43
34	19 23	19 06	18 51	18 38	18 31	18 24	18 17	18 09	18 06	18 02	17 59	17 55	17 51
42	19 26	19 10	18 56	18 43	18 37	18 31	18 24	18 17	18 14	18 11	18 08	18 05	18 02

DURATION OF TWILIGHT, 2022
MORNING AND EVENING TWILIGHT: CIVIL (6º), NAUTICAL (12º)
AND ASTRONOMICAL (18º)

Date	Lat.	0º Civ.	0º Nt.	0º Ast.	10º Civ.	10º Nt.	10º Ast.	20º Civ.	20º Nt.	20º Ast.	30º Civ.	30º Nt.	30º Ast.	40º Civ.	40º Nt.	40º Ast.
		m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Jan.	0	23	49	75	23	49	75	24	51	79	26	56	85	30	64	97
	8	22	48	74	23	49	75	24	51	78	26	56	85	30	64	96
	16	22	48	74	22	48	74	24	51	77	26	55	84	30	63	95
	24	22	47	73	22	48	73	23	50	76	25	54	83	29	62	94
Feb.	1	22	47	72	22	47	73	23	49	76	25	54	82	29	61	93
	9	21	46	71	22	47	72	23	49	75	25	53	81	28	60	92
	17	21	46	70	21	46	71	22	48	74	24	52	80	28	59	91
	25	21	45	70	21	46	70	22	48	74	24	52	80	27	59	90
Mar.	5	21	45	69	21	46	70	22	48	73	24	52	79	27	59	90
	13	21	45	69	21	45	70	22	48	73	24	52	80	27	58	90
	21	21	45	69	21	45	70	22	48	73	24	52	80	27	59	91
	29	21	45	69	21	46	70	22	48	74	24	52	81	27	59	92
Apr.	6	21	45	69	21	46	71	22	48	75	24	53	82	28	61	95
	14	21	45	70	21	46	71	23	49	76	25	54	83	28	62	97
	22	21	46	70	22	47	72	23	50	77	25	55	85	29	63	100
	30	21	46	71	22	47	73	23	50	77	25	55	87	29	65	103
May	8	22	47	72	22	48	74	23	51	79	26	57	89	30	67	108
	16	22	47	73	22	49	75	24	52	81	26	58	91	31	69	112
	24	22	48	74	23	49	76	24	53	82	27	59	93	32	71	116
June	1	22	48	74	23	50	77	24	53	83	27	60	95	32	73	119
	9	23	49	75	23	50	77	25	54	84	27	61	96	33	74	122
	17	23	49	75	23	50	78	25	54	84	28	61	97	33	75	123
	25	23	49	75	23	50	78	25	54	84	27	61	97	33	75	123
July	3	23	49	75	23	50	77	24	54	84	27	60	96	33	74	122
	11	22	48	74	23	50	77	24	53	83	27	60	95	32	73	119
	19	22	48	74	23	49	76	24	53	82	27	59	93	32	71	115
	27	22	47	73	22	49	75	24	52	80	26	58	91	31	69	111
Aug.	4	22	47	72	22	48	74	23	51	79	26	56	88	30	67	106
	12	21	46	71	22	47	73	23	50	78	25	55	86	29	65	103
	20	21	46	70	22	47	72	23	49	76	25	54	85	29	63	99
	28	21	45	70	21	46	71	22	49	75	25	53	83	28	61	96
Sept.	5	21	45	69	21	46	71	22	48	74	24	53	82	28	60	94
	13	21	45	69	21	46	70	22	48	74	24	52	81	27	59	92
	21	21	45	69	21	45	70	22	48	73	24	52	80	27	59	91
	29	21	45	69	21	45	70	22	48	73	24	52	79	27	58	90
Oct.	7	21	45	69	21	46	70	22	48	73	24	52	79	27	58	90
	15	21	45	70	21	46	70	22	48	74	24	52	80	27	59	90
	23	21	46	70	21	46	71	22	48	74	24	52	80	28	59	91
	31	21	46	71	22	47	72	23	49	75	25	53	81	28	60	92
Nov.	8	22	47	72	22	47	73	23	49	76	25	54	82	29	61	93
	16	22	47	73	22	48	73	23	50	76	25	54	83	29	62	94
	24	22	48	74	22	48	74	24	51	77	26	55	84	30	63	95
Dec.	2	22	48	74	23	49	75	24	51	78	26	56	85	30	64	96
	10	23	49	75	23	49	75	24	51	78	26	56	85	30	64	97
	18	23	49	75	23	49	75	24	52	79	26	56	86	31	65	98
	26	23	49	75	23	49	75	24	52	79	26	56	85	31	65	98
	34	23	49	75	23	49	75	24	51	78	26	56	85	30	64	97

DURATION OF TWILIGHT, 2022
MORNING AND EVENING TWILIGHT: CIVIL (6º), NAUTICAL (12º)
AND ASTRONOMICAL (18º)

Date \ Lat.		45º			50º			55º			60º		
		Civ.	Nt.	Ast.	Civ.	Nt.	Ast.	Civ.	Nt.	Ast.	Civ.	Nt.	Ast.
		m	m	m	m	m	m	m	m	m	m	m	m
Jan.	0	34	71	106	38	80	119	45	93	137	57	113	165
	8	33	70	105	38	78	117	44	91	135	55	111	161
	16	33	69	104	37	77	116	43	88	132	52	106	156
	24	32	68	102	36	75	113	41	86	129	50	102	151
Feb.	1	31	67	101	35	74	112	40	84	126	48	98	147
	9	31	65	100	34	72	110	39	82	124	45	95	143
	17	30	64	98	33	71	108	38	80	122	44	92	140
	25	30	64	98	33	70	108	37	79	121	42	91	139
Mar.	5	29	63	98	32	70	108	36	78	121	42	90	140
	13	29	64	98	32	70	108	36	79	121	42	90	142
	21	29	64	99	32	71	110	36	80	125	42	92	147
	29	30	65	101	33	72	113	37	81	130	43	95	155
Apr.	6	30	66	104	33	74	117	38	85	137	44	100	169
	14	31	68	108	34	77	123	39	89	147	46	107	193
	22	32	70	112	35	80	130	41	94	161	50	119	**
	30	32	72	117	36	83	139	43	100	184	53	135	**
May	8	33	76	123	38	88	151	46	110	**	59	169	**
	16	35	79	130	40	93	167	49	121	**	65	**	**
	24	36	82	137	42	99	188	52	136	**	74	**	**
June	1	36	84	144	43	104	**	54	156	**	85	**	**
	9	37	86	150	44	108	**	57	194	**	96	**	**
	17	37	87	153	45	110	**	58	**	**	106	**	**
	25	37	87	153	45	110	**	58	**	**	105	**	**
July	3	37	86	150	44	107	**	57	187	**	95	**	**
	11	36	84	144	43	103	**	54	154	**	83	**	**
	19	35	81	137	41	98	186	51	134	**	73	**	**
	27	34	78	129	40	93	165	48	120	**	64	**	**
Aug.	4	33	75	123	38	87	149	45	109	**	58	165	**
	12	32	72	116	36	82	138	42	100	182	53	134	**
	20	31	69	111	35	79	129	41	93	160	49	118	**
	28	31	67	107	34	76	122	39	88	146	46	107	192
Sept.	5	30	66	104	33	74	117	38	84	136	44	100	168
	13	30	65	101	33	72	113	37	81	130	43	95	155
	21	29	64	99	32	71	110	36	79	125	42	92	147
	29	29	63	98	32	70	108	36	78	122	41	90	142
Oct.	7	29	63	97	32	70	107	36	78	121	42	90	139
	15	30	64	98	33	70	107	37	78	121	42	90	139
	23	30	64	98	33	71	108	37	80	121	43	92	140
	31	31	65	99	34	72	109	38	81	123	45	94	142
Nov.	8	31	66	101	35	74	111	40	84	126	47	98	146
	16	32	68	102	36	75	113	41	86	129	50	102	151
	24	33	69	104	37	77	116	43	88	132	52	106	156
Dec.	2	33	70	105	38	78	117	44	91	135	55	110	161
	10	34	71	106	38	80	119	45	92	137	57	113	164
	18	34	71	107	39	80	120	46	93	138	58	115	166
	26	34	71	107	38	80	119	46	93	138	58	114	166
	34	34	71	106	38	79	119	45	92	136	56	112	163

SUNRISE, SUNSET AND TWILIGHT, 2022
CORRECTION FOR SOUTHERN LATITUDES

For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add
Jan.	July	m	Feb.	Aug.	m	Mar.	Sept.	m	Apr.	Oct.	m	May	Nov.	m
0	1	0	5	9	+9	13	15	+14	19	22	+15	25	26	+10
1	3	0	6	10	9	14	16	14	20	23	15	26	27	9
2	4	0	7	11	9	15	17	14	21	24	14	27	28	9
			8	12	9	16	18	15	22	25	14	28	29	9
3	5	0	9	13	9	17	19	15	23	26	14	29	30	9
4	6	+1	10	14	10	18	20	15	24	27	14	May	Dec.	
5	7	1	11	15	10	19	21	15	25	28	14	30	1	8
6	8	1	12	16	10	20	22	15	26	29	14	31	2	8
7	9	1	13	17	10	21	23	15	27	30	14	June	Dec.	
8	10	2	14	18	10	22	24	15	28	31	14	1	3	8
9	11	2	15	19	11	23	25	15	Apr.	Nov.		2	4	8
10	12	2	16	20	11	24	26	15	29	1	14	3	5	7
11	13	2	17	21	11	25	27	15	30	2	14	4	5	7
12	14	3	18	22	11	26	29	15	May	Nov.		5	6	7
13	15	3	19	23	11	27	30	15	1	3	13	6	7	7
14	16	3	20	25	12	Mar.	Oct.		2	4	13	7	8	7
15	17	3	21	26	12	28	1	15	3	5	13	8	9	6
16	18	4	22	27	12	29	2	15	4	6	13	9	10	6
17	19	4	23	28	12	30	3	15	5	7	13	10	11	6
18	21	4	24	29	12	31	4	16	6	8	13	11	12	6
19	22	5	25	30	13	Apr.	Oct.		7	9	13	12	13	5
20	23	5	26	31	13	1	5	16	8	10	12	13	14	5
21	24	5				2	6	16	9	11	12	14	15	5
22	25	5	Feb.	Sept.		3	7	16	10	12	12	15	16	5
23	26	6	27	1	13	4	7	15	11	13	12	16	17	4
24	27	6	28	2	13	5	8	15	12	14	12	17	18	4
25	28	6	Mar.	Sept.		6	9	15	13	15	12	18	19	4
26	29	6	1	3	13	7	10	15	14	16	12	19	20	4
27	30	7	2	4	13	8	11	15	15	16	11	20	21	3
28	31	7	3	5	13	9	12	15	16	17	11	21	21	3
Jan.	Aug.		4	6	14	10	13	15	17	18	11	22	22	3
29	1	7	5	7	14	11	14	15	18	19	11	23	23	3
30	2	7	6	8	14	12	15	15	19	20	11	24	24	3
31	3	7	7	9	14	13	16	15	20	21	11	25	25	2
Feb.	Aug.		8	10	14	14	17	15	21	22	10	26	26	2
1	5	8	9	11	14	15	18	15	22	23	10	27	27	2
2	6	8	10	12	14	16	19	15	23	24	10	28	28	1
3	7	8	11	13	14	17	20	15	24	25	10	29	29	1
4	8	+9	12	14	+14	18	21	+15	25	26	+10	30	30	+1

To obtain the times of sunrise, sunset and twilight for southern latitudes for any date, use the tables for the same northern latitude for the corresponding date given above, and apply to the times so obtained the correction given in the column headed 'Add'.

In the case of duration of twilight, however, take only the figures for the corresponding date without correction.

SUNRISE, SUNSET AND TWILIGHT, 2022
CORRECTION FOR SOUTHERN LATITUDES

For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add
July	Dec.	m	Aug.	Feb.	m	Sept.	Mar.	m	Oct.	Apr.	m	Nov.	May	m
1	31	+1	7	3	-8	12	10	-14	19	16	-15	26	25	-10
July	Jan.		8	4	8	13	11	14	20	17	15	27	26	9
2	0	+1	9	5	9	14	12	14	21	18	15	28	27	9
3	1	0	10	6	9	15	13	14	22	19	15	29	28	9
4	2	0	11	7	9	16	14	14	23	20	15	30	29	9
5	3	0	12	8	9	17	15	15	24	21	14	Dec.	May	
6	4	-1	13	9	9	18	16	15	25	22	14	1	30	8
7	5	1	14	10	10	19	17	15	26	23	14	2	31	8
8	6	1	15	11	10	20	18	15	27	24	14	Dec.	June	
9	7	1	16	12	10	21	19	15	28	25	14	3	1	8
10	8	2	17	13	10	22	20	15	29	26	14	4	2	8
11	9	2	18	14	10	23	21	15	30	27	14	5	3	7
12	10	2	19	15	11	24	22	15	31	28	14	6	5	7
13	11	2	20	16	11	25	23	15	Nov.	Apr.		7	6	7
14	12	3	21	17	11	26	24	15	1	29	14	8	7	7
15	13	3	22	18	11	27	25	15	2	30	14	9	8	6
16	14	3	23	19	11	28	26	15	Nov.	May		10	9	6
17	15	3	24	19	12	29	26	15	3	1	13	11	10	6
18	16	3	25	20	12	30	27	15	4	2	13	12	11	6
19	16	4	26	21	12	Oct.	Mar.		5	3	13	13	12	5
20	17	4	27	22	12	1	28	15	6	4	13	14	13	5
21	18	4	28	23	12	2	29	15	7	5	13	15	14	5
22	19	4	29	24	12	3	30	15	8	6	13	16	15	5
23	20	5	30	25	13	4	31	15	9	7	13	17	16	4
24	21	5	31	26	13	Oct.	Apr.		10	8	12	18	17	4
25	22	5	Sept.	Feb.		5	1	16	11	9	12	19	18	4
26	23	6	1	27	13	6	2	16	12	10	12	20	19	4
27	24	6	2	28	13	7	3	16	13	11	12	21	21	3
28	25	6				8	4	15	14	12	12	22	22	3
29	26	6	Sept.	Mar.		9	5	15	15	13	12	23	23	3
30	27	7	3	1	13	10	6	15	16	14	12	24	24	3
31	28	7	4	2	13	11	7	15	17	15	11	25	25	2
Aug.	Jan.		5	3	13	12	9	15	18	17	11	26	26	2
1	29	7	6	4	14	13	10	15	19	18	11	27	27	2
2	30	7	7	5	14	14	11	15	20	19	11	28	28	2
3	30	7	8	6	14	15	12	15	21	20	11	29	29	1
4	31	8	9	7	14	16	13	15	22	21	10	30	30	1
Aug.	Feb.		10	8	14	17	14	15	23	22	10	Dec.	July	
5	1	8	11	9	14	18	15	15	24	23	10	31	1	-1
6	2	-8	12	10	-14	19	16	-15	25	24	-10	32	2	0

To obtain the times of sunrise, sunset and twilight for southern latitudes for any date, use the tables for the same northern latitude for the corresponding date given above, and apply to the times so obtained the correction given in the column headed 'Add'.

In the case of duration of twilight, however, take only the figures for the corresponding date without correction.

SUNRISE AND SUNSET, 2022

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date		Kolkata 22º N 32'		Varanasi 25º N 18'		Chennai 13º N 00'		Delhi 28º N 35'		Mumbai 18º N 54'	
		Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	6 16.4	17 02.9	6 43.4	17 18.6	6 30.9	17 53.1	7 14.1	17 34.7	7 11.8	18 11.6
	2	6 17.0	17 04.1	6 44.0	17 19.9	6 31.7	17 54.2	7 14.6	17 36.1	7 12.5	18 12.8
	4	6 17.5	17 05.5	6 44.5	17 21.3	6 32.4	17 55.3	7 15.1	17 37.5	7 13.1	18 14.0
	6	6 18.0	17 06.8	6 44.9	17 22.7	6 33.0	17 56.4	7 15.4	17 39.0	7 13.6	18 15.3
	8	6 18.4	17 08.2	6 45.2	17 24.2	6 33.6	17 57.5	7 15.6	17 40.5	7 14.1	18 16.5
	10	6 18.7	17 09.6	6 45.4	17 25.6	6 34.2	17 58.7	7 15.7	17 42.1	7 14.5	18 17.8
	12	6 18.9	17 11.0	6 45.5	17 27.1	6 34.6	17 59.7	7 15.7	17 43.7	7 14.8	18 19.1
	14	6 19.0	17 12.4	6 45.5	17 28.6	6 35.0	18 00.8	7 15.6	17 45.3	7 15.0	18 20.4
	16	6 19.0	17 13.8	6 45.4	17 30.1	6 35.4	18 01.9	7 15.4	17 46.9	7 15.2	18 21.7
	18	6 18.9	17 15.3	6 45.2	17 31.7	6 35.6	18 02.9	7 15.0	17 48.5	7 15.2	18 22.9
	20	6 18.7	17 16.7	6 44.9	17 33.2	6 35.8	18 04.0	7 14.6	17 50.2	7 15.2	18 24.2
	22	6 18.5	17 18.1	6 44.6	17 34.7	6 35.9	18 05.0	7 14.1	17 51.8	7 15.1	18 25.4
	24	6 18.1	17 19.5	6 44.1	17 36.2	6 36.0	18 05.9	7 13.4	17 53.5	7 14.9	18 26.7
	26	6 17.7	17 20.9	6 43.5	17 37.7	6 35.9	18 06.9	7 12.7	17 55.1	7 14.6	18 27.9
	28	6 17.2	17 22.2	6 42.8	17 39.2	6 35.8	18 07.8	7 11.8	17 56.8	7 14.2	18 29.1
	30	6 16.5	17 23.6	6 42.1	17 40.7	6 35.6	18 08.7	7 10.9	17 58.4	7 13.7	18 30.2
Feb.	1	6 15.8	17 24.9	6 41.2	17 42.1	6 35.4	18 09.5	7 09.8	18 00.0	7 13.2	18 31.4
	3	6 15.0	17 26.2	6 40.2	17 43.5	6 35.0	18 10.3	7 08.7	18 01.6	7 12.6	18 32.5
	5	6 14.2	17 27.4	6 39.2	17 44.9	6 34.6	18 11.1	7 07.4	18 03.2	7 11.9	18 33.5
	7	6 13.2	17 28.7	6 38.1	17 46.3	6 34.2	18 11.8	7 06.1	18 04.7	7 11.1	18 34.6
	9	6 12.2	17 29.9	6 36.9	17 47.7	6 33.6	18 12.5	7 04.7	18 06.3	7 10.3	18 35.6
	11	6 11.1	17 31.0	6 35.6	17 49.0	6 33.0	18 13.2	7 03.2	18 07.8	7 09.4	18 36.6
	13	6 10.0	17 32.2	6 34.3	17 50.3	6 32.4	18 13.8	7 01.6	18 09.3	7 08.4	18 37.5
	15	6 08.7	17 33.3	6 32.8	17 51.5	6 31.7	18 14.4	6 60.0	18 10.8	7 07.3	18 38.4
	17	6 07.4	17 34.4	6 31.3	17 52.8	6 30.9	18 14.9	6 58.3	18 12.2	7 06.2	18 39.3
	19	6 06.1	17 35.4	6 29.8	17 54.0	6 30.0	18 15.4	6 56.5	18 13.6	7 05.0	18 40.1
	21	6 04.7	17 36.4	6 28.2	17 55.2	6 29.1	18 15.9	6 54.6	18 15.0	7 03.8	18 40.9
	23	6 03.2	17 37.4	6 26.5	17 56.3	6 28.2	18 16.3	6 52.7	18 16.4	7 02.5	18 41.7
	25	6 01.7	17 38.4	6 24.8	17 57.4	6 27.2	18 16.7	6 50.7	18 17.8	7 01.1	18 42.5
	27	6 00.1	17 39.3	6 23.0	17 58.5	6 26.2	18 17.1	6 48.7	18 19.1	6 59.8	18 43.2
Mar.	1	5 58.5	17 40.2	6 21.2	17 59.6	6 25.1	18 17.4	6 46.7	18 20.4	6 58.3	18 43.9
	3	5 56.9	17 41.1	6 19.4	18 00.6	6 24.0	18 17.7	6 44.5	18 21.7	6 56.8	18 44.5
	5	5 55.2	17 41.9	6 17.5	18 01.6	6 22.8	18 18.0	6 42.4	18 22.9	6 55.3	18 45.2
	7	5 53.5	17 42.7	6 15.5	18 02.6	6 21.7	18 18.2	6 40.2	18 24.2	6 53.8	18 45.8
	9	5 51.7	17 43.6	6 13.6	18 03.6	6 20.5	18 18.5	6 38.0	18 25.4	6 52.2	18 46.4
	11	5 49.9	17 44.3	6 11.6	18 04.5	6 19.2	18 18.7	6 35.8	18 26.6	6 50.6	18 46.9
	13	5 48.1	17 45.1	6 09.6	18 05.5	6 18.0	18 18.9	6 33.5	18 27.8	6 49.0	18 47.5
	15	5 46.3	17 45.9	6 07.6	18 06.4	6 16.7	18 19.0	6 31.2	18 29.0	6 47.3	18 48.0
	17	5 44.4	17 46.6	6 05.6	18 07.3	6 15.4	18 19.2	6 28.9	18 30.1	6 45.7	18 48.5
	19	5 42.5	17 47.3	6 03.5	18 08.2	6 14.1	18 19.4	6 26.6	18 31.3	6 44.0	18 49.1
	21	5 40.6	17 48.0	6 01.5	18 09.1	6 12.8	18 19.5	6 24.3	18 32.4	6 42.3	18 49.6
	23	5 38.7	17 48.7	5 59.4	18 10.0	6 11.5	18 19.6	6 22.0	18 33.6	6 40.6	18 50.0
	25	5 36.8	17 49.4	5 57.4	18 10.9	6 10.2	18 19.8	6 19.7	18 34.7	6 38.9	18 50.5
	27	5 34.9	17 50.1	5 55.3	18 11.7	6 08.8	18 19.9	6 17.3	18 35.8	6 37.2	18 51.0
	29	5 33.0	17 50.8	5 53.3	18 12.6	6 07.5	18 20.0	6 15.0	18 36.9	6 35.5	18 51.5
	31	5 31.1	17 51.5	5 51.2	18 13.5	6 06.2	18 20.2	6 12.8	18 38.1	6 33.8	18 52.0
Apr.	2	5 29.2	17 52.2	5 49.2	18 14.4	6 04.9	18 20.3	6 10.5	18 39.2	6 32.1	18 52.5

SUNRISE AND SUNSET, 2022

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date		Kolkata 22° N 32'		Varanasi 25° N 18'		Chennai 13° N 00'		Delhi 28° N 35'		Mumbai 18° N 54'	
		Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr.	2	5 29.2	17 52.2	5 49.2	18 14.4	6 04.9	18 20.3	6 10.5	18 39.2	6 32.1	18 52.5
	4	5 27.3	17 52.9	5 47.2	18 15.2	6 03.6	18 20.4	6 08.2	18 40.3	6 30.5	18 53.0
	6	5 25.5	17 53.6	5 45.1	18 16.1	6 02.4	18 20.6	6 06.0	18 41.4	6 28.8	18 53.4
	8	5 23.6	17 54.3	5 43.1	18 17.0	6 01.1	18 20.7	6 03.8	18 42.5	6 27.2	18 54.0
	10	5 21.8	17 55.0	5 41.2	18 17.9	5 59.9	18 20.9	6 01.6	18 43.7	6 25.6	18 54.5
	12	5 20.0	17 55.7	5 39.2	18 18.8	5 58.7	18 21.1	5 59.5	18 44.8	6 24.1	18 55.0
	14	5 18.2	17 56.5	5 37.3	18 19.7	5 57.5	18 21.3	5 57.4	18 46.0	6 22.5	18 55.5
	16	5 16.5	17 57.2	5 35.4	18 20.6	5 56.3	18 21.5	5 55.3	18 47.1	6 21.0	18 56.1
	18	5 14.8	17 57.9	5 33.5	18 21.6	5 55.2	18 21.7	5 53.3	18 48.3	6 19.5	18 56.6
	20	5 13.1	17 58.7	5 31.7	18 22.5	5 54.1	18 21.9	5 51.3	18 49.5	6 18.1	18 57.2
	22	5 11.5	17 59.5	5 29.9	18 23.5	5 53.0	18 22.2	5 49.3	18 50.6	6 16.7	18 57.8
	24	5 09.9	18 00.3	5 28.2	18 24.4	5 52.0	18 22.5	5 47.4	18 51.8	6 15.4	18 58.4
	26	5 08.4	18 01.1	5 26.5	18 25.4	5 51.0	18 22.8	5 45.5	18 53.0	6 14.1	18 59.0
	28	5 06.9	18 01.9	5 24.9	18 26.4	5 50.1	18 23.1	5 43.7	18 54.2	6 12.8	18 59.7
	30	5 05.5	18 02.7	5 23.3	18 27.4	5 49.2	18 23.5	5 42.0	18 55.5	6 11.6	19 00.3
May	2	5 04.2	18 03.5	5 21.8	18 28.4	5 48.4	18 23.9	5 40.3	18 56.7	6 10.5	19 01.0
	4	5 02.9	18 04.4	5 20.4	18 29.4	5 47.5	18 24.3	5 38.7	18 57.9	6 09.4	19 01.7
	6	5 01.6	18 05.3	5 19.0	18 30.5	5 46.8	18 24.7	5 37.1	18 59.1	6 08.4	19 02.4
	8	5 00.5	18 06.1	5 17.7	18 31.5	5 46.1	18 25.1	5 35.6	19 00.4	6 07.4	19 03.1
	10	4 59.4	18 07.0	5 16.4	18 32.6	5 45.4	18 25.6	5 34.2	19 01.6	6 06.5	19 03.9
	12	4 58.3	18 07.9	5 15.3	18 33.6	5 44.9	18 26.1	5 32.9	19 02.8	6 05.7	19 04.6
	14	4 57.4	18 08.8	5 14.2	18 34.7	5 44.3	18 26.6	5 31.6	19 04.1	6 04.9	19 05.4
	16	4 56.5	18 09.7	5 13.2	18 35.7	5 43.8	18 27.1	5 30.4	19 05.3	6 04.2	19 06.1
	18	4 55.6	18 10.6	5 12.2	18 36.8	5 43.4	18 27.6	5 29.3	19 06.5	6 03.5	19 06.9
	20	4 54.9	18 11.5	5 11.3	18 37.8	5 43.0	18 28.2	5 28.3	19 07.7	6 02.9	19 07.7
	22	4 54.2	18 12.5	5 10.6	18 38.8	5 42.7	18 28.8	5 27.4	19 08.9	6 02.4	19 08.5
	24	4 53.6	18 13.4	5 09.9	18 39.9	5 42.5	18 29.4	5 26.6	19 10.0	6 02.0	19 09.3
	26	4 53.1	18 14.2	5 09.2	18 40.9	5 42.3	18 30.0	5 25.8	19 11.2	6 01.6	19 10.1
	28	4 52.7	18 15.1	5 08.7	18 41.9	5 42.1	18 30.6	5 25.2	19 12.3	6 01.3	19 10.9
	30	4 52.3	18 16.0	5 08.3	18 42.8	5 42.0	18 31.2	5 24.6	19 13.4	6 01.1	19 11.6
June	1	4 52.0	18 16.8	5 07.9	18 43.8	5 42.0	18 31.8	5 24.1	19 14.4	6 00.9	19 12.4
	3	4 51.8	18 17.7	5 07.6	18 44.7	5 42.0	18 32.4	5 23.8	19 15.4	6 00.8	19 13.2
	5	4 51.7	18 18.5	5 07.4	18 45.6	5 42.1	18 33.0	5 23.5	19 16.4	6 00.7	19 13.9
	7	4 51.6	18 19.2	5 07.3	18 46.4	5 42.2	18 33.6	5 23.3	19 17.3	6 00.7	19 14.6
	9	4 51.6	18 20.0	5 07.2	18 47.2	5 42.4	18 34.2	5 23.2	19 18.2	6 00.8	19 15.3
	11	4 51.7	18 20.7	5 07.3	18 48.0	5 42.6	18 34.7	5 23.1	19 19.0	6 00.9	19 15.9
	13	4 51.9	18 21.3	5 07.4	18 48.7	5 42.9	18 35.3	5 23.2	19 19.7	6 01.1	19 16.6
	15	4 52.1	18 21.9	5 07.6	18 49.3	5 43.2	18 35.8	5 23.3	19 20.4	6 01.4	19 17.1
	17	4 52.4	18 22.5	5 07.8	18 49.9	5 43.5	18 36.3	5 23.6	19 21.0	6 01.7	19 17.7
	19	4 52.7	18 23.0	5 08.2	18 50.4	5 43.9	18 36.8	5 23.9	19 21.6	6 02.0	19 18.2
	21	4 53.1	18 23.5	5 08.6	18 50.9	5 44.3	18 37.3	5 24.3	19 22.0	6 02.4	19 18.7
	23	4 53.6	18 23.9	5 09.0	18 51.3	5 44.8	18 37.7	5 24.7	19 22.4	6 02.9	19 19.1
	25	4 54.1	18 24.2	5 09.5	18 51.6	5 45.2	18 38.1	5 25.3	19 22.7	6 03.3	19 19.4
	27	4 54.6	18 24.5	5 10.1	18 51.9	5 45.7	18 38.4	5 25.9	19 23.0	6 03.9	19 19.7
	29	4 55.2	18 24.7	5 10.7	18 52.1	5 46.2	18 38.7	5 26.5	19 23.1	6 04.4	19 20.0
July	1	4 55.9	18 24.8	5 11.4	18 52.2	5 46.8	18 39.0	5 27.2	19 23.2	6 05.0	19 20.1
	3	4 56.6	18 24.9	5 12.1	18 52.2	5 47.3	18 39.2	5 28.0	19 23.1	6 05.6	19 20.3

SUNRISE AND SUNSET, 2022

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date	Kolkata 22° N 32'		Varanasi 25° N 18'		Chennai 13° N 00'		Delhi 28° N 35'		Mumbai 18° N 54'	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 1	4 55.9	18 24.8	5 11.4	18 52.2	5 46.8	18 39.0	5 27.2	19 23.2	6 05.0	19 20.1
3	4 56.6	18 24.9	5 12.1	18 52.2	5 47.3	18 39.2	5 28.0	19 23.1	6 05.6	19 20.3
5	4 57.3	18 24.9	5 12.9	18 52.1	5 47.9	18 39.3	5 28.8	19 23.0	6 06.3	19 20.3
7	4 58.0	18 24.8	5 13.7	18 52.0	5 48.4	18 39.4	5 29.7	19 22.8	6 06.9	19 20.3
9	4 58.8	18 24.7	5 14.5	18 51.8	5 49.0	18 39.5	5 30.6	19 22.5	6 07.6	19 20.2
11	4 59.6	18 24.4	5 15.4	18 51.4	5 49.5	18 39.5	5 31.6	19 22.0	6 08.3	19 20.1
13	5 00.4	18 24.1	5 16.3	18 51.0	5 50.1	18 39.4	5 32.6	19 21.5	6 09.0	19 19.9
15	5 01.2	18 23.7	5 17.2	18 50.6	5 50.6	18 39.3	5 33.6	19 21.0	6 09.7	19 19.6
17	5 02.1	18 23.3	5 18.1	18 50.0	5 51.2	18 39.1	5 34.6	19 20.3	6 10.4	19 19.2
19	5 02.9	18 22.7	5 19.1	18 49.3	5 51.7	18 38.8	5 35.7	19 19.5	6 11.1	19 18.8
21	5 03.8	18 22.1	5 20.0	18 48.6	5 52.2	18 38.5	5 36.8	19 18.6	6 11.8	19 18.3
23	5 04.6	18 21.4	5 21.0	18 47.8	5 52.7	18 38.2	5 37.9	19 17.6	6 12.5	19 17.7
25	5 05.5	18 20.6	5 22.0	18 46.9	5 53.2	18 37.8	5 39.0	19 16.6	6 13.2	19 17.1
27	5 06.3	18 19.8	5 23.0	18 45.9	5 53.7	18 37.3	5 40.1	19 15.4	6 13.9	19 16.3
29	5 07.2	18 18.8	5 23.9	18 44.8	5 54.1	18 36.7	5 41.2	19 14.2	6 14.6	19 15.6
31	5 08.0	18 17.8	5 24.9	18 43.7	5 54.6	18 36.1	5 42.3	19 12.9	6 15.3	19 14.7
Aug. 2	5 08.9	18 16.8	5 25.9	18 42.4	5 55.0	18 35.5	5 43.5	19 11.5	6 15.9	19 13.8
4	5 09.7	18 15.6	5 26.8	18 41.1	5 55.3	18 34.7	5 44.6	19 10.0	6 16.6	19 12.8
6	5 10.5	18 14.4	5 27.8	18 39.8	5 55.7	18 34.0	5 45.7	19 08.4	6 17.2	19 11.7
8	5 11.3	18 13.1	5 28.7	18 38.3	5 56.0	18 33.1	5 46.8	19 06.8	6 17.8	19 10.6
10	5 12.1	18 11.8	5 29.6	18 36.8	5 56.3	18 32.2	5 47.9	19 05.1	6 18.4	19 09.4
12	5 12.8	18 10.4	5 30.5	18 35.3	5 56.6	18 31.3	5 49.0	19 03.3	6 19.0	19 08.2
14	5 13.6	18 09.0	5 31.4	18 33.6	5 56.9	18 30.3	5 50.1	19 01.5	6 19.5	19 06.9
16	5 14.3	18 07.5	5 32.3	18 31.9	5 57.1	18 29.3	5 51.1	18 59.6	6 20.0	19 05.6
18	5 15.0	18 05.9	5 33.2	18 30.2	5 57.3	18 28.2	5 52.2	18 57.6	6 20.6	19 04.2
20	5 15.7	18 04.3	5 34.1	18 28.4	5 57.5	18 27.1	5 53.3	18 55.6	6 21.1	19 02.7
22	5 16.4	18 02.7	5 34.9	18 26.6	5 57.7	18 26.0	5 54.3	18 53.6	6 21.5	19 01.3
24	5 17.1	18 01.0	5 35.7	18 24.7	5 57.8	18 24.8	5 55.3	18 51.4	6 22.0	18 59.7
26	5 17.8	17 59.3	5 36.5	18 22.8	5 57.9	18 23.5	5 56.3	18 49.3	6 22.4	18 58.2
28	5 18.4	17 57.5	5 37.4	18 20.8	5 58.0	18 22.3	5 57.3	18 47.1	6 22.9	18 56.6
30	5 19.0	17 55.7	5 38.1	18 18.8	5 58.1	18 21.0	5 58.3	18 44.8	6 23.3	18 54.9
Sept. 1	5 19.6	17 53.9	5 38.9	18 16.8	5 58.2	18 19.7	5 59.3	18 42.6	6 23.7	18 53.3
3	5 20.2	17 52.1	5 39.7	18 14.8	5 58.2	18 18.3	6 00.3	18 40.3	6 24.1	18 51.6
5	5 20.8	17 50.2	5 40.5	18 12.7	5 58.3	18 17.0	6 01.3	18 37.9	6 24.4	18 49.8
7	5 21.4	17 48.2	5 41.2	18 10.6	5 58.3	18 15.6	6 02.2	18 35.6	6 24.8	18 48.1
9	5 22.0	17 46.3	5 42.0	18 08.5	5 58.3	18 14.2	6 03.2	18 33.2	6 25.2	18 46.3
11	5 22.6	17 44.4	5 42.7	18 06.4	5 58.3	18 12.8	6 04.1	18 30.8	6 25.5	18 44.6
13	5 23.2	17 42.4	5 43.5	18 04.2	5 58.3	18 11.4	6 05.1	18 28.4	6 25.9	18 42.8
15	5 23.7	17 40.4	5 44.2	18 02.1	5 58.3	18 10.0	6 06.1	18 26.0	6 26.2	18 41.0
17	5 24.3	17 38.4	5 45.0	17 60.0	5 58.4	18 08.6	6 07.0	18 23.6	6 26.6	18 39.2
19	5 24.9	17 36.4	5 45.7	17 57.8	5 58.4	18 07.2	6 08.0	18 21.2	6 26.9	18 37.4
21	5 25.5	17 34.4	5 46.5	17 55.7	5 58.4	18 05.8	6 09.0	18 18.8	6 27.3	18 35.6
23	5 26.1	17 32.4	5 47.2	17 53.6	5 58.4	18 04.3	6 09.9	18 16.4	6 27.7	18 33.8
25	5 26.7	17 30.4	5 48.0	17 51.4	5 58.4	18 03.0	6 10.9	18 14.0	6 28.0	18 32.1
27	5 27.3	17 28.4	5 48.8	17 49.3	5 58.4	18 01.6	6 11.9	18 11.7	6 28.4	18 30.3
29	5 27.9	17 26.5	5 49.5	17 47.2	5 58.5	18 00.2	6 13.0	18 09.3	6 28.8	18 28.6
Oct. 1	5 28.5	17 24.5	5 50.3	17 45.1	5 58.5	17 58.9	6 14.0	18 07.0	6 29.2	18 26.8

SUNRISE AND SUNSET, 2022

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date	Kolkata 22° N 32'		Varanasi 25° N 18'		Chennai 13° N 00'		Delhi 28° N 35'		Mumbai 18° N 54'	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	5 28.5	17 24.5	5 50.3	17 45.1	5 58.5	17 58.9	6 14.0	18 07.0	6 29.2	18 26.8
3	5 29.2	17 22.6	5 51.2	17 43.0	5 58.6	17 57.5	6 15.0	18 04.7	6 29.6	18 25.1
5	5 29.8	17 20.7	5 52.0	17 40.9	5 58.7	17 56.2	6 16.1	18 02.5	6 30.1	18 23.5
7	5 30.5	17 18.8	5 52.9	17 38.9	5 58.8	17 55.0	6 17.2	18 00.3	6 30.6	18 21.8
9	5 31.2	17 16.9	5 53.7	17 36.9	5 59.0	17 53.7	6 18.3	17 58.1	6 31.0	18 20.2
11	5 32.0	17 15.1	5 54.6	17 34.9	5 59.2	17 52.5	6 19.4	17 55.9	6 31.6	18 18.7
13	5 32.7	17 13.4	5 55.6	17 33.0	5 59.3	17 51.3	6 20.6	17 53.8	6 32.1	18 17.1
15	5 33.5	17 11.6	5 56.5	17 31.1	5 59.6	17 50.2	6 21.8	17 51.7	6 32.7	18 15.6
17	5 34.3	17 09.9	5 57.5	17 29.2	5 59.8	17 49.1	6 23.0	17 49.7	6 33.3	18 14.2
19	5 35.2	17 08.3	5 58.5	17 27.4	6 00.1	17 48.0	6 24.2	17 47.7	6 33.9	18 12.8
21	5 36.0	17 06.7	5 59.5	17 25.7	6 00.4	17 47.0	6 25.5	17 45.7	6 34.6	18 11.5
23	5 36.9	17 05.2	6 00.5	17 24.0	6 00.8	17 46.0	6 26.8	17 43.8	6 35.3	18 10.2
25	5 37.9	17 03.7	6 01.6	17 22.4	6 01.2	17 45.1	6 28.1	17 42.0	6 36.0	18 09.0
27	5 38.8	17 02.3	6 02.7	17 20.8	6 01.6	17 44.3	6 29.5	17 40.3	6 36.8	18 07.8
29	5 39.8	17 01.0	6 03.9	17 19.3	6 02.1	17 43.5	6 30.8	17 38.6	6 37.6	18 06.7
31	5 40.9	16 59.7	6 05.1	17 17.9	6 02.6	17 42.7	6 32.3	17 37.0	6 38.4	18 05.7
Nov. 2	5 41.9	16 58.5	6 06.3	17 16.5	6 03.2	17 42.1	6 33.7	17 35.4	6 39.3	18 04.7
4	5 43.0	16 57.4	6 07.5	17 15.3	6 03.8	17 41.5	6 35.2	17 34.0	6 40.2	18 03.8
6	5 44.2	16 56.4	6 08.8	17 14.1	6 04.4	17 40.9	6 36.7	17 32.6	6 41.2	18 03.0
8	5 45.3	16 55.5	6 10.1	17 13.0	6 05.1	17 40.5	6 38.2	17 31.3	6 42.1	18 02.3
10	5 46.5	16 54.6	6 11.4	17 12.0	6 05.8	17 40.1	6 39.7	17 30.1	6 43.2	18 01.6
12	5 47.7	16 53.8	6 12.8	17 11.0	6 06.5	17 39.7	6 41.3	17 29.0	6 44.2	18 01.0
14	5 48.9	16 53.1	6 14.1	17 10.2	6 07.3	17 39.5	6 42.9	17 28.0	6 45.3	18 00.5
16	5 50.2	16 52.5	6 15.5	17 09.5	6 08.2	17 39.3	6 44.4	17 27.1	6 46.4	18 00.1
18	5 51.5	16 52.0	6 16.9	17 08.8	6 09.0	17 39.2	6 46.0	17 26.3	6 47.6	17 59.8
20	5 52.7	16 51.6	6 18.4	17 08.3	6 10.0	17 39.2	6 47.7	17 25.6	6 48.7	17 59.5
22	5 54.1	16 51.3	6 19.8	17 07.8	6 10.9	17 39.3	6 49.3	17 25.0	6 49.9	17 59.3
24	5 55.4	16 51.0	6 21.3	17 07.5	6 11.9	17 39.4	6 50.9	17 24.6	6 51.1	17 59.3
26	5 56.7	16 50.9	6 22.7	17 07.3	6 12.9	17 39.6	6 52.5	17 24.2	6 52.3	17 59.3
28	5 58.0	16 50.9	6 24.2	17 07.1	6 13.9	17 39.9	6 54.1	17 23.9	6 53.6	17 59.4
30	5 59.3	16 50.9	6 25.6	17 07.1	6 14.9	17 40.2	6 55.7	17 23.8	6 54.8	17 59.5
Dec. 2	6 00.6	16 51.1	6 27.0	17 07.2	6 16.0	17 40.6	6 57.2	17 23.7	6 56.1	17 59.8
4	6 01.9	16 51.4	6 28.4	17 07.4	6 17.1	17 41.1	6 58.8	17 23.8	6 57.3	18 00.1
6	6 03.2	16 51.7	6 29.8	17 07.6	6 18.2	17 41.7	7 00.3	17 24.0	6 58.6	18 00.5
8	6 04.5	16 52.1	6 31.2	17 08.0	6 19.2	17 42.3	7 01.7	17 24.3	6 59.8	18 01.0
10	6 05.8	16 52.7	6 32.5	17 08.5	6 20.3	17 43.0	7 03.2	17 24.7	7 01.0	18 01.6
12	6 07.0	16 53.3	6 33.8	17 09.0	6 21.4	17 43.8	7 04.5	17 25.2	7 02.2	18 02.3
14	6 08.2	16 54.0	6 35.1	17 09.7	6 22.5	17 44.5	7 05.8	17 25.8	7 03.4	18 03.0
16	6 09.3	16 54.7	6 36.3	17 10.4	6 23.6	17 45.4	7 07.1	17 26.5	7 04.6	18 03.8
18	6 10.5	16 55.6	6 37.5	17 11.3	6 24.7	17 46.3	7 08.3	17 27.3	7 05.7	18 04.6
20	6 11.5	16 56.5	6 38.6	17 12.2	6 25.7	17 47.2	7 09.4	17 28.2	7 06.7	18 05.5
22	6 12.5	16 57.5	6 39.6	17 13.2	6 26.7	17 48.2	7 10.4	17 29.2	7 07.8	18 06.5
24	6 13.5	16 58.6	6 40.5	17 14.2	6 27.7	17 49.2	7 11.4	17 30.2	7 08.7	18 07.5
26	6 14.4	16 59.7	6 41.4	17 15.4	6 28.6	17 50.3	7 12.3	17 31.4	7 09.7	18 08.6
28	6 15.2	17 00.9	6 42.2	17 16.6	6 29.5	17 51.3	7 13.0	17 32.6	7 10.5	18 09.7
30	6 15.9	17 02.1	6 43.0	17 17.8	6 30.4	17 52.4	7 13.7	17 33.9	7 11.3	18 10.9
32	6 16.6	17 03.3	6 43.6	17 19.1	6 31.2	17 53.5	7 14.3	17 35.2	7 12.1	18 12.0

MOONRISE, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82°.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0°		10°		20°		30°		40°		50°		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Jan. 0	3	10	3	26	3	42	4	01	4	24	4	58	3	22	3	40	4	20	4	20
1	4	11	4	30	4	50	5	13	5	43	6	26	4	31	4	45	5	32	5	28
2	5	17	5	37	5	59	6	25	6	58	7	47	5	41	5	53	6	43	6	37
3	6	23	6	43	7	06	7	32	8	04	8	52	6	47	7	00	7	50	7	44
4	7	28	7	46	8	06	8	29	8	59	9	41	7	48	8	02	8	48	8	44
5	8	27	8	43	8	59	9	19	9	42	10	15	8	40	8	57	9	38	9	38
6	9	22	9	34	9	46	9	60	10	17	10	40	9	25	9	46	10	19	10	24
7	10	11	10	18	10	26	10	35	10	46	11	00	10	04	10	30	10	55	11	05
8	10	57	10	60	11	03	11	07	11	11	11	17	10	40	11	10	11	28	11	42
9	11	40	11	39	11	38	11	36	11	35	11	32	11	13	11	48	11	58	12	17
10	12	22	12	17	12	11	12	05	11	57	11	47	11	46	12	24	12	27	12	51
11	13	04	12	55	12	45	12	34	12	21	12	03	12	19	13	01	12	57	13	26
12	13	48	13	35	13	21	13	06	12	47	12	20	12	53	13	40	13	30	14	02
13	14	32	14	16	13	60	13	40	13	16	12	42	13	31	14	20	14	05	14	41
14	15	20	15	01	14	41	14	19	13	51	13	10	14	12	15	05	14	44	15	24
15	16	09	15	49	15	27	15	02	14	31	13	46	14	57	15	52	15	28	16	09
16	16	60	16	39	16	17	15	51	15	19	14	31	15	47	16	42	16	17	16	59
17	17	51	17	31	17	10	16	44	16	13	15	27	16	39	17	34	17	10	17	52
18	18	42	18	23	18	04	17	41	17	13	16	31	17	34	18	27	18	06	18	46
19	19	31	19	15	18	59	18	39	18	15	17	42	18	30	19	20	19	04	19	41
20	20	18	20	06	19	53	19	39	19	20	18	54	19	26	20	11	20	02	20	34
21	21	04	20	56	20	47	20	37	20	24	20	08	20	20	21	02	21	00	21	28
22	21	48	21	45	21	40	21	36	21	30	21	22	21	15	21	53	21	58	22	20
23	22	33	22	33	22	34	22	34	22	35	22	36	22	09	22	42	22	56	23	14
24	23	19	23	24	23	29	23	35	23	42	23	53	23	06	23	34	23	56	**	**
25	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	08
26	0	07	0	16	0	26	0	37	0	52	1	12	0	04	0	28	0	58	1	05
27	0	59	1	12	1	27	1	44	2	05	2	35	1	06	1	26	2	03	2	05
28	1	55	2	12	2	31	2	53	3	20	3	60	2	12	2	27	3	12	3	10
29	2	56	3	17	3	38	4	03	4	35	5	22	3	20	3	32	4	21	4	16
30	4	01	4	22	4	44	5	11	5	44	6	33	4	26	4	38	5	29	5	22
31	5	06	5	26	5	47	6	12	6	43	7	29	5	29	5	42	6	30	6	25
Feb. 1	6	08	6	25	6	44	7	05	7	32	8	09	6	24	6	40	7	24	7	22
2	7	05	7	19	7	34	7	50	8	11	8	39	7	14	7	33	8	09	8	12
3	7	58	8	07	8	17	8	29	8	43	9	02	7	56	8	19	8	49	8	56
4	8	46	8	51	8	57	9	03	9	10	9	20	8	34	9	02	9	24	9	36
5	9	32	9	33	9	33	9	34	9	35	9	36	9	10	9	42	9	55	10	13
6	10	16	10	12	10	08	10	04	9	58	9	51	9	43	10	20	10	26	10	48
7	10	59	10	51	10	43	10	33	10	22	10	07	10	16	10	58	10	56	11	23
8	11	43	11	31	11	19	11	05	10	47	10	24	10	51	11	37	11	28	11	59
9	12	27	12	12	11	56	11	38	11	16	10	44	11	28	12	16	12	02	12	37
10	13	14	12	56	12	37	12	15	11	48	11	10	12	08	13	00	12	40	13	19
11	14	02	13	43	13	22	12	57	12	26	11	42	12	52	13	46	13	23	14	04
12	14	53	14	32	14	10	13	44	13	11	12	23	13	40	14	34	14	09	14	52
13	15	44	15	24	15	01	14	36	14	03	13	16	14	31	15	26	15	02	15	44
14	16	35	16	16	15	56	15	32	15	02	14	18	15	26	16	19	15	57	16	38
15	17	25	17	09	16	51	16	30	16	04	15	27	16	21	17	13	16	55	17	33

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.						FOR CERTAIN STATIONS IN INDIA IN I.S.T.			
Date \ Lat.	0º	10º	20º	30º	40º	50º	Kolkata	Chennai	Delhi	Mumbai
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 0	15 39	15 22	15 04	14 43	14 17	13 41	14 34	15 26	15 08	15 46
1	16 42	16 22	16 01	15 37	15 06	14 21	15 31	16 25	16 02	16 44
2	17 49	17 28	17 05	16 39	16 06	15 17	16 34	17 30	17 05	17 48
3	18 54	18 34	18 13	17 48	17 16	16 29	17 43	18 37	18 13	18 55
4	19 57	19 40	19 21	18 59	18 31	17 51	18 51	19 43	19 24	20 03
5	20 54	20 40	20 25	20 08	19 47	19 17	19 57	20 45	20 33	21 07
6	21 46	21 36	21 26	21 14	20 59	20 39	20 59	21 43	21 38	22 07
7	22 33	22 28	22 22	22 16	22 08	21 57	21 57	22 35	22 39	23 03
8	23 18	23 17	23 16	23 15	23 13	23 11	22 51	23 26	23 37	23 56
9	23 60	** **	** **	** **	** **	** **	23 44	** **	** **	** **
10	** **	0 03	0 07	0 11	0 16	0 22	** **	0 13	0 32	0 46
11	0 42	0 49	0 57	1 06	1 17	1 32	0 35	1 01	1 27	1 36
12	1 25	1 36	1 48	2 01	2 18	2 41	1 27	1 49	2 21	2 26
13	2 08	2 23	2 38	2 56	3 19	3 50	2 18	2 37	3 16	3 17
14	2 55	3 12	3 31	3 52	4 19	4 58	3 11	3 27	4 11	4 08
15	3 43	4 02	4 23	4 47	5 18	6 03	4 05	4 18	5 06	5 01
16	4 33	4 54	5 16	5 41	6 14	7 01	4 57	5 09	5 59	5 53
17	5 24	5 45	6 07	6 32	7 04	7 51	5 49	6 00	6 50	6 44
18	6 15	6 34	6 55	7 19	7 49	8 31	6 36	6 50	7 37	7 33
19	7 05	7 22	7 40	8 01	8 26	9 03	7 21	7 37	8 19	8 18
20	7 54	8 07	8 22	8 38	8 59	9 28	8 02	8 21	8 58	9 00
21	8 40	8 50	9 01	9 13	9 28	9 48	8 39	9 02	9 33	9 39
22	9 25	9 31	9 38	9 45	9 53	10 05	9 15	9 42	10 05	10 16
23	10 09	10 11	10 13	10 15	10 17	10 21	9 50	10 21	10 36	10 52
24	10 54	10 52	10 49	10 45	10 42	10 36	10 24	11 00	11 08	11 29
25	11 41	11 34	11 27	11 18	11 07	10 53	11 00	11 41	11 41	12 07
26	12 31	12 19	12 07	11 54	11 37	11 13	11 40	12 25	12 17	12 48
27	13 25	13 10	12 53	12 34	12 11	11 38	12 24	13 14	12 59	13 35
28	14 24	14 05	13 45	13 22	12 53	12 12	13 16	14 09	13 48	14 27
29	15 27	15 07	14 44	14 18	13 46	12 58	14 14	15 09	14 44	15 27
30	16 32	16 11	15 49	15 23	14 50	14 01	15 19	16 14	15 49	16 32
31	17 36	17 17	16 56	16 32	16 02	15 19	16 26	17 20	16 58	17 39
Feb. 1	18 36	18 20	18 03	17 44	17 19	16 43	17 34	18 24	18 08	18 45
2	19 31	19 20	19 07	18 52	18 34	18 09	18 39	19 25	19 17	19 49
3	20 21	20 14	20 07	19 58	19 47	19 31	19 40	20 21	20 21	20 48
4	21 09	21 06	21 03	20 59	20 55	20 49	20 38	21 14	21 22	21 43
5	21 53	21 55	21 56	21 58	22 01	22 04	21 33	22 04	22 20	22 36
6	22 36	22 42	22 48	22 55	23 04	23 16	22 26	22 53	23 16	23 28
7	23 20	23 29	23 40	23 52	** **	** **	23 18	23 42	** **	** **
8	** **	** **	** **	** **	0 06	0 27	** **	** **	0 12	0 18
9	0 03	0 17	0 31	0 48	1 08	1 38	0 11	0 30	1 07	1 10
10	0 49	1 06	1 24	1 44	2 09	2 46	1 04	1 20	2 03	2 01
11	1 37	1 56	2 16	2 39	3 10	3 53	1 57	2 11	2 58	2 54
12	2 26	2 47	3 09	3 34	4 06	4 54	2 50	3 02	3 52	3 46
13	3 17	3 38	4 00	4 26	4 59	5 47	3 42	3 54	4 44	4 38
14	4 08	4 28	4 50	5 14	5 46	6 30	4 31	4 44	5 33	5 28
15	4 59	5 17	5 36	5 58	6 25	7 04	5 17	5 32	6 16	6 14

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Feb.	15	17	25	17	09	16	51	16	30	16	04	15	27	16	21	17	13	16	55	17	33
	16	18	14	18	00	17	46	17	30	17	09	16	40	17	18	18	05	17	54	18	28
	17	19	01	18	51	18	41	18	29	18	15	17	55	18	14	18	57	18	53	19	22
	18	19	46	19	41	19	36	19	29	19	21	19	11	19	10	19	49	19	52	20	16
	19	20	31	20	30	20	29	20	29	20	27	20	26	20	05	20	39	20	51	21	10
	20	21	17	21	21	21	25	21	30	21	35	21	43	21	02	21	31	21	51	22	04
	21	22	04	22	12	22	21	22	31	22	44	23	02	22	00	22	24	22	52	23	01
	22	22	55	23	07	23	21	23	36	23	56	**	**	23	00	23	21	23	56	23	59
	23	23	49	**	**	**	**	**	**	**	**	0	23	**	**	**	**	**	**	**	**
	24	**	**	0	05	0	22	0	43	1	09	1	46	0	03	0	19	1	02	1	01
	25	0	46	1	06	1	27	1	51	2	22	3	07	1	08	1	22	2	09	2	05
	26	1	48	2	09	2	31	2	58	3	31	4	20	2	13	2	25	3	16	3	09
	27	2	51	3	12	3	34	3	60	4	32	5	21	3	16	3	28	4	18	4	11
	28	3	52	4	11	4	31	4	54	5	24	6	05	4	12	4	26	5	13	5	09
Mar.	1	4	50	5	06	5	23	5	42	6	05	6	38	5	03	5	21	6	01	6	01
	2	5	45	5	56	6	08	6	22	6	39	7	03	5	48	6	09	6	42	6	47
	3	6	35	6	42	6	49	6	58	7	09	7	23	6	27	6	53	7	19	7	29
	4	7	22	7	25	7	27	7	31	7	34	7	40	7	04	7	35	7	52	8	06
	5	8	07	8	05	8	03	8	01	7	58	7	55	7	39	8	13	8	22	8	43
	6	8	51	8	45	8	38	8	31	8	22	8	10	8	12	8	52	8	53	9	19
	7	9	35	9	25	9	14	9	02	8	47	8	26	8	47	9	31	9	25	9	55
	8	10	20	10	06	9	51	9	35	9	14	8	45	9	24	10	11	9	59	10	32
	9	11	06	10	49	10	31	10	10	9	45	9	09	10	02	10	53	10	35	11	13
	10	11	55	11	35	11	15	10	51	10	21	9	38	10	45	11	39	11	16	11	57
	11	12	44	12	23	12	01	11	36	11	03	10	16	11	31	12	26	12	01	12	44
	12	13	36	13	14	12	52	12	25	11	53	11	04	12	21	13	17	12	51	13	35
	13	14	26	14	06	13	45	13	20	12	48	12	02	13	15	14	09	13	46	14	27
	14	15	17	14	59	14	39	14	17	13	49	13	09	14	10	15	02	14	42	15	22
	15	16	06	15	51	15	35	15	17	14	53	14	21	15	06	15	56	15	41	16	17
	16	16	53	16	42	16	30	16	16	15	60	15	36	16	03	16	48	16	40	17	12
	17	17	40	17	33	17	26	17	17	17	06	16	52	16	59	17	40	17	40	18	06
	18	18	26	18	23	18	20	18	17	18	14	18	09	17	56	18	32	18	40	19	01
	19	19	12	19	15	19	17	19	20	19	23	19	28	18	53	19	25	19	41	19	57
	20	20	00	20	07	20	14	20	22	20	33	20	48	19	52	20	18	20	43	20	54
	21	20	50	21	02	21	14	21	28	21	46	22	10	20	53	21	15	21	48	21	53
	22	21	44	21	60	22	16	22	36	23	00	23	35	21	57	22	14	22	55	22	55
	23	22	41	23	01	23	21	23	45	**	**	**	**	23	02	23	16	**	**	23	59
	24	23	42	**	**	**	**	**	**	0	14	0	58	**	**	**	**	0	03	**	**
	25	**	**	0	03	0	25	0	52	1	25	2	14	0	07	0	19	1	10	1	03
	26	0	44	1	05	1	28	1	54	2	28	3	18	1	10	1	21	2	12	2	06
	27	1	45	2	04	2	25	2	50	3	21	4	06	2	07	2	20	3	09	3	04
	28	2	42	2	60	3	18	3	39	4	04	4	41	2	58	3	14	3	57	3	56
	29	3	37	3	50	4	04	4	20	4	40	5	07	3	44	4	03	4	39	4	42
	30	4	27	4	36	4	45	4	56	5	10	5	28	4	24	4	48	5	16	5	24
	31	5	14	5	19	5	24	5	29	5	36	5	45	5	01	5	30	5	50	6	03
Apr.	1	5	59	5	59	5	59	5	59	5	60	5	60	5	36	6	08	6	21	6	39
	2	6	43	6	39	6	34	6	29	6	23	6	15	6	09	6	47	6	51	7	15

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Feb.	15	4	59	5	17	5	36	5	58	6	25	7	04	5	17	5	32	6	16	6	14
	16	5	49	6	03	6	19	6	37	7	00	7	31	6	00	6	17	6	57	6	57
	17	6	36	6	47	6	60	7	13	7	30	7	53	6	39	7	00	7	33	7	38
	18	7	23	7	30	7	38	7	46	7	57	8	11	7	16	7	41	8	06	8	16
	19	8	07	8	10	8	14	8	17	8	21	8	27	7	51	8	21	8	38	8	53
	20	8	53	8	51	8	50	8	48	8	46	8	43	8	25	9	00	9	10	9	30
	21	9	40	9	34	9	27	9	20	9	11	8	59	9	01	9	41	9	43	10	07
	22	10	28	10	17	10	06	9	54	9	39	9	18	9	40	10	23	10	17	10	47
	23	11	20	11	05	10	50	10	32	10	10	9	41	10	21	11	10	10	57	11	32
	24	12	16	11	58	11	39	11	17	10	49	10	10	11	09	12	01	11	42	12	21
	25	13	16	12	55	12	33	12	08	11	37	10	50	12	03	12	58	12	34	13	16
	26	14	18	13	57	13	35	13	08	12	34	11	45	13	04	14	00	13	34	14	17
	27	15	21	15	00	14	39	14	14	13	42	12	55	14	08	15	04	14	39	15	22
	28	16	20	16	03	15	45	15	23	14	55	14	15	15	15	16	07	15	48	16	27
Mar.	1	17	17	17	03	16	48	16	31	16	10	15	40	16	20	17	08	16	56	17	31
	2	18	09	17	60	17	50	17	38	17	24	17	03	17	23	18	06	18	02	18	31
	3	18	58	18	53	18	47	18	41	18	34	18	23	18	21	19	00	19	04	19	28
	4	19	44	19	43	19	43	19	42	19	42	19	41	19	18	19	52	20	04	20	23
	5	20	28	20	32	20	36	20	41	20	47	20	55	20	13	20	42	21	02	21	16
	6	21	12	21	20	21	29	21	39	21	51	22	08	21	07	21	32	21	59	22	08
	7	21	56	22	08	22	21	22	36	22	55	23	21	22	00	22	21	22	56	23	00
	8	22	41	22	57	23	14	23	33	23	57	**	**	22	54	23	12	23	52	23	52
	9	23	29	23	47	**	**	**	**	**	**	0	31	23	48	**	**	**	**	**	**
	10	**	**	**	**	0	07	0	29	0	58	1	40	**	**	0	02	0	48	0	45
	11	0	18	0	38	0	60	1	25	1	57	2	44	0	41	0	54	1	44	1	38
	12	1	09	1	30	1	52	2	18	2	51	3	41	1	34	1	46	2	36	2	29
	13	1	60	2	20	2	42	3	08	3	40	4	27	2	24	2	36	3	26	3	20
	14	2	50	3	10	3	30	3	53	4	22	5	05	3	11	3	25	4	11	4	07
	15	3	40	3	57	4	14	4	34	4	59	5	34	3	55	4	11	4	53	4	52
	16	4	28	4	41	4	55	5	11	5	31	5	57	4	35	4	55	5	31	5	34
	17	5	16	5	25	5	34	5	45	5	58	6	16	5	13	5	37	6	05	6	13
	18	6	02	6	06	6	11	6	17	6	24	6	33	5	49	6	17	6	38	6	50
	19	6	48	6	48	6	48	6	48	6	48	6	49	6	24	6	57	7	10	7	28
	20	7	35	7	31	7	26	7	20	7	14	7	05	7	00	7	38	7	43	8	06
	21	8	24	8	15	8	05	7	54	7	41	7	23	7	39	8	21	8	17	8	46
	22	9	16	9	02	8	48	8	31	8	11	7	44	8	20	9	07	8	56	9	30
	23	10	11	9	54	9	36	9	15	8	48	8	11	9	07	9	58	9	40	10	17
	24	11	10	10	50	10	29	10	04	9	33	8	48	9	59	10	53	10	29	11	12
	25	12	12	11	51	11	28	11	01	10	27	9	38	10	57	11	53	11	27	12	10
	26	13	13	12	52	12	30	12	04	11	31	10	42	12	00	12	55	12	30	13	13
	27	14	13	13	54	13	34	13	11	12	41	11	58	13	04	13	58	13	37	14	16
	28	15	09	14	54	14	37	14	18	13	54	13	20	14	08	14	58	14	43	15	19
	29	16	01	15	50	15	38	15	24	15	07	14	42	15	10	15	56	15	48	16	19
	30	16	50	16	43	16	35	16	27	16	16	16	02	16	09	16	50	16	50	17	17
	31	17	36	17	34	17	31	17	28	17	25	17	20	17	06	17	42	17	51	18	11
Apr.	1	18	20	18	22	18	24	18	27	18	30	18	35	18	01	18	32	18	49	19	05
	2	19	04	19	11	19	18	19	26	19	36	19	49	18	55	19	22	19	46	19	57

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.							FOR CERTAIN STATIONS IN INDIA IN I.S.T.			
Lat. / Date	0º	10º	20º	30º	40º	50º	Kolkata	Chennai	Delhi	Mumbai
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 1	5 59	5 59	5 59	5 59	5 60	5 60	5 36	6 08	6 21	6 39
2	6 43	6 39	6 34	6 29	6 23	6 15	6 09	6 47	6 51	7 15
3	7 28	7 19	7 10	6 60	6 47	6 30	6 43	7 26	7 23	7 51
4	8 12	7 60	7 47	7 32	7 13	6 48	7 19	8 05	7 55	8 27
5	8 58	8 42	8 25	8 06	7 43	7 09	7 57	8 47	8 31	9 07
6	9 46	9 28	9 08	8 45	8 16	7 36	8 38	9 31	9 10	9 50
7	10 36	10 15	9 54	9 28	8 56	8 09	9 24	10 18	9 54	10 36
8	11 27	11 05	10 42	10 16	9 43	8 53	10 12	11 08	10 42	11 25
9	12 17	11 57	11 35	11 09	10 35	9 47	11 04	11 59	11 34	12 17
10	13 08	12 48	12 28	12 04	11 34	10 50	11 58	12 52	12 29	13 10
11	13 57	13 40	13 23	13 02	12 36	11 60	12 53	13 44	13 27	14 05
12	14 44	14 31	14 17	14 01	13 41	13 13	13 49	14 36	14 25	14 59
13	15 31	15 22	15 12	15 01	14 47	14 28	14 45	15 28	15 25	15 53
14	16 16	16 12	16 07	16 01	15 54	15 45	15 42	16 19	16 24	16 47
15	17 03	17 03	17 03	17 03	17 03	17 03	16 38	17 12	17 25	17 43
16	17 51	17 55	18 00	18 06	18 13	18 23	17 38	18 06	18 27	18 40
17	18 41	18 50	19 01	19 13	19 27	19 48	18 39	19 03	19 33	19 40
18	19 35	19 49	20 04	20 21	20 43	21 15	19 44	20 03	20 41	20 42
19	20 32	20 51	21 10	21 32	22 00	22 41	20 51	21 06	21 05	21 48
20	21 34	21 55	22 17	22 42	23 16	** **	21 58	22 10	23 01	22 55
21	22 37	22 59	23 22	23 49	** **	0 04	23 04	23 15	** **	24 00
22	23 40	** **	** **	** **	0 23	1 14	** **	** **	0 07	** **
23	** **	0 00	0 22	0 48	1 20	2 07	0 04	0 16	1 06	1 00
24	0 38	0 57	1 16	1 38	2 06	2 45	0 57	1 12	1 57	1 54
25	1 34	1 48	2 03	2 21	2 43	3 14	1 44	2 02	2 40	2 41
26	2 24	2 34	2 45	2 58	3 14	3 35	2 24	2 47	3 18	3 24
27	3 11	3 17	3 24	3 31	3 40	3 52	3 01	3 29	3 52	4 03
28	3 56	3 58	3 59	4 01	4 04	4 07	3 36	4 07	4 22	4 38
29	4 39	4 36	4 34	4 30	4 27	4 21	4 09	4 45	4 53	5 14
30	5 23	5 16	5 08	5 00	4 50	4 36	4 42	5 23	5 23	5 49
May 1	6 07	5 56	5 44	5 31	5 15	4 53	5 17	6 01	5 55	6 25
2	6 52	6 37	6 22	6 04	5 43	5 12	5 54	6 42	6 28	7 03
3	7 40	7 22	7 03	6 41	6 14	5 36	6 33	7 26	7 06	7 45
4	8 28	8 08	7 47	7 23	6 52	6 07	7 17	8 11	7 48	8 29
5	9 19	8 58	8 35	8 09	7 36	6 47	8 05	9 00	8 34	9 18
6	10 10	9 49	9 26	8 60	8 26	7 37	8 55	9 51	9 26	10 08
7	11 00	10 40	10 18	9 54	9 22	8 36	9 49	10 43	10 19	11 01
8	11 49	11 32	11 13	10 50	10 22	9 43	10 43	11 35	11 16	11 55
9	12 36	12 22	12 06	11 48	11 26	10 54	11 38	12 26	12 13	12 48
10	13 22	13 11	12 60	12 46	12 29	12 06	12 32	13 17	13 10	13 41
11	14 07	14 00	13 53	13 45	13 35	13 21	13 27	14 07	14 08	14 34
12	14 52	14 50	14 47	14 45	14 41	14 36	14 22	14 59	15 07	15 28
13	15 39	15 41	15 44	15 47	15 50	15 55	15 20	15 51	16 08	16 23
14	16 27	16 34	16 42	16 51	17 02	17 17	16 20	16 46	17 12	17 22
15	17 20	17 32	17 45	17 59	18 17	18 43	17 24	17 45	18 19	18 23
16	18 17	18 33	18 50	19 11	19 37	20 13	18 30	18 47	19 30	19 29
17	19 19	19 38	19 59	20 23	20 55	21 41	19 41	19 54	20 42	20 37

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Apr.	1	18	20	18	22	18	24	18	27	18	30	18	35	18	01	18	32	18	49	19	05
	2	19	04	19	11	19	18	19	26	19	36	19	49	18	55	19	22	19	46	19	57
	3	19	49	19	59	20	10	20	23	20	39	21	02	19	49	20	11	20	43	20	49
	4	20	34	20	48	21	03	21	21	21	43	22	14	20	43	21	02	21	41	21	42
	5	21	21	21	39	21	57	22	18	22	46	23	25	21	38	21	53	22	37	22	35
	6	22	10	22	29	22	50	23	15	23	47	**	**	22	32	22	45	23	34	23	29
	7	22	60	23	21	23	44	**	**	**	**	0	32	23	26	23	37	**	**	**	**
	8	23	51	**	**	**	**	0	09	0	43	1	32	**	**	**	**	0	27	0	21
	9	**	**	0	12	0	34	1	01	1	34	2	23	0	16	0	28	1	19	1	12
	10	0	41	1	01	1	23	1	48	2	18	3	04	1	05	1	17	2	05	2	00
	11	1	31	1	49	2	08	2	29	2	57	3	36	1	49	2	04	2	48	2	45
	12	2	19	2	34	2	50	3	08	3	30	4	00	2	30	2	48	3	27	3	28
	13	3	06	3	18	3	29	3	42	3	58	4	20	3	08	3	30	4	02	4	07
	14	3	53	3	59	4	06	4	14	4	24	4	38	3	45	4	10	4	35	4	45
	15	4	38	4	41	4	43	4	46	4	49	4	54	4	20	4	51	5	07	5	23
	16	5	26	5	23	5	21	5	18	5	14	5	10	4	56	5	32	5	40	6	00
	17	6	14	6	07	5	60	5	51	5	41	5	27	5	34	6	14	6	14	6	40
	18	7	06	6	54	6	42	6	27	6	10	5	46	6	14	7	00	6	51	7	23
	19	8	02	7	46	7	29	7	10	6	45	6	11	7	00	7	50	7	34	8	11
	20	9	02	8	42	8	22	7	58	7	28	6	45	7	52	8	46	8	23	9	04
	21	10	04	9	43	9	21	8	54	8	20	7	31	8	50	9	46	9	20	10	03
	22	11	08	10	46	10	23	9	57	9	23	8	32	9	53	10	49	10	22	11	06
	23	12	08	11	49	11	28	11	03	10	32	9	47	10	58	11	52	11	29	12	10
	24	13	05	12	49	12	31	12	10	11	45	11	07	12	02	12	53	12	35	13	14
	25	13	58	13	46	13	32	13	16	12	57	12	29	13	04	13	51	13	41	14	13
	26	14	47	14	38	14	29	14	19	14	06	13	49	14	03	14	45	14	42	15	11
	27	15	33	15	29	15	25	15	20	15	14	15	05	14	59	15	37	15	42	16	05
	28	16	16	16	17	16	17	16	18	16	19	16	20	15	54	16	26	16	40	16	58
	29	16	60	17	05	17	10	17	16	17	23	17	33	16	47	17	16	17	37	17	49
	30	17	44	17	52	18	02	18	13	18	27	18	46	17	41	18	04	18	33	18	41
May	1	18	28	18	41	18	55	19	11	19	31	19	58	18	34	18	54	19	30	19	33
	2	19	14	19	31	19	48	20	08	20	33	21	10	19	29	19	45	20	27	20	26
	3	20	02	20	21	20	42	21	06	21	36	22	19	20	23	20	37	21	24	21	20
	4	20	52	21	13	21	36	22	01	22	34	23	23	21	17	21	29	22	19	22	13
	5	21	43	22	04	22	27	22	54	23	28	**	**	22	09	22	20	23	12	23	05
	6	22	34	22	54	23	17	23	42	**	**	0	17	22	58	23	10	**	**	23	54
	7	23	24	23	43	**	**	**	**	0	14	1	02	23	44	23	58	0	00	**	**
	8	**	**	**	**	0	02	0	25	0	55	1	37	**	**	**	**	0	44	0	40
	9	0	12	0	28	0	45	1	05	1	29	2	03	0	25	0	42	1	24	1	23
	10	0	58	1	11	1	25	1	40	1	59	2	24	1	04	1	24	1	59	2	03
	11	1	44	1	53	2	02	2	12	2	25	2	42	1	41	2	04	2	32	2	40
	12	2	28	2	33	2	38	2	43	2	50	2	58	2	15	2	44	3	04	3	17
	13	3	14	3	14	3	14	3	14	3	14	3	14	2	50	3	23	3	36	3	54
	14	4	01	3	57	3	52	3	46	3	39	3	30	3	27	4	04	4	08	4	32
	15	4	52	4	42	4	32	4	21	4	07	3	48	4	05	4	48	4	44	5	13
	16	5	47	5	33	5	18	5	00	4	39	4	10	4	49	5	37	5	25	5	59
	17	6	46	6	28	6	09	5	47	5	19	4	40	5	39	6	31	6	12	6	51

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
May	17	19	19	19	38	19	59	20	23	20	55	21	41	19	41	19	54	20	42	20	37
	18	20	23	20	45	21	08	21	35	22	09	22	59	20	50	21	01	21	53	21	46
	19	21	29	21	50	22	12	22	39	23	13	**	**	21	55	22	06	22	57	22	50
	20	22	31	22	50	23	11	23	35	**	**	0	01	22	52	23	06	23	53	23	49
	21	23	29	23	45	**	**	**	**	0	04	0	46	23	42	23	59	**	**	**	**
	22	**	**	**	**	0	02	0	21	0	45	1	18	**	**	**	**	0	40	0	40
	23	0	21	0	33	0	46	1	00	1	18	1	42	0	25	0	46	1	20	1	25
	24	1	10	1	18	1	26	1	35	1	45	1	60	1	04	1	29	1	55	2	04
	25	1	55	1	58	2	01	2	05	2	09	2	15	1	39	2	08	2	26	2	40
	26	2	38	2	37	2	36	2	34	2	32	2	30	2	11	2	46	2	56	3	16
	27	3	21	3	16	3	10	3	03	2	55	2	44	2	44	3	23	3	26	3	50
	28	4	04	3	55	3	45	3	33	3	19	2	60	3	18	4	01	3	56	4	25
	29	4	49	4	35	4	21	4	05	3	45	3	18	3	53	4	40	4	29	5	02
	30	5	35	5	19	5	01	4	40	4	15	3	40	4	32	5	23	5	05	5	43
	31	6	23	6	04	5	44	5	20	4	50	4	08	5	14	6	07	5	45	6	25
June	1	7	13	6	52	6	30	6	04	5	32	4	44	6	00	6	55	6	30	7	13
	2	8	04	7	43	7	20	6	54	6	20	5	31	6	49	7	46	7	19	8	02
	3	8	55	8	34	8	12	7	47	7	14	6	26	7	42	8	37	8	12	8	55
	4	9	44	9	26	9	05	8	42	8	13	7	31	8	35	9	29	9	08	9	48
	5	10	31	10	15	9	59	9	39	9	15	8	40	9	30	10	20	10	04	10	40
	6	11	17	11	05	10	51	10	36	10	17	9	51	10	23	11	10	11	00	11	33
	7	12	01	11	53	11	44	11	34	11	21	11	03	11	17	11	59	11	57	12	24
	8	12	45	12	40	12	36	12	31	12	24	12	16	12	10	12	48	12	54	13	17
	9	13	29	13	29	13	30	13	30	13	30	13	31	13	05	13	39	13	52	14	09
	10	14	15	14	20	14	25	14	31	14	38	14	49	14	02	14	31	14	52	15	05
	11	15	05	15	14	15	24	15	36	15	51	16	11	15	03	15	27	15	56	16	03
	12	15	58	16	12	16	27	16	45	17	07	17	39	16	07	16	26	17	05	17	06
	13	16	58	17	16	17	36	17	58	18	26	19	08	17	16	17	31	18	16	18	13
	14	18	02	18	23	18	45	19	11	19	45	20	33	18	27	18	39	19	30	19	23
	15	19	09	19	31	19	54	20	20	20	55	21	46	19	36	19	47	20	39	20	31
	16	20	15	20	35	20	57	21	22	21	54	22	39	20	39	20	51	21	41	21	35
	17	21	18	21	35	21	53	22	14	22	40	23	18	21	34	21	50	22	33	22	31
	18	22	14	22	27	22	41	22	58	23	18	23	45	22	21	22	41	23	17	23	20
	19	23	06	23	15	23	24	23	35	23	48	**	**	23	03	23	27	23	55	**	**
	20	23	53	23	57	**	**	**	**	**	**	0	06	23	40	**	**	**	**	0	03
	21	**	**	**	**	0	02	0	07	0	14	0	22	**	**	0	08	0	28	0	41
	22	0	37	0	37	0	37	0	37	0	37	0	37	0	13	0	46	0	59	1	17
	23	1	21	1	16	1	12	1	07	1	00	0	52	0	46	1	24	1	29	1	52
	24	2	03	1	55	1	46	1	36	1	24	1	07	1	20	2	01	1	59	2	26
	25	2	47	2	35	2	22	2	07	1	49	1	24	1	55	2	40	2	31	3	03
	26	3	33	3	17	3	00	2	41	2	17	1	45	2	31	3	21	3	06	3	42
	27	4	20	4	02	3	42	3	19	2	51	2	10	3	13	4	05	3	44	4	24
	28	5	10	4	49	4	27	4	02	3	30	2	44	3	57	4	52	4	27	5	10
	29	5	60	5	39	5	16	4	50	4	16	3	27	4	45	5	42	5	15	5	58
	30	6	51	6	30	6	07	5	42	5	09	4	20	5	37	6	32	6	07	6	50
July	1	7	41	7	21	7	01	6	36	6	06	5	22	6	30	7	25	7	02	7	43
	2	8	28	8	12	7	54	7	34	7	07	6	30	7	25	8	16	7	58	8	36

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

Date		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Lat.		0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
May	17	6	46	6	28	6	09	5	47	5	19	4	40	5	39	6	31	6	12	6	51
	18	7	50	7	29	7	07	6	41	6	08	5	22	6	36	7	32	7	07	7	49
	19	8	55	8	33	8	10	7	44	7	09	6	18	7	40	8	36	8	09	8	53
	20	9	59	9	39	9	17	8	51	8	18	7	31	8	46	9	42	9	17	10	00
	21	10	60	10	42	10	23	10	01	9	33	8	52	9	53	10	45	10	26	11	05
	22	11	55	11	41	11	26	11	09	10	47	10	16	10	57	11	46	11	33	12	08
	23	12	45	12	35	12	25	12	13	11	58	11	38	11	58	12	42	12	37	13	06
	24	13	32	13	27	13	21	13	15	13	06	12	55	12	55	13	34	13	38	14	02
	25	14	16	14	15	14	14	14	13	14	11	14	10	13	50	14	24	14	35	14	54
	26	14	59	15	02	15	06	15	10	15	16	15	23	14	43	15	13	15	32	15	46
	27	15	42	15	49	15	57	16	07	16	18	16	34	15	36	16	01	16	27	16	36
	28	16	25	16	37	16	49	17	04	17	22	17	46	16	28	16	50	17	24	17	28
	29	17	11	17	26	17	42	18	01	18	24	18	57	17	22	17	40	18	20	18	20
	30	17	58	18	16	18	35	18	58	19	27	20	07	18	16	18	31	19	17	19	13
	31	18	47	19	07	19	29	19	54	20	26	21	13	19	11	19	23	20	12	20	06
June	1	19	38	19	59	20	21	20	48	21	22	22	11	20	03	20	14	21	06	20	59
	2	20	28	20	49	21	12	21	38	22	11	22	59	20	54	21	05	21	56	21	49
	3	21	18	21	38	21	59	22	23	22	53	23	37	21	41	21	53	22	41	22	36
	4	22	07	22	24	22	42	23	03	23	30	**	**	22	23	22	38	23	22	23	20
	5	22	53	23	07	23	22	23	39	**	**	0	06	23	02	23	21	23	58	**	**
	6	23	38	23	49	23	59	**	**	0	00	0	29	23	39	**	**	**	**	0	00
	7	**	**	**	**	**	**	0	12	0	27	0	48	**	**	0	01	0	31	0	38
	8	0	22	0	28	0	35	0	42	0	51	1	04	0	13	0	39	1	03	1	14
	9	1	06	1	08	1	10	1	12	1	15	1	19	0	46	1	18	1	34	1	49
	10	1	51	1	48	1	46	1	43	1	39	1	34	1	21	1	57	2	04	2	25
	11	2	38	2	31	2	23	2	15	2	04	1	50	1	57	2	38	2	37	3	04
	12	3	30	3	18	3	05	2	51	2	33	2	10	2	38	3	24	3	15	3	47
	13	4	26	4	10	3	53	3	34	3	09	2	35	3	24	4	14	3	58	4	35
	14	5	28	5	09	4	48	4	24	3	54	3	10	4	18	5	12	4	49	5	31
	15	6	34	6	13	5	50	5	24	4	49	3	60	5	19	6	15	5	50	6	33
	16	7	42	7	20	6	57	6	31	5	57	5	07	6	26	7	23	6	57	7	41
	17	8	46	8	27	8	06	7	43	7	12	6	28	7	36	8	30	8	08	8	49
	18	9	46	9	30	9	13	8	54	8	29	7	55	8	44	9	35	9	19	9	55
	19	10	39	10	28	10	16	10	02	9	45	9	21	9	49	10	34	10	26	10	58
	20	11	29	11	22	11	15	11	06	10	56	10	42	10	48	11	29	11	30	11	56
	21	12	14	12	12	12	10	12	07	12	04	11	59	11	45	12	20	12	29	12	50
	22	12	58	13	00	13	03	13	05	13	09	13	13	12	39	13	10	13	27	13	42
	23	13	41	13	47	13	54	14	02	14	12	14	25	13	32	13	59	14	23	14	33
	24	14	24	14	34	14	46	14	59	15	15	15	37	14	24	14	47	15	19	15	25
	25	15	09	15	23	15	38	15	55	16	17	16	48	15	18	15	37	16	14	16	16
	26	15	55	16	12	16	31	16	52	17	19	17	58	16	11	16	27	17	11	17	09
	27	16	43	17	03	17	24	17	49	18	19	19	05	17	06	17	19	18	07	18	02
	28	17	34	17	54	18	17	18	43	19	17	20	05	17	59	18	10	19	01	18	54
	29	18	24	18	45	19	08	19	34	20	08	20	57	18	50	19	01	19	52	19	46
	30	19	15	19	35	19	56	20	21	20	52	21	38	19	38	19	50	20	39	20	33
July	1	20	03	20	21	20	40	21	03	21	30	22	09	20	22	20	36	21	21	21	19
	2	20	50	21	06	21	22	21	40	22	02	22	34	21	02	21	20	21	59	22	00

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.						FOR CERTAIN STATIONS IN INDIA IN I.S.T.			
Date	Lat.	0º	10º	20º	30º	40º	50º	Kolkata	Chennai	Delhi	Mumbai
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July	1	7 41	7 21	7 01	6 36	6 06	5 22	6 30	7 25	7 02	7 43
	2	8 28	8 12	7 54	7 34	7 07	6 30	7 25	8 16	7 58	8 36
	3	9 15	9 01	8 47	8 30	8 09	7 41	8 18	9 06	8 54	9 28
	4	9 59	9 49	9 39	9 27	9 12	8 52	9 12	9 55	9 50	10 19
	5	10 41	10 36	10 30	10 23	10 14	10 03	10 04	10 43	10 46	11 11
	6	11 25	11 23	11 22	11 20	11 18	11 15	10 57	11 32	11 42	12 02
	7	12 08	12 11	12 14	12 18	12 23	12 29	11 51	12 21	12 40	12 54
	8	12 54	13 02	13 10	13 20	13 31	13 48	12 48	13 14	13 40	13 50
	9	13 45	13 57	14 09	14 24	14 43	15 10	13 49	14 10	14 44	14 48
	10	14 39	14 56	15 14	15 34	15 59	16 36	14 54	15 11	15 53	15 52
	11	15 41	15 60	16 21	16 45	17 17	18 03	16 02	16 15	17 04	16 59
	12	16 46	17 07	17 30	17 57	18 31	19 22	17 12	17 24	18 15	18 08
	13	17 53	18 14	18 37	19 03	19 37	20 25	18 18	18 30	19 21	19 15
	14	18 58	19 17	19 38	20 01	20 30	21 12	19 19	19 33	20 19	20 15
	15	19 59	20 14	20 30	20 49	21 12	21 44	20 11	20 28	21 08	21 09
	16	20 55	21 06	21 17	21 30	21 46	22 08	20 56	21 18	21 50	21 56
	17	21 46	21 52	21 58	22 05	22 14	22 27	21 36	22 03	22 26	22 37
	18	22 32	22 34	22 35	22 37	22 40	22 43	22 12	22 43	22 59	23 15
	19	23 17	23 14	23 11	23 08	23 03	22 58	22 46	23 23	23 30	23 51
	20	** **	23 54	23 46	23 38	23 27	23 13	23 20	** **	** **	** **
	21	0 01	** **	** **	** **	23 52	23 30	23 55	0 01	0 00	0 26
	22	0 45	0 34	0 22	0 08	** **	23 49	** **	0 39	0 32	1 03
	23	1 30	1 15	0 60	0 42	0 19	** **	0 31	1 20	1 06	1 41
	24	2 17	1 59	1 41	1 19	0 51	0 13	1 11	2 03	1 44	2 22
	25	3 06	2 46	2 24	1 60	1 29	0 44	1 55	2 49	2 25	3 07
	26	3 56	3 35	3 12	2 46	2 12	1 24	2 42	3 38	3 12	3 55
	27	4 47	4 26	4 03	3 37	3 03	2 14	3 33	4 28	4 03	4 45
	28	5 37	5 17	4 56	4 31	3 60	3 14	4 26	5 20	4 57	5 39
	29	6 26	6 08	5 50	5 28	5 00	4 21	5 20	6 12	5 53	6 31
	30	7 13	6 58	6 43	6 25	6 03	5 31	6 14	7 03	6 49	7 25
	31	7 58	7 47	7 35	7 22	7 06	6 43	7 08	7 53	7 46	8 16
Aug.	1	8 41	8 34	8 27	8 18	8 08	7 54	8 01	8 41	8 41	9 08
	2	9 23	9 21	9 18	9 15	9 11	9 06	8 53	9 29	9 37	9 58
	3	10 06	10 08	10 10	10 12	10 15	10 18	9 46	10 17	10 33	10 49
	4	10 50	10 57	11 03	11 11	11 21	11 34	10 41	11 08	11 32	11 43
	5	11 38	11 48	11 60	12 13	12 29	12 52	11 39	12 01	12 33	12 38
	6	12 29	12 44	12 60	13 18	13 42	14 14	12 39	12 58	13 38	13 38
	7	13 26	13 44	14 04	14 26	14 56	15 39	13 45	13 59	14 45	14 42
	8	14 27	14 48	15 10	15 37	16 10	16 59	14 52	15 04	15 55	15 48
	9	15 32	15 54	16 17	16 43	17 18	18 09	15 59	16 10	17 02	16 55
	10	16 37	16 58	17 20	17 45	18 16	19 02	17 01	17 14	18 03	17 57
	11	17 41	17 58	18 16	18 37	19 03	19 40	17 57	18 12	18 56	18 54
	12	18 39	18 52	19 06	19 22	19 41	20 08	18 45	19 05	19 41	19 44
	13	19 33	19 41	19 50	19 60	20 12	20 29	19 28	19 53	20 20	20 28
	14	20 22	20 25	20 29	20 34	20 39	20 46	20 07	20 36	20 55	21 09
	15	21 09	21 08	21 07	21 06	21 04	21 02	20 42	21 17	21 27	21 47
	16	21 54	21 49	21 43	21 36	21 28	21 17	21 17	21 56	21 59	22 23

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82°.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0°		10°		20°		30°		40°		50°		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
July 1	20	03	20	21	20	40	21	03	21	30	22	09	20	22	20	36	21	21	21	19
2	20	50	21	06	21	22	21	40	22	02	22	34	21	02	21	20	21	59	22	00
3	21	36	21	47	21	59	22	13	22	30	22	53	21	39	22	00	22	32	22	37
4	22	19	22	26	22	34	22	44	22	55	23	10	22	13	22	38	23	04	23	14
5	23	02	23	05	23	09	23	13	23	18	23	25	22	46	23	16	23	34	23	48
6	23	45	23	44	23	43	23	42	23	41	23	39	23	19	23	53	**	**	**	**
7	**	**	**	**	**	**	**	**	**	**	23	54	23	53	**	**	0	04	0	23
8	0	30	0	24	0	19	0	12	0	05	**	**	**	**	0	32	0	35	0	59
9	1	18	1	08	0	57	0	46	0	31	0	11	0	30	1	14	1	09	1	39
10	2	10	2	56	1	41	1	24	1	02	0	33	1	13	2	01	1	48	2	22
11	3	08	2	50	2	31	2	09	1	42	1	02	2	02	2	54	2	34	3	13
12	4	11	3	51	3	29	3	03	2	30	1	44	2	58	3	54	3	29	4	11
13	5	18	4	57	4	33	4	07	3	33	2	41	4	03	4	59	4	32	5	17
14	6	25	6	05	5	43	5	18	4	45	3	57	5	12	6	07	5	43	6	25
15	7	29	7	11	6	52	6	31	6	03	5	24	6	23	7	15	6	56	7	35
16	8	26	8	13	7	59	7	43	7	22	6	53	7	31	8	18	8	07	8	41
17	9	20	9	11	9	02	8	51	8	38	8	19	8	35	9	18	9	15	9	43
18	10	08	10	04	9	60	9	55	9	49	9	41	9	35	10	12	10	18	10	40
19	10	54	10	54	10	55	10	56	10	57	10	58	10	31	11	04	11	18	11	35
20	11	38	11	43	11	49	11	55	12	02	12	13	11	26	11	54	12	16	12	28
21	12	21	12	31	12	41	12	52	13	07	13	26	12	19	12	43	13	13	13	20
22	13	06	13	19	13	34	13	50	14	10	14	38	13	13	13	33	14	09	14	12
23	13	52	14	08	14	26	14	46	15	12	15	49	14	07	14	23	15	06	15	04
24	14	40	14	59	15	20	15	44	16	13	16	57	15	01	15	15	16	02	15	57
25	15	30	15	50	16	12	16	38	17	12	17	60	15	55	16	06	16	56	16	50
26	16	20	16	41	17	04	17	31	18	04	18	54	16	46	16	58	17	49	17	42
27	17	11	17	32	17	54	18	19	18	51	19	38	17	36	17	47	18	37	18	31
28	18	01	18	19	18	39	19	02	19	31	20	12	18	20	18	34	19	21	19	17
29	18	48	19	04	19	22	19	41	20	05	20	38	19	02	19	19	20	00	19	59
30	19	34	19	47	20	00	20	15	20	34	20	59	19	40	20	00	20	34	20	38
31	20	18	20	27	20	36	20	46	20	59	21	17	20	14	20	39	21	07	21	15
Aug. 1	21	01	21	06	21	11	21	16	21	23	21	32	20	48	21	16	21	37	21	50
2	21	44	21	44	21	44	21	45	21	45	21	46	21	21	21	53	22	06	22	23
3	22	27	22	23	22	18	22	14	22	08	22	00	21	54	22	31	22	36	22	59
4	23	13	23	04	22	55	22	45	22	32	22	16	22	29	23	11	23	08	23	36
5	**	**	23	49	23	36	23	20	23	01	22	35	23	08	23	54	23	44	**	**
6	0	01	**	**	**	**	**	**	23	36	22	60	23	52	**	**	**	**	0	16
7	0	55	0	39	0	21	0	01	**	**	23	34	**	**	0	43	0	25	1	03
8	1	55	1	35	1	14	0	49	0	18	**	**	0	43	1	38	1	15	1	56
9	2	58	2	36	2	13	1	47	1	13	0	22	1	43	2	39	2	13	2	56
10	4	04	3	43	3	20	2	53	2	19	1	29	2	49	3	45	3	19	4	03
11	5	08	4	49	4	28	4	05	3	35	2	50	3	59	4	52	4	30	5	12
12	6	09	5	54	5	37	5	18	4	54	4	19	5	08	5	58	5	43	6	19
13	7	05	6	54	6	42	6	29	6	12	5	49	6	15	7	00	6	53	7	24
14	7	57	7	51	7	44	7	37	7	27	7	15	7	18	7	58	8	00	8	25
15	8	45	8	43	8	42	8	40	8	38	8	36	8	17	8	52	9	03	9	23
16	9	31	9	34	9	38	9	42	9	47	9	54	9	15	9	45	10	03	10	17

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Aug.	16	21	54	21	49	21	43	21	36	21	28	21	17	21	17	21	56	21	59	22	23
	17	22	39	22	29	22	19	22	07	21	53	21	33	21	52	22	35	22	30	23	00
	18	23	25	23	12	22	57	22	40	22	20	21	52	22	29	23	16	23	04	23	38
	19	**	**	23	55	23	37	23	16	22	50	22	14	23	08	23	59	23	41	**	**
	20	0	12	**	**	**	**	23	56	23	26	22	42	23	51	**	**	**	**	0	18
	21	1	01	0	41	0	20	**	**	**	**	23	20	**	**	0	44	0	21	1	02
	22	1	51	1	30	1	07	0	41	0	08	**	**	0	37	1	33	1	07	1	50
	23	2	41	2	20	1	57	1	31	0	57	0	07	1	27	2	22	1	56	2	40
	24	3	33	3	12	2	50	2	24	1	52	1	04	2	19	3	15	2	50	3	32
	25	4	22	4	03	3	44	3	21	2	51	2	09	3	14	4	07	3	46	4	25
	26	5	10	4	54	4	37	4	18	3	54	3	20	4	08	4	58	4	43	5	19
	27	5	55	5	43	5	31	5	16	4	57	4	31	5	03	5	49	5	40	6	12
	28	6	39	6	31	6	22	6	13	6	01	5	44	5	56	6	38	6	36	7	04
	29	7	23	7	19	7	15	7	10	7	04	6	56	6	49	7	27	7	33	7	55
	30	8	05	8	06	8	06	8	07	8	08	8	09	7	43	8	15	8	29	8	46
	31	8	49	8	54	8	60	9	06	9	14	9	25	8	37	9	05	9	27	9	39
Sept.	1	9	36	9	45	9	55	10	07	10	21	10	42	9	34	9	57	10	27	10	34
	2	10	25	10	38	10	53	11	10	11	32	12	02	10	33	10	52	11	30	11	32
	3	11	19	11	36	11	55	12	16	12	44	13	25	11	36	11	51	12	35	12	33
	4	12	16	12	37	12	59	13	25	13	57	14	45	12	40	12	53	13	43	13	37
	5	13	19	13	40	14	04	14	30	15	06	15	57	13	46	13	57	14	49	14	41
	6	14	22	14	43	15	06	15	32	16	06	16	55	14	48	14	59	15	50	15	44
	7	15	25	15	43	16	03	16	26	16	56	17	37	15	45	15	59	16	45	16	41
	8	16	23	16	38	16	55	17	13	17	36	18	08	16	35	16	53	17	33	17	33
	9	17	19	17	29	17	41	17	54	18	09	18	31	17	20	17	42	18	13	18	19
	10	18	09	18	15	18	22	18	29	18	38	18	49	18	00	18	26	18	49	19	01
	11	18	58	18	59	19	00	19	02	19	03	19	06	18	36	19	09	19	23	19	40
	12	19	45	19	41	19	37	19	33	19	28	19	21	19	12	19	49	19	55	20	17
	13	20	30	20	22	20	14	20	04	19	52	19	37	19	48	20	29	20	27	20	54
	14	21	17	21	05	20	52	20	37	20	18	19	54	20	24	21	10	21	01	21	33
	15	22	04	21	49	21	32	21	12	20	48	20	14	21	03	21	53	21	37	22	13
	16	22	53	22	34	22	14	21	51	21	22	20	41	21	45	22	37	22	16	22	56
	17	23	44	23	23	23	00	22	34	22	02	21	15	22	30	23	25	23	00	23	43
	18	**	**	**	**	23	50	23	23	22	48	21	58	23	19	**	**	23	49	**	**
	19	0	34	0	13	**	**	**	**	23	42	22	52	**	**	0	15	**	**	0	32
	20	1	26	1	04	0	41	0	15	**	**	23	55	0	11	1	07	0	41	1	24
	21	2	15	1	56	1	35	1	11	0	39	**	**	1	05	1	59	1	36	2	17
	22	3	04	2	47	2	28	2	08	1	42	1	04	1	59	2	51	2	33	3	11
	23	3	50	3	37	3	22	3	06	2	44	2	15	2	54	3	42	3	30	4	04
	24	4	35	4	25	4	15	4	03	3	49	3	29	3	48	4	31	4	27	4	56
	25	5	19	5	13	5	08	5	01	4	53	4	41	4	41	5	21	5	24	5	48
	26	6	02	6	01	6	00	5	59	5	58	5	56	5	36	6	10	6	21	6	40
	27	6	46	6	50	6	54	6	58	7	04	7	11	6	30	7	00	7	20	7	34
	28	7	33	7	41	7	50	7	59	8	12	8	29	7	28	7	53	8	20	8	28
	29	8	21	8	34	8	48	9	03	9	23	9	51	8	27	8	47	9	23	9	27
	30	9	15	9	31	9	49	10	10	10	36	11	14	9	30	9	46	10	29	10	27
Oct.	1	10	11	10	31	10	53	11	18	11	49	12	36	10	34	10	47	11	36	11	31

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.													FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Aug. 16	9	31	9	34	9	38	9	42	9	47	9	54	9	15	9	45	10	03	10	17
17	10	16	10	23	10	32	10	41	10	53	11	10	10	10	10	35	11	02	11	11
18	11	01	11	13	11	26	11	41	11	59	12	24	11	05	11	26	12	00	12	04
19	11	47	12	03	12	19	12	38	13	03	13	37	12	00	12	17	12	58	12	58
20	12	35	12	53	13	13	13	36	14	05	14	47	12	54	13	09	13	55	13	51
21	13	25	13	45	14	07	14	32	15	05	15	53	13	49	14	01	14	50	14	44
22	14	15	14	36	14	59	15	26	15	60	16	50	14	41	14	52	15	44	15	37
23	15	06	15	27	15	50	16	15	16	49	17	37	15	32	15	43	16	33	16	27
24	15	56	16	15	16	36	17	01	17	31	18	14	16	18	16	31	17	19	17	14
25	16	45	17	02	17	20	17	41	18	06	18	43	17	01	17	17	17	59	17	58
26	17	32	17	45	17	60	18	16	18	37	19	05	17	40	17	59	18	35	18	38
27	18	16	18	26	18	37	18	49	19	04	19	24	18	16	18	38	19	09	19	15
28	18	60	19	06	19	12	19	19	19	28	19	39	18	50	19	17	19	40	19	51
29	19	43	19	45	19	46	19	48	19	50	19	53	19	23	19	54	20	09	20	25
30	20	26	20	23	20	20	20	17	20	13	20	07	19	56	20	31	20	39	21	00
31	21	11	21	04	20	56	20	47	20	36	20	22	20	30	21	11	21	10	21	37
Sept. 1	21	58	21	47	21	35	21	21	21	03	20	40	21	07	21	53	21	44	22	15
2	22	50	22	34	22	17	21	59	21	35	21	02	21	49	22	38	22	23	22	59
3	23	46	23	27	23	07	22	43	22	13	21	32	22	36	23	30	23	08	23	49
4	**	**	**	**	**	**	23	36	23	02	22	13	23	32	**	**	**	**	**	**
5	0	46	0	25	0	02	**	**	**	**	23	11	**	**	0	27	0	01	0	45
6	1	49	1	28	1	04	0	37	0	02	**	**	0	33	1	30	1	03	1	47
7	2	52	2	32	2	10	1	45	1	12	0	24	1	40	2	35	2	10	2	53
8	3	53	3	36	3	18	2	56	2	28	1	49	2	48	3	40	3	21	4	00
9	4	50	4	37	4	23	4	07	3	47	3	18	3	55	4	42	4	31	5	05
10	5	44	5	35	5	26	5	16	5	03	4	44	4	59	5	42	5	39	6	07
11	6	33	6	29	6	25	6	21	6	16	6	08	6	00	6	37	6	44	7	06
12	7	20	7	22	7	23	7	25	7	27	7	29	6	59	7	32	7	46	8	03
13	8	06	8	12	8	18	8	26	8	35	8	47	7	56	8	23	8	47	8	58
14	8	52	9	03	9	14	9	27	9	42	10	04	8	52	9	15	9	47	9	53
15	9	39	9	54	10	09	10	26	10	48	11	20	9	49	10	07	10	46	10	47
16	10	27	10	45	11	04	11	26	11	53	12	32	10	44	11	00	11	44	11	42
17	11	17	11	37	11	58	12	23	12	55	13	42	11	40	11	53	12	41	12	36
18	12	07	12	29	12	52	13	19	13	53	14	43	12	34	12	45	13	37	13	30
19	12	59	13	20	13	44	14	10	14	44	15	35	13	26	13	37	14	28	14	21
20	13	49	14	10	14	31	14	57	15	29	16	15	14	13	14	25	15	15	15	09
21	14	38	14	57	15	16	15	39	16	06	16	46	14	57	15	12	15	57	15	54
22	15	26	15	41	15	57	16	16	16	38	17	10	15	38	15	55	16	34	16	35
23	16	11	16	23	16	35	16	49	17	06	17	30	16	15	16	36	17	09	17	14
24	16	56	17	03	17	11	17	20	17	31	17	46	16	49	17	15	17	41	17	50
25	17	39	17	43	17	46	17	50	17	54	18	00	17	23	17	53	18	10	18	25
26	18	23	18	21	18	20	18	19	18	17	18	14	17	56	18	30	18	40	19	00
27	19	08	19	02	18	56	18	49	18	40	18	29	18	30	19	10	19	12	19	37
28	19	56	19	45	19	34	19	22	19	06	18	45	19	07	19	51	19	45	20	15
29	20	46	20	32	20	16	19	59	19	37	19	06	19	48	20	36	20	23	20	58
30	21	42	21	23	21	04	20	41	20	13	19	33	20	34	21	27	21	06	21	46
Oct. 1	22	40	22	19	21	57	21	31	20	58	20	10	21	27	22	22	21	57	22	39

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Lat. / Date	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Oct. 1	10	11	10	31	10	53	11	18	11	49	12	36	10	34	10	47	11	36	11	31
2	11	12	11	34	11	57	12	24	12	59	13	51	11	39	11	50	12	42	12	35
3	12	14	12	36	12	59	13	26	14	01	14	52	12	41	12	52	13	44	13	37
4	13	16	13	36	13	57	14	21	14	53	15	38	13	39	13	51	14	40	14	34
5	14	14	14	31	14	49	15	09	15	35	16	10	14	29	14	45	15	28	15	27
6	15	09	15	22	15	35	15	50	16	09	16	35	15	15	15	35	16	10	16	13
7	15	60	16	08	16	16	16	26	16	38	16	54	15	55	16	20	16	46	16	55
8	16	48	16	52	16	55	16	59	17	04	17	11	16	32	17	02	17	20	17	35
9	17	35	17	34	17	32	17	31	17	28	17	26	17	08	17	42	17	52	18	12
10	18	21	18	15	18	08	18	01	17	52	17	41	17	43	18	22	18	24	18	49
11	19	07	18	57	18	46	18	33	18	18	17	57	18	18	19	03	18	57	19	27
12	19	55	19	40	19	25	19	07	18	46	18	16	18	57	19	45	19	32	20	06
13	20	43	20	26	20	07	19	45	19	18	18	39	19	38	20	29	20	10	20	49
14	21	34	21	14	20	52	20	27	19	56	19	10	20	22	21	17	20	52	21	35
15	22	25	22	04	21	41	21	14	20	39	19	50	21	10	22	06	21	40	22	23
16	23	17	22	55	22	32	22	05	21	31	20	39	22	01	22	57	22	30	23	15
17	**	**	23	47	23	25	22	59	22	27	21	39	22	54	23	50	23	25	**	**
18	0	07	**	**	**	**	23	56	23	27	22	46	23	49	**	**	**	**	0	07
19	0	56	0	38	0	18	**	**	**	**	23	56	**	**	0	41	0	21	1	01
20	1	43	1	28	1	12	0	53	0	29	**	**	0	43	1	33	1	18	1	54
21	2	28	2	16	2	04	1	51	1	33	1	09	1	37	2	22	2	14	2	46
22	3	12	3	05	2	57	2	48	2	36	2	21	2	30	3	12	3	11	3	38
23	3	55	3	52	3	49	3	46	3	41	3	35	3	24	4	01	4	08	4	29
24	4	39	4	41	4	42	4	44	4	47	4	50	4	19	4	51	5	06	5	23
25	5	25	5	32	5	38	5	46	5	55	6	08	5	16	5	43	6	06	6	17
26	6	14	6	24	6	36	6	50	7	07	7	31	6	15	6	37	7	10	7	15
27	7	07	7	22	7	38	7	57	8	21	8	55	7	19	7	36	8	16	8	17
28	8	04	8	23	8	43	9	07	9	37	10	21	8	24	8	38	9	26	9	21
29	9	05	9	26	9	49	10	16	10	50	11	41	9	31	9	43	10	34	10	27
30	10	08	10	30	10	54	11	21	11	56	12	48	10	35	10	46	11	39	11	32
31	11	10	11	31	11	53	12	19	12	51	13	39	11	35	11	47	12	37	12	31
Nov. 1	12	09	12	27	12	47	13	09	13	36	14	15	12	27	12	42	13	27	13	25
2	13	05	13	19	13	34	13	51	14	12	14	41	13	14	13	33	14	10	14	12
3	13	56	14	05	14	16	14	27	14	42	15	01	13	55	14	18	14	47	14	54
4	14	44	14	49	14	54	15	00	15	08	15	18	14	31	15	00	15	21	15	33
5	15	30	15	30	15	31	15	31	15	32	15	33	15	07	15	39	15	52	16	10
6	16	14	16	10	16	06	16	01	15	55	15	47	15	41	16	18	16	23	16	46
7	16	60	16	51	16	42	16	31	16	19	16	02	16	15	16	58	16	55	17	23
8	17	47	17	34	17	20	17	05	16	45	16	19	16	52	17	39	17	29	18	01
9	18	34	18	18	18	01	17	41	17	16	16	41	17	32	18	22	18	05	18	42
10	19	25	19	05	18	44	18	21	17	51	17	08	18	15	19	08	18	46	19	27
11	20	16	19	55	19	32	19	06	18	32	17	44	19	02	19	57	19	32	20	14
12	21	08	20	46	20	22	19	56	19	21	18	29	19	52	20	48	20	21	21	05
13	21	59	21	38	21	15	20	49	20	15	19	26	20	45	21	41	21	15	21	58
14	22	48	22	29	22	08	21	45	21	14	20	30	21	39	22	32	22	10	22	51
15	23	36	23	20	23	02	22	41	22	15	21	39	22	32	23	24	23	06	23	44
16	**	**	**	**	23	54	23	38	23	18	22	49	23	26	**	**	**	**	**	**

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82°.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0°		10°		20°		30°		40°		50°		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Oct. 1	22	40	22	19	21	57	21	31	20	58	20	10	21	27	22	22	21	57	22	39
2	23	42	23	20	22	56	22	29	21	54	21	02	22	25	23	22	22	55	23	39
3	**	**	**	**	23	60	23	34	22	60	22	09	23	30	**	**	24	00	**	**
4	0	44	0	22	**	**	**	**	**	**	23	30	**	**	0	25	**	**	0	43
5	1	44	1	26	1	05	0	42	0	12	**	**	0	35	1	29	1	08	1	48
6	2	41	2	26	2	10	1	51	1	28	0	55	1	41	2	30	2	16	2	52
7	3	34	3	23	3	12	2	59	2	43	2	20	2	44	3	29	3	23	3	53
8	4	23	4	17	4	11	4	04	3	56	3	44	3	46	4	25	4	27	4	52
9	5	11	5	10	5	09	5	08	5	06	5	04	4	44	5	19	5	30	5	49
10	5	57	6	01	6	05	6	09	6	15	6	23	5	42	6	11	6	30	6	44
11	6	43	6	51	7	00	7	11	7	23	7	41	6	38	7	03	7	31	7	40
12	7	30	7	42	7	56	8	11	8	30	8	58	7	35	7	56	8	31	8	34
13	8	17	8	34	8	51	9	12	9	37	10	13	8	32	8	48	9	31	9	30
14	9	07	9	27	9	47	10	11	10	41	11	26	9	29	9	42	10	29	10	25
15	9	58	10	19	10	42	11	09	11	42	12	31	10	24	10	35	11	27	11	20
16	10	50	11	12	11	35	12	02	12	37	13	28	11	17	11	28	12	20	12	12
17	11	41	12	02	12	25	12	51	13	25	14	13	12	07	12	18	13	09	13	02
18	12	30	12	50	13	11	13	35	14	05	14	47	12	52	13	06	13	53	13	49
19	13	19	13	36	13	53	14	13	14	38	15	14	13	34	13	50	14	32	14	31
20	14	05	14	18	14	32	14	48	15	08	15	35	14	12	14	31	15	07	15	10
21	14	49	14	58	15	08	15	20	15	33	15	52	14	47	15	11	15	40	15	47
22	15	33	15	38	15	43	15	49	15	57	16	06	15	21	15	49	16	10	16	22
23	16	16	16	16	16	17	16	18	16	19	16	20	15	54	16	26	16	39	16	57
24	17	01	16	57	16	53	16	48	16	42	16	34	16	27	17	05	17	10	17	33
25	17	48	17	40	17	31	17	20	17	08	16	50	17	04	17	46	17	43	18	11
26	18	38	18	25	18	11	17	56	17	37	17	10	17	44	18	30	18	20	18	53
27	19	34	19	17	18	58	18	37	18	11	17	35	18	29	19	20	19	02	19	40
28	20	33	20	12	19	51	19	26	18	54	18	08	19	21	20	15	19	51	20	33
29	21	35	21	13	20	50	20	22	19	48	18	56	20	19	21	16	20	48	21	33
30	22	38	22	16	21	53	21	26	20	51	19	60	21	23	22	19	21	52	22	36
31	23	39	23	20	22	59	22	34	22	03	21	17	22	28	23	23	23	00	23	41
Nov. 1	**	**	**	**	**	**	23	43	23	17	22	40	23	34	**	**	**	**	**	**
2	0	36	0	20	0	03	**	**	**	**	**	**	**	**	0	24	0	08	0	45
3	1	30	1	18	1	05	0	50	0	31	0	05	0	37	1	23	1	14	1	46
4	2	19	2	11	2	03	1	54	1	43	1	27	1	37	2	18	2	17	2	44
5	3	06	3	03	2	60	2	56	2	52	2	46	2	35	3	11	3	19	3	41
6	3	51	3	53	3	55	3	57	4	00	4	04	3	31	4	03	4	19	4	35
7	4	36	4	42	4	49	4	57	5	07	5	21	4	27	4	54	5	18	5	29
8	5	22	5	33	5	44	5	58	6	14	6	37	5	23	5	46	6	17	6	23
9	6	09	6	24	6	39	6	58	7	21	7	54	6	19	6	38	7	17	7	18
10	6	58	7	16	7	36	7	58	8	26	9	08	7	17	7	32	8	17	8	13
11	7	49	8	09	8	31	8	57	9	30	10	17	8	13	8	25	9	15	9	09
12	8	40	9	02	9	26	9	53	10	27	11	19	9	08	9	19	10	10	10	03
13	9	33	9	54	10	17	10	44	11	18	12	08	9	59	10	10	11	02	10	54
14	10	23	10	43	11	05	11	30	12	01	12	47	10	46	10	59	11	48	11	42
15	11	11	11	29	11	48	12	10	12	37	13	16	11	30	11	44	12	28	12	26
16	11	58	12	12	12	28	12	46	13	08	13	39	12	08	12	26	13	05	13	06

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Nov. 16	**	**	**	**	23	54	23	38	23	18	22	49	23	26	**	**	**	**	**	**
17	0	21	0	08	**	**	**	**	**	**	**	**	**	**	0	13	0	02	0	35
18	1	05	0	55	0	45	0	34	0	20	0	01	0	18	1	02	0	58	1	27
19	1	47	1	42	1	37	1	31	1	23	1	13	1	11	1	50	1	54	2	17
20	2	30	2	29	2	29	2	28	2	27	2	26	2	04	2	38	2	50	3	09
21	3	14	3	18	3	23	3	28	3	34	3	42	2	59	3	29	3	49	4	02
22	4	01	4	10	4	19	4	30	4	43	5	02	3	58	4	22	4	50	4	58
23	4	53	5	06	5	20	5	37	5	57	6	26	4	59	5	20	5	56	5	59
24	5	49	6	06	6	25	6	46	7	14	7	54	6	05	6	21	7	06	7	03
25	6	50	7	11	7	33	7	58	8	31	9	20	7	14	7	27	8	16	8	10
26	7	55	8	17	8	40	9	08	9	43	10	35	8	22	8	33	9	26	9	18
27	8	60	9	22	9	45	10	11	10	45	11	35	9	27	9	38	10	29	10	22
28	10	03	10	21	10	42	11	05	11	35	12	16	10	23	10	37	11	24	11	20
29	11	01	11	16	11	32	11	51	12	14	12	46	11	13	11	30	12	10	12	10
30	11	54	12	04	12	16	12	29	12	46	13	08	11	55	12	17	12	49	12	55
Dec. 1	12	42	12	49	12	55	13	03	13	13	13	26	12	33	13	00	13	24	13	35
2	13	28	13	30	13	32	13	34	13	37	13	41	13	09	13	40	13	55	14	11
3	14	12	14	10	14	07	14	04	13	60	13	55	13	42	14	18	14	25	14	47
4	14	57	14	50	14	42	14	33	14	23	14	09	14	16	14	57	14	56	15	23
5	15	42	15	31	15	19	15	05	14	48	14	25	14	51	15	36	15	29	16	00
6	16	29	16	13	15	58	15	39	15	16	14	45	15	29	16	18	16	03	16	39
7	17	18	16	59	16	40	16	17	15	49	15	09	16	10	17	03	16	42	17	22
8	18	08	17	48	17	26	17	00	16	28	15	42	16	56	17	51	17	26	18	08
9	19	00	18	38	18	15	17	48	17	14	16	23	17	45	18	41	18	14	18	58
10	19	52	19	31	19	07	18	40	18	06	17	16	18	37	19	33	19	06	19	50
11	20	42	20	22	20	01	19	36	19	04	18	17	19	31	20	25	20	01	20	43
12	21	31	21	13	20	54	20	32	20	04	19	25	20	24	21	17	20	57	21	36
13	22	16	22	02	21	46	21	29	21	06	20	35	21	18	22	06	21	53	22	28
14	22	59	22	49	22	37	22	24	22	08	21	45	22	10	22	54	22	48	23	19
15	23	42	23	35	23	28	23	19	23	09	22	55	23	01	23	42	23	43	**	**
16	**	**	**	**	**	**	**	**	**	**	**	**	23	53	**	**	**	**	0	08
17	0	23	0	20	0	17	0	14	0	11	0	06	**	**	0	29	0	37	0	58
18	1	05	1	07	1	09	1	11	1	14	1	18	0	45	1	17	1	33	1	49
19	1	50	1	56	2	03	2	10	2	20	2	34	1	40	2	07	2	31	2	42
20	2	37	2	48	2	60	3	14	3	31	3	54	2	39	3	01	3	34	3	39
21	3	30	3	46	4	02	4	21	4	45	5	19	3	42	4	00	4	40	4	40
22	4	29	4	48	5	08	5	32	6	02	6	47	4	49	5	03	5	51	5	47
23	5	33	5	54	6	17	6	44	7	19	8	10	5	59	6	10	7	02	6	55
24	6	39	7	02	7	25	7	53	8	27	9	19	7	07	7	18	8	10	8	03
25	7	46	8	06	8	28	8	53	9	25	10	10	8	09	8	22	9	11	9	06
26	8	48	9	05	9	24	9	44	10	10	10	46	9	04	9	20	10	03	10	01
27	9	46	9	58	10	11	10	27	10	46	11	12	9	51	10	11	10	46	10	50
28	10	37	10	45	10	54	11	04	11	15	11	31	10	32	10	57	11	24	11	33
29	11	26	11	29	11	33	11	36	11	41	11	47	11	09	11	39	11	57	12	11
30	12	11	12	10	12	08	12	06	12	04	12	02	11	44	12	18	12	28	12	48
31	12	56	12	50	12	43	12	36	12	28	12	16	12	18	12	57	12	59	13	24
32	13	41	13	31	13	20	13	07	12	52	12	32	12	53	13	37	13	31	14	00

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2022

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

Date \ Lat.	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Nov. 16	11	58	12	12	12	28	12	46	13	08	13	39	12	08	12	26	13	05	13	06
17	12	42	12	53	13	05	13	18	13	35	13	57	12	44	13	06	13	38	13	43
18	13	25	13	32	13	40	13	48	13	58	14	12	13	18	13	44	14	08	14	18
19	14	07	14	10	14	13	14	16	14	20	14	26	13	50	14	20	14	37	14	52
20	14	51	14	49	14	47	14	45	14	43	14	39	14	23	14	58	15	07	15	27
21	15	37	15	30	15	24	15	16	15	07	14	54	14	58	15	38	15	39	16	04
22	16	25	16	14	16	03	15	50	15	34	15	12	15	36	16	20	16	13	16	44
23	17	19	17	04	16	47	16	29	16	06	15	34	16	19	17	08	16	53	17	29
24	18	17	17	59	17	39	17	15	16	45	16	04	17	09	18	02	17	40	18	20
25	19	21	18	59	18	36	18	10	17	36	16	46	18	06	19	02	18	36	19	19
26	20	26	20	04	19	41	19	13	18	38	17	46	19	10	20	07	19	40	20	23
27	21	31	21	10	20	48	20	22	19	50	19	01	20	17	21	13	20	48	21	31
28	22	31	22	13	21	55	21	33	21	06	20	26	21	26	22	17	21	59	22	37
29	23	27	23	13	22	59	22	42	22	21	21	52	22	30	23	18	23	07	23	41
30	**	**	**	**	23	59	23	48	23	35	23	16	23	32	**	**	**	**	**	**
Dec. 1	0	17	0	08	**	**	**	**	**	**	**	**	**	**	0	15	0	12	0	40
2	1	04	1	00	0	56	0	51	0	44	0	35	0	30	1	08	1	14	1	37
3	1	50	1	50	1	51	1	51	1	52	1	53	1	27	1	59	2	13	2	30
4	2	33	2	38	2	44	2	50	2	58	3	08	2	21	2	49	3	11	3	24
5	3	18	3	28	3	38	3	49	4	03	4	23	3	16	3	40	4	09	4	16
6	4	04	4	17	4	32	4	48	5	09	5	38	4	11	4	31	5	08	5	10
7	4	52	5	09	5	27	5	48	6	14	6	52	5	08	5	24	6	07	6	05
8	5	42	6	01	6	22	6	47	7	18	8	03	6	04	6	17	7	05	7	00
9	6	33	6	54	7	17	7	44	8	18	9	08	6	59	7	11	8	02	7	55
10	7	25	7	47	8	10	8	37	9	12	10	02	7	52	8	03	8	55	8	47
11	8	16	8	37	8	59	9	25	9	58	10	45	8	41	8	53	9	43	9	37
12	9	05	9	24	9	44	10	07	10	36	11	18	9	26	9	40	10	25	10	22
13	9	52	10	08	10	25	10	44	11	09	11	42	10	06	10	22	11	03	11	03
14	10	36	10	49	11	02	11	18	11	36	12	01	10	42	11	02	11	37	11	41
15	11	20	11	28	11	37	11	48	12	00	12	17	11	16	11	40	12	07	12	16
16	12	01	12	05	12	10	12	16	12	22	12	31	11	48	12	16	12	36	12	49
17	12	42	12	43	12	43	12	43	12	44	12	44	12	19	12	52	13	05	13	23
18	13	26	13	22	13	17	13	13	13	06	12	58	12	52	13	30	13	35	13	57
19	14	12	14	03	13	54	13	44	13	31	13	14	13	28	14	09	14	07	14	34
20	15	02	14	49	14	35	14	19	13	60	13	33	14	07	14	54	14	43	15	16
21	15	58	15	41	15	22	15	01	14	35	13	58	14	53	15	44	15	26	16	04
22	16	59	16	38	16	17	15	52	15	20	14	34	15	47	16	41	16	17	16	59
23	18	05	17	43	17	19	16	52	16	17	15	25	16	48	17	45	17	18	18	02
24	19	12	18	50	18	27	18	01	17	27	16	35	17	57	18	53	18	27	19	11
25	20	16	19	58	19	38	19	14	18	44	17	60	19	07	20	01	19	40	20	20
26	21	17	21	02	20	45	20	27	20	03	19	30	20	16	21	06	20	52	21	28
27	22	11	22	01	21	50	21	37	21	21	20	58	21	22	22	07	22	01	22	31
28	23	01	22	55	22	49	22	42	22	34	22	22	22	23	23	03	23	06	23	30
29	23	48	23	47	23	46	23	45	23	44	23	42	23	22	23	56	**	**	**	**
30	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	07	0	26
31	0	32	0	36	0	40	0	45	0	51	0	58	0	17	0	47	1	06	1	20
32	1	17	1	25	1	34	1	44	1	57	2	13	1	12	1	37	2	04	2	13

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE AND MOONSET
REDUCTION OF THE L.M.T. OF RISING OR SETTING FOR THE MERIDIAN OF 82°.5 E. LONGITUDE TO THE L.M.T. OF OTHER MERIDIANS

LONGITUDE EAST OF GREENWICH

Daily Variation in Rising or Setting	0°	30°	60°	68°	72°	76°	80°	84°	88°	92°	96°	120°	150°
m	m	m	m	m	m	m	m	m	m	m	m	m	m
28	+ 6.4	+ 4.1	+ 1.8	+ 1.1	+ 0.8	+ 0.5	+ 0.2	- 0.1	- 0.4	- 0.7	- 1.1	- 2.9	- 5.3
29	6.6	4.2	1.8	1.2	0.8	0.5	0.2	0.1	0.4	0.8	1.1	3.0	5.4
30	6.9	4.4	1.9	1.2	0.9	0.5	0.2	0.1	0.5	0.8	1.1	3.1	5.6
31	7.1	4.5	1.9	1.2	0.9	0.6	0.2	0.1	0.5	0.8	1.2	3.2	5.8
32	7.3	4.7	2.0	1.3	0.9	0.6	0.2	0.1	0.5	0.8	1.2	3.3	6.0
33	7.6	4.8	2.1	1.3	1.0	0.6	0.2	0.1	0.5	0.9	1.2	3.4	6.2
34	7.8	5.0	2.1	1.4	1.0	0.6	0.2	0.1	0.5	0.9	1.3	3.5	6.4
35	8.0	5.1	2.2	1.4	1.0	0.6	0.2	0.1	0.5	0.9	1.3	3.6	6.6
36	8.2	5.2	2.3	1.4	1.0	0.6	0.2	0.1	0.5	0.9	1.4	3.7	6.8
37	8.5	5.4	2.3	1.5	1.1	0.7	0.3	0.2	0.6	1.0	1.4	3.9	6.9
38	8.7	5.5	2.4	1.5	1.1	0.7	0.3	0.2	0.6	1.0	1.4	4.0	7.1
39	8.9	5.7	2.4	1.6	1.1	0.7	0.3	0.2	0.6	1.0	1.5	4.1	7.3
40	+ 9.2	+ 5.8	+ 2.5	+ 1.6	+ 1.2	+ 0.7	+ 0.3	- 0.2	- 0.6	- 1.1	- 1.5	- 4.2	- 7.5
41	9.4	6.0	2.6	1.7	1.2	0.7	0.3	0.2	0.6	1.1	1.5	4.3	7.7
42	9.6	6.1	2.6	1.7	1.2	0.8	0.3	0.2	0.6	1.1	1.6	4.4	7.9
43	9.9	6.3	2.7	1.7	1.3	0.8	0.3	0.2	0.7	1.1	1.6	4.5	8.1
44	10.1	6.4	2.8	1.8	1.3	0.8	0.3	0.2	0.7	1.2	1.7	4.6	8.3
45	10.3	6.6	2.8	1.8	1.3	0.8	0.3	0.2	0.7	1.2	1.7	4.7	8.4
46	10.5	6.7	2.9	1.9	1.3	0.8	0.3	0.2	0.7	1.2	1.7	4.8	8.6
47	10.8	6.9	2.9	1.9	1.4	0.8	0.3	0.2	0.7	1.2	1.8	4.9	8.8
48	11.0	7.0	3.0	1.9	1.4	0.9	0.3	0.2	0.7	1.3	1.8	5.0	9.0
49	11.2	7.1	3.1	2.0	1.4	0.9	0.3	0.2	0.7	1.3	1.8	5.1	9.2
50	+ 11.5	+ 7.3	+ 3.1	+ 2.0	+ 1.5	+ 0.9	+ 0.3	- 0.2	- 0.8	- 1.3	- 1.9	- 5.2	- 9.4
51	11.7	7.4	3.2	2.1	1.5	0.9	0.4	0.2	0.8	1.3	1.9	5.3	9.6
52	11.9	7.6	3.3	2.1	1.5	0.9	0.4	0.2	0.8	1.4	2.0	5.4	9.8
53	12.1	7.7	3.3	2.1	1.5	1.0	0.4	0.2	0.8	1.4	2.0	5.5	9.9
54	12.4	7.9	3.4	2.2	1.6	1.0	0.4	0.2	0.8	1.4	2.0	5.6	10.1
55	12.6	8.0	3.4	2.2	1.6	1.0	0.4	0.2	0.8	1.5	2.1	5.7	10.3
56	12.8	8.2	3.5	2.3	1.6	1.0	0.4	0.2	0.9	1.5	2.1	5.8	10.5
57	13.1	8.3	3.6	2.3	1.7	1.0	0.4	0.2	0.9	1.5	2.1	5.9	10.7
58	13.3	8.5	3.6	2.3	1.7	1.0	0.4	0.2	0.9	1.5	2.2	6.0	10.9
59	13.5	8.6	3.7	2.4	1.7	1.1	0.4	0.2	0.9	1.6	2.2	6.1	11.1
60	+ 13.7	+ 8.7	+ 3.8	+ 2.4	+ 1.7	+ 1.1	+ 0.4	- 0.2	- 0.9	- 1.6	- 2.3	- 6.2	- 11.3
61	14.0	8.9	3.8	2.5	1.8	1.1	0.4	0.3	0.9	1.6	2.3	6.4	11.4
62	14.2	9.0	3.9	2.5	1.8	1.1	0.4	0.3	0.9	1.6	2.3	6.5	11.6
63	14.4	9.2	3.9	2.5	1.8	1.1	0.4	0.3	1.0	1.7	2.4	6.6	11.8
64	14.7	9.3	4.0	2.6	1.9	1.2	0.4	0.3	1.0	1.7	2.4	6.7	12.0
65	14.9	9.5	4.1	2.6	1.9	1.2	0.5	0.3	1.0	1.7	2.4	6.8	12.2
66	15.1	9.6	4.1	2.7	1.9	1.2	0.5	0.3	1.0	1.7	2.5	6.9	12.4
67	15.4	9.8	4.2	2.7	2.0	1.2	0.5	0.3	1.0	1.8	2.5	7.0	12.6
68	15.6	9.9	4.3	2.7	2.0	1.2	0.5	0.3	1.0	1.8	2.6	7.1	12.8
69	15.8	10.1	4.3	2.8	2.0	1.2	0.5	0.3	1.1	1.8	2.6	7.2	12.9
70	+ 16.0	+ 10.2	+ 4.4	+ 2.8	+ 2.0	+ 1.3	+ 0.5	- 0.3	- 1.1	- 1.8	- 2.6	- 7.3	- 13.1
71	16.3	10.4	4.4	2.9	2.1	1.3	0.5	0.3	1.1	1.9	2.7	7.4	13.3
72	16.5	10.5	4.5	2.9	2.1	1.3	0.5	0.3	1.1	1.9	2.7	7.5	13.5
73	16.7	10.6	4.6	2.9	2.1	1.3	0.5	0.3	1.1	1.9	2.7	7.6	13.7
74	+ 17.0	+ 10.8	+ 4.6	+ 3.0	+ 2.2	+ 1.3	+ 0.5	- 0.3	- 1.1	- 2.0	- 2.8	- 7.7	- 13.9

SUNRISE, SUNSET AND MOONRISE, MOONSET
CORRECTION FOR LATITUDE

VARIATION PER 10° OF LATITUDE OF THE TIMES OF SUNRISE, SUNSET AND MOONRISE, MOONSET DISTRIBUTED OVER EACH DEGREE OF LATITUDE

Var. per 10° of Lat.	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	15'	30'	45'
m	m	m	m	m	m	m	m	m	m	m	m	m	m
5	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	0.1	0.3	0.4
6	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	0.2	0.3	0.5
7	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	0.2	0.4	0.5
8	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	0.2	0.4	0.6
9	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	0.2	0.5	0.7
10	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	0.3	0.5	0.8
11	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0	0.3	0.6	0.8
12	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	0.3	0.6	0.9
13	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13.0	0.3	0.7	1.0
14	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6	14.0	0.4	0.7	1.1
15	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	0.4	0.8	1.1
16	1.6	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.4	16.0	0.4	0.8	1.2
17	1.7	3.4	5.1	6.8	8.5	10.2	11.9	13.6	15.3	17.0	0.4	0.9	1.3
18	1.8	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	0.5	0.9	1.4
19	1.9	3.8	5.7	7.6	9.5	11.4	13.3	15.2	17.1	19.0	0.5	1.0	1.4
20	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	0.5	1.0	1.5
21	2.1	4.2	6.3	8.4	10.5	12.6	14.7	16.8	18.9	21.0	0.5	1.1	1.6
22	2.2	4.4	6.6	8.8	11.0	13.2	15.4	17.6	19.8	22.0	0.6	1.1	1.7
23	2.3	4.6	6.9	9.2	11.5	13.8	16.1	18.4	20.7	23.0	0.6	1.2	1.7
24	2.4	4.8	7.2	9.6	12.0	14.4	16.8	19.2	21.6	24.0	0.6	1.2	1.8
25	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0	0.6	1.3	1.9
26	2.6	5.2	7.8	10.4	13.0	15.6	18.2	20.8	23.4	26.0	0.7	1.3	2.0
27	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27.0	0.7	1.4	2.0
28	2.8	5.6	8.4	11.2	14.0	16.8	19.6	22.4	25.2	28.0	0.7	1.4	2.1
29	2.9	5.8	8.7	11.6	14.5	17.4	20.3	23.2	26.1	29.0	0.7	1.5	2.2
30	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	0.8	1.5	2.3
31	3.1	6.2	9.3	12.4	15.5	18.6	21.7	24.8	27.9	31.0	0.8	1.6	2.3
32	3.2	6.4	9.6	12.8	16.0	19.2	22.4	25.6	28.8	32.0	0.8	1.6	2.4
33	3.3	6.6	9.9	13.2	16.5	19.8	23.1	26.4	29.7	33.0	0.8	1.7	2.5
34	3.4	6.8	10.2	13.6	17.0	20.4	23.8	27.2	30.6	34.0	0.9	1.7	2.6
35	3.5	7.0	10.5	14.0	17.5	21.0	24.5	28.0	31.5	35.0	0.9	1.8	2.6
36	3.6	7.2	10.8	14.4	18.0	21.6	25.2	28.8	32.4	36.0	0.9	1.8	2.7
37	3.7	7.4	11.1	14.8	18.5	22.2	25.9	29.6	33.3	37.0	0.9	1.9	2.8
38	3.8	7.6	11.4	15.2	19.0	22.8	26.6	30.4	34.2	38.0	1.0	1.9	2.9
39	3.9	7.8	11.7	15.6	19.5	23.4	27.3	31.2	35.1	39.0	1.0	2.0	2.9
40	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0	1.0	2.0	3.0
41	4.1	8.2	12.3	16.4	20.5	24.6	28.7	32.8	36.9	41.0	1.0	2.1	3.1
42	4.2	8.4	12.6	16.8	21.0	25.2	29.4	33.6	37.8	42.0	1.1	2.1	3.2
43	4.3	8.6	12.9	17.2	21.5	25.8	30.1	34.4	38.7	43.0	1.1	2.2	3.2
44	4.4	8.8	13.2	17.6	22.0	26.4	30.8	35.2	39.6	44.0	1.1	2.2	3.3
45	4.5	9.0	13.5	18.0	22.5	27.0	31.5	36.0	40.5	45.0	1.1	2.3	3.4
46	4.6	9.2	13.8	18.4	23.0	27.6	32.2	36.8	41.4	46.0	1.2	2.3	3.5
47	4.7	9.4	14.1	18.8	23.5	28.2	32.9	37.6	42.3	47.0	1.2	2.4	3.5
48	4.8	9.6	14.4	19.2	24.0	28.8	33.6	38.4	43.2	48.0	1.2	2.4	3.6
49	4.9	9.8	14.7	19.6	24.5	29.4	34.3	39.2	44.1	49.0	1.2	2.5	3.7
50	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	1.3	2.5	3.8

REDUCTION OF TIME

REDUCTION OF LOCAL MEAN TIME OF A PLACE INTO
THE INDIAN STANDARD TIME

A-CORRECTION TO BE ADDED TO L.M.T. TO OBTAIN I.S.T.

	LONGITUDE OF PLACE (EAST OF GREENWICH)															
	67°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	81°	82°
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
0	62.0	58.0	54.0	50.0	46.0	42.0	38.0	34.0	30.0	26.0	22.0	18.0	14.0	10.0	6.0	2.0
3	61.8	57.8	53.8	49.8	45.8	41.8	37.8	33.8	29.8	25.8	21.8	17.8	13.8	9.8	5.8	1.8
6	61.6	57.6	53.6	49.6	45.6	41.6	37.6	33.6	29.6	25.6	21.6	17.6	13.6	9.6	5.6	1.6
9	61.4	57.4	53.4	49.4	45.4	41.4	37.4	33.4	29.4	25.4	21.4	17.4	13.4	9.4	5.4	1.4
12	61.2	57.2	53.2	49.2	45.2	41.2	37.2	33.2	29.2	25.2	21.2	17.2	13.2	9.2	5.2	1.2
15	61.0	57.0	53.0	49.0	45.0	41.0	37.0	33.0	29.0	25.0	21.0	17.0	13.0	9.0	5.0	1.0
18	60.8	56.8	52.8	48.8	44.8	40.8	36.8	32.8	28.8	24.8	20.8	16.8	12.8	8.8	4.8	0.8
21	60.6	56.6	52.6	48.6	44.6	40.6	36.6	32.6	28.6	24.6	20.6	16.6	12.6	8.6	4.6	0.6
24	60.4	56.4	52.4	48.4	44.4	40.4	36.4	32.4	28.4	24.4	20.4	16.4	12.4	8.4	4.4	0.4
27	60.2	56.2	52.2	48.2	44.2	40.2	36.2	32.2	28.2	24.2	20.2	16.2	12.2	8.2	4.2	0.2
30	60.0	56.0	52.0	48.0	44.0	40.0	36.0	32.0	28.0	24.0	20.0	16.0	12.0	8.0	4.0	0.0
33	59.8	55.8	51.8	47.8	43.8	39.8	35.8	31.8	27.8	23.8	19.8	15.8	11.8	7.8	3.8	
36	59.6	55.6	51.6	47.6	43.6	39.6	35.6	31.6	27.6	23.6	19.6	15.6	11.6	7.6	3.6	
39	59.4	55.4	51.4	47.4	43.4	39.4	35.4	31.4	27.4	23.4	19.4	15.4	11.4	7.4	3.4	
42	59.2	55.2	51.2	47.2	43.2	39.2	35.2	31.2	27.2	23.2	19.2	15.2	11.2	7.2	3.2	
45	59.0	55.0	51.0	47.0	43.0	39.0	35.0	31.0	27.0	23.0	19.0	15.0	11.0	7.0	3.0	
48	58.8	54.8	50.8	46.8	42.8	38.8	34.8	30.8	26.8	22.8	18.8	14.8	10.8	6.8	2.8	
51	58.6	54.6	50.6	46.6	42.6	38.6	34.6	30.6	26.6	22.6	18.6	14.6	10.6	6.6	2.6	
54	58.4	54.4	50.4	46.4	42.4	38.4	34.4	30.4	26.4	22.4	18.4	14.4	10.4	6.4	2.4	
57	58.2	54.2	50.2	46.2	42.2	38.2	34.2	30.2	26.2	22.2	18.2	14.2	10.2	6.2	2.2	
60	58.0	54.0	50.0	46.0	42.0	38.0	34.0	30.0	26.0	22.0	18.0	14.0	10.0	6.0	2.0	

B- CORRECTION TO BE SUBTRACTED FROM L.M.T. TO OBTAIN I.S.T.

	LONGITUDE OF PLACE (EAST OF GREENWICH)															
	82°	83°	84°	85°	86°	87°	88°	89°	90°	91°	92°	93°	94°	95°	96°	97°
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
0		2.0	6.0	10.0	14.0	18.0	22.0	26.0	30.0	34.0	38.0	42.0	46.0	50.0	54.0	58.0
3		2.2	6.2	10.2	14.2	18.2	22.2	26.2	30.2	34.2	38.2	42.2	46.2	50.2	54.2	58.2
6		2.4	6.4	10.4	14.4	18.4	22.4	26.4	30.4	34.4	38.4	42.4	46.4	50.4	54.4	58.4
9		2.6	6.6	10.6	14.6	18.6	22.6	26.6	30.6	34.6	38.6	42.6	46.6	50.6	54.6	58.6
12		2.8	6.8	10.8	14.8	18.8	22.8	26.8	30.8	34.8	38.8	42.8	46.8	50.8	54.8	58.8
15		3.0	7.0	11.0	15.0	19.0	23.0	27.0	31.0	35.0	39.0	43.0	47.0	51.0	55.0	59.0
18		3.2	7.2	11.2	15.2	19.2	23.2	27.2	31.2	35.2	39.2	43.2	47.2	51.2	55.2	59.2
21		3.4	7.4	11.4	15.4	19.4	23.4	27.4	31.4	35.4	39.4	43.4	47.4	51.4	55.4	59.4
24		3.6	7.6	11.6	15.6	19.6	23.6	27.6	31.6	35.6	39.6	43.6	47.6	51.6	55.6	59.6
27		3.8	7.8	11.8	15.8	19.8	23.8	27.8	31.8	35.8	39.8	43.8	47.8	51.8	55.8	59.8
30	0.0	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0	44.0	48.0	52.0	56.0	60.0
33	0.2	4.2	8.2	12.2	16.2	20.2	24.2	28.2	32.2	36.2	40.2	44.2	48.2	52.2	56.2	60.2
36	0.4	4.4	8.4	12.4	16.4	20.4	24.4	28.4	32.4	36.4	40.4	44.4	48.4	52.4	56.4	60.4
39	0.6	4.6	8.6	12.6	16.6	20.6	24.6	28.6	32.6	36.6	40.6	44.6	48.6	52.6	56.6	60.6
42	0.8	4.8	8.8	12.8	16.8	20.8	24.8	28.8	32.8	36.8	40.8	44.8	48.8	52.8	56.8	60.8
45	1.0	5.0	9.0	13.0	17.0	21.0	25.0	29.0	33.0	37.0	41.0	45.0	49.0	53.0	57.0	61.0
48	1.2	5.2	9.2	13.2	17.2	21.2	25.2	29.2	33.2	37.2	41.2	45.2	49.2	53.2	57.2	61.2
51	1.4	5.4	9.4	13.4	17.4	21.4	25.4	29.4	33.4	37.4	41.4	45.4	49.4	53.4	57.4	61.4
54	1.6	5.6	9.6	13.6	17.6	21.6	25.6	29.6	33.6	37.6	41.6	45.6	49.6	53.6	57.6	61.6
57	1.8	5.8	9.8	13.8	17.8	21.8	25.8	29.8	33.8	37.8	41.8	45.8	49.8	53.8	57.8	61.8
60	2.0	6.0	10.0	14.0	18.0	22.0	26.0	30.0	34.0	38.0	42.0	46.0	50.0	54.0	58.0	62.0

Sunrise and Sunset

The local mean times of Sunrise and Sunset for latitudes 0° to 60° North at intervals of 4 days during the year have been given on pages 280 to 287. The timings relate to the visibility of the upper limb of the Sun on the horizon. From these tables the L.M.T. of rise or set for any day of the year and for any latitude of place can be obtained by simple interpolation. If the place is in the southern hemisphere, the corrections given on pages 290 to 291 will then have to be applied to the timings for the corresponding northern latitude. For a station in India, the timings of Sunrise and Sunset so obtained which are in L.M.T. can be reduced to I.S.T. by applying the correction given on page 314 according to the longitude of the station.

In addition to the above details given in the publication, the timings of Sunrise and Sunset of five important cities of India, viz., Kolkata, Varanasi, Chennai, Delhi and Mumbai have been specially calculated and given in I.S.T. on pages 292 to 295.

Sunrise and Sunset for Southern Latitudes

The timings of Sunrise and Sunset for southern latitudes, which have not been tabulated separately, can be deduced from those for the corresponding northern latitudes by applying the corrections given on pages 290 and 291.

Twilight

The timings of the beginning of morning twilight and ending of evening twilight have been given for latitudes 0° to 60° North on pages 280 to 287. The timings relate to the instant when the center of the Sun is 18° below the horizon. This is now known as astronomical twilight. The period of twilight has been divided into three parts - Civil when the Sun is 6° below the horizon, Nautical when 12° and Astronomical when 18° - and their durations have been given separately on pages 288 and 289 at an interval of 8 days. The figures for any intermediate date can be worked out from the tables by simple interpolation.

Moonrise and Moonset

The local mean times of Moonrise and Moonset for latitudes 0° to 50° North at 10- degrees interval together with the timings of these events in I.S.T. for four important stations in India, Viz., Kolkata, Chennai, Delhi and Mumbai for each day of the year have been given on pages 296 to 311 along with some supplementary tables on pages 312 to 313. A detailed method of calculation for any station is given below.

To find the time of Moonrise and Moonset for any station the figure for the phenomena concerned given against the date is to be taken from the table (pages 296 to 311) for the latitude just lower than the latitude of the station, to which the following corrections will have to be applied :

(a) Correction for difference in latitude;
(b) Correction for longitude, if the place is not on the Central Meridian of India (i.e., 82°.5 E. Long);
(c) Correction for converting L.M.T. into I.S.T., when and where necessary.

These corrections are detailed below :

(a) Correction for difference in latitude - The timings of Moonrise and Moonset have been given for latitudes 0°, 10°, 20°, 30°, 40° and 50° North, and in local mean time. The timing for any particular latitude of place falling within the above limits can be obtained by simple interpolation between figures for the two latitudes, one below and the other above the latitude of the given place. For this purpose the table on page 313 can be conveniently used wherein corrections for latitude are shown according to the variation per 10° of latitude of the timings of Moonrise or Moonset distributed over each degree of latitude. The correction can also be calculated directly by multiplying one-tenth of the time difference between the figures for two consecutive given latitudes by the excess of the latitude of the station over the given lower latitude.

(b) Correction for difference in longitude - The timings thus obtained are exact for the Central Meridian of India, i.e, for longitude 82°.5 East of Greenwich. For other longitudes the correction given on page 312 should be applied according to :

(i) the longitude of the station, and
(ii) the daily variation of the timings of rising or setting, as the case may be, between two consecutive dates.

If greater accuracy is not required, the daily variation may be assumed to be a constant (i.e., 50 minutes) for all dates and corrections from the following table may be applied instead of taking the corrections from the table on page 312.

Longitude of Station (East)	Correction m	Longitude of Station (East)	Correction m
0°	+ 11.5	84°	- 0.2
30°	+ 7.3	88°	- 0.8
60°	+ 3.1	92°	- 1.3
68°	+ 2.0	96°	- 1.9
72°	+ 1.5	120°	- 5.2
76°	+ 0.9	150°	- 9.4
80°	+ 0.3	180°	- 13.5

The timing thus obtained by the above two operations is in L.M.T. of the station

(c) Correction for converting L.M.T. into I.S.T. - The figures obtained by the operations (a) and (b) above would give the local mean time of Moonrise or Moonset for the given station. The local mean time can be reduced to the Indian Standard Time by the help of the reduction table on page 314. In other way to obtain the I.S.T., the L.M.T. may be increased at the rate of 4 minutes per degree of longitude if the station is to the west of 82°.5 East and decreased at the same rate if the station is to the east of 82°.5 East Longitude.

In practice, however, when dealing with the same station, it will be convenient to combine corrections (b) and (c) above, as these are constant day after day, and add this constant to the daily times corrected for latitude only.

Moonrise and Moonset for southern Latitudes

The times of Moonrise and Moonset for southern latitudes have not been given separately. The timings for a station in southern latitude can, however, be deduced from those for the corresponding northern latitude by the following formula :

Timings for a southern latitude = 2 × Timing for 0° latitude - Timing for the same northern latitude.

In this case the local mean time for the same latitude north will have to be calculated first by applying the latitude correction (a) above, and the corresponding time for the southern latitude will have to be deduced by the above formula by utilising the published figure for 0° latitude. The exact L.M.T. of rising or setting for the place in question will, however, be obtained by applying the correction (b) above to the time so deduced.

If necessary, the timings thus obtained may be reduced to I.S.T. by the usual method.

PHASES OF THE MOON, 2022

(Time in I.S.T.)

		d	h	m			d	h	m
Full Moon	Dec, 21	19	10	05	Full Moon	Jul	14	00	08
Last Quarter	Dec, 21	27	07	54	Last Quarter	Jul	20	19	49
New Moon	Jan, 22	03	00	03	New Moon	Jul	28	23	25
First Quarter	Jan	09	23	41	First Quarter	Aug	05	16	37
Full Moon	Jan	18	05	18	Full Moon	Aug	12	07	06
Last Quarter	Jan	25	19	11	Last Quarter	Aug	19	10	06
New Moon	Feb	01	11	16	New Moon	Aug	27	13	47
First Quarter	Feb	08	19	20	First Quarter	Sep	03	23	38
Full Moon	Feb	16	22	26	Full Moon	Sep	10	15	29
Last Quarter	Feb	24	04	02	Last Quarter	Sep	18	03	22
New Moon	Mar	02	23	05	New Moon	Sep	26	03	25
First Quarter	Mar	10	16	15	First Quarter	Oct	03	05	44
Full Moon	Mar	18	12	48	Full Moon	Oct	10	02	25
Last Quarter	Mar	25	11	07	Last Quarter	Oct	17	22	45
New Moon	Apr	01	11	54	New Moon	Oct	25	16	19
First Quarter	Apr	09	12	18	First Quarter	Nov	01	12	07
Full Moon	Apr	17	00	25	Full Moon	Nov	08	16	32
Last Quarter	Apr	23	17	26	Last Quarter	Nov	16	18	57
New Moon	May	01	01	58	New Moon	Nov	24	04	27
First Quarter	May	09	05	51	First Quarter	Nov	30	20	07
Full Moon	May	16	09	44	Full Moon	Dec	08	09	38
Last Quarter	May	23	00	13	Last Quarter	Dec	16	14	26
New Moon	May	30	17	00	New Moon	Dec	23	15	47
First Quarter	Jun	07	20	18	First Quarter	Dec,22	30	06	51
Full Moon	Jun	14	17	22	Full Moon	Jan, 23	07	04	38
Last Quarter	Jun	21	08	41	Last Quarter	Jan, 23	15	07	40
New Moon	Jun	29	08	22	New Moon	Jan, 23	22	02	23
First Quarter	Jul	07	07	44	First Quarter	Jan, 23	28	20	49

PART - IV

ECLIPSES AND OCCULTATIONS

ECLIPSES, 2022

In the year 2022, there are two eclipses of the Sun and two eclipses of the Moon.

I	April	30	Partial eclipse of the Sun	320–322
II	May	16	Total Eclipse of the Moon	332
III	October	25	Partial eclipse of the Sun	323–331
IV	November	8	Total Eclipse of the Moon	333–336

I-Partial eclipse of the Sun, April 30, 2022, Saturday.

Not visible in India.

Area of Visibility

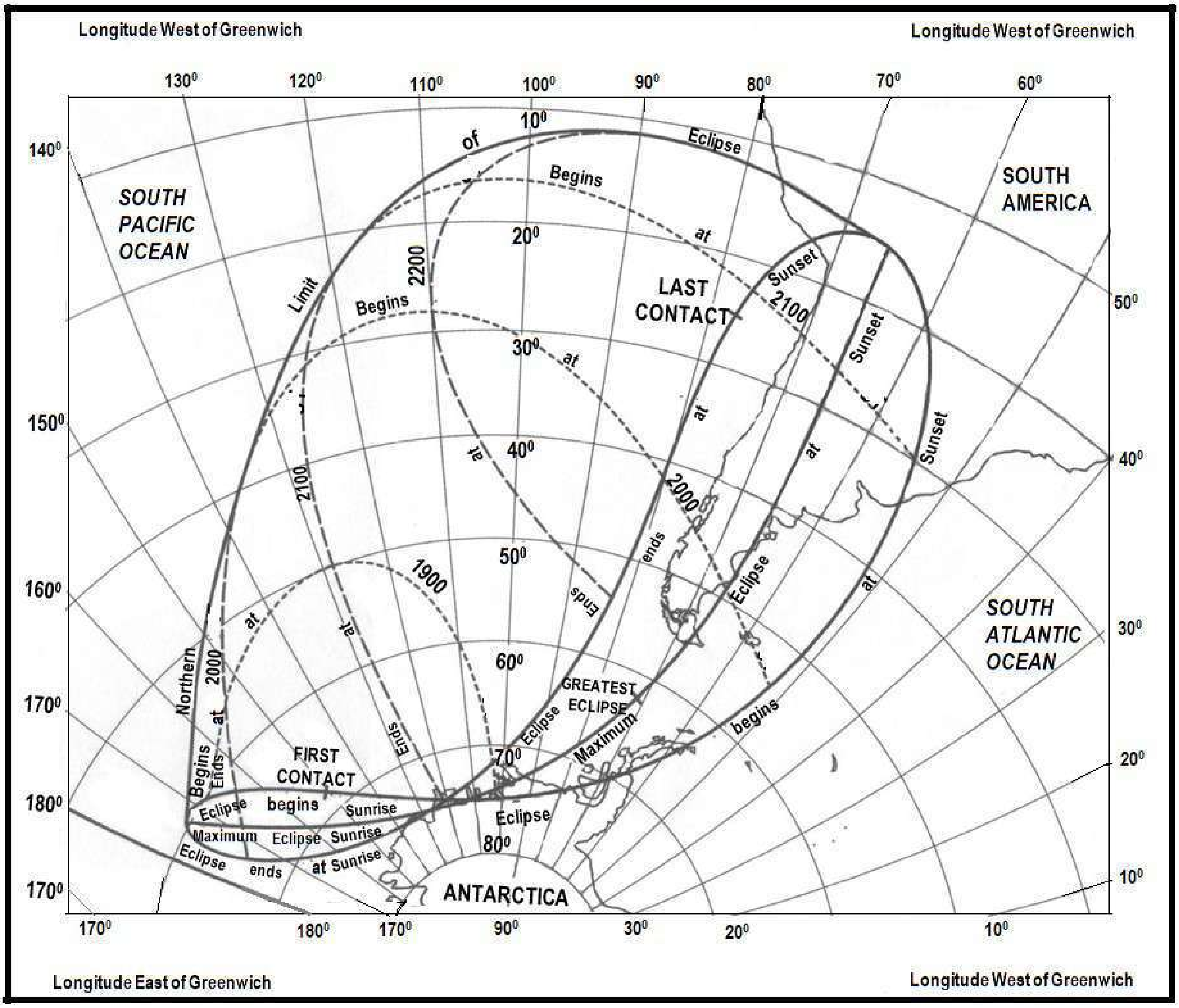
The eclipse will be visible in the region covering extreme northern Antarctica, southern South America, the South Pacific Ocean and the South Atlantic Ocean.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : April $30^d\ 19^h\ 40^m\ 46^s.74$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	2	32	05.97	2	32	05.98
Hourly Motion			117.50			9.55
	°	'	"	°	'	"
Declination	13	45	20.98	14	57	07.36
Hourly Motion		12	22.23			45.67
Equatorial Horizontal Parallax		55	18.82			08.73
True Semi-diameter		15	04.01		15	52.60

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	30	18	45.5	1	0	15.5	-68	03.9	-150	33.6
Greatest eclipse*	30	20	41.4	1	2	11.4	-62	13.6	-71	34.0
Eclipse ends	30	22	37.8	1	4	07.8	-25	07.8	-77	23.1

*Magnitude of the eclipse = 0.639

PARTIAL SOLAR ECLIPSE OF APRIL 30, 2022



The timings of beginning and ending are expressed in UT

ECLIPSES, 2022

BESSELIAN ELEMENTS OF THE PARTIAL ECLIPSE OF THE SUN
APRIL 30

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane
h	m	x	y	sin d	cos d	μ °	'	"	l_1
18	30	-0.570133	-1.552422	+0.257817	+0.966194	98	11	57.7	+0.549111
	40	-0.490930	-1.517455	+0.257852	+0.966185	100	41	59.2	+0.549097
	50	-0.411725	-1.482489	+0.257886	+0.966175	103	12	00.7	+0.549082
19	00	-0.332517	-1.447524	+0.257920	+0.966166	105	42	02.2	+0.549067
	10	-0.253308	-1.412561	+0.257954	+0.966157	108	12	03.7	+0.549051
	20	-0.174098	-1.377600	+0.257989	+0.966148	110	42	05.2	+0.549035
	30	-0.094886	-1.342640	+0.258023	+0.966139	113	12	06.6	+0.549018
	40	-0.015672	-1.307682	+0.258057	+0.966130	115	42	08.1	+0.549000
	50	+0.063542	-1.272725	+0.258091	+0.966121	118	12	09.6	+0.548982
20	00	+0.142758	-1.237770	+0.258125	+0.966111	120	42	11.1	+0.548963
	10	+0.221975	-1.202817	+0.258160	+0.966102	123	12	12.6	+0.548943
	20	+0.301192	-1.167866	+0.258194	+0.966093	125	42	14.1	+0.548922
	30	+0.380410	-1.132917	+0.258228	+0.966084	128	12	15.5	+0.548901
	40	+0.459628	-1.097970	+0.258262	+0.966075	130	42	17.0	+0.548880
	50	+0.538846	-1.063025	+0.258297	+0.966066	133	12	18.5	+0.548857
21	00	+0.618065	-1.028083	+0.258331	+0.966057	135	42	20.0	+0.548834
	10	+0.697283	-0.993142	+0.258365	+0.966047	138	12	21.5	+0.548811
	20	+0.776502	-0.958204	+0.258399	+0.966038	140	42	22.9	+0.548787
	30	+0.855719	-0.923269	+0.258433	+0.966029	143	12	24.4	+0.548762
	40	+0.934937	-0.888336	+0.258468	+0.966020	145	42	25.9	+0.548736
	50	+1.014153	-0.853406	+0.258502	+0.966011	148	12	27.4	+0.548710
22	00	+1.093369	-0.818478	+0.258536	+0.966002	150	42	28.8	+0.548683
	10	+1.172583	-0.783553	+0.258570	+0.965992	153	12	30.3	+0.548656
	20	+1.251797	-0.748631	+0.258604	+0.965983	155	42	31.8	+0.548628
	30	+1.331009	-0.713711	+0.258639	+0.965974	158	12	33.3	+0.548599
	40	+1.410219	-0.678795	+0.258673	+0.965965	160	42	34.8	+0.548570
	50	+1.489428	-0.643882	+0.258707	+0.965956	163	12	36.2	+0.548540

tanf 1= 0.00464954 tanf 2= 0.00462641

TT hr	d °	'	"	Variations per minute x'	y'	μ' '	"
19	14	56	48	+0.007921	+0.003496	15	00
20	14	57	32	+0.007922	+0.003495	15	00
21	14	58	16	+0.007922	+0.003494	15	00
22	14	59	00	+0.007921	+0.003493	15	00

$\xi' = 0.004364\ \rho\cos\phi'\cos(\mu+\lambda)$ $\eta' = 0.004364\ \xi\sin d$

*d stands for declination and μ stands for hour angle

ECLIPSES, 2022

III- Partial eclipse of the Sun, October 25, 2022, Tuesday.

Visible in India.

Area of Visibility

The eclipse is visible in the region covering Europe, the Middle East, northern Africa, western Asia, the North Atlantic Ocean and the North Indian Ocean.

In India the eclipse will begin before sunset in the afternoon and will be seen from most of the places. However, the same cannot be seen from Andaman & Nicobar Islands and some parts of north-east India (name of few of such places are Aizawl, Dibrugarh, Imphal, Itanagar, Kohima, Sibsagar, Silchar, Tamelong).

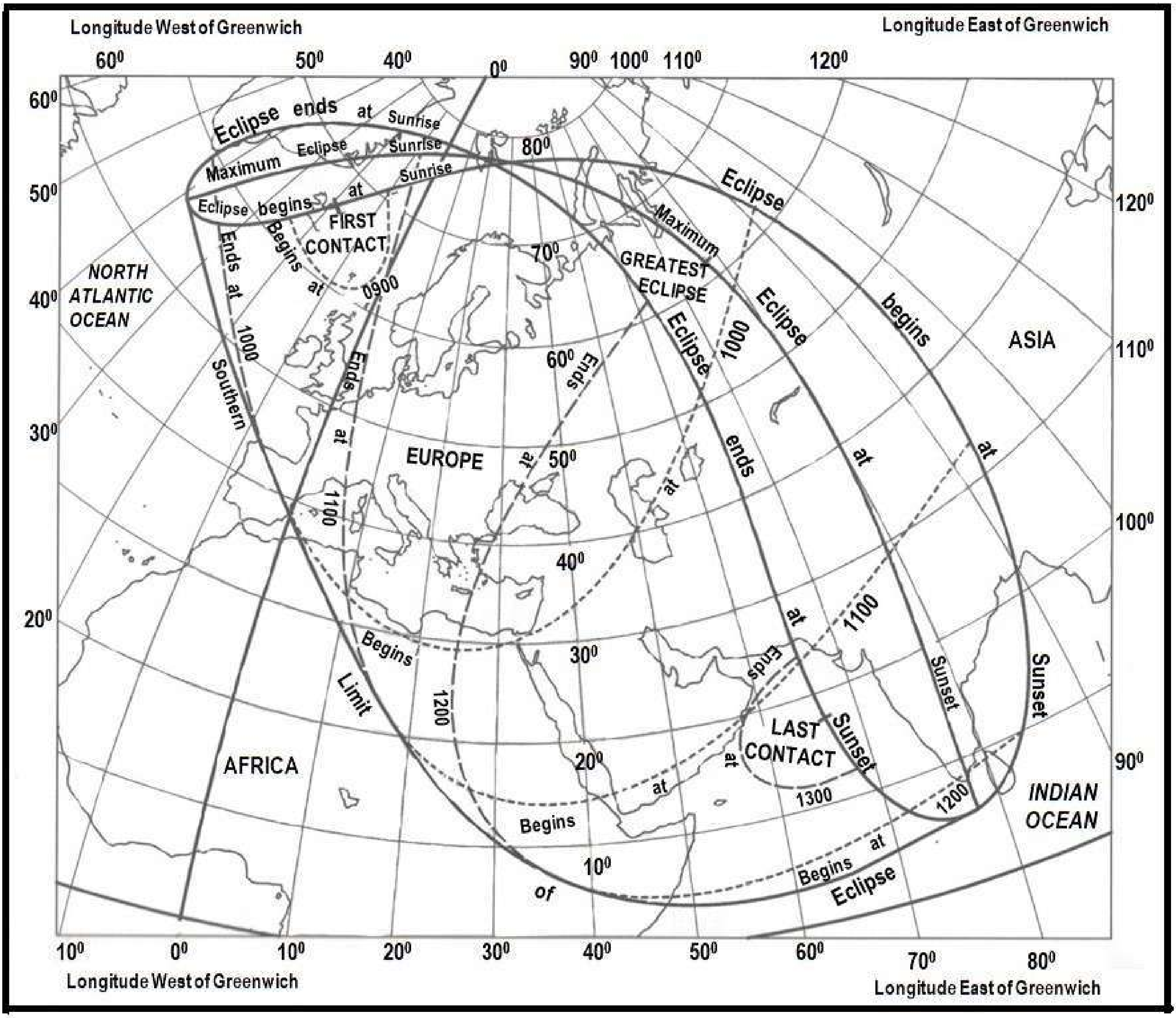
The ending of the eclipse will not be visible from India as the same will be in progress after sunset.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : October $25^d\,10^h\,03^m\,44^s.11$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	13	59	11.49	13	59	11.50
Hourly Motion			127.00			9.57
	°	'	"	°	'	"
Declination	-11	00	24.78	-12	09	28.51
Hourly Motion		-14	44.10			-51.61
Equatorial Horizontal Parallax		58	14.53			08.84
True Semi-diameter		15	51.86		16	04.97

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	25	8	58.5	25	14	28.5	66	29.7	-18	56.2
Greatest eclipse*	25	11	00.2	25	16	30.2	61	46.6	+77	16.8
Eclipse ends	25	13	02.2	25	18	32.2	17	35.8	+66	32.2

*Magnitude of the eclipse = 0.861

PARTIAL SOLAR ECLIPSE OF OCTOBER 25, 2022



The timings of beginning and ending are expressed in UT

ECLIPSES, 2022

BESSELIAN ELEMENTS OF THE PARTIAL ECLIPSE OF THE SUN
OCTOBER 25

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane
h	m	x	y	sin d	cos d	μ °	'	"	l_1
8	30	-0.783794	+1.567794	-0.210285	+0.977640	311	28	34.2	+0.549179
	40	-0.701246	+1.527860	-0.210325	+0.977632	313	58	35.7	+0.549170
	50	-0.618695	+1.487926	-0.210364	+0.977623	316	28	37.1	+0.549159
9	00	-0.536139	+1.447991	-0.210403	+0.977615	318	58	38.6	+0.549148
	10	-0.453578	+1.408056	-0.210442	+0.977606	321	28	40.1	+0.549136
	20	-0.371015	+1.368120	-0.210481	+0.977598	323	58	41.5	+0.549124
	30	-0.288447	+1.328185	-0.210520	+0.977590	326	28	43.0	+0.549111
	40	-0.205876	+1.288249	-0.210559	+0.977581	328	58	44.4	+0.549097
	50	-0.123302	+1.248314	-0.210598	+0.977573	331	28	45.9	+0.549082
10	00	-0.040725	+1.208378	-0.210637	+0.977564	333	58	47.4	+0.549067
	10	+0.041855	+1.168443	-0.210677	+0.977556	336	28	48.8	+0.549051
	20	+0.124437	+1.128508	-0.210716	+0.977547	338	58	50.3	+0.549035
	30	+0.207022	+1.088574	-0.210755	+0.977539	341	28	51.7	+0.549018
	40	+0.289609	+1.048641	-0.210794	+0.977531	343	58	53.2	+0.549000
	50	+0.372198	+1.008708	-0.210833	+0.977522	346	28	54.7	+0.548982
11	00	+0.454789	+0.968776	-0.210872	+0.977514	348	58	56.1	+0.548963
	10	+0.537381	+0.928845	-0.210911	+0.977505	351	28	57.6	+0.548943
	20	+0.619975	+0.888915	-0.210950	+0.977497	353	58	59.0	+0.548922
	30	+0.702570	+0.848986	-0.210989	+0.977488	356	29	00.5	+0.548901
	40	+0.785166	+0.809058	-0.211028	+0.977480	358	59	01.9	+0.548880
	50	+0.867763	+0.769132	-0.211067	+0.977472	361	29	03.4	+0.548857
12	00	+0.950360	+0.729207	-0.211106	+0.977463	363	59	04.8	+0.548834
	10	+1.032958	+0.689284	-0.211146	+0.977455	366	29	06.3	+0.548811
	20	+1.115556	+0.649362	-0.211185	+0.977446	368	59	07.8	+0.548787
	30	+1.198154	+0.609443	-0.211224	+0.977438	371	29	09.2	+0.548762
	40	+1.280751	+0.569525	-0.211263	+0.977429	373	59	10.7	+0.548736
	50	+1.363348	+0.529609	-0.211302	+0.977421	376	29	12.1	+0.548710
13	00	+1.445945	+0.489696	-0.211341	+0.977412	378	59	13.6	+0.548683
	10	+1.528541	+0.449784	-0.211380	+0.977404	381	29	15.0	+0.548656
	20	+1.611136	+0.409875	-0.211419	+0.977396	383	59	16.5	+0.548628
	30	+1.693729	+0.369969	-0.211458	+0.977387	386	29	17.9	+0.548599

tanf 1= 0.00470948

tanf 2= 0.00468606

TT	d			Variations per minute			
hr	°	'	"	x'	y'	μ' '	"
9	-12	08	45	+0.008 256	-0.003994	15	00
10	-12	09	35	+0.008 258	-0.003994	15	00
11	-12	10	24	+0.008 259	-0.003993	15	00
12	-12	11	14	+0.008 260	-0.003992	15	00
13	-12	12	03	+0.008 260	-0.003991	15	00

$\xi' = 0.004364\ \rho \cos\phi' \cos(\mu+\lambda)$

$\eta' = 0.004364\ \xi \sin d$

*d stands for declination and μ stands for hour angle

ECLIPSES, 2022
THE PARTIAL ECLIPSE OF THE SUN, OCTOBER 25
LOCAL CIRCUMSTANCES RELATING TO INDIA

BEGINNING OF ECLIPSE FOR STATIONS IN INDIA
TIME IN I.S.T.

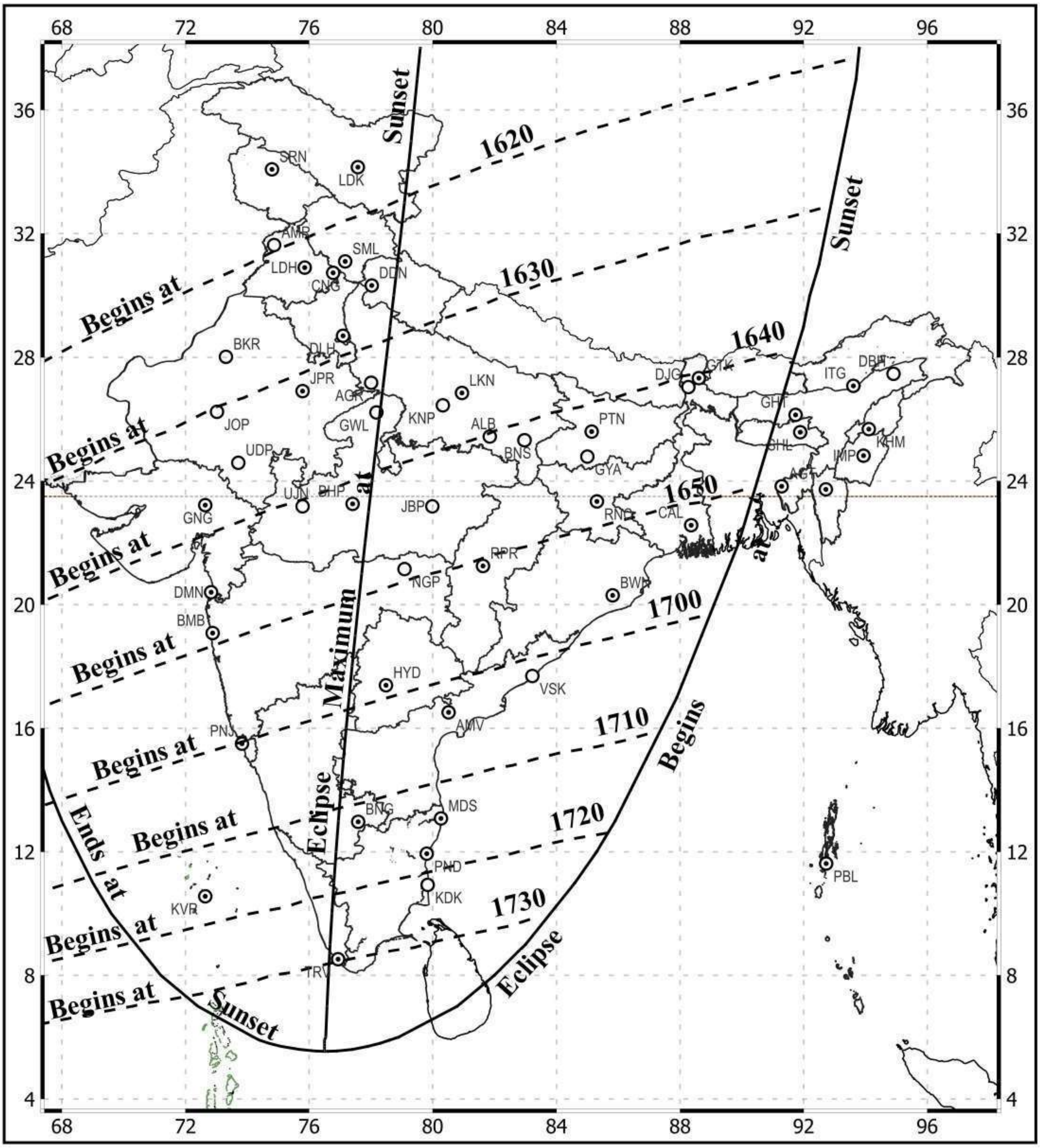
Lat (North)	Longitude East of Greenwich Beginning								
	68°	72°	76°	80°	84°	88°	92°	96°	100°
	h m	h m	h m	h m	h m	h m	h m	h m	h m
36°	16 02.8	16 07.4	16 11.5	16 15.1	16 18.2	16 20.9	16 23.1	– (16 18)	– (16 02)
32°	16 11.7	16 16.3	16 20.3	16 23.9	16 27.0	16 29.7	16 31.9	– (16 23)	– (16 07)
28°	16 21.1	16 25.6	16 29.6	16 33.1	16 36.2	16 38.8	16 41.0	– (16 28)	– (16 12)
24°	16 31.0	16 35.4	16 39.4	16 42.8	16 45.8	16 48.4	– (16 48)	– (16 32)	– (16 16)
20°	16 41.7	16 46.0	16 49.8	16 53.2	16 56.2	16 58.8	– (16 52)	– (16 36)	– (16 20)
16°	16 53.4	16 57.5	17 01.2	17 04.6	17 07.7	17 10.4	– (16 55)	– (16 39)	– (16 23)
12°	17 06.7	17 10.7	17 14.4	17 18.0	17 21.4	– (17 15)	– (16 59)	– (16 43)	– (16 27)
8°	17 23.0	17 27.2	17 31.5	17 36.3	– (17 35)	– (17 19)	– (17 03)	– (16 47)	– (16 31)

ENDING OF ECLIPSE FOR STATIONS IN INDIA
TIME IN I.S.T.

Lat (North)	Longitude East of Greenwich Beginning								
	68°	72°	76°	80°	84°	88°	92°	96°	100°
	h m	h m	h m	h m	h m	h m	h m	h m	h m
36°	– (18 10)	– (17 54)	– (17 38)	– (17 22)	– (17 06)	– (16 50)	– (16 34)	– (16 18)	– (16 02)
32°	– (18 15)	– (17 59)	– (17 43)	– (17 27)	– (17 11)	– (16 55)	– (16 39)	– (16 23)	– (16 07)
28°	– (18 20)	– (18 04)	– (17 48)	– (17 32)	– (17 16)	– (17 00)	– (16 44)	– (16 28)	– (16 12)
24°	– (18 24)	– (18 08)	– (17 52)	– (17 36)	– (17 20)	– (17 04)	– (16 48)	– (16 32)	– (16 16)
20°	– (18 28)	– (18 12)	– (17 56)	– (17 40)	– (17 24)	– (17 08)	– (16 52)	– (16 36)	– (16 20)
16°	– (18 31)	– (18 15)	– (17 59)	– (17 43)	– (17 27)	– (17 11)	– (16 55)	– (16 39)	– (16 23)
12°	18 29.6	– (18 19)	– (18 03)	– (17 47)	– (17 31)	– (17 15)	– (16 59)	– (16 43)	– (16 27)
8°	18 23.5	18 21.7	– (18 07)	– (17 51)	– (17 35)	– (17 19)	– (17 03)	– (16 47)	– (16 31)

"–" Indicates Sun sets before the corresponding phenomenon (i.e. corresponding phenomenon is not visible)
( ) The value in the bracket indicates sunset time of corresponding locations.

PARTIAL SOLAR ECLIPSE OF OCTOBER 25, 2022



The timings of begining are expressed in IST

ECLIPSES, 2022

THE PARTIAL ECLIPSE OF THE SUN, OCTOBER 25

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA AND ITS NEIGHBOURHOOD

Places	Partial Eclipse Begins (IST)	Position Angles at Eclipse Begins	Greatest Eclipse (IST)	Magnitude	Maximum Obscuration	Partial Eclipse Ends (IST)	Sunset Time (IST)	Duration of Eclipse (from the beginning and upto Sunset time)
	h m	P V	h m				h m	h m
Agartala	16 50.5	330 264	*	0.371	25.2%	*	16 51	0 00.5
Ahmedabad	16 38.5	328 267	17 37.1	0.451	33.6%	*	18 06	1 27.5
Ajmer	16 32.0	324 266	17 32.9	0.512	40.3%	*	17 55	1 23.0
Allahabad	16 40.6	325 264	*	0.462	34.7%	*	17 27	0 46.4
Amritsar	16 20.1	318 267	17 24.8	0.606	50.9%	*	17 48	1 27.9
Bangalore	17 12.4	346 271	17 50.8	0.194	9.9%	*	17 56	0 43.6
Bhagalpur	16 44.7	326 263	*	0.428	31.1%	*	17 07	0 22.3
Bhopal	16 42.4	328 265	17 38.2	0.437	32.1%	*	17 47	1 04.6
Bhubaneswar	16 56.7	334 265	*	0.323	20.8%	*	17 16	0 19.3
Cannanore	17 14.4	348 273	17 51.7	0.177	8.7%	*	18 06	0 51.6
Chandigarh	16 23.5	318 265	17 26.5	0.591	49.1%	*	17 38	1 14.5
Chennai	17 14.5	346 271	*	0.181	8.9%	*	17 45	0 30.5
Cochin	17 22.7	353 275	17 53.7	0.124	5.1%	*	18 04	0 41.3
Cooch Behar	16 43.6	325 263	*	0.436	31.9%	*	16 56	0 12.4
Cuttack	16 56.2	333 265	*	0.328	21.2%	*	17 16	0 19.8
Darjeeling	16 41.2	324 263	*	0.458	34.3%	*	17 00	0 18.8
Dehradun	16 26.1	319 265	17 28.0	0.573	47.0%	*	17 37	1 10.9
Delhi	16 29.3	321 265	17 30.5	0.544	43.8%	*	17 42	1 12.7
Dwarka	16 36.5	329 270	17 36.6	0.446	33.1%	*	18 21	1 44.5
Gandhinagar	16 38.1	328 267	17 36.9	0.454	33.9%	*	18 06	1 27.9
Gangtok	16 40.7	324 263	*	0.462	34.7%	*	16 58	0 17.3
Guwahati	16 45.2	326 263	*	0.417	29.9%	*	16 47	0 01.8
Gaya	16 44.6	327 263	*	0.430	31.3%	*	17 15	0 30.4
Haridwar	16 25.7	319 265	17 27.7	0.576	47.4%	*	17 36	1 10.3
Hazaribagh	16 46.8	328 264	*	0.411	29.3%	*	17 14	0 27.2
Hubli	17 00.5	339 269	17 47.1	0.282	17.1%	*	18 02	1 01.5
Hyderabad	16 59.1	337 267	17 45.9	0.300	18.7%	*	17 48	0 48.9
Jaipur	16 32.2	323 266	17 32.7	0.515	40.6%	*	17 50	1 17.8

"*" indicates phenomenon will not occur in that place.

ECLIPSES, 2022

THE PARTIAL ECLIPSE OF THE SUN, OCTOBER 25

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA AND ITS NEIGHBOURHOOD

Places	Partial Eclipse Begins (IST)	Position Angles at Eclipse Begins	Greatest Eclipse (IST)	Magnitude	Maximum Obscuration	Partial Eclipse Ends (IST)	Sunset Time (IST)	Duration of Eclipse (from the beginning and upto Sunset time)
	h m	P V	h m				h m	h m
Jalandhar	16 20.3	318 266	17 24.6	0.610	51.3%	*	17 43	1 22.7
Jammu	16 17.7	317 267	17 23.1	0.624	52.9%	*	17 47	1 29.3
Kanyakumari	17 32.8	0 280	17 55.6	0.067	2.1%	*	18 00	0 27.2
Kavalur	17 14.0	346 271	*	0.184	9.2%	*	17 49	0 35.0
Kavaratti	17 15.7	350 274	17 52.3	0.164	7.8%	*	18 16	1 00.3
Kolhapur	16 57.5	338 269	17 46.1	0.302	18.9%	*	18 06	1 08.5
Kolkata	16 52.3	331 264	*	0.360	24.2%	*	17 04	0 11.7
Koraput	16 58.5	335 266	*	0.309	19.4%	*	17 30	0 31.5
Kozikode	17 17.0	349 273	17 52.4	0.160	7.5%	*	18 05	0 48.0
Kurnool	17 03.6	340 269	17 47.8	0.262	15.4%	*	17 51	0 47.4
Lucknow	16 36.6	323 264	*	0.495	38.3%	*	17 29	0 52.4
Madurai	17 24.6	354 276	17 53.9	0.113	4.4%	*	17 56	0 31.4
Mangalore	17 10.2	345 271	17 50.5	0.207	10.9%	*	18 07	0 56.8
Midnapore	16 52.0	331 264	*	0.364	24.6%	*	17 08	0 16.0
Mount Abu	16 34.7	326 267	17 34.9	0.482	36.9%	*	18 04	1 29.3
Mumbai	16 49.8	334 268	17 42.9	0.359	24.3%	*	18 09	1 19.2
Murshidabad	16 47.9	328 263	*	0.399	28.1%	*	17 01	0 13.1
Muzaffarpur	16 41.6	325 263	*	0.456	34.0%	*	17 12	0 30.4
Mysore	17 14.0	347 272	17 51.4	0.182	9.0%	*	18 00	0 46.0
Nagpur	16 49.4	331 265	17 41.4	0.382	26.5%	*	17 42	0 52.6
Nalgonda	17 01.0	338 267	*	0.285	17.3%	*	17 46	0 45.0
Nasik	16 47.7	332 267	17 41.7	0.380	26.4%	*	18 05	1 17.3
Nellore	17 09.5	343 270	*	0.218	11.8%	*	17 45	0 35.5
Nowgong	16 39.7	325 264	17 36.2	0.465	35.1%	*	17 37	0 57.3
Panaji	17 00.3	339 269	17 47.2	0.280	17.0%	*	18 06	1 05.7
Patna	16 42.7	325 263	*	0.447	33.1%	*	17 14	0 31.3
Pondicherry	17 18.2	349 273	*	0.155	7.1%	*	17 48	0 29.8
Pune	16 51.9	334 268	17 43.7	0.347	23.1%	*	18 06	1 14.1

"*" indicates phenomenon will not occur in that place.

ECLIPSES, 2022

THE PARTIAL ECLIPSE OF THE SUN, OCTOBER 25

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA AND ITS NEIGHBOURHOOD

Places	Partial Eclipse Begins (IST)	Position Angles at Eclipse Begins	Greatest Eclipse (IST)	Magnitude	Maximum Obscuration	Partial Eclipse Ends (IST)	Sunset Time (IST)	Duration of Eclipse (from the beginning and upto Sunset time)
	h m	P V	h m				h m	h m
Puri	16 57.9	334 265	*	0.313	19.8%	*	17 17	0 19.1
Raipur	16 51.2	331 265	*	0.371	25.3%	*	17 32	0 40.8
Rajamundry	17 03.4	339 267	*	0.268	15.8%	*	17 33	0 29.6
Rajkot	16 38.5	329 268	17 37.5	0.440	32.5%	*	18 14	1 35.5
Ranchi	16 48.4	329 264	*	0.396	27.8%	*	17 15	0 26.6
Sambalpur	16 52.2	331 265	*	0.363	24.5%	*	17 22	0 29.8
Shillong	16 46.7	327 263	*	0.403	28.5%	*	16 47	0 00.3
Shimla	16 23.5	319 265	17 26.5	0.590	49.0%	*	17 39	1 15.5
Siliguri	16 42.1	325 263	*	0.450	33.3%	*	17 00	0 17.9
Silvassa	16 45.7	331 268	17 40.9	0.393	27.7%	*	18 07	1 21.3
Srinagar	16 14.5	316 267	17 20.7	0.646	55.6%	*	17 45	1 30.5
Sringeri	17 08.1	344 271	17 49.8	0.223	12.2%	*	18 03	0 54.9
Thanjavur	17 21.9	352 274	*	0.130	5.4%	*	17 52	0 30.1
Thiruvanantapuram	17 30.1	358 279	17 55.2	0.081	2.7%	*	18 02	0 31.9
Trichur	17 19.2	351 274	17 52.9	0.146	6.5%	*	18 02	0 42.8
Udaipur	16 35.7	326 267	17 35.3	0.478	36.5%	*	18 00	1 24.3
Ujjain	16 41.2	328 266	17 38.0	0.441	32.6%	*	17 53	1 11.8
Vadodara	16 41.0	329 267	17 38.4	0.433	31.7%	*	18 04	1 23.0
Varanasi	16 41.9	325 263	*	0.452	33.6%	*	17 22	0 40.1
Vijayawada	17 03.5	339 268	*	0.266	15.7%	*	17 40	0 36.5
Colombo	17 40.2	6 284	*	0.034	0.7%	*	17 49	0 08.8
Dhaka	16 49.5	329 264	*	0.381	26.2%	*	16 53	0 03.5
Islamabad	16 12.8	316 268	17 19.8	0.651	56.2%	*	17 51	1 38.2
Karachi	16 26.3	326 271	17 30.8	0.511	40.2%	*	18 26	1 59.7
Kathmandu	16 36.7	322 263	*	0.498	38.6%	*	17 10	0 33.3
Lahore	16 18.9	318 267	17 24.1	0.613	51.7%	*	17 49	1 30.1
Rwalpindi	16 13.0	316 268	17 20.1	0.649	55.9%	*	17 52	1 39.0
Thimpu	16 40.4	324 262	17 32.9	0.463	34.7%	*	16 52	0 11.6

"*" indicates phenomenon will not occur in that place.

ECLIPSES, 2022

THE PARTIAL ECLIPSE OF THE SUN, OCTOBER 25

EASTERN LIMIT OF THE VISIBILITY OF THE ECLIPSE

Latitude	Begins at Sunset				Maximum at Sunset				Ends at Sunset			
	Longitude (Geographic)		Time (IST)		Longitude (Geographic)		Time (IST)		Longitude (Geographic)		Time (IST)	
	°	'	h	m	°	'	h	m	°	'	h	m
6	78	55	17	53.2	76	32	18	02.7	74	10	18	12.2
7	80	46	17	44.9	76	35	18	01.6	72	24	18	18.4
8	82	01	17	39.0	76	38	18	00.6	71	15	18	22.1
9	83	00	17	34.2	76	41	17	59.5	70	22	18	24.7
10	83	51	17	29.9	76	44	17	58.3	69	38	18	26.8
11	84	35	17	26.1	76	48	17	57.2	69	01	18	28.3
12	85	15	17	22.5	76	52	17	56.0	68	30	18	29.5
13	85	52	17	19.2	76	57	17	54.8	68	02	18	30.5
14	86	25	17	16.0	77	02	17	53.6	67	38	18	31.1
15	86	57	17	13.0	77	07	17	52.3	67	17	18	31.6
16	87	26	17	10.1	77	12	17	51.0	66	58	18	31.9
17	87	54	17	07.3	77	18	17	49.7	66	42	18	32.1
18	88	20	17	04.6	77	24	17	48.4	66	27	18	32.1
19	88	45	17	02.0	77	30	17	47.0	66	15	18	32.0
20	89	08	16	59.5	77	36	17	45.6	66	04	18	31.7
21	89	31	16	57.0	77	42	17	44.2	65	54	18	31.4
22	89	52	16	54.5	77	49	17	42.7	65	46	18	30.9
23	90	12	16	52.2	77	56	17	41.3	65	39	18	30.4
24	90	32	16	49.8	78	02	17	39.8	65	33	18	29.8
25	90	51	16	47.5	78	09	17	38.3	65	28	18	29.0
26	91	09	16	45.3	78	16	17	36.7	65	24	18	28.2
27	91	26	16	43.0	78	23	17	35.2	65	21	18	27.3
28	91	42	16	40.8	78	30	17	33.6	65	18	18	26.4
29	91	58	16	38.7	78	37	17	32.0	65	17	18	25.4
30	92	13	16	36.5	78	44	17	30.4	65	16	18	24.3
31	92	28	16	34.4	78	51	17	28.8	65	15	18	23.2
32	92	41	16	32.2	78	58	17	27.1	65	15	18	22.0
33	92	55	16	30.1	79	05	17	25.4	65	16	18	20.7
34	93	07	16	28.0	79	12	17	23.7	65	17	18	19.4
35	93	19	16	25.9	79	18	17	22.0	65	18	18	18.0

Note:-1) As a result of atmospheric refraction, the sun is visible about half a degree above the horizon at the stated moment. At that time, however, the setting of the upper limb of the sun occurs at places about a degree west of the above line.

2) The beginning, the maximum and the ending of the eclipse are not visible at places to the east of the respective lines, as the phases occur after sunset.

ECLIPSES, 2022

II- Total Eclipse of the Moon, May 16, 2022, Monday

Not Visible in India

Eclipse will be visible in the region covering western Europe, the Middle East, Africa, North America, South America, Antarctica, the Atlantic Ocean and the Pacific Ocean.

The places from where the beginning of the umbral phase is visible at the time of moonset are Madagascar, Kenya, Ethiopia, Egypt, Sudan, Bulgaria, Romania, Poland, Germany and Norway.

The places from where the ending of the umbral phase is visible at the time of moonrise are New Zealand, Fiji, the North Pacific Ocean, north western parts of Canada and extreme south eastern parts of Alaska.

ELEMENTS OF THE ECLIPSE						
Universal Time of Opposition in Right Ascension : May $16^d 4^h 20^m 50^s 31$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	15	31	50.98	3	31	51.03
Hourly Motion			148.95			09.90
	°	'	"	°	'	"
Declination	-19	21	33.36	19	05	18.08
Hourly Motion		-12	10.48	-		34.62
Equatorial Horizontal Parallax		60	33.24			08.70
True Semi-diameter		16	29.64		15	49.25

	Universal Time			Indian Standard Time			Position Angle measured from the North Point of Moon's Limb (N.E.S.W.)	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	16	1	30.8	16	7	00.8	100	-18	47	-24	57
Moon enters umbra	16	2	27.6	16	7	57.6	95	-18	58	-38	37
Moon enters Totality	16	3	28.7	16	8	58.7	258	-19	11	-53	18
Middle of the eclipse*	16	4	11.6	16	9	41.6	–	-19	20	-63	35
Moon leaves Totality	16	4	54.4	16	10	24.4	141	-19	28	-73	53
Moon leaves umbra	16	5	55.5	16	11	25.5	304	-19	41	-88	33
Moon leaves penumbra	16	6	52.3	16	12	22.3	299	-19	52	-102	12

*Magnitude of the eclipse =1.420 (Moon's diam =1.0). Distance between the centers at middle 920".7

Radius of shadow cone at Moon's distance: Penumbra 4677".7, Umbra 2741".3

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (2h 27.6m U.T.)						Western Limit Moonrise at ending (5h 55.5m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
°	°	'	°	°	'	°	°	'	°	°	'
-50	+75	35	+10	+47	55	-50	+156	13	+10	-174	56
40	68	09	20	44	12	40	163	59	20	171	05
30	62	50	30	39	57	30	169	32	30	166	38
20	58	35	40	34	37	20	173	58	40	161	06
-10	54	52	50	27	12	-10	+177	50	50	153	20
0	+51	23	+60	+14	51	0	-178	33	+60	-140	17

The eclipse is visible in the region west of the eastern limit and east of the western limit. Here, moonset and moonrise times relate to visibility of the center of the Moon on the horizon.

ECLIPSES, 2022

IV- Total Eclipse of the Moon, November 8, 2022, Tuesday

Visible in India

Eclipse will be visible in the region covering South America, North America, Australia, Asia, the North Atlantic Ocean, and the Pacific Ocean.

The places from where the beginning of the umbral phase is visible at the time of moonset are western parts of Argentina, Chile, Bolivia, western parts of Brazil and the North Atlantic Ocean.

The places from where the ending of the umbral phase is visible at the time of moonrise are the Indian Ocean, India, Pakistan, Afghanistan, Kazakhstan, Uzbekistan and Eastern Russia.

The eclipse is visible from all places of India at the time of Moonrise. However, the beginning of the partial and total phases of the eclipse is not visible from any places of India as the phenomena will be in progress before Moonrise. Ending of both the total and the partial phases is visible from the eastern parts of the country. Only the ending of the partial phase is visible from the rest parts of the country.

ELEMENTS OF THE ECLIPSE						
Universal Time of Opposition in Right Ascension : November $8^d\,11^h\,11^m\,26^s19$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	2	54	13.49	14	54	13.24
Hourly Motion			124.14			108.03
	°	'	"	°	'	"
Declination	16	53	33.52	-16	37	54.98
Hourly Motion		11	59.13			-43.37
Equatorial Horizontal Parallax		56	07.55			08.88
True Semi-diameter		15	17.28		16	08.56

	Universal Time			Indian Standard Time			Position Angle measured from the North Point of Moon's Limb (N.E.S.W.)	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	8	8	00.4	8	13	30.4	77	16	15	-125	23
Moon enters umbra	8	9	08.9	8	14	38.9	82	16	29	-141	57
Moon enters Totality	8	10	16.3	8	15	46.3	282	16	42	-158	17
Middle of the eclipse*	8	10	59.1	8	16	29.1	–	16	51	-168	39
Moon leaves Totality	8	11	42.0	8	17	12.0	33	17	00	-179	02
Moon leaves umbra	8	12	49.4	8	18	19.4	233	17	13	164	39
Moon leaves penumbra	8	13	57.9	8	19	27.9	238	17	27	148	05

*Magnitude of the eclipse =1.363 (Moon's diam =1.0). Distance between the centers at middle 866".3

Radius of shadow cone at Moon's distance: Penumbra 4425".1, Umbra 2449".2

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (9h 08.9m U.T.)						Western Limit Moonrise at ending (12h 49.4m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
°	°	'	°	°	'	°	°	'	°	°	'
-50	-72	36	+10	-48	58	-50	+96	19	+10	+ 71	31
40	66	20	20	45	46	40	89	43	20	68	10
30	61	47	30	42	07	30	84	57	30	64	20
20	58	08	40	37	35	20	81	07	40	59	35
-10	54	57	50	31	19	-10	77	47	50	52	58
0	-51	57	+60	-21	08	0	+74	39	+60	+ 42	11

The eclipse is visible in the region west of the eastern limit and east of the western limit. Here, moonset and moonrise times relate to visibility of the center of the Moon on the horizon.

ECLIPSES, 2022

THE TOTAL ECLIPSE OF THE MOON, NOVEMBER 8

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA AND ITS NEIGHBOURHOOD

Places	Moonrise Time (IST)	Umbral Phase Begins at 14h 39m (IST)	Totality Begins at 15 h 46m (IST)	Totality Ends at 17h 12m (IST)	Umbral Phase Ends at 18 h 19m (IST)	Duration of Eclipse (from Moonrise time upto the end of umbral phase)
	h m	h m	h m	h m	h m	h m
Agartala	16 38	*	*	Visible	Visible	1 41
Ahmadabad	17 56	*	*	*	Visible	0 23
Aizawl	16 32	*	*	Visible	Visible	1 47
Ajmer	17 43	*	*	*	Visible	0 36
Allahabad	17 15	*	*	*	Visible	1 04
Amritsar	17 33	*	*	*	Visible	0 46
Bangalore	17 50	*	*	*	Visible	0 29
Bhagalpur	16 54	*	*	Visible	Visible	1 25
Bhopal	17 36	*	*	*	Visible	0 43
Bhubaneswar	17 06	*	*	Visible	Visible	1 13
Cannanore	18 01	*	*	*	Visible	0 18
Chandigarh	17 23	*	*	*	Visible	0 56
Chennai	17 39	*	*	*	Visible	0 40
Cochin	17 59	*	*	*	Visible	0 20
Cooch Behar	16 42	*	*	Visible	Visible	1 37
Cuttack	17 05	*	*	Visible	Visible	1 14
Darjeeling	16 46	*	*	Visible	Visible	1 33
Dehradun	17 22	*	*	*	Visible	0 57
Delhi	17 29	*	*	*	Visible	0 50
Dibrugarh	16 17	*	*	Visible	Visible	2 02
Dwarka	18 12	*	*	*	Visible	0 07
Gandhinagar	17 55	*	*	*	Visible	0 24
Gangtok	16 44	*	*	Visible	Visible	1 35
Guwahati	16 34	*	*	Visible	Visible	1 45
Gaya	17 03	*	*	Visible	Visible	1 16
Haridwar	17 21	*	*	*	Visible	0 58
Hazaribagh	17 02	*	*	Visible	Visible	1 17
Hubli	17 55	*	*	*	Visible	0 24
Hyderabad	17 40	*	*	*	Visible	0 39
Imphal	16 26	*	*	Visible	Visible	1 53
Itanagar	16 24	*	*	Visible	Visible	1 55
Jaipur	17 37	*	*	*	Visible	0 42

* Indicates Moon rises after the corresponding phenomenon (i.e. corresponding phenomenon is not visible)

ECLIPSES, 2022

THE TOTAL ECLIPSE OF THE MOON, NOVEMBER 8

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA AND ITS NEIGHBOURHOOD

Places	Moonrise Time (IST)	Umbral Phase Begins at 14h 39m (IST)	Totality Begins at 15 h 46m (IST)	Totality Ends at 17h 12m (IST)	Umbral Phase Ends at 18 h 19m (IST)	Duration of Eclipse (from Moonrise time upto the end of umbral phase)
	h m	h m	h m	h m	h m	h m
Jalandhar	17 28	*	*	*	Visible	0 51
Jammu	17 31	*	*	*	Visible	0 48
Kanyakumari	17 57	*	*	*	Visible	0 22
Kavalur	17 42	*	*	*	Visible	0 37
Kavaratti	18 11	*	*	*	Visible	0 08
Kohima	16 24	*	*	Visible	Visible	1 55
Kolhapur	17 59	*	*	*	Visible	0 20
Kolkata	16 52	*	*	Visible	Visible	1 27
Koraput	17 21	*	*	*	Visible	0 58
Kozikode	17 59	*	*	*	Visible	0 20
Lucknow	17 16	*	*	*	Visible	1 03
Madurai	17 52	*	*	*	Visible	0 27
Mangalore	18 01	*	*	*	Visible	0 18
Midnapore	16 57	*	*	Visible	Visible	1 22
Mount Abu	17 53	*	*	*	Visible	0 26
Mumbai	18 01	*	*	*	Visible	0 18
Murshidabad	16 49	*	*	Visible	Visible	1 30
Muzaffarpur	16 59	*	*	Visible	Visible	1 20
Mysore	17 54	*	*	*	Visible	0 25
Nagpur	17 32	*	*	*	Visible	0 47
Nalgonda	17 37	*	*	*	Visible	0 42
Nasik	17 56	*	*	*	Visible	0 23
Nellore	17 38	*	*	*	Visible	0 41
Nowgong	17 25	*	*	*	Visible	0 54
Panaji	17 59	*	*	*	Visible	0 20
Patna	17 01	*	*	Visible	Visible	1 18
Pondicherry	17 42	*	*	*	Visible	0 37
Pune	17 58	*	*	*	Visible	0 21
Port Blair	16 49	*	*	Visible	Visible	1 30
Puri	17 07	*	*	Visible	Visible	1 12
Raipur	17 22	*	*	*	Visible	0 57

* Indicates Moon rises after the corresponding phenomenon (i.e. corresponding phenomenon is not visible)

ECLIPSES, 2022

THE TOTAL ECLIPSE OF THE MOON, NOVEMBER 8

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA AND ITS NEIGHBOURHOOD

Places	Moonrise Time (IST)	Umbral Phase Begins at 14h 39m (IST)	Totality Begins at 15 h 46m (IST)	Totality Ends at 17h 12m (IST)	Umbral Phase Ends at 18 h 19m (IST)	Duration of Eclipse (from Moonrise time upto the end of umbral phase)
	h m	h m	h m	h m	h m	h m
Rajamundry	17 25	*	*	*	Visible	0 54
Rajkot	18 05	*	*	*	Visible	0 14
Ranchi	17 03	*	*	Visible	Visible	1 16
Sambalpur	17 12	*	*	*	Visible	1 07
Shillong	16 33	*	*	Visible	Visible	1 46
Shimla	17 24	*	*	*	Visible	0 55
Sibsagar	16 20	*	*	Visible	Visible	1 59
Silchar	16 31	*	*	Visible	Visible	1 48
Siliguri	16 46	*	*	Visible	Visible	1 33
Silvassa	17 58	*	*	*	Visible	0 21
Srinagar	17 29	*	*	*	Visible	0 50
Sringeri	17 57	*	*	*	Visible	0 22
Tamelong	16 25	*	*	Visible	Visible	1 54
Thanjavur	17 46	*	*	*	Visible	0 33
Thiruvanantapuram	17 58	*	*	*	Visible	0 21
Trichur	17 57	*	*	*	Visible	0 22
Udaipur	17 49	*	*	*	Visible	0 30
Ujjain	17 43	*	*	*	Visible	0 36
Vadodara	17 54	*	*	*	Visible	0 25
Varanasi	17 10	*	*	Visible	Visible	1 09
Vijayawada	17 33	*	*	*	Visible	0 46
Chittagong	16 35	*	*	Visible	Visible	1 44
Colombo	17 45	*	*	*	Visible	0 34
Dhaka	16 40			Visible	Visible	1 39
Islamabad	17 35	*	*	*	Visible	0 44
Karachi	18 15	*	*	*	Visible	0 04
Kathmandu	16 56	*	*	Visible	Visible	1 23
Lahore	17 34	*	*	*	Visible	0 45
Rwalpindi	17 36	*	*	*	Visible	0 43
Thimpu	16 37	*	*	Visible	Visible	1 42
Yangon	16 27	*	*	Visible	Visible	1 52

* Indicates Moon rises after the corresponding phenomenon (i.e. corresponding phenomenon is not visible)

OCCULTATIONS, 2022

PLANETS BY THE MOON

Sl. No.	Date and Ingress - Egress Times (U.T.)			Planet	Magnitude of Planet	Area of Visibility
		h	h			
1.	Feb – 07	19.7	21.4	Uranus	5.8	Edge of Queen Maud Land, South Sandwich Islands.
2.	Mar –07	05.1	08.5	Uranus	5.8	Parts of E. Antarctica, S.E. Australia, S.E. Melanesia, S.W. Polynesia.
3.	Apr –03	15.9	19.9	Uranus	5.9	South and eastern South America, Ascension Island, St Helena Island, edge of western Central Africa.
4.	May–27	00.6	05.5	Venus	–4.0	S. Madagascar, most of S.E. Asia, S.E. China, most of Micronesia.
5.	May–28	11.7	16.1	Uranus	5.9	Easter Island, most of S. America, Cape Verde Islands, most of W. Africa.
6.	June–22	17.5	20.8	Mars	0.5	George V Land, Oates Land, Marie Byrd Land, S.E. Polynesia.
7.	June–24	20.0	24.6	Uranus	5.8	W. and N. Australia, E. Indonesia, N.W. Melanesia, Micronesia, Hawaii.
8.	July –21	14.6	17.3	Mars	0.3	Japan, N.E. Russia, N.W. Alaska, Svalbard, N. Greenland.
9.	July –22	04.0	08.5	Uranus	5.8	N.E. South America, Cape Verde Islands, Madeira, N.W. Africa, Europe (except British Isles and Scandinavia), S.W. Russia, most of Middle East, westernmost China, N. India.
10.	Aug –18	12.2	16.3	Uranus	5.7	Micronesia, most of Hawaii, Alaska, northernmost USA, Canada, Greenland, Iceland.
11.	Sep – 14	20.7	24.2	Uranus	5.7	Most of North Africa, Europe, parts of Middle East, most of Russia, Greenland, northernmost Canada, northwestern Alaska.
12.	Oct – 12	04.5	07.9	Uranus	5.7	N.W. Mexico, W. USA (including Alaska), most of Canada, N. edge of Russia, Greenland, Iceland, Scandinavia.
13.	Nov –08	10.9	14.5	Uranus	5.6	Asia (except W. and S. India), most of Russia, Alaska, Svalbard, N. half of Greenland, most of N. and W. Canada.
14.	Dec– 05	15.6	19.5	Uranus	5.7	Most of North Africa, Azures, Europe (except Iceland), parts of Middle East, Russia, northernmost Japan.
15.	Dec– 08	02.3	06.2	Mars	–1.9	N.W. Mexico, most of USA (except Alaska), Canada, Greenland, Svalbard, Europe, W. Russia, parts of N. Africa.

OCCULTATIONS, 2022

ELEMENTS OF OCCULTATIONS OF PLANETS

Sl. No.	T_0 (U.T. of Conj. in R.A.)			H_0		Y	x′	y′	Body Occulted					
									Right Ascension			Declination		
	d	h	m	h	m				h	m	s	°	′	″
1.	Feb – 07	19	39.0	26	17.0	-1.2799	0.5092	0.2148	2	34	46.9	14	45	25.1
2.	Mar – 07	6	07.8	14	31.0	-0.9070	0.5136	0.2159	2	37	49.2	15	00	28.6
3.	Apr – 03	17	26.6	27	33.2	-0.6159	0.5163	0.2155	2	42	46.5	15	23	58.5
4.	May – 27	2	51.3	17	23.2	-0.2189	0.4587	0.2247	1	47	50.7	8	59	18.2
5.	May– 28	13	41.7	27	12.2	-0.2751	0.5145	0.2074	2	55	01.9	16	18	59.2
6.	June – 22	18	15.7	34	59.7	-1.0130	0.4766	0.2387	1	20	49.1	6	33	27.8
7.	June – 24	22	12.8	37	25.7	-0.0552	0.5139	0.2022	3	00	30.7	16	42	16.4
8.	July – 21	16	46.5	34	07.7	1.1468	0.4859	0.2083	2	37	39.6	13	32	59.1
9.	July – 22	6	21.5	23	18.2	0.2587	0.5161	0.1991	3	04	27.1	16	58	27.0
10.	Aug – 18	14	37.6	33	20.4	0.6000	0.5214	0.1996	3	06	13.4	17	05	25.1
11.	Sep – 14	22	58.7	43	29.9	0.8447	0.5280	0.2034	3	05	32.0	17	02	19.6
12.	Oct – 12	6	46.3	5	08.2	0.9025	0.5322	0.2084	3	02	37.1	16	50	10.0
13.	Nov – 08	13	11.0	13	24.6	0.8023	0.5314	0.2119	2	58	21.1	16	32	19.9
14.	Dec – 05	17	59.3	20	04.4	0.6997	0.5264	0.2124	2	54	03.7	16	14	17.3
15.	Dec – 08	4	25.1	4	35.3	0.5978	0.5682	0.1013	4	58	38.7	24	59	41.1

OCCULTATIONS, 2022

ELEMENTS OF OCCULTATIONS OF PLANETS

Sl. No.	*l*	*a*
1.	0.2725	1.00
2.	0.2725	1.00
3.	0.2725	1.00
4.	0.2731	1.00
5.	0.2725	1.00
6.	0.2730	1.00
7.	0.2725	1.00
8.	0.2731	1.00
9.	0.2725	1.00
10.	0.2725	1.00
11.	0.2725	1.00
12.	0.2725	1.00
13.	0.2725	1.00
14.	0.2725	1.00
	0.2738	1.00

PART - V

ASTRONOMICAL PHENOMENA
AND
MISCELLANEOUS TABLES

PHENOMENA, 2022

ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h U.T.

Date		Mercury Elong.		Mercury Mag.	Venus Elong.		Venus Mag.	Date		Mercury Elong.		Mercury Mag.	Venus Elong.		Venus Mag.
			°			°					°			°	
Jan.	-4	E.	15	-0.7	E.	20	-4.5	June	30	W.	18	-0.6	W.	30	-3.9
	1		18	-0.7		13	-4.3	July	5		14	-1.1		29	-3.9
	6		19	-0.6	E.	6	-4.3		10		8	-1.6		27	-3.9
	11		19	-0.2	W.	6	-4.2		15	W.	3	-2.1		26	-3.9
	16		14	+0.8		13	-4.2		20	E.	4	-1.8		25	-3.9
	21	E.	6	+3.9	W.	19	-4.5		25	E.	9	-1.2	W.	24	-3.9
	26	W.	7	+3.9		26	-4.7		30		14	-0.8		22	-3.9
	31		16	+1.3		31	-4.8	Aug	4		18	-0.5		21	-3.9
Feb.	5		22	+0.5		35	-4.9		9		21	-0.2		20	-3.9
	10		25	+0.2		38	-4.9		14		24	0.0		18	-3.9
	15	W.	26	+0.1	W.	41	-4.9		19	E.	26	+0.1	W.	17	-3.9
	20		26	0.0		43	-4.8		24		27	+0.2		16	-3.9
	25		25	0.0		44	-4.8		29		27	+0.3		15	-3.9
Mar	2		23	-0.1		45	-4.7	Sept	3		26	+0.5		13	-3.9
	7		21	-0.2		46	-4.7		8		24	+0.7		12	-3.9
	12	W.	18	-0.4	W.	46	-4.6		13	E.	19	+1.3	W.	11	-3.9
	17		15	-0.6		47	-4.5		18		11	+2.9		9	-3.9
	22		11	-0.9		47	-4.5		23	E.	3	----		8	-3.9
	27		7	-1.3		46	-4.4		28	W.	9	+2.9		7	-3.9
Apr.	1	W.	2	-1.9		46	-4.4	Oct.	3		16	+0.6		5	-3.9
	6	E.	3	-1.9	W.	46	-4.3		8	W.	18	-0.4	W.	4	-3.9
	11		9	-1.6		45	-4.3		13		17	-0.8		3	-3.9
	16		14	-1.2		45	-4.2		18		15	-1.0	W.	2	-3.9
	21		18	-0.7		44	-4.2		23		11	-1.1	E.	1	----
	26		20	-0.1		43	-4.1		28		8	-1.1		2	----
May	1	E.	20	+0.5	W.	43	-4.1	Nov	2	W.	4	-1.2	E.	3	-3.9
	6		19	+1.2		42	-4.1		7	W.	1	-1.4		4	-3.9
	11		15	+2.4		41	-4.0		12	E.	2	-1.3		5	-3.9
	16		9	+4.3		40	-4.0		17		5	-1.0		6	-3.9
	21	E.	2	----		39	-4.0		22		8	-0.8		8	-3.9
	26	W.	7	+5.0	W.	38	-4.0		27	E.	10	-0.7	E.	9	-3.9
	31		13	+3.0		37	-4.0	Dec	2		13	-0.6		10	-3.9
June	5		19	+1.8		36	-3.9		7		15	-0.6		11	-3.9
	10		22	+1.1		35	-3.9		12		18	-0.6		12	-3.9
	15		23	+0.6		33	-3.9		17		19	-0.6		14	-3.9
	20	W.	23	+0.2	W.	32	-3.9		22	E.	20	-0.4	E.	15	-3.9
	25		21	-0.2		31	-3.9		27		19	-0.1		16	-3.9
	30	W.	18	-0.6	W.	30	-3.9		32	E.	13	+1.1	E.	17	-3.9

Conjunction-	Mercury d h	Mercury d h	Venus d h	Mercury d h	Venus d h
Inferior:	Jan. 23 10	May 21 19	Jan. 9 01	Sept. 23 07	…
Superior:	Apr. 2 23	July 16 20	…	Nov. 8 17	Oct. 22 21

N.B.- E. means that the planet is in the east of the Sun and W. means that it is in the west of the Sun by the amount of the arc stated.

PHENOMENA, 2022

ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h UT

	Mars		Jupiter		Saturn		Uranus	Neptune	Pluto
Date	Elong.	Mag.	Elong.	Mag.	Elong.	Mag.	Elong.	Elong.	Elong.
	°		°		°		°	°	°
Jan. -9	W. 24	+1.6	E. 58	-2.2	E. 41	+0.7	E. 131	E. 80	E. 25
1	27	+1.5	50	-2.1	31	+0.7	120	70	15
11	30	+1.5	42	-2.1	22	+0.7	110	60	E. 6
21	33	+1.5	34	-2.1	13	+0.7	100	50	W. 5
31	36	+1.4	26	-2.1	E. 4	+0.6	90	40	14
Feb. 10	W. 39	+1.4	E. 18	-2.0	W. 5	+0.6	E. 80	E. 31	W. 24
20	42	+1.3	10	-2.0	14	+0.7	70	21	34
Mar 2	45	+1.3	E. 3	-2.0	22	+0.7	60	11	44
12	47	+1.2	W. 5	-2.0	31	+0.7	51	E. 2	53
22	50	+1.1	12	-2.0	40	+0.7	41	W. 8	63
Apr. 1	W. 52	+1.1	W. 20	-2.0	W. 49	+0.7	E. 32	W. 18	W. 73
11	54	+1.0	27	-2.1	58	+0.7	22	27	83
21	56	+0.9	35	-2.1	67	+0.7	13	37	92
May 1	59	+0.9	43	-2.1	76	+0.7	E. 4	46	102
11	61	+0.8	50	-2.1	86	+0.7	W. 5	55	112
21	W. 63	+0.7	W. 58	-2.2	W. 95	+0.6	W. 14	W. 65	W. 121
31	65	+0.6	66	-2.2	104	+0.6	23	74	131
June 10	67	+0.6	74	-2.3	114	+0.6	32	84	141
20	70	+0.5	82	-2.3	124	+0.5	41	93	151
30	72	+0.4	91	-2.4	133	+0.5	51	103	160
July 10	W. 74	+0.3	W. 100	-2.5	W. 143	+0.4	W. 60	W. 112	W. 170
20	77	+0.3	109	-2.6	154	+0.4	69	122	E. 178
30	80	+0.2	118	-2.6	164	+0.3	78	132	170
Aug 9	83	+0.1	128	-2.7	W. 174	+0.3	88	141	160
19	87	0.0	138	-2.8	E. 175	+0.2	97	151	151
29	W. 91	-0.1	W. 148	-2.9	E. 165	+0.3	W. 107	W. 161	E. 141
Sept 8	95	-0.3	159	-2.9	155	+0.3	117	W. 171	131
18	100	-0.4	W. 170	-2.9	144	+0.4	126	E. 178	121
28	106	-0.6	E. 178	-2.9	134	+0.4	136	169	111
Oct. 8	112	-0.7	167	-2.9	124	+0.5	147	159	101
18	W. 120	-0.9	E. 156	-2.9	E. 114	+0.5	W. 157	E. 149	E. 92
28	129	-1.1	145	-2.8	104	+0.6	167	138	82
Nov 7	139	-1.4	135	-2.8	94	+0.6	W. 178	128	72
17	151	-1.6	124	-2.7	85	+0.7	E. 172	118	62
27	164	-1.8	114	-2.6	75	+0.7	161	108	52
Dec. 7	W. 177	-1.9	E. 104	-2.5	E. 65	+0.7	E. 151	E. 98	E. 42
17	E. 168	-1.7	95	-2.5	56	+0.7	141	88	32
27	155	-1.4	85	-2.4	47	+0.8	130	78	22
37	E. 143	-1.1	E. 76	-2.3	E. 38	+0.8	E. 120	E. 68	E. 13
	d h		d h		d h		d h	d h	d h
Conjunction:	…		Mar. 5 14		Feb. 4 19		May 5 07	Mar. 13 12	Jan. 16 15
Opposition:	Dec. 8 06		Sept. 26 20		Aug. 14 17		Nov. 9 08	Sept. 16 22	July 20 02

Magnitudes at opposition: Uranus +5.7; Neptune +7.8; Pluto +14.4

N.B. - E. means that the planet is in the east of the Sun and W. means that it is in the west of the Sun by the amount of the arc stated.

PHENOMENA, 2022

CONJUNCTIONS, OPPOSITIONS ETC. OF PLANETS WITH THE SUN (IN LONGTITUDE)

UNIVERSAL TIME

MERCURY

		d	h	m			d	h	m	
Heliacal rising W.		…	…	…		July	27	23	00	
Greatest elongation E.	Jan.	7	11	04	(19°.2)	Aug.	27	16	14	(27°.3)
Retrograde	Jan.	14	11	39		Sept.	10	03	28	
Heliacal setting W.	Jan.	18	20	25		Sept.	12	10	01	
Inferior conjunction	Jan.	23	10	27		Sept.	23	06	51	
Heliacal rising E.	Jan.	27	20	30		Sept.	28	14	03	
Direct	Feb.	4	04	26		Oct.	2	09	07	
Greatest elongation W.	Feb.	16	21	07	(26°.3)	Oct.	8	21	13	(18°.0)
Heliacal setting E.	Mar.	14	16	16		Oct.	24	13	23	
Superior conjunction	Apr.	2	23	10		Nov.	8	16	44	
Heliacal rising W.	Apr.	12	04	35		Dec.	1	15	53	
Greatest elongation E.	Apr.	29	08	09	(20°.6)	Dec.	21	15	31	(20°.1)
Retrograde	May	10	11	49		Dec.	29	09	24	
Heliacal setting W.	May	14	19	34			…	…	…	
Inferior conjunction	May	21	19	18			…	…	…	
Heliacal rising E.	June	2	02	52			…	…	…	
Direct	June	3	07	58			…	…	…	
Greatest elongation W.	June	16	14	55	(23°.2)		…	…	…	
Heliacal setting E.	July	7	14	20			…	…	…	
Superior conjunction	July	16	19	39			…	…	…	

VENUS

		d	h	m			d	h	m
Heliacal rising W.		…	…	…			…	…	…
Greatest elongation E.		…	…	…			…	…	…
Retrograde		…	…	…			…	…	…
Heliacal setting W.	Jan.	5	22	06			…	…	…
Inferior conjunction	Jan.	9	00	48			…	…	…
Heliacal rising E.	Jan.	11	08	30			…	…	…
Direct	Jan.	29	08	48			…	…	…
Greatest elongation W.	Mar.	20	09	25	(46°.6)		…	…	…
Heliacal setting E.		…	…	…		Sept.	29	21	40
Superior conjunction		…	…	…		Oct.	22	21	18
Heliacal rising W.	Nov.	21	00	06					

EARTH

		d	h	m			d	h	m		d	h	m
Perihelion	Jan.	4	06	39	Equinoxes	Mar.	20	15	33	Sept.	23	01	04
Aphelion	July	4	07	11	Solstices	June	21	09	14	Dec.	21	21	48

SUPERIOR PLANETS

	MARS				JUPITER				SATURN			
		d	h	m		d	h	m		d	h	m
Heliacal setting W.		…	…	…	Feb.	22	10	18	Jan.	22	04	14
Conjunction		…	…	…	Mar.	5	14	07	Feb.	4	19	05
Heliacal rising E.		…	…	…	Mar.	23	07	56	Feb.	23	23	08
Retrograde	Oct.	30	13	25	July	28	20	38	June	4	21	48
Opposition	Dec.	8	5	42	Sept.	26	19	33	Aug.	14	17	11
Direct		…	…	…	Nov.	23	23	02	Oct.	23	04	06

PHENOMENA, 2022

CONJUNCTIONS, OPPOSITIONS ETC. OF PLANETS WITH THE SUN (IN LONGITUDE)

UNIVERSAL TIME

SUPERIOR PLANETS

	URANUS				NEPTUNE				PLUTO			
		d	h	m		d	h	m		d	h	m
Conjunction	May	5	07	21	Mar.	13	11	44	Jan.	16	14	47
Retrograde	Aug.	24	13	56	June	28	07	57	Apr.	29	18	37
Opposition	Nov.	9	8	26	Sept.	16	22	21	July	20	01	35
Direct	Jan.	18	15	28	Dec.	4	00	17	Oct.	8	21	49

N.B.- The heliacal risings and settings have been calcuted for 23° 11' north latitude. Here E. means east of the Sun or the western horizon and W. means west of the Sun or the eastern horizon.

PHENOMENA, 2022

CONJUNCTION OF PLANETS WITH THE MOON AND OTHER PLANETS (IN LONGITUDE)

UNIVERSAL TIME

	d h m			d h m	
Jan.	3 09 58	Moon conj. Venus	Apr.	24 23 33	Moon conj. Saturn
	4 02 36	Moon conj. Mercury		26 00 51	Moon conj. Mars
	4 18 44	Moon conj. Saturn		27 04 50	Moon conj. Venus
	6 02 57	Moon conj. Jupiter		27 11 07	Moon conj. Jupiter
	29 15 10	Moon conj. Mars		30 21 14	*Venus conj. Jupiter*
	30 03 08	Moon conj. Venus	May	2 15 05	Moon conj. Mercury
	31 02 25	Moon conj. Mercury		22 07 19	Moon conj. Saturn
Feb.	1 11 01	Moon conj. Saturn		24 21 34	Moon conj. Mars
	2 23 57	Moon conj. Jupiter		25 02 28	Moon conj. Jupiter
	16 14 29	*Venus conj. Mars*		27 03 01	Moon conj. Venus
	27 09 05	Moon conj. Venus		29 10 31	*Mars conj. Jupiter*
	27 10 05	Moon conj. Mars		29 11 15	Moon conj. Mercury
	28 22 11	Moon conj. Mercury	June	18 14 46	Moon conj. Saturn
Mar.	1 02 01	Moon conj. Saturn		21 15 37	Moon conj. Jupiter
	2 16 33	*Mercury conj. Saturn*		22 18 59	Moon conj. Mars
	2 21 24	Moon conj. Jupiter		26 07 03	Moon conj. Venus
	6 07 12	*Venus conj. Mars*		27 07 22	Moon conj. Mercury
	21 06 06	*Mercury conj. Jupiter*	July	15 22 27	Moon conj. Saturn
	28 05 08	Moon conj. Mars		19 02 35	Moon conj. Jupiter
	28 13 48	Moon conj. Venus		21 16 07	Moon conj. Mars
	28 14 11	Moon conj. Saturn		26 14 55	Moon conj. Venus
	28 19 27	*Venus conj. Saturn*		29 23 49	Moon conj. Mercury
	30 17 24	Moon conj. Jupiter	Aug.	12 05 57	Moon conj. Saturn
Apr.	1 02 34	Moon conj. Mercury		15 10 59	Moon conj. Jupiter
	5 01 51	*Mars conj. Saturn*		19 11 06	Moon conj. Mars

PHENOMENA, 2022 --- contd.

CONJUNCTION OF PLANETS WITH THE MOON AND OTHER PLANETS (IN LONGITUDE)

UNIVERSAL TIME

d h m		d h m	
Aug. 25 23 50	Moon conj. Venus	Nov. 1 23 22	Moon conj. Saturn
29 16 10	Moon conj. Mercury	4 22 05	Moon conj. Jupiter
Sept. 8 12 33	Moon conj. Saturn	11 13 34	Moon conj. Mars
11 16 30	Moon conj. Jupiter	21 22 55	*Mercury conj. Venus*
17 00 52	Moon conj. Mars	24 13 25	Moon conj. Venus
25 07 24	Moon conj. Venus	24 14 48	Moon conj. Mercury
25 12 49	Moon conj. Mercury	29 06 53	Moon conj. Saturn
26 17 58	*Mercury conj. Venus*	Dec. 2 02 44	Moon conj. Jupiter
Oct. 5 18 00	Moon conj. Saturn	8 04 19	Moon conj. Mars
8 19 37	Moon conj. Jupiter	24 12 15	Moon conj. Venus
15 04 11	Moon conj. Mars	24 19 32	Moon conj. Mercury
24 16 01	Moon conj. Mercury	26 18 19	Moon conj. Saturn
25 12 04	Moon conj. Venus	29 12 12	Moon conj. Jupiter
		29 13 59	*Mercury conj. Venus*

CONJUNCTIONS OF PLANETS WITH BRIGHT STARS (IN R.A.)

d h m		d h m	
June 23 14 16	Mercury 3°.02 N. of Aldebaran	Sept. 9 01 00	Mars 4°.34 N. of Aldebaran
July 1 23 30	Venus 4°.17 N. of Aldebaran	Oct. 17 15 01	Venus 3°.49 N. of Spica
July 16 21 55	Mercury 5°.24 S. of Pollux	Oct. 25 11 29	Mercury 3°.90 N. of Spica
Aug. 4 05 10	Mercury 0°.74 N. of Regulus	Nov. 23 12 49	Mercury 3°.16 N. of Antares
Aug. 7 10 12	Venus 6°.56 S. of Pollux	Nov. 23 17 39	Venus 4°.54 N. of Antares
Sept. 5 01 21	Venus 0°.78 N. of Regulus	Dec. 22 04 24	Mars 8°.24 N. of Aldebaran

ASTRONOMICAL DIARY, 2022

UNIVERSAL TIME

	d	h	m			d	h	m	
Jan.	1	22	55	Moon at perigee	Feb.	13	19	54	Venus greatest helio. lat N.
	2	18	33	NEW MOON		16	07	28	Moon greatest lat. N 4° 56'
	3	08	09	Venus 7°.53 N. of Moon		16	16	56	FULL MOON
	4	01	21	Mercury 3°.12 N of Moon		16	21	07	Mercury greatest elong. W. (26°.3)
	4	06	39	*Earth at perihelion*		18	14	07	Mercury in descending node
	4	16	47	Saturn 4°.19 N of Moon		23	06	53	Moon in descending node
	5	12	57	Moon greatest lat. S 5° 08'		23	22	32	LAST QUARTER
	6	00	11	Jupiter 4°.45 N of Moon		26	22	26	Moon at perigee
	7	09	46	Neptune 4°.08 N of Moon		27	06	29	Venus 8°.74 N. of Moon
	7	11	04	Mercury greatest elong. E. (19°.2)		27	08	59	Mars 3°.52 N of Moon
	9	00	48	Venus in inferior conjunction		28	20	06	Mercury 3°.74 N of Moon
				4° 51' N of Sun		28	22	50	*Mercury at aphelion*
	9	18	11	FIRST QUARTER		28	23	45	Saturn 4°.3 N of Moon
	11	07	06	Mercury in ascending node	Mar.	1	06	48	Moon greatest lat. S 4° 57'
	11	11	27	Uranus 1°.45 N of Moon		2	12	34	*Mercury 0°.7 S of Saturn*
	13	04	19	Moon in ascending node		2	17	35	NEW MOON
	14	00	54	Mercury stationary in RA		2	18	35	Jupiter 4°.14 N of Moon
	14	09	25	Moon at apogee		3	09	02	Neptune 3°.71 N of Moon
	15	23	13	*Mercury at perihelion*		5	14	07	Jupiter in conjunction with Sun
	16	14	47	Pluto in conjunction with Sun		7	06	08	Uranus 0°.8 N of Moon
									Occultation
	17	23	48	FULL MOON		8	08	21	Moon in ascending node
	18	19	54	Uranus stationary in RA		10	10	45	FIRST QUARTER
	20	06	39	Moon greatest lat. N 5°		10	23	05	Moon at apogee
	23	05	50	*Venus at perihelion*		12	14	11	*Venus 4° N of Mars*
	23	10	27	Mercury in inferior conjunction		13	11	44	Neptune in conjunction with Sun
				3° 18' N of Sun		15	09	07	Moon greatest lat. N 5° 01'
	25	13	41	LAST QUARTER		18	07	18	FULL MOON
	26	04	32	Mercury greatest helio. lat N.		20	09	25	Venus greatest elong. W . (46°.6)
	27	06	14	Moon in descending node		20	15	33	*Vernal Equinox*
	29	08	02	Venus stationary in RA		20	22	17	*Mercury 1°.3 S of Jupiter*
	29	15	03	Mars 2°.41 N of Moon		21	04	43	Mercury greatest helio. lat S.
	30	01	50	Venus 10°.15 N. of Moon		22	08	11	Moon in descending node
	30	07	11	Moon at perigee		23	12	19	*Mercury 1°S of Neptune*
	30	19	32	Uranus in square with Sun		23	23	41	Moon at perigee
	31	00	18	Mercury 7°.57 N of Moon		25	05	37	LAST QUARTER
Feb.	1	05	46	NEW MOON		28	02	53	Mars 4°.10 N of Moon
	1	08	57	Saturn 4°.21 N of Moon		28	08	41	Moon greatest lat. S 5° 04'
	1	16	19	Moon greatest lat. S 4° 57'		28	09	49	Venus 6°.69 N. of Moon
	2	21	10	Jupiter 4°.32 N of Moon		28	11	41	Saturn 4°.43 N of Moon
	3	21	13	Neptune 3°.86 N of Moon		29	13	12	*Venus 2°.2 N of Saturn*
	3	22	31	Mercury stationary in RA		30	14	36	Jupiter 3°.93 N of Moon
	4	19	05	Saturn in conjunction with Sun		30	19	18	Neptune 3°.69 N of Moon
	7	19	39	Uranus 1°.17 N of Moon	Apr.	1	00	25	Mercury 2°.55 N of Moon
				Occultation		1	06	24	NEW MOON
	8	13	50	FIRST QUARTER		2	23	10	Mercury in superior conjunction
	9	06	12	Moon in ascending node					1° 02' S of Sun
	11	02	37	Moon at apogee		3	17	27	Uranus 0°.57 N of Moon
	13	01	18	*Venus 6°.6 N of Mars*					*Occultation*

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	d	h	m			d	h	m	
Apr.	4	13	05	Moon in ascending node	May	24	19	23	Mars 2°.78 N of Moon
	4	22	05	*Mars 0°.3 S of Saturn*		25	00	02	Jupiter 3°.25 N of Moon
	7	19	10	Moon at apogee		25	23	59	Mars greatest helio. lat S.
	9	06	29	Mercury in ascending node		27	02	51	Venus 0°.20 N. of Moon
	9	06	48	FIRST QUARTER					*Occultation*
	10	21	31	Venus in descending node		27	22	05	*Mercury at aphelion*
	11	12	12	Moon greatest lat. N 5° 12'		28	13	42	Uranus 0°.25 N of Moon
	12	20	06	*Jupiter 0°.1 N of Neptune*					*Occultation*
	13	22	28	*Mercury at perihelion*		29	00	04	*Mars 0°.6 S of Jupiter*
	16	18	55	FULL MOON		29	02	33	Moon in ascending node
	18	13	44	*Mercury 2°.1 N of Uranus*		29	12	53	Mercury 3°.72 S of Moon
	18	14	01	Moon in descending node		30	11	30	NEW MOON
	18	15	11	Pluto in square with Sun	June	2	01	13	Moon at apogee
	19	15	13	Moon at perigee		3	00	23	Mercury stationary in RA
	23	11	56	LAST QUARTER		5	07	32	Moon greatest lat. N 5° 11'
	24	10	45	Moon greatest lat. S 5° 14'		5	14	03	Saturn stationary in RA
	24	03	48	Mercury greatest helio. lat N.		6	17	40	Venus greatest helio. lat S.
	24	20	55	Saturn 4°.51 N of Moon		7	14	48	FIRST QUARTER
	25	22	05	Mars 3°.90 N of Moon		11	13	17	*Venus 1°.6 S of Uranus*
	27	01	51	Venus 3°.79 N. of Moon		12	10	01	Moon in descending node
	27	03	21	Neptune 3°.71 N of Moon		14	11	52	FULL MOON
	27	08	26	Jupiter 3°.65 N of Moon		14	23	23	Moon at perigee
	27	19	08	*Venus 0°.01 S of Neptune*		16	13	42	Neptune in square with Sun
	29	08	09	Mercury greatest elong. E. (20°.6)		16	14	55	Mercury greatest elong. W. (23°.2)
	30	18	42	*Venus 0°.2 S of Jupiter*		17	03	58	Mercury greatest helio. lat S.
	30	20	28	NEW MOON; *Solar Eclipse*		17	16	52	Moon greatest lat. S 5° 07'
	30	20	39	Pluto stationary in RA		18	12	22	Saturn 4°.27 N of Moon
May	1	04	10	Uranus 0°.40 N of Moon		20	16	50	Neptune 3°.52 N of Moon
	1	19	54	Moon in ascending node		21	03	11	LAST QUARTER
	2	14	17	Mercury 1°.85 N of Moon		21	09	14	*Summer Solstice*
	5	07	21	Uranus in conjunction with Sun		21	13	08	*Mars at perihelion*
	5	12	46	Moon at apogee		21	13	36	Jupiter 2°.74 N of Moon
	8	16	08	Moon greatest lat. N 5° 14'		22	18	16	Mars 0°.94 N of Moon
	9	00	21	FIRST QUARTER					*Occultation*
	10	22	47	Mercury stationary in RA		23	14	16	*Mercury 3°.02 N. of Aldebaran*
	15	10	08	*Venus at aphelion*		24	22	13	Uranus 0°.05 N of Moon
	15	18	49	Saturn in square with Sun					*Occultation*
	15	23	44	Moon in descending node		25	07	09	Moon in ascending node
	16	04	14	FULL MOON; *Lunar Eclipse*		26	08	10	Venus 2°.70 S. of Moon
	17	13	08	Mercury in descending node		27	08	19	Mercury 3°.94 S of Moon
	17	15	27	Moon at perigee		28	23	05	Neptune stationary in RA
	17	23	08	*Mars 0°.6 S of Neptune*		29	00	59	Jupiter in square with Sun
	21	13	32	Moon greatest lat. S 5° 15'		29	02	52	NEW MOON
	21	19	18	Mercury in inferior conjunction		29	06	09	Moon at apogee
				1° 14' S of Sun	July	1	23	30	*Venus 4°.17 N. of Aldebaran*
	22	04	43	Saturn 4°.46 N of Moon		2	09	31	Moon greatest lat. N 5° 04'
	22	18	43	LAST QUARTER		4	07	11	*Earth at aphelion*
	24	10	01	Neptune 3°.67 N of Moon		6	05	50	Mercury in ascending node

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	d	h	m			d	h	m	
July	7	02	14	FIRST QUARTER	Aug.	24	15	15	Uranus stationary in RA
	9	17	28	Moon in descending node		25	10	52	Moon greatest lat. N 5°
	10	21	43	*Mercury at perihelion*		25	20	57	Venus 4°.29 S. of Moon
	13	09	05	Moon at perigee		27	05	26	Mars in square with Sun
	13	18	38	FULL MOON		27	08	17	NEW MOON
	15	08	27	Moon greatest lat. S 5°		27	16	14	Mercury greatest elong. E. (27°.3)
	15	20	17	Saturn 4°.05 N of Moon		29	10	51	Mercury 6°.64 S of Moon
	16	19	39	Mercury in superior conjunction	Sept.	1	21	12	Moon in descending node
				1° 31' N of Sun		3	18	08	FIRST QUARTER
	16	21	55	*Mercury 5°.24 S. of Pollux*		4	20	11	*Venus at perihelion*
	18	00	50	Neptune 3°.29 N of Moon		5	01	21	*Venus 0°.78 N. of Regulus*
	19	00	59	Jupiter 2°.23 N of Moon		7	14	17	Moon greatest lat. S 5° 01'
	20	01	35	Pluto in opposition with Sun		7	18	19	Moon at perigee
	20	14	19	LAST QUARTER		8	10	31	Saturn 3°.94 N of Moon
	21	03	04	Mercury greatest helio. lat N.		9	01	00	*Mars 4°.34 N. of Aldebaran*
	21	16	46	Mars 1°.06 S of Moon		9	19	39	Mercury stationary in RA
				Occultation		10	09	59	FULL MOON
	22	06	21	Uranus 0°.24 S of Moon		10	18	54	Neptune 3°.03 N of Moon
				Occultation		11	15	17	Jupiter 1°.81 N of Moon
	22	09	21	Moon in ascending node		13	03	13	Mercury greatest helio. lat S.
	26	10	24	Moon at apogee		14	14	49	Moon in ascending node
	26	14	11	Venus 4°.17 S. of Moon		14	22	59	Uranus 0°.79 S of Moon
	28	17	55	NEW MOON					*Occultation*
	29	10	16	Moon greatest lat. N 4° 59'		16	22	21	Neptune in opposition with Sun
	29	11	47	Jupiter stationary in RA		17	01	43	Mars 3°.61 S of Moon
	29	21	07	Mercury 3°.60 S of Moon		17	21	52	LAST QUARTER
Aug.	1	09	27	*Mars 1°.4 S of Uranus*		19	14	45	Moon at apogee
	2	00	49	Venus in ascending node		21	12	36	Moon greatest lat. N 5° 07'
	4	05	10	*Mercury 0°.74 N. of Regulus*		23	01	04	*Autumnal Equinox*
	5	11	06	FIRST QUARTER		23	06	51	Mercury in inferior conjunction
									2° 52' S of Sun
	5	20	31	Moon in descending node		25	05	08	Venus 2°.75 S of Moon
	7	10	12	*Venus 6°.56 S. of Pollux*		25	08	15	Mercury 6°.65 S of Moon
	10	17	08	Moon at perigee		25	21	55	NEW MOON
	11	11	37	Moon greatest lat. S 5°		26	01	14	*Mercury 3°.8 S of Venus*
	11	12	53	Uranus in square with Sun		26	12	43	Venus greatest helio. lat N.
	12	01	36	FULL MOON		26	19	33	Jupiter in opposition with Sun
	12	03	56	Saturn 3°.91 N of Moon		28	23	43	Moon in descending node
	13	12	28	Mercury in descending node	Oct.	1	14	49	Mercury stationary in RA
	14	09	53	Neptune 3°.09 N of Moon		2	05	07	Mercury in ascending node
	14	17	11	Saturn in opposition with Sun		3	00	14	FIRST QUARTER
	15	09	42	Jupiter 1°.86 N of Moon		4	16	33	Moon at perigee
	18	10	58	Moon in ascending node		4	16	44	Moon greatest lat. S 5° 07'
	18	14	38	Uranus 0°.55 S of Moon		5	15	51	Saturn 4°.08 N of Moon
				Occultation		6	20	59	*Mercury at perihelion*
	19	04	36	LAST QUARTER		8	02	33	Neptune 3°.10 N of Moon
	19	12	17	Mars 2°.68 S of Moon		8	18	02	Pluto stationary in RA
	22	21	53	Moon at apogee		8	18	12	Jupiter 2°.07 N of Moon
	23	21	21	*Mercury at aphelion*		8	21	13	Mercury greatest elong. W. (18°.0)

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	d	h	m			d	h	m	
Oct.	9	20	55	FULL MOON	Nov.	23	22	57	NEW MOON
	11	21	49	Moon in ascending node		24	12	42	Jupiter stationary in RA
	12	06	46	Uranus 0°.85 S of Moon		24	14	02	Venus 2°.33 N. of Moon
				Occultation		24	15	03	Mercury 0°.94 N of Moon
	15	04	31	Mars 3°.62 S of Moon		26	01	32	Moon at perigee
	17	02	20	Mercury greatest helio. lat N.		28	10	04	Moon greatest lat. S 5° 12'
	17	10	20	Moon at apogee		29	04	40	Saturn 4°.17 N of Moon
	17	15	01	*Venus 3°.49 N. of Spica*		29	20	38	*Mercury at aphelion*
	17	17	15	LAST QUARTER		30	14	36	FIRST QUARTER
	18	15	54	Moon greatest lat. N 5° 12'	Dec.	1	02	15	Mars nearest to Earth
	19	13	30	Pluto in square with Sun		1	13	22	Neptune 3°.17 N of Moon
	20	02	14	Mars in ascending node		2	00	57	Jupiter 2°.51 N of Moon
	22	21	18	Venus in superior conjunction		4	10	07	Neptune stationary in RA
				1° 03' N of Sun		5	12	38	Moon in ascending node
	23	08	30	Saturn stationary in RA		5	17	59	Uranus 0°.65 S of Moon
	24	15	44	Mercury 0°.39 S of Moon					*Occultation*
	25	10	49	NEW MOON; *Solar Eclipse*		6	11	59	*Pluto at aphelion*
	25	11	29	*Mercury 3°.90 N. of Spica*		6	12	00	Pluto greatest helio. lat S.
	25	12	05	Venus 0°.00 N. of Moon		8	04	08	FULL MOON
	26	06	30	Moon in descending node		8	04	25	Mars 0°.54 S of Moon
	29	14	36	Moon at perigee					*Occultation*
	30	10	53	Mars stationary in RA		8	05	42	Mars in opposition with Sun
Nov.	1	06	37	FIRST QUARTER		10	02	29	Mercury greatest helio. lat S.
	1	07	14	Moon greatest lat. S 5° 12'		12	00	29	Moon at apogee
	1	21	08	Saturn 4°.19 N of Moon		12	10	52	Moon greatest lat. N 5° 09'
	4	08	20	Neptune 3°.20 N of Moon		14	17	11	Neptune in square with Sun
	4	20	00	Jupiter 2° N of Moon		16	08	56	LAST QUARTER
	8	06	07	Moon in ascending node		20	01	34	Moon in descending node
	8	11	02	FULL MOON; *Lunar Eclipse*		21	15	31	Mercury greatest elong. E. (20°.1)
	8	13	11	Uranus 0°.75 S of Moon		21	21	48	*Winter Solstice*
				Occultation		22	00	51	Jupiter in square with Sun
	8	16	44	Mercury in superior conjunction		22	04	24	*Mars 8°.24 N. of Aldebaran*
				0° 05' N of Sun		23	10	17	NEW MOON
	9	08	26	Uranus in opposition with Sun		24	08	28	Moon at perigee
	9	11	53	Mercury in descending node		24	11	28	Venus 3°.47 N. of Moon
	11	08	04	Saturn in square with Sun		24	18	29	Mercury 3°.76 N of Moon
	11	13	46	Mars 2°.47 S of Moon		25	13	15	Moon greatest lat. S 5° 04'
	14	06	20	Moon at apogee		26	03	08	*Venus at aphelion*
	15	07	49	Moon greatest lat. N 5° 13'		26	16	11	Saturn 4°.02 N of Moon
	16	13	27	LAST QUARTER		28	20	03	Neptune 2°.98 N of Moon
	21	14	21	Venus in descending node		29	02	42	Mercury stationary in RA
	22	16	24	Moon in descending node		29	04	11	Mercury in ascending node
	22	16	34	*Mercury 1°.4 S of Venus*		29	09	00	*Mercury 1°.4 N of Venus*
	23	12	49	*Mercury 3°.16 N. of Antares*		29	10	34	Jupiter 2°.30 N of Moon
	23	17	39	*Venus 4°.54 N. of Antares*		30	01	20	FIRST QUARTER

TABLE-I

CONVERSION OF MEAN SOLAR INTO SIDEREAL TIME

CORRECTION TO BE *ADDED* TO A MEAN TIME INTERVAL

HOURS			MINUTES				SECONDS			
Mean Time	Correction		Mean Time	Correction	Mean Time	Correction	Mean Time	Correction	Mean Time	Correction
h	m	s	m	s	m	s	s	s	s	s
1	0	09.856	1	0.164	31	5.093	1	.003	31	.085
2	0	19.713	2	0.329	32	5.257	2	.005	32	.088
3	0	29.569	3	0.493	33	5.421	3	.008	33	.090
4	0	39.426	4	0.657	34	5.585	4	.011	34	.093
5	0	49.282	5	0.821	35	5.750	5	.014	35	.096
6	0	59.139	6	0.986	36	5.914	6	.016	36	.099
7	1	08.995	7	1.150	37	6.078	7	.019	37	.101
8	1	18.852	8	1.314	38	6.242	8	.022	38	.104
9	1	28.708	9	1.478	39	6.407	9	.025	39	.107
10	1	38.565	10	1.643	40	6.571	10	.027	40	.110
11	1	48.421	11	1.807	41	6.735	11	.030	41	.112
12	1	58.278	12	1.971	42	6.900	12	.033	42	.115
13	2	08.134	13	2.136	43	7.064	13	.036	43	.118
14	2	17.991	14	2.300	44	7.228	14	.038	44	.120
15	2	27.847	15	2.464	45	7.392	15	.041	45	.123
16	2	37.704	16	2.628	46	7.557	16	.044	46	.126
17	2	47.560	17	2.793	47	7.721	17	.047	47	.129
18	2	57.417	18	2.957	48	7.885	18	.049	48	.131
19	3	07.273	19	3.121	49	8.049	19	.052	49	.134
20	3	17.129	20	3.285	50	8.214	20	.055	50	.137
21	3	26.986	21	3.450	51	8.378	21	.057	51	.140
22	3	36.842	22	3.614	52	8.542	22	.060	52	.142
23	3	46.699	23	3.778	53	8.707	23	.063	53	.145
24	3	56.555	24	3.943	54	8.871	24	.066	54	.148
			25	4.107	55	9.035	25	.068	55	.151
			26	4.271	56	9.199	26	.071	56	.153
			27	4.435	57	9.364	27	.074	57	.156
			28	4.600	58	9.528	28	.077	58	.159
			29	4.764	59	9.692	29	.079	59	.162
			30	4.928	60	9.856	30	.082	60	.164

Local Apparent Sidereal time for any given local mean time
= mean Sid. Time for 0^h U.T. (Pages 13 to 16)
— reduction for longitude of place
+ local mean time reckoned from midnight
+ correction for local mean time added (Table-I)
+ Equation of Equinoxes.

Local apparent Sidereal Time for any hour of Universal Time.
= Sid. Time for 0^h U.T. (Pages 13 to 16)
+ longitude of place (in time)
+ Universal Time
+ correction for U.T. added (Table-I)
+ Equation of Equinoxes.

N.B. The longitude of place is to be taken in time and regarded *positive* for places East of Greenwich. The reduction of Sidereal Time for the longitude of place may be taken from the above table and with the same sign as that of longitude. The correction for the L.M.T. or U.T. added should also be taken from the above table. For details, see the examples given under the EXPLANATION.

TABLE-II
CONVERSION OF SIDEREAL INTO MEAN SOLAR TIME

CORRECTION TO BE *SUBTRACTED* FROM A SIDEREAL TIME INTERVAL

HOURS			MINUTES				SECONDS			
Sidereal Time	Correction		Sidereal Time	Correction	Sidereal Time	Correction	Sidereal Time	Correction	Sidereal Time	Correction
h	m	s	m	s	m	s	s	s	s	s
1	0	09.830	1	0.164	31	5.079	1	.003	31	.085
2	0	19.659	2	0.328	32	5.242	2	.005	32	.087
3	0	29.489	3	0.491	33	5.406	3	.008	33	.090
4	0	39.318	4	0.655	34	5.570	4	.011	34	.093
5	0	49.148	5	0.819	35	5.734	5	.014	35	.096
6	0	58.977	6	0.983	36	5.898	6	.016	36	.098
7	1	08.807	7	1.147	37	6.062	7	.019	37	.101
8	1	18.636	8	1.311	38	6.225	8	.022`	38	.104
9	1	28.466	9	1.474	39	6.389	9	.025	39	.106
10	1	38.296	10	1.638	40	6.553	10	.027	40	.109
11	1	48.125	11	1.802	41	6.717	11	.030	41	.112
12	1	57.955	12	1.966	42	6.881	12	.033	42	.115
13	2	07.784	13	2.130	43	7.045	13	.035	43	.117
14	2	17.614	14	2.294	44	7.208	14	.038	44	.120
15	2	27.443	15	2.457	45	7.372	15	.041	45	.123
16	2	37.273	16	2.621	46	7.536	16	.044	46	.126
17	2	47.103	17	2.785	47	7.700	17	.046	47	.128
18	2	56.932	18	2.949	48	7.864	18	.049	48	.131
19	3	06.762	19	3.113	49	8.027	19	.052	49	.134
20	3	16.591	20	3.277	50	8.191	20	.055	50	.137
21	3	26.421	21	3.440	51	8.355	21	.057	51	.139
22	3	36.250	22	3.604	52	8.519	22	.060	52	.142
23	3	46.080	23	3.768	53	8.683	23	.063	53	.145
24	3	55.909	24	3.932	54	8.847	24	.066	54	.147
			25	4.096	55	9.010	25	.068	55	.150
			26	4.259	56	9.174	26	.071	56	.153
			27	4.423	57	9.338	27	.074	57	.156
			28	4.587	58	9.502	28	.076	58	.158
			29	4.751	59	9.666	29	.079	59	.161
			30	4.915	60	9.830	30	.082	60	.164

Local Mean Time for any given local apparent Sidereal Time
= Time of preceding transit of First Point of Aries (pages 13 to 16)
+ reduction for longitude of place
+ given local apparent Sidereal Time — Equation of Equinoxes
— correction for Sidereal Time added (Table-II).

Otherwise, L.M.T. for any given Sidereal Time may be obtained as follows:-
Given Sidereal Time
— Sidereal Time for 0^h U.T. (pages 13 to 16)
+ reduction for longitude of place
= Sidereal interval since 0^h L.M.T.
This Sidereal interval corrected by the above table gives the required local mean time.

or, Universal Time for any given Sidereal Time may be obtained as follows:-
Given Sidereal Time —longitude of place —Sidereal Time for 0^h U.T. = Sidereal interval since 0^h U.T.
This interval converted into Mean Solar Time by the above table gives the Universal Time required.

N.B. The reduction for longitude of place is of the same sign as that of the longitude, i.e. *positive* for places East of Greenwich and *negative* for West. See Example under EXPLANATION.

TABLE-III
CONVERSION OF ARC TO TIME

DEGREES						MINUTES		SECONDS					
°	h m	°	h m	°	h m	′	m s	″	s	″	s	″	s
0	0 00	49	3 16	98	6 32	0	0 00	0	0.000	0.00	0.000	0.50	0.033
1	0 04	50	3 20	99	6 36	1	0 04	1	0.067	.01	.001	.51	.034
2	0 08	51	3 24	100	6 40	2	0 08	2	0.133	.02	.001	.52	.035
3	0 12	52	3 28	101	6 44	3	0 12	3	0.200	.03	.002	.53	.035
4	0 16	53	3 32	102	6 48	4	0 16	4	0.267	.04	.003	.54	.036
5	0 20	54	3 36	103	6 52	5	0 20	5	0.333	.05	.003	.55	.037
6	0 24	55	3 40	104	6 56	6	0 24	6	0.400	.06	.004	.56	.037
7	0 28	56	3 44	105	7 00	7	0 28	7	0.467	.07	.005	.57	.038
8	0 32	57	3 48	106	7 04	8	0 32	8	0.533	.08	.005	.58	.039
9	0 36	58	3 52	107	7 08	9	0 36	9	0.600	.09	.006	.59	.039
10	0 40	59	3 56	108	7 12	10	0 40	10	0.667	0.10	0.007	0.60	0.040
11	0 44	60	4 00	109	7 16	11	0 44	11	0.733	.11	.007	.61	.041
12	0 48	61	4 04	110	7 20	12	0 48	12	0.800	.12	.008	.62	.041
13	0 52	62	4 08	111	7 24	13	0 52	13	0.867	.13	.009	.63	.042
14	0 56	63	4 12	112	7 28	14	0 56	14	0.933	.14	.009	.64	.043
15	1 00	64	4 16	113	7 32	15	1 00	15	1.000	.15	.010	.65	.043
16	1 04	65	4 20	114	7 36	16	1 04	16	1.067	.16	.011	.66	.044
17	1 08	66	4 24	115	7 40	17	1 08	17	1.133	.17	.011	.67	.045
18	1 12	67	4 28	116	7 44	18	1 12	18	1.200	.18	.012	.68	.045
19	1 16	68	4 32	117	7 48	19	1 16	19	1.267	.19	.013	.69	.046
20	1 20	69	4 36	118	7 52	20	1 20	20	1.333	0.20	0.013	0.70	0.047
21	1 24	70	4 40	119	7 56	21	1 24	21	1.400	.21	.014	.71	.047
22	1 28	71	4 44	120	8 00	22	1 28	22	1.467	.22	.015	.72	.048
23	1 32	72	4 48	121	8 04	23	1 32	23	1.533	.23	.015	.73	.049
24	1 36	73	4 52	122	8 08	24	1 36	24	1.600	.24	.016	.74	.049
25	1 40	74	4 56	123	8 12	25	1 40	25	1.667	.25	.017	.75	.050
26	1 44	75	5 00	124	8 16	26	1 44	26	1.733	.26	.017	.76	.051
27	1 48	76	5 04	125	8 20	27	1 48	27	1.800	.27	.018	.77	.051
28	1 52	77	5 08	126	8 24	28	1 52	28	1.867	.28	.019	.78	.052
29	1 56	78	5 12	127	8 28	29	1 56	29	1.933	.29	.019	.79	.053
30	2 00	79	5 16	128	8 32	30	2 00	30	2.000	0.30	0.020	0.80	0.053
31	2 04	80	5 20	129	8 36	31	2 04	31	2.067	.31	.021	.81	.054
32	2 08	81	5 24	130	8 40	32	2 08	32	2.133	.32	.021	.82	.055
33	2 12	82	5 28	131	8 44	33	2 12	33	2.200	.33	.022	.83	.055
34	2 16	83	5 32	132	8 48	34	2 16	34	2.267	.34	.023	.84	.056
35	2 20	84	5 36	133	8 52	35	2 20	35	2.333	.35	.023	.85	.057
36	2 24	85	5 40	134	8 56	36	2 24	36	2.400	.36	.024	.86	.057
37	2 28	86	5 44	135	9 00	37	2 28	37	2.467	.37	.025	.87	.058
38	2 32	87	5 48	136	9 04	38	2 32	38	2.533	.38	.025	.88	.059
39	2 36	88	5 52	137	9 08	39	2 36	39	2.600	.39	.026	.89	.059
40	2 40	89	5 56	138	9 12	40	2 40	40	2.667	0.40	0.027	0.90	0.06
41	2 44	90	6 00	139	9 16	41	2 44	41	2.733	.41	.027	.91	.061
42	2 48	91	6 04	140	9 20	42	2 48	42	2.800	.42	.028	.92	.061
43	2 52	92	6 08	141	9 24	43	2 52	43	2.867	.43	.029	.93	.062
44	2 56	93	6 12	142	9 28	44	2 56	44	2.933	.44	.029	.94	.063
45	3 00	94	6 16	143	9 32	45	3 00	45	3.000	.45	.030	.95	.063
46	3 04	95	6 20	144	9 36	46	3 04	46	3.067	.46	.031	.96	.064
47	3 08	96	6 24	145	9 40	47	3 08	47	3.133	.47	.031	97	.065
48	3 12	97	6 28	146	9 44	48	3 12	48	3.200	.48	.032	.98	.065

TABLE-III ---- *contd.*
CONVERSION OF ARC TO TIME

DEGREES						MINUTES		SECONDS					
°	h m	°	h m	°	h m	′	m s	″	s	″	s	″	s
147	9 48	158	10 32	169	11 16	49	3 16	49	3.267	0.49	0.033	0.99	0.066
148	9 52	159	10 36	170	11 20	50	3 20	50	3.333	0.50	0.033	1.00	0.067
149	9 56	160	10 40	171	11 24	51	3 24	51	3.400				
150	10 00	161	10 44	172	11 28	52	3 28	52	3.467				
151	10 04	162	10 48	173	11 32	53	3 32	53	3.533				
152	10 08	163	10 52	174	11 36	54	3 36	54	3.600				
153	10 12	164	10 56	175	11 40	55	3 40	55	3.667				
154	10 16	165	11 00	176	11 44	56	3 44	56	3.733				
155	10 20	166	11 04	177	11 48	57	3 48	57	3.800				
156	10 24	167	11 08	178	11 52	58	3 52	58	3.867				
157	10 28	168	11 12	179	11 56	59	3 56	59	3.933				

TABLE-IV
CONVERSION OF TIME TO ARC

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS					
m	° ′	° ′	° ′	° ′	° ′	° ′	s	′ ″	s	″	s	″
0	0 00	15 00	30 00	45 00	60 00	75 00	0	0 00	0.00	0.00	0.50	7.50
1	0 15	15 15	30 15	45 15	60 15	75 15	1	0 15	.01	0.15	.51	7.65
2	0 30	15 30	30 30	45 30	60 30	75 30	2	0 30	.02	0 30	.52	7.80
3	0 45	15 45	30 45	45 45	60 45	75 45	3	0 45	.03	0.45	.53	7.95
4	1 00	16 00	31 00	46 00	61 00	76 00	4	1 00	.04	0.60	.54	8.10
5	1 15	16 15	31 15	46 15	61 15	76 15	5	1 15	.05	0.75	.55	8.25
6	1 30	16 30	31 30	46 30	61 30	76 30	6	1 30	.06	0.90	.56	8.40
7	1 45	16 45	31 45	46 45	61 45	76 45	7	1 45	.07	1.05	.57	8.55
8	2 00	17 00	32 00	47 00	62 00	77 00	8	2 00	.08	1.20	.58	8.70
9	2 15	17 15	32 15	47 15	62 15	77 15	9	2 15	.09	1.35	.59	8.85
10	2 30	17 30	32 30	47 30	62 30	77 30	10	2 30	0.10	1.50	0.60	9.00
11	2 45	17 45	32 45	47 45	62 45	77 45	11	2 45	.11	1.65	.61	9.15
12	3 00	18 00	33 00	48 00	63 00	78 00	12	3 00	.12	1.80	.62	9.30
13	3 15	18 15	33 15	48 15	63 15	78 15	13	3 15	.13	1.95	.63	9.45
14	3 30	18 30	33 30	48 30	63 30	78 30	14	3 30	.14	2.10	.64	9.60
15	3 45	18 45	33 45	48 45	63 45	78 45	15	3 45	.15	2.25	.65	9.75
16	4 00	19 00	34 00	49 00	64 00	79 00	16	4 00	.16	2.40	.66	9.90
17	4 15	19 15	34 15	49 15	64 15	79 15	17	4 15	.17	2.55	.67	10.05
18	4 30	19 30	34 30	49 30	64 30	79 30	18	4 30	.18	2.70	.68	10.20
19	4 45	19 45	34 45	49 45	64 45	79 45	19	4 45	.19	2.85	.69	10.35
20	5 00	20 00	35 00	50 00	65 00	80 00	20	5 00	.20	3.00	0.70	10.50
21	5 15	20 15	35 15	50 15	65 15	80 15	21	5 15	.21	3.15	.71	10.65
22	5 30	20 30	35 30	50 30	65 30	80 30	22	5 30	.22	3.30	.72	10.80
23	5 45	20 45	35 45	50 45	65 45	80 45	23	5 45	.23	3.45	.73	10.95
24	6 00	21 00	36 00	51 00	66 00	81 00	24	6 00	.24	3.60	.74	11.10
25	6 15	21 15	36 15	51 15	66 15	81 15	25	6 15	.25	3.75	.75	11.25
26	6 30	21 30	36 30	51 30	66 30	81 30	26	6 30	.26	3.90	.76	11.40
27	6 45	21 45	36 45	51 45	66 45	81 45	27	6 45	.27	4.05	.77	11.55
28	7 00	22 00	37 00	52 00	67 00	82 00	28	7 00	.28	4.20	.78	11.70
29	7 15	22 15	37 15	52 15	67 15	82 15	29	7 15	.29	4.35	.79	11.85
30	7 30	22 30	37 30	52 30	67 30	82 30	30	7 30	.30	4.50	0.80	12.00

TABLE-IV ---- *contd.*
CONVERSION OF TIME TO ARC

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS					
m	° ′	° ′	° ′	° ′	° ′	° ′	s	′ ″	s	″	s	″
31	7 45	22 45	37 45	52 45	67 45	82 45	31	7 45	0.31	4.65	0.81	12.15
32	8 00	23 00	38 00	53 00	68 00	83 00	32	8 00	.32	4.80	.82	12.30
33	8 15	23 15	38 15	53 15	68 15	83 15	33	8 15	.33	4.95	.83	12.45
34	8 30	23 30	38 30	53 30	68 30	83 30	34	8 30	.34	5.10	.84	12.60
35	8 45	23 45	38 45	53 45	68 45	83 45	35	8 45	.35	5.25	.85	12.75
36	9 00	24 00	39 00	54 00	69 00	84 00	36	9 00	.36	5.40	.86	12.90
37	9 15	24 15	39 15	54 15	69 15	84 15	37	9 15	.37	5.55	.87	13.05
38	9 30	24 30	39 30	54 30	69 30	84 30	38	9 30	.38	5.70	.88	13.20
39	9 45	24 45	39 45	54 45	69 45	84 45	39	9 45	.39	5.85	.89	13.35
40	10 00	25 00	40 00	55 00	70 00	85 00	40	10 00	.40	6.00	.90	13.50
41	10 15	25 15	40 15	55 15	70 15	85 15	41	10 15	.41	6.15	.91	13.65
42	10 30	25 30	40 30	55 30	70 30	85 30	42	10 30	.42	6.30	.92	13.80
43	10 45	25 45	40 45	55 45	70 45	85 45	43	10 45	.43	6.45	.93	13.95
44	11 00	26 00	41 00	56 00	71 00	86 00	44	11 00	.44	6.60	.94	14.10
45	11 15	26 15	41 15	56 15	71 15	86 15	45	11 15	.45	6.75	.95	14.25
46	11 30	26 30	41 30	56 30	71 30	86 30	46	11 30	.46	6.90	.96	14.40
47	11 45	26 45	41 45	56 45	71 45	86 45	47	11 45	.47	7.05	.97	14.55
48	12 00	27 00	42 00	57 00	72 00	87 00	48	12 00	.48	7.20	.98	14.70
49	12 15	27 15	42 15	57 15	72 15	87 15	49	12 15	.49	7.35	0.99	14.85
50	12 30	27 30	42 30	57 30	72 30	87 30	50	12 30	0.50	7.50	1.00	15.00
51	12 45	27 45	42 45	57 45	72 45	87 45	51	12 45				
52	13 00	28 00	43 00	58 00	73 00	88 00	52	13 00				
53	13 15	28 15	43 15	58 15	73 15	88 15	53	13 15				
54	13 30	28 30	43 30	58 30	73 30	88 30	54	13 30		h	°	
55	13 45	28 45	43 45	58 45	73 45	88 45	55	13 45		6 =	90	
56	14 00	29 00	44 00	59 00	74 00	89 00	56	14 00		12 =	180	
57	14 15	29 15	44 15	59 15	74 15	89 15	57	14 15		18 =	270	
58	14 30	29 30	44 30	59 30	74 30	89 30	58	14 30				
59	14 45	29 45	44 45	59 45	74 45	89 45	59	14 45				

TABLE - V
CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS	
m	d	d	d	d	d	d	s	d
0	0.000 000	0.041 667	0.083 333	0.125 000	0.166 667	0.208 333	0	0.000 000
1	.000 694	.042 361	.084 028	.125 694	.167 361	.209 028	1	.000 012
2	.001 389	.043 056	.084 722	.126 389	.168 056	.209 722	2	.000 023
3	.002 083	.043 750	.085 417	.127 083	.168 750	.210 417	3	.000 035
4	.002 778	.044 444	.086 111	.127 778	.169 444	.211 111	4	.000 046
5	.003 472	.045 139	.086 806	.128 472	.170 139	.211 806	5	.000 058
6	.004 167	.045 833	.087 500	.129 167	.170 833	.212 500	6	.000 069
7	.004 861	.046 528	.088 194	.129 861	.171 528	.213 194	7	.000 081
8	.005 556	.047 222	.088 889	.130 556	.172 222	.213 889	8	.000 093
9	.006 250	.047 917	.089 583	.131 250	.172 917	.214 583	9	.000 104
10	0.006 944	0.048 611	0.090 278	0.131 944	0.173 611	0.215 278	10	0.000 116
11	.007 639	.049 306	.090 972	0.132 639	.174 306	.215 972	11	.000 127

TABLE - V ---- *contd.*
CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS	
m	d	d	d	d	d	d	s	d
12	0.008 333	0.050 000	0.091 667	0.133 333	0.175 000	0.216 667	12	0.000 139
13	.009 028	.050 694	.092 361	.134 028	.175 694	.217 361	13	.000 150
14	.009 722	.051 389	.093 056	.134 722	.176 389	.218 056	14	.000 162
15	.010 417	.052 083	.093 750	.135 417	.177 083	.218 750	15	.000 174
16	.011 111	.052 778	.094 444	.136 111	.177 778	.219 444	16	.000 185
17	.011 806	.053 472	.095 139	.136 806	. 178 472	.220 139	17	.000 197
18	.012 500	.054 167	.095 833	.137 500	.179 167	.220 833	18	.000 208
19	.013 194	.054 861	.096 528	.138 194	.179 861	.221 528	19	.000 220
20	0.013 889	0.055 556	0.097 222	0.138 889	0.180 556	0.222 222	20	0.000 231
21	.014 583	056 250	.097 917	.139 583	.181 250	.222 917	21	.000 243
22	.015 278	.056 944	.098 611	.140 278	.181 944	.223 611	22	.000 255
23	.015 972	.057 639	.099 306	.140 972	182 639	.224 306	23	.000 266
24	.016 667	.058 333	.100 000	.141 667	.183 333	.225 000	24	.000 278
25	.017 361	.059 028	.100 694	.142 361	.184 028	.225 694	25	.000 289
26	.018 056	.059 722	.101 389	.143 056	.184 722	.226 389	26	.000 301
27	.018 750	.060 417	.102 083	.143 750	.185 417	.227 083	27	.000 312
28	.019 444	.061 111	.102 778	.144 444	.186 111	.227 778	28	.000 324
29	.020 139	.061 806	.103 472	.145 139	.186 806	.228 472	29	.000 336
30	0.020 833	0.062 500	0.104 167	0.145 833	0.187 500	0.229 167	30	0.000 347
31	.021 528	.063 194	.104 861	.146 528	.188 194	.229 861	31	.000 359
32	.022 222	.063 889	.105 556	.147 222	.188 889	.230 556	32	.000370
33	.022 917	.064 583	.106 250	.147 917	.189 583	.231 250	33	.000 382
34	.023 611	.065 278	.106 944	.148 611	.190 278	.231 944	34	.000 394
35	.024 306	.065 972	.107 639	.149 306	.190 972	.232 639	35	.000 405
36	.025 000	.066 667	.108 333	.150 000	.191 667	.233 333	36	.000 417
37	.025 694	.067 361	.109 028	.150 694	.192 361	.234 028	37	.000 428
38	.026 389	.068 056	.109 722	.151 389	.193 056	.234 722	38	.000 440
39	.027 083	.068 750	.110 417	.152 083	.193 750	.235 417	39	.000 451
40	0.027 778	0.069 444	0.111 111	0.152 778	0.194 444	0.236 111	40	0.000 463
41	.028 472	.070 139	.111 806	.153 472	.195 139	.236 806	41	.000 475
42	.029 167	.070 833	.112 500	.154 167	.195 833	.237 500	42	.000 486
43	.029 861	.071 528	.113 194	.154 861	.196 528	.238 194	43	.000 498
44	.030 556	.072 222	.113 889	.155 556	.197 222	.238 889	44	.000 509
45	.031 250	.072 917	.114 583	.156 250	.197 917	.239 583	45	.000 521
46	.031 944	.073 611	.115 278	.156 944	.198 611	.240 278	46	.000 532
47	.032 639	.074 306	.115 972	.157 639	.199 306	.240 972	47	.000 544
48	.033 333	.075 000	.116 667	.158 333	.200 000	.241 667	48	.000 556
49	.034 028	.075 694	.117 361	.159 028	.200 694	.242 361	49	.000 567
50	0.034 722	0.076 389	0.118 056	0.159 722	0.201 389	0.243 056	50	0.000 579
51	.035 417	.077 083	.118 750	.160 417	.202 083	.243 750	51	.000 590
52	.036 111	.077 778	.119 444	.161 111	.202 778	.244 444	52	.000 602
53	.036 806	.078 472	.120 139	.161 806	.203 472	.245 139	53	.000 613
54	.037 500	.079 167	.120 833	.162 500	.204 167	.245 833	54	.000 625
55	.038 194	.079 861	.121 528	.163 194	.204 861	.246 528	55	.000 637
56	.038 889	.080 556	.122 222	.163 889	.205 556	.247 222	56	.000 648
57	.039 583	.081 250	.122 917	.164 583	.206 250	.247 917	57	.000 660
58	.040 278	.081 944	.123 611	.165 278	.206 944	.248 611	58	.000 671
59	0.040 972	0.082 639	0.124 306	0.165 972	0.207 639	0.249 306	59	0.000 683

TABLE - V ---- *contd.*
CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	6^h	7^h	8^h	9^h	10^h	11^h	SECONDS	
m	d	d	d	d	d	d	s	d
0	0.250 000	0.291 667	0.333 333	0.375 000	0.416 667	0.458 333	0	0.000 000
1	.250 694	.292 361	.334 028	.375 694	. 417 361	.459 028	1	.000 012
2	.251 389	.293 056	.334 722	.376 389	.418 056	.459 722	2	.000 023
3	.252 083	.293 750	.335 417	.377 083	.418 750	.460 417	3	.000 035
4	.252 778	.294 444	.336 111	.377 778	.419 444	.461 111	4	.000 046
5	.253 472	.295 139	.336 806	.378 472	.420 139	.461 806	5	.000 058
6	.254 167	.295 833	.337 500	.379 167	.420 833	.462 500	6	.000 069
7	.254 861	.296 528	338 194	.379 861	.421 528	. 463 194	7	.000 081
8	.255 556	.297 222	.338 889	.380 556	.422 222	. 463 889	8	.000 093
9	.256 250	.297 917	.339 583	.381 250	.422 917	.464 583	9	.000 104
10	0.256 944	0.298 611	0.340 278	0.381 944	0.423 611	0.465 278	10	0.000 116
11	.257 639	.299 306	.340 972	.382 639	.424 306	.465 972	11	.000 127
12	.258 333	.300 000	.341 667	.383 333	.425 000	.466 667	12	.000 139
13	.259 028	.300 694	.342 361	384 028	.425 694	.467 361	13	.000 150
14	.259 722	.301 389	.343 056	.384 722	.426 389	.468 056	14	.000 162
15	.260 417	.302 083	.343 750	.385 417	.427 083	.468 750	15	.000 174
16	.261 111	.302 778	.344 444	.386 111	.427 778	.469 444	16	.000 185
17	.261 806	.303 472	.345 139	.386 806	.428 472	.470 139	17	.000 197
18	.262 500	.304 167	.345 833	.387 500	.429 167	.470 833	18	.000 208
19	.263 194	.304 861	.346 528	.388 194	.429 861	.471 528	19	.000 220
20	0.263 889	0.305 556	0.347 222	0.388 889	0.430 556	0.472 222	20	0.000 231
21	.264 583	.306 250	.347 917	.389 583	.431 250	.472 917	21	.000 243
22	.265 278	.306 944	.348 611	.390 278	.431 944	.473 661	22	.000 255
23	.265 972	.307 639	.349 306	.390 972	.432 639	.474 306	23	.000 266
24	.266 667	.308 383	.350 000	.391 667	.433 333	.475 000	24	.000 278
25	.267 361	.309 028	.350 694	.392 361	.434 028	.475 694	25	.000289
26	.268 056	.309 722	.351 389	.393 056	.434 722	.476 389	26	.000 301
27	.268 750	.310 417	.352 083	.393 750	.435 417	.477 083	27	.000 312
28	.269 444	.311 111	.352 778	.394 444	.436 111	.477 778	28	.000 324
29	.270 139	.311 806	.353 472	.395 139	.436 806	.478 472	29	.000 336
30	0.270 833	0.312 500	0.354 167	0.395 833	0.437 500	0.479 167	30	0.000 347
31	.271 528	.313 194	.354 861	.396 528	.438 194	.479 861	31	.000 359
32	.272 222	.313 889	.355 556	.397 222	.438 889	.480 556	32	.000 370
33	.272 917	.314 583	.356 250	.397 917	.439 583	.481 250	33	.000 382
34	.273 611	.315 278	.356 944	.398 611	.440 278	.481 944	34	.000 394
35	.274 306	.315 972	.357 639	.399 306	.440 972	.482 639	35	.000 405
36	.275 000	.316 667	.358 333	.400 000	.441 667	.483 333	36	.000 417
37	.275 694	.317 361	.359 028	.400 694	.442 361	.484 028	37	.000 428
38	276 389	.318 056	.359 722	.401 389	.443 056	.484 722	38	.000 440
39	.277 083	.318 750	.360 417	.402 083	.443 750	.485 417	39	.000 451
40	0.277 778	0.319 444	0.361 111	0.402 778	0.444 444	0.486 111	40	0.000 463
41	.278 472	.320 139	.361 806	.403 472	.445 139	.486 806	41	.000 475
42	279 167	.320 833	.362 500	.404 167	.445 833	.487 500	42	.000 486
43	.279 861	.321 528	.363 194	.404 861	.446 528	.488 194	43	.000 498
44	.280 556	.322 222	.363 889	.405 556	.447 222	.488 889	44	.000 509
45	.281 250	.322 917	.364 583	.406 250	.447 917	.489 583	45	.000 521
46	0.281 944	0.323 611	0.365 278	0.406 944	0.448 611	0.490 278	46	0.000 532

TABLE - V ---- *contd.*
CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	6^h	7^h	8^h	9^h	10^h	11^h	SECONDS	
m	d	d	d	d	d	d	s	d
47	0.282 639	0.324 306	0.365 972	0.407 639	0.449 306	0.490 972	47	0.000 544
48	.283 333	.325 000	.366 667	.408 333	.450 000	.491 667	48	.000 556
49	.284 028	.325 694	.367 361	.409 028	.450 694	.492 361	49	.000 567
50	0.284 722	0.326 389	0.368 056	0.409 722	0.451 389	0.493 056	50	0.000 579
51	.285 417	.327 083	.368 750	.410 417	.452 083	.493 750	51	.000 590
52	.286 111	.327 778	.369 444	.411 111	.452 778	.494 444	52	.000 602
53	.286 806	.328 472	. 370 139	.411 806	.453 472	.495 139	53	.000 613
54	.287 500	.329 167	.370 833	.412 500	.454 167	.495 833	54	.000 625
55	.288 194	.329 861	.371 528	.413 194	.454 861	.496 528	55	.000 637
56	.288 889	.330 556	.372 222	.413 889	.455 556	.497 222	56	.000 648
57	.289 583	.331 250	.372 917	.414 583	.456 250	.497 917	57	.000 660
58	.290 278	.331 944	.373 611	.415 278	.456 944	.498 611	58	.000 671
59	0.290 972	0.332 639	0.374 306	0.415 972	0.457 639	0.499 306	59	0.000 683

TABLE - VI
CONVERSION OF MINUTES AND SECONDS TO DECIMALS OF A DEGREE

	0′	1′	2′	3′	4′	5′
″	°	°	°	°	°	°
0	0.00000	0.01667	0.03333	0.05000	0.06667	0.08333
1	0028	1694	3361	5028		8361
2	0056	1722	3389	5056	6722	8389
3	0083	1750	3417	5083	6750	8417
4	0111	1778	3444	5111	6778	8444
5	0139	1806	3472	5139	6806	8472
6	0167	1833	3500	5167	6833	8500
7	0194	1861	3528	5194	6861	8528
8	0222	1889	3556	5222	6889	8556
9	0250	1917	3583	5250	6917	8583
10	0.00278	0.01944	0.03611	0.05278	0.06944	0.08611
11	0306	1972	3639	5306	6972	8639
12	0333	2000	3667	5333	7000	8667
13	0361	2028	3694	5361	7028	8694
14	0389	2056	3722	5389	7056	8722
15	0417	2083	3750	5417	7083	8750
16	0444	2111	3778	5444	7111	8778
17	0472	2139	3806	5472	7139	8806
18	0500	2167	3833	5500	7167	8833
19	0528	2194	3861	5528	7194	8861
20	0.00556	0.02222	0.03889	0.05556	0.07222	0.08889
21	0583	2250	3917	5583	7250	8917
22	0611	2278	3944	5611	7278	8944
23	0639	2306	3972	5639	7306	8972
24	0667	2333	4000	5667	7333	9000
25	0.00694	0.02361	0.04028	0.05694	0.07361	0.09028

″	°
0	0.0
6	0.1
12	0.2
18	0.3
24	0.4
30	0.5
36	0.6
42	0.7
48	0.8
54	0.9

TABLE - VI ---- *contd.*
CONVERSION OF MINUTES AND SECONDS TO DECIMALS OF A DEGREE

	0′	1′	2′	3′	4′	5′	In units of the fifth decimal of a Degree.	
″	°	°	°	°	°	°	″	°
26	0.00722	0.02389	0.04056	0.05722	0.07389	0.09056	0.00	0
27	0750	2417	4083	5750	7417	9083	.01	1
28	0778	2444	4111	5778	7444	9111	.05	2
29	0806	2472	4139	5806	7472	9139	.09	3
30	0.00833	0.02500	0.04167	0.05833	0.07500	0.09167	.12	4
31	0861	2528	4194	5861	7528	9194	.16	5
32	0889	2556	4222	5889	7556	9222	.19	6
33	0917	2583	4250	5917	7583	9250	.23	7
34	0944	2611	4278	5944	7611	9278	.26	8
35	0972	2639	4306	5972	7639	9306	.30	9
36	1000	2667	4333	6000	7667	9333	.34	10
37	1028	2694	4361	6028	7694	9361	.37	11
38	1056	2722	4389	6056	7722	9389	.41	12
39	1083	2750	4417	6083	7750	9417	.45	13
40	0.01111	0.02778	0.04444	0.06111	0.07778	0.09444	.48	14
41	1139	2806	4472	6139	7806	9472	.52	15
42	1167	2833	4500	6167	7833	9500	.55	16
43	1194	2861	4528	6194	7861	9528	.59	17
44	1222	2889	4556	6222	7889	9556	.62	18
45	1250	2917	4583	6250	7917	9583	.66	19
46	1278	2944	4611	6278	7944	9611	.70	20
47	1306	2972	4639	6306	7972	9639	.73	21
48	1333	3000	4667	6333	8000	9667	.77	22
49	1361	3028	4694	6361	8028	9694	.81	23
50	0.01389	0.03056	0.04722	0.06389	0.08056	0.09722	.84	24
51	1417	3083	4750	6417	8083	9750	.88	25
52	1444	3111	4778	6444	8111	9778	.91	26
53	1472	3139	4806	6472	8139	9806	.95	27
54	1500	3167	4833	6500	8167	9833	0.98	28
55	1528	3194	4861	6528	8194	9861	1.00	
56	1556	3222	4889	6556	8222	9889		
57	1583	3250	4917	6583	8250	9917	*In critical*	
58	1611	3278	4944	6611	8278	9944	*cases ascend*	
59	0.01639	0.03306	0.04972	0.06639	0.08306	0.09972		

TABLE - VII
INTERPOLATION COEFFICIENTS

n	*B*″	E_0″	E_1″	n	*B*″	E_0″	E_1″
0.00	0.00000	0.00000	0.00000	0.05	0.01188	0.01544	0.00831
.01	.00248	.00328	.00167	.06	0.01410	0.01824	0.00996
.02	.00490	.00647	.00333	.07	.01628	.02094	.01161
.03	.00728	.00955	.00500	.08	.01840	.02355	.01325
.04	.00960	.01254	.00666	.09	.02048	.02607	.01488
0.05	0.01188	0.01544	0.00831	0.10	0.02250	0.02850	0.01650

TABLE - VII ---- *contd.*
INTERPOLATION COEFFICIENTS

n	*B″*	*E₀″*	*E₁″*	n	*B″*	*E₀″*	*E₁″*
0.10	0.02250	0.02850	0.01650	0.55	0.06188	0.05981	0.06394
.11	.02448	.03084	.01811	.56	0.06160	0.05914	0.06406
.12	.02640	.03309	.01971	.57	.06128	.05842	.06413
.13	.02828	.03525	.02130	.58	.06090	.05765	.06415
.14	.03010	.03732	.02288	.59	.06048	.05685	.06410
.15	.03188	.03931	.02444	0.60	0.06000	0.05600	0.06400
.16	.03360	.04122	.02598	.61	.05948	.05511	.06384
.17	.03528	.04304	.02751	.62	.05890	.05419	.06361
.18	.03690	.04477	.02903	.63	.05828	.05322	.06333
.19	.03848	.04643	.03052	.64	.05760	.05222	.06298
0.20	0.04000	0.04800	0.03200	.65	.05688	.05119	.06256
.21	.04148	.04949	.03346	.66	.05610	.05012	.06208
.22	.04290	.05091	.03489	.67	.05528	.04901	.06154
.23	.04428	.05224	.03631	.68	.05440	.04787	.06093
.24	.04560	.05350	.03770	.69	.05348	.04670	.06025
.25	.04688	.05469	.03906	0.70	0.05250	0.04550	0.05950
.26	.04810	.05580	.04040	.71	.05148	.04427	.05868
.27	.04928	.05683	.04172	.72	.05040	.04301	.05779
.28	.05040	.05779	.04301	.73	.04928	.04172	.05683
.29	.05148	.05868	.04427	.74	.04810	.04040	.05580
0.30	0.05250	0.05950	0.04550	.75	.04688	.03906	.05469
.31	.05348	.06025	.04670	.76	.04560	.03770	.05350
.32	.05440	.06093	.04787	.77	.04428	.03631	.05224
.33	.05528	.06154	.04901	.78	.04290	.03489	.05091
.34	.05610	.06208	.05012	.79	.04148	.03346	.04949
.35	.05688	.06256	.05119	0.80	0.04000	0.03200	0.04800
.36	.05760	.06298	.05222	.81	. 03848	.03052	.04643
.37	.05828	.06333	.05322	.82	.03690	.02903	.04477
.38	.05890	.06361	.05419	.83	.03528	.02751	.04304
.39	.05948	.06384	.05511	.84	.03360	.02598	.04122
0.40	0.06000	0.06400	0.05600	.85	.03188	.02444	.03931
.41	.06048	.06410	.05685	.86	.03010	.02288	.03732
.42	.06090	.06415	.05765	.87	.02828	.02130	.03525
.43	.06128	.06413	.05842	.88	.02640	.01971	.03309
.44	.06160	.06406	.05914	.89	.02448	.01811	.03084
.45	.06188	.06394	.05981	0.90	0.02250	0.01650	0.02850
.46	.06210	.06376	.06044	.91	.02048	.01488	.02607
.47	.06228	.06352	.06103	.92	.01840	.01325	.02355
.48	.06240	.06323	.06157	.93	.01628	.01161	.02094
.49	.06248	.06289	.06206	.94	.01410	.00996	.01824
0.50	0.06250	0.06250	0.06250	.95	.01188	.00831	.01544
.51	.06248	.06206	.06289	.96	.00960	.00666	.01254
.52	.06240	.06157	.06323	.97	.00728	.00500	.00955
.53	.06228	.06103	.06352	.98	.00490	.00333	.00647
.54	.06210	.06044	.06376	0.99	.00248	.00167	.00328
0.55	0.06188	0.05981	0.06394	1.00	0.00000	0.00000	0.00000

N.B. – The coefficients are all *negative*. For details about Bessel's and Everett's interpolation formula, please *see* Explanation

TABLE - VIII
EVERETT COEFFICIENTS OF THE SECOND DIFFERENCES
(*The coefficients are all negative*)

n	E_0''	E_1''		n	E_0''	E_1''		n	E_0''	E_1''	
0.000	0.0002	0.0001	1.000	0.050	0.0156	0.0084	0.950	0.100	0.0286	0.0166	0.900
.001	.0005	.0002	0.999	.051	.0159	.0086	.949	.101	.0289	.0167	.899
.002	.0008	.0004	.998	.052	.0161	.0087	.948	.102	.0291	.0169	.898
.003	.0012	.0006	.997	.053	.0164	.0089	.947	.103	.0293	.0171	.897
.004	.0015	.0007	.996	.054	.0167	.0091	.946	.104	.0296	.0172	.896
.005	.0018	.0009	.995	.055	.0170	.0092	.945	.105	.0298	.0174	.895
.006	.0021	.0011	.994	.056	.0173	.0094	.944	.106	.0300	.0175	.894
.007	.0025	.0012	.993	.057	.0175	.0096	.943	.107	.0303	.0177	.893
.008	.0028	.0014	.992	.058	.0178	.0097	.942	.108	.0305	.0179	.892
.009	.0031	.0016	.991	.059	.0181	.0099	.941	.109	.0307	.0180	.891
.010	.0034	.0017	.990	.060	.0184	.0100	.940	.110	.0310	.0182	.890
.011	.0038	.0019	.989	.061	.0186	.0102	.939	.111	.0312	.0184	.889
.012	.0041	.0021	.988	.062	.0189	.0104	.938	.112	.0314	.0185	.888
.013	.0044	.0022	.987	.063	.0192	.0105	.937	.113	.0316	.0187	.887
.014	.0047	.0024	.986	.064	.0195	.0107	.936	.114	.0319	.0188	.886
.015	.0050	.0026	.985	.065	.0197	.0109	.935	.115	.0321	.0190	.885
.016	.0054	.0027	.984	.066	.0200	.0110	.934	.116	.0323	.0192	.884
.017	.0057	.0029	.983	.067	.0203	.0112	.933	.117	.0325	.0193	.883
.018	.0060	.0031	.982	.068	.0205	.0114	.932	.118	.0328	.0195	.882
.019	.0063	.0032	.981	.069	.0208	.0115	.931	.119	.0330	.0196	.881
.020	.0066	.0034	.980	.070	.0211	.0117	.930	.120	.0332	.0198	.880
.021	.0069	.0036	.979	.071	.0213	.0119	.929	.121	.0334	.0200	.879
.022	.0072	.0037	.978	.072	.0216	.0120	.928	.122	.0336	.0201	.878
.023	.0076	.0039	.977	.073	.0219	.0122	.927	.123	.0339	.0203	.877
.024	.0079	.0041	.976	.074	.0221	.0123	.926	.124	.0341	.0204	.876
.025	.0082	.0042	.975	.075	.0224	.0125	.925	.125	.0343	.0206	.875
.026	.0085	.0044	.974	.076	.0226	.0127	.924	.126	.0345	.0207	.874
.027	.0088	.0046	.973	.077	.0229	.0128	.923	.127	.0347	.0209	.873
.028	.0091	.0047	.972	.078	.0232	.0130	.922	.128	.0349	.0211	.872
.029	.0094	.0049	.971	.079	.0234	.0132	.921	.129	.0351	.0212	.871
.030	.0097	.0051	.970	.080	.0237	.0133	.920	.130	.0354	.0214	.870
.031	.0100	.0052	.969	.081	.0239	.0135	.919	.131	.0356	.0215	.869
.032	.0103	.0054	.968	.082	.0242	.0137	.918	.132	.0358	.0217	.868
.033	.0106	.0056	.967	.083	.0244	.0138	.917	.133	.0360	.0219	.867
.034	.0109	.0057	.966	.084	.0247	.0140	.916	.134	.0362	.0220	.866
.035	.0112	.0059	.965	.085	.0249	.0141	.915	.135	.0364	.0222	.865
.036	.0115	.0061	.964	.086	.0252	.0143	.914	.136	.0366	.0223	.864
.037	.0118	.0062	.963	.087	.0255	.0145	.913	.137	.0368	.0225	.863
.038	.0121	.0064	.962	.088	.0257	.0146	.912	.138	.0370	.0226	.862
.039	.0124	.0066	.961	.089	.0259	.0148	.911	.139	.0372	.0228	.861
.040	.0127	.0067	.960	.090	.0262	.0150	.910	.140	.0374	.0230	.860
.041	.0130	.0069	.959	.091	.0264	.0151	.909	.141	.0376	.0231	.859
.042	.0133	.0071	.958	.092	.0267	.0153	.908	.142	.0378	.0233	.858
.043	.0136	.0072	.957	.093	.0269	.0154	.907	.143	.0380	.0234	.857
.044	.0139	.0074	.956	.094	.0272	.0156	.906	.144	.0382	.0236	.856
.045	.0141	.0076	.955	.095	.0274	.0158	.905	.145	.0384	.0237	.855
.046	.0144	.0077	.954	.096	.0277	.0159	. 904	.146	.0386	.0239	.854
.047	.0147	.0079	.953	.097	.0279	.0161	.903	.147	.0388	.0240	.853
.048	.0150	.0081	.952	.098	.0281	.0163	.902	.148	.0390	.0242	.852
.049	0.0153	0.0082	.951	.099	0.0284	0.0164	.901	.149	0.0392	0.0244	.851
0.050			0.950	0.100			0.900	0.150			0.850
	E_1''	E_0''	n		E_1''	E_0''	n		E_1''	E_0''	n

Formula : $f_n = f_0 + n\,\Delta_{1/2}' + E_0''\Delta_0'' + E_1''\Delta_1''$

TABLE - VIII ---- *contd.*
EVERETT COEFFICIENTS OF THE SECOND DIFFERENCES
(*The coefficients are all negative*)

n	E_0''	E_1''		n	E_0''	E_1''		n	E_0''	E_1''	
0.150			0.850	0.200			0.800	0.300			0.700
	0.0394	0.0245			0.0482	0.0321			0.0597	0.0457	
.151			.849	.202			.798	.304			.696
	.0396	.0247			.0485	.0324			.0600	.0462	
.152			.848	.204			.796	.308			.692
	.0398	.0248			.0488	.0327			.0602	.0467	
.153			.847	.206			.794	.312			.688
	.0400	.0250			.0491	.0330			.0605	.0472	
.154			.846	.208			.792	.316			.684
	.0402	.0251			.0493	.0333			.0608	.0476	
.155			.845	.210			.790	.320			.680
	.0404	.0253			.0496	.0336			.0611	.0481	
.156			.844	.212			.788	.324			.676
	.0406	.0254			.0499	.0339			.0613	.0486	
.157			.843	.214			.786	.328			.672
	.0407	.0256			.0502	.0342			.0615	.0490	
.158			.842	.216			.784	.332			.668
	.0409	.0258			.0505	.0345			.0618	.0495	
.159			.841	.218			.782	.336			.664
	.0411	.0259			.0508	.0347			.0620	.0499	
.160			.840	.220			.780	.340			.660
	.0413	.0261			.0510	.0350			.0622	.0503	
.161			.839	.222			.778	.344			.656
	.0415	.0262			.0513	.0353			.0624	.0508	
.162			.838	.224			.776	.348			.652
	.0417	.0264			.0516	.0356			.0626	.0512	
.163			.837	.226			.774	.352			.648
	.0419	.0265			.0519	.0359			.0627	.0516	
.164			.836	.228			.772	.356			.644
	.0420	.0267			.0521	.0362			.0629	.0520	
.165			.835	.230			.770	.360			.640
	.0422	.0268			.0524	.0364			.0631	.0524	
.166			.834	.232			.768	.364			.636
	.0424	.0270			.0526	.0367			.0632	.0528	
.167			.833	.234			.766	.368			.632
	.0426	.0271			.0529	.0370			.0633	.0532	
.168			.832	.236			.764	.372			.628
	.0428	.0273			.0531	.0373			.0634	.0536	
.169			.831	.238			.762	.376			.624
	.0429	.0274			.0534	.0376			.0636	.0540	
.170			.830	.240			.760	.380			.620
	.0431	.0276			.0536	.0378			.0637	.0544	
.171			.829	.242			.758	.384			.616
	.0433	.0277			.0539	.0381			.0638	.0547	
.172			.828	.244			.756	.388			.612
	.0435	.0279			.0541	.0384			.0638	.0551	
.173			.827	.246			.754	.392			.608
	.0437	.0280			.0543	.0387			.0639	.0555	
.174			.826	.248			.752	.396			.604
	.0438	.0282			.0546	.0389			.0640	.0558	
.175			.825	.250			.750	.400			.600
	.0440	.0283			.0548	.0392			.0640	.0562	
.176			.824	.252			.748	.404			.596
	.0442	.0285			.0550	.0395			.0641	.0565	
.177			.823	.254			.746	.408			.592
	.0443	.0287			.0553	.0397			.0641	.0568	
.178			.822	.256			.744	.412			.588
	.0445	.0288			.0555	.0400			.0641	.0572	
.179			.821	.258			.742	.416			.584
	.0447	.0290			.0557	.0403			.0641	.0575	
.180			.820	.260			.740	.420			.580
	.0449	.0291			.0559	.0405			.0641	.0578	
.181			.819	.262			.738	.424			.576
	.0450	.0293			.0561	.0408			.0641	.0581	
.182			.818	.264			.736	.428			.572
	.0452	.0294			.0563	.0411			.0641	.0584	
.183			.817	.266			.734	.432			.568
	.0454	.0296			.0565	.0413			.0641	.0587	
.184			.816	.268			.732	.436			.564
	.0455	.0297			.0567	.0416			.0641	.0590	
.185			.815	.270			.730	.440			.560
	.0457	.0299			.0569	.0418			.0640	.0593	
.186			.814	.272			.728	.444			.556
	.0459	.0300			.0571	.0421			.0640	.0595	
.187			.813	.274			.726	.448			.552
	.0460	.0302			.0573	.0424			.0639	.0598	
.188			.812	.276			.724	.452			.548
	.0462	.0303			.0575	.0426			.0639	.0601	
.189			.811	.278			.722	.456			.544
	.0463	.0304			.0577	.0429			.0638	.0603	
.190			.810	.280			.720	.460			.540
	.0465	.0306			.0579	.0431			.0637	.0606	
.191			.809	.282			.718	.464			.536
	.0467	.0307			.0581	.0434			.0636	.0608	
.192			.808	.284			.716	.468			.532
	.0468	.0309			.0582	.0436			.0635	.0610	
.193			.807	.286			.714	.472			.528
	.0470	.0310			.0584	.0439			.0634	.0613	
.194			.806	.288			.712	.476			.524
	.0471	.0312			.0586	.0441			.0633	.0615	
.195			.805	.290			.710	.480			.520
	.0473	.0313			.0588	.0444			.0632	.0617	
.196			.804	.292			.708	.484			.516
	.0475	.0315			.0589	.0446			.0630	.0619	
.197			.803	.294			.706	.488			.512
	.0476	.0316			.0591	.0449			.0629	.0621	
.198			.802	.296			.704	.492			.508
	.0478	.0318			.0593	.0451			.0627	.0622	
.199			.801	.298			.702	.496			.504
	0.0479	0.0319			0.0594	0.0454			0.0626	0.0624	
0.200			0.800	0.300			0.700	0.500			0.500
	E_1''	E_0''	n		E_1''	E_0''	n		E_1''	E_0''	n

N. B. -- The table is to be used like a critical table without interpolation

TABLE - IX

JULIAN DAY NUMBER

DAYS ELAPSED AT GREENWICH NOON OF JANUARY 0

Yr. A.D.	100	200	300	400	500	600	700	800	900	1000
0	175 7582	179 4107	183 0632	186 7157	190 3682	194 0207	197 6732	201 3257	204 9782	208 6307
20	176 4887	180 1412	183 7937	187 4462	191 0987	194 7512	198 4037	202 0562	205 7087	209 3612
40	177 2192	180 8717	184 5242	188 1767	191 8292	195 4817	199 1342	202 7867	206 4392	210 0917
60	177 9497	181 6022	185 2547	188 9072	192 5597	196 2122	199 8647	203 5172	207 1697	210 8222
80	178 6802	182 3327	185 9852	189 6377	193 2902	196 9427	200 5952	204 2477	207 9002	211 5527

Yr. A.D.	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
							*	*	*	
0	212 2832	215 9357	219 5882	223 2407	226 8932	230 5447	234 1971	237 8495	241 5020	245 1544
20	213 0137	216 6662	220 3187	223 9712	227 6237	231 2752	234 9276	238 5806	242 2324	245 8849
40	213 7442	217 3967	221 0492	224 7017	228 3542	232 0057	235 6581	239 3105	242 9629	246 6154
60	214 4747	218 1272	221 7797	225 4322	229 0847	232 7362	236 3886	240 0410	243 6934	247 3459
80	215 2052	218 8577	222 5102	226 1627	229 8152	233 4667	237 1191	240 7715	244 4239	248 0764
					†					
100	215 9357	219 5882	223 2407	226 8932	230 5447	234 1971	237 8495	241 5020	245 1544	248 8069

NUMBER OF DAYS TO BE ADDED TO REDUCE TO THE BEGINNING OF EACH MONTH

Year	Jan. 0	Feb. 0	Mar. 0	Apr. 0	May 0	Jun. 0	July 0	Aug. 0	Sept. 0	Oct. 0	Nov. 0	Dec. 0
	*	*										
0	0	31	60	91	121	152	182	213	244	274	305	335
1	366	397	425	456	486	517	547	578	609	639	670	700
2	731	762	790	821	851	882	912	943	974	1004	1035	1065
3	1096	1127	1155	1186	1216	1247	1277	1308	1339	1369	1400	1430
4	1461	1492	1521	1552	1582	1613	1643	1674	1705	1735	1766	1796
5	1827	1858	1886	1917	1947	1978	2008	2039	2070	2100	2131	2161
6	2192	2223	2251	2282	2312	2343	2373	2404	2435	2465	2496	2526
7	2557	2588	2616	2647	2677	2708	2738	2769	2800	2830	2861	2891
8	2922	2953	2982	3013	3043	3074	3104	3135	3166	3196	3227	3257
9	3288	3319	3347	3378	3408	3439	3469	3500	3531	3561	3592	3622
10	3353	3684	3712	3743	3773	3804	3834	3865	3896	3926	3957	3987
11	4018	4049	4077	4108	4138	4169	4199	4230	4261	4291	4322	4352
12	4383	4414	4443	4474	4504	4535	4565	4596	4627	4657	4688	4718
13	4749	4780	4808	4839	4869	4900	4930	4961	4992	5022	5053	5083
14	5114	5145	5173	5204	5234	5265	5295	5326	5357	5387	5418	5448
15	5479	5510	5538	5569	5599	5630	5660	5691	5722	5752	5783	5813
16	5844	5875	5904	5935	5965	5996	6026	6057	6088	6118	6149	6179
17	6210	6241	6269	6300	6330	6361	6391	6422	6453	6483	6514	6544
18	6575	6606	6634	6665	6695	6726	6756	6787	6818	6848	6879	6909
19	6940	6971	6999	7030	7060	7091	7121	7152	7183	7213	7244	7274

† From 1582 October 15 to 1599 December 31 inclusive, Gregorian calendar, the numbers given by the above tables must be diminished by 10.

* The numbers given for the years 1700, 1800 and 1900 which are not leap years, are for January - 1 and consequently the numbers 0 and 31 for January 0 and February 0 of these years must be increased by 1 and read as 1 and 32 respectively.

N.B. To find the Julian Day Number for a B.C. date, first express the year astronomically, i.e. diminish it by 1 and put a negative sign before it. Then make the number positive by adding the smallest multiple of 1000. The Julian Day Number for the date thus obtained diminished by 365250 for each multiple of 1000 added will give the required Julian Day Number for the B.C. date in question.

The Julian Day is completed at noon. In order to obtain the Julian Day Number for 0^h U.T., diminish the figure obtained from the above tables by 0.5.

The tables give the Day Numbers upto 1582, Oct. 4 for the Julian calendar and from 1582, Oct. 15 onward for the Gregorian calendar.

TABLE – X

ATMOSPHERIC REFRACTION

MEAN REFRACTION FOR TEMPERATURE 25° C AND PRESSURE 1000 mb

Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction
° ′	′ ″	° ′	′ ″	° ′	′ ″	°	′ ″
-1 00	46 17.5	6 10	7 39.0	17 30	2 49.6	53	0 40.8
0 00	30 59.6	20	7 28.5	18 00	2 44.7	54	39.3
+0 10	29 09.3	30	7 18.5	18 30	2 40.0	55	37.9
20	27 28.9	40	7 08.9	19 00	2 35.6	56	36.5
30	25 57.8	6 50	6 59.7	19 30	2 31.4	57	35.1
0 40	24 34.6	7 00	6 50.8	20 00	2 27.3	58	33.8
0 50	23 18.3	7 10	6 42.3	21 00	2 19.8	59	0 32.6
1 00	22 07.9	20	6 34.1	22 00	2 12.9	60	31.2
10	21 02.6	30	6 26.3	23 00	2 06.6	61	30.0
20	20 02.4	40	6 18.7	24 00	2 00.8	62	28.8
30	19 07.0	7 50	6 11.4	25 00	1 55.4	63	27.6
1 40	18 15.6	8 00	6 04.4	26 00	1 50.4	64	26.4
1 50	17 28.2	8 10	5 57.6	27 00	1 45.7	65	0 25.2
2 00	16 44.0	20	5 51.2	28 00	1 41.3	66	24.1
10	16 02.6	30	5 44.7	29 00	1 37.2	67	23.0
20	15 24.0	40	5 38.6	30 00	1 33.4	68	21.9
30	14 48.0	8 50	5 32.6	31 00	1 29.8	69	20.8
2 40	14 14.4	9 00	5 26.8	32 00	1 26.3	70	19.7
2 50	13 42.9	9 10	5 21.3	33 00	1 23.1	71	0 18.6
3 00	13 13.5	20	5 15.9	34 00	1 20.0	72	17.6
10	12 45.8	30	5 10.6	35 00	1 17.1	73	16.5
20	12 19.6	40	5 05.5	36 00	1 14.3	74	15.5
30	11 55.0	9 50	5 00.6	37 00	1 11.7	75	14.5
3 40	11 31.9	10 00	4 55.9	38 00	1 09.1	76	13.5
3 50	11 10.0	10 30	4 42.4	39 00	1 06.8	77	0 12.5
4 00	10 49.5	11 00	4 30.0	40 00	1 04.4	78	11.5
10	10 30.1	11 30	4 18.7	41 00	1 02.2	79	10.5
20	10 11.7	12 00	4 08.1	42 00	1 00.0	80	09.5
30	9 54.2	12 30	3 58.4	43 00	0 57.9	81	08.6
4 40	9 37.5	13 00	3 49.3	44 00	0 56.0	82	07.6
4 50	9 21.6	13 30	3 40.8	45 00	0 54.1	83	0 06.6
5 00	9 06.5	14 00	3 32.9	46 00	0 52.2	84	05.7
10	8 52.1	14 30	3 25.6	47 00	0 50.4	85	04.7
20	8 38.6	15 00	3 18.6	48 00	0 48.7	86	03.8
30	8 25.5	15 30	3 12.1	49 00	0 47.0	87	02.8
5 40	8 13.0	16 00	3 06.0	50 00	0 45.4	88	01.9
5 50	8 01.2	16 30	3 00.2	51 00	0 43.8	89	0 00.9
6 00	7 49.8	17 00	2 54.8	52 00	0 42.2	90	0 00.0
6 10	7 39.0	17 30	2 49.6	53 00	0 40.8		

Rule: True altitude of a celestial object = Its apparent or observed altitude - refraction.

N.B.-The figures of mean refraction given in the above table are for temperature 25° C and pressure 1000 mb. (750.06 mm. Or 29.530 inches of mercury barometer). For other values of temperature and pressure, corrections form the tables on the following two pages are to be taken and applied to the mean refraction.

TABLE - Xa
ATMOSPHERIC REFRACTION
CORRECTION OF MEAN REFRACTION FOR DIFFERENT VALUES OF TEMPERATURE

Apparent Altitude	- 10° C (14° F)	0° C (32° F)	10° C (50° F)	20° C (68° F)	25° C (77° F)	30° C (86° F)	40° C (104° F)	50° C (122° F)
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
- 1 00	+ 13 31.7	+ 9 17.8	+ 5 13.4	+ 1 37.7	0 00.0	- 1 32.6	- 4 22.5	- 6 54.8
0 00	7 16.3	5 04.8	2 53.4	0 54.8	0 00.0	0 52.1	2 29.6	3 58.2
+ 0 30	5 39.4	3 57.4	2 15.6	0 42.8	0 00.0	0 41.2	1 58.4	3 09.1
1 00	4 27.7	3 07.8	1 47.8	0 34.7	0 00.0	0 32.1	1 33.8	2 30.7
1 30	3 38.4	2 33.1	1 27.9	0 27.8	0 00.0	0 27.1	1 18.1	2 05.2
2 00	3 00.9	2 07.0	1 13.1	0 23.4	0 00.0	0 22.4	1 05.0	1 44.5
2 30	+ 2 32.9	+ 1 48.1	+ 1 02.1	+ 0 19.6	0 00.0	- 0 19.5	- 0 56.0	- 1 29.9
3 00	2 12.7	1 33.2	0 53.8	0 17.2	0 00.0	0 16.7	0 48.2	1 17.5
3 30	1 56.6	1 21.9	0 47.3	0 15.1	0 00.0	0 14.6	0 42.4	1 08.3
4 00	1 43.2	1 12.5	0 42.0	0 13.5	0 00.0	0 12.9	0 37.6	1 00.6
4 30	1 32.5	1 05.0	0 37.9	0 12.0	0 00.0	0 11.7	0 33.9	0 54.5
5 00	1 23.7	0 58.9	0 35.0	0 10.9	0 00.0	0 10.6	0 30.7	0 49.5
6 00	+ 1 10.2	+ 0 49.4	+ 0 30.0	+ 0 09.1	0 00.0	- 0 09.0	- 0 25.8	- 0 41.5
7 00	1 00.3	0 42.5	0 25.6	0 07.9	0 00.0	0 07.6	0 22.1	0 35.7
8 00	0 52.7	0 37.1	0 21.4	0 06.9	0 00.0	0 06.6	0 19.4	0 31.3
9 00	0 46.8	0 32.9	0 19.1	0 06.1	0 00.0	0 05.9	0 17.2	0 27.8
10 00	0 43.0	0 29.6	0 17.1	0 05.4	0 00.0	0 05.3	0 15.5	0 25.0
11 00	0 39.4	0 26.9	0 15.6	0 05.0	0 00.0	0 04.8	0 14.1	0 22.8
12 00	+ 0 35.7	+ 0 24.3	+ 0 14.2	+ 0 04.6	0 00.0	- 0 04.4	- 0 12.8	- 0 20.7
13 00	0 33.1	0 22.6	0 13.2	0 04.2	0 00.0	0 04.0	0 11.9	0 19.2
14 00	0 30.4	0 21.0	0 12.1	0 03.9	0 00.0	0 03.7	0 11.0	0 17.7
15 00	0 28.4	0 19.6	0 11.3	0 03.6	0 00.0	0 03.5	0 10.2	0 16.5
16 00	0 26.4	0 18.2	0 10.3	0 03.4	0 00.0	0 03.3	0 09.5	0 15.4
17 00	0 24.8	0 17.2	0 09.9	0 03.2	0 00.0	0 03.1	0 08.9	0 14.4
18 00	+ 0 23.3	+ 0 16.2	+ 0 09.3	+ 0 03.0	0 00.0	- 0 02.9	- 0 08.4	- 0 13.5
19 00	0 22.1	0 15.2	0 08.8	0 02.7	0 00.0	0 02.7	0 07.9	0 12.8
20 00	0 20.9	0 14.3	0 08.3	0 02.5	0 00.0	0 02.6	0 07.5	0 12.1
25 00	0 16.3	0 11.2	0 06.5	0 02.1	0 00.0	0 02.0	0 05.9	0 09.4
30 00	0 13.1	0 09.0	0 05.2	0 01.7	0 00.0	0 01.6	0 04.7	0 07.6
35 00	0 10.8	0 07.4	0 04.3	0 01.4	0 00.0	0 01.3	0 03.9	0 06.3
40 00	+ 0 09.0	+ 0 06.2	+ 0 03.6	+ 0 01.2	0 00.0	- 0 01.1	- 0 03.2	- 0 05.2
45 00	0 07.5	0 05.2	0 03.0	0 01.0	0 00.0	0 00.9	0 02.7	0 04.4
50 00	0 06.0	0 04.4	0 02.5	0 00.8	0 00.0	0 00.8	0 02.3	0 03.7
55 00	0 05.3	0 03.6	0 02.1	0 00.7	0 00.0	0 00.7	0 02.0	0 03.1
60 00	0 04.4	0 03.0	0 01.8	0 00.6	0 00.0	0 00.6	0 01.6	0 02.5
65 00	0 03.6	0 02.4	0 01.4	0 00.5	0 00.0	0 00.5	0 01.3	0 02.1
70 00	+ 0 02.8	+ 0 01.9	+ 0 01.1	+ 0 00.4	0 00.0	- 0 00.4	- 0 01.0	- 0 01.6
75 00	0 02.0	0 01.4	0 00.8	0 00.3	0 00.0	0 00.3	0 00.7	0 01.2
80 00	0 01.4	0 00.9	0 00.5	0 00.2	0 00.0	0 00.2	0 00.4	0 00.8
85 00	0 00.7	0 00.4	0 00.2	0 00.1	0 00.0	0 00.1	0 00.2	0 00.4
90 00	+ 0 00.0	+ 0 00.0	+ 0 00.0	+ 0 00.0	0 00.0	- 0 00.0	- 0 00.0	- 0 00.0

TABLE - Xb
ATMOSPHERIC REFRACTION
PRESSURE CORRECTION OF REFRACTION FOR DIFFERENT VALUES OF PRESSURE

PRESSURE			AMOUNT OF REFRACTION CORRECTED FOR PRESSURE							
			1′	2′	3′	5′	10′	20′	30′	60′
mb	mm	Inch	″	″	″	′ ″	′ ″	′ ″	′ ″	′ ″
660	495.0	19.49	- 20.4	- 40.8	- 61.3	- 1 42.3	- 3 26.5	- 7 04.9	- 10 59.1	- 24 19
670	502.5	19.79	19.8	39.7	59.5	1 39.3	3 20.4	6 52.5	10 39.8	23 36
680	510.0	20.08	19.2	38.4	57.7	1 36.3	3 14.3	6 39.8	10 20.2	22 53
690	517.5	20.38	18.6	37.2	55.9	1 33.3	3 08.2	6 27.4	10 00.9	22 10
700	525.0	20.67	18.0	36.0	54.1	1 30.3	3 02.2	6 14.9	9 41.5	21 27
710	532.5	20.97	17.4	34.8	52.3	1 27.3	2 56.1	6 02.5	9 22.2	20 45
720	540.0	21.26	- 16.8	- 33.5	- 50.6	- 1 24.3	- 2 50.0	- 5 50.0	- 9 02.8	- 20 01
730	547.5	21.56	16.2	32.4	48.7	1 21.2	2 43.9	5 37.4	8 43.3	19 18
740	555.0	21.85	15.6	31.2	46.9	1 18.2	2 37.8	5 24.9	8 23.9	18 35
750	562.6	22.15	15.0	30.0	45.1	1 15.2	2 31.8	5 12.4	8 04.6	17 53
760	570.1	22.44	14.4	28.9	43.3	1 12.3	2 25.8	5 00.2	7 45.6	17 21
770	577.6	22.74	13.8	27.6	41.5	1 09.2	2 19.7	4 47.5	7 25.9	16 27
780	585.1	23.03	- 13.2	- 26.4	- 39.7	- 1 06.2	- 2 13.6	- 4 35.0	- 7 06.5	- 15 44
790	592.6	23.33	12.6	25.2	37.9	1 03.2	2 07.6	4 22.5	6 47.2	15 01
800	600.1	23.62	12.0	24.0	36.0	1 00.2	2 01.4	4 09.9	6 27.6	14 18
810	607.6	23.92	11.4	22.8	34.3	0 57.2	1 55.4	3 57.5	6 08.3	13 35
820	615.1	24.22	10.8	21.6	32.4	0 54.2	1 49.3	3 44.9	5 48.9	12 52
830	622.6	24.51	10.2	20.4	30.7	0 51.2	1 43.3	3 32.5	5 29.6	12 10
840	630.1	24.81	- 9.6	- 19.2	- 28.9	- 0 48.2	- 1 37.2	- 3 20.0	- 5 10.2	- 11 27
850	637.6	25.10	9.0	18.0	27.0	0 45.1	1 31.1	3 07.4	4 50.7	10 43
860	645.1	25.40	8.4	16.8	25.2	0 42.1	1 25.0	2 54.9	4 31.3	10 01
870	652.6	25.69	7.8	15.6	23.4	0 39.1	1 19.0	2 42.5	4 12.0	9 18
880	660.1	25.99	7.2	14.4	21.6	0 36.1	1 12.9	2 30.0	3 52.6	8 35
890	667.6	26.28	6.6	13.2	19.8	0 33.1	1 06.8	2 17.5	3 33.3	7 52
900	675.1	26.58	- 6.0	- 12.0	- 18.0	- 0 30.1	- 1 00.7	- 2 04.9	- 3 13.7	- 7 09
910	682.6	26.87	5.4	10.8	16.2	0 27.1	0 54.7	1 52.5	2 54.3	6 26
920	690.1	27.17	4.8	9.6	14.4	0 24.1	0 48.6	1 39.9	2 35.0	5 43
930	697.6	27.46	4.2	8.4	12.6	0 21.1	0 42.5	1 27.5	2 15.7	5 01
940	705.1	27.76	3.6	7.2	10.8	0 18.1	0 36.4	1 15.0	1 50.3	4 17
950	712.6	28.05	3.0	6.0	9.0	0 15.0	0 30.3	1 02.4	1 36.9	3 34
960	720.1	28.35	- 2.4	- 4.8	- 7.2	- 0 12.0	- 0 24.3	- 0 49.9	- 1 17.4	- 2 51
970	727.6	28.64	1.8	3.6	5.4	0 09.0	0 18.2	0 37.5	0 58.2	2 09
980	735.1	28.94	1.2	2.4	3.6	0 06.0	0 12.1	0 25.0	0 38.7	1 26
990	742.6	29.24	- 0.6	- 1.2	- 1.8	- 0 03.0	- 0 06.1	- 0 12.5	- 0 19.4	- 0 43
1000	750.1	29.53	0.0	0.0	0.0	0 00.0	0 00.0	0 00.0	0 00.0	0 00
1010	757.6	29.83	+ 0.6	+ 1.2	+ 1.8	+ 0 03.1	+ 0 06.1	+ 0 12.5	+ 0 19.5	+ 0 43
1020	765.1	30.12	1.2	2.4	3.6	0 06.0	0 12.2	0 25.1	0 38.9	1 26
1030	772.6	30.42	1.8	3.6	5.4	0 09.0	0 18.2	0 37.5	0 58.2	2 09
1040	780.1	30.71	2.4	4.8	7.2	0 12.0	0 24.3	0 50.0	0 77.6	2 52
1050	787.6	31.01	+ 3.0	+ 6.0	+ 9.0	+ 0 15.0	+ 0 30.3	+ 0 62.4	+ 0 96.9	+ 3 24

TABLE - XI
FACTORS FOR COMPUTING THE GEOCENTRIC COORDINATES OF A PLACE

ϕ	*S*	*C*	ϕ	*S*	*C*
°			°		
0	0.993306	1.000000	45	0.994972	1.001678
1	0.993307	1.000001	46	0.995031	1.001737
2	0.993310	1.000004	47	0.995089	1.001795
3	0.993315	1.000009	48	0.995147	1.001854
4	0.993322	1.000016	49	0.995205	1.001912
5	0.993331	1.000025	50	0.995262	1.001970
6	0.993342	1.000037	51	0.995320	1.002028
7	0.993355	1.000050	52	0.995377	1.002085
8	0.993370	1.000065	53	0.995433	1.002142
9	0.993387	1.000082	54	0.995489	1.002198
10	0.993406	1.000101	55	0.995544	1.002254
11	0.993427	1.000122	56	0.995599	1.002309
12	0.993449	1.000145	57	0.995652	1.002363
13	0.993474	1.000169	58	0.995705	1.002416
14	0.993500	1.000196	59	0.995758	1.002468
15	0.993528	1.000224	60	0.995809	1.002520
16	0.993558	1.000254	61	0.995859	1.002570
17	0.993590	1.000286	62	0.995908	1.002620
18	0.993623	1.000320	63	0.995956	1.002668
19	0.993658	1.000355	64	0.996002	1.002715
20	0.993695	1.000392	65	0.996048	1.002761
21	0.993733	1.000430	66	0.996092	1.002805
22	0.993773	1.000470	67	0.996135	1.002848
23	0.993814	1.000511	68	0.996176	1.002890
24	0.993856	1.000554	69	0.996216	1.002930
25	0.993900	1.000598	70	0.996255	1.002969
26	0.993945	1.000644	71	0.996291	1.003006
27	0.993992	1.000691	72	0.996327	1.003041
28	0.994039	1.000739	73	0.996360	1.003075
29	0.994088	1.000788	74	0.996392	1.003107
30	0.994138	1.000838	75	0.996422	1.003138
31	0.994189	1.000889	76	0.996451	1.003166
32	0.994241	1.000941	77	0.996477	1.003193
33	0.994293	1.000994	78	0.996502	1.003218
34	0.994347	1.001048	79	0.996525	1.003241
35	0.994401	1.001103	80	0.996546	1.003262
36	0.994456	1.001158	81	0.996565	1.003281
37	0.994512	1.001214	82	0.996582	1.003299
38	0.994568	1.001271	83	0.996597	1.003314
39	0.994625	1.001328	84	0.996610	1.003327
40	0.994682	1.001386	85	0.996622	1.003338
41	0.994740	1.001444	86	0.996631	1.003348
42	0.994798	1.001502	87	0.996638	1.003355
43	0.994856	1.001560	88	0.996643	1.003360
44	0.994914	1.001619	89	0.996646	1.003363
45	0.994972	1.001678	90	0.996647	1.003364

$\rho \sin \phi' = (S+H) \sin \phi$ $\qquad$ $\rho \cos \phi' = (C+H) \cos \phi$

$H = 0.156779 \times$ elevation in meters $\times 10^{-6}$ $\qquad$ $H = 0.047786 \times$ elevation in feet $\times 10^{-6}$

TABLE - XII
CONVERSION OF GEOGRAPHIC TO GEOCENTRIC COORDINATES

φ	φ′ - φ	ρ	ONE DEGREE OF		φ	φ′ - φ	ρ	ONE DEGREE OF	
			Latitude	Longitude				Latitude	Longitude
°	′ ″		Kilometers	Kilometers	°	′ ″		Kilometers	Kilometers
0	0 00.0	1.000000	110.57	111.32	45	- 11 32.7	0.998331	111.13	78.85
1	- 0 24.1	0.999999	110.58	111.30	46	11 32.4	0.998272	111.15	77.46
2	0 48.2	0.999996	110.58	111.25	47	11 31.2	0.998214	111.17	76.06
3	1 12.2	0.999991	110.58	111.17	48	11 29.2	0.998155	111.19	74.63
4	1 36.1	0.999984	110.58	111.05	49	11 26.3	0.998097	111.21	73.17
5	1 59.9	0.999975	110.58	110.90	50	11 22.6	0.998039	111.23	71.70
6	2 23.6	0.999964	110.59	110.71	51	11 18.1	0.997982	111.25	70.20
7	2 47.0	0.999951	110.59	110.50	52	11 12.7	0.997925	111.27	68.68
8	3 10.3	0.999936	110.60	110.24	53	11 06.5	0.997868	111.29	67.14
9	3 33.4	0.999919	110.60	109.96	54	10 59.5	0.997812	111.31	65.58
10	- 3 56.2	0.999900	110.61	109.64	55	- 10 51.7	0.997756	111.32	63.99
11	4 18.7	0.999879	110.62	109.29	56	10 43.1	0.997702	111.34	62.39
12	4 40.9	0.999856	110.62	108.90	57	10 33.7	0.997648	111.36	60.77
13	5 02.8	0.999832	110.63	108.49	58	10 23.5	0.997594	111.38	59.13
14	5 24.3	0.999805	110.64	108.03	59	10 12.6	0.997542	111.40	57.48
15	5 45.4	0.999777	110.65	107.55	60	10 00.9	0.997491	111.41	55.80
16	6 06.0	0.999747	110.66	107.03	61	9 48.5	0.997440	111.43	54.11
17	6 26.3	0.999716	110.67	106.49	62	9 35.4	0.997391	111.45	52.40
18	6 46.1	0.999682	110.68	105.91	63	9 21.5	0.997343	111.46	50.67
19	7 05.4	0.999647	110.69	105.29	64	9 07.0	0.997296	111.48	48.93
20	- 7 24.1	0.999611	110.70	104.65	65	- 8 51.8	0.997250	111.49	47.18
21	7 42.4	0.999573	110.72	103.97	66	8 36.0	0.997206	111.51	45.40
22	8 00.0	0.999533	110.73	103.26	67	8 19.5	0.997163	111.52	43.62
23	8 17.1	0.999492	110.74	102.52	68	8 02.4	0.997121	111.54	41.82
24	8 33.6	0.999449	110.76	101.75	69	7 44.7	0.997081	111.55	40.01
25	8 49.5	0.999405	110.77	100.95	70	7 26.4	0.997042	111.56	38.19
26	9 04.7	0.999360	110.79	100.12	71	7 07.6	0.997005	111.57	36.35
27	9 19.3	0.999314	110.80	99.26	72	6 48.3	0.996970	111.59	34.50
28	9 33.2	0.999266	110.82	98.36	73	6 28.4	0.996936	111.60	32.65
29	9 46.4	0.999217	110.84	97.44	74	6 08.1	0.996904	111.61	30.78
30	- 9 58.9	0.999167	110.85	96.49	75	- 5 47.4	0.996874	111.61	28.90
31	10 10.7	0.999116	110.87	95.50	76	5 26.2	0.996845	111.62	27.02
32	10 21.7	0.999064	110.89	94.49	77	5 04.6	0.996818	111.63	25.12
33	10 32.0	0.999011	110.90	93.45	78	4 42.6	0.996793	111.64	23.22
34	10 41.5	0.998958	110.92	92.39	79	4 20.3	0.996770	111.65	21.31
35	10 50.2	0.998903	110.94	91.29	80	3 57.7	0.996749	111.66	19.39
36	10 58.1	0.998848	110.96	90 16	81	3 34.7	0.996730	111.67	17.47
37	11 05.3	0.998792	110.98	89.01	82	3 11.6	0.996713	111.67	15.54
38	11 11.6	0.998736	111.00	87.83	83	2 48.1	0.996697	111.68	13.61
39	11 17.1	0.998679	111.02	86.63	84	2 24.5	0.996684	111.68	11.67
40	-11 21.8	0.998622	111.03	85.39	85	- 2 00.7	0.996673	111.69	9.73
41	11 25.7	0.998564	111.05	84.14	86	1 36.7	0.996664	111.69	7.79
42	11 28.7	0.998506	111.07	82.85	87	1 12.7	0.996656	111.69	5.85
43	11 30.9	0.998447	111.09	81.54	88	0 48.5	0.996651	111.69	3.90
44	11 32.2	0.998389	111.11	80.21	89	- 0 24.3	0.996648	111.69	1.95
45	-11 32.7	0.998331	111.13	78.85	90	0 00.0	0.996647	111.69	0.00

φ and φ′ are the geographic and geocentric latitude respectively
ρ = radius of the earth.
1 kilometre = 0.621372 miles.

LATITUDE AND LONGITUDE OF PLACES

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Agartala	16	+23 31.8	+ 91 09.0	+6 04 36	+59.89	-34 36	+0.39677	0.91734
Agra	160	+27 05.6	+ 77 34.8	+5 10 19	+50.98	+19 51	+0.45272	0.89091
Ahmedabad	49	+23 03.0	+ 72 40.2	+4 50 41	+47.75	+39 19	+0.38912	0.92064
Aizawl	1097	+23 26.4	+ 92 43.2	+6 10 53	+60.93	-40 53	+0.39540	0.91812
Ajmer	486	+26 16.2	+ 74 22.2	+4 57 29	+48.87	+32 31	+0.43996	0.89738
Alibag (Obs.) Mumbai,	7	+19 00.0	+ 72 30.6	+4 50 02	+47.65	+39 58	+0.33350	0.94586
Aligarh	187	+27 31.8	+ 78 2.44	+5 12 10	+51.28	+17 47	+0.45946	0.88743
Allahabad	96	+25 16.2	+ 81 26.4	+5 25 46	+53.51	+04 14	+0.42429	0.90487
Amritsar	231	+31 22.8	+ 74 31.2	+4 58 05	+48.97	+31 55	+0.51771	0.85454
Bangalore	921	+12 34.8	+ 77 21.0	+5 09 24	+50.83	+20 36	+0.21641	0.97629
Bangkok, Thailand	16	+13 25.0	+100 18.0	+6 41 12	+65.91	- 71 12	+0.23052	0.97289
Baroda	35	+22 12.0	+ 73 9.6	+4 52 38	+48.07	+37 22	+0.37549	0.92632
Bhopal	506	+23 10.2	+ 77 12.6	+5 08 50	+50.73	+21 10	+0.39106	0.91989
Bhuj	105	+23 09.0	+ 69 24.0	+4 37 36	+45.60	+52 24	+0.39072	0.91997
Bhubaneswar	46	+20 00.0	+ 85 30.0	+5 42 00	+56.18	- 12 00	+0.33987	0.94007
Bikaner	224	+28 01.0	+ 73 10.8	+4 52 43	+48.09	+37 17	+0.46695	0.88349
Bilaspur,(H.P)	502	+31 11.4	+ 76 30.0	+5 06 00	+50.27	+24 00	+0.51491	0.85629
Buenos Aires (Naval Obs.), Argentina	6	-34 21.0	- 58 12.0	- 3 52 48	-38.24	.. ..	-0.56107	0.82649
Cairo	68	+30 01.0	+ 31 09.0	+2 04 36	+20.47	.. ..	+0.49733	0.86662
Canberra (Mount Stromlo), Australia	767	-35 10.2	+149 10.5	+9 56 42	+98.02	.. ..	-0.57285	0.81845
Cape Town (Ast. Obs.), S. Africa	18	-33 33.6	+ 18 15.0	+1 13 00	+11.99	.. ..	-0.54967	0.83416
Chandigarh	347	+30 25.2	+ 76 32.0	+5 06 08	+50.29	+23 52	+0.50340	0.86312
Chennai (or Madras) Obs.	7	+13 00.0	+ 80 06.6	+5 20 26	+52.64	+ 9 34	+0.22348	0.97454
Chittagong, Bangladesh	27	+22 12.6	+ 91 31.8	+6 06 07	+60.14	- 36 07	+0.37565	0.92625
Colaba Obs. Mumbai, (Bombay)	14	+19 04.2	+ 72 31.0	+4 50 04	+47.65	+39 56	+0.32465	0.94546
Colombo (Obs.), Srilanka	6	+ 6 33.6	+ 79 33.6	+5 18 14	+52.28	+11 46	+011348	0.99350
Cuttack	26	+20 16.8	+ 85 33.6	+5 42 14	+56.42	- 12 14	+0.34443	0.93839
Dacca,Bangladesh	7	+23 25.8	+ 90 15.6	+6 01 02	+59.31	- 31 02	+0.39518	0.91803
Darjeeling	2128	+27 02.0	+ 88 10.8	+5 52 43	+57.94	- 22 43	+0.45193	0.89166
Dehra Dun	682	+30 11.3	+ 78 01.2	+5 12 05	+51.27	+17 55	+0.49995	0.86520
Delhi	220	+28 21.0	+ 77 07.2	+5 08 29	+50.68	+21 31	+0.47205	0.88076
Dibrugarh	106	+27 17.4	+ 94 06.0	+6 16 24	+61.83	- 46 24	+0.45575	0.88734
Gangtok	1768	+27 12.0	+ 88 22.2	+5 53 29	+58.07	- 23 29	+0.45448	0.89029
Guwahati	55	+26 3.6.0	+ 91 21.0	+6 05 24	+60.03	- 35 24	+0.43666	0.89892
Gauribidanur (Radio Astr. Obs.)	686	+13 36.2	+ 77 26.1	+5 09 44	+50.88	+20 16	+0.23369	0.97223
Gaya	111	+24 27.0	+ 84 34.2	+5 38 17	+55.57	- 8 17	+0.41137	0.91086

1 metre = 3.2808 feet

LATITUDE AND LONGITUDE OF PLACES

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Geneva (Obs.), Switzerland	465	+46 07.8	+ 6 04.2	+0 24 17	+ 3.99	.. ..	+0.71739	0.69428
Greenwich (Royal Obs.).	47	+51 28.6	0 00	0 00 00.0	0.00	.. ..	+0.77872	0.62412
Hanle/ Mt.Saraswati (Indian Ast. Obs.)	4467	+32 46.8	+ 78 57.9	+5 15 51.6	+51.89	+14 8.4	+0.53870	0.84217
Haridwar	274	+29 34.8	+ 78 08.0	+5 12 32.0	+51.34	+ 17 28	+0.49076	0.87041
Heidelberg Obs., Germany	570	+49 14.0	+ 8 25.2	+0 33 41.0	+ 5.53	.. ..	+0.75382	0.65430
Helwan (Obs.), Egypt	116	+29 51.5	+ 31 22.8	+2 05 31.2	+20.62	.. ..	+0.49494	0.86800
Herstmonceux (Royal Obs.), Sussex, U.K.	31	+50 52.0	+ 0 20.3	+0 01 21.0	+ 0.22	.. ..	+0.77205	0.63241
Hyderabad (Nizamiah Obs.)	554	+17 25.9	+ 78 27.2	+5 13 49.0	+51.55	+ 16 11	+0.29768	0.95444
Imphal	801	+24 26.4	+ 93 34.8	+6 14 19.0	+61.49	- 44 19	+0.41126	0.91103
India, Central Station of	-	+23 11.0	+ 82 30.0	+5 30 00.0	+54.21	0 00	+0.39124	0.91973
Indore	556	+22 26.4	+ 75 30.0	+5 02 00.0	+49.61	+ 28 00	+0.37938	0.92481
Istambul (Univ. Obs.), Turkey	65	+41 00.7	+ 28 57.9	+1 55 51.6	+19.03	.. ..	+0.65277	0.75567
IUCAA Giravali Obs., Pune	1000	+18 19.2	+ 73 30.6	+4 54 02.0	+48.3	+35 58	+0.31237	0.94978
Jabalpur	393	+23 07.2	+ 79 34.2	+5 18 17.0	+52.29	+ 11 43	+0.39026	0.92022
Jaipur	436	+26 33.0	+ 75 31.2	+5 02 05.0	+49.62	+ 27 55	+0.44431	0.89520
Jakarta, Indonesia	23	- 6 07.2	+106 30.0	+7 06 00.0	+69.98	.. ..	-0.10590	0.99434
Jamshedpur	152	+22 29.4	+ 86 06.6	+5 44 26.0	+56.58	- 14 26	+0.38016	0.92442
Japal Rangapur (Obs.),	695	+17 05.9	+ 78 43.7	+5 14 55.0	+51.73	+ 15 05	+0.29216	0.95618
Jodhpur	224	+26 10.8	+ 73 00.6	+4 52 02.0	+47.97	+ 37 58	+0.43854	0.89803
Johannesberg, South Africa	1806	- 26 10.9	+ 28 04.5	+1 52 18.0	+18.45	.. ..	-0.43868	0.89824
Kabul, Afghanistan	1766	+34 18.0	+ 69 10.8	+4 36 43.0	+45.46	+ 53 17	+0.56051	0.82721
Kanchipuram	76	+12 30.0	+ 79 27.0	+5 17 48.0	+52.21	+ 12 12	+0.21503	0.97646
Kanpur	126	+26 15.6	+ 80 13.2	+5 20 53.0	+52.71	+ 9 07	+0.43978	0.89740
Karachi, Pakistan	4	+24 53.6	+ 67 02.4	+4 28 10.0	+44.05	+ 61 50	+0.41836	0.90763
Kathmandu, Nepal	1324	+27 23.2	+ 85 07.2	+5 40 29.0	+55.93	- 10 29	+0.45733	0.88874
Kavalur (Vainu Bappu Obs.),	725	+12 34.6	+ 78 49.6	+5 15 18.0	+51.80	+ 14 42	+0.21635	0.97627
Kodaikanal (Solar Obs.)	2343	+10 13.8	+ 77 28.1	+5 09 52.0	+50.90	+ 20 08	+0.17649	0.98457
Kohima	1405	+25 24.0	+ 94 04.8	+6 16 19.0	+61.82	- 46 19	+0.42642	0.90409
Kolkata (Alipore Obs.), (Calcutta)	6	+22 19.2	+ 88 12.0	+5 52 48.0	+57.96	- 22 48	+0.37742	0.92553
Kolkata (Presi. Coll. Obs.)	12	+22 23.4	+ 88 16.2	+5 53 05.0	+58.00	- 23 05	+0.37854	0.92506
Kurnool	281	+15 30.0	+ 78 03.0	+5 12 12.0	+51.29	+ 17 48	+0.26552	0.96390

1 metre = 3.2808 feet

LATITUDE AND LONGITUDE OF PLACES

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Kyoto (Univ. Ast. Dept. Obs.), Japan	86	+35 00.6	+135 20.4	+9 1 22.0	+88.93	.. ..	+0.57052	0.81997
Lahore, Pakistan	214	+31 22.2	+ 74 15.6	+4 57 02.0	+48.80	+ 32 58	+0.51756	0.85269
Lucknow	113	+26 31.2	+ 80 33.6	+5 22 14.0	+52.94	+ 7 46	+0.44383	0.89539
Maitri (Indian base station at Antarctica)	132	-70 46.0	+ 11 45.0	+0 47 00.0	+ 7.72	.. ..	-0.94069	0.33041
Mangalore	22	+12 33.0	+ 74 31.8	+4 58 07.0	+48.97	+ 31 53	+0.21587	0.97626
Moscow (Sternberg State Ast. Inst.), Russia	195	+55 27.0	+ 37 22.2	+2 29 29.0	+24.56	.. ..	+0.82001	0.56843
Mount Abu (Gurushikhar Obs.)	1700	+24 23.4	+ 72 25.8	+4 49 43.0	+47.59	+40 17	+0.41053	0.91152
Mount Palomar (Obs.), U.S.A.	1706	+33 21.4	-116 51.8	- 7 47 27.2	-76.79	.. ..	+054687	0.83633
Mount Wilson (Obs.), U.S.A.	1742	+34 13.0	-118 03.6	- 7 52 14.4	-77.58	.. ..	+0.55931	0.82802
Mysore	767	+12 10.8	+ 76 25.2	+5 05 41.0	+50.22	+ 24 19	+0.20963	0.97775
Nagpur	312	+21 05.4	+ 79 04.2	+5 16 17.0	+51.96	+ 13 43	+0.35760	0.93347
Nainital (Aryabhatta Res. Inst. Of Obs. Sci.)	1927	+29 13.8	+ 79 18.0	+5 17 12.0	+52.11	+ 12 48	+0. 48558	0.87363
New York (Rutherford Obs.), U.S.A.	25	+40 25.8	- 74 00.6	- 4 56 02.0	-48.63	.. ..	+0.64509	0.76228
Ottawa, Canada	87	+45 16.2	- 75 22.2	- 5 01 29.0	-49.53	.. ..	+0.70688	0.70497
Panaji	56	+15 18.0	+ 73 33.0	+4 54 12.0	+48.33	+ 35 48	+0.26217	0.96479
Paris (Obs.), France	67	+48 30.0	+ 2 12.0	+0 08 49.0	+ 1.45	.. ..	+0.74535	0.66387
Patiala	251	+30 12.0	+ 76 15.0	+5 05 00.0	+50.10	+ 25 00	+0.50010	0.86504
Patna	53	+25 21.6	+ 85 03.6	+5 40 14.0	+55.89	- 10 14	+0.42570	0.90420
Peshawar, Pakistan	358	+34 01.0	+ 71 34.0	+4 46 15.0	+47.03	+ 43 45	+0.55630	0.82979
Pondicherry	6	+11 34.8	+ 79 29.4	+5 17 58.0	+52.23	+ 12 02	+0. 19942	0.97978
Pune	559	+18 19.0	+ 73 30.0	+4 54 00.0	+48 .30	+ 36 00	+0.31230	0.94973
Porbandar	7	+21 22.2	+ 69 29.4	+4 37 58.0	+45.66	+ 52 02	+0.36211	0.93166
Port Blair	79	+11 24.0	+ 92 25.8	+6 09 43.0	+60.74	- 39 43	+0.19636	0.98041
Puri	6	+19 28.8	+ 85 29.4	+5 41 58.0	+56.18	- 11 58	+0.33137	0.94311
Quetta, Pakistan	1673	+30 07.2	+ 67 00.0	+4 28 00.0	+44.03	+ 62 00	+0.49901	0.86593
Rajkot	132	+22 10.8	+ 70 33.6	+4 42 14.0	+46 .36	+ 47 46	+0.37518	0.92646
Rawalpindi, Pakistan	510	+33 22.2	+ 73 03.6	+4 52 14.0	+48.01	+ 37 46	+0.54696	0.83605
Rome (Obs.), Italy	152	+41 33.0	+ 12 16.8	+0 49 07.2	+ 8.07	.. ..	+0.65982	0.74950
San Fernando (Naval Obs.), Spain	27	+36 28.0	- 6 12.2	-0 24 48.8	- 4.08	.. ..	+0.59108	0.80516
Shillong	1500	+25 20.4	+ 91 33.6	+6 06 14.0	+61.16	- 36 14	+0.42549	0.90455

1 metre = 3.2808 feet

LATITUDE AND LONGITUDE OF PLACES

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Sholapur	476	+17 24.0	+ 75 33.6	+5 02 14	+49.65	+ 27 46	+0.29715	0.95460
Siliguri	127	+26 24.0	+ 88 13.2	+5 52 53	+57.97	- 22 53	+0.44196	0.89632
Simla	2202	+31 03.6	+ 77 07.8	+5 08 31	+50. 68	+ 21 29	+0.51312	0.85769
Singapore	18	+ 1 10.2	+103 30.6	+6 54 02	+68.02	.. ..	+0.02028	0.99980
Srinagar	1586	+34 03.6	+ 74 30.6	+4 58 02	+48.96	+ 31 58	+0.55704	0.82953
St. Petersburg Univ. Obs., Russia	3	+59 56.5	+ 30 17.7	+2 01 11	+19.91	.. ..	+0.86189	0.50214
Tehran, Iran	1200	+35 24.6	+ 51 15.0	+3 25 00	+33.68	.. ..	+0.57630	0.81610
Tokyo (Hydrographic Obs.), Japan	41	+35 24.0	+138 27.0	+9 13 48	+90.98	.. ..	+0.57605	0.81605
Thiruvanantapuram	61	+ 8 17.4	+ 76 34.2	+5 06 17	+50.31	+ 23 43	+0.14323	0.98963
Udaipur (Solar Obs.)	301	+24 21.0	+ 73 25.2	+4 53 41	+48.24	+ 36 19	+0.40980	0.91161
Udhagamandalam (Ooty) (Rad. Astr.Centre)	2150	+11 22.9	+ 76 40.0	+5 06 40	+50.38	+ 23 20	+0.19611	0.98079
Ujjain	496	+23 06.3	+ 75 28.2	+5 01 53	+49.59	+ 28 07	+0.39002	0.92033
Varanasi	76	+25 10.8	+ 83 00.0	+5 32 00	+54.54	- 2 00	+0.42288	0.90554
Visakhapatnam	38	+17 25.8	+ 83 08.4	+5 32 34	+54.63	- 2 34	+0.29763	0.95438
Washington (U. S. Naval Obs.), U.S.A.	92	+38 33.0	- 77 02.4	- 5 08 10	-50.62	.. ..	+0.61984	0.78309
Yangon, Myanmar	28	+16 27.0	+ 96 7.20	+6 24 29	+63.16	- 54 29	+0.28136	0.95933

1 metre = 3.2808 feet

SEMI-DIURNAL AND SEMI-NOCTURNAL ARCS

(FOR TRUE ALTITUDE = 0)

Lat. / Decli.	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
° '	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
0 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00
5 00	6 00	6 04	6 07	6 12	6 14	6 17	6 20	6 24	6 26	6 28	6 30	6 32	6 35
10 00	6 00	6 07	6 15	6 23	6 28	6 34	6 41	6 49	6 52	6 56	7 01	7 06	7 11
15 00	6 00	6 11	6 22	6 36	6 43	6 52	7 02	7 14	7 20	7 27	7 34	7 42	7 51
20 00	6 00	6 15	6 30	6 49	6 59	7 11	7 25	7 43	7 51	8 00	8 11	8 22	8 36
23 00	6 00	6 18	6 36	6 58	7 11	7 25	7 43	8 05	8 15	8 27	8 40	8 56	9 15
25 00	6 00	6 19	6 39	7 02	7 16	7 32	7 51	8 15	8 27	8 40	8 55	9 13	9 35
28 00	6 00	6 22	6 45	7 12	7 27	7 46	8 08	8 37	8 52	9 08	9 28	9 59	10 28
30 00	6 00	6 23	6 49	7 18	7 35	7 56	8 21	8 54	9 11	9 30	9 55	10 30	12 00

When the latitude of the place and the declination of the heavenly body are of the same sign then the figure represent semi-diurnal arc, when of opposite signs then semi-nocturnal arc.

AMPLITUDE OF RISING AND SETTING

(FOR TRUE ALTITUDE = 0)

Lat. / Decli.	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '
0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
5 00	5 00	5 05	5 19	5 47	6 06	6 32	7 05	7 48	8 08	8 32	8 58	9 28	10 02
10 00	10 00	10 09	10 39	11 34	12 14	13 06	14 13	15 40	16 23	17 11	18 05	19 08	20 19
15 00	15 00	15 14	15 59	17 23	18 25	19 45	21 28	23 45	24 52	26 07	27 34	29 14	31 10
20 00	20 00	20 19	21 21	23 16	24 41	26 31	28 56	32 09	33 45	35 35	37 42	40 12	43 10
23 00	23 00	23 50	25 03	27 21	29 04	31 18	34 15	38 15	40 16	42 37	45 22	48 40	52 44
25 00	25 00	25 25	26 44	29 13	31 04	33 29	36 42	41 06	43 21	45 58	49 06	52 54	57 42
28 00	28 00	28 28	29 58	32 50	34 58	37 48	41 36	46 55	49 41	53 00	57 06	62 22	69 52
30 00	30 00	30 31	32 09	35 16	37 37	40 45	45 00	51 04	54 18	58 17	63 24	70 39	90 00

The amplitude of rising and setting points of a heavenly body is measured from the East or the West point of the horizon towards the northern or southern direction as the case may be. The amplitude is of the same sign as that of declination of the body.

Note - If true zenith distance of the heavenly body at the time of rising or setting be 90° + *h*, then the figures of the above two tables would require some correction according to the value of *h* (vide Explanation).

AUGMENTATION OF MOON'S SEMI-DIAMETER

Moon 's Apparent Altitude

Semi-diameter	0°	6°	12°	18°	24°	30°	36°	42°	48°	54°	60°	66°	72°	78°	84°	90°
' "	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
14 30	0.1	1.5	2.9	4.3	5.6	6.9	8.1	9.2	10.2	11.1	11.8	12.5	13.0	13.4	13.6	13.7
15 00	0.1	1.6	3.1	4.6	6.0	7.3	8.6	9.8	10.9	11.8	12.7	13.4	13.9	14.3	14.6	14.6
15 30	0.1	1.7	3.3	4.9	6.4	7.9	9.2	10.5	11.6	12.7	13.5	14.3	14.9	15.3	15.6	15.6
16 00	0.1	1.9	3.6	5.2	6.8	8.4	9.8	11.2	12.4	13.5	14.4	15.2	15.9	16.3	16.6	16.7
16 30	0.2	2.0	3.8	5.6	7.3	8.9	10.5	11.9	13.2	14.4	15.4	16.2	16.9	17.4	17.6	17.7
17 00	0.2	2.1	4.0	5.9	7.7	9.5	11.1	12.6	14.0	15.3	16.3	17.2	17.9	18.4	18.7	18.8

The visible or apparent semi-diameter of the moon is augmented over the tabulated value due to moon's altitude above the horizon.

NATURAL TRIGONOMETRIC FUNCTIONS

ANGLE		Sin	Cos	Tan	Cot	Sec	Cosec		
Arc	Time								
°	h m							h m	°
0	0 00	0.00000	1.00000	0.00000	Infinity	1.00000	Infinity	6 00	90
1	0 04	.01745	0.99985	.01746	57.28996	.00015	57.29869	5 56	89
2	0 08	.03490	.99939	.03492	28.63625	.00061	28.65371	5 52	88
3	0 12	.05234	.99863	.05241	19.08114	.00137	19.10732	5 48	87
4	0 16	.06976	.99756	.06993	14.30067	.00244	14.33559	5 44	86
5	0 20	.08716	.99619	.08749	11.43005	.00382	11.47371	5 40	85
6	0 24	.10453	.99452	.10510	9.51436	.00551	9.56667	5 36	84
7	0 28	.12187	.99255	.12278	8.14435	.00751	8.20551	5 32	83
8	0 32	.13917	.99027	.14054	7.11537	.00983	7.18530	5 28	82
9	0 36	.15643	.98769	.15838	6.31375	.01247	6.39245	5 24	81
10	0 40	.17365	.98481	.17633	5.67128	.01543	5.75877	5 20	80
11	0 44	0.19081	0.98163	0.19438	5.14455	1.01872	5.24084	5 16	79
12	0 48	.20791	.97815	.21256	4.70463	.02234	4.80973	5 12	78
13	0 52	.22495	.97437	.23087	4.33148	.02630	4.44541	5 08	77
14	0 56	.24192	.97030	.24933	4.01078	.03061	4.13357	5 04	76
15	1 00	.25882	.96593	.26795	3.73205	.03528	3.86370	5 00	75
16	1 04	.27564	.96126	.28675	3.48741	.04030	3.62796	4 56	74
17	1 08	.29237	.95630	.30573	3.27085	.04569	3.42030	4 52	73
18	1 12	.30902	.95106	.32492	3.07768	.05146	3.23607	4 48	72
19	1 16	.32557	.94552	.34433	2.90421	.05762	3.07155	4 44	71
20	1 20	.34202	.93969	.36397	2.74748	.06418	2.92380	4 40	70
21	1 24	0.35837	0.93358	0.38386	2.60509	1.07115	2.79043	4 36	69
22	1 28	.37461	.92718	.40403	2.47509	.07853	2.66947	4 32	68
23	1 32	.39073	.92050	.42447	2.35585	.08636	2.55930	4 28	67
24	1 36	.40674	.91355	.44523	2.24604	.09464	2.45859	4 24	66
25	1 40	.42262	.90631	.46631	2.14451	.10338	2.36620	4 20	65
26	1 44	.43837	.89879	.48773	2.05030	.11260	2.28117	4 16	64
27	1 48	.45399	.89101	.50953	1.96261	.12233	2.20269	4 12	63
28	1 52	.46947	.88295	.53171	1.88073	.13257	2.13005	4 08	62
29	1 56	.48481	.87462	.55431	1.80405	.14335	2.06267	4 04	61
30	2 00	.50000	.86603	.57735	1.73205	.15470	2.00000	4 00	60
31	2 04	0.51504	0.85717	0.60086	1.66428	1.16663	1.94160	3 56	59
32	2 08	.52992	.84805	.62487	1.60033	.17918	1.88708	3 52	58
33	2 12	.54464	.83867	.64941	1.53987	.19236	1.83608	3 48	57
34	2 16	.55919	.82904	.67451	1.48256	.20622	1.78829	3 44	56
35	2 20	.57358	.81915	.70021	1.42815	.22077	1.74345	3 40	55
36	2 24	.58779	.80902	.72654	1.37638	.23607	1.70130	3 36	54
37	2 28	.60182	.79864	.75355	1.32704	.25214	1.66164	3 32	53
38	2 32	.61566	.78801	.78129	1.27994	.26902	1.62427	3 28	52
39	2 36	.62932	.77715	.80978	1.23490	.28676	1.58902	3 24	51
40	2 40	.64279	.76604	.83910	1.19175	.30541	1.55572	3 20	50
41	2 44	0.65606	0.75471	0.86929	1.15037	1.32501	1.52425	3 16	49
42	2 48	.66913	.74314	.90040	1.11061	.34563	1.49448	3 12	48
43	2 52	.68200	.73135	.93252	1.07237	.36733	1.46628	3 08	47
44	2 56	.69446	.71934	0.96569	1.03553	.39016	1.43956	3 04	46
45	3 00	0.70711	0.70711	1.00000	1.00000	1.41421	1.41421	3 00	45
		Cos	Sin	Cot	Tan	Cosec	Sec	Time	Arc
								ANGLE	

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.		Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m		h	h	m
Aden	+ 3	15	00	Belgium	+ 1	13	00
Afghanistan	+ 4 1/2	16	30	Belize	- 6Ψ	06	00Ψ
Alaska	-9	03	00	Bermuda	- 4	08	00
- Day light Saving Time	- 8	04	00	Bhutan	+ 6	18	00
Albania	+ 1	13	00	Bolivia	- 4	08	00
- Day light Saving Time	+ 2	14	00	Brazil-			
Aleutian Islands	- 10	02	00	Eastern (including coast)	- 3*	09	00*
Algeria	0	12	00	Western	- 3*	09	00*
Angola	+ 1	13	00	Territory of Acre	- 4*	08	00*
Argentina	- 3	09	00	Bulgaria	+ 2	14	00
Ascension Islands	0	12	00	Cambodia	+ 7	19	00
Australia-				Cameroon	+ 1	13	00
Capital Territory (Canberra), Victoria, New South Wales, Queensland, Tasmania.	+ 10	22	00	Canada- Newfoundland	- 3 1/2*	08	30*
South Australia, Northern Territory, Broken Hill Area	+ 9 1/2	21	30	East of Long. 63° W N W Territories (East of Long. 68° W), New Brunswick Nova Scotia, Prince Edward Island	- 4*	08	00*
- Day light Saving Time	+ 10 1/2	22	30				
Western Australia	+ 8	20	00	Quebec (West of Long.63°W), Ontario (East of Long 90° W) (Ottawa), Nunavut (East) and NW Territories (Long.. W 68°-85°)	- 5*	07	00*
- Day light Saving Time	+ 9	21	00				
Austral Islands	- 10	02	00	Ontario (West of Long. 90° W), Manitoba, NW Territories (Long. W 85°-102°), East Saskatchewan, Nunavut (Central)	- 6*	06	00*
Austria	+ 1	13	00	Alberta	- 7*	05	00*
Azores	- 1	11	00	Yukon Time	- 8	04	00
Bahrain	+ 3	15	00	Canary Island	+ 1	13	00
Bangladesh	+ 6	18	00	Cape Verde Islands	- 1	11	00

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.
	h	h m		h	h m
Caroline Islands-	+ 11	23 00	Ghana	0	12 00
Truk, Ponape	+ 11	23 00	Gibraltar	+ 1↓	13 00↓
Central African Republic	+ 1	13 00	Greece	+ 2	14 00
Chile	- 4*	08 00*	Greenland		
China, People's Republic of	+ 8	20 00	Angmagssalik, W. Coast	- 3	09 00
Cocos-keeling Islands	+ 6 1/2	18 30	Thule Area	- 4	08 00
Colombia	- 5	07 00	Guam	+ 10	22 00
Congo Republic	+ 1	13 00	Guatemala	- 6	06 00
Cook Islands	- 10	02 00	Guiana		
			Dutch (Surinam)	- 3	09 00
Corsica	+ 1↓	13 00↓	French	- 3	09 00
Costa Rica	- 6	06 00	Guyana Republic	- 4	08 00
Croatia	+1	13 00	Haiti	- 5	07 00
Cuba	- 5*	07 00*	Hawaiian Islands	- 10	02 00
Czech Republic	+1	13 00	Honduras	- 6	06 00
Cyprus	+ 2	14 00	Hong Kong	+ 8*	20 00*
Dahomey Republic (Africa)	+ 1	13 00	Hungary	+ 1	13 00
Denmark	+ 1	13 00	Iceland	0	12 00
Ecuador	- 5	07 00	India	+ 5 1/2	17 30
Egypt	+ 2*	14 00*	Indonesia, Republic of-	--	--
Estonia	+ 2	14 00	Sumatra, Java, West & Central Kalimantan	+ 7	19 00
El Salvador	- 6	06 00	Bali, South & East Kalimantan	+ 8	20 00
Ethiopia	+ 3	15 00	Irian Jaya, Maluku	+ 9	21 00
Falkland Islands	-4	08 00	Iran	+ 3 1/2	15 30
Fiji	+12	24 00	Iraq	+ 3	15 00
Finland	+2	14 00	Ireland, Republic of	0	12 00
France	+1↓	13 00↓	Israel	+2	14 00
Germany	+1	13 00	Italy	+1*	13 00*

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.		Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m		h	h	m
Ivory Coast	0	12	00	Monaco	+ 1	13	00
Japan (and Japan Is.)	+ 9	21	00	Mongolia	+ 8	20	00
Jordan	+ 2	14	00	Morocco	0*	12	00*
Kenya	+ 3	15	00	Mozambique	+ 2	14	00
Korea (North & South)	+ 9	21	00	Nepal	+ 5 3/4	17	45
Kuwait	+ 3	15	00	Netherlands (Holland)	+ 1	13	00
Laos	+ 7	19	00	New Caledonia	+ 11	23	00
Latvia	+ 2	14	00	New Hebrides	+ 11	23	00
Lebanon	+ 2*	14	00*	New Zealand	+ 12	24	00
Liberia	0	12	00	Nicaragua	- 6	06	00
Libya	+ 2	14	00	Niger	+ 1	13	00
Lithuania	+ 3	15	00	Nigeria	+ 1	13	00
Luxembourg	+ 1↓	13	00↓	Norfolk Island	+ 11 1/2	23	30
Madagascar	+ 3	15	00	Norway	+ 1*	13	00*
Madeira	- 1*	11	00*	Oman (Masira, Muscat, Salalah)	+ 4	16	00
Malawi	+ 2	14	00	Pakistan	+ 5	17	00
Malaysia	+ 8	20	00	Papua New Guinea	+ 10	22	00
Maldives Island	+ 5	17	00	Paraguay	- 4	08	00
Malta	+ 1	13	00	Peru	- 5	07	00
Manchuria (China)	+ 8	20	00	Philippines	+ 8	20	00
Mariana Island	+ 10	22	00	Poland	+ 1*	13	00*
Marquesas Islands	- 9 1/2	02	30	Portugal	+ 1	13	00
Marshall Islands	+ 12	24	00	Puerto Rico	- 4	08	00
Mauritania	0	12	00	Reunion	+ 4	16	00
Mauritius	+ 4	16	00	Romania	+ 2	14	00
Mayanmar	+ 6 1/2	18	30	Sakhalin	+ 11	23	00
Mexico-				Samoa	- 11	01	00
Mexico City	- 6	06	00	Sardinia	+ 1	13	00
Sonora, Sinaloa, Nayarit, Baja California Sur	- 7	05	00				
Baja California	- 8	04	00				

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.		Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m		h	h	m
Saudi Arabia-				Tangier	0	12	00
Jeddah	+ 3	15	00	Thailand	+ 7	19	00
Dhahran	+ 4	16	00	Uganda	+ 3	15	00
Senegal	0	12	00	Ukraine	+ 2	14	00
Serbia	+ 1	13	00	United Arab Emirates	+ 4	16	00
Sierra Leone	0	12	00	USA Aleutian	- 10*	02	00*
Singapore	+ 8	20	30	USA Hawaii	- 10*	02	00*
Solomon Islands	+ 11	23	00	USA Pacific	- 8*	04	00*
Somalia	+ 3	15	00	USA Mountain	- 7*	05	00*
South Africa	+ 2	14	00	USA Arizona	- 7*	05	00*
Spain	+ 1↓	13	00↓	USA Central	- 6*	06	00*
Sri Lanka	+ 5 1/2	17	30	USA Eastern	- 5*	07	00*
Sudan	+ 2	14	00	Uruguay	- 3	09	00
Sweden	+ 1	13	00	Uzbekistan	+ 5	17	00
Switzerland	+ 1	13	00	Zambia	+ 2	14	00
Syria	+ 2*	14	00*	Zimbabwe	+ 2	14	00
Tanzania	+ 3	15	00				

* During summer seasons clock time differs from Standard time.
Ψ Winter time may be kept in these countries.
↓ This time is used throughout the year, but may differ from legal time.

PART - VI

INDIAN CALENDAR
AND
EXPLANATION

INDIAN CALENDAR
EXPLANATORY NOTE

The astronomical data included in this section on Indian Calendar have been calculated in accordance with the recommendations of the Calendar Reform Committee, as outlined in its report, and the calculations have been done on the basis of the positions of the Sun, Moon and Planets, as contained in the main tables of the Ephemeris. However, the information on Luni- Solar Calendar in this section have been calculated on the basis of traditional Nirayana Calendric system following the Government's decision not to disturb the traditional procedure in fixing the days of religious festivals. Certain additional data, which are required for the compilation of an Indian Panchang (Almanac), have also been furnished to meet the requirements of the numerous Panchang makers of this country. The tables of this section have been extended beyond December, 2022 and materials up to April 20, 2023 have been furnished in order to facilitate preparation of Almanacs for one complete Indian year. The longitudes of the Sun, Moon and Planets and certain other data relating to their positions for the period of 2023 covered by this calendar have also been given in separate table for the same purpose.

All calculations contained in this section have been done for an adopted Central Station of India situated at $82^0 30'$ longitude East of Greenwich and $23^0 11'$ latitude North (latitude of Ujjain) and accordingly the timings have been expressed in the local mean time of this Central Station, which is also the Indian Standard Time. This time (I.S.T.) is $5^h 30^m$ ahead on the Universal Time or Greenwich Mean Time.

The Calendar used in this section is the 'National Calendar' of India as recommended by the Calendar Reform Committee and introduced by the Government of India with effect from the 22 nd March 1957, corresponding to the 1st of Chaitra, 1879 Saka Era. Thereafter, Govt. of India has decided to introduce an all India Nirayana Solar Calendar in addition to the existing National Calendar. This new Calendar has been introduced with effect from 14th April, 2004 corresponding to 1st Vaisakha of 5105 Kali, Kali Era being the Era of this new Calendar and this Calendar have fixed number of days for its months. Dates of the Nirayana Calendar have been indicated in addition to the existing National Calendar. The months of these Calendars, the number of days assigned to each month of the two Calendars, and the dates of the Gregorian calendar corresponding to the first day of each month of both the Calendars are as follows :-

Months of the National Calendar	Gregorian date for 1st of the month	Months of the Nirayana Calendar	Gregorian date for 1st of the month
Chaitra (30 days ; 31 days in a leap-year)	March 22 (March 21 in a leap-year)	Vaisakha (31 days)	April 14
		Jyaishtha (31 days)	May 15
Vaisakha (31 days)	April 21	Ashadha (31 days)	June 15
Jyaishtha (31 days)	May 22	Sravana (31 days)	July 16
Ashadha (31 days)	June 22	Bhadra (31 days)	August 16
Sravana (31 days)	July 23	Asvina (30 days)	September 16
Bhadra (31 days)	August 23	Kartika (30 days)	October 16
Asvina (30 days)	September 23	Agrahayana (30 days)	November 15
Kartika (30 days)	October 23	Pausha (30 days)	December 15
Agrahayana (30 days)	November 22	Magha (30 days)	January 14
Pausha (30 days)	December 22	Phalguna (30 days ; 31 days in a leap-year)	February 13
Magha (30 days)	January 21		
Phalguna (30 days)	February 20	Chaitra (30 days)	March 15

Different items included in this section are elaborated below :-

The Sunrise and Sunset times, calculated for the Central Station, relate respectively to the appearance and disappearance of the upper limb of the Sun on the horizon. The amount of horizontal refraction taken for this purpose is $31'$ and the semi-diameter of the Sun as $16'$, so that at the given times of Sunrise and Sunset, the centre of the Sun actually $47'$ below the horizon.

The apparent noon is the local mean time of the sun's meridian passage, i.e., the mid-day reduced to the above standard meridian of India ($82\frac{1}{2}^0$ E. Longitude).

The ending moments of tithis, nakshatras and yogas have been given in Indian Standard Time and shown against their ordinal numbers. The phenomena being geocentric ones, their timings in I.S.T. are applicable for the whole of India without any modification. These timings reduced by a deduction of $5^h 30^m$ would give the G.M.T. applicable for all places on the earth.

The tithi is based on the difference of longitude of the Moon and that of the Sun. A tithi is completed when the longitude of the Moon gains exactly 12^0 or its integral multiple on that of the Sun and as such there are 30 tithis in lunar month. A difference in longitude of 12^0 indicates the ending of the 1st tithi, 24^0 that of the 2nd tithi and so on. The number of tithis have been shown from Sukla 1 to Sukla 15 (full-moon) and again from Krishna 1 to Krishna 14 and Krishna 30 (new moon), using the symbols S and K for Sukla paksha (waxing Moon)and Krishna paksha (waning Moon) respectively.

A nakshatra is completed when the nirayana longitude of the Moon as measured from the initial point attains a value of $13° 20'$ or an integral multiple thereof. When this longitude is $13° 20'$ the 1st nakshatra ends and so on. There are thus 27 nakshatras in a sidereal month and the nakshatra divisions occupy fixed positions in the sphere of stars. In the case of the Sun the calculation also has been done on the same basis. But in this case, the time of Sun's entry into a nakshatra-division has been stated, whereas in the case of the Moon, the time of its exit from the division has been given.

Like nakshatras, there are 27 yogas. Yoga is calculated from the sum of nirayana longitudes of the Sun and the Moon. When the sum amounts to $13° 20'$, the first yoga ends; when it amounts to $26° 40'$, the second yoga ends, and so on. Thus, in all 27 yogas cover 360°. Names of the nakshatras and yogas have been given at the bottom of the table. It will be seen that two of the names Vyatipata and Vaidhriti occur also under Phenomena, where they have been treated as special yogas and calculated by a somewhat different rule. The 27 yogas which have got very little astronomical significance have been included in this publication only to meet the needs of Panchang where the yoga is also one of the components.

For the purpose of calculation of rasis, nakshatras and yogas, an initial point which occupies a fixed position on the ecliptic has been adopted as the origin for the measurement of longitudes. The position of this initial point coincides with the vernal equinoctial point of vernal equinox day of 285 A.D. For the purpose of assigning a precise position to it, the tropical longitude of this initial point has been adopted as $23° 15' 00''$ for 0^h on 21st March, 1956. The tropical longitude of this fixed initial point for any day is known as ayanamsa. The longitude of a celestial body measured from this initial point is known as nirayana longitude.

The entry into different rasis of the Moon and of the Sun have been shown at the bottom of the relevant pages of the calendar and the calculations have been done on the same basis as in the case of nakshatras, utilising the nirayana longitudes. Rasis, which cover arc of 30^0 of the zodiac belt, are measured along the ecliptic from the above-mentioned initial point.

The tithi, nakshatra and yoga as are current at Sunrise at the Central Station, have been shown against the date with their ending moments in I. S. T. When the time of these or any other phenomena falls after midnight and before the next Sunrise, the time has been expressed after adding 24^h to the I.S.T. without changing the date after midnight in order to maintain continuity of time-reckoning from one Sunrise to the next, in conformity with the system followed in Indian religious calendars.

The solar months recommended for the religious calendar, such as, Saura Vaisakha, Saura Jyaishtha, etc., by the Calendar Reform Committee in 1955 have been reckoned from the moments when the apparent longitude of the Sun equals $23° 15'$, $53° 15'$ and so on. The calculation for this purpose thus has not been done with a variable ayanamsa, as in the case of rasis and nakshatras, but with a fixed ayanamsa of $23° 15'$. These months are shown for purpose of illustration only, but are not used in practice for actual luni-solar adjustment.

The lunar months for determining the dates of religious festivals are reckoned from one New-Moon to the next (Sukladi system or mukhya mana). The lunar month for this purpose is named after the Nirayana or Sidereal solar month in which the initial New-Moon from which the month starts, falls.

Phenomena mentioned in the table include New-Moon, Full-Moon, Sayana Vyatipata (when the sum of the tropical longitudes of the Sun and the Moon equals 180^0), Sayana Vaidhriti (when the above sum amounts to 360^0), eclipses, heliacal rising and setting of Venus, Mars and Jupiter and Jupiter's transit into rasis.

The principal festivals of different states have been fixed on the basis of the criterion stated here, but in doing so, the rules and conventions of the states concerned have been followed as far as practicable.

LIST OF HOLIDAYS

The list of holidays for the Government of India as well as for the State Governments have been prepared in a consolidated form and the dates fixed for them, have been shown in a separate table under the head 'Principal Festivals for Holidays'. The principal festivals of Moslems, Parsis, Jewish and Christians have also been shown separately.

AYANAMSA

The value of ayanamsa has been given in the calendar for the first day of the month and also in a separate table at the end at interval of three days. The ayanamsa value has been calculated from the polynomial of precession in longitude published by N.Capitaine et. al. (2003) in journal Astronomy and Astrophysics. The polynomial for ayanamsa has been introduced in this publication from the year 2021. The polynomial used is as given below.

Mean Ayanamsa $=23^0 51' 25''.53+5028''.796195*T+1''.1054348*T^2+0''.00007964*T^3-0''.00023857*T^4-0''.0000000383*T^5$

Where T=(JD-2451545)/36525

Ayanamsha for J2000.0 is taken as $23^0 51' 25''.53$

The Sayana Vyatipata and Sayana Vaidhriti, reported under the column "Phenomena", are calculated on the basis of defination given in the report of Calendar Reform Committee. These are classified as the Calendar Reform Committee view and no way related to the 'mahapata yoga' defined in some Indian traditional texts (siddhantic treatises).

HELIACAL RISING AND SETTING OF PLANETS, 2023
(JANUARY TO APRIL)

Planet	National Date		Nirayana Date		Gregorian Date		Time (I.S.T)	
							h	m
Mercury sets in the West	Pausha	12, 1944 Saka	Pausha	19, 5123 Kali	Jan.	2, 2023	29	43
Mercury rises in the East	Pausha	21, 1944 Saka	Pausha	28, 5123 Kali	Jan.	11, 2023	24	27
Mercury sets in the East	Phalguna	06, 1944 Saka	Phalguna	13, 5123 Kali	Feb.	25, 2023	18	43
Mercury rises in the West	Chaitra	06, 1945 Saka	Chaitra	13, 5123 Kali	Mar.	27, 2023	14	32
Jupiter sets in the West	Chaitra	10, 1945 Saka	Chaitra	17, 5123 Kali	Mar.	31, 2023	16	26
Saturn sets in the West	Magha	14, 1944 Saka	Magha	03, 5123 Kali	Jan.	9, 2023	08	10
Saturn rises in the East	Phalguna	18, 1944 Saka	Phalguna	09, 5123 Kali	Mar.	9, 2023	11	51

N.B.- Here East means the eastern horizon or west of the Sun and West means the western horizon or east of the Sun.

RETROGRESSION OF PLANETS, 2023
(JANUARY TO APRIL)

Planet		National Date		Nirayana Date		Gregorian Date		Time (I.S.T)	
								h	m
Mercury	Direct	Pausa	28, 1944 Saka	Magha	05, 5123 Kali	Jan.	18, 2023	18	49
Mars	Direct	Pausa	22, 1944 Saka	Pausa	29, 5123 Kali	Jan.	12, 2023	26	29
Uranus	Direct	Magha	02, 1944 Saka	Magha	09, 5123 Kali	Jan.	22, 2023	28	28

MEAN RAHU, 2023

Date		Longitude	Date		Longitude	Date		Longitude
		° ′ ″			° ′ ″			° ′ ″
Jan.	-2	16 08 03	Feb.	7	14 04 03	Mar.	19	11 56 52
	8	15 39 26		17	13 32 15		29	11 25 04
	18	15 07 38		27	13 00 28	Apr.	8	10 53 17
Jan.	28	14 35 51	Mar.	9	12 28 40		18	10 21 29
							28	09 49 41

ECLIPSES, 2023
(JANUARY TO APRIL)

Annual-Total Solar eclipse **Not visible in India**

30, Chaitra 1945 SE ,7 Vaisakh, 5124 KE, 20 April, 2023

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INDIAN CALENDAR

SAKA ERA 1943

Makara : Tapas

Month of PAUSHA (30 days)

Winter (Sisira), 1st Month

(*Nirayana*) 8 Pausha, 5122 Kali Era to (*Nirayana*) 7 Magha, 5122 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi			Nakshatra			Yoga		
									No.	Ending Moment		No.	Ending Moment		No.	Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2021 A.D.															
1	Wed	Dec. 22	6	37.6	11	58.5	17	19.7	K 3	16	52.7	8	24	44.9	26	12	02.4
2	Thu	23	6	38.0	11	59.0	17	20.3	4	18	27.8	9	26	41.3	27	12	11.1
3	Fri	24	6	38.5	11	59.5	17	20.8	K 5	19	34.9	10	28	09.5	1	11	59.7
4	Sat	25	6	38.9	12	00.0	17	21.3	6	20	09.8	11	29	05.4	2	11	24.7
5	Sun	26	6	39.4	12	00.5	17	21.9	7	20	08.7	12	29	25.5	3	10	23.1
6	Mon	27	6	39.8	12	01.0	17	22.5	8	19	28.9	13	29	07.4	4	8	52.3
7	Tue	28	6	40.2	12	01.5	17	23.1	9	18	09.8	14	28	11.0	5	6	50.9
															(6	28	18.6)
8	Wed	29	6	40.5	12	02.0	17	23.7	K 10	16	12.6	15	26	38.4	7	25	16.8
9	Thu	30	6	40.9	12	02.5	17	24.3	11	13	40.8	16	24	33.9	8	21	48.8
10	Fri	31	6	41.2	12	03.0	17	24.9	12	10	40.0	17	22	04.2	9	17	59.3
		2022 A.D.															
11	Sat	Jan. 1	6	41.6	12	03.4	17	25.6	13	7	17.5	18	19	17.4	10	13	54.5
									(14	27	42.1)						
12	Sun	2	6	41.9	12	03.9	17	26.2	K 30	24	03.5	19	16	23.4	11	9	41.7
															(12	29	28.6)
13	Mon	3	6	42.1	12	04.4	17	26.9	S 1	20	32.4	20	13	32.8	13	25	24.1
14	Tue	4	6	42.4	12	04.8	17	27.6	2	17	19.5	21	10	56.7	14	21	36.6
15	Wed	5	6	42.6	12	05.3	17	28.2	3	14	35.4	22	8	46.1	15	18	14.2
16	Thu	6	6	42.8	12	05.7	17	28.9	4	12	29.8	23	7	11.2	16	15	23.9
												(24	30	20.6)			
17	Fri	7	6	43.0	12	06.2	17	29.6	S 5	11	10.8	25	30	19.6	17	13	11.3
18	Sat	8	6	43.2	12	06.6	17	30.3	6	10	43.5	26	-	-	18	11	39.5
19	Sun	9	6	43.3	12	07.0	17	31.0	7	11	09.3	26	7	10.2	19	10	48.6
20	Mon	10	6	43.4	12	07.4	17	31.7	8	12	24.9	27	8	49.4	20	10	35.7
21	Tue	11	6	43.5	12	07.8	17	32.4	9	14	22.2	1	11	09.7	21	10	54.6
22	Wed	12	6	43.6	12	08.2	17	33.1	S 10	16	49.6	2	13	59.9	22	11	37.2
23	Thu	13	6	43.7	12	08.6	17	33.8	11	19	33.2	3	17	06.8	23	12	33.8
24	Fri	14	6	43.7	12	08.9	17	34.5	12	22	19.6	4	20	17.6	24	13	34.9
25	Sat	15	6	43.7	12	09.3	17	35.2	13	24	57.5	5	23	21.1	25	14	32.3
26	Sun	16	6	43.7	12	09.7	17	36.0	14	27	18.8	6	26	09.2	26	15	19.5
27	Mon	17	6	43.6	12	10.0	17	36.7	S 15	29	18.4	7	28	37.1	27	15	52.2
28	Tue	18	6	43.5	12	10.3	17	37.4	K 1	---	---	8	30	42.4	1	16	07.7
29	Wed	19	6	43.4	12	10.6	17	38.1	K 1	6	54.2	9	---	---	2	16	05.1
30	Thu	20	6	43.3	12	10.9	17	38.8	K 2	8	05.5	9	8	24.3	3	15	44.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana | SAKA ERA 1943
Dakshina Gola | Month of PAUSHA (30 days) | Ayanamsa on 1st : 24° 09′ 36″

(*Nirayana*) 8 Pausha, 5122 Kali Era to (*Nirayana) 7* Magha, 5122 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2021A.D.					
1	Dec. 22	SAURA PAUSHA	CHANDRA MARGASIRSHA			1. Uttarayana day.
2	23					
3	24					
4	25					4- Birthday of Sadhu T.L. Vaswani (Sindhi).
5	26					5- Jor mela-3 days(Punjab).
6	27					6. Ashtaka (Pupashtaka).
7	28			7- Sun enters Purvashadha nak. ($30^h 02^m.5$)		
8	29					8- Birthday of Parsvanath(Jain)
9	30					9- Saphla Ekadasi.
10	31					
	2022A.D.					
11	Jan. 1				11- Sayana Vyatipata ($11^h 26^m.6$)	
12	2		CHANDRA PAUSHA		12- New Moon ($24^h 03^m.5$)	12-Vakula Amavasya (Odisha).
13	3					
14	4					
15	5				15- Venus sets in the West ($27^h 36^m$)	
16	6					
17	7					
18	8					19- Guru Govind Singh's Birthday.
19	9					
20	10					
21	11			21- Sun enters Uttarashadha nak. ($7^h 57^m.2$)	21- Venus Rises in the East ($14^h 00^m$)	
22	12					22- Samba Dasami (Odisha).
23	13			23- Saura Maghadi ($17^h 01^m.3$)	23- Sayana Vaidhriti ($21^h 57^m.7$)	23- Purtrada Ekadasi, Vaikuntha Ekadasi (S. India), Lohri (Jammu & Kashmir, Punjab), Bhogi(S.India).
24	14					24-Makara Samkranti (Bengal), Magha Bihu (Assam), Makara Samkranti (N. India), Pongal (S. India), Makara Snana, Tila Samkranti, Birthday of Sant Paramanand (Sindhi).
25	15	SAURA MAGHA				25. Mattu Pongal or Kanumu, Tai Pongal (Kerala).
26	16					
27	17				27- Full Moon ($29^h 18^m.4$)	27. Paushi Purnima, Pushyabhisheka Yatra.
28	18					28. Floating Festival/ Tai Poosam.
29	19			30- Sun Enters Tropical Aquarius ($8^h 09^m.1$)		
30	Jan. 20					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Simha 2, $26^h 41^m.2$; Kanya 5, $11^h 13^m.9$; Tula 7, $16^h 43^m.8$; Vrischika 9, $19^h 07^m.7$; Dhanus 11,1 $9^h 17^m.4$; Makara 13, $18^h 52^m.0$; Kumbha 15, $19^h 53^m.7$; Mina 17, $24^h 15^m.1$; Mesha 20, $8^h 49^m.4$; Vrisha22, $20^h 45^m.5$; Mithuna25, $09^h 50^m.8$; Karkata27, $22^h 02^m.2$; Sinha 30, $08^h 24^m.3$ Sun enters :- Nirayana Makara 24, $14^h 29^m.6$.

INDIAN CALENDAR

SAKA ERA 1943

Kumbha : Tapasya

Month of MAGHA (30 days)

Winter (Sisira), 2nd Month

(*Nirayana*) 8 Magha, 5122 Kali Era to (*Nirayana*) 7 Phalguna, 5122 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi No.		Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2022 A.D.																	
1	Fri	Jan.	21	6	43.2	12	11.2	17	39.5	K	3	8	52.4	10	9	42.9	4	15	04.5
2	Sat		22	6	43.0	12	11.5	17	40.2		4	9	14.9	11	10	38.0	5	14	06.3
3	Sun		23	6	42.8	12	11.7	17	40.9	K	5	9	12.5	12	11	09.1	6	12	48.8
4	Mon		24	6	42.6	12	12.0	17	41.6		6	8	44.3	13	11	15.0	7	11	11.2
5	Tue		25	6	42.4	12	12.2	17	42.3		7	7	49.0	14	10	54.5	8	9	12.2
											(8	30	25.7)						
6	Wed		26	6	42.2	12	12.4	17	43.0		9	28	34.5	15	10	06.4	9	6	51.2
																	(10	28	08.0)
7	Thu		27	6	41.9	12	12.7	17	43.7	K	10	26	16.8	16	8	51.0	11	25	03.5
8	Fri		28	6	41.6	12	12.9	17	44.4		11	23	36.1	17	7	10.1	12	21	40.3
														(18	29	07.5)			
9	Sat		29	6	41.3	12	13.0	17	45.1		12	20	37.8	19	26	49.1	13	18	02.4
10	Sun		30	6	40.9	12	13.2	17	45.8		13	17	29.2	20	24	22.6	14	14	15.2
11	Mon		31	6	40.6	12	13.4	17	46.5		14	14	18.7	21	21	57.5	15	10	25.4
12	Tue	Feb.	1	6	40.2	12	13.5	17	47.1	K	30	11	16.1	22	19	44.1	16	6	40.5
																	(17	27	08.7)
13	Wed		2	6	39.8	12	13.6	17	47.8	S	1	8	31.7	23	17	53.1	18	23	58.2
											(2	30	16.0)						
14	Thu		3	6	39.3	12	13.8	17	48.5		3	28	38.7	24	16	34.6	19	21	16.2
15	Fri		4	6	38.9	12	13.9	17	49.1		4	27	47.5	25	15	57.8	20	19	09.2
16	Sat		5	6	38.4	12	13.9	17	49.7	S	5	27	47.3	26	16	08.7	21	17	41.0
17	Sun		6	6	37.9	12	14.0	17	50.4		6	28	38.5	27	17	09.8	22	16	53.0
18	Mon		7	6	37.4	12	14.1	17	51.0		7	30	16.5	1	18	58.6	23	16	42.9
19	Tue		8	6	36.9	12	14.1	17	51.6		8	---	---	2	21	27.2	24	17	05.0
20	Wed		9	6	36.3	12	14.2	17	52.2		8	8	31.3	3	24	23.2	25	17	50.5
21	Thu		10	6	35.8	12	14.2	17	52.9		9	11	08.7	4	27	31.7	26	18	48.6
22	Fri		11	6	35.2	12	14.2	17	53.5	S	10	13	52.6	5	---	---	27	19	48.4
23	Sat		12	6	34.6	12	14.2	17	54.0		11	16	27.8	5	6	37.4	1	20	39.6
24	Sun		13	6	34.0	12	14.2	17	54.6		12	18	42.4	6	9	27.4	2	21	14.4
25	Mon		14	6	33.3	12	14.1	17	55.2		13	20	28.7	7	11	52.6	3	21	27.7
26	Tue		15	6	32.7	12	14.1	17	55.8		14	21	43.3	8	13	48.5	4	21	17.2
27	Wed		16	6	32.0	12	14.0	17	56.3	S	15	22	26.5	9	15	13.9	5	20	42.9
28	Thu		17	6	31.3	12	14.0	17	56.9	K	1	22	40.7	- 10	16	10.6	6	19	46.2
29	Fri		18	6	30.6	12	13.9	17	57.4		2	22	29.7	11	16	41.9	7	18	29.7
30	Sat		19	6	29.9	12	13.8	17	58.0	K	3	21	57.0	12	16	51.4	8	16	56.0

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Uttarayana — SAKA ERA 1943

Dakshina Gola — Month of MAGHA (30 days) — Ayanamsa on 1st : 24° 09′ 42″

(*Nirayana*) 8 Magha, 5122 Kali Era to (*Nirayana)* 7 Phalguna, 5122 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.					
1	Jan. 21	MAGHA	CHANDRA PAUSA			1- Ganesha Sankastha Chaturthi, Martyrdom Day of Hemu Kalani.
2	22					
3	23					3- Netaji's Birthday.
4	24			4- Sun enters Sravana nak. ($10^h 20^m.2$)		
5	25					5- Birthday of Swami Vivekananda (according to tithi), Astaka (Mamsastaka).
6	26				6- Sayana Vyatipata ($25^h 28^m.2$)	6- Republic Day.
7	27					
8	28					8- Shattila Ekadasi, Birthday of Lala Lajpat Rai.
9	29					
10	30					10- Meru Trayodasi (Jain),Ratanti Kalika Puja. Martyr's Day (Mahatma Gandhi Commemoration Day).
11	31					11-Tai Amavasya, Makara Vavu (Kerala).
12	Feb. 1				12- New Moon ($11^h 16^m.1$)	12. Mauni Amavassya, Mahodaya Yoga(Vyatipata after $6^h 41^m$, Amavasya upto $11^h 16^m$).
13	2	SAURA	CHANDRA MAGHA			13- Magha Sukladi.
14	3					
15	4					15- Tila Chaturthi, Kundu Chaturthi, Varada Chaturthi, Ganesha Puja (Bengal).
16	5					16- Sri Panchami, Saraswati Puja, Vasanta Panchami.
17	6			17- Sun enters Dhanishtha nak.($13^h 24^m.1$)		
18	7					18- Ratha Saptami (Purvarunodaya), Vidhana Saptami, Arogya Saptami.
19	8					19- Bhismashtami.
20	9					
21	10					
22	11			22- Saura Phalgunadi ($29^h 48^m.0$)	22- Sayana Vaidhriti ($25^h 50^m.9$)	
23	12					23- Jaya Ekadasi, Bhaimi Ekadasi (Bengal).
24	13	SAURA PHALGUNA				24- Bhishma Dvadasi.
25	14					25- Desert Festival-3 days(Jaisalmer).
26	15					
27	16				27- Full Moon ($22^h 26^m.5$)	27- Maghi Purnima, Guru Ravi Das's Birthday.
28	17					28- Masi Magham.
29	18			29- Sun Enters Trop.Pisces ($22^h 13^m.0$)		
	Feb. 19					
30				30- Sun enters Satabhisaj nak. ($17^h 57^m.4$)		30- Shivaji Jayanti.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Kanya 2, $16^h 48^m.1$; Tula 4, $23^h 08^m.1$; Vrischika 6,$27^h 12^m.4$; Dhanus 8, $29^h 07^m.5$; Makara 10, $29^h 45^m.8$; Kumbha 13, $6^h 45^m.0$; Mina 15,$10^h 02^m.6$ Mesha 17,$17^h 09^m.8$; Vrisha 19, $28^h 09^m.2$; Mithuna 22, $17^h 05^m.7$; Karkata 24, $29^h 19^m.0$; Simha 27, $15^h 13^m.8$,Kanya 29, $22^h 46^m.1$; Sun enters :- Nirayana Kumbha 23, $27^h 27^m.6$.

INDIAN CALENDAR

SAKA ERA 1943

Mina : Madhu

Month of PHALGUNA (30 days)

Spring (Vasanta), 1st Month

(*Nirayana*) 8 Phalguna, 5122 Kali Era to (*Nirayana*) 7 Chaitra, 5122 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi No.		Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2022A.D.																	
1	Sun	Feb.	20	6	29.2	12	13.7	17	58.5	K	4	21	05.8	13	16	42.2	9	15	07.4
2	Mon		21	6	28.4	12	13.6	17	59.0		5	19	58.0	14	16	16.7	10	13	05.4
3	Tue		22	6	27.6	12	13.5	17	59.5		6	18	35.0	15	15	36.0	11	10	51.2
4	Wed		23	6	26.9	12	13.3	18	00.0		7	16	56.9	16	14	40.6	12	8	25.1
																	(13	29	47.3)
5	Thu		24	6	26.1	12	13.2	18	00.5		8	15	04.3	17	13	30.8	14	26	58.1
6	Fri		25	6	25.3	12	13.0	18	01.0		9	12	57.9	18	12	07.3	15	23	58.6
7	Sat		26	6	24.5	12	12.9	18	01.5	K	10	10	39.7	19	10	32.1	16	20	50.7
8	Sun		27	6	23.6	12	12.7	18	02.0		11	8	13.1	20	8	48.6	17	17	38.0
											(12	29	43.2)						
9	Mon		28	6	22.8	12	12.5	18	02.5		13	27	16.5	21	7	02.0	18	14	24.8
														(22	29	19.0)			
10	Tue	Mar.	1	6	22.0	12	12.3	18	02.9		14	25	00.8	23	27	47.9	19	11	16.7
11	Wed		2	6	21.1	12	12.2	18	03.4	K	30	23	04.8	24	26	37.3	20	8	20.1
																	(21	29	41.7)
12	Thu		3	6	20.2	12	11.9	18	03.9	S	1	21	37.1	25	25	56.0	22	27	28.0
13	Fri		4	6	19.4	12	11.7	18	04.3		2	20	45.6	26	25	51.5	23	25	44.4
14	Sat		5	6	18.5	12	11.5	18	04.8		3	20	36.4	27	26	29.1	24	24	34.7
15	Sun		6	6	17.6	12	11.3	18	05.2		4	21	12.6	1	27	50.9	25	24	00.3
16	Mon		7	6	16.7	12	11.1	18	05.6	S	5	22	33.0	2	29	54.1	26	23	59.5
17	Tue		8	6	15.8	12	10.8	18	06.1		6	24	31.6	3	---	---	27	24	27.2
18	Wed		9	6	14.9	12	10.6	18	06.5		7	26	57.1	3	8	31.2	1	25	15.3
19	Thu		10	6	13.9	12	10.3	18	06.9		8	29	34.7	4	11	30.0	2	26	13.2
20	Fri		11	6	13.0	12	10.1	18	07.3		9	---	---	5	14	35.3	3	27	09.7
21	Sat		12	6	12.1	12	09.8	18	07.7		9	8	08.0	6	17	31.7	4	27	53.9
22	Sun		13	6	11.1	12	09.5	18	08.1	S	10	10	22.2	7	20	05.7	5	28	17.2
23	Mon		14	6	10.2	12	09.2	18	08.5	K	11	12	05.9	8	22	07.7	6	28	13.7
24	Tue		15	6	09.2	12	09.0	18	08.9		12	13	12.5	9	23	32.9	7	27	40.4
25	Wed		16	6	08.3	12	08.7	18	09.3		13	13	40.0	10	24	20.7	8	26	37.6
26	Thu		17	6	07.3	12	08.4	18	09.7		14	13	30.2	11	24	33.9	9	25	07.4
27	Fri		18	6	06.3	12	08.1	18	10.1	S	15	12	47.6	12	24	17.6	10	23	13.5
28	Sat		19	6	05.4	12	07.8	18	10.5	K	1	11	37.7	13	23	37.7	11	21	00.4
29	Sun		20	6	04.4	12	07.5	18	10.9		2	10	06.9	14	22	40.2	12	18	32.5
30	Mon		21	6	03.4	12	07.2	18	11.2	K	3	8	20.8	15	21	30.7	13	15	54.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½°E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1943

Uttarayana
Dakshina Gola

Month of PHALGUNA (30 days)

Ayanamsa on 1st : 24^{0} 09$^{/}$ 46$^{//}$

(*Nirayana*) 8 Phalguna, 5122 Kali Era to (*Nirayana)* 7 Chaitra, 5122 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022 A.D.					
1	Feb. 20	SAURA PHALGUNA	CHANDRA MAGHA			
2	21				2- Sayana Vyatipata (10^{h} 21^{m}.2)	
3	22				3- Jupiter sets in the west (15^{h} 48^{m})	
4	23					
5	24					5.-Ashtaka (Sakastaka, Janaki Janma,Vaikkatashtami (kerela).
6	25					
7	26					7- Vijaya Ekadasi(Smarta), Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj).
8	27					8- Vijaya Ekadasi (Vaishnava & Vidhava), Trisprisha Mahadvadasi.
9	28					9- Maha Shivratri (Kashmir).
10	Mar. 1					10- Maha Shivratri, Maha Shivratri (S. India).
11	2				11- New Moon (23^{h} 04^{m}.8)	
12	3		CHANDRA PHALGUNA			
13	4			13- Sun Enters Purva Bhadrapada nak. (24^{h} 11^{m}.5)		13- Birthday of Sri Ramakrisha Paramahamsa Deva (according to tithi).
14	5				14- Sayana Vaidhriti (10^{h} 19^{m}.1)	
15	6					
16	7					
17	8					
18	9					
19	10					19-Holastaka.
20	11					
21	12					
22	13			22-Saura Chaitradi (26^{h} 17^{m}.0)		
23	14					23- Amlaki Ekadasi, Govinda Dvadasi (Dvadasi after 12^{h} 06^{m})
24	15	SAURA CHAITRA				
25	16					
26	17					26- Holikadahana.
27	18			27-Sun Enters Uttara Bhadrapada nak. (8^{h} 37^{m}.2)	27- Sayana Vyatipata (20^{h} 26^{m}.8) 27- Full Moon (12^{h} 47^{m}.6)	27- Holi, Dolyatra, Birthday of Sri Chaitanya, Panguni Uttiram.
28	19					28- Hola, Vasantotsava.
29	20			29- Sun Enters Trop. Aries(21^{h} 03^{m}.4)		29- Mahavishuva day.
30	Mar. 21					30- Indian Year Ending day.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½^{0} E. Long.

Moon enters :-Tula1,28^{h} 31^{m} .4; Vrischika 4, 8^{h} 55^{m}.8; Dhanus 6, 12^{h} 07^{m}.3;Makara 8, 14^{h} 21^{m}.9; Kumbha 10, 16^{h} 31^{m}.4;Mina 12, 20^{h} 03^{m}.2;Mesha 14, 26^{h} 29^{m} .1; Vrisha 17,12^{h} 30^{m}.6; Mithuna 19,25^{h} 02^{m}.8; Karkata 22,13^{h}29^{m}.9;Simha 24,23^{h} 32^{m}.8;Kanya 27,6^{h}32^{m}.4; Tula29,11^{h} 10^{m} .8;

Sun enters: Nirayana Mina 23, 24^{h} 16^{m}.4.

INDIAN CALENDAR

SAKA ERA 1944 — Mesha : Madhava

Month of CHAITRA (30 days) — Spring (Vasanta), 2nd Month

(*Nirayana*) 7 Chaitra, 5122 Kali Era to (*Nirayana)* 7 Vaisakha, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi			Nakshatra			Yoga		
									No.	Ending Moment		No.	Ending Moment		No.	Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022 A.D.															
1	Tue	Mar. 22	6	02.4	12	06.9	18	11.6	K 4	6	24.6	16	20	13.6	14	13	08.8
									(K 5	28	22.2)						
2	Wed	23	6	01.5	12	06.6	18	12.0	6	26	16.7	17	18	52.2	15	10	19.4
3	Thu	24	6	00.5	12	06.3	18	12.4	7	24	10.3	18	17	29.7	16	7	28.0
															(17	28	36.4)
4	Fri	25	5	59.5	12	06.0	18	12.7	8	22	04.7	19	16	07.4	18	25	45.9
5	Sat	26	5	58.5	12	05.7	18	13.1	9	20	02.1	20	14	47.4	19	22	58.0
6	Sun	27	5	57.6	12	05.4	18	13.5	K 10	18	04.6	21	13	32.1	20	20	14.8
7	Mon	28	5	56.6	12	05.1	18	13.9	11	16	15.6	22	12	24.4	21	17	38.6
8	Tue	29	5	55.6	12	04.8	18	14.2	12	14	38.9	23	11	28.2	22	15	12.8
9	Wed	30	5	54.6	12	04.5	18	14.6	13	13	19.6	24	10	48.5	23	13	01.0
10	Thu	31	5	53.7	12	04.2	18	15.0	14	12	23.0	25	10	30.6	24	11	07.4
11	Fri	Apr. 1	5	52.7	12	03.9	18	15.3	K 30	11	54.4	26	10	39.9	25	9	35.8
12	Sat	2	5	51.8	12	03.6	18	15.7	S 1	11	58.7	27	11	21.1	26	8	29.9
13	Sun	3	5	50.8	12	03.3	18	16.1	2	12	39.0	1	12	37.1	27	7	51.7
14	Mon	4	5	49.8	12	03.1	18	16.5	3	13	55.6	2	14	28.4	1	7	41.9
15	Tue	5	5	48.9	12	02.8	18	16.8	4	15	45.7	3	16	51.7	2	7	58.6
16	Wed	6	5	47.9	12	02.5	18	17.2	S 5	18	01.9	4	19	39.7	3	8	37.2
17	Thu	7	5	47.0	12	02.2	18	17.6	6	20	33.2	5	22	41.4	4	9	30.6
18	Fri	8	5	46.1	12	01.9	18	18.0	7	23	05.6	6	25	43.2	5	10	29.6
19	Sat	9	5	45.1	12	01.7	18	18.4	8	25	24.4	7	28	30.7	6	11	23.6
20	Sun	10	5	44.2	12	01.4	18	18.7	9	27	16.1	8	---	---	7	12	02.6
21	Mon	11	5	43.3	12	01.1	18	19.1	S 10	28	30.7	8	6	51.0	8	12	17.7
22	Tue	12	5	42.4	12	00.9	18	19.5	11	29	02.6	9	8	34.7	9	12	02.6
23	Wed	13	5	41.5	12	00.6	18	19.9	12	28	50.3	10	9	36.6	10	11	13.8
24	Thu	14	5	40.6	12	00.3	18	20.3	13	27	56.3	11	9	55.8	11	9	50.7
25	Fri	15	5	39.7	12	00.1	18	20.7	14	26	25.6	12	9	35.0	12	7	55.3
															(13	29	31.5)
26	Sat	16	5	38.9	11	59.9	18	21.1	S 15	24	25.0	13	8	39.6	14	26	44.2
27	Sun	17	5	38.0	11	59.6	18	21.5	K 1	22	02.0	14	7	16.5	15	23	39.5
												(15	29	33.5)			
28	Mon	18	5	37.1	11	59.4	18	21.9	2	19	24.2	16	27	38.5	16	20	23.1
29	Tue	19	5	36.3	11	59.2	18	22.3	3	16	39.1	17	25	38.8	17	17	01.1
30	Wed	20	5	35.5	11	59.0	18	22.7	K 4	13	53.4	18	23	41.2	18	13	38.7

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1944

Uttarayana
Uttara Gola

Month of CHAITRA (30 days)

Ayanamsa on 1st : $24^0 09^{/} 49^{//}$

(*Nirayana*) 8 Chaitra, 5122 Kali Era to (*Nirayana)* 7 Vaisakha, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022 A.D					
1	Mar. 22	SAURA CHAITRA	CHANDRA PHALGUNA			1- Indian New Year's Day, Ranga Panchami, Bijoy Govindaji Halangkar(Manipur).
2	23				2 -Jupiter rises in the East (13^h $26^m.0$)	
3	24					
4	25					4- Varsitaparambha (Jain), Sitalastami.
5	26					
6	27					
7	28					7- Papamochani Ekadasi.
8	29					
9	30				9- Sayana Vaidhriti (21^h $19^m.6$)	9- Madhukrishna Trayodasi, Varuni (Satabhisaj Nak. upto $10^h 49^m$).
10	31			10- Sun Enters Revati nak. ($19^h 25^m.4$)		
11	Apr. 1				11-New Moon ($11^h 54^m.4$)	
12	2		CHANDRA CHAITRA			12- Chaitra Sukladi, (Gudi Padava,Ugadi), Vasanta Navaratrarambha (or Sthapana Navaratrarambha), Cheti Chand (Sindhi New year,s Day), Telugu New Years Day.
13	3					
14	4					14- Gauri Tritiya (Gangaur), Andolana Tritiya, Sarhul (Bihar).
15	5					15- Birthday Anniversary of Swami Leela Shah(Sindhi).
16	6					16- Sri Lashmi Panchami.
17	7					17- Skanda Shashthi.
18	8					18-Vasanti Pujarambha, Oil Begins(Jain).
19	9					19- Annapurna Puja, Ashokashtami (Punarvasu whole day), Mela Bahu Fart (Jammu).
20	10					20- Rama Navami.
21	11					
22	12					22- Kamada Ekadasi (Smarta).
23	13			23-Saura Vaisakhadi ($10^h 17^m.7$)	23 -Jupiter enters into Mina (15^h $49^m.8$)	23- Kamada Ekadasi (Vaishnava & Vidhava).
24	14			24-Sun Enters Asvini Nak. ($8^h 41^m.4$)	23-Sayana Vyatipata ($8^h 20^m.8$)	24- Chaitra Samkranti, Chadak Puja, Cheiraoba (Manipur), Vaisakhi(Punjab, Haryana, H.P. Delhi & Odisha), Mesha Samkranti (Odisha), Meshadi (Tamilnadu), Tamil New Years Day, Visu (Kerala), Ananga Trayodasi, Mahavira Jayanti (Jain), Dr. B.R. Ambedkar Jayanti, Beginning of Nirayana 5123 K.E.
25	15	SAURA VAISAKHA				25- Vaisakhadi (Bengal), Bahag Bihu (Assam), Shilhenba (Manipur) Damanaka Chaturdasi, Trivandram Arat (Kerela).
26	16				26-Full Moon ($24^h 25^m.0$)	26- Chaitri Purnima, Oli Ends (Jain), Hanumat Jayanti (S. India).
27	17					
28	18					
29	19					
30	Apr. 20			30- SunEnters Trop. Taurus ($07^h 54^m.2m$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Vrischika 1, $14^h 33^m.4$; Dhanus 3, $17^h 29^m.7$; Makara 5, $20^h 28^m.0$; Kumbha 7, 23^h $54^m.5$; Mina 9, $28^h 32^m.7$; Mesha 12, 11^h $21^m.0$; Vrisha 14, 21^h $01^m.4$; Mithuna 17, 09^h $09^m.6$; Karkata 19, 21^h $50^m.8$; Simha 22, 8^h $34^m.7$; Kanya 24, 15^h $54^m.2$; Tula 26, 20^h $01^m.0$; Vrischika 28, $22^h 08^m.0$; Dhanus 30, $23^h 41^m.2$;

Sun enters :- Nirayana Mesha 24, 8^h $41^m.4m$.

SAKA ERA 1944

Vrisha : Sukra

Month of VAISAKHA (31 days)

Summer (Grishma), 1st Month

(*Nirayana*) 8 Vaisakha, 5123 Kali Era to (*Nirayana)* 7 Jyaishtha, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022A.D.															
1	Thu	Apr. 21	5	34.6	11	58.8	18	23.1	K 5	11	12.9	19	21	51.5	19	10	20.7
2	Fri	22	5	33.8	11	58.6	18	23.5	6	8	42.9	20	20	14.3	20	7	11.1
															(21	28	13.4)
3	Sat	23	5	33.0	11	58.4	18	23.9	7	6	27.5	21	18	53.6	22	25	30.2
									(8	28	30.0)						
4	Sun	24	5	32.2	11	58.2	18	24.4	9	26	53.0	22	17	52.2	23	23	03.3
5	Mon	25	5	31.5	11	58.0	18	24.8	K 10	25	38.6	23	17	12..6	24	20	54.5
6	Tue	26	5	30.7	11	57.8	18	25.2	11	24	48.5	24	16	56.3	25	19	05.0
7	Wed	27	5	29.9	11	57.7	18	25.7	12	24	24.3	25	17	05.1	26	17	35.9
8	Thu	28	5	29.2	11	57.5	18	26.1	13	24	27.2	26	17	40.2	27	16	28.1
9	Fri	29	5	28.5	11	57.4	18	26.5	14	24	58.3	27	18	42.6	1	15	42.3
10	Sat	30	5	27.8	11	57.3	18	27.0	K 30	25	58.1	1	20	12.9	2	15	18.8
11	Sun	May 1	5	27.1	11	57.1	18	27.4	S 1	27	25.8	2	22	10.5	3	15	17.4
12	Mon	2	5	26.4	11	57.0	18	27.9	2	29	19.1	3	24	33.5	4	15	36.9
13	Tue	3	5	25.7	11	56.9	18	28.3	3	---	---	4	27	17.7	5	16	14.5
14	Wed	4	5	25.1	11	56.8	18	28.8	3	7	33.4	5	---	---	6	17	06.1
15	Thu	5	5	24.5	11	56.7	18	29.2	4	10	01.4	5	6	16.3	7	18	05.7
16	Fri	6	5	23.9	11	56.7	18	29.7	S 5	12	33.2	6	9	20.1	8	19	05.8
17	Sat	7	5	23.3	11	56.6	18	30.2	6	14	57.0	7	12	17.9	9	19	57.7
18	Sun	8	5	22.7	11	56.5	18	30.6	7	17	00.7	8	14	57.5	10	20	32.6
19	Mon	9	5	22.1	11	56.5	18	31.1	8	18	32.9	9	17	07.8	11	20	42.5
20	Tue	10	5	21.6	11	56.4	18	31.6	9	19	25.0	10	18	39.7	12	20	21.1
21	Wed	11	5	21.0	11	56.4	18	32.0	S 10	19	31.8	11	19	27.7	13	19	24.1
22	Thu	12	5	20.5	11	56.4	18	32.5	11	18	51.9	12	19	30.0	14	17	50.3
23	Fri	13	5	20.0	11	56.4	18	33.0	12	17	27.5	13	18	48.3	15	15	40.6
24	Sat	14	5	19.5	11	56.4	18	33.4	13	15	23.3	14	17	27.5	16	12	58.2
25	Sun	15	5	19.1	11	56.4	18	33.9	14	12	46.1	15	15	34.5	17	9	48.3
26	Mon	16	5	18.6	11	56.4	18	34.4	S 15	9	44.1	16	13	17.8	18	6	16.7
															(19	26	30.6)
27	Tue	17	5	18.2	11	56.4	18	34.9	K 1	6	26.0	17	10	46.3	20	22	37.1
									(2	27	00.8)						
28	Wed	18	5	17.8	11	56.4	18	35.3	3	23	37.4	18	8	09.6	21	18	43.7
29	Thu	19	5	17.4	11	56.5	18	35.8	4	20	24.4	19	5	37.0	22	14	57.3
												(20	27	17.3)			
30	Fri	20	5	17.0	11	56.5	18	36.3	K 5	17	29.6	21	25	18.2	23	11	24.5
31	Sat	21	5	16.7	11	56.6	18	36.7	K 6	14	59.7	22	23	46.4	24	8	11.0

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Uttarayana
Uttara Gola

SAKA ERA 1944

Month of VAISAKHA (31 days)

Ayanamsa on 1st : $24^{0}09'52''$

(*Nirayana*) 8 Vaisakha, 5123 Kali Era to (*Nirayana*) 7 Jyaishtha, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.					
1	Apr. 21	S A U R A V A I S A K H A	C H A N D R A C H A I T R A			
2	22					
3	23					3 - Babu Kuer Singh Day (Bihar).
4	24					
5	25				5- Sayana Vaidhriti (7^h $13^m.8$)	
6	26					6 - Sri Vallabhacharya Jayanti, Varuthini Ekadasi.
7	27			7- Sun Enters Bharani nak. ($24^h 31^m.8$)		
8	28					
9	29					
10	30				10-New Moon ($25^h 58^m.1$)	
11	May 1		C H A N D R A V A I S A K H A		11-Partial Solar Eclipse (Not visible in India).	11 - Tithi of Deva Damodara (Assam), May Day.
12	2					
13	3					13 - Parasuram Jayanti, Akshaya Tritiya, Kedar Badri Yatra, Birthday anniversary of Dada Chellaram (Sindhi).
14	4					14- Akshaya Tritiya (Bengal), Varsitapa Samapanna (Jain).
15	5					
16	6					16- Sri Sankaracharya Jayanti, Sri Ramanujacharya Jayanti (S. India).
17	7					17- Sri Ramanujacharya Jayanti.
18	8				18 -Sayana Vyatipata ($17^h 26^m.3$)	18- Gangotpatti.
19	9					19- Birthday of Rabindranath Tagore.
20	10					20- Sita Navami, Trichur Pooram (Kerala).
21	11			21- Sun Enters Krittika nak. (18^h 35^m. 8)		
22	12					22- Mohini Ekadasi, Minakshi Kalyanam.
23	13					
24	14			24- Saura Jyaishthadi ($6^h 42^m.8$)		24- Nrisimha Chaturdasi.
25	15	SAURA JYAISHTHA				
26	16				26-Full Moon ($9^h 44^m.1$) 26- Total Lunar Eclipse (Not visible in India)	26- Vaisakhi Purnima, Buddha Purnima.
27	17					
28	18					
29	19					
30	20				30-Sayana Vaidhrit (19^h $13^m.5$)	
31	May 21			31- Sun Enters Trop.Gemini (6^h $52^m.5$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Makara 2, 25^h $52^m.4$; Kumbha 4, $29^h 29^m.6$; Mina 7, 11^h $00^m.5$; Mesha 9, 18^h $42^m.6$; Vrisha 11, 28^h $44^m.0$; Mithuna 14, 16^h $45^m.7$; Karkata 17, 05^h $34^m.7$; Simha 19, 17^h $07^m.8$; Kanya 21, 25^h $32^m.6$; Tula 24, 6^h $12^m.5$; Vrischika 26, 7^h $53^m.7$; Dhanus 28, 8^h $09^m.6$; Makara 30, 8^h $45^m.3$

Sun enters :-Nirayana Vrisha 25, 5^h $29^m.5$

SAKA ERA 1944

Month of JYAISHTHA (31 days)

Mithuna :Suchi

Summer (Grishma), 2nd Month

(*Nirayana*) 8 Jyaishtha, 5123 Kali Era to (*Nirayana)* 7 Ashadha, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022 A.D.															
1	Sun	May 22	5	16.3	11	56.7	18	37.2	K 7	13	00.2	23	22	46.7	25	5	21.2
															(26	26	58.6)
2	Mon	23	5	16.0	11	56.7	18	37.7	8	11	34.9	24	22	22.0	27	25	04.9
3	Tue	24	5	15.7	11	56.8	18	38.2	9	10	45.8	25	22	33.3	1	23	40.3
4	Wed	25	5	15.5	11	56.9	18	38.6	K 10	10	32.9	26	23	19.6	2	22	44.1
5	Thu	26	5	15.2	11	57.0	18	39.1	11	10	54.7	27	24	38.5	3	22	14.1
6	Fri	27	5	15.0	11	57.1	18	39.5	12	11	48.3	1	26	26.4	4	22	07.7
7	Sat	28	5	14.8	11	57.3	18	40.0	13	13	10.0	2	28	39.1	5	22	21.8
8	Sun	29	5	14.6	11	57.4	18	40.4	14	14	55.5	3	---	----	6	22	53.0
9	Mon	30	5	14.4	11	57.5	18	40.9	K 30	17	00.3	3	7	12.2	7	23	38.0
10	Tue	31	5	14.3	11	57.7	18	41.3	S 1	19	19.4	4	10	01.0	8	24	32.9
11	Wed	June 1	5	14.1	11	57.8	18	41.8	2	21	47.3	5	13	00.3	9	25	33.6
12	Thu	2	5	14.0	11	58.0	18	42.2	3	24	17.5	6	16	04.0	10	26	35.4
13	Fri	3	5	13.9	11	58.2	18	42.6	4	26	42.3	7	19	05.0	11	27	32.6
14	Sat	4	5	13.8	11	58.3	18	43.0	S 5	28	53.0	8	21	54.9	12	28	19.0
15	Sun	5	5	13.8	11	58.5	18	43.4	6	---	---	9	24	24.8	13	28	47.7
16	Mon	6	5	13.7	11	58.7	18	43.8	6	6	40.3	10	26	25.7	14	28	52.1
17	Tue	7	5	13.7	11	58.9	18	44.2	7	7	55.4	11	27	49.5	15	28	26.3
18	Wed	8	5	13.7	11	59.1	18	44.6	8	8	30.9	12	28	30.7	16	27	26.1
19	Thu	9	5	13.7	11	59.2	18	44.9	9	8	22.0	13	28	26.2	17	25	48.9
20	Fri	10	5	13.7	11	59.4	18	45.3	S 10	7	26.6	14	27	36.6	18	23	34.8
21	Sat	11	5	13.8	11	59.6	18	45.7	11	5	46.0	15	26	05.3	19	20	45.9
									(12	27	24.1)						
22	Sun	12	5	13.9	11	59.8	18	46.0	13	24	27.1	16	23	58.5	20	17	26.3
23	Mon	13	5	13.9	12	00.1	18	46.3	14	21	03.3	17	21	24.2	21	13	41.8
24	Tue	14	5	14.0	12	00.3	18	46.6	S 15	17	21.7	18	18	32.2	22	9	39.6
25	Wed	15	5	14.1	12	00.5	18	46.9	K 1	13	32.4	19	15	32.9	23	5	27.6
															(24	25	14.2)
26	Thu	16	5	14.3	12	00.7	18	47.2	2	9	45.5	20	12	37.2	25	21	08.1
27	Fri	17	5	14.4	12	00.9	18	47.5	3	6	11.4	21	9	55.9	26	17	17.4
									(4	27	00.1)						
28	Sat	18	5	14.6	12	01.1	18	47.8	K 5	24	20.2	22	7	39.2	27	13	49.8
29	Sun	19	5	14.8	12	01.3	18	48.0	6	22	19.2	23	5	56.0	1	10	51.6
												(24	28	53.3)			
30	Mon	20	5	15.0	12	01.5	18	48.2	7	21	02.1	25	28	35.4	2	8	27.7
31	Tue	21	5	15.2	12	01.8	18	48.5	K 8	20	31.3	26	29	03.2	3	6	40.6

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Uttarayana SAKA ERA 1944

Uttara Gola Month of JYAISHTHA (31 days) Ayanamsa on 1st : $24^0 09^{/} 57^{//}$

(Nirayana) 8 Jyaishtha, 5123 Kali Era to *(Nirayana)* 7 Ashadha, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.					
1	May 22	SAURA JYAISHTHA	CHANDRA VAISAKHA			
2	23					
3	24					
4	25			4- Sun enters Rohini nak. ($14^h 51^m.8$)		
5	26					5- Apara Ekadasi, Bhadrakali Ekadasi (Punjab).
6	27					
7	28					7- Savitri Chaturdasi.
8	29					8- Phalaharini Kalika Puja.
9	30		CHANDRA JYAISHTHA		9- New Moon ($17^h 00^m.3$)	9- Vata Savitri Vrata (Amavasya Paksha).
10	31					
11	June 1					
12	2				12- Sayana Vyatipata ($23^h 27^m.3$)	12- Rambha Tritiya, Pratap Jayanti (Rajasthan).
13	3					13- Guru Arjan Dev's Martyrdom Day (Sikh).
14	4					
15	5					15- Vindhyavasini Puja, Aranya Shashthi (Bengal), Jamatri Shashthi.
16	6					
17	7					
18	8			18- Sun enters Mrigasiras nak. ($12^h 37^m.6$)		18- Mela Kshir Bhawani (Kashmir).
19	9					19- Ganga Dasahara.
20	10					20- Nirjala Ekadasi (Smarta).
21	11					21- Nirjala Ekadasi (Vaishnava & Vidhava), Champaka Dvadasi, Trisprisa Mahadvadasi.
22	12					
23	13					
24	14			24- Saura Ashadhadi ($13^h 01^m.1$)	24- Full Moon ($17^h 21^m.7$)	24- Vata Savitri Vrata (Purnima Paksha), Deva Snana Purnima.
25	15				25- Sayana Vaidhriti ($12^h 53^m.4$)	25- Guru Hargobind's Bithday (Jammu & Kashmir), Rajas Samkrarti (Odisha).
26	16	SAURA ASHADHA				
27	17					
28	18					
29	19					
30	20			31-Sun enters Trop. Cancer ($14^h 43^m.8$)		
31	June 21					31. Dakshinayana Day.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters:- Kumbha 1, $11^h 12^m.3$;Mina 3, $16^h 27^m.1$; Mesha 5,$24^h 38^m.5$;Vrisha 8, $11^h 15^m.6$;Mithuna 10, $23^h 29^m.7$;Karkata 13, $12^h 20^m.4$; Simha 15, $24^h 24^m.8$; Kanya 18, $10^h 04^m.0$; Tula 20, $16^h 06^m.8$; Vrischika 22, $18^h 33^m.0$;Dhanus 24, $18^h 32^m.2$;Makara 26, $17^h 55^m.1$; Kumbha 28, $18^h 43^m.0$;Mina 30, $22^h 35^m.6$; Sun enters :-Nirayana Mithuna 25, $12^h 04^m.0$

SAKA ERA 1944

Karkata : Nabhas

Month of ASHADHA (31 days)

Rains (Varsa), 1st Month

(*Nirayana*) 8 Ashadha, 5123 Kali Era to (*Nirayana)* 7 Sravana, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022 A.D.															
1	Wed	June 22	5	15.4	12	02.0	18	48.7	K 9	20	45.9	27	---	---	4	5	30.7
															(5	28	55.8)
2	Thu	23	5	15.6	12	02.2	18	48.8	K 10	21	42.0	27	6	14.4	6	28	51.8
3	Fri	24	5	15.9	12	02.4	18	49.0	11	23	12.8	1	8	03.7	7	29	13.0
4	Sat	25	5	16.1	12	02.6	18	49.2	12	25	10.4	2	10	23.6	8	---	---
5	Sun	26	5	16.4	12	02.8	18	49.3	13	27	26.2	3	13	05.8	8	5	53.3
6	Mon	27	5	16.7	12	03.1	18	49.4	14	---	---	4	16	02.0	9	6	46.5
7	Tue	28	5	17.0	12	03.3	18	49.5	14	5	52.5	5	19	05.0	10	7	46.8
8	Wed	29	5	17.3	12	03.5	18	49.6	K 30	8	22.3	6	22	08.4	11	8	49.5
9	Thu	30	5	17.6	12	03.7	18	49.7	S 1	10	49.8	7	25	07.1	12	9	50.5
10	Fri	Jul. 1	5	18.0	12	03.9	18	49.8	2	13	09.9	8	27	56.1	13	10	45.9
11	Sat	2	5	18.3	12	04.1	18	49.8	3	15	17.6	9	---	---	14	11	32.2
12	Sun	3	5	18.7	12	04.2	18	49.8	4	17	07.3	9	6	30.2	15	12	05.5
13	Mon	4	5	19.0	12	04.4	18	49.8	S 5	18	33.2	10	8	43.6	16	12	21.2
14	Tue	5	5	19.4	12	04.6	18	49.8	6	19	29.0	11	10	30.3	17	12	14.9
15	Wed	6	5	19.8	12	04.8	18	49.7	7	19	49.0	12	11	44.0	18	11	41.8
16	Thu	7	5	20.1	12	04.9	18	49.7	8	19	28.7	13	12	19.6	19	10	37.9
17	Fri	8	5	20.5	12	05.1	18	49.6	9	18	25.6	14	12	13.5	20	9	00.3
18	Sat	9	5	20.9	12	05.2	18	49.5	S 10	16	39.9	15	11	24.7	21	6	47.9
															(22	28	01.7)
19	Sun	10	5	21.3	12	05.4	18	49.4	11	14	14.3	16	9	55.3	23	24	44.4
20	Mon	11	5	21.7	12	05.5	18	49.2	12	11	14.1	17	7	49.8	24	21	01.1
												(18	29	15.6)			
21	Tue	12	5	22.1	12	05.7	18	49.1	13	7	46.8	19	26	21.6	25	16	58.5
									(14	28	01.2)						
22	Wed	13	5	22.5	12	05.8	18	48.9	S 15	24	07.6	20	23	18.6	26	12	44.2
23	Thu	14	5	23.0	12	05.9	18	48.7	K 1	20	16.8	21	20	18.1	27	8	27.0
															(1	28	16.1)
24	Fri	15	5	23.4	12	06.0	18	48.5	2	16	39.9	22	17	31.6	2	24	20.5
25	Sat	16	5	23.8	12	06.1	18	48.2	3	13	27.6	23	15	10.5	3	20	48.9
26	Sun	17	5	24.2	12	06.2	18	48.0	4	10	50.0	24	13	25.1	4	17	48.7
27	Mon	18	5	24.7	12	06.3	18	47.7	K 5	8	55.6	25	12	23.7	5	15	25.7
28	Tue	19	5	25.1	12	06.3	18	47.4	6	7	50.3	26	12	11.7	6	13	43.3
29	Wed	20	5	25.5	12	06.4	18	47.1	7	7	36.5	27	12	50.5	7	12	42.1
30	Thu	21	5	26.0	12	06.4	18	46.7	8	8	12.6	1	14	17.2	8	12	19.5
31	Fri	22	5	26.4	12	06.5	18	46.4	K 9	9	32.8	2	16	24.8	9	12	30.2

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1944

Dakshinayana

Uttara Gola

Month of ASHADHA (31 days)

Ayanamsa on 1st : $24^0 10' 03''$

Nirayana) 8 Ashadha, 5123 Kali Era to (*Nirayana)* 7 Sravana, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.					
1	June 22	SAURA ASHADHA	CHANDRA JYAISHTHA	1- Sun Enters Ardra nak. ($11^h42^m.5$)		
2	23					
3	24					3- Yogini Ekadasi.
4	25					
5	26					
6	27				6- Sayana Vyatipata ($28^h38^m.9$)	
7	28					
8	29				8- New Moon ($8^h22^m.3$)	
9	30		CHANDRA ASHADHA			9- Manoratha Dvitiya Vrata (Bengal).
10	July 1					10- Rathayatra.
11	2					
12	3					
13	4					
14	5					14- Kumara Shashthi (Vrata).
15	6			15- Sun enters Punarvasu nak. ($11^h11^m.5$)		15- Vivasvat Saptami.
16	7					16- Kharchi Puja (Tripura).
17	8					17- Mela Sharik Bhagwati (Kashmir).
18	9					18- Punaryatra, Ultaratha (Odisha), Bahudha Yatra.
19	10					19- Harisayani Ekadasi.
20	11				20- Sayana Vaidhriti ($8^h22^m.2$)	
21	12					21- Mela Jwalamukhi (Kashmir).
22	13				22- Full Moon ($24^h07^m.6$)	22- Guru Purnima, Vyasa Puja, Asadhi Purnima, Martyr's Day (Kashmir).
23	14					
24	15			24- Saura Sravanadi ($23^h49^m.7$)		
25	16					25- Manasa Puja Begins(Bengal).
26	17	SAURA SRAVANA				
27	18					27- Naga Panchami (Bengal).
28	19					
29	20			29- Sun enters Pushya nak. ($10^h48^m.9$)		
30	21					
31	July 22			31- Sun enters Trop.Leo ($25^h36^m.9$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters:-Mesha 2,6^h 14^m.4;Vrisha 4,17^h 02^m.4; Mithuna 7,5^h 33^m.1; Karkata 9,18^h 23^m.2; Simha 12, 6^h 30^m.2; Kanya 14,16^h 52^m.1;Tula 16,24^h 21^m.9;Vrischika 18, 28^h 21^m.3; Dhanus 20,29^h 15^m.6; Makara 22, 28^h 32^m.8;Kumbha 24, 28^h 17^m.1;Mina 27, 6^h 34^m.6;Mesha 29,12^h 50^m.5;Vrisha 31,23^h 01^m.9; Sun enters:-Nirayana Karkata 25, 22^h 57^m.1

SAKA ERA 1944

Simha : Nabhasya

Month of SRAVANA (31 days)

Rains (Varsa), 2nd Month

(*Nirayana*) 8 Sravana, 5123 Kali Era to (*Nirayana*) 7 Bhadra, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022 A.D.															
1	Sat	July 23	5	26.8	12	06.5	18	46.0	K 10	11	27.8	3	19	03.0	10	13	06.7
2	Sun	24	5	27.3	12	06.5	18	45.6	11	13	46.1	4	22	00.3	11	14	00.4
3	Mon	25	5	27.7	12	06.6	18	45.2	12	16	16.0	5	25	05.6	12	15	02.8
4	Tue	26	5	28.1	12	06.6	18	44.7	13	18	47.5	6	28	09.4	13	16	06.6
5	Wed	27	5	28.6	12	06.6	18	44.3	14	21	12.3	7	---	---	14	17	05.9
6	Thu	28	5	29.0	12	06.5	18	43.8	K 30	23	25.0	7	7	04.7	15	17	56.4
7	Fri	29	5	29.5	12	06.5	18	43.3	S 1	25	21.9	8	9	46.9	16	18	35.3
8	Sat	30	5	29.9	12	06.5	18	42.8	2	27	00.6	9	12	12.8	17	19	00.6
9	Sun	31	5	30.3	12	06.4	18	42.3	3	28	18.7	10	14	20.1	18	19	10.5
10	Mon	Aug. 1	5	30.7	12	06.4	18	41.7	4	29	13.7	11	16	06.4	19	19	03.3
11	Tue	2	5	31.2	12	06.3	18	41.2	S 5	---	---	12	17	28.8	20	18	36.6
12	Wed	3	5	31.6	12	06.2	18	40.6	S 5	5	42.4	13	18	23.8	21	17	47.6
13	Thu	4	5	32.0	12	06.2	18	40.0	6	5	41.2	14	18	47.6	22	16	33.6
									(7	29	06.9)						
14	Fri	5	5	32.4	12	06.1	18	39.3	8	27	57.1	15	18	37.4	23	14	52.0
15	Sat	6	5	32.8	12	06.0	18	38.7	9	26	11.4	16	17	51.4	24	12	41.4
16	Sun	7	5	33.3	12	05.8	18	38.1	S 10	23	51.3	17	16	30.3	25	10	01.8
17	Mon	8	5	33.7	12	05.7	18	37.4	11	21	00.9	18	14	37.2	26	6	54.9
															(27	27	24.2)
18	Tue	9	5	34.1	12	05.6	18	36.7	12	17	46.4	19	12	17.7	1	23	35.3
19	Wed	10	5	34.5	12	05.4	18	36.0	13	14	16.0	20	9	39.7	2	19	35.0
20	Thu	11	5	34.9	12	05.3	18	35.3	14	10	39.0	21	6	52.7	3	15	31.5
												(22	28	07.6)			
21	Fri	12	5	35.3	12	05.1	18	34.6	S 15	7	05.7	23	25	35.8	4	11	33.2
									(K 1	27	47.2)						
22	Sat	13	5	35.6	12	04.9	18	33.8	2	24	54.1	24	23	28.4	5	7	49.2
															(6	28	28.0)
23	Sun	14	5	36.0	12	04.7	18	33.0	3	22	36.4	25	21	55.9	7	25	37.3
24	Mon	15	5	36.4	12	04.5	18	32.3	4	21	02.4	26	21	06.8	8	23	23.0
25	Tue	16	5	36.8	12	04.3	18	31.5	K 5	20	18.0	27	21	06.7	9	21	48.9
26	Wed	17	5	37.2	12	04.1	18	30.7	6	20	25.1	1	21	57.3	10	20	55.7
27	Thu	18	5	37.5	12	03.9	18	29.9	7	21	21.5	2	23	35.4	11	20	40.9
28	Fri	19	5	37.9	12	03.7	18	29.0	8	23	00.0	3	25	53.3	12	20	58.8
29	Sat	20	5	38.3	12	03.5	18	28.2	9	25	09.4	4	28	39.7	13	21	41.0
30	Sun	21	5	38.6	12	03.2	18	27.4	K 10	27	36.4	5	---	---	14	22	37.9
31	Mon	22	5	39.0	12	03.0	18	26.5	K 11	---	---	5	7	41.0	15	23	39.6

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1944

Dakshinayana

Uttara Gola

Month of SRAVANA (31 days)

Ayanamsa on 1st : $24^0 10^{/} 08^{//}$

(Nirayana) 8 Sravana, 5123 Kali Era to *(Nirayana)* 7 Bhadra, 5123 Kali Era

Date	Gergorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022 A.D.		CHANDRA ASHADHA			
1	July 23				1- Sayana Vyatipata ($10^h01^m.2$)	
2	24					2- Kamika Ekadasi .
3	25					
4	26					4- Ker Puja (Tripura).
5	27					
6	28				6- New moon ($23^h25^m.0$)	6- Chitalagi Amavasya (Odisha), Adi Amavasya (Tamil Nadu), Karkataka Vavu (Kerala).
7	29	SAURA SRAVANA	CHANDRA SRAVANA			
8	30					
9	31					9- Madhusrava Tritiya (Teej), Adi Puram(S. India).
10	Aug. 1					10- Tilak Commemoration Day.
						11- Nag Panchami (Bengal).
11	2					12- Rik Upakarma,
12	3			12- Sun enters Aslesha nak. ($9^h37^m.5$)		13- Goswami Tulasidas Jayanti.
13	4					17- Jhulana Yatrarambha, Jhulana Yatrarambha (Purvahna) , Pavitra Ekadasi.
14	5				14-Sayana Vaidhriti ($23^h 01^m.9$)	
15	6					
						20- Jhulana Yatrasamapanna (Prodasa) , Raksha Bandhan, Balabhadra Puja (Odisha), Naroli Purnima, Avani Avittam (S.India),Yaju Upakarma, Sravani Purnima.
16	7					
17	8					
18	9					
19	10					
20	11					21-Jhulana Yatra Samapanna, Solono (Rakhi Bandhan), Vara Maha Lakshmi Vrata (S.India),Amarnath Yatra, Gayatri Japam.
21	12				21- Full moon ($7^h 05^m.7$)	
22	13					
23	14					23- Teejri (Sindhi).
24	15					24- Bahula Chaturthi (Sankastha Chaturthi), Independence Day.
25	16			25- Saura Bhadrapadadi ($8^h26^m.9$)		25- Raksha Panchami (Odisha).
						26-Manasa Puja ends (Bengal), Simhadi(Kerala),Beginning of Kollam Era .
26	17	SAURA BHADRAPADA		26- Sun enters Magha nak. ($7^h23^m.3$)	26- Sayana Vyatipata ($18^h04^m.2$)	27- Jammashtami(Smarta), Sri Krishna Jayanti (T.N, Kerala & Assam), Vadi Thadri (Sindhi).
27	18					
28	19					
29	20					28- Janmashtami(Vaishnava), Gokulashtami (Nandotsava).
30	21				31- Full moon ($17^h 32^m.0$)	
31	Aug. 22					29- Sri Jayanti (Ramanuja).

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Mithuna 3, $11^h 32^m.6$; Karkata 5, $24^h 22^m.0$; Simha 8, $12^h 12^m.8$; Kanya 10, $22^h 29^m.4$; Tula 13, $6^h 39^m.8$; Vrischika 15, $12^h 06^m.2$; Dhanus 17, $14^h 37^m.2$; Makara 19, $14^h 58^m.4$; Kumbha 21, $14^h 49^m.4$; Mina 23, $16^h 15^m.3$; Mesha 25, $21^h 06^m.7$; Vrisha 28, $6^h 06^m.5$; Mithuna 30, $18^h 09^m.3$; Sun enters: Nirayana Simha 26, $7^h 23^m.3$.

INDIAN CALENDAR

SAKA ERA 1944

Kanya: Isha

Month of BHADRA (31 days) — Autumn (Sarat), 1st Month

(*Nirayana*) 8 Bhadra, 5123 Kali Era to (*Nirayana*) 7 Asvina, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022 A.D.															
1	Tue	Aug. 23	5	39.3	12	02.7	18	25.6	K 11	6	07.5	6	10	44.3	16	24	37.3
2	Wed	24	5	39.7	12	02.4	18	24.7	12	8	31.0	7	13	38.6	17	25	24.4
3	Thu	25	5	40.0	12	02.2	18	23.8	13	10	38.4	8	16	16.2	18	25	56.3
4	Fri	26	5	40.4	12	01.9	18	22.9	14	12	24.5	9	18	32.6	19	26	10.6
5	Sat	27	5	40.7	12	01.6	18	22.0	K 30	13	47.1	10	20	26.0	20	26	06.3
6	Sun	28	5	41.1	12	01.3	18	21.1	S 1	14	45.8	11	21	56.3	21	25	43.5
7	Mon	29	5	41.4	12	01.0	18	20.2	2	15	21.1	12	23	04.0	22	25	02.6
8	Tue	30	5	41.7	12	00.7	18	19.2	3	15	33.5	13	23	49.4	23	24	03.8
9	Wed	31	5	42.0	12	00.4	18	18.3	4	15	23.2	14	24	12.3	24	22	46.8
10	Thu	Sept. 1	5	42.4	12	00.1	18	17.3	S 5	14	49.6	15	24	12.0	25	21	11.0
11	Fri	2	5	42.7	11	59.8	18	16.4	6	13	51.7	16	23	47.2	26	19	15.5
12	Sat	3	5	43.0	11	59.5	18	15.4	7	12	28.7	17	22	57.4	27	16	59.5
13	Sun	4	5	43.3	11	59.1	18	14.4	8	10	40.4	18	21	42.8	1	14	23.2
14	Mon	5	5	43.6	11	58.8	18	13.4	9	8	28.2	19	20	05.5	2	11	27.4
15	Tue	6	5	44.0	11	58.5	18	12.5	S 10	5	54.9	20	18	09.4	3	8	14.8
									(11	27	05.1)				(4	28	49.0)
16	Wed	7	5	44.3	11	58.1	18	11.5	12	24	05.3	21	16	00.2	5	25	15.3
17	Thu	8	5	44.6	11	57.8	18	10.5	13	21	03.4	22	13	45.8	6	21	40.2
18	Fri	9	5	44.9	11	57.4	18	09.5	14	18	08.2	23	11	34.8	7	18	10.8
19	Sat	10	5	45.2	11	57.1	18	08.5	S 15	15	29.1	24	9	36.9	8	14	54.6
20	Sun	11	5	45.5	11	56.7	18	07.4	K 1	13	15.4	25	8	02.0	9	11	59.1
21	Mon	12	5	45.8	11	56.4	18	06.4	2	11	36.0	26	6	59.1	10	9	31.0
22	Tue	13	5	46.1	11	56.0	18	05.4	3	10	37.9	27	6	35.9	11	7	35.7
23	Wed	14	5	46.4	11	55.7	18	04.4	4	10	25.9	1	6	57.4	12	6	16.6
															(13	29	34.6)
24	Thu	15	5	46.7	11	55.3	18	03.4	K 5	11	01.0	2	8	04.9	14	29	27.3
25	Fri	16	5	47.0	11	54.9	18	02.4	6	12	19.9	3	9	55.3	15	---	---
26	Sat	17	5	47.3	11	54.6	18	01.3	7	14	14.7	4	12	21.1	15	5	49.4
27	Sun	18	5	47.6	11	54.2	18	00.3	8	16	33.6	5	15	10.8	16	6	32.8
28	Mon	19	5	47.9	11	53.9	17	59.3	9	19	02.3	6	18	10.5	17	7	27.8
29	Tue	20	5	48.2	11	53.5	17	58.3	K 10	21	26.9	7	21	06.6	18	8	23.9
30	Wed	21	5	48.6	11	53.2	17	57.3	11	23	35.0	8	23	47.0	19	9	11.7
31	Thu	22	5	48.9	11	52.8	17	56.2	K 12	25	18.0	9	26	03.2	20	9	43.7

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Dakshinayana — SAKA ERA 1944

Uttara Gola — Month of BHADRA (31 days) — Ayanamsa on 1st : $24^0 10^{/} 13^{//}$

(*Nirayana*) 8 Bhadra, 5123 Kali Era to (*Nirayana*) 7 Asvina, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022 A.D.					
1	Aug. 23	SAURA BHADRAPADA	CHANDRA SRAVANA	1- Sun enters Trop. Virgo($8^h 46^m.1$)		1- Aja Ekadasi.
2	24					2- Paryusana Parvarambha (Chaturthi Paksha-Jain), Paryusana Parvarambha (Panchami Paksha-Jain).
3	25					3- Aghora Chaturdasi, Kailas Yatra- 2 days,
4	26					4- Saptapuri Amavasya (Odisha), Pithori.
5	27		CHANDRA BHADRAPADA		5- New Moon ($13^h 47^m.1$)	5- Kusotpatini, Jain Festival.
6	28					
7	29					7- Tithi of Sri Sankara Deva(Assam).
8	30			8-Sun enters Purva Phalguni nak. ($27^h 17^m.9$)		8- Haritalika Gauri Tritiya, Samaveda Upakarma, Haritalika Chaturthi.
9	31				9- Sayana Vaidhriti ($8^h 35^m.4$)	9-Samvatsarii (Chaturthi Paksha-Jain), Samvatsari (Panchami Paksha-Jain), Ganesha Chaturthi, Vinayaka Chaturthi (Tamil Nadu).
10	Sept. 1					10-Rishi Panchami, Mela Pat-3 days (Jammu & Kashmir).
11	2					11-Surya Shashthi.
12	3					12- Radhashtami, Maha Lakshmi Vratarambha, Durvashtami, Keil Muhurth (Coorg).
13	4					
14	5					
15	6					15- Dol Gyaras (M.P.), Parsva Parivartini Ekadasi(Smarta).
16	7					16- First Onam Day, Sravana Dvadasi, Sakrotthana, Vamana Jayanti, Heikra Hitamba (Manipur), Parsva Parivartini Ekadasi (Vaishnava & Vidhava).
17	8					17- Onam or Thiru Onam Day(Kerala).
18	9					18- Ananta Chaturdesi, Third Onam Day, Indra Purnima.
19	10				19- Full Moon ($15^h 29^m.1$)	19-Sri Narayana Guru Deva's Birthday (Kerala), Fourth Onam Day.
20	11					20- Pitri Paksha Tarpara Begins or Mahalaya paksha Begins (S.India),
21	12				21- Sayana Vyatipata ($6^h 47^m.7$)	
22	13			22- Sun enters Uttara Phalguni nak. ($21^h 14^m.5$)		
23	14					23- Tithi of Sri Madhava Deva (Assam).
24	15					
25	16			25- Saura Asvinadi ($8^h 41^m.6$)		
26	17	SAURA ASVINA				26- Visvakarma Puja, Maha Lakshmi Vrata Samapanna.
27	18					
28	19					28- Matri Navami.
29	20					
30	21					30- Indira Ekadasi, Samadhi Day of Narayan Guru (Kerala).
31	Sept. 22					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :Karkata 2, $6^h 56^m.3$;Simha 4, $18^h 32^m.6$;Kanya 6, $28^h 15^m.3$;Tula 9, $12^h 03^m.7$;Vrischika 11, $17^h 55^m.7$;Dhanus 13, $21^h 42^m.8$;Makara 15,$23^h 38^m.0$;Kumbha17, $24^h 39^m.2$; Mina 19, $26^h 23^m.1$; Mesha 22, $6^h 35^m.9$; Vrisha 24, $14^h 28^m.7$; Mithuna 26, $25^h 43^m.8$; Karkata 29, $14^h 23^m.6$;Simha 31, $26^h 03^m.2$; Sun enters :- Nirayana Kanya 26, $7^h 22^m.0$.

INDIAN CALENDAR

SAKA ERA 1944

Tula : Urja

Month of ASVINA (30 days) Autumn (Sarat), 2nd Month

(*Nirayana*) 8 Asvina, 5123 Kali Era to (*Nirayana*) 7 Kartika, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022A.D.															
1	Fri	Sep. 23	5	49.2	11	52.5	17	55.2	K 13	26	31.1	10	27	50.5	21	9	54.6
2	Sat	24	5	49.5	11	52.1	17	54.2	14	27	12.9	11	29	07.4	22	9	41.8
3	Sun	25	5	49.8	11	51.8	17	53.2	K 30	27	24.5	12	---	---	23	9	04.7
4	Mon	26	5	50.1	11	51.4	17	52.2	S 1	27	08.7	12	5	55.2	24	8	04.5
5	Tue	27	5	50.5	11	51.1	17	51.2	2	26	28.8	13	6	16.4	25	6	43.0
															(26	29	02.8)
6	Wed	28	5	50.8	11	50.7	17	50.2	3	25	28.1	14	6	14.3	27	27	06.2
7	Thu	29	5	51.1	11	50.4	17	49.2	4	24	09.4	15	5	52.2	1	24	55.4
												(16	29	12.9)			
8	Fri	30	5	51.5	11	50.1	17	48.2	S 5	22	35.2	17	28	18.7	2	22	32.1
9	Sat	Oct. 1	5	51.8	11	49.7	17	47.2	6	20	47.4	18	27	11.3	3	19	57.6
10	Sun	2	5	52.2	11	49.4	17	46.2	7	18	47.7	19	25	52.6	4	17	13.5
11	Mon	3	5	52.5	11	49.1	17	45.2	8	16	38.2	20	24	24.9	5	14	21.1
12	Tue	4	5	52.9	11	48.8	17	44.3	9	14	21.4	21	22	51.1	6	11	22.6
13	Wed	5	5	53.2	11	48.5	17	43.3	S 10	12	00.9	22	21	15.1	7	8	20.5
															(8	29	18.1)
14	Thu	6	5	53.6	11	48.2	17	42.4	11	9	41.0	23	19	41.8	9	26	19.6
15	Fri	7	5	53.9	11	47.9	17	41.4	12	7	27.1	24	18	17.2	10	23	29.7
									(13	29	25.4)						
16	Sat	8	5	54.3	11	47.6	17	40.5	14	27	42.4	25	17	07.9	11	20	53.5
17	Sun	9	5	54.7	11	47.3	17	39.5	S 15	26	25.0	26	16	20.7	12	18	36.0
18	Mon	10	5	55.1	11	47.1	17	38.6	K 1	25	39.2	27	16	02.0	13	16	42.2
19	Thu	11	5	55.5	11	46.8	17	37.7	2	25	30.0	1	16	17.2	14	15	15.9
20	Wed	12	5	55.9	11	46.5	17	36.8	3	26	00.0	2	17	10.0	15	14	19.5
21	Thu	13	5	56.3	11	46.3	17	35.9	4	27	09.0	3	18	40.9	16	13	53.7
22	Fri	14	5	56.7	11	46.1	17	35.0	K 5	28	53.0	4	20	47.1	17	13	56.5
23	Sat	15	5	57.1	11	45.8	17	34.1	6	---	---	5	23	21.8	18	14	23.6
24	Sun	16	5	57.5	11	45.6	17	33.3	6	7	04.0	6	26	14.5	19	15	07.9
25	Mon	17	5	57.9	11	45.4	17	32.4	7	9	30.4	7	29	12.4	20	16	00.6
26	Tue	18	5	58.4	11	45.2	17	31.6	8	11	58.4	8	---	---	21	16	51.7
27	Wed	19	5	58.8	11	45.0	17	30.8	9	14	14.0	8	8	01.7	22	17	31.5
28	Thu	20	5	59.3	11	44.8	17	30.0	K 10	16	05.2	9	10	30.2	23	17	51.8
29	Fri	21	5	59.7	11	44.7	17	29.2	11	17	23.1	10	12	28.3	24	17	46.3
30	Sat	22	6	00.2	11	44.5	17	28.4	K 12	18	03.0	11	13	50.2	25	17	11.5

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Dakshinayana

Dakshina Gola

SAKA ERA 1944

Month of ASVINA (30 days)

Ayanamsa on 1st : $24^0 10^{/} 16^{//}$

(*Nirayana*) 8 Asvina, 5123 Kali Era to (*Nirayana)* 7 Kartika, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.					
1	Sept. 23	SAURA ASVINA	CHANDRA BHADRAPADA	1- Sun enters Trop. Libra ($6^h33^m.7$)		1- Magha Trayodasi, Jalavishuva Day.
2	24					
3	25				3- New Moon ($27^h 24^m.5$) 3- Sayana Vaidhriti ($17^h 40^m.8$)	3- Mahalaya Amavasya, Sarva pitri Amavasya , Tarpana Layba (Manipur)
4	26		CHANDRA ASVINA			4-Saradiya Navaratrarambha, Maharaja Agrasen's Jayanti.
5	27			5- Sun enters Hasta nak. ($12^h43^m.3$)		
6	28					
7	29				7- Venus sets in the West ($27^h 10^m$)	
8	30					8- Upanga LalitaVrata(Lalita Panchami)
9	Oct. 1					9- Oli begins(Jain).
10	2					10- Durga Puja begins (Saptami), Mahatma Gandhi's Birthday, Saraswati Avahana.
11	3					11- Mahashtami.
12	4					12- Maha Navami, Ayudha Puja.
13	5					13-Vijaya Dasami (Dussehara or Dasahara),Vijaya Dasami (Bengal & Kerala),Sri Madhavacharya Jayanti,Saraswati Visarjana.
14	6					14- Bharat Milap, Papankusa Ekadasi (Pasankusa).
15	7				15- Sayana Vyatipata ($20^h 51^m.7$)	
16	8					
17	9				17- Full Moon ($26^h 25^m.0$)	17- Kojagori Lakshmi Puja (Bengal). Kumara Purnima (Odisha), Sarat Purnima, Kojagor (Lakshmindra Puja) Maharshi Valmiki's Birthday, Oli Ends (Jain),
18	10			18- Sun enters Chitra nak. ($25^h46^m.1$)		
19	11					
20	12					
21	13					21- Karaka Chaturthi, Dasaratha Chaturthi.
22	14					
23	15					
24	16			24- Saura Kartikadi ($21^h04^m.3$)		
25	17					25- Kaveri Samkramana Snana, Ahoyi Ashtami, Karashtami, Ahoyi Ashtami (Punjab).
26	18	SAURA KARTIKA				
27	19					
28	20				28- Sayana Vaiidhriti ($26^h 50^m.1$)	
29	21					29- Rama Ekadasi, Govatsa Dvadasi.
30	22					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Kanya 3, $11^h 22^m.0$; Tula 5, $18^h 18^m.0$; Vrischika 7, $23^h 24^m.2$; Dhanus 9, $27^h 11^m.3$; Makara 12, $6^h 01^m.9$; Kumbha 14, $8^h 27^m.8$; Mina 16, $11^h 23^m.4$; Mesha 18, $16^h 02^m.0$; Vrisha 20, $23^h 29^m.2$; Mithuna 23, $10^h 01^m.4$; Karkata 25, $22^h 28^m.2$; Simha 28, $10^h 30^m.2$; Kanya 30, $20^h 04^m.8$; Sun enters :- Nirayana Tula 25, $19^h 22^m.7$.

SAKA ERA 1944

Vrischika : Sahas
Hemanta, 1st Month

Month of KARTIKA (30 days)

(*Nirayana*) 8 Kartika, 5123 Kali Era to (*Nirayana)* 7 Agrahayana, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022A.D.															
1	Sun	Oct. 23	6	00.7	11	44.4	17	27.7	K 13	18	03.7	12	14	34.3	26	16	06.3
2	Mon	24	6	01.2	11	44.2	17	26.9	14	17	27.5	13	14	41.8	27	14	31.9
3	Tue	25	6	01.7	11	44.1	17	26.2	K 30	16	18.6	14	14	16.6	1	12	31.0
4	Wed	26	6	02.2	11	44.0	17	25.5	S 1	14	42.6	15	13	24.2	2	10	07.6
5	Thu	27	6	02.7	11	43.9	17	24.8	2	12	45.7	16	12	10.7	3	7	26.3
															(4	28	31.9)
6	Fri	28	6	03.2	11	43.8	17	24.1	3	10	34.1	17	10	42.5	5	25	29.1
7	Sat	29	6	03.7	11	43.7	17	23.4	4	8	13.8	18	9	05.6	6	22	22.3
									(S 5	29	50.2)						
8	Sun	30	6	04.3	11	43.7	17	22.8	6	27	28.3	19	7	25.6	7	19	15.3
												(20	29	47.5)			
9	Mon	31	6	04.8	11	43.6	17	22.1	7	25	12.0	21	28	15.4	8	16	11.8
10	Tue	Nov. 1	6	05.4	11	43.6	17	21.5	8	23	05.0	22	26	52.9	9	13	14.5
11	Wed	2	6	05.9	11	43.6	17	20.9	9	21	10.3	23	25	43.0	10	10	26.0
12	Thu	3	6	06.5	11	43.6	17	20.4	S 10	19	30.7	24	24	48.6	11	7	48.6
															(12	29	24.2)
13	Fri	4	6	07.1	11	43.6	17	19.8	11	18	08.9	25	24	12.2	13	27	14.8
14	Sat	5	6	07.6	11	43.6	17	19.3	12	17	07.4	26	23	56.5	14	25	22.3
15	Sun	6	6	08.2	11	43.6	17	18.8	13	16	29.1	27	24	04.0	15	23	48.7
16	Mon	7	6	08.8	11	43.7	17	18.3	14	16	16.5	1	24	37.4	16	22	35.7
17	Tue	8	6	09.4	11	43.7	17	17.8	S 15	16	32.2	2	25	38.7	17	21	44.9
18	Wed	9	6	10.0	11	43.8	17	17.3	K 1	17	17.6	3	27	09.0	18	21	17.0
19	Thu	10	6	10.6	11	43.9	17	16.9	2	18	33.4	4	29	07.9	19	21	12.0
20	Fri	11	6	11.3	11	44.0	17	16.5	3	20	17.7	5	---	---	20	21	28.4
21	Sat	12	6	11.9	11	44.1	17	16.1	4	22	26.4	5	7	32.7	21	22	02.6
22	Sun	13	6	12.5	11	44.2	17	15.7	K 5	24	52.0	6	10	17.9	22	22	49.4
23	Mon	14	6	13.2	11	44.4	17	15.4	6	27	24.2	7	13	14.9	23	23	41.7
24	Tue	15	6	13.8	11	44.5	17	15.1	7	29	50.3	8	16	12.6	24	24	30.7
25	Wed	16	6	14.5	11	44.7	17	14.8	8	---	---	9	18	58.6	25	25	07.4
26	Thu	17	6	15.1	11	44.9	17	14.5	8	7	57.4	10	21	20.5	26	25	23.0
27	Fri	18	6	15.8	11	45.1	17	14.3	9	9	33.7	11	23	08.1	27	25	10.3
28	Sat	19	6	16.5	11	45.3	17	14.0	K 10	10	30.2	12	24	14.2	1	24	24.4
29	Sun	20	6	17.1	11	45.5	17	13.8	11	10	41.8	13	24	35.9	2	23	02.9
30	Mon	21	6	17.8	11	45.8	17	13.7	K 12	10	07.5	14	24	13.9	3	21	06.0

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Dakshinayana — SAKA ERA 1944

Dakshina Gola — Month of KARTIKA (30 days) — Ayanamsa on 1st : $24^{0} 10^{/} 20^{//}$

(*Nirayana*) 8 Kartika, 5123 Kali Era to (*Nirayana)* 7 Agrahayana, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022 A.D.					
1	Oct. 23	SAURA KARTIKA	CHANDRA ASVINA	1- Sun enters Trop. Scorpio ($16^h 05^m.7$)		1-Dhana Trayodasi, Kali Chaturdasi.
2	24			2- Sun enters Svati nak. ($12^h 18^m.3$)		2-Naraka Chaturdasi (Purvarunodaya), Hanumajjanma (N.India) (Purvarunodaya), Dipavali (S. India), Dipavali, Kali Puja, Lakshmi Puja, Lakshmi Dipam, Mahavira Nirvana(Jain).
3	25				3- New Moon ($16^h 18^m.6$) 3- Partial Solar Eclipse (Visible in India)	3-Kaumudi Dipam, Kedar Gauri Vrata (S. India), Govardhana Puja, Annakuta.
4	26		CHANDRA KARTIKA			4- Kartika Sukladi, Yama Dvitiya, Bali Puja.
5	27					5- Visvakarma Day, Bhratri Dvitiya (Bengal), Dwat Puja (Bihar).
6	28					
7	29					7- Jnana Panchami(Jain).
8	30					8- Pratihara Shashthi or Surya Shashthi (Chhat- Bihar).
9	31					
10	Nov. 1					10-Gopashtami or Goshthashtami, Trivandrum Arat (Kerala), Martyrdom day of Bhagat Kanwar Ram (Sindhi).
11	2				11- Sayana Vyatipata ($7^h 45^m.9$)	11- Jagaddhatri Puja, Akshaya Navami.
12	3					
13	4					13- Utthana or Deva Prabodhani Ekadasi, Tulasi Vivaha.
14	5					
15	6			15- Sun enters Visakha nak. ($20^h 27^m.3$)		15-Vaikuntha Chaturdasi , Vaikuntha Chaturdasi (Prodosa).
16	7					16-Rasayatra (Samarta), Tripurotsava.
17	8				17- Full Moon ($16^h 32^m.2$) 17- Total Lunar Eclipse (Visible in India)	17-Rasayatra (Vaishnava), Kartiki Purnima, Rathayatra(Jain), Guru Nanak's Birthday, Puskar Fair (Ajmer).
18	9					
19	10					
20	11					
21	12					
22	13					
23	14					23-Children's Day (Nehru's Birthday).
24	15			24- Saura Margasirshadi ($21^h 15^m.6$)	24- Sayana Vaidhriti ($8^h 58^m.8$)	
25	16					25- Kartika Puja, Kalashtami, Prathamashtami(Orissa).
26	17	SAURA MARGASIRSHA				26- Death Anniversary of Lala Lajpat Rai.
27	18					
28	19			28- Sun enters Anuradha nak. ($26^h 35^m.0$)		
29	20				29- Venus rises in the East ($29^h 36^m$)	29- Birthday celebration of Prof.Ram Panjwani (Sindhi), Utpanna Ekadasi.
30	Nov. 21					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters : Tula 2, $26^h 33^m.0$; Vrischika 5, $6^h 30^m.7$; Dhanus 7, $9^h 05^m.6$; Makara 9, $11^h 23^m.8$; Kumbha 11, $14^h 16^m.2$; Mina 13, $18^h 19^m.5$; Mesha 15, $24^h 04^m.0$; Vrisha 18, $7^h 58^m.5$; Mithuna 20, $18^h 17^m.4$ Karkata 23, $6^h 30^m.1$; Simha 25, $18^h 58^m.6$; Kanya 27, $29^h 28^m.7$; Tula 30, $12^h 30^m.2$; Sun enters :- Nirayana Vrischika 25, $19^h 15^m.2$.

INDIAN CALENDAR

SAKA ERA 1944

Dhanus : Sahasya
Hemanta, 2nd Month

Month of AGRAHAYANA (30 days)

(*Nirayana*) 8 Agrahayana, 5123 Kali Era to (*Nirayana)* 7 Pausha, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022A.D.															
1	Tue	Nov. 22	6	18.5	11	46.0	17	13.5	K 13	8	49.8	15	23	12.1	4	18	36.5
2	Wed	23	6	19.2	11	46.3	17	13.4	14	6	53.9	16	21	37.1	5	15	38.7
									(K 30	28	27.2)						
3	Thu	24	6	19.8	11	46.6	17	13.3	S 1	25	38.0	17	19	37.0	6	12	18.7
4	Fri	25	6	20.5	11	46.9	17	13.2	2	22	35.4	18	17	21.0	7	8	43.0
															(8	28	58.7)
5	Sat	26	6	21.2	11	47.2	17	13.1	3	19	28.4	19	14	58.3	9	25	13.1
6	Sun	27	6	21.9	11	47.5	17	13.1	4	16	25.9	20	12	38.2	10	21	33.0
7	Mon	28	6	22.6	11	47.8	17	13.1	S 5	13	35.7	21	10	29.0	11	18	04.4
8	Tue	29	6	23.3	11	48.2	17	13.1	6	11	04.9	22	8	38.1	12	14	52.4
9	Wed	30	6	24.0	11	48.5	17	13.1	7	8	58.9	23	7	11.2	13	12	01.1
												(24	30	12.4)			
10	Thu	Dec. 1	6	24.6	11	48.9	17	13.2	8	7	21.7	25	29	43.7	14	9	33.0
									(9	30	15.2)						
11	Fri	2	6	25.3	11	49.3	17	13.3	S 10	29	39.9	26	29	45.4	15	7	29.3
															(16	29	50.1)
12	Sat	3	6	26.0	11	49.7	17	13.4	11	29	34.8	27	30	16.4	17	28	34.3
13	Sun	4	6	26.7	11	50.1	17	13.5	12	29	58.2	1	---	---	18	27	40.4
14	Mon	5	6	27.3	11	50.5	17	13.7	13	---	----	1	7	14.8	19	27	06.8
15	Tue	6	6	28.0	11	50.9	17	13.9	13	6	48.0	2	8	38.4	20	26	51.8
16	Wed	7	6	28.7	11	51.3	17	14.1	14	8	01.9	3	10	25.1	21	26	53.8
17	Thu	8	6	29.3	11	51.7	17	14.3	S 15	9	38.2	4	12	32.8	22	27	11.3
18	Fri	9	6	29.9	11	52.2	17	14.5	K 1	11	34.5	5	14	59.3	23	27	42.4
19	Sat	10	6	30.6	11	52.6	17	14.8	2	13	48.3	6	17	41.9	24	28	24.7
20	Sun	11	6	31.2	11	53.1	17	15.1	3	16	15.2	7	20	36.1	25	29	14.3
21	Mon	12	6	31.8	11	53.5	17	15.4	4	18	49.3	8	23	35.9	26	30	06.3
22	Tue	13	6	32.4	11	54.0	17	15.7	K 5	21	21.9	9	26	32.6	27	---	---
23	Wed	14	6	33.0	11	54.5	17	16.1	6	23	42.6	10	29	15.8	27	6	54.0
24	Thu	15	6	33.6	11	55.0	17	16.5	7	25	39.8	11	---	----	1	7	29.8
25	Fri	16	6	34.2	11	55.4	17	16.9	8	27	02.5	11	7	34.5	2	7	45.5
26	Sat	17	6	34.8	11	55.9	17	17.3	9	27	41.9	12	9	18.1	3	7	33.4
27	Sun	18	6	35.3	11	56.4	17	17.7	K 10	27	32.5	13	10	18.4	4	6	47.4
															(5	29	23.5)
28	Mon	19	6	35.9	11	56.9	17	18.1	11	26	32.9	14	10	30.7	6	27	20.4
29	Tue	20	6	36.4	11	57.4	17	18.6	12	24	45.7	15	9	54.6	7	24	39.6
30	Wed	21	6	36.9	11	57.9	17	19.1	K 13	22	16.5	16	8	33.1	8	21	25.1
												(17	30	32.9)			

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Dakshinayana — SAKA ERA 1944

Dakshina Gola — Month of AGRAHAYANA (30 days) — Ayanamsa on 1st : $24^{0} 10^{/} 24^{//}$

(*Nirayana*) 8 Agrahayana, 5123 Kali Era to (*Nirayana)* 7 Pausha, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.		CHANDRA KARTIKA			
1	Nov. 22	SAURA MARGASIRSHA		1- Sun enters Trop. Saggitarius ($13^h 50^m.5$)		
2	23				2- New Moon ($28^h 27^m.2$)	
3	24		CHANDRA MARGASIRSHA			3- Guru Teg Bahadur's Martyrdom Day.
4	25					
5	26					
6	27				6- Sayana Vyatipata ($19^h 01^m.1$)	
7	28					7- Guha Shashthi, Subrahmanya Shashthi (S. India).
8	29					8- Champa Shashthi (Maharashtra), Mulakrupini Shashthi (Bengal).
9	30					9- Mitra Saptami.
10	Dec. 1					
11	2					
12	3			12- Sun enters Jyeshtha nak. ($6^h 51^m.0$)		12- Mokshada Ekadasi (Smarta), Gita Jayanti. Mauna Ekadasi (Jain).
13	4					13- Mokshada Ekadasi (Vaishnava & Vidhava), Akhanda Dvadasi.
14	5					14- Bharani Dipam.
15	6					15- Krittika Dipam.
16	7					16- Shri Datta Jayanti (Maharashtra), Datta treya Jayanti.
17	8				17- Full Moon ($09^h 38^m.2$)	17- Huthri - 3 Days (Coorg), Margi Purnima.
18	9					
19	10				19- Sayana Vaidhriti ($12^h 56^m.1$)	
20	11					
21	12					
22	13					
23	14					
24	15			24- Saura Paushadi ($12^h 09^m.5$)		
25	16			25- Sun enters Mula nak.($9^h 58^m.5$)		25- Ashtaka(Pupashtaka), Vaikktashtami (Kerala).
26	17	SAURA PAUSHA				
27	18					27- Birthday of Parsvanath (Jain).
28	19					28- Saphala Ekadasi.
29	20					
30	Dec. 21			30- Sun enters Tropical Capricorn ($27^h 18^m.2$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Vrischika 2, $16^h 03^m.5$; Dhanus 4, $17^h 21^m.0$; Makara 6, $18^h 04^m.6$; Kumbha 8, $19^h 51^m.4$; Mina 10, $23^h 48^m.0$; Mesha 12, $30^h 16^m.4$; Vrisha 15, $15^h 03^m.0$; Mithuna 17, $25^h 43^m.9$;Karkata 20, $13^h 51^m.8$ Simha 22, $26^h 32^m.6$; Kanya 25, $14^h 04^m.0$; Tula 27, $22^h 30^m.7$; Vrischika 29, $26^h 57^m.5$ Sun enters :- Nirayana Dhanus 25, $9^h 58^m.5$.

SAKA ERA 1944

Makara : Tapas

Month of PAUSHA (30 days)

Winter (Sisira), 1st Month

(*Nirayana*) 8 Pausha, 5123 Kali Era to (*Nirayana*) 7 Magha, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2022 A.D.															
1	Thu	Dec. 22	6	37.4	11	58.4	17	19.6	K 14	19	13.6	18	28	02.6	9	17	43.0
2	Fri	23	6	37.9	11	58.9	17	20.1	K 30	15	46.8	19	25	13.0	10	13	40.7
3	Sat	24	6	38.4	11	59.4	17	20.7	S 1	12	06.8	20	22	15.3	11	9	26.5
															(12	29	09.5)
4	Sun	25	6	38.8	11	59.9	17	21.2	2	8	24.8	21	19	21.2	13	24	58.5
									(3	28	51.7)						
5	Mon	26	6	39.3	12	00.4	17	21.8	4	25	38.2	22	16	41.8	14	21	01.9
6	Tue	27	6	39.7	12	00.9	17	22.4	S 5	22	53.5	23	14	27.2	15	17	27.1
7	Wed	28	6	40.1	12	01.4	17	22.9	6	20	45.0	24	12	45.9	16	14	20.3
8	Thu	29	6	40.5	12	01.9	17	23.6	7	19	17.8	25	11	44.0	17	11	45.6
9	Fri	30	6	40.8	12	02.4	17	24.2	8	18	34.3	26	11	24.3	18	9	45.2
10	Sat	31	6	41.2	12	02.8	17	24.8	9	18	33.6	27	11	46.9	19	8	18.7
		2023A.D..															
11	Sun	Jan. 1	6	41.5	12	03.3	17	25.4	S 10	19	12.1	1	12	48.5	20	7	23.9
12	Mon	2	6	41.8	12	03.8	17	26.1	11	20	23.9	2	14	23.6	21	6	56.7
13	Tue	3	6	42.1	12	04.3	17	26.7	12	22	02.4	3	16	25.8	22	6	52.4
14	Wed	4	6	42.3	12	04.7	17	27.4	13	24	01.2	4	18	48.5	23	7	06.0
15	Thu	5	6	42.5	12	05.2	17	28.1	14	26	14.5	5	21	26.0	24	7	33.2
16	Fri	6	6	42.8	12	05.6	17	28.7	S 15	28	37.9	6	24	13.7	25	8	10.1
17	Sat	7	6	43.0	12	06.0	17	29.4	K 1	---	---	7	27	08.0	26	8	53.9
18	Sun	8	6	43.1	12	06.5	17	30.1	K 1	7	07.6	8	30	05.3	27	9	41.9
19	Mon	9	6	43.3	12	06.9	17	30.8	2	9	39.9	9	---	---	1	10	31.4
20	Tue	10	6	43.4	12	07.3	17	31.5	3	12	10.0	9	9	01.2	2	11	19.3
21	Wed	11	6	43.5	12	07.7	17	32.2	4	14	31.9	10	11	50.1	3	12	01.3
22	Thu	12	6	43.6	12	08.1	17	32.9	K 5	16	37.5	11	14	24.5	4	12	31.9
23	Fri	13	6	43.6	12	08.5	17	33.6	6	18	17.7	12	16	35.5	5	12	44.6
24	Sat	14	6	43.7	12	08.8	17	34.3	7	19	23.2	13	18	13.9	6	12	32.8
25	Sun	15	6	43.7	12	09.2	17	35.0	8	19	45.9	14	19	11.6	7	11	50.0
26	Mon	16	6	43.6	12	09.6	17	35.8	9	19	20.6	15	19	23.0	8	10	31.3
27	Tue	17	6	43.6	12	09.9	17	36.5	K 10	18	05.6	16	18	46.0	9	8	34.2
															(10	29	58.4)
28	Wed	18	6	43.5	12	10.2	17	37.2	11	16	03.1	17	17	22.5	11	26	46.6
29	Thu	19	6	43.5	12	10.5	17	37.9	12	13	18.5	18	15	17.7	12	23	03.7
30	Fri	20	6	43.4	12	10.8	17	38.6	13	10	00.2	19	12	40.2	13	18	56.8
									(K 14	30	18.0)						

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana — SAKA ERA 1944

Dakshina Gola — Month of PAUSHA (30 days) — Ayanamsa on 1st : 24° 10′ 30″

(*Nirayana*) 8 Pausha, 5123 Kali Era to (*Nirayana*) 7 Magha, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2022A.D.					
1	Dec. 22	SAURA PAUSHA	CHANDRA MARGASIRSHA			1- Uttarayana day.
2	23		CHANDRA PAUSHA		2- New Moon ($15^h 46^m.8$)	2- Vakula Amavasya (Odisha).
3	24					
4	25				2- Sayana Vyatipata ($11^h 09^m.8$)	4- Birthday of Sadhu T. L.Vaswani (Sindhi).
5	26					5- Jor Mela- 3 days (Punjab).
6	27					
7	28					
8	29			8- Sun enters Purvashadha nak.($12^h 08^m.5$)		8- Guru Gobind Singh's Birthday.
9	30					
10	31					
	2023A.D.					
11	Jan. 1					11- Samba Dasami (Odisha).
12	2					12- Vaikuntha Ekadasi (S.India), Putrada Ekadasi.
13	3					
14	4				14- Sayana Vaidhriti ($16^h 14^m.0$)	
15	5					
16	6				16- Full Moon ($28^h 37^m.9$)	16- Paushi Purnima, Pushyabhisheka Yatra, Arudra Darsanam (Purvarunodaya)(S.India).
17	7					
18	8					
19	9					
20	10					20- Ganesha Sankastha Chaturthi.
21	11			21- Sun enters Uttarashadha nak. ($14^h 13^m.2$)		
22	12					
23	13			23- Saura Maghadi ($22^h 56^m.2$)		23- Lohri (Punjab; Jammu & Kashmir).
24	14					24- Bhogi (S. India), Makara Samkranti (Bengal), Magha Bihu (Assam), Makara Samkranti(N.India), Birthday of Swami Vivekananda (According to Tithi), Birthday of Sant Parmanand (Sindhi).
25	15	SAURA MAGHA				25- Pongal (S. India), Makara Snana, Tila Samkranti, Tai Pongal (Kerala), Astaka (Mamsastaka).
26	16					26- Mattu Pongal or Kanumu.
27	17				27- Sayana Vyatipata ($27^h 15^m.6$)	
28	18					28- Shattila Ekadasi.
29	19					
30	Jan. 20			30- Sun Enters Trop. Aquarius ($13^h 59^m.5$)		30- Meru Trayodasi(Jain), Ratanti Kalika Puja.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Dhanus 1,$28^h 02^m.6$; Makara 3, $27^h 31^m.0$; Kumbha 5, $27^h 30^m.8$; Mina 7, $29^h 55^m.5$; Mesha 10, $11^h 46^m.9$; Vrisha 12, $20^h 51^m.9$; Mithuna 15, $8^h 05^m.7$; Karkata 17, $20^h 24^m.0$; Simha 20, $9^h 01^m.2$; Kanya 22, $20^h 59^m.8$; Tula 25, $6^h 48^m.3$; Vrischika 27, $12^h 59^m.8$; Dhanus 29, $15^h 17^m.7$; Sun enters :- Nirayana Makara 24, $20^h 45^m.5$

SAKA ERA 1944

Kumbha : Tapasya

Month of MAGHA (30 days)

Winter (Sisira), 2nd Month

(*Nirayana*) 8 Magha, 5123 Kali Era to (*Nirayana*) 7 Phalguna, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise	Apparent Noon	Sunset	Tithi No.	Tithi Ending Moment	Nakshatra No.	Nakshatra Ending Moment	Yoga No.	Yoga Ending Moment
			h m	h m	h m		h m		h m		h m
		2023A.D.									
1	Sat	Jan. 21	6 43.2	12 11.1	17 39.3	K 30	26 23.2	20	9 40.2	14	14 34.4
								(21	30 29.7)		
2	Sun	22	6 43.1	12 11.4	17 40.1	S 1	22 27.9	22	27 20.9	15	10 05.6
										(16	29 40.1)
3	Mon	23	6 42.9	12 11.7	17 40.8	2	18 43.9	23	24 26.5	17	25 27.5
4	Tue	24	6 42.7	12 11.9	17 41.5	3	15 22.6	24	21 57.9	18	21 36.6
5	Wed	25	6 42.5	12 12.2	17 42.2	4	12 34.6	25	20 05.4	19	18 15.1
6	Thu	26	6 42.2	12 12.4	17 42.9	S 5	10 28.6	26	18 56.8	20	15 28.9
7	Fri	27	6 42.0	12 12.6	17 43.6	6	9 10.7	27	18 36.7	21	13 21.6
8	Sat	28	6 41.7	12 12.8	17 44.3	7	8 43.6	1	19 05.9	22	11 54.1
9	Sun	29	6 41.3	12 13.0	17 44.9	8	9 05.8	2	20 21.1	23	11 04.4
10	Mon	30	6 41.0	12 13.2	17 45.6	9	10 12.1	3	22 15.3	24	10 48.1
11	Tue	31	6 40.6	12 13.3	17 46.3	S 10	11 54.4	4	24 39.3	25	10 58.6
12	Wed	Feb. 1	6 40.3	12 13.5	17 47.0	11	14 02.5	5	27 23.2	26	11 28.9
13	Thu	2	6 39.9	12 13.6	17 47.6	12	16 26.6	6	30 18.0	27	12 11.7
14	Fri	3	6 39.4	12 13.7	17 48.3	13	18 58.1	7	--- ---	1	13 01.1
15	Sat	4	6 39.0	12 13.8	17 48.9	14	21 30.4	7	9 16.3	2	13 51.9
16	Sun	5	6 38.5	12 13.9	17 49.6	S 15	23 58.5	8	12 12.7	3	14 40.8
17	Mon	6	6 38.0	12 14.0	17 50.2	K 1	26 19.1	9	15 03.4	4	15 24.9
18	Tue	7	6 37.5	12 14.0	17 50.8	2	28 28.7	10	17 45.1	5	16 02.1
19	Wed	8	6 37.0	12 14.1	17 51.5	3	30 23.6	11	20 14.5	6	16 29.8
20	Thu	9	6 36.5	12 14.1	17 52.1	4	--- ---	12	22 27.2	7	16 45.0
21	Fri	10	6 35.9	12 14.2	17 52.7	4	7 58.8	13	24 17.8	8	16 43.8
22	Sat	11	6 35.3	12 14.2	17 53.3	K 5	9 08.5	14	25 39.9	9	16 21.6
23	Sun	12	6 34.7	12 14.2	17 53.9	6	9 46.2	15	26 27.4	10	15 33.7
24	Mon	13	6 34.1	12 14.1	17 54.5	7	9 46.2	16	26 35.4	11	14 15.9
25	Tue	14	6 33.5	12 14.1	17 55.0	8	9 04.4	17	26 01.4	12	12 25.1
26	Wed	15	6 32.8	12 14.1	17 55.6	9	7 39.5	18	24 45.9	13	10 00.2
						(K 10	29 33.1)				
27	Thu	16	6 32.2	12 14.0	17 56.2	11	26 49.6	19	22 52.6	14	7 02.5
										(15	27 35.3)
28	Fri	17	6 31.5	12 14.0	17 56.7	12	23 36.5	20	20 28.3	16	23 44.0
29	Sat	18	6 30.8	12 13.9	17 57.3	13	20 02.7	21	17 41.8	17	19 35.8
30	Sun	19	6 30.1	12 13.8	17 57.3	K 14	16 18.8	22	14 44.0	18	15 19.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana — SAKA ERA 1944

Dakshina Gola — Month of MAGHA (30 days) — Ayanamsa on 1st : 24° 10′ 36″

(*Nirayana*) 8 Magha, 5123 Kali Era to (*Nirayana)* 7 Phalguna, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023 A.D.					
1	Jan. 21	SAURA MAGHA	CHANDRA PAUSHA		1- New Moon ($26^h 23^m.2$)	1- Mauni Amavasya, Tai Amavasya, Makara Vavu (Kerala), Martyrdom Day of Hemu Kalani (Sindhi).
2	22		CHANDRA MAGHA			2- Magha Sukladi.
3	23					3- Netaji's Birthday.
4	24			4- Sun enters Sravana nak. ($16^h 28^m.4$)		4-Tila Chaturthi, Kunda Chaturthi.
5	25					5- Varada Chaturthi, Ganesha Puja (Bengal).
6	26					6-Sri Panchami, Saraswati Puja, Vasanta Panchami, Republic Day.
7	27					
8	28					8-Ratha Saptami (Purvarunodaya), Vidhana Saptami, Arogya Saptami, Bhismashtami, Birthday of Lala Lajpat Rai.
9	29				9- Sayana Vaidhriti ($19^h 56^m.2$)	
10	30					10- Martyr's Day (Mahatma Gandhi Commemoration Day).
11	31					
12	Feb. 1					12- Jaya Ekadasi, Bhaimi Ekadasi (Bengal).
13	2					13- Bhishma Dvadasi.
14	3					14- Desert Festival- 3 days(Jaisalmer).
15	4					
16	5				16- Full Moon ($23^h 58^m.5$)	16-Guru Ravi Das's Birthday, Maghi Purnima, Floating Festival / Tai Poosam.
17	6			17- Sun enters Dhanishtha Nak.($19^h 39^m.5$)		
18	7					
19	8					
20	9					
21	10					
22	11					
23	12			23- Saura Phalgunadi ($11^h 44^m.2$)	23- Sayana Vyatipata ($12^h 35^m.7$)	
24	13	SAURA PHALGUNA				24- Astaka (Sakashtaka), Janaki Janma.
25	14					
26	15					26-Birthday of Swami Dayananda Saraswati (Founder of 'Arya Samaj).
27	16					27-Viyaja Ekadasi (Smarta).
28	17					28-Vijaya Ekadasi (Vaishnava & Vidhava), Maha Shivaratri (Kashmir).
29	18			29- Sun enters Trop. Pisces ($28^h 04^m.3$)		29- Maha Shivaratri, Shivaratri (S. India).
30	Feb. 19			30- Sun enters Satabhisaj nak. ($24^h 09^m.5$)		30- Shivaji Jayanti.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :-Makara 1, $14^h 53^m.1$; Kumbha 3, $13^h 51^m.2$; Mina 5, $14^h 29^m.7$; Mesha 7, $18^h 36^m.7$; Vrisha 9, $26^h 46^m.3$; Mithuna 12, $13^h 59^m.3$; Karkata 14, $26^h 31^m.7$; Simha 17, $15^h 03^m.4$; Kanya 19, $26^h 49^m.4$; Tula 22, $13^h 02^m.8$; Vrischika 24, $20^h 37^m.3$; Dhanus 26, $24^h 45^m.9$; Makara 28, $25^h 48^m.4$; Kumbha 30, $25^h 14^m.3$; Sun enters :- Nirayana Kumbha 24, $9^h 44^m.9$.

SAKA ERA 1944

Mina : Madhu

Month of PHALGUNA (30 days)

Spring (Vasanta), 1st Month

(*Nirayana*) 8 Phalguna, 5123 Kali Era to (*Nirayana*) 7 Chaitra, 5123 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2023A.D.															
1	Mon	Feb. 20	6	29.3	12	13.7	17	58.4	K 30	12	35.9	23	11	46.2	19	11	02.8
2	Tue	21	6	28.6	12	13.6	17	58.9	S 1	9	05.3	24	9	00.4	20	6	55.9
									(2	29	58.2)				(21	27	07.7)
3	Wed	22	6	27.8	12	13.5	17	59.4	3	27	25.0	25	6	38.1	22	23	46.1
												(26	28	49.9)			
4	Thu	23	6	27.1	12	13.4	17	59.9	4	25	34.2	27	27	44.1	23	20	57.7
5	Fri	24	6	26.3	12	13.2	18	00.4	S 5	24	31.8	1	27	26.5	24	18	47.3
6	Sat	25	6	25.5	12	13.1	18	00.9	6	24	20.7	2	27	58.8	25	17	17.1
7	Sun	26	6	24.7	12	12.9	18	01.4	7	24	59.3	3	29	18.7	26	16	26.2
8	Mon	27	6	23.8	12	12.8	18	01.9	8	26	22.0	4	---	---	27	16	11.2
9	Tue	28	6	23.0	12	12.6	18	02.4	9	28	19.4	4	7	19.6	1	16	25.6
10	Wed	Mar. 1	6	22.2	12	12.4	18	02.8	S 10	---	---	5	9	51.7	2	17	01.6
11	Thu	2	6	21.3	12	12.2	18	03.3	S 10	6	40.0	6	12	43.4	3	17	50.5
12	Fri	3	6	20.4	12	12.0	18	03.7	11	9	11.7	7	15	43.3	4	18	44.3
13	Sat	4	6	19.6	12	11.8	18	04.2	12	11	43.7	8	18	41.4	5	19	36.1
14	Sun	5	6	18.7	12	11.6	18	04.6	13	14	07.7	9	21	30.3	6	20	20.4
15	Mon	6	6	17.8	12	11.3	18	05.1	14	16	17.8	10	24	04.8	7	20	53.7
16	Tue	7	6	16.9	12	11.1	18	05.5	S 15	18	10.3	11	26	22.1	8	21	13.6
17	Wed	8	6	16.0	12	10.9	18	05.9	K 1	19	43.1	12	28	19.9	9	21	18.5
18	Thu	9	6	15.1	12	10.6	18	06.4	2	20	54.6	13	29	56.8	10	21	07.3
19	Fri	10	6	14.1	12	10.4	18	06.8	3	21	42.9	14	---	---	11	20	38.5
20	Sat	11	6	13.2	12	10.1	18	07.2	4	22	06.1	14	7	10.9	12	19	50.5
21	Sun	12	6	12.3	12	09.8	18	07.6	K 5	22	01.8	15	7	59.9	13	18	41.5
22	Mon	13	6	11.3	12	09.6	18	08.0	6	21	27.8	16	8	21.2	14	17	09.6
23	Tue	14	6	10.4	12	09.3	18	08.4	7	20	22.6	17	8	12.9	15	15	13.3
24	Wed	15	6	09.4	12	09.0	18	08.8	8	18	46.0	18	7	33.7	16	12	52.0
25	Thu	16	6	08.5	12	08.7	18	09.2	9	16	39.7	19	6	24.1	17	10	06.4
												(20	28	46.8)			
26	Fri	17	6	07.5	12	08.5	18	09.6	K 10	14	07.3	21	26	46.3	18	6	58.7
															(19	27	32.5)
27	Sat	18	6	06.5	12	08.2	18	10.0	11	11	14.3	22	24	29.3	20	23	53.0
28	Sun	19	6	05.6	12	07.9	18	10.4	12	8	07.7	23	22	03.9	21	20	06.4
									(13	28	55.8)						
29	Mon	20	6	04.6	12	07.6	18	10.7	14	25	47.8	24	19	39.5	22	16	19.8
30	Tue	21	6	03.6	12	07.3	18	11.1	K 30	22	53.2	25	17	25.6	23	12	40.8

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana
Dakshina Gola

SAKA ERA 1944
Month of PHALGUNA (30 days)

Ayanamsa on 1st : $24^{0} 10^{/} 40^{//}$

(*Nirayana*) 8 Phalguna, 5123 Kali Era to (*Nirayana*) 7 Chaitra, 5123 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023 A.D.		CHANDRA MAGHA			
1	Feb. 20	SAURA PHALGUNA	CHANDRA PHALGUNA		1- New Moon ($12^h 35^m.9$)	
2	21					2- Birthday of Sri Ramakrishna Paramahamsa Deva (according to tithi).
3	22					
4	23				4- Sayana Vaidhriti ($29^h 02^m.3$)	
5	24					
6	25					
7	26					
8	27					8- Holashtaka.
9	28					
10	Mar. 1					
11	2					
12	3					12- Amlaki Ekadasi.
13	4					13- Govinda Dvadasi (Dvadasi upto $11^h 44^m$)
14	5			14- Sun enters Purva Bhadrapada nak. ($06^h 24^m.9$)		
15	6					15- Masi Magham.
16	7				16- Full Moon ($18^h 10^m.3$)	16 -Holikadahana, Dolyatra, Birthday of Sri Chaitanya.
17	8					17- Holi, Hola, Vasantotsava.
18	9				18- Sayana Vyatipata ($18^h 04^m.7$)	
19	10					
20	11					
21	12					21-Ranga Panchami, Bijoy Govindaji, Halangkar (Manipur).
22	13					
23	14			23- Saura Chaitradi ($8^h 13^m.8$)		23- Vaikkatashtami (Kerala).
24	15					24-Varsitaparambha(Jain), Sitalashtami.
25	16	SAURA CHAITRA				
26	17					
27	18			27-Sun enters Uttara Bhadrapada nak. ($14^h 52^m.9$)		27- Papamochani Ekadasi.
28	19					28- Varuni (Trayodasi upto 28h 56m, Satabhisaj nak. after 22h04m), Madhu Krishna Trayodasi.
29	20			29-Sun enters Trop. Aries ($26^h 54^m.4$)		
30	Mar. 21				30- New Moon ($22^h 53^m.2$) 30- Sayana Vaidhriti ($20^h 22^m.7$)	30- Maha Vishuva Day, Indian Year Ending day.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of $82\frac{1}{2}^{0}$ E. Long.

Moon enters :- Mina 2, $25^h 11^m.0$; Mesha 4, $27^h 44^m.1$; Vrisha 7, $10^h 14^m.4$; Mithuna 9, $20^h 32^m.5$; Karkata 12, $8^h 58^m.2$; Simha 14, $21^h 30^m.3$; Kanya 17, $8^h 53^m.4$; Tula 19, $18^h 36^m.9$; Vrischika 21, $26^h 18^m.6$; Dhanus 24, $7^h 33^m.7$; Makara 26, $10^h 18^m.6$; Kumbha 28, $11^h 17^m.1$; Mina 30, $11^h 57^m.5$; Sun enters: Nirayana Mina 24, $6^h 34^m.5$.

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS

Festivals	Criterion	Date
		National / Nirayana/ Gregorian 1943 S.E./ 5122 K.E./ 2022 A.D.
65. Guru Gobind Singh's Birthday	Pausha S7	Pausha 19 / Pausha 26 / Jan.9
66. Vaikuntha Ekadasi (S. India),	S11 of Saura Pausha	Pausha 23 / Pausa 30 / Jan 13
Bhogi (S.India)	Day before Pongal	Pausha 23 / Pausa 30 / Jan. 13
67. Makara Samkranti (Bengal), Magha	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan. 14
Bihu (Assam), Makaradi Snana,	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan. 14
Tila Samkranti, Pongal (S.India),	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan. 14
Makara Samkranti (N.India).	The Day after Lohri.	Pausha 24/ Magha 1/ Jan 14
68. Mattu Pongal or Kanumu,	The Day after Pongal.	Pausha 25 / Magha 2 / Jan. 15
Tai Pongal (Kerala).	The Day of Saura Maghadi (18 Ghatika rule)	Pausha 25 / Magha 2 / Jan. 15
69. Netaji's Birthday.	Fixed	Magha 3 / Magha 10 / Jan. 23
70. Republic Day.	Fixed	Magha 6 / Magha 13 / Jan. 26
71. Sri Panchami, Vasanta Panchami.	Magha S5	Magha 16 / Magha 23 / Feb 5
72. Guru Ravidas's Birthday.	Magha S15	Magha 27 / Phalguna 4 / Feb 16
73. Shivaji Jayanti.	Fixed	Magha 30 / Phalguna 7 / Feb 19
74. Birth Day of Swami Dayananda Saraswati (Founder of "Arya Samaj")	Phalguna K 10 (Purnimanta)	Phalguna 7/Phalguna 14/Feb 26
75. Maha Shivratri.	Magha K 14	Phalguna 10/Phalguna 17/Mar 1
76. Holikadahana.	Phalguna S 15(Night)	Phalguna 26/Chaitra 3/Mar 17
77. Dolyatra	Phalguna S 15	Phalguna 27/Chaitra 4/Mar 18
Holi	Day after Holikadahan	
78. Hola,Vasantotsava	Phalguna K 1	Phalguna 28/ Chaitra 5 /March 19
79. MahaVishuva day	Day of Sun's entry into Trop. Aries (Midnight rule)	Phalhuna 29/Chaitra 6/ Mar 20
		Saka 1944/ 5122 /2022 A.D.
1. Indian New Year's Day	Fixed	Chaitra 1 / Chaitra 8/ Mar. 22
2. Chaitra Sukladi(Gudi Padava, Ugadi),	Chaitra S 1	Chaitra 12 / Chaitra 19/ Apr2
Cheti Chand (Sindhi New Year's Day),	Chaitra S 1	Chaitra 12 / Chaitra 19/ Apr. 2
Telugu New Year's Day, Vasanta Navaratrarambha.	Chaitra S 1	Chaitra 12 / Chaitra 19/ Apr. 2
3. Sarhul(Bihar).	Chaitra S 3	Chaitra 14/ Chaitra 21 / Apr 4
4. Vasanti Pujarambha, Oli Begins (Jain).	Chaitra S 7	Chaitra 18/ Chaitra 25 / Apr. 8
5. Rama Navami.	Chaitra S 9	Chaitra 20/ Chaitra 27 / Apr 10
		Saka 1944/ 5123 K.E. /2022 A.D.
6. Vaisakhi (Punjab, Hariyana, H.P., Delhi	Saura Vaisakhadi(Sunrise Rule)	Chaitra 24/ Vaisakha 1/Apr. 14
& Odisha), Visu(Kerala),	SauraVaisakhadi (Sunrise	Chaitra 24 / Vaisakha 1/ Apr. 14
Chaitra Samkranti, Chadak Puja	Rule) Saura Vaisakhadi(Midnight	Chaitra 24/ Vaisakha 1 / Apr. 14
(Begal), Cheiraoba	Rule)	Chaitra 24/ Vaisakha 1 / Apr. 14
(Manipur), Meshadi (T.N),	Saura Vaisakhadi(Midnight Rule)	Chaitra 24/ Vaisakha 1 / Apr. 14
Tamil New year's Day,	Saura Vaisakhadi(Sunset Rule)	Chaitra 24/ Vaisakha 1 / Apr. 14
Mahavira Jayanti,	Chaitra S13	Chaitra 24/ Vaisakha 1 / Apr. 14
Dr. B.R.Ambedkar Jayanti,	Fixed	Chaitra 24/ Vaisakha 1 / Apr. 14
Beginning of 5123 K.E.		
7. Vaisakhadi (Bengal) , Bahag Bihu	Day following SauraVaisakhadi	Chaitra 25/ Vaisakha 2 / Apr. 15
(Assam), Shilhenba (Manipur)	(Midnight Rule)	Chaitra 25/ Vaisakha 2 / Apr. 15
8. Oli Ends (Jain).	Chaitra S15	Chaitra 26/ Vaisakha 3 / Apr. 16
9. Babu Kuer Singh Day (Bihar)	Fixed	Vaisakha 3 / Vaisakha 10 /Apr. 23
10. Tithi of Deva Damodara (Assam),	S1 of Saura Vaisakha	Vaisakha 11 / Vaisakha 18/ May 1
May Day	Fixed	Vaisakha 11 / Vaisakha 18 / May 1
11. Akshaya Tritiya	Vaisakha S3	Vaisakha 13/ Vaisakha 20 / May 3
12.Akshaya Tritiya (Bengal)	Vaisakha S3(Tithi more than one muhurta)	Vaisakha 14/ Vaisakha 21/ May 4
13. Birthday of Rabindranath Tagore	25 Vaisakha of Beng. Calendar	Vaisakha 19/Vaisakha 26/May 9
14. Buddha Purnima	Vaisakha S15	Vaisakha 26/Jyaishtha2/May 16
15. Pratap Jayanti (Rajasthan)	Jyaishtha S3	Jyaishtha 12/ Jyaishtha19/June 2
16. Guru Arjan Dev's Martyrdom Day	Jyaishtha S4	Jyaishtha 13/ Jyaishtha20/June 2
17. Rajas Samkranti (Odisha)	SauraAshadhadi (Sunrise rule)	Jyaishtha 25/ Ashadha 1/June 15
18. Rathayatra	Ahadha S2	Ashadha 10/Ashadha 17/July 1
19. Kharchi Puja (Tripura)	Ashadha S8	Ashadha 16/Ashadha 23/July 7
20. Punaryatra,	Ashadha S10	Ashadha 18/Ashadha 25/July 9
Ultaratha (Odisha), Bahudha Yatra	9th day from Rathayatra	

Festivals	Criterion	Date National / Nirayana/ Gregorian 1943 S.E./ 5122 K.E./ 2022 A.D
21. Ker Puja (Tripura)	First Tuesday or Saturday after 14 days from Kharchi Puja not falling on K10	Ashadha 18/Ashadha 25/July 9 Sravana 4/ Sravana 11/July 26
22. KarkatakaVavu (Kerala)	K30 of SauraSravana	Sravana 6 / Sravana 13/ July 28
23. Tilak Commemoration Day	Fixed	Sravana 10 / Srabana 17 / Aug. 1
24. Rik Upakarma	Sravana S5, Hasta Nak. of Chandra Bhadra	Sravana 12 / Sravana 19 / Aug. 3
25. Jhulana Yatrarambha	Sravana S 11	Sravana 17 / Srabana 24 / Aug. 8
26. Avani Avittam (S. India)	Sravana S 15	Sravana 20 / Srabana 27/ Aug. 11
Naroli Purnima,	Sravana S 15(Aparahna&Sayahna)	Sravana 20 /Srabana 27 / Aug. 11
Raksha Bandhan	Sravana S15 (Pradosa)	Sravana 20 / Srabana 27 / Aug. 11
27. Solono (Rakhi Bandhan),	Sravana S 15(Udayvyapini)	Sravana 21 / Srabana 28 / Aug.12
Jhulana Yatra Samapanna	Sravana S 15 (Purvahna)	Sravana 21 / Srabana 28 / Aug 12
28. Independence Day	Fixed	Sravana 24 /Srabana 31/ Aug. 15
29. Janmashtami (Smarta)	Sravana K8 (Nishitha)	Sravana 27 / Bhadra 3/ Aug. 18
30. Jnmashtami (Vaishnava),	Sravana K 8	Sravana 28 / Bhadra 4 / Aug. 19
Gokulastami (Nandotsava)	Day after Janmashtami	Sravana 28 / Bhadra 4 / Aug. 19
31. Sri Jayanti (Ramanuja)	Rohini Nakshatra of Saura Bhadra	Sravana 29/Bhadra 5/Aug 20
32. Paryusana Parvarambha (Chaturthi Paksha-Jain),	7 days before Samvatsari (Chaturthi paksha)	Bhadr 2 / Bhadra 9 / Aug. 24
ParyusanaParvarambha (Panchami Paksha-Jain)	7 days before Samvatsari (Panchami paksha)	Bhadra 2 / Bhadra 9/ Aug. 24
33. Jain Festival	Sravana K30 (Udayavyapin)	Bhadra 5 / Bhadra 12 / Aug. 27
34. Tithi of Sri Sankara Deva (Assam)	S2 of Saura Bhadra	Bhadra 7 / Bhadra 14/ Aug. 29
35. Vinayak Chaturthi (Tamilnadu),	S4 of Saura Bhandra	Bhadra 9 / Bhadra 16/ Aug. 31
Ganesha Chaturthi,	Bhadra S4	Bhadra 9/ Bhadra 16/ Aug 31
Samvatsari (Chaturthi Paksha-Jain),	Bhadra S4 (Udayavyapini)	Bhadra 9 / Bhadra 16/ Aug. 31
Samvatsari (Panchami Paksha-Jain)	Bhadra S5	Bhadra 9/ Bhadra 16/ Aug 31
36. Radhashtami	Bhadra S8	Bhadra 12/ Bhadra 19/ Sept 3
37. First Onam Day	Day before Thiru Onam Day	Bhadra 16/ Bhadra 23/ Sept 7
38. Onam or Thiru Onam Day	Srabana Nak. of Saura Bhadra	Bhadra 17/ Bhadra 24/ Sept 8
39. Ananta Chaturdasi,	Bhadra S14	Bhadra 18/ Bhadra 25/ Sept 9
Third Onam Day	Day after Thiru Onam Day	Bhadra 18/ Bhadra 25/ Sept 9
40. Fourth Onam Day	Two Days after Thiru Onam Day	Bhadra 19/ Bhadra 26/ Sept 10
41. Tithi of Sri Madhava Deva (Assam)	K5 of Saura Bhadra	Bhadra 23 /Bhadra 30 /Sept 14
42. Samadhi Day of Narayan Guru (Kerala)	Fixed	Bhadra 30 / Asvina 6 /Sept 21
43. Mahalaya Amavasya, Sarvapitri	Bhadra K30	Asvina 3/ Asvina 10 / Sept 25
Amavasya, Tarpana Layba (Manipur)	Bhadra K30	Asvina 3/ Asvina 10 / Sept 25
44. Saradiya Navaratrarambha	Asvina S 1	Asvina 4 / Asvina 11 / Sept 26
45. Oli Begins (Jain),	Eight Days before Oli Ends	Asvina 9 / Asvina 16 / Oct 1
46. Mahatma Gandhi's Birthday,	Fixed	Asvina 10/ Asvina 17 / Oct 2
Durga Puja Begins (Saptami)	Asvina S7	Asvina 10 / Asvina 17 / Oct 2
47. Durga Puja (Mahashtami)	Asvina S8	Asvina 11 / Asvina 18 / Oct 3
48. Durga Puja (Mahanavami),	Asvina S9	Asvina 12 / Asvina 19 / Oct 4
Ayudha Puja	Day before Dussehara	Asvina 12 / Asvina 19 / Oct 4
49. Vijaya Dasami (Dussehara or Dasahara),	Asvina S10 (Aparahna)	Asvina 13/Asvina 20/Oct 5
Vijaya Dasami (Bengal & Kerala)	Asvina S10 (Purvahna)	Asvina 13/Asvina 20/Oct 5
50. Kumara Purnima (Odisha)	Asvina S15 (Pradosa)	Asvina 17/Asvina 24/Oct 9
Maharshi Valmiki's Birthday,	Asvina S15 (Udayavyapini)	Asvina 17/Asvina 24/Oct 9
Oil Ends (Jain),	Asvina S15 (Udayavyapini)	Asvina 17/Asvina 24/Oct 9
Kojagori Lakshmi Puja (Bengal)	Asvina S15 (Pradosa)	Asvina 17/Asvina 24/Oct 9
51. Kaveri Samkramana Snana	Saura Kartikadi (Midnight Rule)	Asvina 25/Kartika 2/Oct 17
52. Naraka Chaturdasi(Purvarunodaya),	Asvina K14 (Purvarunodaya)	Kartika 2/ Kartika 9 /Oct 24
Hanumajjanma,	Asvina K14 (Udayavyapini)	Kartika 2/ Kartika 9 /Oct 24
Dipavali (S. India),	Asvina K14	Kartika 2/ Kartika 9 /Oct 24
Dipavali, Kali Puja	Asvina K30	Kartika 2/ Kartika 9 /Oct 24
53. Govardhana Puja	Kartika S 1	Kartika 3/ Kartika 10 /Oct 25

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS

Festivals	Criterion	National / Nirayana/ Gregorian
		1943 S.E./ 5122 K.E./ 2022 A.D.
54. Kartika Sukladi, Bali Puja,	Kartika S 1	Kartika 4/ Kartika 11 /Oct 26
Bhratri Dvitiya, Tikka Ceremony, Bhai Duj	Kartika S2 (Aparahna)	Kartika 4/ Kartika 11 /Oct 26
55. Dwat Puja (Bihar),	Kartika S 2 (Purvahna)	Kartika 5/ Kartika 12 /Oct 27
Bhratri Dvitiya (Bengal)	Kartika S 2 (Madhyahna)	Kartika 5/ Kartika 12 /Oct 27
56. Pratihara Shashthi or Surya Shashthi (Chhat-Bihar)	Kartika S6	Kartika 8/ Kartika 15 /Oct 30
57. Rasayatra (Smarta)	Kartika S 15 (Nisithavyapini)	Kartika 16/ Kartika 23 /Nov 7
58. Rasayatra (Vaishnava),	Kartika S 15 (Udayavyapini)	Kartika 17/ Kartika 24 /Nov 8
Kartiki Purnima,	Kartika S15	Kartika 17/ Kartika 24 /Nov 8
Rathayatra (Jain), Guru Nanak's	Kartika S 15 (Udayavyapini)	Kartika 17/ Kartika 24 /Nov 8
Birthday, Puskar Fair	Kartika S15	Kartika 17/ Kartika 24 /Nov 8
59. Prathamashtami (Odisha)	Kartika K8	Kartika 25/ Agrahayana 2 /Nov 16
60. Guru Teg Bahadur's Martyrdom Day	Fixed	Agrahayana3/Agrahayan24/Nov24
61. Huthi-3 Days (Coorg)	S15 to K2 of SauraMargasirsha	Agrahayana17/Agrahayana10/Dec8
62. Jor Mela-3 Days (Punjab)	Fixed	Pausha 5 / Pausha 12 /Dec 26
63. Guru Gobind Singh's Birthday	Pausha S 7	Pausha 8 / Pausha 15 /Dec 29
		1944 S.E/ 5123 K.E./2023 A.D.
64. Vaikuntha Ekadasi (S. India),	S11 of Saura Pausha	Pausha 12 / Pausha 19 / Jan 2
65. Bhogi (S.India),	Day before Pongal	Pausha 24 / Magha 1 / Jan.14
Makara Samkranti (Bengal),	The day of Saura Maghadi	Pausha 24 / Magha 1 / Jan 14
Magha Bihu (Assam),	The day of Saura Maghadi	Pausha 24 / Magha 1 / Jan. 14
Makara Samkranti (N. India)	The Day after Lohri	Pausha 24 / Magha 1 / Jan. 14
66. Makara Snana, Tila Samkranti,	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Pongal (S. India)	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Tai Pongal (Kerala)	The day of Saura Maghadi (18 Ghatika rule)	Pausha 25 / Magha 2 / Jan. 15
67. Mattu Pongal or Kanumu	The Day after Pongal	Pausha 26 / Magha 3 /Jan 16
68. Netaji's Birthday	Fixed	Magha 3 / Magha 10 / Jan. 23
69. Sri Panchami, Vasanta Panchami	Magha S 5	Magha 6 / Magha 13 / Jan 26
Republic Day	Fixed	Magha 6 / Magha 13 / Jan 26
	Magha S 15	Magha 16 / Magha 23 / Feb 5
70. Guru Ravi Das's Birthday	Phalguna K 10 (Purnimanta)	Magha 26/Phalguna 3/Feb 5
71. Birthday of Swami Dayananda Saraswati (Fouder of Arya Swamaj)	Magha K14	Magha 29 / Phalguna 6 / Feb 18
72. Maha Shivratri	Fixed	Magha 30 / Phalguna 7 / Feb 19
73. Shivaji Jayanti	Phalguna S15 (Night)	Phalguna 16/Phalguna 23/Mar 7
74. Holikadahana,	Phalguna S15	Phalguna 16/Phalguna 23/Mar 7
Dolyatra	Day after Holikadahan	Phalguna 17/Phalguna 24/Mar 8
75. Holi,	Phalguna K1	Phalguna 17/Phalguna 24/Mar 8
Hola, Vasantotsava	Day of Sun's entry into Trop. Aries (Midnight rule)	Phalguna 30/Chaitra 7/Mar 21
76. Mahavishuva Day		

Special Festivals for Jammu and Kashmir

Festivals	Criterion	Date
		National / Nirayana / Gregorian
		Saka 1943 / Kali 5122 / 2022 A.D
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausa 23 / Pausa 30 / Jan 13
		Saka 1944 / Kali 5122 / 2022 A.D
1. Mela Bahu Fort	Chaitra S 8	Chaitra 19 / Chaitra 26 / /April 9
		Saka 1944 / Kali 5123 / 2022 A.D
2. Mela Kshir Bhawani	Jyaishtha S 8	Jyaishtha 18 / Jyaishtha 25/ June 8
3. Guru Hargobind's Birthday	Jyaishtha K 1	Jyaishtha 25/ Ashadha 1/ June 15
4. Martyr's Day	Fixed	Ashadha 22/ Ashadha 29/ July 13
5. Kailas Yatra-2 Days	Sravana K 13 & K 14	Bhadra 3 /Bhadra 10 / Aug 25
6. Mela Pat - 3 Days	Bhadra S 5 to S 7	Bhadra 10 /Bhadra 17 / Sep 1
		Saka 1944 / Kali 5123 / 2023 A.D
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausha 23/ Pausha 30 /Jan 13

Moslem Festival (2022-23 A.D.)

Festivals	Criterion	Date
		National/Nirayana/Gregorian
		Saka 1944/Kali 5122/2022A.D
1. First Day of Ramadan	1 Ramadan	Chaitra 13 / Chaitra 20 / Apr 03
		Saka1944/Kali 5123/2022 A.D
2.Shahadat-e-Hazrat Ali	21 Ramadan	Vaisakha 03/Vaisakha 10/Apr 23
3.Jumatul Vida	Last Friday of Ramadan	Vaisakha 09/Vaisakha 16/Apr 29
4.Sab-e-Qadr*	27 Ramadan	Vaisakha 09/Vaisakha 16/May 29
5.Id-ul-Fitr	1 Shawwal	Vaisakha 13/Vaisakha 20/May 03
6.Id-uz-Zuha(Bakrid)	10 Zulhijja	Ashadha 19/Ashadha 26/July 10
7.Muharram	10 Muharram	Sravana 18/Sravana 25/Aug 09
8.Chelhum	Fortieth Day from (39 days after) 10 Muharram	Bhadra 26/ Asvina 02/Sep 17
9.AkheriChaharShumba	Last Wednesday of Safar	Bhadra 30/Asvina 06/ Sep 21
10.Shahadat-e-Iman Hasan	28 Safar	Asvina 03/Asvina 10/Sep 25
11.Miland-un-Nabi or Id-e-Milad (Birthday of Prophet), Fateha Dwaz Daham or Bara Wafat	12 Rabiu'lawwal	Asvina 17/Asvina 24/Oct 09
12.Id-e-Maulad	17 Rabiu'lawwal	Asvina 22/Asvina 29/Oct 14
13.FatehaYazdaham (Giarhween Sharif)	11 Rabiu'ssani	Kartika 16/Kartika 23/Nov 07
		Saka1944/Kali 5123/2023A.D
14. Hazrat Ali's Birthday	13 Rajab	Magha 16 / Magha 23/ Feb 05
15. Sab-e-Miraj*	27 Rajab	Magha 30/Phalguna 07/ Feb 19
16. Sab-e-Barat*	15 Shaban	Phalguna17/Phalguna 24/ Mar 08
		Saka1945/Kali 5123/2023A.D
1. First Day of Ramadan	1 Ramadan	Chaitra 03 /Chaitra 10 /Mar 24
2. Shahadat-e-Hazrat Ali	21 Ramadan	Chaitra 23 /Chaitra 30 / April 13
		Saka1945/Kali 5124/2023 A.D
3.Sab-e-Qadr*	27 Ramadan	Chaitra 29/ Vaisakha 06 /Apr 19

The Islamic Calendar (2022-23 A.D.)
(Hejira: 1443-1444A.H.)

The beginning dates of the different months of the Islamic Calendar for the year 2022-23 A.D. determined on the basis of the first visibility of the lunar crescent after the New-Moon day culculated for the Central Station of India are as follows:-

Jumadu' ssani	1443	Jan. 05	2022A.D.	(29)	Safar	"	Aug 29	"	(30)
Rajab	"	Feb. 03	"	(30)	Rabiu'l awwal	"	Sept 28	"	(30)
Shaban	"	March05	"	(29)	Rabiu's sani	"	Oct 28	"	(29)
Ramadan	"	April 03	"	(30)	Jumadu'l awwal	"	Nov 26	"	(29)
Shawwal	"	May 03	"	(29)	Jumadu's sani	"	Dec 25	"	(30)
Zu'lqada	"	June 01	"	(30)	Rajab	"	Jan 24	2023	(29)
Zulhijja	"	July. 31	"	(30)	Shaban	"	Feb 22	"	(30)
MUHARRAM	1444	July 31	"	(29)	Ramadan	"	March 24*	"	(29)

N.B.-Actually the months begin from sunset of the preceding day when the Moon becomes first visible.
*The moon may be visible on 03.03.2022 in western part of India.

Fixed Calendar

According to the Fixed Calendar the beginning dates of different months are as follows : Jan. 05(2022 A.D.), Feb. 03, Mar. 05, Apr. 03, May 03, June 01, July 01, July 30, Aug. 29, Sept. 27, Oct. 27, Nov. 25, Dec. 25 , Jan. 23(2023 A.D.) Feb. 22, Mar. 23.

THE PARSI (SHAHENSHAHI) CALENDAR, 2022 - 2023 A.D.

(As used by the Indian Parsis)

Yazdejardi Era : 1391 - 1392

The beginning dates of different months of the Parsi Shahenshahi Calendar are as follows :
As regards the Parsi Kadmi Calendar, the months are the same but they begin 30 days earlier.

Shahrivar	1391	Jan. 13	2022	(30)	Ardibehesht	1392	Sept. 15	2022	(30)
Meher	"	Feb. 12	"	(30)	Khordad	"	Oct. 15	"	(30)
Avan	"	Mar. 14	"	(30)	Tir	"	Nov. 14	"	(30)
Adar	"	Apr. 13	"	(30)	Amardad	"	Dec. 14	"	(30)
Dei	"	May 13	"	(30)	Shahrivar	"	Jan. 13	2023	(30)
Bahman	"	June 12	"	(30)	Meher	"	Feb. 12	"	(30)
Aspandad	"	July 12	"	(30)	Avan	"	Mar. 14	"	(30)
Gathas(I-V)	"	Aug. 11	"	(5)	Adar	"	Apr. 13	"	(30)
FARVARDIN	1392	Aug. 16	"	(30)	Dei	"	May 13	"	(30)

PARSI FESTIVALS 2018-2019 A.D.

Festivals	Criterion	Shahenshahi	Kadmi
		National / Nirayana / Gregorian Saka 1944/ Kali 5123/ 2022 A.D.	**National / Nirayana / Gregorian Saka 1944/ Kali 5123/ 2022 A.D.**
Zarthost-no-Diso	11 Dei	Jyaishtha 2/ Jyaishtha 9/ May 23	Vaisakha 3/ Vaisakha 10/ Apr. 23
Gatha Gahambar	Gatha III	Sravana 22/ Sravana 29/ Aug. 13	Ashadha 23/ Ashadha 30/ July 14
Parsi New Year Eve	Gatha V	Sravana 24/ Sravana 31/ Aug. 15	Ashadha 25/ Sravana 1/ July 16
Parsi New Year's Day	1 Farvardin	Sravana 25/ Bhadra 1/ Aug. 16	Ashadha 26/ Sravana 2/ July 17
Khordad Sal (Birthday of Prophet Zarthost)	6 Farvardin	Shravana 30/ Bhadra 6/ Aug. 21	Ashadha 31/ Sravana 7/ July 22

N.B.- Jamshedi Naoroj falls on March 21 every year

THE JEWISH CALENDAR, 2022 - 2023 A.D.

Jewish Era : 5782 - 83 A.M.

To beginning dates of different months of the Jewish Calendar are as follows:

Shebat	5782	Jan.	04	2022	(30)	Ellul	5782	Aug.	29	2022	(29)
Veadar	"	Feb.	03	"	(30)	TISHRI	5783	Sept.	27	"	(30)
Adar	"	Mar.	05	"	(29)	Heshvan	"	Oct.	27	"	(29)
Nisan	"	April	03	"	(30)	Kislev	"	Nov.	25	"	(30)
Iyar	"	May	03	"	(29)	Tebeth	"	Dec.	25	"	(29)
Sivan	"	June	01	"	(30)	Shebat	"	Jan.	23	2023	(30)
Tammuz	"	July	01	"	(29)	Adar	"	Feb.	22	"	(29)
Ab	"	July	30	"	(30)	Nisan	"	Mar.	23	"	(30)

JEWISH FESTIVALS 2022-2023 A.D.

Festivals	Criterion	Date
		Saka 1944 / Kali 5123 / 2022 AD
First day of Passover (Pesach)	15 Nisan	Chaitra 27 / Vaisakha 4 / April 17
Feast of Weeks (Shebuoth)	6 Sivan	Jyaishtha 16 / Jyaishtha 23 / June 06
Tishabeab	9 Ab	Sravana 16 / Sravana 23 / August 07
Jewish New Year (Rosh Hashanah)	1 Tishri	Asvina 5/ Asvina 12 / September 27
Day of Atonement (Yom Kippur)	10 Tishri	Asvina 14 / Asvina 21 / October 06
First day of Tabernacles (Succoth)	15 Tishri	Asvina19/Asvina26/October 11
Last day of Succoth (SimhathTorah)	23 Tishri	Asvina 27 / Kartika 4 / October 19
Hanukah	25 Kislev	Agrahayana 28/Pausha 5/December 19
		Saka 1944/Kali 5123 / 2023 A.D.
Purim	14 Adar	Phalguna 16/ Phalguna 23 / March 07
		Saka 1945/Kali 5123 / 2023 A.D.
First day of Passover (Pesach)	15 Nisan	Chaitra 16 / Chaitra23 / April 06

CHRISTIAN FESTIVALS, 2022-2023 A.D.

Festivals	Criterion	Date
		National/Nirayana/Gregorian
		Saka 1943 / Kali 5122/ 2022 A.D.
1. Christian (English) New Year's Day	Fixed	Pausha 11 / Pausha 18 / Jan. 01
2. Epiphany	Fixed	Pausha 16 / Pausha 23 / Jan. 06
3. Septuagesima Sunday	63 days before Easter Sunday	Magha 24/Phalguna 01/ Feb 13
4. Quinquagesima (Shrove) Sunday	49 days before Easter Sunday	Phalguna 08 /Phalguna 15/ Feb 27
5. Ash Wednesday	46 days before Easter Sunday	Phalguna 11 /Phalguna 18/ Mar 02
		Saka 1944/ Kali 5122 / 2022 A.D.
6. Palm Sunday	7 days before Easter Sunday	Chaitra 20 / Chaitra 27 / April 10
		Saka 1944/ Kali 5123 / 2022 A.D.
7. Good Friday	2 days before Easter Sunday	Chaitra 25 / Vaisakha 02/April 15
8. Easter (Holy) Saturday	Day before Easter Sunday	Chaitra 26 / Vaisakha 03 / April 16
9. Easter Sunday	First Sunday after the 14th day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Chaitra 27 / Vaisakha 04 / April 17
10. Low Sunday	7 days after Easter Sunday	Vaisakha 4/ Vaisakha 11 / April 24
11. Rogation Sunday	35 days after Easter Sunday	Jyaishtha 1 / Jyaishtha 8 /May 22
12. Ascension Day-Holy Thursday	39 days after Easter Sunday	Jyaishtha 5 / Jyaishtha 12/May 26
13. Ascension Sunday	3 days after Ascension day	Jyaishtha 8 / Jyaishtha 15 /May 29
14. Whit Sunday-Pentecost	49 days after Easter Sunday	Jyaishtha 15/Jyaishtha 22/June 05
15. Trinity Sunday	56 days after Easter Sunday	Jyaishtha 22/Jyaishtha 29/June 12
16. Corpus Christi (Thursday)	60 days after Easter Sunday	Jyaishtha 26/Ashadha 2/June 16
17. First Sunday in Advent	Fourth Sunday before Christmas, i.e.,Sunday nearest to Nov.,30.	Agrahayana1/Agrahayana13/Nov27
18. Christmas Eve	Day before Christmas	Pausha 3 / Pausha 10 / Dec. 24
19. Christmas Day	Fixed	Pausha 4 / Pausha 11 / Dec. 25
20. New Year Eve	Fixed	Pausha 10 / Pausha 17 / Dec. 31
		Saka 1944/ Kali 5123 / 2023 A.D.
1. Christian (English) New Year's Day	Fixed	Pausha 11 / Pausha 18 / Jan. 01
2 Epiphany	Fixed	Pausha 16 / Pausha 23 / Jan. 06
3. Septuagesima Sunday	63 days before Easter Sunday	Magha 16 / Magha 23/ Feb 05
4. Quinquagesima (Shrove) Sunday	49 days before Easter Sunday	Magha 30 / Phalguna 7/ Feb 19
5. Ash Wednesday	46 days before Easter Sunday	Phalguna 3/Phalguna 10 /Feb 22
		Saka 1945 / Kali 5123/ 2023 A.D.
6. Palm Sunday	7 days before Easter Sunday	Chaitra 12/Chaitra 19 / April 02
7. Good Friday	2 days before Easter Sunday	Chaitra 17/ Chaitra 24/ April 07
8. Easter (Holy) Saturday	Day before Easter Sunday	Chaitra 18/ Chaitra 25 / April 08
9. Easter Sunday	First Sunday after the 14th day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Chaitra 19/Chaitra 26/April 09
		Saka 1945 / Kali 5124/ 2023 A.D.
10. Low Sunday	7 days after Easter Sunday	Chaitra 26/ Vaisakha 03 / April 16

THE INDIAN LUNAR CALENDAR

TIME OF NEW MOON(IN I.S.T.) MARKING THE
COMMENCEMENT OF LUNAR MONTHS

		2004 (1925-26 S.E.)				2007 (1928-29 S.E.)				2010 (1931-32 S.E.)		
		d	h	m		d	h	m		d	h	m
Pausha			---				---				---	
Magha	Jan.	21	26	35	Jan.	19	09	31	Jan.	15	12	41
Phalguna	Feb.	20	14	48	Feb.	17	21	44	Feb.	14	08	21
Chaitra	Mar.	20	28	11	Mar.	19	08	13	Mar.	15	26	31
									Apr.	*14*	*17*	*59*
Vaisakha	Apr.	19	18	51	Apr.	17	17	06	May	14	06	34
Jyaishtha	May	19	10	22	*May*	*16*	*24*	*57*	June	12	16	45
					June	15	08	43				
Ashadha	June	17	29	57	July	14	17	34	July	11	25	10
Sravana	*July*	*17*	*16*	*54*	Aug.	12	28	33	Aug.	10	08	38
	Aug.	16	06	54								
Bhadra	Sept.	14	19	59	Sept.	11	18	14	Sept.	8	16	00
Asvina	Oct.	14	08	18	Oct.	11	10	31	Oct.	7	24	15
Kartika	Nov.	12	19	57	Nov.	9	28	33	Nov.	6	10	22
Margasirsha	Dec.	12	06	59	Dec.	9	23	10	Dec.	5	23	06
Pausha			---				---				---	

		2005 (1926-27 S.E.)				2008 (1929-30 S.E.)				2011 (1932-33 S.E.)		
		d	h	m		d	h	m		d	h	m
Pausha	Jan.	10	17	33	Jan.	8	17	17	Jan.	4	14	33
Magha	Feb.	8	27	58	Feb.	7	09	14	Feb.	3	08	01
Phalguna	Mar.	10	14	40	Mar.	7	22	44	Mar.	4	26	16
Chaitra	Apr.	8	26	02	Apr.	6	09	25	Apr.	*3*	*20*	*02*
Vaisakha	May	8	14	15	May	5	17	48	May	3	12	21
Jyaishtha	June	6	27	25	June	3	24	53	June	1	26	33
Ashadha	July	6	17	33	July	3	07	49	July	1	14	24
Sravana	Aug.	5	08	35	Aug.	1	15	43	July	30	24	10
Bhadra	Sept.	3	24	15	Aug.	30	25	28	Aug.	29	08	34
Asvina	Oct.	3	15	58	Sept	29	13	42	Sept.	27	16	39
Kartika	Nov.	2	06	55	Oct.	28	28	44	Oct.	26	25	26
Margasirsha	Dec.	1	20	31	Nov.	27	22	25	Nov.	25	11	40
Pausha	Dec.	31	08	42	Dec.	27	17	52	Dec.	24	23	36

		2006 (1927-28 S.E.)				2009 (1930-31 S.E.)				2012 (1933-34 S.E.)		
		d	h	m		d	h	m		d	h	m
Pausha			---				---				---	
Magha	Jan.	29	19	45	Jan.	26	13	25	Jan.	23	13	09
Phalguna	Feb.	27	30	01	Feb.	25	07	05	Feb.	21	28	05
Chaitra	Mar.	29	15	45	Mar.	26	21	36	Mar.	22	20	07
Vaisakha	Apr.	27	25	14	Apr.	25	08	53	Apr.	21	12	48
Jyaishtha	May	27	10	56	May	24	17	41	May	20	05	17
Ashadha	June	25	21	35	June	22	25	05	June	19	20	32
Sravana	July	25	10	01	July	22	08	05	July	19	09	54
Bhadra	Aug.	23	24	40	Aug.	20	15	32	*Aug.*	*17*	*21*	*24*
									Sept.	16	07	41
Asvina	Sept.	22	17	15	Sept.	18	24	14	Oct.	15	17	33
Kartika	Oct.	22	10	44	Oct.	18	11	03	Nov.	13	27	38
Margasirsha	Nov.	20	27	48	Nov.	16	24	44	Dec.	13	14	12
Pausha	Dec.	20	19	31	Dec.	17	17	32			---	

N.B.-The figres in the italics show the beginning of the intercalary(*mala or adhika*) month followed by the normal (*suddha or nija*) month of the same name.

THE INDIAN LUNAR CALENDAR

TIME OF NEW MOON(IN I.S.T.) MARKING THE
COMMENCEMENT OF LUNAR MONTHS

		2013 (1934-35 S.E.)				2016 (1937-38 S.E.)				2019 (1940-41 S.E.)				2022 (1943-44 S.E.)	
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha	Jan.	11	25	14	Jan.	10	07	01	Jan.	06	06	58	Jan.	02	24	04
Magha	Feb.	10	12	50	Feb.	08	20	09	Feb.	04	26	34	Feb.	01	11	16
Phalguna	Mar.	11	25	21	Mar.	09	07	25	Mar.	06	21	34	Mar.	02	23	05
Chaitra	Apr.	10	15	05	Apr.	07	16	54	Apr.	05	14	21	Apr.	01	11	54
Vaisakha	May	10	05	58	May	06	25	00	May	04	28	16	Apr.	30	25	58
Jyaishtha	June	08	21	26	June	05	08	30	June	03	15	32	May	30	17	00
Ashadha	July	08	12	44	July	04	16	31	July	02	24	46	June	29	08	22
Sravana	Aug.	06	27	21	Aug.	02	26	15	Aug.	01	08	42	July	28	23	25
Bhadra	Sept.	05	17	06	Sept.	01	14	33	Aug.	30	16	07	Aug.	27	13	47
Asvina	Oct.	05	06	05	Sept.	30	29	41	Sept.	28	23	56	Sept.	25	27	25
Kartika	Nov.	03	18	20	Oct.	30	23	08	Oct.	28	09	09	Oct.	25	16	19
Margasirsha	Dec.	02	29	52	Nov.	29	17	48	Nov.	26	20	36	Nov.	23	28	27
Pausha			---		Dec.	29	12	23	Dec.	26	10	43	Dec.	23	15	47

		2014 (1935-36 S.E.)				2017 (1938-39 S.E.)				2020 (1941-42 S.E.)				2023 (1944-45 S.E.)	
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha	Jan.	01	16	44			---				---				---	
Magha	Jan.	30	27	09	Jan.	27	29	37	Jan.	24	27	12	Jan.	21	26	23
Phalguna	Mar.	01	13	30	Feb.	26	20	28	Feb.	23	21	02	Feb.	20	12	36
Chaitra	Mar.	30	24	15	Mar.	28	08	27	Mar.	24	14	58	Mar.	21	22	53
Vaisakha	Apr.	29	11	44	Apr.	26	17	46	Apr.	23	07	56	Apr.	20	09	43
Jyaishtha	May	28	24	10	May	25	25	14	May	22	23	09	May	19	21	23
Ashadha	June	27	13	39	June	24	08	01	June	21	12	11	June	18	10	07
Sravana	July	26	28	12	July	23	15	16	July	20	23	03	July	17	24	02
Bhadra	Aug.	25	19	43	Aug.	21	24	00	Aug.	19	08	12	Aug.	16	15	08
Asvina	Sept.	24	11	44	Sept	20	11	00	*Sept.*	*17*	*16*	*30*	Sept.	15	07	10
Kartika	Oct.	23	27	27	Oct.	19	24	42	Oct.	16	25	01	Oct.	14	23	25
Margasirsha	Nov.	22	18	02	Nov.	18	17	12	Nov.	15	10	37	Nov.	13	14	57
Pausha	Dec.	22	07	06	Dec.	18	12	00	Dec.	14	21	47	Dec.	12	29	02

		2015 (1936-37 S.E.)				2018 (1939-40 S.E.)				2021 (1942-43 S.E.)				2024 (1945-46 S.E.)	
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha	Jan.	20	18	44			---		Jan.	13	10	30	Jan.	11	17	27
Magha	Feb.	18	29	17	Jan.	17	07	47	Feb.	11	24	36	Feb.	09	28	29
Phalguna	Mar.	20	15	06	Feb.	15	26	35	Mar.	13	15	51	Mar.	10	14	30
Chaitra	Apr.	18	24	27	Mar.	17	18	42	Apr.	12	08	01	Apr.	08	23	51
Vaisakha	May	18	09	43	Apr.	16	07	27	May	11	24	30	May	08	08	52
Jyaishtha	*June*	*16*	*19*	*35*	*May*	*15*	*17*	*18*	June	10	16	23	June	06	18	08
					June	13	25	13								
Ashadha	July	16	06	54	July	13	08	18	July	10	06	47	July	05	28	27
Sravana	Aug.	14	20	23	Aug.	11	15	28	Aug.	08	19	20	Aug.	04	16	43
Bhadra	Sept.	13	12	11	Sept.	09	23	32	Sept.	07	06	22	Sept.	03	07	26
Asvina	Oct.	12	29	36	Oct.	9	09	17	Oct.	06	16	35	Oct.	02	24	19
Kartika	Nov.	11	23	17	Nov.	07	21	32	Nov.	04	26	45	Nov.	01	17	18
Margasirsha	Dec.	11	15	59	Dec.	07	12	50	Dec.	04	13	13	Dec.	01	11	51
Pausha			---				---				---		Dec.	30	27	57

N.B.-The figres in the italics show the beginning of the intercalary(*mala or adhika*) month followed by the normal (*suddha or nija*) month of the same name.

INDIAN CALENDAR

SAKA ERA 1945 — Mesha : Madhava

Month of CHAITRA(30 days) — Spring (Vasanta), 2nd Month

(*Nirayana*) 7 Chaitra, 5123 Kali Era to (*Nirayana)* 7 Vaisakha, 5124 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi				Nakshatra			Yoga		
										No.		Ending Moment		No.	Ending Moment		No.	Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2023 A.D.																	
1	Wed	Mar	22	6	02.7	12	07.0	18	11.5	S	1	20	21.5	26	15	32.2	24	9	16.9
2	Thu		23	6	01.7	12	06.7	18	11.9		2	18	21.3	27	14	08.5	25	6	15.3
																	(26	27	42.2)
3	Fri		24	6	00.7	12	06.4	18	12.3		3	17	00.2	1	13	22.2	27	25	42.5
4	Sat		25	5	59.7	12	06.1	18	12.6		4	16	23.5	2	13	18.8	1	24	19.0
5	Sun		26	5	58.8	12	05.8	18	13.0	S	5	16	33.3	3	14	01.0	2	23	31.9
6	Mon		27	5	57.8	12	05.5	18	13.4		6	17	28.4	4	15	27.2	3	23	18.8
7	Tue		28	5	56.8	12	05.2	18	13.8		7	19	03.0	5	17	32.3	4	23	34.6
8	Wed		29	5	55.9	12	04.9	18	14.1		8	21	07.8	6	20	06.9	5	24	12.0
9	Thu		30	5	54.9	12	04.6	18	14.5		9	23	30.8	7	22	59.4	6	25	02.0
10	Fri		31	5	53.9	12	04.3	18	14.9	S	10	25	59.0	8	25	57.1	7	25	55.6
11	Sat	Apr.	1	5	52.9	12	04.0	18	15.2		11	28	20.3	9	28	48.4	8	26	44.0
12	Sun		2	5	52.0	12	03.7	18	15.6		12	---	---	10	--	---	9	27	20.4
13	Mon		3	5	51.0	12	03.4	18	16.0		12	6	24.8	10	7	23.7	10	27	39.6
14	Tue		4	5	50.1	12	03.1	18	16.4		13	8	05.8	11	9	36.4	11	27	38.5
15	Wed		5	5	49.1	12	02.8	18	16.7		14	9	19.5	12	11	22.8	12	27	15.6
16	Thu		6	5	48.2	12	02.5	18	17.1	S	15	10	04.5	13	12	41.6	13	26	30.8
17	Fri		7	5	47.2	12	02.3	18	17.5	K	1	10	21.2	14	13	33.1	14	25	24.6
18	Sat		8	5	46.3	12	02.0	18	17.9		2	10	11.1	15	13	58.7	15	23	58.3
19	Sun		9	5	45.4	12	01.7	18	18.2		3	9	36.0	16	14	00.2	16	22	13.3
20	Mon		10	5	44.4	12	01.4	18	18.6		4	8	37.8	17	13	39.4	17	20	10.7
21	Tue		11	5	43.5	12	01.2	18	19.0	K	5	7	18.4	18	12	58.3	18	17	52.1
											(6	29	40.0)						
22	Wed		12	5	42.6	12	00.9	18	19.4		7	27	44.6	19	11	58.8	19	15	19.0
23	Thu		13	5	41.7	12	00.6	18	19.8		8	25	34.9	20	10	43.3	20	12	33.1
24	Fri		14	5	40.8	12	00.4	18	20.2		9	23	13.9	21	9	14.4	21	9	36.5
25	Sat		15	5	39.9	12	00.1	18	20.6	K	10	20	45.7	22	7	35.7	22	6	32.0
																	(23	27	22.7)
26	Sun		16	5	39.0	11	59.9	18	21.0		11	18	14.9	23	5	51.5	24	24	12.7
														(24	28	06.9)			
27	Mon		17	5	38.2	11	59.7	18	21.4		12	15	46.9	25	26	27.9	25	21	06.5
28	Tue		18	5	37.3	11	59.4	18	21.8		13	13	27.8	26	25	01.1	26	18	08.9
29	Wed		19	5	36.5	11	59.2	18	22.2		14	11	24.2	27	23	53.1	27	15	25.1
30	Thu		20	5	35.6	11	59.0	18	22.6	K	30	9	42.5	1	23	10.6	1	13	00.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

AYANAMSA, 2022

TRUE AYANAMSA FOR 5h 29^{m}

Date 2022	Ayanamsa			Date 2022	Ayanamsa			Date 2022	Ayanamsa			Date 2022-23	Ayanamsa		
	°	'	"		°	'	"		°	'	"		°	'	"
Jan. 1	24	9	37.6	May 1	24	9	53.5	Aug. 29	24	10	13.5	Dec. 27	24	10	31.1
4	24	9	38.6	4	24	9	54.0	Sept. 1	24	10	13.5	30	24	10	31.4
7	24	9	39.2	7	24	9	54.7	4	24	10	14.0	Jan. 2	24	10	31.8
10	24	9	39.4	10	24	9	55.2	7	24	10	14.7	5	24	10	32.5
13	24	9	39.8	13	24	9	55.3	10	24	10	15.1	8	24	10	33.3
16	24	9	40.6	16	24	9	55.7	13	24	10	15.0	11	24	10	33.8
19	24	9	41.3	19	24	9	56.5	16	24	10	15.3	14	24	10	34.1
22	24	9	41.6	22	24	9	57.3	19	24	10	15.8	17	24	10	34.4
25	24	9	41.8	25	24	9	57.6	22	24	10	16.3	20	24	10	35.3
28	24	9	42.3	28	24	9	57.8	25	24	10	16.4	23	24	10	36.2
31	24	9	43.3	31	24	9	58.4	28	24	10	16.4	26	24	10	36.4
Feb. 3	24	9	43.8	June 3	24	9	59.2	Oct. 1	24	10	16.8	29	24	10	36.7
6	24	9	43.9	6	24	9	59.8	4	24	10	17.5	Feb. 1	24	10	37.3
9	24	9	44.2	9	24	10	00.1	7	24	10	17.9	4	24	10	38.0
12	24	9	44.8	12	24	10	00.4	10	24	10	17.9	7	24	10	38.4
15	24	9	45.4	15	24	10	01.3	13	24	10	18.1	10	24	10	38.5
18	24	9	45.7	18	24	10	02.2	16	24	10	18.7	13	24	10	38.7
21	24	9	45.7	21	24	10	02.6	19	24	10	19.2	16	24	10	39.4
24	24	9	46.1	24	24	10	02.8	22	24	10	19.5	19	24	10	40.2
27	24	9	46.8	27	24	10	03.4	25	24	10	19.5	22	24	10	40.4
Mar. 2	24	9	47.3	30	24	10	04.2	28	24	10	19.9	25	24	10	40.5
5	24	9	47.3	July 3	24	10	04.8	31	24	10	20.8	28	24	10	40.9
8	24	9	47.4	6	24	10	05.1	Nov. 3	24	10	21.3	Mar. 3	24	10	41.5
11	24	9	47.9	9	24	10	05.4	6	24	10	21.4	6	24	10	41.9
14	24	9	48.4	12	24	10	06.2	9	24	10	21.7	9	24	10	41.9
17	24	9	48.7	15	24	10	07.2	12	24	10	22.4	12	24	10	42.0
20	24	9	48.7	18	24	10	07.6	15	24	10	23.0	15	24	10	42.5
23	24	9	48.9	21	24	10	07.8	18	24	10	23.4	18	24	10	43.2
26	24	9	49.6	24	24	10	08.3	21	24	10	23.6	21	24	10	43.4
29	24	9	50.1	27	24	10	09.0	24	24	10	24.1	24	24	10	43.4
Apr. 1	24	9	50.1	30	24	10	09.5	27	24	10	25.1	27	24	10	43.8
4	24	9	50.2	Aug. 2	24	10	09.8	30	24	10	25.8	30	24	10	44.4
7	24	9	50.7	5	24	10	09.9	Dec. 3	24	10	26.0	Apr. 2	24	10	44.8
10	24	9	51.2	8	24	10	10.5	6	24	10	26.4	5	24	10	44.9
13	24	9	51.6	11	24	10	11.4	9	24	10	27.2	8	24	10	44.9
16	24	9	51.6	14	24	10	11.8	12	24	10	28.0	11	24	10	45.4
19	24	9	51.9	17	24	10	11.9	15	24	10	28.5	14	24	10	46.2
22	24	9	52.6	20	24	10	12.2	18	24	10	28.7	17	24	10	46.5
25	24	9	53.2	23	24	10	12.8	21	24	10	29.2	20	24	10	46.5
28	24	9	53.4	26	24	10	13.3	24	24	10	30.2	23	24	10	46.9
May 1	24	9	53.5	Aug. 29	24	10	13.5	Dec. 27	24	10	31.1	Apr. 26	24	10	47.6

Mean Ayanamsa= 23°51′25″.53 for J2000.0
Mean Ayanamsa= 24°09′51″.92+ precession from 2022.0 to date
Mean Ayanamsa= 24°10′42″.04+ precession from 2023.0 to date
True Ayanamsa= Mean Ayanamsa+ nutation in longitude

LONGITUDE OF SUN, MOON AND PLANETS, 2023

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Jan. 0	279	15	51	20	45	50	294	06	40	296	07	44	69	13	57	1	04	25	322	19	10
1	280	16	59	33	38	16	293	42	08	297	22	54	69	03	57	1	11	34	322	25	08
2	281	18	08	46	13	36	293	05	48	298	38	03	68	54	47	1	18	53	322	31	08
3	282	19	16	58	35	33	292	18	06	299	53	11	68	46	26	1	26	22	322	37	12
4	283	20	24	70	47	26	291	19	59	301	08	18	68	38	55	1	33	60	322	43	20
5	284	21	32	82	51	58	290	12	57	302	23	25	68	32	13	1	41	47	322	49	30
6	285	22	40	94	51	15	288	58	58	303	38	31	68	26	21	1	49	43	322	55	43
7	286	23	48	106	46	55	287	40	20	304	53	36	68	21	17	1	57	48	323	01	59
8	287	24	56	118	40	15	286	19	40	306	08	40	68	17	02	2	06	02	323	08	18
9	288	26	04	130	32	33	284	59	35	307	23	43	68	13	36	2	14	25	323	14	39
10	289	27	11	142	25	18	283	42	32	308	38	46	68	10	57	2	22	57	323	21	04
11	290	28	18	154	20	30	282	30	45	309	53	47	68	09	07	2	31	37	323	27	30
12	291	29	26	166	20	44	281	25	59	311	08	48	68	08	03	2	40	25	323	33	60
13	292	30	33	178	29	21	280	29	33	312	23	48	68	07	45	2	49	22	323	40	32
14	293	31	40	190	50	19	279	42	19	313	38	47	68	08	14	2	58	26	323	47	06
15	294	32	47	203	28	10	279	04	43	314	53	45	68	09	29	3	07	39	323	53	43
16	295	33	54	216	27	31	278	36	51	316	08	42	68	11	28	3	17	00	324	00	22
17	296	35	01	229	52	35	278	18	33	317	23	38	68	14	12	3	26	29	324	07	03
18	297	36	07	243	46	20	278	09	26	318	38	34	68	17	40	3	36	06	324	13	47
19	298	37	14	258	09	29	278	08	59	319	53	29	68	21	51	3	45	51	324	20	33
20	299	38	20	272	59	32	278	16	37	321	08	22	68	26	45	3	55	43	324	27	20
21	300	39	26	288	10	10	278	31	44	322	23	15	68	32	21	4	05	43	324	34	10
22	301	40	31	303	31	36	278	53	43	323	38	06	68	38	38	4	15	50	324	41	02
23	302	41	35	318	52	00	279	21	57	324	52	56	68	45	36	4	26	04	324	47	56
24	303	42	39	333	59	39	279	55	52	326	07	44	68	53	14	4	36	25	324	54	51
25	304	43	41	348	45	09	280	34	56	327	22	32	69	01	31	4	46	54	325	01	47
26	305	44	43	3	02	39	281	18	40	328	37	17	69	10	26	4	57	29	325	08	46
27	306	45	43	16	50	12	282	06	37	329	52	01	69	19	60	5	08	10	325	15	46
28	307	46	43	30	08	58	282	58	24	331	06	43	69	30	10	5	18	59	325	22	47
29	308	47	41	43	02	17	283	53	39	332	21	23	69	40	55	5	29	54	325	29	49
30	309	48	38	55	34	38	284	52	02	333	36	02	69	52	17	5	40	55	325	36	53
31	310	49	34	67	50	53	285	53	17	334	50	39	70	04	12	5	52	02	325	43	59

LONGITUDE OF SUN, MOON AND PLANETS, 2023

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Feb. 1	311	50	28	79	55	38	286	57	09	336	05	14	70	16	41	6	03	16	325	51	05
2	312	51	22	91	52	59	288	03	24	337	19	47	70	29	42	6	14	36	325	58	12
3	313	52	14	103	46	17	289	11	50	338	34	18	70	43	16	6	26	01	326	05	21
4	314	53	05	115	38	10	290	22	17	339	48	47	70	57	20	6	37	33	326	12	30
5	315	53	55	127	30	33	291	34	35	341	03	14	71	11	55	6	49	10	326	19	41
6	316	54	43	139	24	51	292	48	37	342	17	39	71	26	59	7	00	52	326	26	52
7	317	55	31	151	22	15	294	04	16	343	32	01	71	42	32	7	12	40	326	34	03
8	318	56	17	163	23	59	295	21	25	344	46	22	71	58	33	7	24	33	326	41	16
9	319	57	02	175	31	32	296	39	58	346	00	40	72	15	02	7	36	32	326	48	29
10	320	57	46	187	46	56	297	59	53	347	14	56	72	31	57	7	48	36	326	55	42
11	321	58	29	200	12	50	299	21	03	348	29	10	72	49	19	8	00	45	327	02	56
12	322	59	11	212	52	30	300	43	26	349	43	22	73	07	06	8	12	58	327	10	11
13	323	59	52	225	49	40	302	06	59	350	57	31	73	25	18	8	25	17	327	17	25
14	325	00	31	239	08	01	303	31	39	352	11	39	73	43	55	8	37	41	327	24	41
15	326	01	10	252	50	43	304	57	24	353	25	44	74	02	56	8	50	09	327	31	56
16	327	01	48	266	59	26	306	24	12	354	39	46	74	22	21	9	02	43	327	39	12
17	328	02	24	281	33	27	307	52	02	355	53	47	74	42	09	9	15	20	327	46	28
18	329	02	59	296	28	50	309	20	53	357	07	45	75	02	19	9	28	03	327	53	43
19	330	03	33	311	38	20	310	50	43	358	21	40	75	22	51	9	40	49	328	00	59
20	331	04	06	326	51	58	312	21	31	359	35	33	75	43	44	9	53	40	328	08	14
21	332	04	36	341	58	42	313	53	18	0	49	23	76	04	59	10	06	35	328	15	30
22	333	05	06	356	48	26	315	26	03	2	03	10	76	26	34	10	19	33	328	22	45
23	334	05	33	11	13	44	316	59	45	3	16	55	76	48	29	10	32	36	328	29	59
24	335	05	58	25	10	33	318	34	26	4	30	36	77	10	44	10	45	42	328	37	13
25	336	06	22	38	38	14	320	10	04	5	44	14	77	33	18	10	58	53	328	44	27
26	337	06	44	51	38	47	321	46	41	6	57	49	77	56	10	11	12	06	328	51	40
27	338	07	04	64	15	57	323	24	17	8	11	21	78	19	21	11	25	24	328	58	52
28	339	07	22	76	34	30	325	02	53	9	24	49	78	42	49	11	38	44	329	06	04

LONGITUDE OF SUN, MOON AND PLANETS, 2023

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Mar 1	340	07	38	88	39	25	326	42	29	10	38	14	79	06	34	11	52	09	329	13	15
2	341	07	52	100	35	35	328	23	06	11	51	35	79	30	36	12	05	36	329	20	25
3	342	08	04	112	27	21	330	04	45	13	04	53	79	54	54	12	19	06	329	27	34
4	343	08	13	124	18	27	331	47	26	14	18	07	80	19	27	12	32	40	329	34	42
5	344	08	21	136	11	54	333	31	10	15	31	18	80	44	16	12	46	16	329	41	49
6	345	08	27	148	09	57	335	15	59	16	44	24	81	09	19	12	59	55	329	48	55
7	346	08	31	160	14	16	337	01	53	17	57	27	81	34	37	13	13	37	329	55	60
8	347	08	33	172	26	04	338	48	53	19	10	25	82	00	09	13	27	21	330	03	03
9	348	08	34	184	46	19	340	36	60	20	23	20	82	25	55	13	41	08	330	10	06
10	349	08	32	197	16	01	342	26	13	21	36	11	82	51	55	13	54	58	330	17	06
11	350	08	29	209	56	21	344	16	33	22	48	58	83	18	07	14	08	50	330	24	06
12	351	08	24	222	48	53	346	08	01	24	01	41	83	44	33	14	22	44	330	31	04
13	352	08	17	235	55	29	348	00	36	25	14	20	84	11	11	14	36	41	330	38	00
14	353	08	09	249	18	09	349	54	17	26	26	55	84	38	01	14	50	40	330	44	55
15	354	07	59	262	58	41	351	49	02	27	39	26	85	05	04	15	04	42	330	51	49
16	355	07	47	276	58	06	353	44	51	28	51	53	85	32	18	15	18	45	330	58	40
17	356	07	34	291	15	59	355	41	40	30	04	15	85	59	45	15	32	51	331	05	30
18	357	07	19	305	50	01	357	39	26	31	16	34	86	27	22	15	46	58	331	12	18
19	358	07	03	320	35	31	359	38	04	32	28	48	86	55	11	16	01	08	331	19	04
20	359	06	44	335	25	48	1	37	28	33	40	57	87	23	11	16	15	19	331	25	48
21	0	06	24	350	12	54	3	37	30	34	53	02	87	51	22	16	29	31	331	32	30
22	1	06	01	4	48	47	5	38	03	36	05	03	88	19	43	16	43	45	331	39	09
23	2	05	37	19	06	37	7	38	56	37	16	59	88	48	14	16	58	01	331	45	47
24	3	05	10	33	01	41	9	39	56	38	28	50	89	16	56	17	12	18	331	52	22
25	4	04	42	46	31	47	11	40	50	39	40	36	89	45	47	17	26	36	331	58	55
26	5	04	11	59	37	05	13	41	21	40	52	17	90	14	48	17	40	56	332	05	25
27	6	03	38	72	19	42	15	41	12	42	03	52	90	43	58	17	55	17	332	11	53
28	7	03	03	84	43	09	17	40	01	43	15	23	91	13	18	18	09	39	332	18	18
29	8	02	25	96	51	45	19	37	29	44	26	47	91	42	46	18	24	02	332	24	41
30	9	01	45	108	50	14	21	33	12	45	38	07	92	12	23	18	38	25	332	31	01
31	10	01	03	120	43	20	23	26	46	46	49	20	92	42	08	18	52	50	332	37	18

LONGITUDE OF SUN, MOON AND PLANETS, 2023

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Apr. 1	11	00	18	132	35	33	25	17	47	48	00	28	93	12	01	19	07	15	332	43	33
2	11	59	31	144	30	53	27	05	52	49	11	29	93	42	02	19	21	41	332	49	44
3	12	58	42	156	32	47	28	50	36	50	22	25	94	12	11	19	36	07	332	55	53
4	13	57	51	168	43	57	30	31	36	51	33	14	94	42	28	19	50	34	333	01	59
5	14	56	57	181	06	22	32	08	32	52	43	57	95	12	51	20	05	02	333	08	01
6	15	56	02	193	41	19	33	41	02	53	54	34	95	43	22	20	19	29	333	14	01
7	16	55	04	206	29	26	35	08	48	55	05	04	96	13	60	20	33	57	333	19	57
8	17	54	04	219	30	53	36	31	34	56	15	28	96	44	45	20	48	26	333	25	50
9	18	53	03	232	45	29	37	49	06	57	25	45	97	15	36	21	02	54	333	31	40
10	19	51	60	246	12	52	39	01	09	58	35	55	97	46	35	21	17	23	333	37	27
11	20	50	55	259	52	31	40	07	32	59	45	59	98	17	40	21	31	52	333	43	11
12	21	49	48	273	43	45	41	08	06	60	55	56	98	48	51	21	46	21	333	48	51
13	22	48	39	287	45	39	42	02	43	62	05	46	99	20	09	22	00	50	333	54	27
14	23	47	29	301	56	44	42	51	15	63	15	30	99	51	33	22	15	19	334	00	00
15	24	46	17	316	14	55	43	33	38	64	25	06	100	23	03	22	29	48	334	05	30
16	25	45	04	330	37	12	44	09	46	65	34	35	100	54	40	22	44	16	334	10	55
17	26	43	48	344	59	47	44	39	39	66	43	56	101	26	22	22	58	44	334	16	17
18	27	42	31	359	18	13	45	03	16	67	53	10	101	58	10	23	13	11	334	21	35
19	28	41	12	13	27	53	45	20	37	69	02	17	102	30	05	23	27	38	334	26	49
20	29	39	51	27	24	27	45	31	48	70	11	15	103	02	04	23	42	05	334	31	59

SUN AND MOON, 2023

DECLINATION OF SUN, LATITUDE AND DECLINATION OF MOON FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date	Declination of Sun		Latitude of Moon		Declination of Moon		Date	Declination of Sun		Latitude of Moon		Declination of Moon	
	°	'	°	'	°	'		°	'	°	'	°	'
Jan. 0	-23	06.9	-1	49.9	+6	24.5	Feb. 1	-17	14.2	+3	18.5	+26	21.3
1	23	02.4	-0	43.3	12	03.0	2	16	57.2	4	00.9	27	26.4
2	22	57.4	+0	23.9	17	04.3	3	16	39.8	4	32.5	27	14.6
3	22	52.0	1	28.7	21	17.2	4	16	22.1	4	52.2	25	47.9
4	22	46.2	2	28.3	24	30.5	5	16	04.2	4	59.1	23	12.5
5	22	39.9	3	20.5	26	34.9	6	15	46.0	4	53.1	19	37.9
6	22	33.1	4	03.2	27	24.0	7	15	27.5	4	34.1	15	15.0
7	22	25.9	4	34.9	26	55.8	8	15	08.8	4	02.7	10	15.5
8	22	18.2	4	54.5	25	13.7	9	14	49.8	3	20.0	+4	50.3
9	22	10.2	5	01.3	22	25.3	10	14	30.5	2	27.6	-0	49.6
10	22	01.6	4	55.0	18	40.9	11	14	11.0	1	27.3	6	33.1
11	21	52.7	4	35.8	14	11.6	12	13	51.3	+0	21.4	12	08.0
12	21	43.3	4	04.2	9	08.2	13	13	31.3	-0	47.1	17	19.6
13	21	33.5	3	21.3	+3	40.7	14	13	11.1	1	54.9	21	50.0
14	21	23.3	2	28.3	-2	00.9	15	12	50.7	2	58.2	25	17.0
15	21	12.7	1	26.8	7	46.2	16	12	30.1	3	52.7	27	16.9
16	21	01.7	+0	19.2	13	22.2	17	12	09.3	4	33.9	27	28.9
17	20	50.2	-0	51.6	18	32.1	18	11	48.3	4	57.6	25	43.4
18	20	38.4	2	01.8	22	53.8	19	11	27.1	5	01.0	22	06.5
19	20	26.2	3	06.6	26	00.5	20	11	05.7	4	43.2	16	59.3
20	20	13.5	4	00.9	27	25.1	21	10	44.1	4	05.7	10	51.1
21	20	00.5	4	39.4	26	49.2	22	10	22.4	3	12.1	-4	12.4
22	19	47.2	4	58.4	24	11.8	23	10	00.5	2	07.3	+2	29.4
23	19	33.4	4	55.9	19	51.0	24	9	38.5	-0	56.7	8	51.7
24	19	19.3	4	32.6	14	16.4	25	9	16.3	+0	14.9	14	36.9
25	19	04.9	3	51.5	7	59.9	26	8	54.0	1	23.4	19	31.0
26	18	50.1	2	56.8	-1	29.6	27	8	31.5	2	25.8	23	23.0
27	18	34.9	1	53.3	+4	52.2	28	-8	08.9	+3	19.9	+26	04.5
28	18	19.4	-0	45.7	10	48.6							
29	18	03.6	+0	22.2	16	06.3							
30	17	47.5	1	27.2	20	33.9							
31	-17	31.0	+2	26.7	+24	01.8							

SUN AND MOON, 2023

DECLINATION OF SUN, LATITUDE AND DECLINATION OF MOON FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date	Declination of Sun		Latitude of Moon		Declination of Moon		Date	Declination of Sun		Latitude of Moon		Declination of Moon	
	°	'	°	'	°	'		°	'	°	'	°	'
Mar. 1	-7	46.3	+4	03.9	+27	29.8	Apr. 1	+4	21.3	+5	10.4	+21	59.1
2	7	23.5	4	36.7	27	36.8	2	4	44.4	4	54.4	17	58.2
3	7	00.5	4	57.4	26	27.3	3	5	07.5	4	25.3	13	12.8
4	6	37.5	5	05.3	24	07.1	4	5	30.5	3	43.9	7	53.4
5	6	14.4	4	60.0	20	44.8	5	5	53.4	2	51.4	+2	10.9
6	5	51.3	4	41.5	16	30.5	6	6	16.1	1	49.7	-3	43.0
7	5	28.0	4	10.4	11	35.3	7	6	38.8	+0	41.3	9	34.6
8	5	04.7	3	27.4	6	10.6	8	7	01.4	-0	30.4	15	08.4
9	4	41.3	2	34.1	+0	27.7	9	7	23.8	1	41.8	20	06.0
10	4	17.8	1	32.7	-5	21.1	10	7	46.1	2	48.7	24	06.8
11	3	54.3	+0	25.7	11	03.0	11	8	08.3	3	47.1	26	49.5
12	3	30.7	-0	43.8	16	22.8	12	8	30.3	4	33.1	27	56.2
13	3	07.1	1	52.4	21	03.4	13	8	52.2	5	03.6	27	16.5
14	2	43.5	2	56.3	24	45.0	14	9	14.0	5	16.1	24	51.3
15	2	19.8	3	51.7	27	06.5	15	9	35.6	5	09.2	20	52.6
16	1	56.1	4	34.7	27	49.7	16	9	57.1	4	43.1	15	39.6
17	1	32.4	5	01.8	26	43.5	17	10	18.4	3	59.2	9	35.1
18	1	08.7	5	10.2	23	49.1	18	10	39.5	3	00.6	-3	02.3
19	0	44.9	4	58.3	19	20.0	19	11	00.4	1	51.4	+3	36.2
20	-0	21.2	4	26.5	13	38.8	20	+11	21.2	-0	36.5	+9	58.9
21	+0	02.5	3	36.9	7	11.9							
22	0	26.3	2	33.6	-0	26.3							
23	0	50.0	1	21.8	+6	13.3							
24	1	13.6	-0	06.7	12	25.0							
25	1	37.3	+1	06.7	17	50.6							
26	2	00.9	2	14.4	22	15.3							
27	2	24.4	3	13.5	25	28.0							
28	2	47.9	4	01.9	27	21.7							
29	3	11.4	4	38.5	27	53.8							
30	3	34.7	5	02.4	27	06.2							
31	+3	58.1	+5	13.1	+25	05.1							

PLANETS, 2023

GEOCENTRIC LATITUDE AND DECLINATION FOR $5^h\ 29^m.0$ I.S.T.

Date	Mercury		Venus		Mars		Jupiter		Saturn	
	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination
	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '
Jan. 0	0 32.9	-20 44.9	-1 21.6	-22 15.5	+2 48.4	+24 36.4	-1 17.5	-0 45.4	-1 14.6	-15 14.9
2	1 11.4	20 17.3	1 24.1	21 48.3	2 49.2	24 34.3	1 17.0	0 39.2	1 14.6	15 10.9
4	1 49.9	19 56.2	1 26.4	21 18.5	2 49.9	24 32.4	1 16.5	0 32.8	1 14.6	15 06.9
6	2 25.0	19 42.0	1 28.5	20 46.3	2 50.3	24 30.8	1 16.0	0 26.1	1 14.5	15 02.8
8	2 53.3	19 34.4	1 30.3	20 11.6	2 50.5	24 29.5	1 15.5	0 19.2	1 14.5	14 58.7
10	3 12.2	19 32.7	1 31.8	19 34.5	2 50.5	24 28.5	1 15.1	0 12.1	1 14.5	14 54.4
12	3 21.1	19 36.4	1 33.1	18 55.2	2 50.4	24 27.9	1 14.6	-0 04.7	1 14.5	14 50.2
14	3 20.8	19 44.7	1 34.1	18 13.8	2 50.1	24 27.7	1 14.2	+0 02.9	1 14.5	14 45.8
16	3 13.0	19 56.9	1 34.9	17 30.3	2 49.6	24 27.8	1 13.8	0 10.6	1 14.5	14 41.4
18	2 59.8	20 11.7	1 35.3	16 44.9	2 49.1	24 28.2	1 13.3	0 18.6	1 14.5	14 37.0
20	2 43.0	20 28.1	1 35.5	15 57.6	2 48.4	24 29.0	1 12.9	0 26.8	1 14.6	14 32.5
22	2 23.9	20 44.8	1 35.4	15 08.5	2 47.6	24 30.1	1 12.5	0 35.1	1 14.6	14 27.9
24	2 03.6	21 00.7	1 35.0	14 17.9	2 46.8	24 31.6	1 12.1	0 43.6	1 14.6	14 23.3
26	1 42.8	21 14.9	1 34.4	13 25.7	2 45.9	24 33.4	1 11.7	0 52.3	1 14.7	14 18.7
28	1 22.0	21 26.7	1 33.4	12 32.0	2 44.9	24 35.4	1 11.4	1 01.2	1 14.7	14 14.0
30	1 01.5	21 35.4	1 32.2	11 37.1	2 43.8	24 37.7	1 11.0	1 10.2	1 14.8	14 09.3
Feb. 1	0 41.6	21 40.5	1 30.6	10 40.9	2 42.7	24 40.3	1 10.6	1 19.4	1 14.8	14 04.5
3	0 22.5	21 41.6	1 28.8	9 43.6	2 41.5	24 43.0	1 10.3	1 28.7	1 14.9	13 59.7
5	+0 04.1	21 38.5	1 26.7	8 45.4	2 40.4	24 45.9	1 09.9	1 38.2	1 15.0	13 54.9
7	-0 13.3	21 30.8	1 24.3	7 46.2	2 39.1	24 49.0	1 09.6	1 47.8	1 15.1	13 50.1
9	0 29.7	21 18.4	1 21.6	6 46.2	2 37.9	24 52.1	1 09.3	1 57.5	1 15.2	13 45.3
11	0 45.0	21 01.2	1 18.6	5 45.6	2 36.6	24 55.4	1 09.0	2 07.3	1 15.3	13 40.4
13	0 59.3	20 39.0	1 15.4	4 44.3	2 35.3	24 58.7	1 08.7	2 17.3	1 15.4	13 35.5
15	1 12.4	20 11.8	1 11.9	3 42.5	2 34.0	25 02.0	1 08.4	2 27.3	1 15.5	13 30.6
17	1 24.2	19 39.4	1 08.1	2 40.4	2 32.6	25 05.3	1 08.1	2 37.5	1 15.6	13 25.7
19	1 34.9	19 01.9	1 04.1	1 37.9	2 31.3	25 08.6	1 07.8	2 47.7	1 15.7	13 20.8
21	1 44.2	18 19.3	0 59.8	-0 35.2	2 30.0	25 11.8	1 07.6	2 58.1	1 15.8	13 15.9
23	1 52.2	17 31.4	0 55.3	+0 27.6	2 28.6	25 14.9	1 07.3	3 08.5	1 16.0	13 11.0
25	1 58.7	16 38.3	0 50.5	1 30.3	2 27.3	25 18.0	1 07.1	3 19.0	1 16.1	13 06.1
27	-2 03.8	-15 39.9	-0 45.6	+2 33.0	+2 25.9	+25 20.8	-1 06.8	+3 29.6	-1 16.3	-13 01.2

PLANETS, 2023

GEOCENTRIC LATITUDE AND DECLINATION FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date	Mercury		Venus		Mars		Jupiter		Saturn	
	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination
	° '	°	° '	° '	° '	° '	° '	° '	° '	° '
Feb. 27	-2 03.8	-15 39.9	-0 45.6	+2 33.0	+2 25.9	+25 20.8	-1 06.8	+3 29.6	-1 16.3	-13 01.2
Mar. 1	2 07.4	14 36.4	0 40.4	3 35.5	2 24.5	25 23.6	1 06.6	3 40.2	1 16.4	12 56.3
3	2 09.3	13 27.6	0 35.0	4 37.7	2 23.2	25 26.1	1 06.4	3 51.0	1 16.6	12 51.4
5	2 09.6	12 13.7	0 29.4	5 39.5	2 21.8	25 28.4	1 06.2	4 01.7	1 16.8	12 46.6
7	2 08.1	10 54.7	0 23.7	6 40.8	2 20.5	25 30.5	1 06.0	4 12.5	1 17.0	12 41.7
9	2 04.7	9 30.5	0 17.8	7 41.5	2 19.1	25 32.2	1 05.8	4 23.4	1 17.2	12 36.9
11	1 59.4	8 01.4	0 11.7	8 41.5	2 17.8	25 33.8	1 05.6	4 34.3	1 17.4	12 32.2
13	1 52.0	6 27.5	-0 05.5	9 40.8	2 16.5	25 35.0	1 05.4	4 45.2	1 17.6	12 27.4
15	1 42.6	4 49.0	+0 00.8	10 39.2	2 15.1	25 35.9	1 05.2	4 56.2	1 17.8	12 22.7
17	1 31.0	3 06.2	0 07.3	11 36.6	2 13.8	25 36.4	1 05.1	5 07.1	1 18.0	12 18.1
19	1 17.2	-1 19.6	0 13.8	12 33.0	2 12.5	25 36.6	1 04.9	5 18.1	1 18.2	12 13.4
21	1 01.3	+0 30.2	0 20.4	13 28.2	2 11.2	25 36.4	1 04.8	5 29.2	1 18.5	12 08.9
23	0 43.2	2 22.4	0 27.1	14 22.2	2 09.9	25 35.8	1 04.7	5 40.2	1 18.7	12 04.3
25	0 23.3	4 15.7	0 33.9	15 14.8	2 08.6	25 34.9	1 04.5	5 51.2	1 18.9	11 59.9
27	-0 01.7	6 08.9	0 40.6	16 06.0	2 07.3	25 33.5	1 04.4	6 02.3	1 19.2	11 55.4
29	+0 21.2	8 00.2	0 47.4	16 55.6	2 06.0	25 31.6	1 04.3	6 13.3	1 19.5	11 51.1
31	0 44.7	9 47.9	0 54.2	17 43.6	2 04.7	25 29.4	1 04.2	6 24.3	1 19.7	11 46.8
Apr. 2	1 08.4	11 30.1	1 00.9	18 29.9	2 03.5	25 26.6	1 04.1	6 35.3	1 20.0	11 42.5
4	1 31.5	13 05.0	1 07.7	19 14.4	2 02.2	25 23.4	1 04.1	6 46.3	1 20.3	11 38.4
6	1 53.2	14 31.1	1 14.3	19 56.9	2 00.9	25 19.7	1 04.0	6 57.2	1 20.6	11 34.3
8	2 12.9	15 47.1	1 20.9	20 37.5	1 59.7	25 15.5	1 03.9	7 08.1	1 20.9	11 30.3
10	2 29.9	16 52.2	1 27.4	21 16.0	1 58.5	25 10.9	1 03.9	7 19.0	1 21.2	11 26.3
12	2 43.7	17 45.6	1 33.8	21 52.4	1 57.2	25 05.7	1 03.8	7 29.9	1 21.5	11 22.5
14	2 53.5	18 27.0	1 40.0	22 26.5	1 56.0	24 60.0	1 03.8	7 40.7	1 21.8	11 18.7
16	2 59.0	18 56.1	1 46.1	22 58.4	1 54.8	24 53.8	1 03.7	7 51.4	1 22.1	11 15.0
18	2 59.8	19 12.8	1 52.0	23 27.9	1 53.6	24 47.1	1 03.7	8 02.2	1 22.5	11 11.5
20	+2 55.3	+19 17.0	+1 57.8	+23 55.1	+1 52.4	+24 39.8	-1 03.7	+8 12.8	-1 22.8	-11 08.0

URANUS, NEPTUNE AND PLUTO, 2023

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date		Uranus			Neptune			Pluto			Date		Uranus			Neptune			Pluto		
		°	'	"	°	'	"	°	'	"			°	'	"	°	'	"	°	'	"
Jan.	0	45	10	00	352	51	18	297	37	35	Feb.	25	45	24	43	354	24	19	299	23	14
	2	45	7	46	352	53	12	297	41	22		27	45	28	09	354	28	42	299	26	30
	4	45	5	45	352	55	15	297	45	12	Mar.	1	45	31	47	354	33	08	299	29	41
	6	45	3	55	352	57	25	297	49	03		3	45	35	35	354	37	35	299	32	49
	8	45	2	16	352	59	42	297	52	55		5	45	39	33	354	42	04	299	35	51
	10	45	0	50	353	2	07	297	56	48		7	45	43	41	354	46	34	299	38	49
	12	44	59	35	353	4	38	298	0	43		9	45	47	59	354	51	05	299	41	42
	14	44	58	32	353	7	17	298	4	38		11	45	52	27	354	55	37	299	44	30
	16	44	57	42	353	10	02	298	8	33		13	45	57	04	355	0	10	299	47	13
	18	44	57	04	353	12	55	298	12	29		15	46	1	50	355	4	43	299	49	51
	20	44	56	39	353	15	54	298	16	26		17	46	6	45	355	9	16	299	52	24
	22	44	56	27	353	18	59	298	20	22		19	46	11	49	355	13	50	299	54	51
	24	44	56	27	353	22	11	298	24	18		21	46	17	01	355	18	23	299	57	12
	26	44	56	40	353	25	28	298	28	13		23	46	22	21	355	22	55	299	59	27
	28	44	57	06	353	28	51	298	32	07		25	46	27	49	355	27	26	300	1	36
	30	44	57	44	353	32	19	298	35	60		27	46	33	24	355	31	57	300	3	39
Feb.	1	44	58	35	353	35	54	298	39	52		29	46	39	06	355	36	26	300	5	36
	3	44	59	39	353	39	33	298	43	42		31	46	44	55	355	40	54	300	7	27
	5	45	0	55	353	43	17	298	47	31	Apr.	2	46	50	51	355	45	19	300	9	11
	7	45	2	24	353	47	06	298	51	17		4	46	56	52	355	49	43	300	10	49
	9	45	4	04	353	50	59	298	55	01		6	47	2	59	355	54	04	300	12	20
	11	45	5	57	353	54	56	298	58	43		8	47	9	11	355	58	22	300	13	44
	13	45	8	02	353	58	57	299	2	22		10	47	15	29	356	2	38	300	15	02
	15	45	10	20	354	3	03	299	5	59		12	47	21	53	356	6	52	300	16	14
	17	45	12	49	354	7	12	299	9	33		14	47	28	20	356	11	02	300	17	19
	19	45	15	31	354	11	25	299	13	04		16	47	34	52	356	15	09	300	18	17
	21	45	18	24	354	15	40	299	16	31		18	47	41	28	356	19	12	300	19	08
	23	45	21	28	354	19	58	299	19	54		20	47	48	07	356	23	11	300	19	52
	25	45	24	43	354	24	19	299	23	14		22	47	54	49	356	27	06	300	20	29

EXPLANATION

In the following pages, a short explanation of the terms used in this Ephemeris has been given and the scope and limitations of the information furnished have been stated in a concise form. The values of the different constants and other data upon which the tabulated quantities are based have also been given in some cases in order to facilitate the use of this Ephemeris. It is not intended to furnish here any detailed explanation about the compilation of the tabular matter for which the reader is referred to the relevant literature.

Many changes have been incorporated in this publication from time to time including several recomendations of IAU at its General Assembly.

THE STANDARD EPOCH AND TIME SCALES

There are two classes of time scales used in Astronomy, one based on the Systeme International (SI) - the atomic second, the other based on the rotation of the Earth. Time scales based on the SI second include TAI and TT for practical applications. Time scale based on the rotation of the Earth include mean and apparent sidereal time and UT1. Because of irregularites in the Earth's rotation and its tidal deceleration, Earth's rotation based time scales do not advance at a uniform rate, and they increasingly lag behind the SI-second-based time scales. The widely disseminated time scale UTC is a hybrid, it advances by SI seconds but is subjct to one-second corrections (leap seconds) to keep it within $0^{s}.9$ of UT1.

The standard epoch J 2000.0 corresponds to 2000 January 1, 12^{h} TT (JD 245 1545.0 TT). A date may be expressed in years as a Julian epoch or for some purposes as a Besselian epoch.

Julian epoch = J [2000.0 + (JD − 245 1545.0)/ 365.25]
Where the quantity in the denominator is the Julian year.

Besselian epoch= B [1900.0 + (JD − 241 5020.313 52)/ 365.242 198 781]
Where the quantity in the denominator is the length of tropical year.

Prefixes J and B stand for the Julian and Besselian epochs respectively.

Various time systems used in this publication and their inter-relationships are described below :

Sidereal time system is derived from the Earth's rotation with respect to the stars. Local sidereal time is defined as the local hour angle of the vernal equinox. It is 0^{h} at the instant when the vernal equinox is at the upper transit of the local meridian. It is determined from observation of meridian transits of known stars. As the equinox oscillates about its mean position due to the effect of nutation, it gives rise to two kinds of sidereal time : the apparent sidereal time which is the hour angle of the true equinox of date and the mean sidereal time which is the hour angle of the mean equinox of date. The relation between the two is:

Apparent sidereal time = Mean sidereal time + Equation of Equinoxes

Equation of equinoxes is the total nutation in longitude multiplied by the cosine of the obliquity of the ecliptic. Its value varies within $\pm$ 1.2 seconds of time in a period of about 18.6 years.

Sidereal time on the geographic meridian of Greenwich is known as Greenwich sidereal time. Local sidereal time is related to Greenwich sidereal time (mean or apparent as appropriate) as follows:

Local sidereal time = Greenwich sidereal time + λ, where λ is the observer's longitude measured positively to the east (from 1985 onwards the sign convention for east terrestrial longitude to be positive has been adopted).

International Atomic Time (TAI) is a highly precise time scale given by atomic clocks. It is now being used as a standard in astronomy as it is independent of the Earth's rotation. Its fundamental unit, the SI second, is

defined as the duration of 9 192 631 770 cycles of the radiation corresponding to the transition between two hyperfine levels of the ground state of the Cesium 133 atom. This time scale results from analysis of data from atomic time standards of many countries carried out at the Bureau International de l ' Heure in Paris.

Universal Time (UT) is used for civil time keeping. It is an outgrowth of the mean solar time system derived from the Earth's rotation with respect to the Sun. It has been formally defined through a strict relationship with the Greenwich mean sidereal time and is, therefore, determined from observation of star transits. The universal time directly derived from observation is designated UT_o. It contains nonuniformities due to variations in the rotation of the Earth and is peculiar to the observer's geographic location because of polar motion. When UT_o is corrected for Earth's polar motion, it is called UT1. When UT1 is further corrected for seasonal variation in the Earth's rotation, it is called UT2. Both UT_o and UT2 are not for general usage. Instead, the national time services provide what is known as co-ordinated universal time (UTC). It is a smoothed version of UT2 and differs from TAI by an integral number of seconds. It contains step adjustments of exactly one second (leap seconds) in order to keep it always within 0.90 seconds of UT1. Beginning with 1972, the step adjustments are usually inserted after the 60^{th} second of the last minute of December 31 or June 30. In this publication, UT1 has been used in computations relating to hour angles, etc., unless otherwise stated.

Dynamical Time replaces ephemeris time (ET) as argument of ephemerides with effect from 1985 in this publication. The concept of different dynamical times for observers in different frames of reference arises out of general theory of relativity. In this publication, terrestrial time (TT) is the tabular argument of the fundamental geocentric ephemerides and barycentric dynamical time (TDB) is the arguments of ephemerides referred to the barycentre of the solar system. The former corresponds to proper time and the latter to co-ordinate time in terms of the general theory of relativity. Both TT and TDB are independent of the Earth's rotation. These scales are so defined that the difference between them is purely periodic. Their difference is given by:-

$TDB = TT + 0^s.001\,657 \sin g + 0^s.000\,022 \sin (L - L_J)$, where higher order terms have been neglected. Here g is the mean anomaly of the Earth in its orbit around the Sun and is given by:-

$$g = 357^\circ.53 + 0^\circ.985\,600\,28\,(JD - 245\,1545.0)$$
$$L - L_J = 246^\circ.11 + 0.902\,517\,92\,(JD - 245\,1545.0)$$

Where $L - L_J$ is the difference in the mean longitude of the Sun and Jupiter.

Relationship Between universal time and sidereal time

Universal time is defined in terms of Greenwich mean sidereal time by:

$$\text{GMST at } 0^h \text{UT1} = 6^h\,41^m\,50^s.549\,377 + 864\,018\,4^s.704\,478\,T_u + 0^s.092\,772\,T_u^2 - 2^s.93 \times 10^{-8}\,T_u^3 - 1^s.997 \times 10^{-6}\,T_u^4 - 2^s.5 \times 10^{-9}\,T_u^5$$

where T_u is the number of Julian centuries of 36525 days of universal time elapsed since 1 January, 2000,12^h UT (JD 245 154 5.0). In other words,

$$T_u = (JD - 245\,1545.0)/\,36525$$

The above expression implies that the ratio of UT1 to GMST at the epoch J2000.0 is 0.997 269 566 329 084 and its inverse is 1.002 737 909 350 795.

The following relationship holds during 2022:

On day of year d at t^h UT1 GMST = $6^h.642\,95925 + 0^h.065\,709\,8246\,d + 1^h.002\,737\,91\,t$

where day of the year d is tabulated on pages 4 to 12.

EXPLANATION

In 2022 :

1 mean solar day = 1.002 737 909 35 mean sidereal days
= $24^h\ 03^m\ 56^s.555\ 37$ of mean sidereal time

1 mean sidereal day = 0.997 269 566 33 mean solar days
= $23^h\ 56^m\ 04^s.090\ 53$ of mean solar time

Conversion of local mean time to local sidereal time

Calculate local sidereal time at $15^h\ 54^m\ 42^s$ L.M.T. on 2022 January 1, for Delhi longitude,

$\lambda = 77° \ 13' \ 00''$ East ($5^h\ 08^m\ 52^s$)

		h	m	s
1.	Universal time = Local mean time $- \lambda$	10	45	50
2.	Greenwich mean sidereal time at 0^h U.T. on January 1, 2022 (Page 13).	6	42	31.209
		h	m	s
3.	Add equivalent mean sidereal time for 10 45 50 (UT × 1.002 737 9093).	10	47	36.094
4.	Greenwich mean sidereal time at desired L.M.T.	17	30	7.302685
5.	Add equation of equinoxes at UT=0^d. 45 (second order interpolation may be used).			-0.87135
6.	Greenwich apparent sidereal time	17	30	6.431
7.	Add longitude (east positive)	5	08	52.000
8.	Local apparent sidereal time	22	38	58.431

For local mean sidereal time, the above process may be repeated by neglecting the equation of equinoxes.

Conversion of local sidereal time to local mean time

Calculate local mean time at $22^h\ 38^m\ 58^s.431$ local apparent sidereal time on 2022 January 1, for Delhi longitude, $\lambda = 77° \ 13' \ 00''$ East ($5^h\ 08^m\ 52^s$)

		h	m	s
1.	Local apparent sidereal time	22	38	58.431
2.	Subtract longitude (east positive)	5	08	52.000
3.	Greenwich apparent sidereal time	17	30	6.431
4.	Subtract equation of equinox at 0^h U.T.			-0.877
5.	Greenwich mean sidereal time (provisional)	17	30	7.309
6.	Subtract Greenwich mean sidereal time at 0^h U.T.	6	42	31.209
7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.0998

EXPLANATION

7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.0998
8.	Mean time interval in days corresponding to (7) above = (M.S.T. (P) × 0.997 269 566) = $0^d.45$ (UT). Subtract the increment to equation of equinoxes for $0^d.45$ UT (using second order interpolation)	(-)		0.01300
9.	Mean sidereal time	10	47	36.087
10.	Equivalent UT (MST × 0.997 269 566)	10	45	49.993
11.	Local mean time = UT + λ	15	54	41.993

The mean time from the local mean sidereal time may be worked out on similar lines as above by neglecting the equation of equinoxes.

Notation for time-scales and related quantities

UT1 — Universal time (also UT); counted from 0^h (mid night); unit is second of mean solar time, affected by iregularities in the Earth's rate of rotation.

UT0 — local approximation to universal time; not corrected for polar motion (rarely used).

GMST — Greenwich mean sidereal time; GHA of mean equinox of date.

GAST — Greenwich apparent sidereal time; GHA of true Eqinox of date.

TAI — international atomic time; unit is the SI second of geoid.

UTC — coordinated universal time; differs from TAI by an integral number of seconds, and is the basis of most radio time signals and national and/ or legal time systems.

ΔUT — = UT1 – UTC; increment to be applied to UTC to give UT1

TDB — barycentric dynamical time; used as time-scale of ephemerides, referred to the barycentre of the solar system.

T_{eph} — the independent variable of the equations of motion used by the JPL ephemerides, in particular DE405/LE405. T_{eph} and TDB may be considered to be equivalent.

TT — terrestrial time; used as time-scale of ephemerides for observations from the Earth's surface (geoid).

TT — = TAI + $32^s.184$.

ΔT — = TT – UT1; increment to be applied to UT1 to give TT.
= TAI + $32^s.184$ – UT1

ΔAT — = TAI –UT1; increment to be applied to UTC to give TAI; an integral number of seconds.

ΔTT — = TT – UTC = ΔAT + $32^s.184$; increment to be applied to UTC to give TT.

UT1 - UT0 — $= -(x \sin\lambda + y \cos\lambda)\tan\phi/15$
where λ and ϕ are usual geodetic longitude and latitude of the place, and x and y are the co-ordinates of the pole with respect to the geodetic system, in arcseconds.

GAST — = GMST + $\varepsilon_\gamma/15$, ε_γ is equation of equinox.

In order to convert the tabulations for 0^h TT to 0^h UT, one may interpolate to $\Delta T\, \delta_{1/2}/h$ where h is the tabular interval and $\delta_{1/2}$ is the first difference of the tabular values.

REDUCTION OF TIME SCALES, 1620-1644
ΔT = ET - UT

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1620.0	+124	1625.0	+102	1630.0	+85	1635.0	+72	1640.0	+62
1621	119	1626	98	1631	82	1636	70	1641	60
1622	115	1627	95	1632	79	1637	67	1642	58
1623	110	1628	91	1633	77	1638	65	1643	57
1624	+ 106	1629	+ 88	1634	+74	1639	+63	1644	+55

REDUCTION OF TIME SCALES, 1645-1819

ΔT = ET - UT

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1645.0	+ 54	1680.0	+ 16	1715.0	+ 10	1750.0	+ 13	1785.0	+ 17
1646	53	1681	15	1716	10	1751	14	1786	17
1647	51	1682	14	1717	11	1752	14	1787	17
1648	50	1683	14	1718	11	1753	14	1788	17
1649	49	1684	13	1719	11	1754	14	1789	17
1650.0	+ 48	1685.0	+ 12	1720.0	+ 11	1755.0	+ 14	1790.0	+ 17
1651	47	1686	12	1721	11	1756	14	1791	17
1652	46	1687	11	1722	11	1757	14	1792	16
1653	45	1688	11	1723	11	1758	15	1793	16
1654	44	1689	10	1724	11	1759	15	1794	16
1655.0	+ 43	1690.0	+ 10	1725.0	+ 11	1760.0	+ 15	1795.0	+ 16
1656	42	1691	10	1726	11	1761	15	1796	15
1657	41	1692	9	1727	11	1762	15	1797	15
1658	40	1693	9	1728	11	1763	15	1798	14
1659	38	1694	9	1729	11	1764	15	1799	14
1660.0	+ 37	1695.0	+ 9	1730.0	+ 11	1765.0	+ 16	1800.0	+ 13.7
1661	36	1696	9	1731	11	1766	16	1801	13.4
1662	35	1697	9	1732	11	1767	16	1802	13.1
1663	34	1698	9	1733	11	1768	16	1803	12.9
1664	33	1699	9	1734	12	1769	16	1804	12.7
1665.0	+ 32	1700.0	+ 9	1735.0	+ 12	1770.0	+ 16	1805.0	+ 12.6
1666	31	1701	9	1736	12	1771	16	1806	12.5
1667	30	1702	9	1737	12	1772	16	1807	12.5
1668	28	1703	9	1738	12	1773	16	1808	12.5
1669	27	1704	9	1739	12	1774	16	1809	12.5
1670.0	+ 26	1705.0	+ 9	1740.0	+ 12	1775.0	+ 17	1810.0	+ 12.5
1671	25	1706	9	1741	12	1776	17	1811	12.5
1672	24	1707	9	1742	12	1777	17	1812	12.5
1673	23	1708	10	1743	12	1778	17	1813	12.5
1674	22	1709	10	1744	13	1779	17	1814	12.5
1675.0	+ 21	1710.0	+ 10	1745.0	+ 13	1780.0	+ 17	1815.0	+ 12.5
1676	20	1711	10	1746	13	1781	17	1816	12.5
1677	19	1712	10	1747	13	1782	17	1817	12.4
1678	18	1713	10	1748	13	1783	17	1818	12.3
1679	+ 17	1714	+ 10	1749	+ 13	1784	+ 17	1819	+ 12.2

This table is based on an adopted value of $-26''/cy^2$ for the tidal term ($\dot{n}$) in the mean motion of the Moon from the results of analyses of observations of lunar occultations of stars, eclipses of the Sun and transits of Mercury. (see F.R. Stephenson and L.V. Morrison, 1984 *PhD* Trans, R, Soc. London, Ser A, 313, 47-70).

To calculate the values of ΔT for a different value of the tidal term ($\dot{n}'$), add $-0.000\,091\,(\dot{n}' + 26)\,(\text{year} - 1955)^2$ seconds to the tabulated values of ΔT.

REDUCTION OF TIME SCALES FROM 1820

1820 - 1939, ΔT = ET − UT. **From 1940, ΔT = TDT - UT.**
2019, ΔT = TT - UT.

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1820.0	+ 12.0	1860.0	+ 7.88	1900.0	− 2.72	1940.0	+ 24.33	1980.0	+ 50.54
1821	11.7	1861	7.82	1901	1.54	1941	24.83	1981	51.38
1822	11.4	1862	7.54	1902	− 0.02	1942	25.30	1982	52.17
1823	11.1	1863	6.97	1903	+ 1.24	1943	25.70	1983	52.96
1824	10.6	1864	6.40	1904	2.64	1944	26.24	1984	53.79
1825.0	10.2	1865.0	6.02	1905.0	3.86	1945.0	26.77	1985.0	54.34
1826	9.6	1866	5.41	1906	5.37	1946	27.28	1986	54.87
1827	9.1	1867	4.10	1907	6.14	1947	27.78	1987	55.32
1828	8.6	1868	2.92	1908	7.75	1948	28.25	1988	55.82
1829	8.0	1869	1.82	1909	9.13	1949	28.71	1989	56.30
1830.0	+ 7.5	1870.0	+ 1.61	1910.0	+ 10.46	1950.0	+ 29.15	1990.0	+ 56.86
1831	7.0	1871	+ 0.10	1911	11.53	1951	29.57	1991	57.57
1832	6.6	1872	− 1.02	1912	13.36	1952	29.97	1992	58.31
1833	6.3	1873	1.28	1913	14.65	1953	30.36	1993	58.12
1834	6.0	1874	2.69	1914	16.01	1954	30.72	1994	59.98
1835.0	5.8	1875.0	3.24	1915.0	17.20	1955.0	31.07	1995.0	60.78
1836	5.7	1876	3.64	1916	18.24	1956	31.35	1996	61.63
1837	5.6	1877	4.54	1917	19.06	1957	31.68	1997	62.29
1838	5.6	1878	4.71	1918	20.25	1958	32.18	1998	62.97
1839	5.6	1879	5.11	1919	20.95	1959	32.68	1999	63.47
1840.0	+ 5.7	1880.0	− 5.40	1920.0	+ 21.16	1960.0	+ 33.15	2000.0	+ 63.83
1841	5.8	1881	5.42	1921	22.25	1961	33.59	2001	64.09
1842	5.9	1882	5.20	1922	22.41	1962	34.00	2002	64.30
1843	6.1	1883	5.46	1923	23.03	1963	34.47	2003	64.47
1844	6.2	1884	5.46	1924	23.49	1964	35.03	2004	64.57
1845.0	6.3	1885.0	5.79	1925.0	23.62	1965.0	35.73	2005	+ 64.69
1846	6.5	1886	5.63	1926	23.86	1966	36.54	2006	64.85
1847	6.6	1887	5.64	1927	24.49	1967	37.43	2007	65.15
1848	6.8	1888	5.80	1928	24.34	1968	38.29	2008	65.46
1849	6.9	1889	5.66	1929	24.08	1969	39.20	2009	65.78
1850.0	+ 7.1	1890.0	− 5.87	1930.0	+ 24.02	1970.0	+ 40.18	2010	+ 66.07
1851	7.2	1891	6.01	1931	24.00	1971	41.17	2011	66.32
1852	7.3	1892	6.19	1932	23.87	1972	42.23	2012	66.60
1853	7.4	1893	6.64	1933	23.95	1973	43.37	2013	66.91
1854	7.5	1894	6.44	1934	23.86	1974	44.49	2014	67.28
1855.0	7.6	1895.0	6.47	1935.0	23.93	1975.0	45.48	2015	67.64
1856	7.7	1896	6.09	1936	23.73	1976	46.46	2016	68.10
1857	7.7	1897	5.76	1937	23.92	1977	47.52	2017	68.59
1858	7.8	1898	4.66	1938	23.96	1978	48.53	2018	68.97
1859	7.8	1899	3.74	1939	24.02	1979	49.59	2019	69.22

Extrapolated Values

2020	+ 69.40	2022	+ 70	2024	+ 70
2021	+ 70	2023	+ 70		

Difference TAI – UTC = ΔAT

Date	ΔAT s	Date	ΔAT s	Date	ΔAT s	Date	ΔAT s
1972 Jul.1		1979 Jan.1		1990 Jan.1		1999 Jan. 1	
	+ 11.00		+ 18.00		+ 25.00		+ 32.00
1973 Jan.1		1980 Jan.1		1991 Jan.1		2006 Jan. 1	
	+ 12.00		+ 19.00		+ 26.00		+ 33.00
1974 Jan.1		1981 Jul.1		1992 Jul.1		2009 Jan. 1	
	+ 13.00		+ 20.00		+ 27. 00		+ 34.00
1975 Jan.1		1982 Jul.1		1993 Jul.1		2012 Jul. 1	
	+ 14.00		+ 21.00		+ 28.00		+ 35.00
1976 Jan.1		1983 Jul.1		1994 Jul.1		2015 Jul. 1	
	+ 15.00		+ 22.00		+ 29.00		+ 36.00
1977 Jan.1		1985 Jul.1		1996 Jan.1		2017 Jan. 1	
	+ 16.00		+ 23.00		+ 30.00		+ 37.00
1978 Jan.1		1988 Jan.1		1997 Jul.1		In critical cases descend	
	+ 17.00		+ 24.00		+ 31.00	ΔET	
1979 Jan.1		1990 Jan.1		1999 Jan.1		ΔTT	$= \Delta AT + 32^{s}.184$

From 1990 onwards, ΔT is for Jan. 1 0^{h} UTC.

See page 2 for a summary of the notation for time-scales.

Astronomical Reference System and Reference Frames

A reference system is the complete specification of how a celestial coordinate system is to be formed. Both the origin and the orientation of the fundamental planes (or axes) are defined. A reference system also incorporates a specification of the fundamental models needed to construct the system; that is, the basis for the algorithms used to transform between observable quantities and reference data in the system. A reference frame, on the other hand, consists of a set of identifiable fiducial points on the sky along with their coordinates, which serves as the practical realization of a reference system.

For example, the fundamental plane of an astronomical reference system has conventionally been the extension of the Earth's equatorial plane, at some date, to infinity. Declination is the angular distance north or south of this plane, and right ascension is the angular distance measured eastward along the equator from some defined reference point. This reference point, the right asscension origin, has traditionally been the Equinox: the point at which the Sun, in its yearly circuit of the celestial sphere, crosses the equatorial plane moving from south to north. The Sun's apparent yearly motion lies in the ecliptic, the plane of the Earth's orbit. The equinox, therefore, is a direction in the space along the nodal line defined by the intersection of the ecliptic and equatorial planes; equivalently, on the celestial sphere, the equinox is at one of the two intersections of the great circles representing these planes. Because both of these planes are moving, the coordinate systems that they define must have a date associated with them; such a reference system must therefore be specified as "the equator and equinox of (some date)".

Of course, such a reference system is an idealization, because the theories of motion of the Earth that define how the two planes move are imperfect. In fact, the very definations of these planes are problematic for high precession work. Even if the fundamental planes of a reference system are defined without any reference to the motions of the Earth, there is no way magically to paint them on the celestial sphere at any particular time. Therefore, in practice, we use a specific reference frame - a set of fiducial objects with assigned coordinates - as the practical representation of an astronomical reference system. The scheme is completely analogous to how terrestrial reference systems are established using survey control stations (geodetic reference point) on the Earth's surface.

Most commonly, a reference frame consists of a catalog of precise positions (and motions, if measurable) of stars or extragalactic objects as seen from the solar system barycenter at a specific epoch (now usually "J2000.0", which is 12h TT on January 2000). Each object's instantaneous position, expressed as right ascension and declination, indicates the object's angular distance from the catalog's equator and origin of right ascension. Any two such objects in the catalog (if they are not coicident or antipodal) therefore uniquely orient a spherical coordinate system on the sky - a reference frame.

EXPLANATION

A modern astrometric catalog contains data on a large number of objects (N), so the coordinate system is vastly overdetermined. The quality of the reference frame defined by a catalog depends on the extent to which the coordinates of all possible pairs of objects ($N^2/2$) serve to the identical equator and right ascesion origin, within the expected random errors. Typically, every catalog contains systematic errors, that is, errors in position that are similar for objects that are in the same area of the sky, or are of the same magnitude (flux) or color (spectral index). Systematic errors mean that the reference frame is warped, or is effectively different for different classes of objects. Obviously, minimizing systematic errors when a catalog is constructed is at least as important as minimizing the random errors.

To be useful, a reference frame must be implemented at the time of actual observations, and this requires the computation of the apparent coordinates of the catalog objects at arbitrary dates and times. The accuracy with which we know the motions of the objects accross the sky is an essential factor in this computation. Astrometric star catalogs list proper motions, which are the projection of each star's space motion onto the celestial sphere, expressed as an angular rate in right ascension and declination per unit time. Because the tabulated proper motions are never perfect, any celesial reference frame deteriorates with time. Moreover, systematic errors in the proper motions can produce time-dependent warpings and spurious rotations of the frame. Therefore, the accuracy and consistency of the proper motions are critical to the overall quality, utility, and longevity of reference frames defined by stars. Even reference frames defined by extragalactic objects, which are usually considered to have zero proper motion, may deteriorate, because many of these objects show small apparent motions that are artifacts of their emission mechanisms.

The position of solar system objects can also be used to define a reference frame. For each solar system body involved, an ephemeris is used, which is simply a table of the celestial coordinates of the body as a funtion of time (or an algorithm that yields such a table). A reference frame defined by the ephemerides of one or more solar system bodies is called a dynamical reference frame. Because the ephemerides used incorporate the motion of the Earth as well as that of the other solar system bodies, dynamical reference frames embody in a very fundamental way the moving equator and ecliptic, hence the equinox. They have therefore been used to correct the orientation of star catalog reference frames (the star positions were systematically adjusted) on the basis of simultaneous observations of star and planets. In a sense, the solar system is used as a gyrocompass. However, dynamical reference frames are not very practical for establishing a coordinate system for day to day astronomical observations.

Descriptions of reference frames and reference systems often refer to three coordinate axes, which are simply the set of right-handed cartesian axes that correspond to the usual celestial spherical coordinate system. The xy-plane is the equator, the z-axis points toward the north celestial pole, and the x-axis points toward the origin of right ascension. Although in principal this allows us to specify the position of any celestial object in rectangular coordinates, the distance scale (based on stellar parallaxes) is not established to high precession beyond the solar system. What a reference system actually defines is the way in which the two coventional astronomical angular coordinates, right ascension and declination, overlay real observable points in the sky.

The fundamental celestial reference system for astronomical application is now the International Celestial Reference System (ICRS) as provided in resolution B2 of 1997. The "realization" of of the ICRS, called the International Celestial Reference Frame (ICRF), is a set of high accuracy positions of extragalactic radio sources measured by very long baseline interferometry.

The IAU Working Group on nomenclature for Fundamental Astronomy has recomended the following definations for ICRS and ICRF:

International Celestial Reference System (ICRS): The idealized barycetric co-ordinate system to which celestial positions are referred. It is kinematically non-rotating with respect to the ensemble of distant extragalactic objects. It has no intrinsic orientation but was aligned close to the mean equator and dynamical equinox of J2000.0 for continuity with previous fundamental reference systems. Its orientation is independent of epoch, ecliptic or equator and is realized by a list of adopted coordinates of extragalactic sources.

International Celestial Reference Frame (ICRF): A set of extragalactic objects whose adopted positions and uncertainties realize the ICRS axes and give the uncertainties of the axes. It is also the name of radio catalogue whose 212 defining sources are currently the most accurate realization of the ICRS. The orientation of the ICRF catalogue was carried over from earlier IERS radio catalogs and was within the errors of the standard stellar and dynamical frames at the time of adoption. Successive revision of the ICRF are intended to minimize rotation from its original orientation.

Some important reference systems and their designations as per IAU 2000 resolution B1.6, B1.7 and B1.8, and IAU 2006 resolutions 1 and 2 are listed below:

(i) Barycentric Celestial Reference System (BCRS): a system of barycentric space-time coordinates for the solar system within the framework of General Relativity. For all practical applications, the BCRS is assumed to be oriented according to the ICRS axes, the directions of which are realized by the International Celestial Reference Frame. The ICRS is not identical to the system defined by the dynamical mean equator and equinox of J2000.0, although the difference in orientation is only about $0''.02$.

(ii) The Geocentric Celestial Reference System (GCRS): is a system of geocentric space-time coordinates within the framework of General Relativity. The directions of the GCRS axes are obtained from those of the BCRS (ICRS) by a relativistic transformation. Positions of stars obtained from ICRS reference data, corrected for proper motion, parallax, light-bending, and aberration (for a geocentric observer) are with respect to the GCRS. The same is true for planetary positions, although the corrections are somewhat different.

(iii) The J2000.0 dynamical reference system: mean equator and equinox of J2000.0; a geocentric system where the origin of right ascension is the intersection of the mean ecliptic and equator of J2000.0; the system in which the IAU 2000 precession-nutation is defined. For precise applications a small rotation (frame bias) should be made to GCRS positions before precession and nutation are applied. The J2000.0 system may also be barycentric, for example as the reference system for catalogues.

(iv) The true system of date (t); true equator and equinox of date: a geocentric system of date, the pole of which is the celestial intermediate pole (CIP), with the origin of right ascension at the equinox on the true equator of date (intermediate equator). It is a system "between" the GCRS and the Terrestrial Intermediate Reference System that seperates the components labelled precession-nutation and polar motion.

(v) The Celestial Intermediate Reference System (i): the IAU recomended geocentric system of date, the pole of which is the celestial intermediate pole (CIP), with the origin of right ascension at the celestial intermediate origin (CIO) which is located on the intermediate equator (true equator of date). It is a system "between" (intermeiate) the GCRS and the Terrestrial Intermediate Reference System that seperates the components labelled precession-nutation and polar motion.

Precession and Nutation

The algorithms for precession were based on the IAU (1976) value for the rate of general precession in ecliptic longitude. Nutation was given by the 1980 IAU Theory of Nutation. However, IAU (1976) rate of precession had been overestimated by approximately 3 milliarcseconds per year. Further observations also revealed periodic errors of a few milliarcseconds in the 1980 IAU Theory of Nutation.

As part of the 2000 IAU resolutions, the IAU 2000A precession-nutation model was introduced, based on an updated value for the rate of precession and a completely new nutation theory. As before, the model actually consists of two parts, a precession algorithm describing the smooth secular motion of the celestial pole and a nutation algorithm describing the small periodic variations in the pole's position. The precession algorithm consists of short polynomial series for the values of certain angles. The sines and cosines of these angles, in combination, then define the elements of a precession matrix, **P**. The nutation algorithm consists of a rather long series expansion in Fourier terms for the angular offsets, in ecliptic longitude and latitude, of the actual celestial pole (as modeled) from the precession-only pole (true pole - mean pole). The sines and cosines of these offsets, in combination, then define the elements of a nutation matrix, **N.** The **P** and **N** matrices are applied to the coordinates of celestial objects, expressed as 3-vectors, to transform them from the equator and equinox of one epoch to the equator and equinox of another.

EXPLANATION

A precession transformation is applied to celestial coordinates to convert them from the mean equator and equinox of J2000.0 to the mean equator and equinox of another date, t. Nutation is applied to the resulting coordinates to transform them to the true equator and equinox of t. Generally we will start with celestial coordinates in the GCRS, which are obtained from basic ICRS data by applying the usual algoriths for proper place. Therefore before we apply precession and nutation - we must first apply the frame bias correction to transform the GCRS coordinates to the dynamical mean equator and equinox of J2000.0. Schematically,

GCRS => frame bias = mean equator & equinox of J2000.0 = precession =>

mean equator & equinox of t = nutation => true equator & equinox of t.

The reduction from a geocentric position **r** with respect to the Geocentric Celestial Reference System (GCRS) to a position $\mathbf{r}_t$ with respect to equator and equinox of date, and vice versa, is given by;

$$\mathbf{r}_t = \mathbf{M}\,\mathbf{r} \quad \text{and } \mathbf{r} = \mathbf{M}^{-1}\mathbf{r}_t$$

Using the 4-rotation Fukishma-Williams (F-W) method, the rotation matrix **M** may be witten as

$$\mathbf{M} = \mathbf{N}\,\mathbf{P}\,\mathbf{B}$$

Since the rotation to orient the GCRS to J2000.0 system are small the following approximate matrix **B** is called frame bias matrix, accurate to 2"x 10^{-9} (1 x 10^{-14} radians), may be used:

$$\mathbf{B} = \begin{bmatrix} 1 & d\alpha_0 & -\xi_0 \\ -d\alpha_0 & 1 & -\eta_0 \\ \xi_0 & \eta_0 & 1 \end{bmatrix}$$

where $d\alpha_0$ = -14.6 mas, ξ_0 = -16.6170 mas, and η_0 = -6.8192 mas, all converted to radians (divide by 206 264 806.247).

Precession

The time argument T is given by

$$T = (t - 2000.0)/100 = (JD_{TT} - 2451545.0)/36525,$$ which is a function of TT.

The Capitine *et al.* method, the formulation of which seperates precession of the equator from precession of the ecliptic, is via the precession angles χ_A, ω_A, ψ_A, which are

$$\psi_A = 5038''.481\,507\,T - 1''.079\,0069\,T^2 - 0''.001\,140\,45\,T^3 + 0''.000\,132\,851\,T^4 - 9''.51 \times 10^{-8}\,T^5$$

$$\omega_A = \varepsilon_0 - 0''.025\,754\,T + 0''.051\,2623\,T^2 - 0''.007\,725\,03\,T^3 - 0''.000\,000\,467\,T^4 + 33''.37 \times 10^{-8}\,T^5$$

$$\chi_A = 10''.556\,403\,T - 2''.381\,4292\,T^2 - 0''.001\,211\,97\,T^3 + 0''.000\,170\,663\,T^4 - 5''.60 \times 10\text{-}8\,T^5$$

The mean obliquity of the ecliptic at J2000.0 (or the equivalent TDB date) is ε_0 = 84381".406

(i) A rotation from the mean equator and equinox of J2000.0 to the mean ecliptic and equinox of J2000.0. This is simply a rotation around the x-axis (the direction toward the mean equinox of J2000.0) by the angle ε_0, the mean obliquity of J2000.0. After the rotation, the fundamental plane is the ecliptic of J2000.0

(ii) A rotation around the new z-axis (the direction toward the ecliptic pole of J2000.0) by the angle $-\psi_A$, the amount of precession of the equator from J2000.0 to t.

(iii) A rotation around the new x-axis (the direction along the intersection of the mean equator of t with the ecliptic of J2000.0) by the angle $-\omega_A$, the obliquity of the mean equator of t with respect to the ecliptic of J2000.0. After the rotation, the fundamental plane is the mean equator of t.

(iv) A rotation around the new z-axis (the direction toward the mean celestial pole of t) by the angle χ_A, accounting for the precession of the ecliptic along the mean equator of t. After the rotation, the new x-axis is in the direction of the mean equinox of date.

$$\mathbf{P} = \begin{bmatrix} C_4C_2 - S_2S_4C_3 & C_4S_2C_1 + S_4C_3C_2C_1 - S_1S_4S_3 & C_4S_2S_1 + S_4C_3C_2S_1 + C_1S_4S_3 \\ -S_4C_2 - S_2C_4C_3 & -S_4S_2C_1 + C_4C_3C_2C_1 - S_1C_4S_3 & -S_4S_2S_1 + C_4C_3C_2S_1 + C_1C_4S_3 \\ S_2S_3 & -S_3C_2C_1 - S_1C_3 & -S_3C_2S_1 + C_3C_1 \end{bmatrix}$$

where $S_1 = \sin \varepsilon_0$ $\quad S_2 = \sin(-\psi_A)$ $\quad S_3 = \sin(-\omega_A)$ $\quad S_4 = \sin \chi_A$
$C_1 = \cos \varepsilon_0$ $\quad C_2 = \cos(-\psi_A)$ $\quad C_3 = \cos(-\omega_A)$ $\quad C_4 = \cos \chi_A$

Existing applications that use the 3-angle precession formulation of Newcomb and Lieske can be easily modified for the IAU 2000A precession, by replacing the current polynomials for the angles ζ_A, Z_A and θ_A with the following:

$$\zeta_A = 2''.650545 + 2306''.083227\,T + 0''.2988499\,T^2 + 0''.01801828\,T^3 - 0''.000005971\,T^4 - 0''.0000003173\,T^5$$

$$Z_A = -2''.650545 + 2306''.077181\,T + 1''.0927348\,T^2 + 0''.01826837\,T^3 - 0''.000028596\,T^4 - 0''.0000002904\,T^5$$

$$\theta_A = 2004''.191903\,T - 0''.4294934\,T^2 - 0''.04182264\,T^3 - 0''.000007089\,T^4 - 0''.0000001274\,T^5$$

The centennial (per Julian century) rates of general precession in right ascension and declination are given by :

$$m = 4612''.604\,08 + 2''.783\,169\,4\,T + 0''.108\,859\,95\,T^2 - 0''.000\,138\,268\,T^3 \text{ and}$$

$$n = 2004''.191\,903 - 0''.858\,986\,8\,T - 0''.125\,467\,92\,T^2 - 0''.000\,028\,356\,T^3$$

The elements of the matrix **P** given in terms of ζ_A, Z_A, θ_A are as follows:

$$\mathbf{P} = \begin{bmatrix} \cos\zeta_A \cos\theta_A \cos Z_A - \sin\zeta_A \sin Z_A & -\sin\zeta_A \cos\theta_A \cos Z_A - \cos\zeta_A \sin Z_A & -\sin\theta_A \cos Z_A \\ \cos\zeta_A \cos\theta_A \sin Z_A + \sin\zeta_A \cos Z_A & -\sin\zeta_A \cos\theta_A \sin Z_A + \cos\zeta_A \cos Z_A & -\sin\theta_A \sin Z_A \\ \cos\zeta_A \sin\theta_A & -\sin\zeta_A \sin\theta_A & \cos\theta_A \end{bmatrix}$$

The formula for reduction of precession in right ascension and declination are as follows :

$$\begin{aligned} \sin(\alpha - Z_A)\cos\delta &= \sin(\alpha_o + \zeta_A)\cos\delta_o. \\ \cos(\alpha - Z_A)\cos\delta &= \cos(\alpha_o + \zeta_A)\cos\theta_A \cos\delta_o - \sin\theta_A \sin\delta_o \\ \sin\delta &= \cos(\alpha_o + \zeta_A)\sin\theta_A \cos\delta_o + \cos\theta_A \sin\delta_o \end{aligned}$$

$$\begin{aligned} \sin(\alpha_o + \zeta_A)\cos\delta_o &= \sin(\alpha - Z_A)\cos\delta \\ \cos(\alpha_o + \zeta_A)\cos\delta_o &= \cos(\alpha - Z_A)\cos\theta_A \cos\delta + \sin\theta_A \sin\delta \\ \sin\delta_o &= -\cos(\alpha - Z_A)\sin\theta_A \cos\delta + \cos\theta_A \sin\delta \end{aligned}$$

EXPLANATION

Values of the angles ζ_A, Z_A, θ_A and of the elements of the matrix P for reduction from the standard epoch J 2000.0 to epoch of year are as follows:

Epoch J 2022.5 | Rotation matrix P for reduction to epoch J 2022.5

$$\zeta_A = +521''.535 = +0^\circ.144\,871$$
$$Z_A = +516''.272 = +0^\circ.143\,409$$
$$\theta_A = +450''.921 = +0^\circ.125\,256$$

$$\mathbf{P} = \begin{bmatrix} +0.999\,984\,95 & -0.005\,031\,40 & -0.002\,186\,12 \\ +0.005\,031\,40 & +0.999\,987\,34 & -0.000\,005\,47 \\ +0.002\,186\,12 & -0.000\,005\,53 & +0.999\,997\,61 \end{bmatrix}$$

The obliquity of the ecliptic of date (with respect to the mean equator of date) is given by:

$$\varepsilon = \varepsilon_0 - 46''.836\,769T - 0''.000\,183\,1\,T^2 + 0''.002\,003\,4\,T^3 - 0''.000\,000\,576\,T^4 - 0''.000\,000\,043\,4\,T^5$$

where $\varepsilon_0 = 84381''.406$

The precessional motion of the ecliptic specified by the inclination (π_A) and longitude of the node (Π_A) of the ecliptic of date with respect to the ecliptic and equinox of J 2000.0 are given by:

$$\text{Sin}\,\pi_A \sin\Pi_A = +4''.199\,094\,T + 0''.193\,987\,T^2 - 0''.000\,224\,66\,T^3$$
$$\text{Sin}\,\pi_A \cos\Pi_A = -46''.811\,015\,T + 0''.051\,028\,T^2 + 0''.000\,524\,13\,T^3$$

For epoch J 2022.5

$$\varepsilon = 23^\circ\,26'\,10''.87 = 23^\circ.436\,352$$
$$\pi_A = +10''.573 = 0^\circ.002\,936\,9$$
$$\Pi_A = 174^\circ\,49'.2 = 174^\circ.820$$

Approximate formulae for the reduction of precession in co-ordinates and orbital elements referred to the mean equinox and equator or ecliptic of date (t) are as follows :

Reduction to J 2000.0	Reduction from J 2000.0
$\alpha_o = \alpha - M - N\sin\alpha_m \tan\delta_m$	$\alpha = \alpha_o + M + N\sin\alpha_m \tan\delta_m$
$\delta_o = \delta - N\cos\alpha_m$	$\delta = \delta_o + \mathrm{N}\cos\alpha_m$
$\lambda_o = \lambda - a + b\cos(\lambda + c')\tan\beta_o$	$\lambda = \lambda_o + a - b\cos(\lambda_o + c)\tan\beta$
$\beta_o = \beta - b\sin(\lambda + c')$	$\beta = \beta_o + b\sin(\lambda_o + c)$
$\Omega_o = \Omega - a + b\sin(\Omega + c')\cot i_o$.	$\Omega = \Omega_o + a - b\sin(\Omega_o + c)\cot i$
$i_o = i - b\cos(\Omega + c')$	$i = i_o + b\cos(\Omega_o + c)$
$\omega_o = \omega - b\sin(\Omega + c')\,\mathrm{cosec}\,i_o$	$\omega = \omega_o + b\sin(\Omega_o + c)\,\mathrm{cosec}\,i$

The precessional constants M, N etc. are given by :

$$M = 1^\circ.281\,155\,668\,9\,T + 0^\circ.000\,386\,551\,31\,T^2 + 0^\circ.000\,010\,079\,T^3$$
$$N = 0^\circ.556\,719\,973\,1\,T - 0^\circ.000\,119\,303\,72\,T^2 - 0^\circ.000\,011\,617\,4\,T^3$$
$$a = 1^\circ.396\,887\,83\,T + 0^\circ.000\,307\,065\,22\,T^2$$
$$b = 0^\circ.013\,055\,270\,3\,T - 0^\circ.000\,009\,303\,50\,T^2$$
$$c = 5^\circ.125\,890\,67 + 0^\circ.818\,993\,58\,T + 0^\circ.000\,104\,256\,09\,T^2 - 0^\circ.000\,104\,155\,607\,T^3$$
$$c' = 5^\circ.125\,890\,67 - 0^\circ.577\,894\,252\,T - 0^\circ.000\,164\,504\,28\,T^2 - 0^\circ.000\,104\,177\,728\,T^3$$

where $T = (t - 2000.0)/100 = (JD_{TT} - 245\,1545.0)/36525$

Formulae for the reduction from the mean equinox and equator or ecliptic of the middle of year (t_1) to date (t) are as follows :

$$\alpha = \alpha_1 + \tau\,(m + n \sin \alpha_1 \tan \delta_1) \qquad \delta = \delta_1 + \tau\, n \cos \alpha_1$$
$$\lambda = \lambda_1 + \tau\,\{p - \pi \cos(\lambda_1 + 6^\circ) \tan \beta\} \qquad \beta = \beta_1 + \tau\,\pi \sin(\lambda_1 + 6^\circ)$$
$$\Omega = \Omega_1 + \tau\,\{\rho - \pi \sin(\Omega_1 + 6^\circ) \cot i\} \qquad i = i_1 + \tau\,\pi \cos(\Omega_1 + 6^\circ)$$
$$\omega = \omega_1 + \tau\,\pi \sin(\Omega_1 + 6^\circ) \operatorname{cosec} i$$

where $\tau = t - t_1$ and π is the annual rate of rotation of the ecliptic. The precessional constants p, m, etc. are as follows :

		Epoch J 2022.5
Annual general precession	p =	$+\ 0^\circ.013\,971\,10$
Annual precession in R.A.	m =	$+\ 0^\circ.012\,814\,07$
Annual precession in Dec.	n =	$+\ 0^\circ.005\,566\,99$
Annual rate of rotation	π =	$+\ 0^\circ.000\,130\,52$
Longitude of axis	Π =	$+\ 175^\circ.0820$

$$\gamma = 180^\circ - \Pi = +\,4^\circ.9180$$

Where Π is the longitude of the instantaneous rotation axis of the ecliptic, measured from the mean equinox of date.

Nutation

The changes in the amplitudes of the nutation components are also not directly taken from the observations; instead a new nutation theory is developed and fit to observations by allowing a small number of geophysical constants to be free parameters. These parameters are constants in a "transfer function" that modifies the amplitudes of the terms from a rigid- Earth nutation development. Since there are fewer solved-for geophysical constants than the number of terms with observed amplitudes, the fit cannot be perfect. For the IAU 2000A model, 7 geophysical parameters were determined based on the observed amplitudes of 21 nutation terms (prograde and retrograde amplitudes for each) together with the apparent change in the rate of precession in longitude. Note that the number of free parameters in the model are both quite small compared to the 1365 terms in the new, full nutation serirs.

Nutation is conventionally expressed as two small angles, $\Delta\psi$ the nutation in longitude, and $\Delta\varepsilon$, the nutation in obliquity. These angles are measured in the Ecliptic system of date, which is developed as a part of precession formulation. The angle $\Delta\psi$ is the small change in the position of the equinox along the ecliptic due to nutation, so effect of nutation on the ecliptic coordinates of a fixed point in the sky is simply to add $\Delta\psi$ to its ecliptic longitude. The angle $\Delta\varepsilon$ is the small change in the obliquity of the ecliptic due to nutation. The true obliquity of date is $\varepsilon' = \varepsilon + \Delta\varepsilon$. Nutation in obliquity reflects the orientation of the equator in space and does not affect the ecliptic coordinates of a fixed point on the sky.

Formulas for Nutation

l is the mean anomaly of the Moon.

l' is the mean anomaly of the Sun (Earth).

Ω is the longitude of the ascending node of the Moon's mean orbit on the ecliptic, measured from the mean equinox of date.

D is the mean elongation of the Moon from the Sun.

F is the difference $L - \Omega$, where L is the mean longitude of the Moon.

ε $= \varepsilon_0 - 46''.836\,769\,T - 0''.000\,183\,1\,T^2 + 0''.002\,003\,4\,T^3 - 0''.000\,000\,576\,T^4 - 0''.000\,000\,043\,4\,T^5$

where $\varepsilon_0 = 84381''.406$

EXPLANATION

The fundamental arguments are given by:

The five arguments are the same fundamental luni - solar arguments used in previous nutation theories, but with updated expressions.

l = $485\,868''.249\,036 + (1325^r + 715\,923''.2178)\,T + 31''.8792\,T^2 + 0''.051\,635\,T^3 - 0''.000\,244\,70\,T^4$

l' = $128\,7104''.793\,04 + (99^r + 129\,2581''.048)\,T - 0''.5532\,T^2 - 0''.000\,136\,T^3 - 0''.000\,011\,49\,T^4$

F = $335\,779''.526\,232 + (1342^r + 295\,262''.8478)\,T - 12''.7512\,T^2 - 0''.001\,037\,T^3 + 0''.000\,004\,17\,T^4$

D = $107\,2260''.703\,69 + (1236^r + 110\,5601''.209)\,T - 6''.3706\,T^2 + 0''.006\,593\,T^3 - 0''.000\,031\,69\,T^4$

Ω = $450\,160''.398\,036 - (5^r + 482\,890''.5431)\,T + 7''.722\,T^2 + 0''.007\,702\,T^3 - 0''.000\,059\,39\,T^4$

where $1^r = 360^o = 129\,6000''$

Reduction for nutation - rigorous formulae

Nutation in longitude ($\Delta\psi$) and obliquity ($\Delta\varepsilon$) have been calculated using IAU 2000A series definitions (order of 1 μas) with the following adjustments which are required for use at the highest precession with the IAU 2006 precession, viz:

$$\Delta\psi = \Delta\psi_{2000A} + (0.4697 \times 10^{-6} - 2.7774 \times 10^{-6} T)\,\Delta\psi_{2000A}$$

$$\Delta\varepsilon = \Delta\varepsilon_{2000A} - 2.7774 \times 10^{-6}\, T\, \Delta\varepsilon_{2000A}$$

where T is measured in Julian centuries from 245 1545.0 TT. $\Delta\psi$ and $\Delta\varepsilon$ together with the true obliquity of the ecliptic (ε') are tabulated daily at 0^h TT, on page 18 to 32.

Once the nutation series has been evaluated and the values of $\Delta\psi$ and $\Delta\varepsilon$ are available, the nutation matrix can be constructed.

A mean place ($\mathbf{r}_m$) may be transformed to a true place $(\mathbf{r}_t)$ and vice versa, as follows:

$\mathbf{r}_t = \mathbf{N}\,\mathbf{r}_m$ $\qquad \mathbf{r}_m = N^{-1}\,\mathbf{r}_t$

where $\mathbf{N} = \mathbf{R}_1(-\varepsilon')\,\mathbf{R}_3(-\Delta\psi)\,\mathbf{R}_1(+\varepsilon)$

$\varepsilon' = \varepsilon + \Delta\varepsilon$

$\mathbf{R}_1$ and $\mathbf{R}_3$ are the standard rotations about the x and z axes respectively.

(i) A rotation from the mean equator and equinox of t to the mean ecliptic and equinox of t. This is simply a rotation around the x - axis (the direction toward the mean equinox of t) by the angle ε , the mean obliquity of t.

(ii) A rotation around the new z-axis (the direction toward the ecliptic pole of t) by the angle - $\Delta\psi$, the amount of nutation in longitude at t. After the rotation, the new x- axis is in the direction of true equinox of t.

(iii) A rotation around the new x-axis (the direction toward true equinox of t by the angle $-\varepsilon'$, the true oliquity of t. After the rotation, the fundamental plane is the true equator of t, orthogonal to the computed position of the CIP at t.

The nutation matrix can be written:

$$\mathbf{N} = \begin{bmatrix} C_2 & S_2C_1 & S_2S_1 \\ -S_2C_3 & C_3C_2C_1 - S_1S_3 & C_3C_2S_1 + C_1S_3 \\ S_2S_3 & -S_3C_2C_1 - S_1C_3 & -S_3C_2S_1 + C_3C_1 \end{bmatrix}$$

where $S_1 = \sin(\varepsilon)$ $\quad S_2 = \sin(-\Delta\psi)$ $\quad S_3 = \sin(-\varepsilon - \Delta\varepsilon)$

$C_1 = \cos(\varepsilon)$ $\quad C_2 = \cos(-\Delta\psi)$ $\quad C_3 = \cos(-\varepsilon - \Delta\varepsilon)$

Approximate reduction for nutation for converting mean place to true place can be done with the help of the following formualae :

$$\Delta\alpha = (\cos\varepsilon + \sin\varepsilon\,\sin\alpha\,\tan\delta)\,\Delta\psi - \cos\alpha\,\tan\delta\,\Delta\varepsilon$$

$$\Delta\delta = \sin\varepsilon\,\cos\alpha\,\Delta\psi + \sin\alpha\,\Delta\varepsilon$$

$$\Delta\lambda = \Delta\psi; \qquad \Delta\beta = 0$$

where $\Delta\psi$ and $\Delta\varepsilon$ are nutations in longitude and obliquity respectively. Mean rectangular coordinates (x, y, z) can be converted to true rectangular co-ordinates with the help of the following :

$$\Delta x = -(y \cos \varepsilon + z \sin \varepsilon)\, \Delta\psi$$
$$\Delta y = +x\, \Delta\psi \cos \varepsilon - z\, \Delta\varepsilon$$
$$\Delta z = +x\, \Delta\psi \sin \varepsilon + y\, \Delta\varepsilon$$

where both $\Delta\psi$ and $\Delta\varepsilon$ are in radians.

The elements of the corresponding rotation matrix are:

$$\mathbf{N} = \begin{bmatrix} 1 & -\Delta\psi \cos \varepsilon & -\Delta\psi \sin \varepsilon \\ +\Delta\psi \cos \varepsilon & 1 & -\Delta\varepsilon \\ +\Delta\psi \sin \varepsilon & +\Delta\varepsilon & 1 \end{bmatrix}$$

Daily values of $\Delta\psi$ and $\Delta\varepsilon$ during 2022 are tabulated on pages 18 to 32.

Approximate reduction for precession and nutation in right ascension and declination from the standard equinox and equator of J 2000.0 to the true equinox and equator of date during 2022 can be done using the following formulae and table :

$$\alpha = \alpha_o + f + g \sin (G + \alpha_o) \tan \delta_o$$
$$\delta = \delta_o + g \cos (G + \alpha_o)$$

where the units of the correction to α_o and δ_o are in second of time and minutes of arc respectively.

Date 2022		*f* s	*g* s	*g* ′	*G* h	m	Date 2022		*f* s	*g* s	*g* ′	*G* h	m
Jan.	**- 9**	+66.7	29.0	7.24	23	58	**June**	**30** *	+68.4	29.7	7.43	23	58
	1	+66.8	29.0	7.25	23	58	**July**	**10**	+68.5	29.8	7.44	23	58
	11	+66.9	29.1	7.27	23	58		**20**	+68.6	29.8	7.45	23	58
	21 * †	+67.0	29.1	7.28	23	58		**30**	+68.7	29.9	7.47	23	58
	31	+67.1	29.2	7.29	23	58	**Aug.**	**9** *	+68.8	29.9	7.47	23	57
Feb.	**10**	+67.2	29.2	7.30	23	58		**19**	+68.9	29.9	7.48	23	57
	20	+67.3	29.2	7.31	23	58		**29**	+69.0	30.0	7.49	23	57
Mar.	**2** *	+67.4	29.3	7.32	23	58	**Sept.**	**8**	+69.1	30.0	7.50	23	57
	12	+67.4	29.3	7.32	23	58		**18** *	+69.1	30.0	7.51	23	57
	22	+67.5	29.3	7.33	23	58		**28**	+69.1	30.0	7.51	23	57
Apr.	**1**	+67.5	29.3	7.34	23	57	**Oct.**	**8**	+69.2	30.1	7.52	23	57
	11 *	+67.6	29.4	7.35	23	58		**18**	+69.3	30.1	7.53	23	57
	21	+67.7	29.4	7.35	23	58		**28** *	+69.4	30.1	7.54	23	57
May.	**1**	+67.7	29.4	7.36	23	58	**Nov.**	**7**	+69.5	30.2	7.55	23	57
	11	+67.9	29.5	7.37	23	58		**17**	+69.6	30.2	7.56	23	57
	21 *	+68.0	29.5	7.38	23	58		**27**	+69.7	30.3	7.57	23	57
	31	+68.0	29.6	7.39	23	58	**Dec.**	**7** *	+69.8	30.3	7.58	23	57
June	**10**	+68.2	29.6	7.40	23	58		**17**	+69.9	30.4	7.59	23	57
	20	+68.3	29.7	7.42	23	58		**27**	+70.0	30.4	7.61	23	57
	30 *	+68.4	29.7	7.43	23	58		**37**	+70.1	30.5	7.62	23	57

* 40 - day date † 400 day date for osculation epoch

Differential Precession and Nutation can be applied to obtain the differences in the mean place of an object relative to a comparison star for a standard epoch (J 2000.0) using the following formulae:

correction to R.A. : $e \tan \delta \, \Delta\alpha \; - \; f \sec^2 \delta \, \Delta\delta$

correction to declination : $f \, \Delta\alpha$

where $\Delta\alpha$ and $\Delta\delta$ are the observed differences in right ascension and declination of the object relative to the comparison star and

$e \;=\; - \cos \alpha \,(n\, t + \sin \varepsilon \, \Delta\psi) \; - \sin \alpha \, \Delta\varepsilon$

$f \;=\; + \sin \alpha \,(n\, t + \sin \varepsilon \, \Delta\psi) \; - \cos \alpha \, \Delta\varepsilon$

$\varepsilon \;=\; 23^\circ.44, \; \sin\varepsilon = 0.398$

$n \;=\; 0.000\,0972$ radian for epoch J 2022.5

t is the time in years from the standard epoch to the time of observation.

$\Delta\psi$, $\Delta\varepsilon$ are nutations in longitude and obliquity at the time of observation expressed in radians, (1" = 0.000 004 8481 rad).

Aberration

Aberration is the displacement of the position of a celestial object due to finite speed of light. The actual velocity of light in space c is the vectorial sum of its velocity relative to the observer c_r and the velocity V of the observer. Although the special theory of relativity has no provision of breaking up aberration of light into components, total effects of aberration in astronomy are broken into stellar, annual, elliptic, secular and planetary aberration for convenience of computation. In case of stars, all that can be determined is the displacement in their positions caused by the motion of the observer alone. It is calculated on the basis of the actual instantaneous motion of the Earth round the barycentre of the solar system.

Earlier, the practice was to resolve the stellar aberration into two components; one contributed by the circular motion of the Earth moving with a constant mean velocity round the Sun, and the other, a nearly constant displacement perpendicular to the major axis of the orbit arising due to ellipticity of the orbit of the Earth. The latter, known as the E-terms of aberration was included in the mean position of the stars as given in star catalogues and was omitted in the computation of day numbers. As a result, the mean places of stars differed from the catalogue mean places. This procedure was adopted to minimise the computation work for the user of star catalogues. However, this practice has caused much confusion lately because the accurate total velocity of the Earth referred to the barycentre of the solar system could not be used in computing stellar aberration. In accordance with a decision of the IAU in 1976, this occasion has been used to simplify this procedure by removing the E terms of aberration from the mean places and to include them in the reduction from mean to apparent place so that the apparent places remain unchanged. Thus, the mean places of FK5 are free from E terms. In other words, they will be the positions of the stars at epoch J 2000.0 as viewed from the barycentre of the solar system, in the co-ordinate system defined by the Earth's mean equator and equinox of J 2000.0.

The conversion of 1950.0 star catalogue positions (α, δ) to actual mean places $(\alpha+\Delta\alpha, \; \delta+\Delta\delta)$ can be accomplished by :

$$\Delta\alpha = 0^{s}.\,0227 \sin(\alpha + 11^{h}.\,25) \sec\delta$$

$$\Delta\delta = 0''.341 \cos(\alpha + 11^{h}.\,25) \sin\delta + 0''.029 \cos\delta$$

For solar system objects, the displacement of the light source during the time (Δt) taken by light to travel from it to the Earth combined with the effect of relative motion of the Earth and the light is known as planetary aberration. Its computation requires a knowledge of the distance and motion of the light source and can be accomplished as follows. First, the barycentric position of the body at time t- Δt is combined with the barycentric position of the Earth at time t and then the correction for annual aberration is applied. Planetary aberration may also be

computed by interpolating the geometric (geocentric) ephemeris of the body to the time $t - \Delta t$. The light time Δt is given by:

$$\Delta t \text{ (in days)} = 0.005\,7755 \times \text{distance in a.u.}$$

Annual aberration for reduction from a geometric place (α_0, δ_o) to an apparent geocentric place (α, δ) is given by :

$$\alpha = \alpha_0 + (-\dot{X} \sin \alpha_0 + \dot{Y} \cos \alpha_0) / (c \cos \delta_0)$$

$$\delta = \delta_0 + (-\dot{X} \cos \alpha_0 \sin \delta_0 - \dot{Y} \sin \alpha_0 \sin \delta_0 + \dot{Z} \cos \delta_0) / c,$$ where c = 173.14 a.u./day and $\dot{X}, \dot{Y}, \dot{Z}$ are the velocity components of the Earth (pages 256 to 270).

The reduction of observations of the radial velocity to a common origin at the barycentre is given by adding the component of the Earth's velocity in the direction (α_0, δ_0) of the object :

$$\dot{X} \cos \alpha_0 \cos \delta_0 + \dot{Y} \sin \alpha_0 \cos \delta_0 + \dot{Z} \sin \delta_0$$

Differential annual aberration corrections to be added to the observed differences of right ascension and declination (in the sense moving object minus star) to give true differences are:

(R.A.) a $\Delta\alpha$ + b $\Delta\delta$ (in units of $0^s.001$) ; (declination) c $\Delta\alpha$ + d $\Delta\delta$ (in units of $0''.01$)

Here $\Delta\alpha$ is to be taken in units of 1^m and $\Delta\delta$ in units of 1'. The coefficients a, b, c and d are defined by:

$a = -5.701 \cos (H+\alpha) \sec \delta$
$b = -0.380 \sin (H+\alpha) \sec \delta \tan \delta$
$c = +8.552 \sin (H+\alpha) \sin \delta$
$d = -0.570 \cos (H+\alpha) \cos \delta$
$H^h = 23.4 - (\text{day of year}/15.2)$
(The day of year is tabulated on pages 4 to 12)

Annual parallax correction can be calculated approximately for reduction from the catalogue place (α_0,δ_0) to the geocentric place (α,δ) using the following formulae;

$$\alpha = \alpha_0 + (\pi / 15 \cos \delta_0)(X \sin \alpha_0 - Y \cos \alpha_0) \text{ and } \delta = \delta_0 + \pi(X \cos \alpha_0 \sin \delta_0 + Y \sin \alpha_0 \sin \delta_0 - Z \cos \delta_0)$$

where π is the annual parallax and X, Y, Z, are the coordinates of the Earth as given on pages 256 to 270.

Deflection of light in the gravitational field of the Sun may significantly affect the apparent direction of a star or of a body in the solar system. The elongation (E) from the centre of the Sun is increased by an amount that, for a star, depends on the elongation in the following manner:

$$\Delta E = 0''.004\,07 / \tan (E/2)$$

E	0°.25	0°.5	1°	2°	5°	10°	20°	50°	90°
ΔE	1".866	0".933	0".466	0".233	0".093	0".047	0".023	0".009	0".004

The body disappears behind the Sun when E is less than the limmiting grazing value of about 8°.25. The effects in right ascension and declination may be calculated approximately from;

$\cos E = \sin \delta \sin \delta_0 + \cos \delta \cos \delta_0 \cos (\alpha - \alpha_0)$
$\Delta\alpha = 0^s.000\,271 \cos\delta_0 \sin (\alpha-\alpha_0) / (1-\cos E) \cos \delta$
$\Delta\delta = 0''.004\,07 [(\sin \delta \cos \delta_0 \cos (\alpha-\alpha_0) - \cos \delta \sin \delta_0] / (1-\cos E)$
where α, δ refer to the star, and α_0, δ_0 to the Sun.

EXPLANATION

TABULAR DATA

PART-I -TIME SCALES AND EPHEMERIDES

Dates of year beginning in 2022 of various Indian and important foreign chronological eras are listed on page 3 followed by Gregorian calendar for the current year (pages 4 to 12). The calendar contains, besides the usual information, a count of Julian Day (JD) number for each date. The system of Julian day numbers maintains a continuous count of astronomical days, beginning with JD = 0 on 1 January 4713 B.C., Julian proleptic calendar. Julian Day numbers for other years can be found from the table on page 361. Various time scales used in this publication, their inter -relationships (as given on page 2) and the basis for computation of sidereal time as tabulated on pages 13 to 16; have been discussed above under the section on time scales. The concept of equation of time defined as the difference between local apparent solar time and local mean solar time (in the sense apparent minus mean) is no longer used in astronomy and therefore, it is no more tabulated in this publication. It can, however, be obtained to a precision of about 1 second using the following relation :

Equation of time at 12^h U.T. = 12^h – tabulated value of TT of Sun's ephemeris transit (pages 19 to 33).

In this publication, the ephemeridies of the Sun and planets were reported earlier based on computation jointly made by USNO and JPL by simultaneous numerical integration designated as DE 200/ LE 200. A more recent JPL ephemeris, DE 405/ LE 405 has now come into widespread use, provide barycentric equatorial rectangular coordinates for the period 1600 to 2201. The reference frame for basic ephemerides is the ICRF; the alignment onto this frame has an estimated accuracy of 1 - 2 arcseconds. The JPL DE 405/ LE 405 ephemerides have been developed in a barycentric reference system using a barycentric coordinate time scale $T_{eph.}$. The present edition use the DE 405/ LE 405 ephemeridies data on the positions of the Sun, Moon and planets. The value of some astronomical constants based on previously used DE200/ LE200 ephemeridies and currently used DE 405/ LE 405 ephemerides are given below.

Constant	DE 405 Value	DE 200/ LE 200 Value
Light-time for unit distance, τ_A	499.004 783 84 s	499.004 7837………..s
Geocentric gravitational constant, GE	$3.986\,004\,418 \times 10^{14} m^3 s^{-2}$	$3.986\,004\,48 \ldots\ldots \times 10^{14} m^3 s^{-2}$
Heliocentric gravitational constant, GS	$1.327\,124\,42\,099 \times 10^{20} m^3 s^{-2}$	$1.327\,124\,40 \ldots\ldots \times 10^{20} m^3 s^{-2}$
Ratio of mass of Sun to that of Earth, (GS)/ (GE)	332 946.0 487	332 946.038……….
Ratio of mass of Moon to that of Earth, μ	0.012 300 0371	0.012 300 034
Obliquity of the ecliptic at J2000.0, ε	23° 26′ 21″.406	23° 26′ 21″.4119….
Unit distance, A	$1.495\,978\,707 \times 10^{11}$ m	$1.495\,978\,7066 \times 10^{11}$ m
Ratio of mass of Sun to that of Earth + Moon	328 900.5596	328 900.55
Ratio of mass of Sun to mass of each planet :		
Jupiter	1047.348 644	1047.350
Saturn	3497.9018	3498.0
Uranus	229 02.98	229 60
Pluto	$1.365\,66 \times 10^8$	1.3×10^8
Pallas	9.709×10^9	9.247×10^9
Vesta	7.407×10^9	7.253×10^9

EXPLANATION

The Sun

Mean elements of the orbit of the Sun can be calculated with the help of the following expressions for use during 2022 only :

Geometric mean longitude	:	$L = 279^\circ.650\,161 + 0.985\,647\,36\ d$
Mean longitude of perigee	:	$\Gamma = 283^\circ.315\,596 + 0.000\,047\,08\ d$
Mean anomaly	:	$g = 356^\circ.334\,566 + 0.985\,600\,28\ d$
Eccentricity	:	$e = 0^\circ.016\,997\,56 - 0.\,000\,000\,001\ d$
Obliquity of the ecliptic w.r.t. mean equator of date	:	$\varepsilon = 23^\circ.436\,417 - 0.000\,000\,36\ d$

where d is the interval in days from 2022 January 0 at 0^h TT and is given by

d = JD − 245 9579.5 = day of the year (pages 4 to 12) + fraction of day from 0^h TT.

The above angular elements are referred to the mean equinox and ecliptic of date. The position of ecliptic of date with respect to the ecliptic of the standard epoch J 2000.0 is given by the formulae given under *Precession.*

The length of the principal years at 2022.0 as derived from the Sun's mean motion are given on page 2.

Geometric longitude of the Sun with respect to the mean equinox of date is tabulated on even numbered pages 18 to 32. Apparent longitude and latitude are with respect to the true equinox and ecliptic of date respectively. The two longitudes are related as follows :

Apparent longitude = Geometric longitude + nutation in longitude − 20″.4955/ R.

Aberration has been computed by dividing 20".4955 by the true distance to the Sun. Precession in longitude is the total precessional displacement of a point along the ecliptic since the epoch J 2022.5. Revised value of the annual general precession p = 0°. 013 971 10 (for J 2022.5) has been used to compute this quantity. Components of nutation are the results of summation of the revised series of nutation. The sum of the terms with period shorter than 35 days is separately tabulated under Besselian Day numbers (pages 244 to 251).

Apparent Right Ascension and true distance (radius vector), declination (tabulated on odd numbered pages 19 to 33) of the Sun have been computed from the original barycentric rectangular co-ordinates. Although the apparent right ascension and declination have been corrected for light time, the radius vector or the true geocentric distance in astronomical units is the geometric distance at the tabular time.

The Semidiameter is based on a value of 16′ 01″.18 at unit distance being inclusive of an allowance for irradiation of 1″.55. The tabular value is obtained by dividing 16′ 01″.18 by the radius vector.

Ephemeris Transit is the TT of the transit of the Sun over the ephemeris meridian which according to its definition, is 1.002 7379 ΔT east of the Greenwich meridian. Here ΔT is the difference TT − UT. This transit time. This transit time can be interpolated to other meridians with an interpolating factor *p,* as follows:

$$p = -\lambda/360 + 1.002\,7379 \times \Delta T/86400$$

where λ is the longitude (east positive). The interpolated TT can be converted into UT by subtracting ΔT from TT.

Equatorial rectangular co-ordinates (geocentric) of the Sun, referred to the ICRS axes, are given in a.u. on pages 34 to 41. The direction of these axes have been defined by the IAU and realized in practice by the coordinates of several hundred extra galactic radio sources.

EXPLANATION

Horizontal parallax (page 17) of the Sun is the angle subtended at the Sun by the equatorial radius of the Earth. The new value of the Solar parallax $\Pi_o = 8''.794\,148$ has been used to compute the horizontal parallax.

Mean longitude and mean anomaly (page 17) of the Sun have been computed using revised expressions for the mean motion of the Earth around the Sun as given on page 449.

Heliographic co-ordinates given on pages 42 to 45 for 0^h UT include the position angle P of the northern extremity of the axis of rotation measured eastward from the north point of the disc and the heliographic latitude B_o and longitude L_o of the central point of the disc.

The observed angular distance ρ_1 from the centre of the disc of the Sun of a feature on the Sun's surface, as seen from the Earth, can be converted into its heliocentric angular distance ρ from the centreof the Sun's disc as follows :

$$\sin(\rho + \rho_1) = \rho_1 / S, \quad \text{where } S \text{ is the semi diameter of the Sun.}$$

The observed position (ρ, θ) of a feature (Sunspot, etc.) with respect to the centre of Sun's disc can be converted into heliographic co-ordinates (L, B) as follows :

$$\sin B = \sin B_o \cos \rho + \cos B_o \sin \rho \cos(P - \theta)$$
$$\cos B \sin(L - L_o) = \sin \rho \sin(P - \theta)$$
$$\cos B \cos(L - L_o) = \cos \rho \cos B_o - \sin B_o \sin \rho \cos(P - \theta)$$

The physical ephemeris of the Sun has been calculated from the elements determined by R. C. Carrington (observation of the spots on the Sun, 1863).

The Synodic rotation numbers are given below according to R. C. Carrington's Greenwich photoheliographic series which commenced on 9 November, 1853 with number 1. The standard solar meridian from which heliographic longitudes on the surface of the Sun are measured (positive towards the west) is that which passes through the ascending node of the solar equator on the ecliptic on 1854 January 1, Greenwich mean noon. The beginning of each synodic rotation is the instant at which the standard solar meridian passes through the central point of the apparent disc of the Sun, i.e., when the heliographic longitude L_o of this central point is zero.

SYNODIC ROTATION NUMBERS, 2022

Number		Date of Commencement		Number		Date of Commencement		Number		Date of Commencement	
2252	2021	Dec.	15.49	2257		May.	1.07	2262		Sept.	14.17
2253	2022	Jan.	11.82	2258		May.	28.29	2263		Oct.	11.44
2254		Feb.	8.16	2259		June.	24.49	2264		Nov.	7.74
2255		Mar.	7.50	2260	2022	July.	21.69	2265	2022	Dec.	5.05
2256		Apr.	3.80	2261		Aug.	17.91	2266	2023	Jan.	1.38

At the date of commencement of each synodic rotation period, the value of L_o is zero ; that is, the prime meridian passes through the central point of the disk.

The mean rotational elements of the Sun during 2022 are as follows :

Longitude of the ascending node of the solar equator on the ecliptic of date is 76°.01, and on the mean equator of date 16°.16. Inclination of the solar equator on the ecliptic of date is 7°.25, and on the mean equator of date 26°.10. The mean position of the pole on the solar equator is at right ascension 286°.16 and declination 63°.90. Sidereal period of rotation of the prime meridian is 14°.18 44 per day and its mean synodic period of rotation is 27.2753 days.

EXPLANATION

The Moon

The ephemerides of the Moon reported in this publication are based on the fundamental arguments developed by Simon et. al (1994). The angular elements are referred to the mean equinox and ecliptic of date. Mean elements of the mean equator and of the orbit of the Moon (page 47) can be computed during 2022 with the help of the following expressions :-

The inclination i of the mean equator of the Moon to the true equator of the Earth is given by :

$$i = 22^\circ.640\,4 - 0.001\,571\,d - 0.000\,000\,197\,d^2$$

The arc of the mean equator of the Moon from its ascending node on the true equator of the Earth to its ascending node on the ecliptic of date :

$$\Delta = 242^\circ.757\,6 - 0.054\,499\,d - 0.000\,001\,539\,d^2$$

The arc of the true equator of the Earth from the true equinox of date to the ascending node of the mean equator of the Moon :

$$\Omega' = -\,3^\circ.449\,8 + 0.001\,699\,d + 0.000\,001\,670\,d^2$$

The inclination (I) of the mean equator of the Moon to the ecliptic = $1^\circ\ 32'\ 33''.6$.

The ascending node of the mean lunar equator on the ecliptic is at the descending node of the mean lunar orbit on the ecliptic that is at longitude $\Omega + 180^\circ$.

The above expressions give the mean elements with respect to the true equator of the Earth to a precision of about $0^\circ.001$.

The following expressions for the mean elements of the orbit of the Moon Γ', Ω mean longitude of the Moon L' and elongation D are referred to the mean equinox and ecliptic of date.

Mean longitude of the Moon, measured along the ecliptic to the mean ascending node and then along the mean orbit :

$$L' = 244^\circ.074\,043 + 13.176\,396\,46\,d$$

Mean longitude of the Moon's perigee measured in the same way as L' :

$$\Gamma' = 258^\circ.424\,340 + 0.111\,403\,40\,d$$

Mean longitude of the mean ascending node of the lunar orbit on the ecliptic :

$$\Omega = 59^\circ.587\,632 - 0.052\,953\,74\,d$$

Mean elongation of the Moon from the Sun :

$$D = L' - L = 324^\circ.423\,882 + 12.190\,749\,10\,d$$

Mean inclination of the lunar orbit to the ecliptic = $5^\circ.156\,689\,8$

The above expressions are valid for use in 2022 only.

In all the above expressions, the time argument d is the interval in days since 0^h TT January 0, 2022 and is given by $d = \mathrm{JD} - 245\,9579.5$

The length of the principal mean months at 2022.0 as derived from the above mean orbital elements of the Moon are given on page 2.

The apparent geocentric longitude and latitude of the Moon (pages 48 to 63) are referred to the true equinox and ecliptic of date. The true distance between the centres of the Earth and the Moon is given in a.u. Semi-diameter is derived from the horizontal parallax by $S = \mathrm{Sin}^{-1}\,(k \sin\pi)$ where $k = 0.272\,5076$. The semi-diameter at mean distance is taken to be $15'\ 32''.58$ without making any correction for irradiation.

EXPLANATION

The right ascension and declination given on pages 64 to 79 for 0 hour & 12 hour of TT are referred to the true equator and equinox of date.

Horizontal parallax is tabulated at twelve hourly intervals on pages 64 to 79. It is derived from $\sin^{-1}(1/r)$ where r is the true distance in units of the Earth's equatorial radius. The tabulated R.A. and declination have been corrected for light time while the horizontal parallax is the geometric value for the tabular time.

The times of New Moon, First Quarter, Full Moon and Last Quarter are the moments at which the excess of the Moon's apparent longitude over that of the Sun is $0°$, $90°$, $180°$ and $270°$ respectively. Moon at Apogee and Perigee are the times when the Moon is at the greatest and least distance from the Earth. The timings are given in U.T. The corresponding timings in U.T. of the phases of the Moon are also given in the calendar portion on pages 4 to 12. For more precise values of the moments of New Moon and Full Moon, a reference may be made to Part VI - Indian Calendar where the times are given in I.S.T.

Moon's Age, given for 0^h TT, is the number of days elapsed since the preceding New Moon (conjunction). The times of Moon's upper and lower transit are given in TT for the ephemeris meridian. Interpolation to any other meridian by means of differences given and with the help of the ephemeris longitude will yield the local mean time of transit. The apparent geocentric declination given for the time of ephemeris transit can also be similarly interpolated.

Physical ephemeris of the Moon (pages 88 to 95) has been computed using the formulae and constants of D. Eckhardt (*The Moon and the Planets, 25 3, 1981; High precision Earth Rotation and Earth-Moon Dynamics, ed. O. Calame, pages 193-198, 1982)* with inclination *I* as given above (IAU value).

In case of the Moon, selenographic longitudes are measured for a point on the surface of the Moon from the lunar meridian that passes through the mean central point of the visible disc positive towards the west towards Mare Crisium. Selenographic latitudes are reckoned positive towards the north limb. The mean central point of the disc is defined as the point on the lunar surface intersected by the radius of the Moon directed towards the Earth, when the Moon is simultaneously at the ascending node and coincident with the mean longitude.

The Moon presents roughly the same hemisphere to the Earth. However, due to non uniformity of the revolution of the Moon around the Earth (optical libration) and an oscillation of the actual rotational motion of the Moon about its mean rotation (physical libration), about 59% of the Moon's surface can be seen from the Earth. The contribution to the Earth's selenographic longitude and latitude due to physical libration has been tabulated separately. These are geocentric values.

The tabular selenographic longitude and latitude of the Earth are the selenographic co-ordinates of the apparent central point of the Moon from which point the Earth is in selenographic zenith. These co-ordinates are the total librations (sums of optical and physical librations) in longitude and latitude respectively. When the libration in longitude, i.e. the selenographic longitude of the Earth, is positive, the mean central point of the disc is displaced eastward exposing to view a region on the west limb. When the libration in latitude, i.e. the selenographic latitude of the Earth, is positive, a region on the north limb is exposed to view.

The selenographic co-ordinates of the point on the lunar surface where the Sun is in the Zenith are the selenographic co-ordinates of the Sun. The selenographic co-longitude of the Sun tabulated in the ephemeris is obtained by subtracting the selenographic longitude of the Sun from $90°$ or $450°$; it is approximately $270°$, $0°$, $90°$ and $180°$ at new-moon, first quarter, full-moon and last quarter respectively.

The position angle of the axis is the angle that the lunar meridian through the apparent central point of the disc towards the north lunar pole forms with the declination circle through the central point, reckoned counter clockwise from the north point of the disc.

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The position angle of the bright limb is the position angle of the mid point of the illuminated limb, reckoned eastward from the north point of the disc. The position angle of the two cusps may be obtained by adding $\pm\ 90°$ to that of the bright limb.

The expression for calculating the selenographic altitude (a) of the Sun (above the lunar horizon) at a point at selenographic longitude l and latitude b is as follows :

$\sin a = \sin b_\circ \ \sin b \ + \cos b_\circ \ \cos b \ \sin (c_\circ + l)$, where $(c_\circ, b_\circ)$ are the Sun's co-longitude and latitude at the time.

The following expressions can be used to compute the differential corrections to be applied to the tabular geocentric librations to form the topocentric librations :

$$\Delta l \ = \ -\pi' \ \sin (Q - C) \ \sec b$$
$$\Delta b \ = \ +\pi' \ \cos (Q - C)$$

$\Delta \mathrm{C} \ = \ + \sin (b + \Delta b)\ \Delta l \ - \pi' \ \sin Q \ \tan \delta$, where Q is the geocentric parallactic angle of the Moon and π' is the topocentric horizontal parallax. The latter is obtained from the geocentric horizontal parallax (π) (pages 64 to 79) by using :

$$\pi' = \pi \ (\sin z \ + 0.0084 \sin 2\, z)$$

where z is the geocentric zenith distance of the Moon. The values of z and Q may be calculated from the geocentric R.A. (α) and declination (δ) of the Moon by using :

$$\sin z \ \ \sin Q \ = \ \cos \phi \ \sin h$$
$$\sin z \ \cos Q \ = \ \cos \delta \ \sin \phi \ - \ \sin \delta \ \cos \phi \ \cos h$$
$$\cos z \ = \ \sin \delta \ \ \sin \phi \ + \ \cos \delta \ \cos \phi \ \cos h$$

where ϕ is the geocentric latitude of the observer and h is the local hour angle of the Moon given by :

h = local apparent sidereal time $- \alpha$

Second differences in the tabular values of the geocentric librations must be taken into account in interpolation for the time of observation.

Major Planets

The heliocentric and geocentric positions of the major planets given on pages 96 to 197 have been derived directly from the numerical integration mentioned on page 448.

The heliocentric longitude and latitude are referred to the mean equinox and ecliptic of date. The tabular argument of heliocentric ephemeris is barycentric dynamical time (TDB).

The apparent geocentric longitude and latitude are referred to the true equinox and ecliptic of date and are planetary aberration. The apparent right ascension and declination are also corrected for planetary aberration and referred to the true equinox and equator of date. The tabular argument for both the terrestrial dynamical time (TDT). The TDT of transit over the ephemeris meridian has been furnished, which may be interpolated to any other meridian to obtain the LMT of transit.

As regards Pluto, in addition to the usual data, figures have been furnished for reduction of the apparent right ascension and apparent declination to the corresponding astrometric places referred to the mean equinox and equator of J 2000.0. The astrometric ephemeris is obtained by first adding the usual planetary aberration to the

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planet's true geocentric places referred to the standard equinox J 2000.0 and then subtracting the stellar aberration pertinent to the position occupied by the planet. The astrometric place is thus affected by the amount of the terms in the aberration dependent on the longitude of the Earth's perihelion as are the catalogue mean places of stars in the neighbourhood. The astrometric ephemeris is, therefore, rigorously comparable with photographic observations that are referred to catalogue mean places J 2000.0 of neighbouring stars, it being only necessary to correct the observations for geocentric parallax in case of the planets and proper motion in case of the stars.

The tabular true distance from the Earth is the actual geocentric distance at the tabulated time and not at the instant when the light left the planet.

The horizontal parallax of planets is $8''.794\ 143$ divided by the geocentric distance. As regards the semi-diameter, the tabulated value is the value at unit distance divided by the geocentric distance. The semi-diameters at unit distance are as follows : Mercury $3''.36$, Venus $8''.34$, Mars $4''.68$, Jupiter $98''.57$ (Equatorial) and $92''.12$ (Polar), Saturn $83''.13$ (Equatorial) and $74''.96$ (Polar), Uranus $35''.24$, Neptune $34''.14$ and Pluto $2''.07$.

The heliocentric osculating elements of the orbits of the major planets, including Pluto, are given at intervals of 40 days on pages 200 to 201. The osculating elements are the elements of the instantaneous ecliptic orbit of the planet around the Sun determined by its actual position and velocity components for the instant, and as such the elements are affected by the attractions of other planets. The true place of a planet deduced from these elements is thus inclusive of the planetary perturbations, which need not, therefore, be considered separately in such a deduction.

The osculating elements for the Earth refer to the Earth/Moon barycentre. The correction in ecliptic rectangular co-ordinates in conversion from the Earth/Moon barycentre to the Earth's centre is given by :

$$\text{Earth's Centre} = (\text{Earth / Moon barycentre}) - (0.000\,0312\cos L,\ 0.000\,2865\sin L,\ 0.0000124\,\mathrm{sinL},\ -0.00000718\,\mathrm{sinL}, 0.00000657\,\mathrm{cosL},\ 0.00000285\,\mathrm{cosL})$$

where $L = 218° + 481\,268°\,T$, with T measured in Julian centuries from JD 245 1545.0 to 5 decimals; the co-ordinates are in a.u. with reference to mean equinox and ecliptic of date.

PART II - STARS

The mean places of 482 stars, apparent places of 68 stars at 10-day intervals. daily apparent place of *Polaris* and tables for finding latitude of place from altitude of polaris and azimuth of polaris are given in this section. The ecliptic co-ordinates (mean longitude and latitude) of 451 stars have also been given. To facilitate reduction from mean to apparent place of a star, Besselian Day Numbers as well as the barycentric position and velocity components of the Earth alongwith rotation matrix elements for precession and nutation have been tabulated.

Mean Places of Stars (pages 215 to 226)

Beginning with the issue for 1988, calculation of the mean and apparent places are based directly on the basic-FK5 compiled by the A.R.I., Heidelberg.

The table for mean places of stars includes all stars of magnitude upto 3.9 as well as the component stars of the different lunar asterisms of the Hindus, Chinese and Arabian even when those are fainter than magnitude 3.9.

In case double or multiple stars, *m* denotes the mean position of the centre of gravity (*c.g.*) of the system; *p* the preceding component having less right ascension, *f* the following component and *A* the brighter component of the system. The magnitude of the binary stars is the integrated value for the two components.

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The mean longitude and latitude of 451 important stars have been computed using the conversion from equatorial mean positions to ecliptic co-ordinates. Similarly, annual variations in longitude and latitude, etc., are the differentials of the conversion formulae. All quantities relate to the middle of the current Julian year.

Apparent Places of Stars (pages 227 to 243)

The apparent places of 68 selected stars are reported under this section. These positions are completely based on the FK5 beginning with the issue for 1988.

Smaller aberration has been computed from the total velocity of the Earth referred to the barycentre of the solar system. The E-terms of aberration are no longer included in the mean places in the FK5, but rather in the reduction from mean to apparent places.

Reductions to apparent places have been computed rigorously and directly without the intermediary of the mean place for the begining of the year. The rigorous computation also includes effects of relativistic light deflection. Because of this, the apparent places of a star when approaching very closely the Sun cannot be interpolated by the user, but these cases are of no practical interest in normal applications.

Apparent places of 68 bright stars with annual variation and annual proper motion at 10-day interval have been given on pages 227 to 243. The number, name, are taken generally from the FK5, magnitude and spectrum are taken from SIMBAD data base. Corrections for parallax have been applied where appreciable.

The right ascension and declination are referred to the true equator and equinox of date but with the omission of the short period terms of nutation. After interpolating the given apparent places to date and longitude of the station, the following corrections for the effect of short period terms of nutation are to be applied :

$$\Delta\alpha = a\, d\psi + b\, d\varepsilon \quad \text{seconds of time}$$
$$\Delta\delta = a'\, d\psi + b'\, d\varepsilon \quad \text{seconds of arc}$$

where $d\psi$ and $d\varepsilon$ are short period terms of nutation as tabulated on pages 244 to 251. The values of a, b, a' and b' are given for each star under the apparent place.

The Apparent places of Polaris for each day of the year (pages 272 to 274) have been computed rigorously.

Besselian Day Numbers (pages 244 to 251)

All stellar data tabulations are now for the standard epoch at the middle of the current Julian year rather than the beginning of the Besselian year and accordingly the Besselian Day Numbers and second order day numbers are referred to the mean equator and equinox of the epoch, J 2022.5. Although for full precision the reduction to the apparent place has to be computed rigorously as described below, Besselian Day Numbers can still be used for less precision.

In the tabulated data, τ is the fraction of the Julian year since the standard epoch J 2022.5 A, B and E are Besselian Day Numbers designed to incorporate corrections to the position of a star on account of precession and nutation. In this case, the correction due to precession is measured from the middle of the year, and this is secured by incorporating in A the value of the precision corresponding to τ.The terms of short-period in nutation are included in A and B, which are also shown separately on pages 244 to 251.

The Besselian Day Numbers C and D, designed to include the effect of aberration, are now computed based on the total velocity of the Earth.

Second order day numbers, needed only for high declination stars for high accuracy, have been tabulated on pages 252 to 255.

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The barycentric position and velocity components of the Earth and rotation matrix elements for rigorous reduction of precesision and nutation have been tabulated on pages 256 to 270. Use of these data with examples is discussed below :-

Apparent place reduction with full precision (rigorous method)

Conversion of the barycentric co-ordinates of a star for the standard equinox and equator of J 2000.0 (TDB) to its apparent geocentric co-ordinates referred to the true equinox and equator of date (TT) can be done rigorously as follows:

The geocentric vector **P** of the star at the required epoch (ignoring the distinction between TDB and TT for the stellar case) is given be by:

$$\mathbf{P} = \mathbf{q} + T\mathbf{m} - \pi\mathbf{E_B} \text{ ....(1)}$$

Here **q** is the barycentric direction of the star at epoch J 2000.0 referred to the standard equinox and equator of J2000.0 and is given by :-

$$\mathbf{q} = (\cos\alpha_0 \cos\delta_0 ,\ \sin\alpha_0 \cos\delta_0 ,\ \sin\delta_0)$$

where α_0 and δ_0 are the right ascension and declination for the equator, equinox and epoch of J 2000.0.

The space motion vector $\mathbf{m} = (m_x, m_y, m_z)$ of the star in equation (1), expressed in radians/century, is given by :

$$\begin{aligned}
m_x &= -\mu_\alpha \cos\delta_0 \sin\alpha_0 - \mu_\delta \sin\delta_0 \cos\alpha_0 + \nu\pi \cos\delta_0 \cos\alpha_0 \\
m_y &= \mu_\alpha \cos\delta_0 \cos\alpha_0 - \mu_\delta \sin\delta_0 \sin\alpha_0 + \nu\pi \cos\delta_0 \sin\alpha_0 \\
m_z &= \mu_\delta \cos\delta_0 + \nu\pi \sin\delta_0
\end{aligned}$$

where these expressions take into account the radial velocity (v) in au/century (1 km/s = 21.094 952 75 a.u./ century), measured positively away from the Earth as well as proper motion(μ_α, μ_δ) in right ascension and declination in radian/century and π is the parallax in radians.

T is the interval in Julian centuries from J2000.0, given by $T = (JD - 245\,1545.0)/ 36525$; $\mathbf{E}_B$ and $\dot{\mathbf{E}}_\mathbf{B}$ in a.u. per day are Earth's barycentric position and velocity vectors at co-ordinate time t = TDB referred to the equator and equinox of J 2000.0 (pages 256 to 270).

The heliocentric position of the Earth **E** is given by

$$\mathbf{E} = \mathbf{E}_B - \mathbf{S}_B \text{ ....(2)}$$

Where $\mathbf{S_B}$ is the barycentric position of the Sun at time t. This can be obtained from the heliocentric position of the barycentre tabulated on page 202 by reversing the sign of the respective x, y, and z.

The geocentric direction **p** of the star and the unit vector **e** can be computed from $\mathbf{p} = \mathbf{P}/|\mathbf{P}|$ and $\mathbf{e} = \mathbf{E}/|\mathbf{E}|$

The geocentric direction $\mathbf{p_1}$ of the star after applying the correction for light deflection in the natural frame is obtained as follows:

$$\mathbf{p_1} = \mathbf{p} + (2\ \mu/c^2 E)(\mathbf{e} - (\mathbf{p}.\mathbf{e})\,\mathbf{p})/(1 + \mathbf{p}.\mathbf{e}) \text{.............(3)}$$

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Where $\mu/c^2 = 9.87 \times 10^{-9}$ a.u and $E = |\mathbf{E}|$, the vector $\mathbf{p}_1$ is a unit vector to the order of μ/c^2 and dot (**.**) indicates scalar product.

The proper direction $\mathbf{p}_2$ in the geocentric inertial frame, that is moving with the instantaneous velocity **V** of the Earth relative to the natural frame, is given by:

$$\mathbf{p}_2 = (\beta^{-1}\mathbf{p}_1 + (1 + \mathbf{p}_1.\mathbf{V})/(1+\beta^{-1}))\mathbf{V})/(1+\mathbf{p}_1.\mathbf{V}) \ldots\ldots\ldots\ldots\ldots(4)$$

Where $\mathbf{V} = \dot{\mathbf{E}}_{\mathbf{B}}/c = 0.0057755\ \dot{\mathbf{E}}_{\mathbf{B}}$ and $\beta = (1 - V^2)^{-1/2}$; the velocity **V** expressed in units of velocity of light and is equal to the Earth's velocity in the barycentric frame to the order of V^2.

The apparent geocentric direction $\mathbf{p}_3$ is obtained by applying precession and nutation to the proper direction $\mathbf{p}_2$ by multiplying it row by column with the rotation matrix M=NPB (given on pages 257 to 271) as follows:

$$\mathbf{p}_3 = M\,\mathbf{p}_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The above direction $\mathbf{p}_3$ is in rectangular co- ordinates (ξ, η, ζ). It can be converted into spherical co- ordinates (α, δ) using :

$$\alpha = \tan^{-1}(\eta/\xi) \quad \text{and} \quad \delta = \tan^{-1}(\zeta/\beta) \ldots\ldots\ldots\ldots\ldots\ldots(6)$$

Where $\beta = (\xi^2 + \eta^2)^{1/2}$

where the quadrant of α can be determined by the signs of ξ and η.

Correction for polar motion :

The apparent geocentric direction $\mathbf{p}_3$, given by equation (5) above, is for the true equator and equinox with the z axis pointing towards the celestial ephemeris pole. A further correction for polar motion may be applied to $\mathbf{p}_3$ to obtain $\mathbf{p}_4$ i.e. the direction relative to the conventional terrestrial reference system in which the z-axis is in the direction of the adopted mean position of the pole, as follows :

$$\mathbf{p}_4 = \mathbf{R}_2(-x)\,\mathbf{R}_1(-y)\,\mathbf{R}_3(\text{GAST})\,\mathbf{p}_3$$

where GAST is the Greenwich apparent sidereal time at the corresponding instant of UT and

$$\mathbf{R}_1(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & \sin\theta \\ 0 & -\sin\theta & \cos\theta \end{bmatrix} \qquad \mathbf{R}_2(\theta) = \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix}$$

$$\mathbf{R}_3(\theta) = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

are the standard matrices that produce rotations through an angle θ about the x, y and z - axes respectively.

Polar motion is described by x and y, the co- ordinates of the celestial ephemeris pole with respect to the adopted origin; x and y are measured in seconds of arc from the origin along the meridians at longitudes 0° and 270°. Current values for the reduction of observations are published by the International Polar Motion Service and the Bureau International de l' Heure.

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Example of stellar reduction :

Calculation of apparent position of a fictitious star on 2022, January 1 at 0^h TT from the catalogue data, mean right ascension (α_0), declination (δ_0), centennial proper motion (μ_α, μ_δ) in right ascension and declination, parallax (π) and radial velocity (ν) of a fictitious star for the standard equinox and equator of J 2000.0 (TDB) as given below:

$\alpha_0 = 14^h\ 39^m\ 36^s.087$

$\mu_\alpha = -49.486$ s/ century
$= -0.003\,598\,7$ rad/century

$\delta_0 = -60°\ 50'\ 07''.14$

$\mu_\delta = +69''.60$ s/ century
$= +0.000\,337\,4$ rad/ century

$\pi = 0''.752$
$= 3.646 \times 10^{-6}$ rad

$\nu = -22.2$ km/ s
$\nu\,\pi = -0.001\,707\,4$ rad/ century

The barycentric position vector of the Sun and the position and velocity vectors of the Earth referred to J2000.0 on 2022 January 1, 0^h TDB (pages 202, 256 to 270) are :

Vector	Julian date	Barycentric Rectangular Components x	y	z
$\mathbf{E_B}$	245 9580.5	$-0.183\,233\,697$	$+0.890\,887\,343$	$+0.386\,385\,809$
$\dot{\mathbf{E}}_\mathbf{B}$	245 9580.5	$-0.017\,221\,344$	$-0.002\,870\,041$	$-0.001\,243\,193$
$\mathbf{S_B}$	245 9580.5	$-0.008\,580\,131$	$+0.003\,002\,315$	$+0.001\,490\,227$

In order to calculate the geocentric vector **P** of the star at J 2000.0, using equation (1), the vectors **q** and **m** may be computed using positional data of the star.

$\mathbf{q} = (-0.373\,854\,098,\quad -0.312\,594\,565,\quad -0.873\,222\,624)$
$\mathbf{m} = (-0.000\,712\,684,\quad +0.001\,690\,102,\quad +0.001\,655\,340)$
$\mathbf{T} = (245\,9580.5 - 245\,1545.0)/\,36525 = +0.22$

The geocentric vector **P** may be computed from equation (1) by substituting the vectors **q, m** and $\mathbf{E_B}$ and time **T**.

$\mathbf{P} = (-0.374\,010\,221,\quad -0.312\,222\,742,\quad -0.872\,858\,450)$ and $|\mathbf{P}| = 0.999\,624\,209$

The heliocentric position vector **E** of earth may be obtained using equation (2)

$\mathbf{E} = (-0.174\,653\,566,\quad +0.887\,885\,028,\quad +0.384\,895\,582)$ and $|\mathbf{E}| = 0.983\,355\,633$

The unit vectors **p** and **e** in the direction of **P** and **E** respectively are as follows :

$\mathbf{p} = (-0.374\,150\,823,\quad -0.312\,340\,117,\quad -0.873\,186\,585)$

$\mathbf{e} = (-0.177\,609\,768,\quad +0.902\,913\,451,\quad +0.391\,410\,360)$

The scalar product $\mathbf{p.e} = -0.557\,337\,530$ and $2\mu/c^2 = 1.974 \times 10^{-8}$ a. u. The second term in the equation (3) represents the correction for the light deflection in the natural frame, and is given by the following vector :

$(2\mu/c^2\,\mathbf{E})(\mathbf{e} - (\mathbf{p.e})\,\mathbf{p})/(1 + \mathbf{p.e}) = (-0.000\,000\,017,\quad +0.000\,000\,032,\quad -0.000\,000\,004)$

Addition of the above correction to the unit vector **p** gives geocentric direction $\mathbf{p_1}$ of the star :

$\mathbf{p_1}$ = (– 0.374 150 840, – 0.312 340 084, – 0.873 186 590)

The velocity vector $\mathbf{V} = 0.000\ 1011\ \dot{\mathbf{E}}_{\mathbf{B}}$ and $\beta^{-1} = (1 - V^2)^{1/2}$ are as follows:

V = (– 0.000 099 462, – 0.000 016 576, – 0.000 007 180)

β^{-1} = 0.999 999 995

The scalar product $\mathbf{p_1} . \mathbf{V}$ = + 0.000 048 661

Now substituting quantities computed above in the equation (4), the proper direction is obtained as:

$\mathbf{p_2}$ = (– 0.374 232 092, – 0.312 341 460, – 0.873 151 277)

The precession and nutation matrix (**M**) from page 257 is as follows:

$$\mathbf{M} = \begin{bmatrix} +0.999\,985\,985 & -0.004\,855\,855 & -0.002\,109\,802 \\ +0.004\,855\,813 & +0.999\,988\,210 & -0.000\,048\,518 \\ +0.002\,109\,897 & +0.000\,014\,607 & +0.999\,997\,774 \end{bmatrix}$$

Finally the apparent geocentric direction $\mathbf{p_3}$ is obtained by multiplying the proper direction $\mathbf{p_2}$ to the precession and nutation matrix as given by the equation (5).

Thus $\mathbf{p_3}$ = (– 0.370 867 987, – 0.314 133 280, – 0.873 943 487) and the apparent right ascension and declination:

$\alpha = \tan^{-1}(\eta/\xi) = 14^{h}\ 41^{m}\ 3^{s}.679$; $\delta = \tan^{-1}(\zeta/\beta) = -60^\circ\ 55''\ 12'.660$

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PART III - Tables of Sunrise, Sunset, Twilight and Moonrise, Moonset

The times of Sunrise, Sunset and Twilight, which can be obtained immediately from the given tables by simple interpolation for the desired latitude within the scope of the tables, are in local mean time of the place. Strictly speaking, the timings of these events are for places on the meridian of Greenwich. By simple interpolation for longitude, the correct time (L.M.T.) for the station can be obtained, which can thereafter be reduced to the zonal standard time by applying correction of time pertinent to the place.

At the given times of Sunrise and Sunset, the upper limb of the Sun is on the horizon; the true zenith distance of the Sun's center is then taken as 90° 50′, allowing 16′ for semi- diameter and 34′ for horizontal refraction.

The timings of the beginning of morning twilight and ending of evening twilight relate to the instants when the center of the Sun is 18° below the horizon. This is now known as astronomical twilight. The period of twilight has been divided into three parts – Civil when the Sun is 6° below the horizon, Nautical when 12° and Astronomical when 18° and their duration have been given.

The timings of rising and setting in U.T. of a body with right ascension α, declination δ and zenith distance z at latitude ϕ and east longitude λ may be computed from

$$UT = 0.99727\ [\alpha - \lambda\ \pm \cos^{-1}\ \{(\cos z - \sin\phi\sin\delta)/(\cos\phi\ \cos\delta)\} - \text{GAST at } 0^h\,\text{UT}],$$

where each term is expressed in time measure and GAST at 0^h UT as tabulated on page 13. The negative sign in the expression corresponds to rising and positive sign to setting. If the quantity $\{(\cos z - \sin\phi\ \sin\delta)/(\cos\phi\ \cos\delta)$ is numerically greater than one, there is no phenomenon. However, the tabulated timings of Moonrise and Moonset have been computed by inverse by interpolation for the zenith distance at z = 90° 34′.001- 0.72755 π, where π is the horizontal parallax of the Moon at the time of phenomena. The above value includes semi-diameter and the effect of refraction.

The Sunrise and Sunset times for certain stations in India (Kolkata, Varanasi, Chennai, Delhi, Mumbai) have been separately computed and given in Indian Standard Time. In these calculations the amount of horizontal refraction has been taken as 31′, the value derived from consideration of the atmospheric conditions in India, and consequently the zenith distance of the Sun's center is 90° 47′ at the times given. In the section on Indian Calendar, the Sunrise and Sunset times which have been given for latitude 23° 11′ North and Central Meridian of India, also relates to the times when upper limb of the Sun is on the horizon as in the general tables.

The Moonrise and Moonset times given for certain latitudes relate to the local mean time calculated for the Central Meridian of India. By simple interpolation with the help of a table given on page 313, the local mean time for any other latitude can easily be obtained. At the time given, the Moon's upper limb is on the horizon and so the true geocentric zenith distance of the Moon's center is 90° 34′ *plus* semi- diameter of the Moon *minus* the horizontal parallax, where 34′ has been allowed for horizontal refraction. Taking the mean values of the semi-diameter and the parallax, the zenith distance of the Moon at the moment is about 89° 52′, which varies from 89° 55′ to 89° 49′ as the parallax increases from 53′.6 to 61′.9.

The times of Moonrise and Moonset for certain stations in India (Kolkata, Chennai, Delhi and Mumbai) are separately calculated and given in I.S.T.

The times of Sunrise, Sunset and Moonrise, Moonset given are for an observer on the surface of the Earth considered to be a flat surface around that point without any obstruction in the directions of rising or setting. For an observer stationed at some elevation above the surface, the rising will be further accelerated and the setting retarded according to the height of the observer. The additional arc of depression to be considered on this account is 2′.10$\sqrt{h}$ where h is the height of the observer in meters above the ground level. The dip of the sensible horizon is however 1′.77 $\sqrt{h}$. The effect of atmospheric refraction is included in the above results, without which both the terms would have got reduced to the same value of 1′.93 $\sqrt{h}$.

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The values of the arc of depression according to height of the observer are given below:

Height	Depression	Height	Depression	Height	Depression	Height	Depression
Meters	′	Meters	′	Meters	′	Meters	′
0	0.0	40	13.3	300	36	2000	94
2	3.0	50	14.8	400	42	3000	115
5	4.7	75	18.2	500	47	4000	133
10	6.6	100	21.0	750	58	5000	148
20	9.4	150	25.7	1000	66	6000	163
30	11.5	200	29.7	1500	81	7000	176
40	13.3	300	36.4	2000	94	8000	188

The correction to the rising and setting times due to the above height of the observer may be obtained by multiplying the arc of depression given in the table by the figures from the table below:

Latitude of Station

Decli. of Sun	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
° ′	m	m	m	m	m	m	m	m	m	m	m	m	m
0	.067	.068	.071	.077	.082	.087	.094	.104	.108	.113	.119	.126	.133
5	.067	.068	.071	.077	.082	.088	.095	.105	.109	.115	.121	.127	.135
10	.068	.069	.072	.079	.083	.089	.097	.108	.113	.119	.126	.133	.142
15	.069	.070	.074	.081	.086	.093	.101	.113	.119	.127	.134	.144	.156
20	.071	.072	.076	.084	.090	.097	.108	.123	.130	.139	.151	.165	.183
23 27	.073	.074	.078	.087	.093	.102	.114	.132	.142	.155	.171	.192	.223

The deviation of the rising or the setting point on the horizon (i.e., amplitude) on account of the above arc of depression h (obtained after adding to it the normal depression at rising or setting) may be found as $h \tan\phi \sec A$, deviation being towards the north in the northern hemisphere and south in the southern hemisphere. Here A, the amplitude of the rising of setting point measured from the east or west point of the horizon, is obtained from $\sin A - \sin\delta \, \sec\phi$. The values of the amplitude for certain latitudes and declinations are given in a table on page 371.

PART IV — ECLIPSES AND OCCULTATIONS

Eclipses and Occultations have been calculated on the basis of the tabulated positions of the Sun and the Moon. The semi-diameters of the Sun and the Moon used in these calculations exclude irradiation. The Sun's tabular semi-diameter which includes irradiation is diminished by 1."55 for this purpose.

The semi-diameter of the Moon given by $\sin s = k \sin \pi$, where π is the Moon's horizontal parallax is based on the adopted constant $k = 0.272\,5076$ to account for the irregularities of the lunar limb. It corresponds to the mean radius of Watt's datum as determined by observations of occultations and to the adopted radius of the Earth, introduced in 1982 and is consistent with the IAU system of Astronomical constants (1976). It is used with effect from 1986 in this publication. Refraction is neglected in calculation of eclipses of both the Sun and the Moon.

EXPLANATION

The circumstances of the phenomena are given provisionally in Universal Time, using ΔT (A) = + $71^s.0$ and the points on the Earth's surface are also expressed in terms of geographic longitude measured positively to the east.

Lunar Eclipses

In the calculation of lunar eclipses, the semi-diameter of the shadow -cone has been increased by one-fiftieth to take account of the influence of the atmosphere in absorbing Sun's rays passing through it . In the calculation of rising and setting limits, the time when the centre of the Moon becomes visible on the horizon has been considered as rising or setting. Elsewhere in this book the upper limb visible on the horizon is taken as the criterion for rising or setting. The horizontal refraction used in these calculations of rising and setting is 31′.

The method of computation of a lunar eclipse is detailed below :

Let α, δ be the right ascension and declination of the Moon at an instant T_0 at or very near to the moment of opposition, and let α', δ' be the corresponding co-ordinates of the centre of the Earth's shadow (α'= R. A. of Sun + 12^h, δ' = Sun's declination). Let π, s be parallax and semi-diameter of the Moon and π', s' be parallax and semi-diameter of the Sun.

As the Earth is not a perfect sphere, its shadow will differ slightly from a cone. It would however, be sufficient for our purpose if we use a mean radius for the Earth, which is equivalent to submitting for π a parallax π_1, reduced to latitude 45° , so that $\pi_1 = 0.9983\,33\,\pi$.

The radius of the shadow-cone at Moon's distance is 1.02 ($\pi_1 + \pi' - s'$) for umbra, and 1.02 ($\pi_1 + \pi' + s'$) for penumbra.

Let L be the angle between the centre of the Moon and that of the shadow-cone at the desired circumstance of the eclipse, so that

$L_1 = 1.02\,(\pi_1 + \pi' - s') + s$ . . . . for first and last contacts

$L_2 = 1.02\,(\pi_1 + \pi' - s') - s$ . . . . for second and third contacts

For the penumbral eclipse,

$L' = 1.02\,(\pi_1 + \pi' + s') + s$ . . . . for first and last contacts

The Besselian elements x, y may be computed with sufficient accuracy with the following :

$x = (\alpha - \alpha')\cos\delta$ $\qquad$ x' = hourly variation of $(\alpha - \alpha')\cos\delta$

$y = (\delta - \delta')$ $\qquad$ y' = hourly variation of $(\delta - \delta')$

Let $m \sin M = x$, and $m \cos M = y$, so that $\tan M = x/y$, and $m^2 = x^2 + y^2$. The quantity m, taken always positive at all times, represents the angular distance between the centre of the Moon and of the shadow cone. The angle M may take any value from 0° to 360°.

Again, let $n \sin N = x'$, and $n \cos N = y'$, so that $n^2 = x'^2 + y'^2$, and $\tan N = x'/y'$. The angle N lies in the first or the second quadrant according as y' is positive or negative. The value of n is positive.

The time of greatest obscuration or middle of the eclipse is given by

$$T_0 - 1/n\,\{ m \cos (M - N) \} \quad \text{or} \quad T_0 - (x x' + y y')/n^2 \quad \text{(hours)}$$

EXPLANATION

The auxiliary angle ψ is given by :

$\sin \psi = \{ m \sin (M - N) \} / L = (x y' - y x') / nL$. The value of either L_1, L_2 or L' should be used or L according to the circumstances of the eclipse under consideration.

Then, time of the beginning or ending = time of middle + (1/n) ($L \cos \psi$).

The value of ψ should be so taken that $\cos \psi$ may be negative for the beginning and positive for the ending of the phase. In other words, when $\sin \psi$ is positive, i.e., when $(M - N)$ falls in the 1st or the 2nd quadrant, ψ would be in the second quadrant for the beginning and in the first quadrant for the ending; and when $\sin \psi$ is negative, i.e., when $(M - N)$ is in the 3rd or the 4th quadrant, ψ would be in the third quadrant for the beginning and fourth quadrant for the ending.

If greater accuracy is desired, the computations may be repeated using the times obtained above as initial times.

The magnitude of the eclipse, the Moon's diameter being unity, is $(L_1 - \Delta) / 2s$,

where $\Delta = m \sin (M - N)$ is taken positive. When the computations are repeated for greater accuracy, the average values of L_1, Δ and s for the first and last umbral contacts or those corresponding to the time of greatest obscurations should be used.

When Δ becomes less than L_2, the eclipse is a total one. The computations of the beginning and ending of the total phase may be done in the same way as above using the value of L_2.

The position angle of contact P on the Moon's limb, measured from the north point in the direction N.E.S.W. is $180^\circ + N + \psi$ for the first and last contacts both with umbra and penumbra as the case may be, and is $N + \psi$ for the second and third contacts in case of a total eclipse.

When M is calculated for the exact time of the phenomena, i.e., beginning or ending, then P may be obtained by considering $N + \psi = M$, i.e., $P = M + 180^\circ$ or $P = M$ as the case may be.

Solar Eclipses

Computation of the elements and circumstances of solar eclipses has been done following the method of Bessel. The geometric position of the shadow of the Moon relative to the Earth is described by the Besselian elements in a system of geocentric rectangular co-ordinates. In this system, the geocentric plane perpendicular to the axis of the shadow is taken as the xy plane and called the fundamental plane. The x-axis is the intersection of the fundamental plane with the plane of equator and is positive towards east. The y-axis is positive towards the north. The z-axis is parallel to the axis of the shadow and is positive towards the Moon. The tabular values of x and y are the co-ordinates of the axis of the shadow on the fundamental plane in units of the Earth's equatorial radius. The quantities d and μ specify the declination and hour angle of the point on the celestial sphere towards which the axis of the shadow is directed.

The elements l_1 and l_2 are the radii of the penumbral and umbral cones on the fundamental plane. The elements l_2 is regarded as positive for an annular eclipse and negative for a total eclipse. The elements f_1 and f_2 are the angles between the axis of the shadow and the generators of the penumbral and umbral cones respectively.

The Besselian elements x, y, sin d, cos d, μ, l_1 and l_2 are computed and tabulated at an interval of 10 minutes to facilitate the accurate computation of the circumstances of the eclipse. The given eclipse maps show the path of the eclipse, beginning and ending times of the eclipse, the area of visibility and rising and setting limits of the eclipse.

EXPLANATION

The method of computation of the local circumstances of the solar eclipse is given below :

The approximate time (U.T.) of the beginning and ending of a solar eclipse may be obtained from the corresponding eclipse map and used as estimated initial time. To obtain the geocentric rectangular co-ordinates, ξ, η, ζ of the observer located on the surface of the Earth in geographic longitude λ (measured east positive) and latitude ϕ in terms of the Besselian elements, we have;

$$\xi = \rho \cos \phi' \sin H$$

$$\eta = \rho \sin \phi' \cos d - \rho \cos \phi' \sin d \cos H$$

$$\zeta = \rho \sin \phi' \sin d + \rho \cos \phi' \cos d \cos H$$

and their variations per minute as :

$$\xi' = \mu' \rho \cos \phi' \cos H$$

$$\eta' = \mu' \xi \sin d - \zeta d'$$

where $H = \mu + \lambda$ and μ' is variation per minute in hour angle. In most of the cases, the variation ζ' is not needed and may be neglected. The values of $\rho \cos \phi'$ and $\rho \sin \phi'$ used above may be found for the observer's latitude ϕ using Table – XI.

The eclipse begins or ends at the station when $(x - \xi)^2 + (y - \eta)^2 = (l_1 - \zeta \tan f_1)^2$.

Now let $m \sin M = x - \xi$, $m \cos M = y - \eta$ so that $\tan M = (x - \xi)/(y - \eta)$ and $m^2 = (x - \xi)^2 + (y - \eta)^2$. The angle M may have any value from 0° to 360° and m is always positive.

Again let $n \sin N = x' - \xi'$, $n \cos N = y' - \eta'$ so that $\tan N = (x' - \xi')/(y' - \eta')$ and $n^2 = (x' - \xi')^2 + (y' - \eta')^2$. The angle N is in the first two quadrants and n is positive.

The radius of the shadow at a height ζ above the fundamental plane may be determined by $L_1 = l_1 - \zeta \tan f_1$ or $L_2 = l_2 - \zeta \tan f_2$ as the case may be.

Now the required time of the event will be obtained by applying a correction τ to the adopted initial time concerned, given by

$$\tau = -\{m \cos (M - N)\}/n + (L \cos \psi)/n \quad \text{(in minutes),} \quad \text{where } \sin \psi = \{m \sin (M - N)\}/L$$

The value of ψ for which $\cos \psi$ is negative should be taken for the beginning of the eclipse for the beginning of the annular phase or the end of the total phase, and the value of ψ for which $\cos \psi$ is positive is to be taken for the end of the eclipse, for the end of the annular phase or the beginning of the total phase. When $M - N$ falls within 0° to 180°, ψ is in the 2nd or the 1st quadrant according to the required phase of the eclipse, for the other half it is in the 3rd or the 4th quadrant according to the phase.

If the correction τ obtained above exceeds 3 or 4 minutes and greater accuracy is desired, the computation should be repeated using the new times now obtained as initial times.

For finding the time of greatest phase , the calculations should be started adopting a new assumed time midway between the beginning and ending times. The correction to this adopted time is given by:

$$\tau = -\{m \cos (M - N)\}/n \text{ (in minutes).}$$

EXPLANATION

The magnitude of greatest partial eclipse is the fraction of the Sun's diameter obscured by the Moon at the time of greatest phase, and is given by : $M_1 = (L_1 - \Delta) / (2 L_1 - 0.5459)$ where Δ, the minimum distance between the centres of the two bodies, is given by $m \sin (M - N)$ and is to be taken positive.

The magnitude of the central phase, in the same units, is $M_2 = (0.5459) / (2 L_1 - 0.5459)$.

The position angle of the point of contact measured from the north point of the Sun in the direction N. E. S. W. (i.e. clockwise direction) may be obtained from $P = N + \psi$ or if, measured from the vertex, from $V = P - C$ where C, the parallactic angle, is given by $\tan C = (\xi / \eta)$.

Occultations

The occultations of visible planets and certain bright stars (*Aldebaran , Regulas, Spica and Antares)* by the Moon are given whenever they occur, together with the time, area of visibility and the Besselian elements. The area of visibility includes also the regions from which the occultations is visible even during day light hours. The two times given in the first table for the occultations are the times of first and last contact of the shadow cylinder with the Earth and as such the occultation may be expected to be visible only within the period between these times.

The elements are similar to those for solar eclipses and are given for T_0, the instant of conjunction in R.A. when x = 0. The common geocentric hour angle of the bodies, or more precisely of the line passing through the center of the Earth parallel to the line joining the center of the two bodies for the Greenwich meridians is H_0 and its hourly variation is about $60^m.16$ or $15^o.04$. Y is the value of y for the instant of conjunction and x', y' are the hourly variations of x and y. For a place where an occultation is visible, the times of immersion and emersion can be computed with the help of these elements by a method similar to that used in computing the local circumstances of a solar eclipse as explained below:

Let φ and λ be respectively the latitude and longitude of the place. The longitude of place is to be taken in hours and minutes and as usual measured positively towards east of Greenwich.

For night visibility of an occultation, the necessary conditions are as follows:

(1) The Sun must not be much more than an hour above the horizon at the local mean time $T_0 + \lambda$ (and it must be below the horizon at time $T_0 + \lambda + t$).

(2) The Moon must be above the horizon by an appreciable amount, i.e., the quantity $H_0 + \lambda$, taken without regard to sign for this purpose, must be less than the semidiurnal are of the star of planet by at least one hour.

For prediction of an occultation, find the approximate time (U.T.) of local apparent connection by applying to the given T_0 a correction t (in hours) taken from the following table*:

$H_0 + \lambda$

φ	h m 0-00	h m 0-30	h m 1-00	h m 1-30	h m 2-00	h m 2-30	h m 3-00	h m 3-30	h m 4-00	h m 4-30	h m 5-00	h m 5-30	h m 6-00
	h	h	h	h	h	h	h	h	h	h	h	h	h
0°	0.00	0.41	0.77	1.08	1.32	1.50	1.62	1.69	1.72	1.73	1.71	1.65	1.58
10°	0.00	0.40	0.75	1.06	1.29	1.47	1.59	1.66	1.70	1.70	1.69	1.63	1.56
20°	0.00	0.37	0.70	0.99	1.21	1.38	1.51	1.58	1.62	1.63	1.61	1.56	1.50
30°	0.00	0.32	0.62	0.87	1.08	1.24	1.36	1.44	1.49	1.50	1.50	1.45	1.40
40°	0.00	0.26	0.51	0.73	0.92	1.07	1.18	1.26	1.30	1.32	1.32	1.30	1.26
50°	0.00	0.20	0.40	0.58	0.73	0.86	0.96	1.03	1.08	1.11	1.11	1.10	1.07
60°	0.00	0.15	0.29	0.42	0.53	0.63	0.72	0.78	0.83	0.85	0.87	0.86	0.85

*The value of t has the same sign as that of $\sin (H_0 + \lambda)$.

The Besselian elements x and y at the time of local conjunctions $T_0 + t$ may be calculated as follows :

$x = x' t$, and $y = Y + y' t$.

EXPLANATION

Occultations for which y - η for the time local conjunction is not within ± 0.35 will not be visible at the place. In order to decide this, an estimated value of η may be used as an approximation for which the following tables are given indicating the minimum and maximum values of η.

Limiting value of η (when on meridian i.e., when $H_0 + \lambda = 0$)

φ - d ………	0°	10°	20°	30°	40°	50°	60°
η ………	0.00	0.17	0.34	0.50	0.64	0.76	0.86

The values of η has the same sign as that of φ - d.

(* The table has been constructed taking $x' = 0.5773$; for other values of x' the figures will vary inversely. For this purpose the figures of the table may be multiplied by 1.15 for $x' = 0.50$, by 1.05 for $x' = 0.55$, by 0.95 or $x' = 0.60$ and by 0.89 for $x' = 0.65$)

Limiting value of η (when rising or setting i.e. when $H_0 + \lambda + t$ = S.D. arc)

	Latitude (φ)						
d	0°	10°	20°	30°	40°	50°	60°
0°	0.00	0.17	0.34	0.50	0.64	0.76	0.86
± 9	0.00	0.17	0.34	0.50	0.65	0.77	0.87
± 18	0.00	0.18	0.36	0.52	0.67	0.80	0.91
± 27	0.00	0.19	0.38	0.56	0.72	0.86	0.97

The value of η has the same sign that of φ

For the instant $T_0 + t$, compute the following quantities in addition to x and y :

Let H = (H + λ) + $a\,t$ (converted into arc). The value of a has been given for planets under elements; it is 1.027 for stars. The observer's position on the fundamental plane is given by:

$$\xi = \rho \cos \varphi' \sin H \quad \text{and} \quad \eta = \rho \sin \varphi' \cos d - \rho \cos \varphi' \sin d \cos H$$

and the hourly variations ;

$$\xi' = 0.2618\, a\, \rho \cos \varphi' \cos H, \quad \eta' = 0.2618\, a\, \xi \sin d.$$

The value of the co-efficient 0.2618 a is 0.2625 for stars.

Let $u = x - \xi$, $v = y - \eta$, $u' = x' - \xi'$, $v' = y' - \eta'$ so that $n^2 = u'^2 + v'^2$.

Now $\sin \psi = (uv' - vu')$ / nl, where l = 0.2725, for stars, and for planets, it will be found under elements.

The correction τ to the time of immersion and emersion is given by :

$$\tau = -(60/n^2)(uu' + vv') \mp (60\, l / n) \cos \psi$$

The negative sign in the second term is to be taken for immersion or the first contact and the positive sign for emersion or the last contact.

Instant of immersion or emersion = $T_0 + t + \tau$.

If greater accuracy is desired, a second set of calculations may be done in the following way using the new times now obtained as initial times. For the revised time of immersion or emersion T, compute H = (H + λ + at) + $a\tau$, $x, y, \xi, \eta, \xi', \eta'$; u, v, u', v' and D = $uu' + vv'$. The second correction t′ is given by : $t' = (30/D) \times [l^2 - (u^2 + v^2)]$ in mins. of time.

The final time of immersion or emersion = $T + t'$.

The angles of contact on the Moon's limb:

EXPLANATION

$P = M + 180°$, where $\tan M = (u + u't')/(v + v't')$,

$V = P - C$, where $\tan C = (\xi + \xi' t')/(\eta + \eta' t')$,

where t′ is to be taken in hours.

PART V – Miscellaneous Tables

Phenomena

The stellar magnitudes of planets together with their elongations from the Sun have been given under 'phenomena' at suitable intervals of days. The computation in the next portion of the phenomena has been based on longitude and that in the Astronomical Diary mainly on right ascension, with the exception that the conjunctions, squares and oppositions of planets with the Sun included in the latter have been calculated on the basis of longitudes. In the case of conjunctions in right ascension, the differences in declination between the planets or the Moon and the planet have also been given. The dates of heliacal visibility of planets (Mercury to Saturn) have also been given and these are based on the method given on page 469.

Interpolation

Interpolation Coefficients have been given on pages 357 to 360 according to the formula of both Bessel and Everett, for each hundredth part of the time-interval.

Let the tabular value of a function given at equal intervals be represented by f and the first and second differences by Δ with relevant dashes and subscripts as shown below. It is required to determine the value of the function at some intermediate point.

Function	First difference	Second difference
f_{-1}		
	$\Delta'_{-½}$	
f_0		Δ''_0
	$\Delta'_{½}$	
f_1		Δ''_1
	$\Delta'_{1½}$	
f_2		

The epochs for which the values of the function are to be taken should be so chosen that the time for which the value of the function is required may fall within the interval f_0 and f_2 and let n be the time interval from f_0 up to the moment for which the value of the function is required. It is expressed as a fraction of the interval at which the given values of the function are tabulated. Let f_n be the value of the function for the desired time which is now required to be determined.

The two formulae for interpolation which are generally used for the purpose are as follows :

$f_n = f_0 + n\,\Delta'_{½} + B''(\Delta''_0 + \Delta''_1)$…………………Bessel
$f_n = f_0 + n\,\Delta'_{½} + E_0''\Delta''_0 + E_1''\Delta''_1$………………Everett

in which $f_0 + n\Delta'_{½}$ may be replaced by $(1-n)f_0 + nf_1$, if necessary, and where

$$B'' = n\,(n-1)/\,4,\ \ E_0'' = -\,n\,(n-1)\,(n-2)/\,6 \ \text{ and }\ E_1'' = n\,(n+1)\,(n-1)/\,6$$

It will be noted that in Bessel's formula the value of $\Delta''_0 + \Delta''_1$ is the same as $\Delta'_{1½} - \Delta'_{-½}$. The value of the coefficients B'', E_0'' and E_1'', all of which are negative within the range f_0 to f_1 , will be obtained from the table on page 357 to 360 for the given value of n.

EXPLANATION

Bessel's method of interpolation is more simple, but greater accuracy is yielded by Everett's formula on account of the fact that it includes the effect of third differences also.

The more complete formula of Bessel is as follows :

$$f_n = f_0 + n\Delta'_{½} + \{n(n-1)(\Delta''_0 + \Delta''_1)\}/4 + \{n(n-1)(n - ½)\Delta'''_{½}\}/6 + \cdots\cdots$$

The rate of variation of the function at a point, i.e., the instantaneous motion per unit of time interval may be obtained by the following formula :

Motion = $\Delta'_{½} + C\Delta_0'' + D\Delta_1''$, where $C = -(3n^2 - 6n + 2)/6$ and $D = (3n^2 - 1)/6$

When $n = 0$, the motion $f_0' = \{(\Delta'_{-½} + \Delta'_{½})/2\} - (\Delta_1'' - \Delta_0'')/6$,
when $n = ½$, $f'_{½} = \Delta'_{½} - \{(\Delta_1'' - \Delta_0'')/24\}$ and when $n = 1$, $f_1' = \{(\Delta'_{½} + \Delta'_{1½})/2\} - (\Delta_1'' - \Delta_0'')/6$

The stationary point (i.e., when $f' = 0$) occurs when $n = ½ - (\Delta'_{½}/\Delta''_1)$ or $½ - (\Delta'_{-½}/\Delta''_0)$.

Geocentric Co-ordinates and other Constants

The tables given on pages 365 and 366 are for computing the geocentric co-ordinates of a place for which the geodetic, i.e., geographic or common latitude φ is known. From the first table, the values of ρ sin φ′ and ρ cos φ′ can be directly obtained, while the second table gives the values of the geocentric latitude φ′ and the radius of the Earth ρ separately

The constants used for these tables and the others given below are the 1976 I.A.U. System of astronomical constants introduced in this publication with effect from the 1985 issue.

Equatorial radius (a) = 637 8140 m = 3963.20 miles.
Polar radius (b) = 635 6755 m = 3949.91 miles.
Flattening of the Earth (f) = (a-b)/a = 1/298.257 = 0.003 353 64.
Ellipticity or eccentricity (e) = 0.081 8192, e^2 = 0.006 694 39.

The following expressions are obtained from the above values of flattening and radius of the Earth.

S = 0.994 9743 – 0.001 6708 cos 2 φ + 0.000 0021 cos 4 φ

C = 1.001 6799 – 0.001 6820 cos 2 φ + 0.000 0021 cos 4 φ

ρ = 0.998 3271 + 0.001 6764 cos 2 φ - 0.000 0035 cos 4 φ

φ′ = φ - 11′ 32″.726 sin 2 φ + 1″.163 sin 4 φ - 0″.003 sin 6 φ

One degree of longitude (in km.) = 111.4133 cos φ - 0.0935 cos 3 φ

One degree of latitude (in km.) = 111.1334 – 0.5598 cos 2 φ + 0.0012 cos 4 φ

g (cm/sec^2) = 978.031 + 5.1859 sin^2 φ - 0.0057 sin^2 2 φ - 0.000 308H. where H is the elevation in meters above sea level.

Period of Earth satellite of negligible mass = 84.489 09 $d^{3/2}$ mins., where d is the mean distance of the satellite from the Earth's center measured in units of 6378140 m (Earth's equatorial radius).

Invariable plane of the solar system; Ω = 106°35′ 01″ + 3452″T, I = 1° 34′ 59″ - 18″T

Pole of galactic plane (1950); α = 12^h 49^m.0, δ = +27° 24′

Solar apex (1950).. α = 18^h 06^m, δ = +30°

Solar motion = 20.0 km. or 12.4 miles per sec.

Speed of the Earth moving around the Sun = 29.79 km. or 18.51 miles per sec.

EXPLANATION

Heliacal Rising and Setting of Planets

The planets Mercury to Saturn (as well as the Moon) remain invisible to the naked eyes for some days at the time of conjunction with the Sun. This phenomenon of planet's invisibility due to its proximity to the Sun is known as combust or heliacal setting of the planets, and it plays an important part in Indian Calendar. The dates of heliacal setting and rising of the planets marking the period or invisibility have been calculated assuming that the phenomenon occurs when, at the given station, the Sun attains a Zenith distance of $90°+h$ at the time when the zenith distance of the planet is 90°. The values of h for different planets adopted for the purpose are as follows :

Mercury 10° (Direct) and 11° (Retrograde)
Venus 6°, Mars 14,° Jupiter 8°.5 , and Saturn 12°

The day of the first visibility of the lunar crescent after a new-moon day has also been determined in a somewhat similar way on the basis of the following values of the limiting altitude of the Moon above the horizon corresponding to its azimuth difference from the Sun, when the zenith distance of the Sun is 90°.

Azimuth difference	0°	5°	10°	15°	20°
Altitude	10°.4	10°.0	9°.3	8°.0	6°.2

When the altitude of the Moon at sunset exceeds the above limit, the Moon is likely to be visible in that evening and when the excess is more than a degree, the Moon is sure to be visible. The beginning dates of the months of the Islamic Calendar have been determined on the basis of the above calculations and indicated on the date following that of the first visibility of the Moon.

In the above calculations, the atmospheric refraction and the horizontal parallax of the Moon are neglected.

The computations of heliacal rising and setting of planets and determination of the dates of first visibility of the Moon have been done for the central station of India.

ASTRONOMICAL CONSTANTS*

Units : The units meter (m), kilogram (kg.) and second (s) are the units of length, mass and time in the International System of Unit (SI).

The astronomical unit of time is a time interval of one (*D*) of 86400 seconds. An interval of 36525 days is one Julian century.

The astronomical unit of mass is the mass of the Sun (*S*).

The astronomical unit of length is that length (*A*) for which the Gaussian gravitational constant (*k*) takes the value of 0.01720209895 when the units of measurement are the astronomical unit of length, mass and time. The dimensions of k^2 are those of the constant of gravitational (*G*), i.e. $L^3M^{-1}T^{-2}$. The term "unit distance" is also used for the length *A*.

Defining Constants :

1. Gaussian gravitational constant $k = 0.017\ 202\ 098\ 95$
2. Speed of light $c = 299\ 792\ 458\ ms^{-1}$

EXPLANATION

Primary Constants :

3.	Light-time for unit distance	τ_A = 499.004 78384 s
4.	Equatorial radius for Earth	a_e = 637 8136.6 m
	[IUGG value	a_e = 637 8137 m]
5.	Dynamical form-factor for Earth	J_2 = 0.001 082 6359
6.	Geocentric gravitational constant	GE = 3.986 004 418 X 10^{14} $m^3\ s^{-2}$
7.	Constant of Gravitation	G = 6.674 28 X 10^{-11} $m^3\ kg^{-1}\ s^{-2}$
8.	Ratio of mass of Moon to that of Earth	μ = 0.012 300 0371
9.	General precession in longitude, per Julian century, at standard epoch J 2000.0	P = 5028".796195
10.	Obliquity of the ecliptic, at standard epoch J2000.0	ε = 23° 26' 21".406

Derived Constants

11.	Constant of nutation at standard epoch J2000.0	N = 9".2052 331
12.	Unit distance	$c\tau_A = A$ =1.495 978 707 x 10^{11}m
13.	Solar parallax	arc sin $(a_e/A) = \pi\odot$ = 8".794143
14.	Constant of aberration for standard Epoch J2000.0	k = 20".49551
15.	Flattening factor for the Earth	f = 0.003 352 82 = 1/298.25642
16.	Heliocentric gravitational constant	$A^3\ k^2/D^2 = GS$ = 1.327 124 42099 x 10^{20} $m^3\ s^{-2}$
17.	Ratio of mass of Sun to that of the Earth	$(GS)/(GE) = S/E$ = 332 946.0487
18.	Ratio of mass of Sun to that of Earth + Moon	$(S/E)/(1+\mu)$ = 328 900.5596
19.	Mass of the Sun	$(GS)/G = S$ = 1.9884 x 10^{30} kg
20.	System of planetary masses : (Ratios of mass of Sun to those of the planets etc.)	

Mercury	6023600	Jupiter	1047.348644
Venus	408523.719	Saturn	3497.9018
Earth + Moon	328900.5596	Uranus	22902.98
Mars	3098703.59	Neptune	19412.26
		Pluto	136566000

Other quantities for use in the preparation of ephemerides :

It is recommended that the values given in the following list should normally be used in the preparation of new ephemerides.

21. Masses of minor planets in unit of the solar mass :

(1) Ceres	4.72 x 10^{-10}
(2) Pallas	1.03 x 10^{-10}
(3) Vesta	1.35 x 10^{-10}

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*See page 448 also for some of the constants actually used in preparation of the ephemerides reported in the publication.

EXPLANATION

22. Masses of satellites in unit of the planet's mass :

Jupiter	Io	4.704×10^{-5}
	Europa	2.528×10^{-5}
	Ganymede	7.805×10^{-5}
	Callisto	5.667×10^{-5}
Saturn	Titan	2.366×10^{-4}
Neptune	Triton	2.089×10^{-4}

23. Equatorial radii in km.

Mercury	2439.7	Jupiter	71492	Pluto	1195
Venus	6051.8	Saturn	60268		
Earth	6378.1366	Uranus	25559	Moon	1737.4
Mars	3396.19	Neptune	24764	Sun	696000

24. Gravity fields of the planets.

	J_2	J_3	J_4
Earth	$+ 1.08263 \times 10^{-3}$	$- 2.54 \times 10^{-6}$	$- 1.61 \times 10^{-6}$
Mars	$+ 1.964 \times 10^{-3}$	$+ 36 \times 10^{-6}$	
Jupiter	$+ 14.75 \times 10^{-3}$		$- 580 \times 10^{-6}$
Saturn	$+ 16.45 \times 10^{-3}$		$- 1000 \times 10^{-6}$
Uranus	$+ 12 \times 10^{-3}$		
Neptune	$+ 4 \times 10^{-3}$		

25. Gravity field of the Moon.

$\gamma = (B-A)/C = 0.000\,2278$		$C/MR^2 = 0''.392$
$\beta = (C-B)/B = 0.000\,6313$		$I = 5552''.7 = 1^\circ\ 32'\ 32.7''$
$C_{20} = - 0.000\,2027$	$C_{30} = - 0.000\,006$	$C_{32} = + 0.000\,0048$
$C_{22} = + 0.000\,0223$	$C_{31} = + 0.000\,029$	$S_{32} = + 0.000\,0017$
	$S_{31} = + 0.000\,004$	$C_{33} = + 0.000\,0018$
		$S_{33} = - 0.000\,001$

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