सत्यमेव जयते

THE
INDIAN
ASTRONOMICAL EPHEMERIS

FOR THE YEAR

2023

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, 2024 which is the end of the year 1945 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 2023 has been done under the supervision of Shri S. Sen, Head, Positional Astronomy Centre, India Meteorological Department, Kolkata.

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Director General of Meteorology

Mausam Bhawan
New Delhi –110 003
24 August , 2022 A.D.
(2 Bhadra , 1944 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	2023.0	=	2023 Jan. 0.604	=	JD	245	9945.104
J	2023.5	=	2023 July 2.875	=	JD	246	0128.475
J	2000.0	=	2000 Jan. 1.5	=	JD	245	1545.0

Tabulations of Julian date against calendar date for 2020 are given on pages 4 to12 and for other years are given at Table IX of Part-V on page 359.

The fraction of the year from 2020.5 is tabulated with the Besselian day numbers on pages 244-251.

The lengths of the principal years and mean months at 2023.0 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	X	Solar Cycle	16
Epact	8	Roman Indiction	1
Dominical Letter	A		

CHRONOLOGICAL ERAS

The year 1945 of the Saka Era (Indian National Calendar) begins on March 22, 2023.
The year 1945 of the Saka Era or Saka Shalivahana (Lunisolar, Traditional Calendar) begins on March 22, 2023.
The year 1945 of the Saka Era (Solar, Traditional Calendar) begins on April 14, 2023.
The year 5124 Kali Era begins on April 14, 2023.
The year 2080 of the Vikram Samvat begins on March 22, 2023 (Chaitradi) and November 26, 2023 (Kartikadi) according to different systems of reckoning.
The year 1430 of the Bengali on April 15, 2023.
The year 1199 of the Kollam Era begins on August 18, 2023.
Jovian year (Barhaspatya Varsa or 60-year cycle of Jupiter) 51 Pingala begins on May 19, 2023 (North Indian Usage), and 37 Sobhona March 22, 2023 (Lunar Chaitradi) or April 14, 2023 (Solar) (South Indian Usage).
Vedanga Jyotisa year 4- Annuvatsara of the 5-year cycle (389 th cycle of Paitamaha Siddhanta) begins on February 10, 2023.
The year 2567 of the Buddha Nirvana era begins on May 05, 2023.
The year 2550 of the Mahavira Nirvana Era begins on November 26, 2023.
The year 1445 of the Mohammedan Era begins on July 20, 2023.
The year 1393 of the Yazdejardi Era begins on August 16, 2023 according to the Indian Parsi (Shahenshahi) Calendar.
The year 6736 of the Julian period begins on January 14, 2023.
The year 5784 of the Jewish Era (A.M.) begins on September 16, 2023.
The year 2799 of the Greek Olympiad, being the 3rd year of the 4-Year cycle (700 th Olympiad) begins on July, 2023.
The year 2776 of the Foundation of Rome (A.U.C.) begins on January 14, 2023.
The year 2772 of the Nabonassar begins on April 18, 2023.
The year 2335 of the Seleucidean era begins in the present-day usage of the Syrians on September 14 or October 14, 2023 according to different sects.
The Gregorian Year 2023 begins on January 1, 2023.

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	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			
Dec.	27		Tue	-187.875	-0.0137	940.5	Pausha	6	281	
	28	362	Wed	186.875	-0.0110	941.5		7	282	
	29	363	Thu	185.875	-0.0082	942.5		8	283	
	30	364	Fri	184.875	-0.0055	943.5		9	284	30-First Quarter
Dec.	31	365	Sat	183.875	-0.0027	944.5		10	285	1^h 21^m U.T.
Jan.	1	1	Sun	182.875	0.0000	945.5		11	286	
	2	2	Mon	181.875	0.0027	946.5		12	287	
	3	3	Tue	-180.875	0.0055	947.5		13	288	
	4	4	Wed	179.875	0.0082	948.5		14	289	
	5	5	Thu	178.875	0.0110	949.5		15	290	
	6	6	Fri	177.875	0.0137	950.5		16	291	6-Full Moon
	7	7	Sat	176.875	0.0164	951.5		17	292	23^h 08^m U.T.
	8	8	Sun	175.875	0.0192	952.5		18	293	
	9	9	Mon	174.875	0.0219	953.5		19	294	
	10	10	Tue	-173.875	0.0246	954.5		20	295	
	11	11	Wed	172.875	0.0274	955.5		21	296	
	12	12	Thu	171.875	0.0301	956.5		22	297	
	13	13	Fri	170.875	0.0329	957.5		23	298	
	14	14	Sat	169.875	0.0356	958.5		24	299	
	15	15	Sun	168.875	0.0383	959.5		25	300	15-Last Quarter
	16	16	Mon	167.875	0.0411	960.5		26	301	2^h 10^m U.T.
	17	17	Tue	-166.875	0.0438	961.5		27	302	
	18	18	Wed	165.875	0.0465	962.5		28	303	
	19	19	Thu	164.875	0.0493	963.5		29	304	
	20	20	Fri	163.875	0.0520	964.5		30	305	
	21	21	Sat	162.875	0.0548	965.5	Magha	1	306	21-New Moon
	22	22	Sun	161.875	0.0575	966.5		2	307	20^h 53^m U.T.
	23	23	Mon	160.875	0.0602	967.5		3	308	
	24	24	Tue	-159.875	0.0630	968.5		4	309	
	25	25	Wed	158.875	0.0657	969.5		5	310	
	26	26	Thu	157.875	0.0684	970.5		6	311	
	27	27	Fri	156.875	0.0712	971.5		7	312	
	28	28	Sat	155.875	0.0739	972.5		8	313	28-First Quarter
	29	29	Sun	154.875	0.0767	973.5		9	314	15^h 19^m U.T.
	30	30	Mon	153.875	0.0794	974.5		10	315	
	31	31	Tue	-152.875	0.0821	975.5		11	316	
Feb.	1	32	Wed	151.875	0.0849	976.5		12	317	
	2	33	Thu	150.875	0.0876	977.5		13	318	
	3	34	Fri	149.875	0.0904	978.5		14	319	
	4	35	Sat	148.875	0.0931	979.5		15	320	
	5	36	Sun	147.875	0.0958	980.5		16	321	5-Full Moon
	6	37	Mon	-146.875	0.0986	981.5		17	322	18^h 29^m U.T.

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	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	1944 Saka Era			
Feb.	7	38	Tue	-145.875	0.1013	982.5	Magha	18	323	
	8	39	Wed	144.875	0.1040	983.5		19	324	
	9	40	Thu	143.875	0.1068	984.5		20	325	
	10	41	Fri	142.875	0.1095	985.5		21	326	
	11	42	Sat	141.875	0.1123	986.5		22	327	
	12	43	Sun	140.875	0.1150	987.5		23	328	
	13	44	Mon	139.875	0.1177	988.5		24	329	13-Last Quarter $16^h\ 01^m$ U.T.
	14	45	Tue	-138.875	0.1205	989.5		25	330	
	15	46	Wed	137.875	0.1232	990.5		26	331	
	16	47	Thu	136.875	0.1259	991.5		27	332	
	17	48	Fri	135.875	0.1287	992.5		28	333	
	18	49	Sat	134.875	0.1314	993.5		29	334	
	19	50	Sun	133.875	0.1342	994.5		30	335	
	20	51	Mon	132.875	0.1369	995.5	Phalguna	1	336	20-New Moon $07^h\ 06^m$ U.T.
	21	52	Tue	-131.875	0.1396	996.5		2	337	
	22	53	Wed	130.875	0.1424	997.5		3	338	
	23	54	Thu	129.875	0.1451	998.5		4	339	
	24	55	Fri	128.875	0.1478	999.5		5	340	
	25	56	Sat	127.875	0.1506	2460000.5		6	341	
	26	57	Sun	126.875	0.1533	001.5		7	342	
	27	58	Mon	125.875	0.1561	002.5		8	343	27-First Quarter $08^h\ 06^m$ U.T.
	28	59	Tue	-124.875	0.1588	003.5		9	344	
Mar.	1	60	Wed	123.875	0.1615	004.5		10	345	
	2	61	Thu	122.875	0.1643	005.5		11	346	
	3	62	Fri	121.875	0.1670	006.5		12	347	
	4	63	Sat	120.875	0.1698	007.5		13	348	
	5	64	Sun	119.875	0.1725	008.5		14	349	
	6	65	Mon	118.875	0.1752	009.5		15	350	
	7	66	Tue	-117.875	0.1780	010.5		16	351	7-Full Moon $12^h\ 40^m$ U.T.
	8	67	Wed	116.875	0.1807	011.5		17	352	
	9	68	Thu	115.875	0.1834	012.5		18	353	
	10	69	Fri	114.875	0.1862	013.5		19	354	
	11	70	Sat	113.875	0.1889	014.5		20	355	
	12	71	Sun	112.875	0.1917	015.5		21	356	
	13	72	Mon	111.875	0.1944	016.5		22	357	
	14	73	Tue	-110.875	0.1971	017.5		23	358	
	15	74	Wed	109.875	0.1999	018.5		24	359	15-Last Quarter $2^h\ 08^m$ U.T.
	16	75	Thu	108.875	0.2026	019.5		25	360	
	17	76	Fri	107.875	0.2053	020.5		26	361	
	18	77	Sat	106.875	0.2081	021.5		27	362	
	19	78	Sun	105.875	0.2108	022.5		28	363	
	20	79	Mon	-104.875	0.2136	023.5		29	364	

CALENDAR, 2023

Day of Month	Day of Year	Day of Week	Days since J 2023.5	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
					2460	1944 Saka Era		
Mar. 21	80	Tue	-103.875	0.2163	024.5	Phalguna 30	365	21-New Moon
22	81	Wed	102.875	0.2190	025.5	1945, Chaitra1	1	17^h 23^m U.T.
23	82	Thu	101.875	0.2218	026.5	2	2	
24	83	Fri	100.875	0.2245	027.5	3	3	
25	84	Sat	99.875	0.2272	028.5	4	4	
26	85	Sun	98.875	0.2300	029.5	5	5	
27	86	Mon	97.875	0.2327	030.5	6	6	
28	87	Tue	-96.875	0.2355	031.5	7	7	
29	88	Wed	95.875	0.2382	032.5	8	8	29-First Quarter
30	89	Thu	94.875	0.2409	033.5	9	9	2^h 32^m U.T.
31	90	Fri	93.875	0.2437	034.5	10	10	
Apr. 1	91	Sat	92.875	0.2464	035.5	11	11	
2	92	Sun	91.875	0.2491	036.5	12	12	
3	93	Mon	90.875	0.2519	037.5	13	13	
4	94	Tue	-89.875	0.2546	038.5	14	14	
5	95	Wed	88.875	0.2574	039.5	15	15	
6	96	Thu	87.875	0.2601	040.5	16	16	6-Full Moon
7	97	Fri	86.875	0.2628	041.5	17	17	4^h 34^m U.T.
8	98	Sat	85.875	0.2656	042.5	18	18	
9	99	Sun	84.875	0.2683	043.5	19	19	
10	100	Mon	83.875	0.2711	044.5	20	20	
11	101	Tue	-82.875	0.2738	045.5	21	21	
12	102	Wed	81.875	0.2765	046.5	22	22	
13	103	Thu	80.875	0.2793	047.5	23	23	13-Last Quarter
14	104	Fri	79.875	0.2820	048.5	24	24	9^h 11^m U.T.
15	105	Sat	78.875	0.2847	049.5	25	25	
16	106	Sun	77.875	0.2875	050.5	26	26	
17	107	Mon	76.875	0.2902	051.5	27	27	
18	108	Tue	-75.875	0.2930	052.5	28	28	
19	109	Wed	74.875	0.2957	053.5	29	29	
20	110	Thu	73.875	0.2984	054.5	30	30	20-New Moon
21	111	Fri	72.875	0.3012	055.5	Vaisakha 1	31	4^h 12^m U.T.
22	112	Sat	71.875	0.3039	056.5	2	32	
23	113	Sun	70.875	0.3066	057.5	3	33	
24	114	Mon	69.875	0.3094	058.5	4	34	
25	115	Tue	-68.875	0.3121	059.5	5	35	
26	116	Wed	67.875	0.3149	060.5	6	36	
27	117	Thu	66.875	0.3176	061.5	7	37	27-First Quarter
28	118	Fri	65.875	0.3203	062.5	8	38	21^h 20^m U.T.
29	119	Sat	64.875	0.3231	063.5	9	39	
30	120	Sun	63.875	0.3258	064.5	10	40	
May 1	121	Mon	-62.875	0.3285	065.5	11	41	

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	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
						2460	1945 Saka Era			
May	2	122	Tue	-61.875	0.3313	066.5	Vaisakha	12	42	
	3	123	Wed	60.875	0.3340	067.5		13	43	
	4	124	Thu	59.875	0.3368	068.5		14	44	
	5	125	Fri	58.875	0.3395	069.5		15	45	5-Full Moon
	6	126	Sat	57.875	0.3422	070.5		16	46	$17^h 34^m$ U.T.
	7	127	Sun	56.875	0.3450	071.5		17	47	
	8	128	Mon	55.875	0.3477	072.5		18	48	
	9	129	Tue	-54.875	0.3505	073.5		19	49	
	10	130	Wed	53.875	0.3532	074.5		20	50	
	11	131	Thu	52.875	0.3559	075.5		21	51	
	12	132	Fri	51.875	0.3587	076.5		22	52	12-Last Quarter
	13	133	Sat	50.875	0.3614	077.5		23	53	$14^h 28^m$ U.T.
	14	134	Sun	49.875	0.3641	078.5		24	54	
	15	135	Mon	48.875	0.3669	079.5		25	55	
	16	136	Tue	-47.875	0.3696	080.5		26	56	
	17	137	Wed	46.875	0.3724	081.5		27	57	
	18	138	Thu	45.875	0.3751	082.5		28	58	
	19	139	Fri	44.875	0.3778	083.5		29	59	19-New Moon
	20	140	Sat	43.875	0.3806	084.5		30	60	$15^h 53^m$ U.T.
	21	141	Sun	42.875	0.3833	085.5		31	61	
	22	142	Mon	41.875	0.3860	086.5	Jyaisha	1	62	
	23	143	Tue	-40.875	0.3888	087.5		2	63	
	24	144	Wed	39.875	0.3915	088.5		3	64	
	25	145	Thu	38.875	0.3943	089.5		4	65	
	26	146	Fri	37.875	0.3970	090.5		5	66	
	27	147	Sat	36.875	0.3997	091.5		6	67	27-First Quarter
	28	148	Sun	35.875	0.4025	092.5		7	68	$15^h 22^m$ U.T.
	29	149	Mon	34.875	0.4052	093.5		8	69	
	30	150	Tue	-33.875	0.4079	094.5		9	70	
	31	151	Wed	32.875	0.4107	095.5		10	71	
June	1	152	Thu	31.875	0.4134	096.5		11	72	
	2	153	Fri	30.875	0.4162	097.5		12	73	
	3	154	Sat	29.875	0.4189	098.5		13	74	
	4	155	Sun	28.875	0.4216	099.5		14	75	4-Full Moon
	5	156	Mon	27.875	0.4244	100.5		15	76	$3^h 42^m$ U.T.
	6	157	Tue	-26.875	0.4271	101.5		16	77	
	7	158	Wed	25.875	0.4299	102.5		17	78	
	8	159	Thu	24.875	0.4326	103.5		18	79	
	9	160	Fri	23.875	0.4353	104.5		19	80	
	10	161	Sat	22.875	0.4381	105.5		20	81	10-Last Quarter
	11	162	Sun	21.875	0.4408	106.5		21	82	$19^h 31^m$ U.T.
	12	163	Mon	-20.875	0.4435	107.5		22	83	

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	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
						2460	1945 Saka Era			
June	13	164	Tue	-19.875	0.4463	108.5	Jyaishtha	23	84	
	14	165	Wed	18.875	0.4490	109.5		24	85	
	15	166	Thu	17.875	0.4518	110.5		25	86	
	16	167	Fri	16.875	0.4545	111.5		26	87	
	17	168	Sat	15.875	0.4572	112.5		27	88	
	18	169	Sun	14.875	0.4600	113.5		28	89	18-New Moon
	19	170	Mon	13.875	0.4627	114.5		29	90	$4^h\ 37^m$ U.T.
	20	171	Tue	-12.875	0.4654	115.5		30	91	
	21	172	Wed	11.875	0.4682	116.5		31	92	
	22	173	Thu	10.875	0.4709	117.5	Ashadha	1	93	
	23	174	Fri	9.875	0.4737	118.5		2	94	
	24	175	Sat	8.875	0.4764	119.5		3	95	
	25	176	Sun	7.875	0.4791	120.5		4	96	
	26	177	Mon	6.875	0.4819	121.5		5	97	26-First Quarter $7^h\ 50^m$ U.T.
	27	178	Tue	-5.875	0.4846	122.5		6	98	
	28	179	Wed	4.875	0.4873	123.5		7	99	
	29	180	Thu	3.875	0.4901	124.5		8	100	
	30	181	Fri	2.875	0.4928	125.5		9	101	
July	1	182	Sat	1.875	0.4956	126.5		10	102	
	2	183	Sun	-0.875	0.4983	127.5		11	103	
	3	184	Mon	+0.125	0.5010	128.5		12	104	3-Full Moon $11^h\ 39^m$ U.T.
	4	185	Tue	+1.125	0.5038	129.5		13	105	
	5	186	Wed	2.125	0.5065	130.5		14	106	
	6	187	Thu	3.125	0.5093	131.5		15	107	
	7	188	Fri	4.125	0.5120	132.5		16	108	
	8	189	Sat	5.125	0.5147	133.5		17	109	
	9	190	Sun	6.125	0.5175	134.5		18	110	
	10	191	Mon	7.125	0.5202	135.5		19	111	10-Last Quarter $1^h\ 48^m$ U.T.
	11	192	Tue	+8.125	0.5229	136.5		20	112	
	12	193	Wed	9.125	0.5257	137.5		21	113	
	13	194	Thu	10.125	0.5284	138.5		22	114	
	14	195	Fri	11.125	0.5312	139.5		23	115	
	15	196	Sat	12.125	0.5339	140.5		24	116	
	16	197	Sun	13.125	0.5366	141.5		25	117	
	17	198	Mon	14.125	0.5394	142.5		26	118	17-New Moon $18^h\ 32^m$ U.T.
	18	199	Tue	+15.125	0.5421	143.5		27	119	
	19	200	Wed	16.125	0.5448	144.5		28	120	
	20	201	Thu	17.125	0.5476	145.5		29	121	
	21	202	Fri	18.125	0.5503	146.5		30	122	
	22	203	Sat	19.125	0.5531	147.5		31	123	
	23	204	Sun	20.125	0.5558	148.5	Sravana	1	124	
	24	205	Mon	+21.125	0.5585	149.5		2	125	

CALENDAR, 2023

Day of Month	Day of Year	Day of Week	Days since J 2023.5	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
					2460	1945 Saka Era		
July 25	206	Tue	+22.125	0.5613	150.5	Sravana 3	126	25-First Quarter
26	207	Wed	23.125	0.5640	151.5	4	127	22^h 07^m U.T.
27	208	Thu	24.125	0.5667	152.5	5	128	
28	209	Fri	25.125	0.5695	153.5	6	129	
29	210	Sat	26.125	0.5722	154.5	7	130	
30	211	Sun	27.125	0.5750	155.5	8	131	
31	212	Mon	28.125	0.5777	156.5	9	132	
Aug. 1	213	Tue	+29.125	0.5804	157.5	10	133	1-Full Moon
2	214	Wed	30.125	0.5832	158.5	11	134	18^h 32^m U.T.
3	215	Thu	31.125	0.5859	159.5	12	135	
4	216	Fri	32.125	0.5887	160.5	13	136	
5	217	Sat	33.125	0.5914	161.5	14	137	
6	218	Sun	34.125	0.5941	162.5	15	138	
7	219	Mon	35.125	0.5969	163.5	16	139	
8	220	Tue	+36.125	0.5996	164.5	17	140	8-Last Quarter
9	221	Wed	37.125	0.6023	165.5	18	141	10^h 28^m U.T.
10	222	Thu	38.125	0.6051	166.5	19	142	
11	223	Fri	39.125	0.6078	167.5	20	143	
12	224	Sat	40.125	0.6106	168.5	21	144	
13	225	Sun	41.125	0.6133	169.5	22	145	
14	226	Mon	42.125	0.6160	170.5	23	146	
15	227	Tue	+43.125	0.6188	171.5	24	147	
16	228	Wed	44.125	0.6215	172.5	25	148	16-New Moon
17	229	Thu	45.125	0.6242	173.5	26	149	9^h 38^m U.T.
18	230	Fri	46.125	0.6270	174.5	27	150	
19	231	Sat	47.125	0.6297	175.5	28	151	
20	232	Sun	48.125	0.6325	176.5	29	152	
21	233	Mon	49.125	0.6352	177.5	30	153	
22	234	Tue	+50.125	0.6379	178.5	31	154	
23	235	Wed	51.125	0.6407	179.5	Bhadra 1	155	
24	236	Thu	52.125	0.6434	180.5	2	156	24-First Quarter
25	237	Fri	53.125	0.6461	181.5	3	157	9^h 57^m U.T.
26	238	Sat	54.125	0.6489	182.5	4	158	
27	239	Sun	55.125	0.6516	183.5	5	159	
28	240	Mon	56.125	0.6544	184.5	6	160	
29	241	Tue	+57.125	0.6571	185.5	7	161	
30	242	Wed	58.125	0.6598	186.5	8	162	
31	243	Thu	59.125	0.6626	187.5	9	163	31-Full Moon
Sept. 1	244	Fri	60.125	0.6653	188.5	10	164	1^h 36^m U.T.
2	245	Sat	61.125	0.6680	189.5	11	165	
3	246	Sun	62.125	0.6708	190.5	12	166	
4	247	Mon	+63.125	0.6735	191.5	13	167	

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	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
						2460	1945 Saka Era			
Sept.	5	248	Tue	+64.125	0.6763	192.5	Bhadra	14	168	
	6	249	Wed	65.125	0.6790	193.5		15	169	6-Last Quarter
	7	250	Thu	66.125	0.6817	194.5		16	170	$22^h\ 21^m$ U.T.
	8	251	Fri	67.125	0.6845	195.5		17	171	
	9	252	Sat	68.125	0.6872	196.5		18	172	
	10	253	Sun	69.125	0.6900	197.5		19	173	
	11	254	Mon	70.125	0.6927	198.5		20	174	
	12	255	Tue	+71.125	0.6954	199.5		21	175	
	13	256	Wed	72.125	0.6982	200.5		22	176	
	14	257	Thu	73.125	0.7009	201.5		23	177	
	15	258	Fri	74.125	0.7036	202.5		24	178	15-New Moon
	16	259	Sat	75.125	0.7064	203.5		25	179	$1^h\ 40^m$ U.T.
	17	260	Sun	76.125	0.7091	204.5		26	180	
	18	261	Mon	77.125	0.7119	205.5		27	181	
	19	262	Tue	+78.125	0.7146	206.5		28	182	
	20	263	Wed	79.125	0.7173	207.5		29	183	
	21	264	Thu	80.125	0.7201	208.5		30	184	
	22	265	Fri	81.125	0.7228	209.5		31	185	22-First Quarter
	23	266	Sat	82.125	0.7255	210.5	Asvina	1	186	$19^h\ 32^m$ U.T.
	24	267	Sun	83.125	0.7283	211.5		2	187	
	25	268	Mon	84.125	0.7310	212.5		3	188	
	26	269	Tue	+85.125	0.7338	213.5		4	189	
	27	270	Wed	86.125	0.7365	214.5		5	190	
	28	271	Thu	87.125	0.7392	215.5		6	191	
	29	272	Fri	88.125	0.7420	216.5		7	192	29-Full Moon
	30	273	Sat	89.125	0.7447	217.5		8	193	$9^h\ 57^m$ U.T.
Oct.	1	274	Sun	90.125	0.7474	218.5		9	194	
	2	275	Mon	91.125	0.7502	219.5		10	195	
	3	276	Tue	+92.125	0.7529	220.5		11	196	
	4	277	Wed	93.125	0.7557	221.5		12	197	
	5	278	Thu	94.125	0.7584	222.5		13	198	
	6	279	Fri	95.125	0.7611	223.5		14	199	6-Last Quarter
	7	280	Sat	96.125	0.7639	224.5		15	200	$13^h\ 48^m$ U.T.
	8	281	Sun	97.125	0.7666	225.5		16	201	
	9	282	Mon	98.125	0.7694	226.5		17	202	
	10	283	Tue	+99.125	0.7721	227.5		18	203	
	11	284	Wed	100.125	0.7748	228.5		19	204	
	12	285	Thu	101.125	0.7776	229.5		20	205	
	13	286	Fri	102.125	0.7803	230.5		21	206	
	14	287	Sat	103.125	0.7830	231.5		22	207	14-New Moon
	15	288	Sun	104.125	0.7858	232.5		23	208	$17^h\ 55^m$ U.T.
	16	289	Mon	+105.125	0.7885	233.5		24	209	

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar		Day of Year	Phases of the Moon
							Day of Month			
						2460	1945 Saka Era			
Oct.	17	290	Tue	+106.125	0.7913	234.5	Asvina	25	210	
	18	291	Wed	107.125	0.7940	235.5		26	211	
	19	292	Thu	108.125	0.7967	236.5		27	212	
	20	293	Fri	109.125	0.7995	237.5		28	213	
	21	294	Sat	110.125	0.8022	238.5		29	214	
	22	295	Sun	111.125	0.8049	239.5		30	215	22-First Quarter
	23	296	Mon	112.125	0.8077	240.5	Kartika	1	216	$3^h\ 29^m$ U.T.
	24	297	Tue	+113.125	0.8104	241.5		2	217	
	25	298	Wed	114.125	0.8132	242.5		3	218	
	26	299	Thu	115.125	0.8159	243.5		4	219	
	27	300	Fri	116.125	0.8186	244.5		5	220	
	28	301	Sat	117.125	0.8214	245.5		6	221	28-Full Moon
	29	302	Sun	118.125	0.8241	246.5		7	222	$20^h\ 24^m$ U.T.
	30	303	Mon	119.125	0.8268	247.5		8	223	
	31	304	Tue	+120.125	0.8296	248.5		9	224	
Nov.	1	305	Wed	121.125	0.8323	249.5		10	225	
	2	306	Thu	122.125	0.8351	250.5		11	226	
	3	307	Fri	123.125	0.8378	251.5		12	227	
	4	308	Sat	124.125	0.8405	252.5		13	228	
	5	309	Sun	125.125	0.8433	253.5		14	229	5-Last Quarter
	6	310	Mon	126.125	0.8460	254.5		15	230	$8^h\ 37^m$ U.T.
	7	311	Tue	+127.125	0.8488	255.5		16	231	
	8	312	Wed	128.125	0.8515	256.5		17	232	
	9	313	Thu	129.125	0.8542	257.5		18	233	
	10	314	Fri	130.125	0.8570	258.5		19	234	
	11	315	Sat	131.125	0.8597	259.5		20	235	
	12	316	Sun	132.125	0.8624	260.5		21	236	
	13	317	Mon	133.125	0.8652	261.5		22	237	13-New Moon $9^h\ 27^m$ U.T.
	14	318	Tue	+134.125	0.8679	262.5		23	238	
	15	319	Wed	135.125	0.8707	263.5		24	239	
	16	320	Thu	136.125	0.8734	264.5		25	240	
	17	321	Fri	137.125	0.8761	265.5		26	241	
	18	322	Sat	138.125	0.8789	266.5		27	242	
	19	323	Sun	139.125	0.8816	267.5		28	243	
	20	324	Mon	140.125	0.8843	268.5		29	244	20-First Quarter $10^h\ 50^m$ U.T.
	21	325	Tue	+141.125	0.8871	269.5		30	245	
	22	326	Wed	142.125	0.8898	270.5	Agrahayana	1	246	
	23	327	Thu	143.125	0.8926	271.5		2	247	
	24	328	Fri	144.125	0.8953	272.5		3	248	
	25	329	Sat	145.125	0.8980	273.5		4	249	
	26	330	Sun	146.125	0.9008	274.5		5	250	
	27	331	Mon	+147.125	0.9035	275.5		6	251	27-Full Moon $9^h\ 16^m$ U.T.

CALENDAR, 2023

Day of Month		Day of Year	Day of Week	Days since J 2023.5	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	
						2460	1945 Saka Era		
Nov.	28	332	Tue	+148.125	0.9062	276.5	Agrahayana 7	252	
	29	333	Wed	149.125	0.9090	277.5	8	253	
	30	334	Thu	150.125	0.9117	278.5	9	254	
Dec.	1	335	Fri	151.125	0.9145	279.5	10	255	
	2	336	Sat	152.125	0.9172	280.5	11	256	
	3	337	Sun	153.125	0.9199	281.5	12	257	
	4	338	Mon	154.125	0.9227	282.5	13	258	
	5	339	Tue	+155.125	0.9254	283.5	14	259	5-Last Quarter
	6	340	Wed	156.125	0.9282	284.5	15	260	$5^h\ 49^m$ U.T.
	7	341	Thu	157.125	0.9309	285.5	16	261	
	8	342	Fri	158.125	0.9336	286.5	17	262	
	9	343	Sat	159.125	0.9364	287.5	18	263	
	10	344	Sun	160.125	0.9391	288.5	19	264	
	11	345	Mon	161.125	0.9418	289.5	20	265	
	12	346	Tue	+162.125	0.9446	290.5	21	266	12-New Moon
	13	347	Wed	163.125	0.9473	291.5	22	267	$23^h\ 32^m$ U.T.
	14	348	Thu	164.125	0.9501	292.5	23	268	
	15	349	Fri	165.125	0.9528	293.5	24	269	
	16	350	Sat	166.125	0.9555	294.5	25	270	
	17	351	Sun	167.125	0.9583	295.5	26	271	
	18	352	Mon	168.125	0.9610	296.5	27	272	
	19	353	Tue	+169.125	0.9637	297.5	28	273	19-First Quarter
	20	354	Wed	170.125	0.9665	298.5	29	274	$18^h\ 39^m$ U.T.
	21	355	Thu	171.125	0.9692	299.5	30	275	
	22	356	Fri	172.125	0.9720	300.5	Pausha 1	276	
	23	357	Sat	173.125	0.9747	301.5	2	277	
	24	358	Sun	174.125	0.9774	302.5	3	278	
	25	359	Mon	175.125	0.9802	303.5	4	279	
	26	360	Tue	+176.125	0.9829	304.5	5	280	
	27	361	Wed	177.125	0.9856	305.5	6	281	27-Full Moon
	28	362	Thu	178.125	0.9884	306.5	7	282	$0^h\ 33^m$ U.T.
	29	363	Fri	179.125	0.9911	307.5	8	283	
	30	364	Sat	180.125	0.9939	308.5	9	284	
	31	365	Sun	181.125	0.9966	309.5	10	285	
	32	1	Mon	+182.125	0.9993	310.5	11	286	

The new epoch is the middle of the Julian year, denoted by J 2023.5 (i.e. 2023, July 2.875) 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, 2023

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
Jan.	0	6	37	37.363	-0.645	17	19	31.869	Feb.	15	9	38	58.910	-0.567	14	18	40.033
	1	6	41	33.918	0.646	17	15	35.959		16	9	42	55.465	0.559	14	14	44.124
	2	6	45	30.474	0.645	17	11	40.050		17	9	46	52.021	0.549	14	10	48.214
	3	6	49	27.029	0.641	17	07	44.140		18	9	50	48.576	0.541	14	06	52.305
	4	6	53	23.584	0.635	17	03	48.231		19	9	54	45.131	0.536	14	02	56.395
	5	6	57	20.140	0.627	16	59	52.321		20	9	58	41.687	0.536	13	59	00.486
	6	7	01	16.695	-0.618	16	55	56.412		21	10	02	38.242	-0.540	13	55	04.576
	7	7	05	13.250	0.610	16	52	00.502		22	10	06	34.797	0.547	13	51	08.667
	8	7	09	09.806	0.603	16	48	04.593		23	10	10	31.353	0.556	13	47	12.757
	9	7	13	06.361	0.598	16	44	08.684		24	10	14	27.908	0.563	13	43	16.848
	10	7	17	02.917	0.596	16	40	12.774		25	10	18	24.464	0.567	13	39	20.938
	11	7	20	59.472	0.596	16	36	16.865		26	10	22	21.019	0.569	13	35	25.029
	12	7	24	56.027	-0.598	16	32	20.955		27	10	26	17.574	-0.568	13	31	29.119
	13	7	28	52.583	0.602	16	28	25.046		28	10	30	14.130	0.565	13	27	33.210
	14	7	32	49.138	0.606	16	24	29.136	Mar.	1	10	34	10.685	0.561	13	23	37.301
	15	7	36	45.693	0.610	16	20	33.227		2	10	38	07.240	0.557	13	19	41.391
	16	7	40	42.249	0.611	16	16	37.317		3	10	42	03.796	0.554	13	15	45.482
	17	7	44	38.804	0.610	16	12	41.408		4	10	45	60.351	0.553	13	11	49.572
	18	7	48	35.359	-0.604	16	08	45.498		5	10	49	56.906	-0.554	13	07	53.663
	19	7	52	31.915	0.594	16	04	49.589		6	10	53	53.462	0.557	13	03	57.753
	20	7	56	28.470	0.582	16	00	53.679		7	10	57	50.017	0.564	13	00	01.844
	21	8	00	25.026	0.570	15	56	57.770		8	11	01	46.573	0.571	12	56	05.934
	22	8	04	21.581	0.560	15	53	01.860		9	11	05	43.128	0.580	12	52	10.025
	23	8	08	18.136	0.554	15	49	05.951		10	11	09	39.683	0.589	12	48	14.115
	24	8	12	14.692	-0.553	15	45	10.041		11	11	13	36.239	-0.596	12	44	18.206
	25	8	16	11.247	0.556	15	41	14.132		12	11	17	32.794	0.601	12	40	22.296
	26	8	20	07.802	0.562	15	37	18.223		13	11	21	29.349	0.602	12	36	26.387
	27	8	24	04.358	0.567	15	33	22.313		14	11	25	25.905	0.600	12	32	30.477
	28	8	28	00.913	0.571	15	29	26.404		15	11	29	22.460	0.595	12	28	34.568
	29	8	31	57.469	0.572	15	25	30.494		16	11	33	19.016	0.588	12	24	38.658
	30	8	35	54.024	-0.570	15	21	34.585		17	11	37	15.571	-0.582	12	20	42.749
	31	8	39	50.579	0.566	15	17	38.675		18	11	41	12.126	0.577	12	16	46.840
Feb.	1	8	43	47.135	0.561	15	13	42.766		19	11	45	08.682	0.577	12	12	50.930
	2	8	47	43.690	0.554	15	09	46.856		20	11	49	05.237	0.581	12	08	55.021
	3	8	51	40.245	0.548	15	05	50.947		21	11	53	01.792	0.588	12	04	59.111
	4	8	55	36.801	0.544	15	01	55.037		22	11	56	58.348	0.598	12	01	03.202
	5	8	59	33.356	-0.541	14	57	59.128		23	12	00	54.903	-0.607	11	57	07.292
	6	9	03	29.911	0.540	14	54	03.218		24	12	04	51.458	0.613	11	53	11.383
	7	9	07	26.467	0.542	14	50	07.309		25	12	08	48.014	0.617	11	49	15.473
	8	9	11	23.022	0.547	14	46	11.399		26	12	12	44.569	0.617	11	45	19.564
	9	9	15	19.578	0.553	14	42	15.490		27	12	16	41.125	0.615	11	41	23.654
	10	9	19	16.133	0.560	14	38	19.581		28	12	20	37.680	0.612	11	37	27.745
	11	9	23	12.688	-0.566	14	34	23.671		29	12	24	34.235	-0.608	11	33	31.835
	12	9	27	09.244	0.571	14	30	27.762		30	12	28	30.791	0.605	11	29	35.926
	13	9	31	05.799	0.573	14	26	31.852		31	12	32	27.346	0.603	11	25	40.016
	14	9	35	02.354	0.572	14	22	35.943	Apr.	1	12	36	23.901	0.604	11	21	44.107
	15	9	38	58.910	-0.567	14	18	40.033		2	12	40	20.457	-0.607	11	17	48.198

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

SIDEREAL TIME, 2023

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	36	23.901	-0.604	11	21	44.107	May	17	15	37	45.448	-0.636	8	20	52.271
	2	12	40	20.457	0.607	11	17	48.198		18	15	41	42.004	0.638	8	16	56.362
	3	12	44	17.012	0.612	11	13	52.288		19	15	45	38.559	0.637	8	13	00.452
	4	12	48	13.568	0.620	11	09	56.379		20	15	49	35.114	0.633	8	09	04.543
	5	12	52	10.123	0.628	11	06	00.469		21	15	53	31.670	0.627	8	05	08.633
	6	12	56	06.678	0.637	11	02	04.560		22	15	57	28.225	0.619	8	01	12.724
	7	13	00	03.234	-0.645	10	58	08.650		23	16	01	24.781	-0.611	7	57	16.815
	8	13	03	59.789	0.650	10	54	12.741		24	16	05	21.336	0.604	7	53	20.905
	9	13	07	56.344	0.651	10	50	16.831		25	16	09	17.891	0.599	7	49	24.996
	10	13	11	52.900	0.649	10	46	20.922		26	16	13	14.447	0.596	7	45	29.086
	11	13	15	49.455	0.644	10	42	25.012		27	16	17	11.002	0.596	7	41	33.177
	12	13	19	46.010	0.637	10	38	29.103		28	16	21	07.557	0.598	7	37	37.267
	13	13	23	42.566	-0.630	10	34	33.193		29	16	25	04.113	-0.602	7	33	41.358
	14	13	27	39.121	0.624	10	30	37.284		30	16	29	00.668	0.606	7	29	45.448
	15	13	31	35.677	0.622	10	26	41.374		31	16	32	57.224	0.610	7	25	49.539
	16	13	35	32.232	0.624	10	22	45.465	June	1	16	36	53.779	0.613	7	21	53.629
	17	13	39	28.787	0.629	10	18	49.556		2	16	40	50.334	0.613	7	17	57.720
	18	13	43	25.343	0.637	10	14	53.646		3	16	44	46.890	0.609	7	14	01.810
	19	13	47	21.898	-0.645	10	10	57.737		4	16	48	43.445	-0.601	7	10	05.901
	20	13	51	18.453	0.652	10	07	01.827		5	16	52	40.000	0.590	7	06	09.991
	21	13	55	15.009	0.655	10	03	05.918		6	16	56	36.556	0.577	7	02	14.082
	22	13	59	11.564	0.655	9	59	10.008		7	17	00	33.111	0.566	6	58	18.173
	23	14	03	08.120	0.653	9	55	14.099		8	17	04	29.666	0.557	6	54	22.263
	24	14	07	04.675	0.648	9	51	18.189		9	17	08	26.222	0.553	6	50	26.354
	25	14	11	01.230	-0.642	9	47	22.280		10	17	12	22.777	-0.553	6	46	30.444
	26	14	14	57.786	0.637	9	43	26.370		11	17	16	19.333	0.556	6	42	34.535
	27	14	18	54.341	0.633	9	39	30.461		12	17	20	15.888	0.560	6	38	38.625
	28	14	22	50.896	0.631	9	35	34.551		13	17	24	12.443	0.564	6	34	42.716
	29	14	26	47.452	0.631	9	31	38.642		14	17	28	08.999	0.565	6	30	46.806
	30	14	30	44.007	0.634	9	27	42.732		15	17	32	05.554	0.564	6	26	50.897
May	1	14	34	40.562	-0.639	9	23	46.823		16	17	36	02.109	-0.560	6	22	54.987
	2	14	38	37.118	0.645	9	19	50.913		17	17	39	58.665	0.553	6	18	59.078
	3	14	42	33.673	0.652	9	15	55.004		18	17	43	55.220	0.544	6	15	03.168
	4	14	46	30.229	0.658	9	11	59.094		19	17	47	51.776	0.535	6	11	07.259
	5	14	50	26.784	0.662	9	08	03.185		20	17	51	48.331	0.526	6	07	11.349
	6	14	54	23.339	0.662	9	04	07.275		21	17	55	44.886	0.520	6	03	15.440
	7	14	58	19.895	-0.659	9	00	11.366		22	17	59	41.442	-0.515	5	59	19.530
	8	15	02	16.450	0.652	8	56	15.457		23	18	03	37.997	0.513	5	55	23.621
	9	15	06	13.005	0.643	8	52	19.547		24	18	07	34.552	0.514	5	51	27.711
	10	15	10	09.561	0.633	8	48	23.638		25	18	11	31.108	0.517	5	47	31.802
	11	15	14	06.116	0.624	8	44	27.728		26	18	15	27.663	0.520	5	43	35.892
	12	15	18	02.672	0.619	8	40	31.819		27	18	19	24.218	0.524	5	39	39.983
	13	15	21	59.227	-0.618	8	36	35.909		28	18	23	20.774	-0.527	5	35	44.074
	14	15	25	55.782	0.620	8	32	40.000		29	18	27	17.329	0.528	5	31	48.164
	15	15	29	52.338	0.625	8	28	44.090		30	18	31	13.885	0.525	5	27	52.255
	16	15	33	48.893	0.631	8	24	48.181	July	1	18	35	10.440	0.518	5	23	56.345
	17	15	37	45.448	-0.636	8	20	52.271		2	18	39	06.995	-0.508	5	20	00.436

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

SIDEREAL TIME, 2023

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	35	10.440	-0.518	5	23	56.345	Aug.	16	21	36	31.987	-0.402	2	23	04.510
	2	18	39	06.995	0.508	5	20	00.436		17	21	40	28.542	0.405	2	19	08.600
	3	18	43	03.551	0.495	5	16	04.526		18	21	44	25.098	0.410	2	15	12.691
	4	18	46	60.106	0.483	5	12	08.617		19	21	48	21.653	0.417	2	11	16.781
	5	18	50	56.661	0.472	5	08	12.707		20	21	52	18.208	0.424	2	07	20.872
	6	18	54	53.217	0.466	5	04	16.798		21	21	56	14.764	0.431	2	03	24.962
	7	18	58	49.772	-0.465	5	00	20.888		22	22	00	11.319	-0.437	1	59	29.053
	8	19	02	46.328	0.467	4	56	24.979		23	22	04	07.874	0.441	1	55	33.143
	9	19	06	42.883	0.472	4	52	29.069		24	22	08	04.430	0.441	1	51	37.234
	10	19	10	39.438	0.476	4	48	33.160		25	22	12	00.985	0.438	1	47	41.324
	11	19	14	35.994	0.478	4	44	37.250		26	22	15	57.541	0.431	1	43	45.415
	12	19	18	32.549	0.478	4	40	41.341		27	22	19	54.096	0.423	1	39	49.505
	13	19	22	29.104	-0.475	4	36	45.432		28	22	23	50.651	-0.415	1	35	53.596
	14	19	26	25.660	0.469	4	32	49.522		29	22	27	47.207	0.410	1	31	57.686
	15	19	30	22.215	0.462	4	28	53.613		30	22	31	43.762	0.408	1	28	01.777
	16	19	34	18.770	0.454	4	24	57.703		31	22	35	40.317	0.411	1	24	05.867
	17	19	38	15.326	0.446	4	21	01.794	Sept.	1	22	39	36.873	0.418	1	20	09.958
	18	19	42	11.881	0.440	4	17	05.884		2	22	43	33.428	0.427	1	16	14.049
	19	19	46	08.437	-0.436	4	13	09.975		3	22	47	29.984	-0.435	1	12	18.139
	20	19	50	04.992	0.434	4	09	14.065		4	22	51	26.539	0.440	1	08	22.230
	21	19	54	01.547	0.435	4	05	18.156		5	22	55	23.094	0.443	1	04	26.320
	22	19	57	58.103	0.438	4	01	22.246		6	22	59	19.650	0.442	1	00	30.411
	23	20	01	54.658	0.443	3	57	26.337		7	23	03	16.205	0.438	0	56	34.501
	24	20	05	51.213	0.449	3	53	30.427		8	23	07	12.760	0.434	0	52	38.592
	25	20	09	47.769	-0.453	3	49	34.518		9	23	11	09.316	-0.430	0	48	42.682
	26	20	13	44.324	0.456	3	45	38.608		10	23	15	05.871	0.427	0	44	46.773
	27	20	17	40.880	0.456	3	41	42.699		11	23	19	02.426	0.425	0	40	50.863
	28	20	21	37.435	0.453	3	37	46.790		12	23	22	58.982	0.427	0	36	54.954
	29	20	25	33.990	0.446	3	33	50.880		13	23	26	55.537	0.430	0	32	59.044
	30	20	29	30.546	0.436	3	29	54.971		14	23	30	52.093	0.437	0	29	03.135
	31	20	33	27.101	-0.425	3	25	59.061		15	23	34	48.648	-0.445	0	25	07.225
Aug.	1	20	37	23.656	0.415	3	22	03.152		16	23	38	45.203	0.454	0	21	11.316
	2	20	41	20.212	0.408	3	18	07.242		17	23	42	41.759	0.463	0	17	15.407
	3	20	45	16.767	0.407	3	14	11.333		18	23	46	38.314	0.470	0	13	19.497
	4	20	49	13.322	0.410	3	10	15.423		19	23	50	34.869	0.476	0	09	23.588
	5	20	53	09.878	0.415	3	06	19.514		20	23	54	31.425	0.478	0	05	27.678
	6	20	57	06.433	-0.422	3	02	23.604		21	23	58	27.980	-0.477	0	01	31.769
	7	21	01	02.989	0.427	2	58	27.695		22	0	02	24.536	0.473	23	53	39.950
	8	21	04	59.544	0.430	2	54	31.785		23	0	06	21.091	0.468	23	49	44.040
	9	21	08	56.099	0.429	2	50	35.876		24	0	10	17.646	0.461	23	45	48.131
	10	21	12	52.655	0.426	2	46	39.966		25	0	14	14.202	0.456	23	41	52.221
	11	21	16	49.210	0.420	2	42	44.057		26	0	18	10.757	0.454	23	37	56.312
	12	21	20	45.765	-0.414	2	38	48.147		27	0	22	07.312	-0.456	23	34	00.403
	13	21	24	42.321	0.408	2	34	52.238		28	0	26	03.868	0.462	23	30	04.493
	14	21	28	38.876	0.404	2	30	56.329		29	0	29	60.423	0.471	23	26	08.584
	15	21	32	35.432	0.402	2	27	00.419		30	0	33	56.978	0.481	23	22	12.674
	16	21	36	31.987	-0.402	2	23	04.510	Oct.	1	0	37	53.534	-0.488	23	18	16.765

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

SIDEREAL TIME, 2023

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	37	53.534	-0.488	23	18	16.765	Nov.	16	3	39	15.081	-0.498	20	17	24.929
	2	0	41	50.089	0.492	23	14	20.855		17	3	43	11.636	0.488	20	13	29.020
	3	0	45	46.645	0.492	23	10	24.946		18	3	47	08.192	0.479	20	09	33.110
	4	0	49	43.200	0.489	23	06	29.036		19	3	51	04.747	0.472	20	05	37.201
	5	0	53	39.755	0.485	23	02	33.127		20	3	55	01.302	0.468	20	01	41.291
	6	0	57	36.311	0.480	22	58	37.217		21	3	58	57.858	0.468	19	57	45.382
	7	1	01	32.866	-0.476	22	54	41.308		22	4	02	54.413	-0.472	19	53	49.472
	8	1	05	29.421	0.474	22	50	45.398		23	4	06	50.968	0.477	19	49	53.563
	9	1	09	25.977	0.474	22	46	49.489		24	4	10	47.524	0.481	19	45	57.653
	10	1	13	22.532	0.477	22	42	53.579		25	4	14	44.079	0.483	19	42	01.744
	11	1	17	19.088	0.482	22	38	57.670		26	4	18	40.634	0.482	19	38	05.834
	12	1	21	15.643	0.489	22	35	01.760		27	4	22	37.190	0.477	19	34	09.925
	13	1	25	12.198	-0.498	22	31	05.851		28	4	26	33.745	-0.469	19	30	14.015
	14	1	29	08.754	0.506	22	27	09.941		29	4	30	30.301	0.460	19	26	18.106
	15	1	33	05.309	0.514	22	23	14.032		30	4	34	26.856	0.450	19	22	22.196
	16	1	37	01.864	0.519	22	19	18.123	Dec.	1	4	38	23.411	0.442	19	18	26.287
	17	1	40	58.420	0.521	22	15	22.213		2	4	42	19.967	0.435	19	14	30.377
	18	1	44	54.975	0.520	22	11	26.304		3	4	46	16.522	0.431	19	10	34.468
	19	1	48	51.530	-0.516	22	07	30.394		4	4	50	13.077	-0.430	19	06	38.559
	20	1	52	48.086	0.510	22	03	34.485		5	4	54	09.633	0.432	19	02	42.649
	21	1	56	44.641	0.502	21	59	38.575		6	4	58	06.188	0.434	18	58	46.740
	22	2	00	41.197	0.496	21	55	42.666		7	5	02	02.744	0.438	18	54	50.830
	23	2	04	37.752	0.492	21	51	46.756		8	5	05	59.299	0.442	18	50	54.921
	24	2	08	34.307	0.492	21	47	50.847		9	5	09	55.854	0.444	18	46	59.011
	25	2	12	30.863	-0.496	21	43	54.937		10	5	13	52.410	-0.444	18	43	03.102
	26	2	16	27.418	0.502	21	39	59.028		11	5	17	48.965	0.440	18	39	07.192
	27	2	20	23.973	0.510	21	36	03.118		12	5	21	45.520	0.432	18	35	11.283
	28	2	24	20.529	0.517	21	32	07.209		13	5	25	42.076	0.422	18	31	15.373
	29	2	28	17.084	0.520	21	28	11.299		14	5	29	38.631	0.410	18	27	19.464
	30	2	32	13.640	0.520	21	24	15.390		15	5	33	35.187	0.397	18	23	23.554
	31	2	36	10.195	-0.516	21	20	19.480		16	5	37	31.742	-0.387	18	19	27.645
Nov.	1	2	40	06.750	0.510	21	16	23.571		17	5	41	28.297	0.381	18	15	31.735
	2	2	44	03.306	0.503	21	12	27.662		18	5	45	24.853	0.378	18	11	35.826
	3	2	47	59.861	0.496	21	08	31.752		19	5	49	21.408	0.380	18	07	39.916
	4	2	51	56.416	0.491	21	04	35.843		20	5	53	17.963	0.383	18	03	44.007
	5	2	55	52.972	0.488	21	00	39.933		21	5	57	14.519	0.386	17	59	48.097
	6	2	59	49.527	-0.488	20	56	44.024		22	6	01	11.074	-0.388	17	55	52.188
	7	3	03	46.082	0.490	20	52	48.114		23	6	05	07.629	0.386	17	51	56.279
	8	3	07	42.638	0.495	20	48	52.205		24	6	09	04.185	0.382	17	48	00.369
	9	3	11	39.193	0.500	20	44	56.295		25	6	13	00.740	0.374	17	44	04.460
	10	3	15	35.749	0.507	20	41	00.386		26	6	16	57.296	0.364	17	40	08.550
	11	3	19	32.304	0.512	20	37	04.476		27	6	20	53.851	0.353	17	36	12.641
	12	3	23	28.859	-0.516	20	33	08.567		28	6	24	50.406	-0.343	17	32	16.731
	13	3	27	25.415	0.516	20	29	12.657		29	6	28	46.962	0.336	17	28	20.822
	14	3	31	21.970	0.513	20	25	16.748		30	6	32	43.517	0.330	17	24	24.912
	15	3	35	18.525	0.507	20	21	20.838		31	6	36	40.072	0.328	17	20	29.003
	16	3	39	15.081	-0.498	20	17	24.929		32	6	40	36.628	-0.328	17	16	33.093

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

SUN, 2023
MEAN LONGITUDE AND ANOMALY

Date	Horizontal Parallax	Mean Longitude			Mean Anomaly	Date	Horizontal Parallax	Mean Longitude			Mean Anomaly
	"	°	′	"	°		"	°	′	"	°
Jan. 1	8.94	280	23	49.545	357.064	July 10	8.65	107	40	12.339	184.328
11	8.94	290	15	12.850	6.920	20	8.65	117	31	35.644	194.184
21	8.94	300	06	36.155	16.776	30	8.66	127	22	58.949	204.040
31	8.93	309	57	59.460	26.632	Aug. 9	8.67	137	14	22.254	213.896
Feb. 10	8.91	319	49	22.765	36.488	19	8.69	147	05	45.559	223.752
20	8.9	329	40	46.070	46.344	29	8.71	156	57	8.864	233.608
Mar. 2	8.88	339	32	9.374	56.200	Sept. 8	8.73	166	48	32.169	243.464
12	8.85	349	23	32.679	66.056	18	8.75	176	39	55.474	253.320
22	8.83	359	14	55.984	75.912	28	8.77	186	31	18.779	263.176
Apr. 1	8.8	9	06	19.289	85.768	Oct. 8	8.8	196	22	42.084	273.032
11	8.78	18	57	42.594	95.624	18	8.82	206	14	5.389	282.888
21	8.75	28	49	5.899	105.480	28	8.85	216	05	28.694	292.744
May 1	8.73	38	40	29.204	115.336	Nov. 7	8.87	225	56	51.998	302.600
11	8.71	48	31	52.509	125.192	17	8.89	235	48	15.303	312.456
21	8.69	58	23	15.814	135.048	27	8.91	245	39	38.608	322.312
31	8.68	68	14	39.119	144.904	Dec. 7	8.93	255	31	1.913	332.168
June 10	8.66	78	06	2.424	154.760	17	8.94	265	22	25.218	342.024
20	8.65	87	57	25.729	164.616	27	8.94	275	13	48.523	351.880
30	8.65	97	48	49.034	174.472	37	8.94	285	05	11.828	1.736
July 10	8.65	107	40	12.339	184.328	47	8.94	294	56	35.133	11.592

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Jan.	0	279	16	21.82	-0.36	279	15	50.47	20.84	-25.57	-10.55	+6.57	17.21
	1	280	17	30.42	0.22	280	16	59.05	20.84	25.44	10.57	6.55	17.18
	2	281	18	38.83	-0.11	281	18	07.49	20.84	25.30	10.55	6.52	17.15
	3	282	19	47.13	+0.04	282	19	15.85	20.84	25.16	10.48	6.48	17.11
	4	283	20	55.24	0.14	283	20	24.07	20.84	25.02	10.37	6.46	17.09
	5	284	22	03.26	0.25	284	21	32.22	20.84	24.88	10.24	6.45	17.07
	6	285	23	11.12	+0.32	285	22	40.22	20.84	-24.74	-10.10	+6.45	17.08
	7	286	24	18.85	0.40	286	23	48.08	20.84	24.60	9.97	6.48	17.11
	8	287	25	26.49	0.43	287	24	55.84	20.84	24.46	9.86	6.53	17.15
	9	288	26	34.06	0.43	288	26	03.48	20.84	24.32	9.78	6.58	17.20
	10	289	27	41.48	0.43	289	27	10.94	20.84	24.18	9.74	6.64	17.26
	11	290	28	48.87	0.40	290	28	18.34	20.84	24.04	9.74	6.70	17.32
	12	291	29	56.16	+0.32	291	29	25.58	20.84	-23.91	-9.78	+6.75	17.37
	13	292	31	03.40	0.22	292	30	32.76	20.84	23.77	9.84	6.79	17.41
	14	293	32	10.53	+0.11	293	31	39.83	20.84	23.63	9.91	6.81	17.42
	15	294	33	17.59	-0.00	294	32	46.82	20.84	23.49	9.97	6.80	17.42
	16	295	34	24.50	0.14	295	33	53.71	20.84	23.35	10.00	6.78	17.40
	17	296	35	31.28	0.29	296	35	00.53	20.83	23.21	9.97	6.75	17.36
	18	297	36	37.82	-0.40	297	36	07.16	20.83	-23.07	-9.87	+6.72	17.33
	19	298	37	44.16	0.50	298	37	13.66	20.83	22.93	9.72	6.70	17.31
	20	299	38	50.13	0.61	299	38	19.82	20.83	22.79	9.52	6.71	17.31
	21	300	39	55.66	0.68	300	39	25.56	20.83	22.65	9.31	6.75	17.35
	22	301	41	00.65	0.72	301	40	30.72	20.83	22.52	9.15	6.82	17.42
	23	302	42	04.96	0.72	302	41	35.12	20.82	22.38	9.05	6.91	17.51
	24	303	43	08.48	-0.68	303	42	38.66	20.82	-22.24	-9.04	+6.99	17.60
	25	304	44	11.06	0.61	304	43	41.20	20.82	22.10	9.09	7.06	17.66
	26	305	45	12.67	0.50	305	44	42.72	20.82	21.96	9.18	7.10	17.70
	27	306	46	13.20	0.40	306	45	43.16	20.82	21.82	9.27	7.11	17.71
	28	307	47	12.59	0.29	307	46	42.49	20.81	21.68	9.33	7.10	17.70
	29	308	48	10.78	0.14	308	47	40.67	20.81	21.54	9.35	7.08	17.68
	30	309	49	07.81	-0.04	309	48	37.73	20.81	-21.40	-9.32	+7.06	17.65
	31	310	50	03.62	+0.11	310	49	33.60	20.81	21.26	9.26	7.04	17.64
Feb.	1	311	50	58.21	0.18	311	50	28.28	20.80	21.12	9.17	7.04	17.63
	2	312	51	51.56	0.29	312	51	21.74	20.80	20.99	9.07	7.05	17.64
	3	313	52	43.70	0.36	313	52	13.98	20.80	20.85	8.97	7.08	17.67
	4	314	53	34.66	0.40	314	53	05.03	20.79	20.71	8.89	7.13	17.72
	5	315	54	24.40	+0.40	315	53	54.82	20.79	-20.57	-8.84	+7.19	17.78
	6	316	55	12.99	0.40	316	54	43.42	20.79	20.43	8.83	7.26	17.85
	7	317	56	00.39	0.36	317	55	30.79	20.78	20.29	8.87	7.33	17.92
	8	318	56	46.65	0.29	318	56	16.98	20.78	20.15	8.94	7.39	17.97
	9	319	57	31.82	0.18	319	57	02.05	20.78	20.01	9.04	7.43	18.02
	10	320	58	15.88	+0.07	320	57	46.01	20.77	19.87	9.15	7.46	18.04
	11	321	58	58.86	-0.04	321	58	28.88	20.77	-19.73	-9.26	+7.47	18.05
	12	322	59	40.73	0.18	322	59	10.68	20.77	19.59	9.33	7.45	18.03
	13	324	00	21.55	0.29	323	59	51.47	20.76	19.46	9.37	7.43	18.01
	14	325	01	01.30	0.43	325	00	31.25	20.76	19.32	9.35	7.40	17.98
	15	326	01	39.95	-0.54	326	01	09.98	20.75	-19.18	-9.26	+7.38	17.95

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

SUN, 2023

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
Jan.	0	18	40	19.38	-23	06	52.64	0.983 3616	16	15.88	12	02	57.04
	1	18	44	44.50	23	02	23.25	0.983 3368	16	15.91	12	03	25.47
	2	18	49	09.31	22	57	26.26	0.983 3176	16	15.93	12	03	53.56
	3	18	53	33.78	22	52	01.85	0.983 3043	16	15.94	12	04	21.29
	4	18	57	57.87	22	46	10.19	0.983 2970	16	15.95	12	04	48.63
	5	19	02	21.56	22	39	51.46	0.983 2959	16	15.95	12	05	15.55
	6	19	06	44.83	-22	33	05.85	0.983 3010	16	15.94	12	05	42.03
	7	19	11	07.64	22	25	53.57	0.983 3125	16	15.93	12	06	08.05
	8	19	15	29.97	22	18	14.81	0.983 3303	16	15.91	12	06	33.59
	9	19	19	51.81	22	10	09.80	0.983 3543	16	15.89	12	06	58.61
	10	19	24	13.12	22	01	38.76	0.983 3846	16	15.86	12	07	23.10
	11	19	28	33.89	21	52	41.91	0.983 4209	16	15.82	12	07	47.03
	12	19	32	54.09	-21	43	19.51	0.983 4632	16	15.78	12	08	10.39
	13	19	37	13.70	21	33	31.79	0.983 5113	16	15.73	12	08	33.16
	14	19	41	32.72	21	23	19.02	0.983 5650	16	15.68	12	08	55.32
	15	19	45	51.11	21	12	41.47	0.983 6239	16	15.62	12	09	16.85
	16	19	50	08.87	21	01	39.42	0.983 6879	16	15.56	12	09	37.72
	17	19	54	25.97	20	50	13.17	0.983 7567	16	15.49	12	09	57.93
	18	19	58	42.40	-20	38	23.03	0.983 8298	16	15.42	12	10	17.46
	19	20	02	58.15	20	26	09.34	0.983 9070	16	15.34	12	10	36.28
	20	20	07	13.18	20	13	32.42	0.983 9879	16	15.26	12	10	54.39
	21	20	11	27.49	20	00	32.65	0.984 0723	16	15.18	12	11	11.75
	22	20	15	41.04	19	47	10.38	0.984 1600	16	15.09	12	11	28.36
	23	20	19	53.83	19	33	26.00	0.984 2509	16	15.00	12	11	44.19
	24	20	24	05.82	-19	19	19.85	0.984 3451	16	14.91	12	11	59.23
	25	20	28	17.02	19	04	52.33	0.984 4427	16	14.81	12	12	13.47
	26	20	32	27.41	18	50	03.81	0.984 5439	16	14.71	12	12	26.89
	27	20	36	36.98	18	34	54.68	0.984 6490	16	14.61	12	12	39.49
	28	20	40	45.72	18	19	25.35	0.984 7584	16	14.50	12	12	51.27
	29	20	44	53.65	18	03	36.22	0.984 8722	16	14.39	12	13	02.22
	30	20	49	00.74	-17	47	27.70	0.984 9907	16	14.27	12	13	12.33
	31	20	53	07.00	17	31	00.20	0.985 1141	16	14.15	12	13	21.61
Feb.	1	20	57	12.43	17	14	14.12	0.985 2426	16	14.02	12	13	30.06
	2	21	01	17.04	16	57	09.87	0.985 3764	16	13.89	12	13	37.68
	3	21	05	20.82	16	39	47.86	0.985 5155	16	13.75	12	13	44.48
	4	21	09	23.77	16	22	08.49	0.985 6601	16	13.61	12	13	50.46
	5	21	13	25.91	-16	04	12.16	0.985 8102	16	13.46	12	13	55.63
	6	21	17	27.23	15	45	59.26	0.985 9658	16	13.30	12	13	59.99
	7	21	21	27.75	15	27	30.19	0.986 1268	16	13.15	12	14	03.55
	8	21	25	27.48	15	08	45.34	0.986 2932	16	12.98	12	14	06.32
	9	21	29	26.42	14	49	45.10	0.986 4649	16	12.81	12	14	08.31
	10	21	33	24.58	14	30	29.85	0.986 6417	16	12.64	12	14	09.53
	11	21	37	21.98	-14	11	00.00	0.986 8234	16	12.46	12	14	09.99
	12	21	41	18.62	13	51	15.92	0.987 0098	16	12.27	12	14	09.71
	13	21	45	14.53	13	31	18.02	0.987 2006	16	12.09	12	14	08.69
	14	21	49	09.70	13	11	06.69	0.987 3954	16	11.90	12	14	06.94
	15	21	53	04.17	-12	50	42.35	0.987 5940	16	11.70	12	14	04.48

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Feb.	15	326	01	39.95	-0.54	326	01	09.98	20.75	-19.18	-9.26	+7.38	17.95
	16	327	02	17.48	0.61	327	01	47.64	20.75	19.04	9.13	7.38	17.95
	17	328	02	53.82	0.68	328	02	24.14	20.74	18.90	8.98	7.40	17.98
	18	329	03	28.93	0.72	329	02	59.39	20.74	18.76	8.85	7.46	18.03
	19	330	04	02.75	0.76	330	03	33.30	20.74	18.62	8.76	7.54	18.11
	20	331	04	35.11	0.72	331	04	05.66	20.73	18.48	8.76	7.63	18.20
	21	332	05	05.95	-0.65	332	04	36.44	20.73	-18.34	-8.83	+7.71	18.28
	22	333	05	35.16	0.54	333	05	05.53	20.72	18.20	8.95	7.76	18.32
	23	334	06	02.61	0.43	334	05	32.86	20.72	18.07	9.08	7.78	18.34
	24	335	06	28.28	0.32	335	05	58.42	20.71	17.93	9.20	7.77	18.33
	25	336	06	52.04	0.18	336	06	22.10	20.71	17.79	9.27	7.74	18.31
	26	337	07	13.84	-0.04	337	06	43.88	20.70	17.65	9.30	7.71	18.27
	27	338	07	33.73	+0.07	338	07	03.79	20.70	-17.51	-9.28	+7.68	18.24
	28	339	07	51.57	0.18	339	07	21.68	20.69	17.37	9.23	7.67	18.23
Mar.	1	340	08	07.45	0.29	340	07	37.63	20.69	17.23	9.17	7.67	18.23
	2	341	08	21.31	0.36	341	07	51.56	20.68	17.09	9.11	7.69	18.24
	3	342	08	33.21	0.40	342	08	03.52	20.68	16.95	9.06	7.72	18.28
	4	343	08	43.08	0.40	343	08	13.42	20.67	16.81	9.04	7.77	18.33
	5	344	08	50.98	+0.40	344	08	21.30	20.67	-16.67	-9.06	+7.83	18.38
	6	345	08	56.97	0.36	345	08	27.24	20.66	16.54	9.11	7.89	18.44
	7	346	09	01.03	0.29	346	08	31.20	20.66	16.40	9.21	7.94	18.49
	8	347	09	03.24	0.22	347	08	33.29	20.65	16.26	9.34	7.98	18.53
	9	348	09	03.56	+0.11	348	08	33.47	20.65	16.12	9.49	8.00	18.55
	10	349	09	02.11	-0.00	349	08	31.88	20.64	15.98	9.63	8.00	18.55
	11	350	08	58.88	-0.14	350	08	28.54	20.64	-15.84	-9.75	+7.98	18.52
	12	351	08	53.94	0.25	351	08	23.53	20.63	15.70	9.83	7.94	18.48
	13	352	08	47.30	0.40	352	08	16.87	20.63	15.56	9.85	7.90	18.44
	14	353	08	39.02	0.50	353	08	08.63	20.62	15.42	9.81	7.86	18.40
	15	354	08	29.06	0.61	354	07	58.76	20.61	15.28	9.73	7.84	18.38
	16	355	08	17.46	0.68	355	07	47.28	20.61	15.14	9.62	7.84	18.38
	17	356	08	04.21	-0.72	356	07	34.14	20.60	-15.01	-9.51	+7.87	18.41
	18	357	07	49.30	0.72	357	07	19.31	20.60	14.87	9.44	7.93	18.46
	19	358	07	32.62	0.72	358	07	02.64	20.59	14.73	9.43	8.00	18.53
	20	359	07	14.21	0.65	359	06	44.17	20.59	14.59	9.50	8.06	18.60
	21	0	06	53.88	0.54	0	06	23.72	20.58	14.45	9.62	8.11	18.64
	22	1	06	31.63	0.43	1	06	01.33	20.57	14.31	9.77	8.12	18.66
	23	2	06	07.33	-0.32	2	05	36.89	20.57	-14.17	-9.92	+8.11	18.64
	24	3	05	40.94	0.18	3	05	10.39	20.56	14.03	10.03	8.07	18.60
	25	4	05	12.33	-0.04	4	04	41.74	20.56	13.89	10.09	8.02	18.55
	26	5	04	41.55	+0.11	5	04	10.96	20.55	13.75	10.09	7.97	18.50
	27	6	04	08.47	0.22	6	03	37.91	20.55	13.61	10.06	7.93	18.46
	28	7	03	33.09	0.32	7	03	02.59	20.54	13.48	10.00	7.91	18.43
	29	8	02	55.40	+0.40	8	02	24.97	20.53	-13.34	-9.94	+7.90	18.43
	30	9	02	15.42	0.43	9	01	45.05	20.53	13.20	9.89	7.92	18.44
	31	10	01	33.16	0.47	10	01	02.82	20.52	13.06	9.86	7.95	18.47
Apr.	1	11	00	48.59	0.47	11	00	18.25	20.52	12.92	9.87	7.98	18.50
	2	12	00	01.77	+0.43	11	59	31.38	20.51	-12.78	-9.92	+8.03	18.54

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

SUN, 2023

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	53	04.17	-12	50	42.35	0.987 5940	16	11.70	12	14	04.48
	16	21	56	57.92	12	30	05.40	0.987 7958	16	11.50	12	14	01.31
	17	22	00	50.98	12	09	16.28	0.988 0006	16	11.30	12	13	57.45
	18	22	04	43.35	11	48	15.41	0.988 2079	16	11.10	12	13	52.91
	19	22	08	35.03	11	27	03.25	0.988 4174	16	10.89	12	13	47.69
	20	22	12	26.03	11	05	40.22	0.988 6288	16	10.68	12	13	41.80
	21	22	16	16.37	-10	44	06.76	0.988 8421	16	10.47	12	13	35.25
	22	22	20	06.05	10	22	23.30	0.989 0571	16	10.26	12	13	28.06
	23	22	23	55.09	10	00	30.28	0.989 2740	16	10.05	12	13	20.23
	24	22	27	43.50	9	38	28.12	0.989 4929	16	09.84	12	13	11.77
	25	22	31	31.29	9	16	17.26	0.989 7140	16	09.62	12	13	02.70
	26	22	35	18.49	8	53	58.11	0.989 9375	16	09.40	12	12	53.05
	27	22	39	05.10	-8	31	31.10	0.990 1637	16	09.18	12	12	42.81
	28	22	42	51.14	8	08	56.65	0.990 3927	16	08.95	12	12	32.01
Mar.	1	22	46	36.63	7	46	15.17	0.990 6247	16	08.73	12	12	20.68
	2	22	50	21.60	7	23	27.05	0.990 8599	16	08.50	12	12	08.82
	3	22	54	06.05	7	00	32.70	0.991 0984	16	08.26	12	11	56.47
	4	22	57	50.01	6	37	32.51	0.991 3403	16	08.03	12	11	43.63
	5	23	01	33.50	-6	14	26.85	0.991 5857	16	07.79	12	11	30.34
	6	23	05	16.54	5	51	16.10	0.991 8347	16	07.55	12	11	16.61
	7	23	08	59.15	5	28	00.62	0.992 0872	16	07.30	12	11	02.46
	8	23	12	41.35	5	04	40.79	0.992 3433	16	07.05	12	10	47.92
	9	23	16	23.17	4	41	16.96	0.992 6029	16	06.80	12	10	33.01
	10	23	20	04.63	4	17	49.47	0.992 8659	16	06.54	12	10	17.76
	11	23	23	45.76	-3	54	18.68	0.993 1322	16	06.28	12	10	02.18
	12	23	27	26.58	3	30	44.93	0.993 4015	16	06.02	12	09	46.30
	13	23	31	07.11	3	07	08.57	0.993 6735	16	05.75	12	09	30.14
	14	23	34	47.38	2	43	29.96	0.993 9480	16	05.49	12	09	13.73
	15	23	38	27.40	2	19	49.46	0.994 2246	16	05.22	12	08	57.08
	16	23	42	07.21	1	56	07.43	0.994 5029	16	04.95	12	08	40.22
	17	23	45	46.80	-1	32	24.26	0.994 7825	16	04.68	12	08	23.16
	18	23	49	26.21	1	08	40.33	0.995 0629	16	04.41	12	08	05.93
	19	23	53	05.45	0	44	56.02	0.995 3437	16	04.13	12	07	48.54
	20	23	56	44.54	-0	21	11.74	0.995 6247	16	03.86	12	07	31.01
	21	0	00	23.49	+0	02	32.12	0.995 9055	16	03.59	12	07	13.35
	22	0	04	02.31	0	26	15.19	0.996 1858	16	03.32	12	06	55.58
	23	0	07	41.04	+0	49	57.06	0.996 4657	16	03.05	12	06	37.72
	24	0	11	19.69	1	13	37.36	0.996 7452	16	02.78	12	06	19.78
	25	0	14	58.26	1	37	15.69	0.997 0243	16	02.51	12	06	01.78
	26	0	18	36.79	2	00	51.68	0.997 3032	16	02.24	12	05	43.74
	27	0	22	15.29	2	24	24.94	0.997 5821	16	01.97	12	05	25.68
	28	0	25	53.78	2	47	55.11	0.997 8610	16	01.70	12	05	07.61
	29	0	29	32.27	+3	11	21.80	0.998 1403	16	01.43	12	04	49.56
	30	0	33	10.79	3	34	44.67	0.998 4200	16	01.16	12	04	31.54
	31	0	36	49.35	3	58	03.36	0.998 7004	16	00.89	12	04	13.58
Apr.	1	0	40	27.97	4	21	17.52	0.998 9814	16	00.62	12	03	55.69
	2	0	44	06.67	+4	44	26.80	0.999 2634	16	00.35	12	03	37.90

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Apr.	1	11	00	48.59	+0.47	11	00	18.25	20.52	-12.92	-9.87	+7.98	18.50
	2	12	00	01.77	0.43	11	59	31.38	20.51	12.78	9.92	8.03	18.54
	3	12	59	12.67	0.40	12	58	42.20	20.50	12.64	10.01	8.06	18.58
	4	13	58	21.42	0.29	13	57	50.83	20.50	12.50	10.13	8.09	18.60
	5	14	57	28.02	0.22	14	56	57.30	20.49	12.36	10.27	8.10	18.61
	6	15	56	32.50	+0.07	15	56	01.64	20.49	12.22	10.42	8.08	18.60
	7	16	55	34.91	-0.04	16	55	03.94	20.48	-12.08	-10.54	+8.05	18.56
	8	17	54	35.37	0.18	17	54	04.32	20.48	11.95	10.62	8.00	18.51
	9	18	53	33.90	0.29	18	53	02.83	20.47	11.81	10.65	7.94	18.44
	10	19	52	30.58	0.43	19	51	59.54	20.46	11.67	10.62	7.88	18.38
	11	20	51	25.47	0.50	20	50	54.53	20.46	11.53	10.53	7.83	18.34
	12	21	50	18.61	0.61	21	49	47.78	20.45	11.39	10.41	7.81	18.32
	13	22	49	10.05	-0.65	22	48	39.35	20.45	-11.25	-10.30	+7.82	18.32
	14	23	47	59.79	0.65	23	47	29.18	20.44	11.11	10.21	7.85	18.35
	15	24	46	47.85	0.65	24	46	17.29	20.43	10.97	10.17	7.90	18.40
	16	25	45	34.26	0.58	25	45	03.67	20.43	10.83	10.20	7.95	18.45
	17	26	44	18.96	0.50	26	43	48.29	20.42	10.69	10.29	7.99	18.48
	18	27	43	01.86	0.40	27	42	31.07	20.42	10.55	10.42	8.00	18.49
	19	28	41	43.00	-0.29	28	41	12.08	20.41	-10.42	-10.55	+7.98	18.47
	20	29	40	22.24	-0.14	29	39	51.23	20.41	10.28	10.66	7.93	18.43
	21	30	38	59.60	+0.00	30	38	28.54	20.40	10.14	10.71	7.87	18.37
	22	31	37	34.97	0.14	31	37	03.90	20.39	10.00	10.72	7.81	18.30
	23	32	36	08.30	0.29	32	35	37.28	20.39	9.86	10.67	7.75	18.24
	24	33	34	39.58	0.40	33	34	08.65	20.38	9.72	10.59	7.70	18.19
	25	34	33	08.80	+0.47	34	32	37.97	20.38	-9.58	-10.50	+7.68	18.17
	26	35	31	35.90	0.54	35	31	05.16	20.37	9.44	10.41	7.67	18.16
	27	36	30	00.89	0.58	36	29	30.23	20.37	9.30	10.34	7.69	18.17
	28	37	28	23.76	0.58	37	27	53.14	20.36	9.16	10.31	7.71	18.20
	29	38	26	44.58	0.58	38	26	13.96	20.36	9.02	10.32	7.74	18.22
	30	39	25	03.32	0.50	39	24	32.65	20.35	8.89	10.36	7.77	18.25
May	1	40	23	20.00	+0.43	40	22	49.26	20.35	-8.75	-10.44	+7.79	18.27
	2	41	21	34.69	0.36	41	21	03.85	20.34	8.61	10.54	7.80	18.27
	3	42	19	47.45	0.25	42	19	16.50	20.34	8.47	10.66	7.78	18.26
	4	43	17	58.28	+0.11	43	17	27.24	20.33	8.33	10.76	7.74	18.22
	5	44	16	07.28	-0.00	44	15	36.18	20.33	8.19	10.82	7.69	18.16
	6	45	14	14.53	0.14	45	13	43.43	20.32	-8.05	10.83	7.62	18.09
	7	46	12	20.14	-0.25	46	11	49.09	20.32	-7.91	-10.77	+7.55	18.02
	8	47	10	24.13	0.36	47	09	53.21	20.31	7.77	10.66	7.49	17.97
	9	48	08	26.62	0.47	48	07	55.85	20.31	7.63	10.51	7.46	17.93
	10	49	06	27.69	0.50	49	05	57.08	20.30	7.49	10.34	7.46	17.93
	11	50	04	27.37	0.54	50	03	56.92	20.30	7.36	10.21	7.48	17.95
	12	51	02	25.82	0.54	51	01	55.45	20.29	7.22	10.12	7.52	17.99
	13	52	00	22.96	-0.47	51	59	52.62	20.29	-7.08	-10.10	+7.57	18.03
	14	52	58	18.90	0.40	52	57	48.53	20.28	6.94	10.14	7.60	18.07
	15	53	56	13.59	0.32	53	55	43.14	20.28	6.80	10.22	7.62	18.08
	16	54	54	07.04	0.18	54	53	36.49	20.27	6.66	10.32	7.61	18.07
	17	55	51	59.24	-0.07	55	51	28.62	20.27	-6.52	-10.39	+7.57	18.03

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

SUN, 2023

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	40	27.97	+4	21	17.52	0.998 9814	16	00.62	12	03	55.69
	2	0	44	06.67	4	44	26.80	0.999 2634	16	00.35	12	03	37.90
	3	0	47	45.49	5	07	30.86	0.999 5463	16	00.08	12	03	20.22
	4	0	51	24.42	5	30	29.39	0.999 8303	15	59.81	12	03	02.69
	5	0	55	03.51	5	53	22.06	1.000 1154	15	59.53	12	02	45.31
	6	0	58	42.76	6	16	08.54	1.000 4017	15	59.26	12	02	28.12
	7	1	02	22.21	+6	38	48.53	1.000 6891	15	58.98	12	02	11.13
	8	1	06	01.88	7	01	21.72	1.000 9775	15	58.71	12	01	54.36
	9	1	09	41.78	7	23	47.81	1.001 2669	15	58.43	12	01	37.84
	10	1	13	21.95	7	46	06.48	1.001 5570	15	58.15	12	01	21.59
	11	1	17	02.39	8	08	17.42	1.001 8476	15	57.88	12	01	05.62
	12	1	20	43.13	8	30	20.31	1.002 1383	15	57.60	12	00	49.96
	13	1	24	24.19	+8	52	14.81	1.002 4288	15	57.32	12	00	34.62
	14	1	28	05.58	9	14	00.58	1.002 7186	15	57.04	12	00	19.62
	15	1	31	47.31	9	35	37.28	1.003 0074	15	56.77	12	00	04.98
	16	1	35	29.40	9	57	04.53	1.003 2946	15	56.49	11	59	50.71
	17	1	39	11.87	10	18	22.00	1.003 5799	15	56.22	11	59	36.81
	18	1	42	54.72	10	39	29.31	1.003 8630	15	55.95	11	59	23.32
	19	1	46	37.96	+11	00	26.12	1.004 1435	15	55.68	11	59	10.22
	20	1	50	21.62	11	21	12.06	1.004 4213	15	55.42	11	58	57.54
	21	1	54	05.71	11	41	46.79	1.004 6963	15	55.16	11	58	45.29
	22	1	57	50.22	12	02	09.95	1.004 9684	15	54.90	11	58	33.46
	23	2	01	35.17	12	22	21.17	1.005 2377	15	54.64	11	58	22.08
	24	2	05	20.57	12	42	20.12	1.005 5044	15	54.39	11	58	11.14
	25	2	09	06.42	+13	02	06.43	1.005 7684	15	54.14	11	58	00.67
	26	2	12	52.74	13	21	39.78	1.006 0300	15	53.89	11	57	50.66
	27	2	16	39.53	13	40	59.81	1.006 2894	15	53.65	11	57	41.13
	28	2	20	26.80	14	00	06.20	1.006 5467	15	53.40	11	57	32.09
	29	2	24	14.56	14	18	58.62	1.006 8020	15	53.16	11	57	23.54
	30	2	28	02.82	14	37	36.74	1.007 0555	15	52.92	11	57	15.50
May	1	2	31	51.58	+14	56	00.27	1.007 3074	15	52.68	11	57	07.97
	2	2	35	40.86	15	14	08.88	1.007 5578	15	52.45	11	57	00.97
	3	2	39	30.67	15	32	02.28	1.007 8068	15	52.21	11	56	54.49
	4	2	43	21.02	15	49	40.18	1.008 0547	15	51.98	11	56	48.56
	5	2	47	11.91	16	07	02.30	1.008 3014	15	51.74	11	56	43.18
	6	2	51	03.36	16	24	08.36	1.008 5470	15	51.51	11	56	38.35
	7	2	54	55.38	+16	40	58.08	1.008 7915	15	51.28	11	56	34.09
	8	2	58	47.97	16	57	31.20	1.009 0348	15	51.05	11	56	30.41
	9	3	02	41.14	17	13	47.44	1.009 2767	15	50.82	11	56	27.30
	10	3	06	34.89	17	29	46.51	1.009 5170	15	50.60	11	56	24.78
	11	3	10	29.23	17	45	28.13	1.009 7554	15	50.37	11	56	22.85
	12	3	14	24.16	18	00	51.98	1.009 9914	15	50.15	11	56	21.51
	13	3	18	19.67	+18	15	57.77	1.010 2247	15	49.93	11	56	20.76
	14	3	22	15.77	18	30	45.20	1.010 4548	15	49.72	11	56	20.61
	15	3	26	12.47	18	45	13.97	1.010 6814	15	49.50	11	56	21.04
	16	3	30	09.74	18	59	23.77	1.010 9041	15	49.29	11	56	22.06
	17	3	34	07.60	+19	13	14.32	1.011 1225	15	49.09	11	56	23.65

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
May	17	55	51	59.24	-0.07	55	51	28.62	20.27	-6.52	-10.39	+7.57	18.03
	18	56	49	50.11	+0.07	56	49	19.45	20.27	6.38	10.43	7.51	17.97
	19	57	47	39.70	0.22	57	47	09.06	20.26	6.24	10.42	7.45	17.90
	20	58	45	27.86	0.36	58	44	57.30	20.26	6.10	10.35	7.38	17.84
	21	59	43	14.66	0.47	59	42	44.21	20.25	5.96	10.25	7.34	17.79
	22	60	40	60.00	0.58	60	40	29.68	20.25	5.83	10.12	7.31	17.76
	23	61	38	43.89	+0.65	61	38	13.70	20.25	-5.69	-9.99	+7.30	17.75
	24	62	36	26.25	0.68	62	35	56.18	20.24	5.55	9.87	7.31	17.76
	25	63	34	07.17	0.68	63	33	37.19	20.24	5.41	9.79	7.33	17.78
	26	64	31	46.58	0.68	64	31	16.64	20.23	5.27	9.74	7.36	17.81
	27	65	29	24.51	0.65	65	28	54.59	20.23	5.13	9.74	7.40	17.84
	28	66	27	00.98	0.58	66	26	31.02	20.23	4.99	9.77	7.43	17.87
	29	67	24	36.03	+0.50	67	24	06.01	20.22	-4.85	-9.83	+7.44	17.89
	30	68	22	09.61	0.40	68	21	39.53	20.22	4.71	9.91	7.44	17.88
	31	69	19	41.83	0.29	69	19	11.68	20.22	4.57	9.98	7.42	17.86
June	1	70	17	12.76	0.14	70	16	42.56	20.22	4.43	10.03	7.38	17.82
	2	71	14	42.38	+0.04	71	14	12.19	20.21	4.30	10.02	7.32	17.76
	3	72	12	10.86	-0.11	72	11	40.74	20.21	4.16	9.96	7.26	17.69
	4	73	09	38.20	-0.22	73	09	08.21	20.21	-4.02	-9.83	+7.20	17.64
	5	74	07	04.58	0.29	74	06	34.78	20.20	3.88	9.65	7.17	17.60
	6	75	04	30.04	0.36	75	04	00.44	20.20	3.74	9.44	7.16	17.60
	7	76	01	54.69	0.40	76	01	25.28	20.20	3.60	9.25	7.19	17.62
	8	76	59	18.63	0.40	76	58	49.37	20.20	3.46	9.12	7.24	17.67
	9	77	56	42.00	0.36	77	56	12.80	20.19	3.32	9.05	7.30	17.73
	10	78	54	04.78	-0.29	78	53	35.59	20.19	-3.18	-9.04	+7.35	17.78
	11	79	51	27.07	0.18	79	50	57.84	20.19	3.04	9.09	7.38	17.81
	12	80	48	48.88	-0.07	80	48	19.58	20.19	2.90	9.16	7.39	17.81
	13	81	46	10.25	+0.04	81	45	40.90	20.18	2.76	9.22	7.37	17.79
	14	82	43	31.16	0.18	82	43	01.78	20.18	2.63	9.25	7.33	17.75
	15	83	40	51.58	0.32	83	40	22.22	20.18	2.49	9.22	7.28	17.70
	16	84	38	11.52	+0.43	84	37	42.24	20.18	-2.35	-9.15	+7.23	17.65
	17	85	35	30.95	0.54	85	35	01.79	20.17	2.21	9.04	7.19	17.61
	18	86	32	49.85	0.65	86	32	20.83	20.17	2.07	8.89	7.16	17.58
	19	87	30	08.17	0.72	87	29	39.30	20.17	1.93	8.75	7.16	17.58
	20	88	27	25.93	0.76	88	26	57.19	20.17	1.79	8.61	7.18	17.60
	21	89	24	43.09	0.79	89	24	14.47	20.17	1.65	8.50	7.22	17.63
	22	90	21	59.65	+0.79	90	21	31.10	20.17	-1.51	-8.43	+7.26	17.68
	23	91	19	15.57	0.76	91	18	47.05	20.17	1.37	8.40	7.31	17.72
	24	92	16	30.88	0.68	92	16	02.35	20.17	1.23	8.40	7.36	17.77
	25	93	13	45.57	0.61	93	13	17.00	20.16	1.10	8.45	7.39	17.80
	26	94	10	59.67	0.50	94	10	31.04	20.16	0.96	8.51	7.41	17.82
	27	95	08	13.16	0.40	95	07	44.47	20.16	0.82	8.57	7.41	17.82
	28	96	05	26.13	+0.29	96	04	57.40	20.16	-0.68	-8.62	+7.39	17.80
	29	97	02	38.56	0.14	97	02	09.82	20.16	0.54	8.63	7.36	17.76
	30	97	59	50.54	+0.04	97	59	21.84	20.16	0.40	8.59	7.31	17.71
July	1	98	57	02.10	-0.07	98	56	33.50	20.16	0.26	8.48	7.27	17.67
	2	99	54	13.30	-0.18	99	53	44.88	20.16	-0.12	-8.31	+7.24	17.64

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

SUN, 2023

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	34	07.60	+19	13	14.32	1.011 1225	15	49.09	11	56	23.65
	18	3	38	06.03	19	26	45.33	1.011 3365	15	48.89	11	56	25.81
	19	3	42	05.03	19	39	56.52	1.011 5458	15	48.69	11	56	28.53
	20	3	46	04.58	19	52	47.62	1.011 7503	15	48.50	11	56	31.79
	21	3	50	04.68	20	05	18.35	1.011 9501	15	48.31	11	56	35.60
	22	3	54	05.31	20	17	28.44	1.012 1451	15	48.13	11	56	39.93
	23	3	58	06.47	+20	29	17.64	1.012 3354	15	47.95	11	56	44.77
	24	4	02	08.13	20	40	45.68	1.012 5212	15	47.78	11	56	50.12
	25	4	06	10.28	20	51	52.32	1.012 7025	15	47.61	11	56	55.95
	26	4	10	12.91	21	02	37.32	1.012 8795	15	47.44	11	57	02.26
	27	4	14	16.01	21	13	00.45	1.013 0523	15	47.28	11	57	09.04
	28	4	18	19.57	21	23	01.50	1.013 2212	15	47.12	11	57	16.26
	29	4	22	23.57	+21	32	40.26	1.013 3864	15	46.97	11	57	23.93
	30	4	26	28.00	21	41	56.52	1.013 5480	15	46.82	11	57	32.02
	31	4	30	32.84	21	50	50.11	1.013 7063	15	46.67	11	57	40.51
June	1	4	34	38.10	21	59	20.85	1.013 8614	15	46.52	11	57	49.41
	2	4	38	43.74	22	07	28.58	1.014 0135	15	46.38	11	57	58.69
	3	4	42	49.77	22	15	13.16	1.014 1629	15	46.24	11	58	08.34
	4	4	46	56.16	+22	22	34.44	1.014 3095	15	46.11	11	58	18.35
	5	4	51	02.91	22	29	32.30	1.014 4536	15	45.97	11	58	28.71
	6	4	55	10.00	22	36	06.60	1.014 5950	15	45.84	11	58	39.39
	7	4	59	17.41	22	42	17.21	1.014 7335	15	45.71	11	58	50.40
	8	5	03	25.13	22	48	03.99	1.014 8691	15	45.58	11	59	01.70
	9	5	07	33.14	22	53	26.80	1.015 0012	15	45.46	11	59	13.29
	10	5	11	41.41	+22	58	25.52	1.015 1297	15	45.34	11	59	25.14
	11	5	15	49.94	23	03	00.01	1.015 2541	15	45.23	11	59	37.24
	12	5	19	58.71	23	07	10.16	1.015 3741	15	45.11	11	59	49.56
	13	5	24	07.68	23	10	55.87	1.015 4892	15	45.01	12	00	02.08
	14	5	28	16.85	23	14	17.05	1.015 5992	15	44.90	12	00	14.78
	15	5	32	26.18	23	17	13.63	1.015 7038	15	44.81	12	00	27.63
	16	5	36	35.65	+23	19	45.54	1.015 8027	15	44.72	12	00	40.60
	17	5	40	45.23	23	21	52.74	1.015 8959	15	44.63	12	00	53.67
	18	5	44	54.90	23	23	35.17	1.015 9833	15	44.55	12	01	06.80
	19	5	49	04.62	23	24	52.80	1.016 0647	15	44.47	12	01	19.97
	20	5	53	14.36	23	25	45.61	1.016 1403	15	44.40	12	01	33.16
	21	5	57	24.10	23	26	13.58	1.016 2101	15	44.34	12	01	46.33
	22	6	01	33.81	+23	26	16.70	1.016 2742	15	44.28	12	01	59.46
	23	6	05	43.47	23	25	54.99	1.016 3327	15	44.22	12	02	12.52
	24	6	09	53.04	23	25	08.46	1.016 3858	15	44.17	12	02	25.49
	25	6	14	02.50	23	23	57.14	1.016 4336	15	44.13	12	02	38.33
	26	6	18	11.83	23	22	21.06	1.016 4764	15	44.09	12	02	51.04
	27	6	22	21.00	23	20	20.30	1.016 5144	15	44.05	12	03	03.57
	28	6	26	29.99	+23	17	54.91	1.016 5478	15	44.02	12	03	15.92
	29	6	30	38.79	23	15	04.98	1.016 5769	15	44.00	12	03	28.05
	30	6	34	47.36	23	11	50.59	1.016 6019	15	43.97	12	03	39.95
July	1	6	38	55.70	23	08	11.85	1.016 6232	15	43.95	12	03	51.60
	2	6	43	03.78	+23	04	08.89	1.016 6410	15	43.94	12	04	02.98

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
July	1	98	57	02.10	-0.07	98	56	33.50	20.16	-0.26	-8.48	+7.27	17.67
	2	99	54	13.30	0.18	99	53	44.88	20.16	-0.12	8.31	7.24	17.64
	3	100	51	24.29	0.25	100	50	56.08	20.16	+0.02	8.10	7.24	17.64
	4	101	48	35.17	0.29	101	48	07.16	20.16	0.16	7.89	7.27	17.67
	5	102	45	45.98	0.29	102	45	18.14	20.16	0.30	7.72	7.33	17.73
	6	103	42	56.93	0.25	103	42	29.20	20.16	0.43	7.62	7.41	17.80
	7	104	40	08.07	-0.22	104	39	40.36	20.16	+0.57	-7.60	+7.48	17.88
	8	105	37	19.49	0.11	105	36	51.73	20.16	0.71	7.64	7.54	17.93
	9	106	34	31.26	-0.00	106	34	03.43	20.16	0.85	7.71	7.57	17.96
	10	107	31	43.42	+0.11	107	31	15.53	20.16	0.99	7.78	7.57	17.96
	11	108	28	56.07	0.22	108	28	28.13	20.16	1.13	7.82	7.55	17.94
	12	109	26	09.13	0.36	109	25	41.20	20.16	1.27	7.82	7.51	17.90
	13	110	23	22.65	+0.47	110	22	54.77	20.16	+1.41	-7.77	+7.48	17.87
	14	111	20	36.67	0.61	111	20	08.88	20.16	1.55	7.67	7.45	17.84
	15	112	17	51.13	0.68	112	17	23.46	20.16	1.69	7.55	7.44	17.83
	16	113	15	06.01	0.76	113	14	38.47	20.16	1.83	7.42	7.45	17.83
	17	114	12	21.29	0.79	114	11	53.88	20.16	1.97	7.29	7.48	17.86
	18	115	09	36.99	0.83	115	09	09.68	20.17	2.10	7.19	7.53	17.91
	19	116	06	53.09	+0.83	116	06	25.85	20.17	+2.24	-7.12	+7.58	17.96
	20	117	04	09.52	0.79	117	03	42.30	20.17	2.38	7.10	7.65	18.02
	21	118	01	26.32	0.76	118	00	59.08	20.17	2.52	7.12	7.71	18.08
	22	118	58	43.44	0.65	118	58	16.14	20.17	2.66	7.17	7.76	18.13
	23	119	56	00.90	0.58	119	55	33.53	20.17	2.80	7.25	7.80	18.17
	24	120	53	18.70	0.47	120	52	51.24	20.17	2.94	7.33	7.81	18.19
	25	121	50	36.82	+0.32	121	50	09.28	20.18	+3.08	-7.41	+7.81	18.19
	26	122	47	55.30	0.22	122	47	27.71	20.18	3.22	7.46	7.80	18.17
	27	123	45	14.13	+0.11	123	44	46.54	20.18	3.36	7.46	7.77	18.14
	28	124	42	33.34	-0.04	124	42	05.80	20.18	3.50	7.41	7.74	18.10
	29	125	39	53.03	0.11	125	39	25.60	20.18	3.63	7.29	7.71	18.08
	30	126	37	13.17	0.18	126	36	45.90	20.19	3.77	7.13	7.71	18.08
	31	127	34	33.87	-0.25	127	34	06.78	20.19	+3.91	-6.95	+7.74	18.10
Aug.	1	128	31	55.24	0.25	128	31	28.31	20.19	4.05	6.78	7.80	18.16
	2	129	29	17.35	0.25	129	28	50.52	20.19	4.19	6.68	7.88	18.24
	3	130	26	40.33	0.18	130	26	13.52	20.20	4.33	6.65	7.97	18.33
	4	131	24	04.32	0.11	131	23	37.46	20.20	4.47	6.70	8.05	18.41
	5	132	21	29.40	-0.00	132	21	02.45	20.20	4.61	6.79	8.10	18.45
	6	133	18	55.64	+0.11	133	18	28.58	20.20	+4.75	-6.90	+8.11	18.47
	7	134	16	23.13	0.25	134	15	55.98	20.21	4.89	6.98	8.11	18.46
	8	135	13	51.90	0.40	135	13	24.71	20.21	5.03	7.02	8.08	18.43
	9	136	11	22.02	0.50	136	10	54.84	20.21	5.16	7.01	8.05	18.40
	10	137	08	53.47	0.61	137	08	26.34	20.22	5.30	6.96	8.02	18.37
	11	138	06	26.29	0.72	138	05	59.24	20.22	5.44	6.87	8.01	18.36
	12	139	04	00.43	+0.79	139	03	33.48	20.22	+5.58	-6.77	+8.02	18.37
	13	140	01	35.94	0.83	140	01	09.08	20.23	5.72	6.68	8.05	18.40
	14	140	59	12.77	0.86	140	58	45.98	20.23	5.86	6.61	8.10	18.45
	15	141	56	50.90	0.86	141	56	24.14	20.23	6.00	6.57	8.16	18.50
	16	142	54	30.33	+0.83	142	54	03.56	20.24	+6.14	-6.57	+8.23	18.57

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

SUN, 2023

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	38	55.70	+23	08	11.85	1.016 6232	15	43.95	12	03	51.60
	2	6	43	03.78	23	04	08.89	1.016 6410	15	43.94	12	04	02.98
	3	6	47	11.59	22	59	41.81	1.016 6554	15	43.92	12	04	14.08
	4	6	51	19.10	22	54	50.74	1.016 6666	15	43.91	12	04	24.87
	5	6	55	26.31	22	49	35.81	1.016 6746	15	43.91	12	04	35.35
	6	6	59	33.18	22	43	57.12	1.016 6793	15	43.90	12	04	45.49
	7	7	03	39.71	+22	37	54.78	1.016 6805	15	43.90	12	04	55.29
	8	7	07	45.89	22	31	28.91	1.016 6780	15	43.90	12	05	04.74
	9	7	11	51.70	22	24	39.64	1.016 6714	15	43.91	12	05	13.80
	10	7	15	57.12	22	17	27.12	1.016 6603	15	43.92	12	05	22.47
	11	7	20	02.14	22	09	51.50	1.016 6445	15	43.93	12	05	30.73
	12	7	24	06.74	22	01	52.96	1.016 6236	15	43.95	12	05	38.56
	13	7	28	10.92	+21	53	31.68	1.016 5974	15	43.98	12	05	45.95
	14	7	32	14.64	21	44	47.87	1.016 5656	15	44.01	12	05	52.88
	15	7	36	17.89	21	35	41.73	1.016 5281	15	44.04	12	05	59.32
	16	7	40	20.65	21	26	13.47	1.016 4847	15	44.08	12	06	05.27
	17	7	44	22.91	21	16	23.30	1.016 4355	15	44.13	12	06	10.70
	18	7	48	24.64	21	06	11.47	1.016 3802	15	44.18	12	06	15.61
	19	7	52	25.84	+20	55	38.19	1.016 3190	15	44.24	12	06	19.97
	20	7	56	26.48	20	44	43.71	1.016 2519	15	44.30	12	06	23.77
	21	8	00	26.56	20	33	28.26	1.016 1790	15	44.37	12	06	27.01
	22	8	04	26.06	20	21	52.11	1.016 1005	15	44.44	12	06	29.66
	23	8	08	24.97	20	09	55.50	1.016 0165	15	44.52	12	06	31.72
	24	8	12	23.29	19	57	38.69	1.015 9272	15	44.60	12	06	33.19
	25	8	16	21.00	+19	45	01.95	1.015 8328	15	44.69	12	06	34.04
	26	8	20	18.11	19	32	05.56	1.015 7336	15	44.78	12	06	34.29
	27	8	24	14.61	19	18	49.79	1.015 6298	15	44.88	12	06	33.92
	28	8	28	10.48	19	05	14.93	1.015 5219	15	44.98	12	06	32.92
	29	8	32	05.74	18	51	21.27	1.015 4101	15	45.08	12	06	31.31
	30	8	36	00.39	18	37	09.10	1.015 2947	15	45.19	12	06	29.07
	31	8	39	54.41	+18	22	38.71	1.015 1761	15	45.30	12	06	26.22
Aug.	1	8	43	47.82	18	07	50.38	1.015 0546	15	45.41	12	06	22.75
	2	8	47	40.61	17	52	44.39	1.014 9302	15	45.53	12	06	18.67
	3	8	51	32.79	17	37	21.00	1.014 8032	15	45.65	12	06	13.99
	4	8	55	24.36	17	21	40.46	1.014 6735	15	45.77	12	06	08.72
	5	8	59	15.34	17	05	43.01	1.014 5408	15	45.89	12	06	02.85
	6	9	03	05.74	+16	49	28.92	1.014 4050	15	46.02	12	05	56.40
	7	9	06	55.55	16	32	58.46	1.014 2658	15	46.15	12	05	49.38
	8	9	10	44.80	16	16	11.91	1.014 1230	15	46.28	12	05	41.79
	9	9	14	33.48	15	59	09.56	1.013 9761	15	46.42	12	05	33.62
	10	9	18	21.59	15	41	51.73	1.013 8250	15	46.56	12	05	24.90
	11	9	22	09.15	15	24	18.73	1.013 6694	15	46.70	12	05	15.62
	12	9	25	56.16	+15	06	30.86	1.013 5092	15	46.85	12	05	05.78
	13	9	29	42.61	14	48	28.47	1.013 3442	15	47.01	12	04	55.40
	14	9	33	28.52	14	30	11.85	1.013 1744	15	47.17	12	04	44.48
	15	9	37	13.88	14	11	41.34	1.012 9995	15	47.33	12	04	33.02
	16	9	40	58.71	+13	52	57.27	1.012 8197	15	47.50	12	04	21.03

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Aug.	16	142	54	30.33	+0.83	142	54	03.56	20.24	+6.14	-6.57	+8.23	18.57
	17	143	52	11.05	0.79	143	51	44.24	20.24	6.28	6.62	8.29	18.63
	18	144	49	52.97	0.72	144	49	26.08	20.24	6.42	6.70	8.35	18.69
	19	145	47	36.14	0.61	145	47	09.13	20.25	6.56	6.81	8.39	18.73
	20	146	45	20.52	0.50	146	44	53.38	20.25	6.70	6.93	8.41	18.75
	21	147	43	06.07	0.40	147	42	38.81	20.26	6.83	7.05	8.42	18.75
	22	148	40	52.83	+0.25	148	40	25.46	20.26	+6.97	-7.15	+8.41	18.74
	23	149	38	40.73	0.14	149	38	13.31	20.26	7.11	7.20	8.38	18.71
	24	150	36	29.77	+0.04	150	36	02.34	20.27	7.25	7.21	8.35	18.68
	25	151	34	19.98	-0.07	151	33	52.60	20.27	7.39	7.16	8.32	18.65
	26	152	32	11.36	0.14	152	31	44.08	20.28	7.53	7.05	8.31	18.64
	27	153	30	03.94	0.22	153	29	36.78	20.28	7.67	6.92	8.32	18.65
	28	154	27	57.81	-0.22	154	27	30.78	20.29	+7.81	-6.79	+8.37	18.69
	29	155	25	52.95	0.22	155	25	26.00	20.29	7.95	6.70	8.44	18.76
	30	156	23	49.52	0.14	156	23	22.60	20.30	8.09	6.67	8.52	18.84
	31	157	21	47.57	-0.07	157	21	20.59	20.30	8.23	6.72	8.60	18.92
Sept.	1	158	19	47.20	+0.04	158	19	20.10	20.30	8.37	6.84	8.66	18.98
	2	159	17	48.55	0.14	159	17	21.30	20.31	8.50	6.98	8.68	19.00
	3	160	15	51.68	+0.29	160	15	24.30	20.31	+8.64	-7.11	+8.67	18.99
	4	161	13	56.72	0.43	161	13	29.24	20.32	8.78	7.20	8.64	18.96
	5	162	12	03.68	0.58	162	11	36.17	20.32	8.92	7.24	8.60	18.92
	6	163	10	12.61	0.68	163	09	45.11	20.33	9.06	7.22	8.56	18.88
	7	164	08	23.55	0.79	164	07	56.10	20.33	9.20	7.17	8.54	18.86
	8	165	06	36.53	0.86	165	06	09.14	20.34	9.34	7.10	8.54	18.85
	9	166	04	51.53	+0.94	166	04	24.20	20.34	+9.48	-7.03	+8.55	18.86
	10	167	03	08.56	0.97	167	02	41.28	20.35	9.62	6.97	8.58	18.90
	11	168	01	27.56	0.97	168	01	00.30	20.35	9.76	6.95	8.63	18.94
	12	168	59	48.59	0.94	168	59	21.30	20.36	9.90	6.98	8.69	18.99
	13	169	58	11.56	0.90	169	57	44.21	20.36	10.03	7.04	8.74	19.05
	14	170	56	36.49	0.83	170	56	09.02	20.37	10.17	7.14	8.79	19.09
	15	171	55	03.31	+0.72	171	54	35.71	20.38	+10.31	-7.27	+8.82	19.13
	16	172	53	32.03	0.61	172	53	04.27	20.38	10.45	7.42	8.84	19.14
	17	173	52	02.54	0.50	173	51	34.63	20.39	10.59	7.57	8.84	19.14
	18	174	50	34.90	0.36	174	50	06.86	20.39	10.73	7.69	8.81	19.11
	19	175	49	08.99	0.25	175	48	40.86	20.40	10.87	7.78	8.78	19.07
	20	176	47	44.83	0.11	176	47	16.66	20.40	11.01	7.82	8.73	19.03
	21	177	46	22.35	+0.00	177	45	54.18	20.41	+11.15	-7.80	+8.69	18.98
	22	178	45	01.54	-0.07	178	44	33.43	20.41	11.29	7.74	8.66	18.95
	23	179	43	42.43	0.11	179	43	14.41	20.42	11.43	7.64	8.65	18.94
	24	180	42	24.93	0.14	180	41	57.01	20.43	11.57	7.54	8.67	18.96
	25	181	41	09.14	0.14	181	40	41.30	20.43	11.70	7.45	8.71	19.00
	26	182	39	55.03	0.11	182	39	27.22	20.44	11.84	7.42	8.77	19.06
	27	183	38	42.68	-0.04	183	38	14.82	20.44	+11.98	-7.46	+8.84	19.13
	28	184	37	32.12	+0.07	184	37	04.15	20.45	12.12	7.56	8.89	19.18
	29	185	36	23.44	0.18	185	35	55.32	20.46	12.26	7.71	8.91	19.20
	30	186	35	16.74	0.32	186	34	48.47	20.46	12.40	7.86	8.90	19.19
Oct.	1	187	34	12.14	+0.47	187	33	43.74	20.47	+12.54	-7.98	+8.86	19.14

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

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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	40	58.71	+13	52	57.27	1.012 8197	15	47.50	12	04	21.03
	17	9	44	43.01	13	33	59.96	1.012 6349	15	47.67	12	04	08.52
	18	9	48	26.79	13	14	49.74	1.012 4452	15	47.85	12	03	55.49
	19	9	52	10.06	12	55	26.94	1.012 2507	15	48.03	12	03	41.95
	20	9	55	52.82	12	35	51.88	1.012 0515	15	48.22	12	03	27.92
	21	9	59	35.08	12	16	04.90	1.011 8478	15	48.41	12	03	13.40
	22	10	03	16.87	+11	56	06.34	1.011 6398	15	48.60	12	02	58.40
	23	10	06	58.18	11	35	56.52	1.011 4277	15	48.80	12	02	42.93
	24	10	10	39.04	11	15	35.78	1.011 2119	15	49.00	12	02	27.01
	25	10	14	19.45	10	55	04.46	1.010 9926	15	49.21	12	02	10.65
	26	10	17	59.44	10	34	22.89	1.010 7703	15	49.42	12	01	53.86
	27	10	21	39.00	10	13	31.41	1.010 5452	15	49.63	12	01	36.66
	28	10	25	18.17	+9	52	30.35	1.010 3179	15	49.84	12	01	19.07
	29	10	28	56.94	9	31	20.03	1.010 0887	15	50.06	12	01	01.11
	30	10	32	35.35	9	10	00.75	1.009 8578	15	50.28	12	00	42.79
	31	10	36	13.41	8	48	32.81	1.009 6256	15	50.50	12	00	24.13
Sept.	1	10	39	51.15	8	26	56.47	1.009 3921	15	50.72	12	00	05.17
	2	10	43	28.58	8	05	12.00	1.009 1575	15	50.94	11	59	45.92
	3	10	47	05.73	+7	43	19.69	1.008 9215	15	51.16	11	59	26.39
	4	10	50	42.62	7	21	19.80	1.008 6840	15	51.38	11	59	06.62
	5	10	54	19.29	6	59	12.64	1.008 4447	15	51.61	11	58	46.62
	6	10	57	55.73	6	36	58.52	1.008 2035	15	51.84	11	58	26.41
	7	11	01	31.97	6	14	37.77	1.007 9601	15	52.07	11	58	06.01
	8	11	05	08.04	5	52	10.70	1.007 7143	15	52.30	11	57	45.43
	9	11	08	43.93	+5	29	37.66	1.007 4659	15	52.53	11	57	24.70
	10	11	12	19.68	5	06	58.97	1.007 2147	15	52.77	11	57	03.82
	11	11	15	55.29	4	44	14.99	1.006 9606	15	53.01	11	56	42.83
	12	11	19	30.79	4	21	26.05	1.006 7035	15	53.25	11	56	21.72
	13	11	23	06.18	3	58	32.49	1.006 4434	15	53.50	11	56	00.53
	14	11	26	41.50	3	35	34.67	1.006 1802	15	53.75	11	55	39.26
	15	11	30	16.74	+3	12	32.92	1.005 9139	15	54.00	11	55	17.94
	16	11	33	51.94	2	49	27.60	1.005 6446	15	54.26	11	54	56.58
	17	11	37	27.10	2	26	19.06	1.005 3723	15	54.52	11	54	35.19
	18	11	41	02.26	2	03	07.64	1.005 0972	15	54.78	11	54	13.81
	19	11	44	37.42	1	39	53.70	1.004 8194	15	55.04	11	53	52.43
	20	11	48	12.60	1	16	37.60	1.004 5392	15	55.31	11	53	31.08
	21	11	51	47.83	+0	53	19.69	1.004 2568	15	55.58	11	53	09.79
	22	11	55	23.12	0	30	00.33	1.003 9726	15	55.85	11	52	48.56
	23	11	58	58.49	+0	06	39.88	1.003 6868	15	56.12	11	52	27.41
	24	12	02	33.95	-0	16	41.31	1.003 3999	15	56.39	11	52	06.38
	25	12	06	09.53	0	40	02.87	1.003 1124	15	56.67	11	51	45.47
	26	12	09	45.25	1	03	24.47	1.002 8246	15	56.94	11	51	24.71
	27	12	13	21.12	-1	26	45.77	1.002 5369	15	57.22	11	51	04.12
	28	12	16	57.18	1	50	06.45	1.002 2497	15	57.49	11	50	43.74
	29	12	20	33.44	2	13	26.22	1.001 9632	15	57.76	11	50	23.57
	30	12	24	09.94	2	36	44.77	1.001 6777	15	58.04	11	50	03.65
Oct.	1	12	27	46.70	-3	00	01.80	1.001 3932	15	58.31	11	49	44.01

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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 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Oct.	1	187	34	12.14	+0.47	187	33	43.74	20.47	+12.54	-7.98	+8.86	19.14
	2	188	33	09.67	0.61	188	32	41.21	20.47	12.68	8.04	8.80	19.09
	3	189	32	09.38	0.72	189	31	40.91	20.48	12.82	8.04	8.74	19.02
	4	190	31	11.38	0.86	190	30	42.95	20.48	12.96	8.00	8.69	18.97
	5	191	30	15.66	0.94	191	29	47.29	20.49	13.10	7.92	8.67	18.94
	6	192	29	22.24	1.01	192	28	53.94	20.50	13.24	7.85	8.66	18.93
	7	193	28	31.17	+1.04	193	28	02.93	20.50	+13.37	-7.78	+8.67	18.94
	8	194	27	42.36	1.04	194	27	14.15	20.51	13.51	7.75	8.70	18.97
	9	195	26	55.89	1.04	195	26	27.67	20.51	13.65	7.75	8.73	19.00
	10	196	26	11.70	0.97	196	25	43.43	20.52	13.79	7.80	8.77	19.04
	11	197	25	29.74	0.90	197	25	01.38	20.52	13.93	7.88	8.80	19.07
	12	198	24	50.02	0.83	198	24	21.53	20.53	14.07	8.00	8.82	19.09
	13	199	24	12.47	+0.68	199	23	43.84	20.54	+14.21	-8.14	+8.83	19.10
	14	200	23	37.04	0.58	200	23	08.27	20.54	14.35	8.28	8.81	19.08
	15	201	23	03.73	0.43	201	22	34.82	20.55	14.49	8.40	8.78	19.04
	16	202	22	32.43	0.32	202	22	03.43	20.55	14.63	8.49	8.73	18.99
	17	203	22	03.09	0.18	203	21	34.06	20.56	14.77	8.52	8.67	18.93
	18	204	21	35.65	+0.07	204	21	06.62	20.57	14.90	8.51	8.60	18.87
	19	205	21	10.06	-0.04	205	20	41.10	20.57	+15.04	-8.44	+8.55	18.81
	20	206	20	46.28	0.11	206	20	17.41	20.58	15.18	8.33	8.52	18.78
	21	207	20	24.24	0.14	207	19	55.49	20.58	15.32	8.21	8.52	18.78
	22	208	20	03.91	0.14	208	19	35.26	20.59	15.46	8.11	8.54	18.79
	23	209	19	45.27	0.11	209	19	16.68	20.60	15.60	8.04	8.58	18.83
	24	210	19	28.32	-0.07	210	18	59.72	20.60	15.74	8.04	8.63	18.88
	25	211	19	13.05	+0.04	211	18	44.39	20.61	+15.88	-8.10	+8.67	18.92
	26	212	18	59.49	0.14	212	18	30.71	20.61	16.02	8.21	8.69	18.94
	27	213	18	47.67	0.29	213	18	18.76	20.62	16.16	8.34	8.67	18.92
	28	214	18	37.70	0.40	214	18	08.68	20.62	16.30	8.45	8.63	18.88
	29	215	18	29.56	0.54	215	18	00.47	20.63	16.44	8.51	8.57	18.81
	30	216	18	23.41	0.68	216	17	54.31	20.64	16.57	8.50	8.49	18.74
	31	217	18	19.25	+0.79	217	17	50.21	20.64	+16.71	-8.44	+8.42	18.67
Nov.	1	218	18	17.10	0.90	218	17	48.16	20.65	16.85	8.34	8.37	18.62
	2	219	18	17.06	0.97	219	17	48.23	20.65	16.99	8.23	8.34	18.59
	3	220	18	19.11	1.01	220	17	50.39	20.66	17.13	8.12	8.34	18.58
	4	221	18	23.28	1.04	221	17	54.64	20.66	17.27	8.03	8.35	18.59
	5	222	18	29.58	1.04	222	18	00.97	20.67	17.41	7.98	8.37	18.61
	6	223	18	37.93	+0.97	223	18	09.32	20.67	+17.55	-7.98	+8.40	18.64
	7	224	18	48.38	0.90	224	18	19.73	20.68	17.69	8.02	8.43	18.67
	8	225	19	00.87	0.83	225	18	32.15	20.68	17.83	8.09	8.45	18.68
	9	226	19	15.41	0.72	226	18	46.58	20.69	17.97	8.18	8.45	18.68
	10	227	19	31.86	0.58	227	19	02.93	20.69	18.11	8.28	8.43	18.67
	11	228	19	50.27	0.47	228	19	21.25	20.70	18.24	8.37	8.40	18.63
	12	229	20	10.50	+0.32	229	19	41.41	20.70	+18.38	-8.43	+8.34	18.57
	13	230	20	32.55	0.18	230	20	03.44	20.71	18.52	8.44	8.28	18.50
	14	231	20	56.26	+0.07	231	20	27.20	20.71	18.66	8.39	8.21	18.43
	15	232	21	21.62	-0.04	232	20	52.66	20.72	18.80	8.29	8.15	18.37
	16	233	21	48.51	-0.11	233	21	19.69	20.72	+18.94	-8.15	+8.11	18.33

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

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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	27	46.70	-3	00	01.80	1.001 3932	15	58.31	11	49	44.01
	2	12	31	23.75	3	23	17.02	1.001 1096	15	58.58	11	49	24.66
	3	12	35	01.11	3	46	30.11	1.000 8268	15	58.85	11	49	05.63
	4	12	38	38.81	4	09	40.73	1.000 5447	15	59.12	11	48	46.95
	5	12	42	16.86	4	32	48.53	1.000 2630	15	59.39	11	48	28.62
	6	12	45	55.29	4	55	53.15	0.999 9815	15	59.66	11	48	10.69
	7	12	49	34.11	-5	18	54.24	0.999 7002	15	59.93	11	47	53.16
	8	12	53	13.35	5	41	51.42	0.999 4187	16	00.20	11	47	36.05
	9	12	56	53.01	6	04	44.31	0.999 1369	16	00.47	11	47	19.38
	10	13	00	33.13	6	27	32.54	0.998 8548	16	00.75	11	47	03.17
	11	13	04	13.71	6	50	15.73	0.998 5722	16	01.02	11	46	47.44
	12	13	07	54.77	7	12	53.47	0.998 2891	16	01.29	11	46	32.21
	13	13	11	36.34	-7	35	25.40	0.998 0053	16	01.56	11	46	17.48
	14	13	15	18.43	7	57	51.11	0.997 7208	16	01.84	11	46	03.29
	15	13	19	01.05	8	20	10.21	0.997 4357	16	02.11	11	45	49.63
	16	13	22	44.23	8	42	22.29	0.997 1500	16	02.39	11	45	36.53
	17	13	26	27.97	9	04	26.97	0.996 8638	16	02.66	11	45	24.00
	18	13	30	12.29	9	26	23.84	0.996 5773	16	02.94	11	45	12.06
	19	13	33	57.21	-9	48	12.48	0.996 2906	16	03.22	11	45	00.72
	20	13	37	42.74	10	09	52.49	0.996 0040	16	03.49	11	44	49.99
	21	13	41	28.89	10	31	23.45	0.995 7180	16	03.77	11	44	39.88
	22	13	45	15.66	10	52	44.97	0.995 4327	16	04.05	11	44	30.41
	23	13	49	03.09	11	13	56.62	0.995 1487	16	04.32	11	44	21.60
	24	13	52	51.17	11	34	58.00	0.994 8664	16	04.60	11	44	13.46
	25	13	56	39.93	-11	55	48.73	0.994 5862	16	04.87	11	44	06.01
	26	14	00	29.38	12	16	28.43	0.994 3084	16	05.14	11	43	59.25
	27	14	04	19.54	12	36	56.72	0.994 0336	16	05.40	11	43	53.22
	28	14	08	10.43	12	57	13.26	0.993 7618	16	05.67	11	43	47.92
	29	14	12	02.07	13	17	17.68	0.993 4934	16	05.93	11	43	43.38
	30	14	15	54.48	13	37	09.64	0.993 2283	16	06.19	11	43	39.61
	31	14	19	47.66	-13	56	48.77	0.992 9667	16	06.44	11	43	36.62
Nov.	1	14	23	41.64	14	16	14.68	0.992 7083	16	06.69	11	43	34.43
	2	14	27	36.43	14	35	26.99	0.992 4531	16	06.94	11	43	33.05
	3	14	31	32.03	14	54	25.29	0.992 2010	16	07.19	11	43	32.50
	4	14	35	28.46	15	13	09.18	0.991 9517	16	07.43	11	43	32.77
	5	14	39	25.72	15	31	38.24	0.991 7051	16	07.67	11	43	33.88
	6	14	43	23.82	-15	49	52.08	0.991 4610	16	07.91	11	43	35.84
	7	14	47	22.76	16	07	50.25	0.991 2193	16	08.15	11	43	38.65
	8	14	51	22.56	16	25	32.36	0.990 9797	16	08.38	11	43	42.31
	9	14	55	23.21	16	42	57.99	0.990 7423	16	08.61	11	43	46.84
	10	14	59	24.72	17	00	06.71	0.990 5068	16	08.84	11	43	52.22
	11	15	03	27.10	17	16	58.12	0.990 2732	16	09.07	11	43	58.46
	12	15	07	30.33	-17	33	31.79	0.990 0413	16	09.30	11	44	05.56
	13	15	11	34.42	17	49	47.32	0.989 8112	16	09.52	11	44	13.52
	14	15	15	39.37	18	05	44.29	0.989 5827	16	09.75	11	44	22.32
	15	15	19	45.17	18	21	22.30	0.989 3559	16	09.97	11	44	31.98
	16	15	23	51.81	-18	36	40.94	0.989 1310	16	10.19	11	44	42.46

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Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2023.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Nov.	16	233	21	48.51	-0.11	233	21	19.69	20.72	+18.94	-8.15	+8.11	18.33
	17	234	22	16.86	0.18	234	21	48.20	20.73	19.08	7.98	8.09	18.32
	18	235	22	46.59	0.18	235	22	18.08	20.73	19.22	7.83	8.10	18.33
	19	236	23	17.59	0.18	236	22	49.19	20.73	19.36	7.71	8.14	18.36
	20	237	23	49.86	0.14	237	23	21.52	20.74	19.50	7.65	8.18	18.40
	21	238	24	23.35	-0.07	238	23	55.00	20.74	19.64	7.66	8.22	18.44
	22	239	24	57.97	+0.04	239	24	29.56	20.75	+19.78	-7.71	+8.25	18.46
	23	240	25	33.77	0.18	240	25	05.27	20.75	19.91	7.79	8.24	18.46
	24	241	26	10.74	0.29	241	25	42.17	20.76	20.05	7.87	8.21	18.43
	25	242	26	48.95	0.43	242	26	20.33	20.76	20.19	7.90	8.16	18.37
	26	243	27	28.35	0.58	243	26	59.75	20.76	20.33	7.88	8.09	18.30
	27	244	28	08.99	0.68	244	27	40.46	20.77	20.47	7.80	8.02	18.23
	28	245	28	50.99	+0.79	245	28	22.58	20.77	+20.61	-7.68	+7.97	18.18
	29	246	29	34.28	0.86	246	29	06.04	20.78	20.75	7.52	7.93	18.14
	30	247	30	18.95	0.90	247	29	50.86	20.78	20.89	7.36	7.92	18.13
Dec.	1	248	31	05.04	0.94	248	30	37.08	20.78	21.03	7.22	7.93	18.14
	2	249	31	52.53	0.94	249	31	24.67	20.79	21.17	7.11	7.96	18.17
	3	250	32	41.39	0.90	250	32	13.60	20.79	21.31	7.05	8.00	18.20
	4	251	33	31.67	+0.83	251	33	03.89	20.79	+21.45	-7.03	+8.03	18.23
	5	252	34	23.32	0.72	252	33	55.51	20.80	21.58	7.05	8.06	18.26
	6	253	35	16.32	0.65	253	34	48.47	20.80	21.72	7.10	8.08	18.28
	7	254	36	10.68	0.50	254	35	42.76	20.80	21.86	7.16	8.08	18.28
	8	255	37	06.28	0.36	255	36	38.30	20.80	22.00	7.22	8.06	18.25
	9	256	38	03.13	0.25	256	37	35.11	20.81	22.14	7.26	8.02	18.21
	10	257	39	01.12	+0.11	257	38	33.11	20.81	+22.28	-7.25	+7.97	18.16
	11	258	40	00.25	-0.00	258	39	32.29	20.81	22.42	7.19	7.91	18.10
	12	259	41	00.36	0.11	259	40	32.52	20.81	22.56	7.07	7.86	18.05
	13	260	42	01.39	0.22	260	41	33.72	20.82	22.70	6.90	7.82	18.01
	14	261	43	03.29	0.25	261	42	35.82	20.82	22.84	6.70	7.81	18.00
	15	262	44	05.87	0.29	262	43	38.60	20.82	22.98	6.50	7.83	18.02
	16	263	45	09.07	-0.29	263	44	41.96	20.82	+23.12	-6.33	+7.87	18.06
	17	264	46	12.76	0.25	264	45	45.76	20.83	23.25	6.22	7.93	18.12
	18	265	47	16.87	0.18	265	46	49.91	20.83	23.39	6.19	7.99	18.17
	19	266	48	21.34	-0.11	266	47	54.35	20.83	23.53	6.21	8.03	18.22
	20	267	49	26.12	+0.00	267	48	59.08	20.83	23.67	6.26	8.05	18.23
	21	268	50	31.12	0.14	268	50	04.02	20.83	23.81	6.31	8.04	18.22
	22	269	51	36.38	+0.29	269	51	09.25	20.83	+23.95	-6.34	+8.01	18.19
	23	270	52	41.84	0.40	270	52	14.74	20.84	24.09	6.32	7.96	18.14
	24	271	53	47.54	0.50	271	53	20.51	20.84	24.23	6.24	7.91	18.09
	25	272	54	53.47	0.61	272	54	26.57	20.84	24.37	6.11	7.87	18.04
	26	273	55	59.69	0.68	273	55	32.95	20.84	24.51	5.95	7.85	18.02
	27	274	57	06.16	0.76	274	56	39.59	20.84	24.65	5.78	7.85	18.02
	28	275	58	12.99	+0.76	275	57	46.58	20.84	+24.79	-5.62	+7.87	18.04
	29	276	59	20.11	0.76	276	58	53.83	20.84	24.92	5.49	7.91	18.08
	30	278	00	27.60	0.72	278	00	01.40	20.84	25.06	5.40	7.96	18.13
	31	279	01	35.42	0.68	279	01	09.26	20.84	25.20	5.36	8.02	18.18
	32	280	02	43.60	+0.58	280	02	17.45	20.84	+25.34	-5.36	+8.07	18.23

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -19' 41".828 and subtract precession from J 2023.5.

SUN, 2023

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	23	51.81	-18	36	40.94	0.989 1310	16	10.19	11	44	42.46
	17	15	27	59.29	18	51	39.81	0.988 9082	16	10.41	11	44	53.78
	18	15	32	07.59	19	06	18.49	0.988 6876	16	10.62	11	45	05.92
	19	15	36	16.70	19	20	36.59	0.988 4697	16	10.84	11	45	18.86
	20	15	40	26.61	19	34	33.73	0.988 2547	16	11.05	11	45	32.61
	21	15	44	37.31	19	48	09.51	0.988 0431	16	11.26	11	45	47.15
	22	15	48	48.80	-20	01	23.59	0.987 8353	16	11.46	11	46	02.47
	23	15	53	01.07	20	14	15.60	0.987 6317	16	11.66	11	46	18.56
	24	15	57	14.10	20	26	45.23	0.987 4326	16	11.86	11	46	35.43
	25	16	01	27.90	20	38	52.15	0.987 2384	16	12.05	11	46	53.04
	26	16	05	42.45	20	50	36.06	0.987 0493	16	12.24	11	47	11.41
	27	16	09	57.75	21	01	56.67	0.986 8655	16	12.42	11	47	30.50
	28	16	14	13.77	-21	12	53.67	0.986 6871	16	12.59	11	47	50.33
	29	16	18	30.52	21	23	26.76	0.986 5141	16	12.76	11	48	10.86
	30	16	22	47.97	21	33	35.64	0.986 3464	16	12.93	11	48	32.09
Dec.	1	16	27	06.10	21	43	20.03	0.986 1839	16	13.09	11	48	54.00
	2	16	31	24.90	21	52	39.62	0.986 0266	16	13.24	11	49	16.57
	3	16	35	44.35	22	01	34.12	0.985 8743	16	13.39	11	49	39.78
	4	16	40	04.43	-22	10	03.25	0.985 7267	16	13.54	11	50	03.61
	5	16	44	25.11	22	18	06.73	0.985 5838	16	13.68	11	50	28.03
	6	16	48	46.38	22	25	44.31	0.985 4452	16	13.82	11	50	53.03
	7	16	53	08.21	22	32	55.73	0.985 3110	16	13.95	11	51	18.58
	8	16	57	30.57	22	39	40.76	0.985 1808	16	14.08	11	51	44.65
	9	17	01	53.43	22	45	59.15	0.985 0544	16	14.20	11	52	11.21
	10	17	06	16.77	-22	51	50.71	0.984 9318	16	14.33	11	52	38.23
	11	17	10	40.56	22	57	15.23	0.984 8126	16	14.44	11	53	05.68
	12	17	15	04.77	23	02	12.52	0.984 6969	16	14.56	11	53	33.52
	13	17	19	29.36	23	06	42.43	0.984 5844	16	14.67	11	54	01.72
	14	17	23	54.28	23	10	44.79	0.984 4752	16	14.78	11	54	30.25
	15	17	28	19.51	23	14	19.46	0.984 3693	16	14.88	11	54	59.05
	16	17	32	45.01	-23	17	26.30	0.984 2668	16	14.98	11	55	28.11
	17	17	37	10.73	23	20	05.20	0.984 1679	16	15.08	11	55	57.38
	18	17	41	36.63	23	22	16.05	0.984 0730	16	15.18	11	56	26.82
	19	17	46	02.69	23	23	58.77	0.983 9824	16	15.27	11	56	56.39
	20	17	50	28.86	23	25	13.29	0.983 8964	16	15.35	11	57	26.07
	21	17	54	55.12	23	25	59.58	0.983 8153	16	15.43	11	57	55.82
	22	17	59	21.43	-23	26	17.62	0.983 7397	16	15.51	11	58	25.60
	23	18	03	47.77	23	26	07.41	0.983 6696	16	15.58	11	58	55.39
	24	18	08	14.11	23	25	28.98	0.983 6056	16	15.64	11	59	25.16
	25	18	12	40.40	23	24	22.34	0.983 5476	16	15.70	11	59	54.87
	26	18	17	06.63	23	22	47.55	0.983 4960	16	15.75	12	00	24.50
	27	18	21	32.75	23	20	44.64	0.983 4507	16	15.79	12	00	54.01
	28	18	25	58.75	-23	18	13.68	0.983 4117	16	15.83	12	01	23.37
	29	18	30	24.58	23	15	14.73	0.983 3792	16	15.86	12	01	52.56
	30	18	34	50.23	23	11	47.86	0.983 3528	16	15.89	12	02	21.55
	31	18	39	15.65	23	07	53.15	0.983 3326	16	15.91	12	02	50.30
	32	18	43	40.82	-23	03	30.70	0.983 3183	16	15.93	12	03	18.79

SUN, 2023

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME

MEAN EQUATOR AND EQUINOX OF J 2023.5 AND J 2000.0

Date		$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
Jan.	0	+0.153 8913	+0.153 0092	-0.891 2496	-0.891 2473	-0.385 9944	-0.386 3501
	1	0.171 1354	0.170 2560	0.888 5897	0.888 5875	0.384 8015	0.385 1966
	2	0.188 3249	0.187 4484	0.885 6542	0.885 6520	0.383 4891	0.383 9235
	3	0.205 4547	0.204 5814	0.882 4440	0.882 4418	0.382 0579	0.382 5313
	4	0.222 5197	0.221 6499	0.878 9604	0.878 9582	0.380 5083	0.381 0207
	5	0.239 5149	0.238 6489	0.875 2045	0.875 2024	0.378 8409	0.379 3921
	6	+0.256 4354	+0.255 5735	-0.871 1776	-0.871 1754	-0.377 0563	-0.377 6461
	7	0.273 2763	0.272 4186	0.866 8808	0.866 8786	0.375 1550	0.375 7832
	8	0.290 0325	0.289 1793	0.862 3154	0.862 3133	0.373 1376	0.373 8041
	9	0.306 6991	0.305 8508	0.857 4828	0.857 4807	0.371 0047	0.371 7092
	10	0.323 2712	0.322 4280	0.852 3844	0.852 3823	0.368 7570	0.369 4993
	11	0.339 7440	0.338 9061	0.847 0215	0.847 0195	0.366 3949	0.367 1748
	12	+0.356 1123	+0.355 2801	-0.841 3957	-0.841 3936	-0.363 9193	-0.364 7365
	13	0.372 3714	0.371 5450	0.835 5084	0.835 5063	0.361 3306	0.362 1850
	14	0.388 5161	0.387 6959	0.829 3612	0.829 3592	0.358 6297	0.359 5209
	15	0.404 5416	0.403 7278	0.822 9558	0.822 9538	0.355 8172	0.356 7449
	16	0.420 4428	0.419 6356	0.816 2939	0.816 2919	0.352 8938	0.353 8578
	17	0.436 2147	0.435 4143	0.809 3773	0.809 3754	0.349 8604	0.350 8604
	18	+0.451 8520	+0.451 0589	-0.802 2080	-0.802 2061	-0.346 7176	-0.347 7533
	19	0.467 3498	0.466 5640	0.794 7880	0.794 7861	0.343 4664	0.344 5374
	20	0.482 7028	0.481 9246	0.787 1194	0.787 1176	0.340 1077	0.341 2138
	21	0.497 9057	0.497 1354	0.779 2048	0.779 2029	0.336 6425	0.337 7833
	22	0.512 9535	0.512 1913	0.771 0465	0.771 0447	0.333 0720	0.334 2470
	23	0.527 8409	0.527 0871	0.762 6476	0.762 6458	0.329 3972	0.330 6062
	24	+0.542 5632	+0.541 8180	-0.754 0108	-0.754 0091	-0.325 6196	-0.326 8622
	25	0.557 1155	0.556 3791	0.745 1394	0.745 1377	0.321 7405	0.323 0162
	26	0.571 4932	0.570 7658	0.736 0367	0.736 0350	0.317 7613	0.319 0699
	27	0.585 6919	0.584 9738	0.726 7058	0.726 7041	0.313 6836	0.315 0245
	28	0.599 7075	0.598 9989	0.717 1501	0.717 1485	0.309 5088	0.310 8817
	29	0.613 5358	0.612 8369	0.707 3730	0.707 3714	0.305 2384	0.306 6428
	30	+0.627 1729	+0.626 4839	-0.697 3778	-0.697 3762	-0.300 8739	-0.302 3094
	31	0.640 6148	0.639 9361	0.687 1677	0.687 1662	0.296 4167	0.297 8829
Feb.	1	0.653 8580	0.653 1896	0.676 7463	0.676 7448	0.291 8685	0.293 3648
	2	0.666 8985	0.666 2407	0.666 1168	0.666 1153	0.287 2306	0.288 7567
	3	0.679 7329	0.679 0858	0.655 2826	0.655 2812	0.282 5046	0.284 0599
	4	0.692 3574	0.691 7213	0.644 2471	0.644 2457	0.277 6919	0.279 2760
	5	+0.704 7687	+0.704 1437	-0.633 0137	-0.633 0123	-0.272 7940	-0.274 4064
	6	0.716 9631	0.716 3495	0.621 5858	0.621 5844	0.267 8125	0.269 4526
	7	0.728 9374	0.728 3353	0.609 9668	0.609 9655	0.262 7488	0.264 4162
	8	0.740 6880	0.740 0976	0.598 1602	0.598 1589	0.257 6044	0.259 2986
	9	0.752 2116	0.751 6331	0.586 1695	0.586 1683	0.252 3808	0.254 1012
	10	0.763 5048	0.762 9385	0.573 9982	0.573 9970	0.247 0795	0.248 8257
	11	+0.774 5644	+0.774 0103	-0.561 6498	-0.561 6486	-0.241 7021	-0.243 4735
	12	0.785 3870	0.784 8453	0.549 1280	0.549 1269	0.236 2501	0.238 0462
	13	0.795 9692	0.795 4401	0.536 4364	0.536 4353	0.230 7251	0.232 5452
	14	0.806 3078	0.805 7914	0.523 5787	0.523 5776	0.225 1285	0.226 9722
	15	+0.816 3994	+0.815 8960	-0.510 5587	-0.510 5577	-0.219 4622	-0.221 3289

SUN, 2023

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2023.5 AND J 2000.0

Date		$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
Feb.	15	+0.816 3994	+0.815 8960	-0.510 5587	-0.510 5577	-0.219 4622	-0.221 3289
	16	0.826 2408	0.825 7504	0.497 3804	0.497 3794	0.213 7277	0.215 6168
	17	0.835 8285	0.835 3514	0.484 0478	0.484 0469	0.207 9267	0.209 8376
	18	0.845 1595	0.844 6957	0.470 5651	0.470 5642	0.202 0611	0.203 9933
	19	0.854 2305	0.853 7803	0.456 9366	0.456 9358	0.196 1327	0.198 0855
	20	0.863 0385	0.862 6019	0.443 1669	0.443 1661	0.190 1435	0.192 1164
	21	+0.871 5807	+0.871 1579	-0.429 2606	-0.429 2598	-0.184 0956	-0.186 0878
	22	0.879 8543	0.879 4454	0.415 2224	0.415 2217	0.177 9909	0.180 0020
	23	0.887 8570	0.887 4622	0.401 0572	0.401 0565	0.171 8317	0.173 8609
	24	0.895 5867	0.895 2060	0.386 7697	0.386 7690	0.165 6200	0.167 6668
	25	0.903 0412	0.902 6748	0.372 3647	0.372 3641	0.159 3580	0.161 4218
	26	0.910 2188	0.909 8668	0.357 8470	0.357 8465	0.153 0477	0.155 1279
	27	+0.917 1177	+0.916 7802	-0.343 2214	-0.343 2208	-0.146 6914	-0.148 7872
	28	0.923 7364	0.923 4135	0.328 4923	0.328 4918	0.140 2909	0.142 4018
Mar.	1	0.930 0734	0.929 7652	0.313 6646	0.313 6641	0.133 8484	0.135 9736
	2	0.936 1272	0.935 8338	0.298 7427	0.298 7422	0.127 3658	0.129 5048
	3	0.941 8965	0.941 6180	0.283 7312	0.283 7308	0.120 8452	0.122 9973
	4	0.947 3802	0.947 1166	0.268 6347	0.268 6343	0.114 2885	0.116 4531
	5	+0.952 5769	+0.952 3284	-0.253 4576	-0.253 4573	-0.107 6977	-0.109 8741
	6	0.957 4855	0.957 2522	0.238 2045	0.238 2043	0.101 0748	0.103 2622
	7	0.962 1051	0.961 8869	0.222 8799	0.222 8797	0.094 4216	0.096 6195
	8	0.966 4345	0.966 2316	0.207 4881	0.207 4880	0.087 7401	0.089 9478
	9	0.970 4728	0.970 2852	0.192 0337	0.192 0336	0.081 0322	0.083 2491
	10	0.974 2190	0.974 0467	0.176 5210	0.176 5209	0.074 2997	0.076 5251
	11	+0.977 6722	+0.977 5153	-0.160 9545	-0.160 9545	-0.067 5447	-0.069 7779
	12	0.980 8314	0.980 6900	0.145 3387	0.145 3387	0.060 7690	0.063 0093
	13	0.983 6958	0.983 5699	0.129 6780	0.129 6780	0.053 9744	0.056 2213
	14	0.986 2644	0.986 1541	0.113 9769	0.113 9770	0.047 1630	0.049 4156
	15	0.988 5365	0.988 4418	0.098 2400	0.098 2402	0.040 3367	0.042 5944
	16	0.990 5111	0.990 4320	0.082 4721	0.082 4722	0.033 4974	0.035 7595
	17	+0.992 1876	+0.992 1241	-0.066 6777	-0.066 6779	-0.026 6472	-0.028 9131
	18	0.993 5651	0.993 5173	0.050 8619	0.050 8621	0.019 7882	0.022 0571
	19	0.994 6432	0.994 6111	0.035 0294	0.035 0297	0.012 9225	0.015 1938
	20	0.995 4214	0.995 4050	0.019 1855	0.019 1858	-0.006 0523	0.008 3253
	21	0.995 8995	0.995 8988	-0.003 3351	-0.003 3355	+0.000 8202	-0.001 4539
	22	0.996 0775	0.996 0925	+0.012 5165	+0.012 5161	0.007 6926	+0.005 4182
	23	+0.995 9555	+0.995 9862	+0.028 3642	+0.028 3638	+0.014 5627	+0.012 2887
	24	0.995 5340	0.995 5804	0.044 2029	0.044 2024	0.021 4283	0.019 1553
	25	0.994 8136	0.994 8756	0.060 0276	0.060 0270	0.028 2872	0.026 0159
	26	0.993 7950	0.993 8726	0.075 8332	0.075 8326	0.035 1370	0.032 8681
	27	0.992 4791	0.992 5724	0.091 6150	0.091 6143	0.041 9758	0.039 7100
	28	0.990 8669	0.990 9758	0.107 3681	0.107 3674	0.048 8014	0.046 5394
	29	+0.988 9594	+0.989 0839	+0.123 0879	+0.123 0872	+0.055 6117	+0.053 3541
	30	0.986 7579	0.986 8979	0.138 7697	0.138 7690	0.062 4048	0.060 1523
	31	0.984 2635	0.984 4189	0.154 4090	0.154 4082	0.069 1787	0.066 9319
Apr.	1	0.981 4774	0.981 6483	0.170 0014	0.170 0006	0.075 9314	0.073 6911
	2	+0.978 4010	+0.978 5873	+0.185 5423	+0.185 5415	+0.082 6609	+0.080 4277

SUN, 2023
EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2023.5 AND J 2000.0

Date		$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
Apr.	1	+0.981 4774	+0.981 6483	+0.170 0014	+0.170 0006	+0.075 9314	+0.073 6911
	2	0.978 4010	0.978 5873	0.185 5423	0.185 5415	0.082 6609	0.080 4277
	3	0.975 0357	0.975 2373	0.201 0275	0.201 0266	0.089 3655	0.087 1401
	4	0.971 3828	0.971 5997	0.216 4526	0.216 4516	0.096 0433	0.093 8263
	5	0.967 4439	0.967 6759	0.231 8133	0.231 8124	0.102 6925	0.100 4845
	6	0.963 2203	0.963 4675	0.247 1056	0.247 1046	0.109 3112	0.107 1129
	7	+0.958 7137	+0.958 9759	+0.262 3252	+0.262 3241	+0.115 8977	+0.113 7098
	8	0.953 9253	0.954 2025	0.277 4680	0.277 4669	0.122 4502	0.120 2734
	9	0.948 8568	0.949 1489	0.292 5298	0.292 5287	0.128 9671	0.126 8019
	10	0.943 5096	0.943 8165	0.307 5067	0.307 5055	0.135 4465	0.133 2936
	11	0.937 8852	0.938 2069	0.322 3944	0.322 3932	0.141 8867	0.139 7467
	12	0.931 9851	0.932 3214	0.337 1887	0.337 1874	0.148 2860	0.146 1595
	13	+0.925 8109	+0.926 1618	+0.351 8854	+0.351 8841	+0.154 6424	+0.152 5301
	14	0.919 3642	0.919 7295	0.366 4802	0.366 4789	0.160 9543	0.158 8568
	15	0.912 6468	0.913 0264	0.380 9688	0.380 9674	0.167 2196	0.165 1375
	16	0.905 6604	0.906 0542	0.395 3467	0.395 3453	0.173 4366	0.171 3705
	17	0.898 4071	0.898 8150	0.409 6095	0.409 6081	0.179 6032	0.177 5538
	18	0.890 8891	0.891 3110	0.423 7529	0.423 7514	0.185 7176	0.183 6854
	19	+0.883 1087	+0.883 5445	+0.437 7722	+0.437 7708	+0.191 7777	+0.189 7633
	20	0.875 0685	0.875 5180	0.451 6633	0.451 6618	0.197 7816	0.195 7857
	21	0.866 7712	0.867 2343	0.465 4217	0.465 4202	0.203 7275	0.201 7506
	22	0.858 2198	0.858 6963	0.479 0433	0.479 0418	0.209 6136	0.207 6562
	23	0.849 4171	0.849 9070	0.492 5241	0.492 5225	0.215 4379	0.213 5007
	24	0.840 3664	0.840 8695	0.505 8601	0.505 8584	0.221 1988	0.219 2823
	25	+0.831 0709	+0.831 5870	+0.519 0474	+0.519 0457	+0.226 8946	+0.224 9994
	26	0.821 5336	0.822 0626	0.532 0824	0.532 0807	0.232 5236	0.230 6503
	27	0.811 7580	0.812 2998	0.544 9615	0.544 9598	0.238 0844	0.236 2335
	28	0.801 7474	0.802 3017	0.557 6812	0.557 6794	0.243 5755	0.241 7475
	29	0.791 5050	0.792 0717	0.570 2380	0.570 2363	0.248 9952	0.247 1907
	30	0.781 0343	0.781 6132	0.582 6287	0.582 6269	0.254 3423	0.252 5617
May	1	+0.770 3386	+0.770 9296	+0.594 8500	+0.594 8482	+0.259 6152	+0.257 8591
	2	0.759 4213	0.760 0243	0.606 8987	0.606 8969	0.264 8128	0.263 0817
	3	0.748 2859	0.748 9006	0.618 7718	0.618 7699	0.269 9336	0.268 2280
	4	0.736 9358	0.737 5620	0.630 4663	0.630 4644	0.274 9765	0.273 2968
	5	0.725 3743	0.726 0118	0.641 9793	0.641 9773	0.279 9401	0.278 2869
	6	0.713 6047	0.714 2535	0.653 3077	0.653 3058	0.284 8233	0.283 1971
	7	+0.701 6305	+0.702 2902	+0.664 4489	+0.664 4469	+0.289 6249	+0.288 0261
	8	0.689 4548	0.690 1254	0.675 4000	0.675 3979	0.294 3437	0.292 7727
	9	0.677 0810	0.677 7621	0.686 1580	0.686 1559	0.298 9785	0.297 4358
	10	0.664 5122	0.665 2039	0.696 7201	0.696 7180	0.303 5281	0.302 0141
	11	0.651 7520	0.652 4538	0.707 0833	0.707 0812	0.307 9911	0.306 5064
	12	0.638 8035	0.639 5154	0.717 2446	0.717 2425	0.312 3665	0.310 9113
	13	+0.625 6704	+0.626 3921	+0.727 2011	+0.727 1990	+0.316 6528	+0.315 2276
	14	0.612 3562	0.613 0876	0.736 9497	0.736 9476	0.320 8487	0.319 4540
	15	0.598 8648	0.599 6055	0.746 4874	0.746 4853	0.324 9529	0.323 5891
	16	0.585 1999	0.585 9498	0.755 8113	0.755 8091	0.328 9641	0.327 6316
	17	+0.571 3657	+0.572 1246	+0.764 9184	+0.764 9161	+0.332 8811	+0.331 5802

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2023.5 AND J 2000.0

Date	$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
May 17	+0.571 3657	+0.572 1246	+0.764 9184	+0.764 9161	+0.332 8811	+0.331 5802
18	0.557 3664	0.558 1341	0.773 8059	0.773 8036	0.336 7025	0.335 4336
19	0.543 2063	0.543 9825	0.782 4711	0.782 4689	0.340 4273	0.339 1907
20	0.528 8898	0.529 6744	0.790 9115	0.790 9093	0.344 0541	0.342 8503
21	0.514 4215	0.515 2142	0.799 1247	0.799 1224	0.347 5820	0.346 4113
22	0.499 8059	0.500 6064	0.807 1083	0.807 1060	0.351 0100	0.349 8727
23	+0.485 0476	+0.485 8557	+0.814 8602	+0.814 8579	+0.354 3371	+0.353 2335
24	0.470 1512	0.470 9667	0.822 3783	0.822 3760	0.357 5624	0.356 4928
25	0.455 1214	0.455 9441	0.829 6608	0.829 6585	0.360 6851	0.359 6499
26	0.439 9627	0.440 7924	0.836 7059	0.836 7035	0.363 7044	0.362 7039
27	0.424 6798	0.425 5162	0.843 5118	0.843 5094	0.366 6196	0.365 6540
28	0.409 2774	0.410 1202	0.850 0769	0.850 0745	0.369 4301	0.368 4997
29	+0.393 7599	+0.394 6089	+0.856 3998	+0.856 3974	+0.372 1351	+0.371 2402
30	0.378 1319	0.378 9870	0.862 4790	0.862 4766	0.374 7342	0.373 8750
31	0.362 3981	0.363 2589	0.868 3133	0.868 3109	0.377 2268	0.376 4035
June 1	0.346 5629	0.347 4291	0.873 9013	0.873 8989	0.379 6124	0.378 8253
2	0.330 6306	0.331 5021	0.879 2420	0.879 2396	0.381 8905	0.381 1398
3	0.314 6058	0.315 4823	0.884 3341	0.884 3317	0.384 0607	0.383 3466
4	+0.298 4927	+0.299 3739	+0.889 1768	+0.889 1743	+0.386 1226	+0.385 4453
5	0.282 2955	0.283 1813	0.893 7687	0.893 7663	0.388 0757	0.387 4355
6	0.266 0185	0.266 9085	0.898 1090	0.898 1065	0.389 9197	0.389 3167
7	0.249 6658	0.250 5598	0.902 1963	0.902 1939	0.391 6541	0.391 0884
8	0.233 2416	0.234 1393	0.906 0296	0.906 0272	0.393 2784	0.392 7502
9	0.216 7503	0.217 6515	0.909 6077	0.909 6052	0.394 7920	0.394 3015
10	+0.200 1961	+0.201 1006	+0.912 9293	+0.912 9268	+0.396 1945	+0.395 7418
11	0.183 5837	0.184 4912	0.915 9931	0.915 9907	0.397 4852	0.397 0705
12	0.166 9177	0.167 8279	0.918 7982	0.918 7958	0.398 6638	0.398 2871
13	0.150 2028	0.151 1155	0.921 3434	0.921 3409	0.399 7297	0.399 3912
14	0.133 4438	0.134 3587	0.923 6276	0.923 6252	0.400 6824	0.400 3822
15	0.116 6457	0.117 5626	0.925 6502	0.925 6477	0.401 5216	0.401 2598
16	+0.099 8136	+0.100 7322	+0.927 4103	+0.927 4078	+0.402 2469	+0.402 0235
17	0.082 9525	0.083 8725	0.928 9073	0.928 9049	0.402 8580	0.402 6731
18	0.066 0674	0.066 9886	0.930 1409	0.930 1384	0.403 3548	0.403 2085
19	0.049 1636	0.050 0857	0.931 1106	0.931 1081	0.403 7370	0.403 6293
20	0.032 2460	0.033 1688	0.931 8163	0.931 8139	0.404 0047	0.403 9356
21	+0.015 3199	+0.016 2430	0.932 2580	0.932 2555	0.404 1577	0.404 1272
22	-0.001 6099	-0.000 6866	+0.932 4356	+0.932 4332	+0.404 1961	+0.404 2043
23	0.018 5381	0.017 6149	0.932 3495	0.932 3470	0.404 1200	0.404 1668
24	0.035 4599	0.034 5371	0.931 9998	0.931 9973	0.403 9295	0.404 0150
25	0.052 3704	0.051 4483	0.931 3869	0.931 3845	0.403 6249	0.403 7490
26	0.069 2646	0.068 3434	0.930 5113	0.930 5089	0.403 2063	0.403 3690
27	0.086 1378	0.085 2178	0.929 3736	0.929 3712	0.402 6741	0.402 8753
28	-0.102 9852	-0.102 0666	+0.927 9744	+0.927 9720	+0.402 0285	+0.402 2682
29	0.119 8021	0.118 8852	0.926 3144	0.926 3120	0.401 2700	0.401 5480
30	0.136 5840	0.135 6690	0.924 3944	0.924 3921	0.400 3988	0.400 7152
July 1	0.153 3263	0.152 4136	0.922 2153	0.922 2130	0.399 4155	0.399 7701
2	-0.170 0248	-0.169 1144	+0.919 7779	+0.919 7756	+0.398 3203	+0.398 7130

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Date		$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
July	1	-0.153 3263	-0.152 4136	+0.922 2153	+0.922 2130	+0.399 4155	+0.399 7701
	2	0.170 0248	0.169 1144	0.919 7779	0.919 7756	0.398 3203	0.398 7130
	3	0.186 6750	0.185 7673	0.917 0830	0.917 0807	0.397 1138	0.397 5445
	4	0.203 2727	0.202 3681	0.914 1315	0.914 1292	0.395 7964	0.396 2650
	5	0.219 8138	0.218 9124	0.910 9241	0.910 9219	0.394 3683	0.394 8746
	6	0.236 2940	0.235 3961	0.907 4616	0.907 4594	0.392 8299	0.393 3739
	7	-0.252 7091	-0.251 8149	+0.903 7446	+0.903 7424	+0.391 1816	+0.391 7630
	8	0.269 0547	0.268 1645	0.899 7739	0.899 7716	0.389 4235	0.390 0423
	9	0.285 3263	0.284 4403	0.895 5501	0.895 5478	0.387 5561	0.388 2119
	10	0.301 5193	0.300 6377	0.891 0739	0.891 0717	0.385 5795	0.386 2723
	11	0.317 6290	0.316 7522	0.886 3465	0.886 3443	0.383 4942	0.384 2238
	12	0.333 6508	0.332 7789	0.881 3686	0.881 3664	0.381 3006	0.382 0667
	13	-0.349 5797	-0.348 7131	+0.876 1415	+0.876 1394	+0.378 9991	+0.379 8016
	14	0.365 4111	0.364 5500	0.870 6665	0.870 6644	0.376 5903	0.377 4289
	15	0.381 1402	0.380 2847	0.864 9449	0.864 9428	0.374 0747	0.374 9492
	16	0.396 7621	0.395 9126	0.858 9783	0.858 9762	0.371 4531	0.372 3632
	17	0.412 2722	0.411 4288	0.852 7683	0.852 7662	0.368 7261	0.369 6716
	18	0.427 6657	0.426 8287	0.846 3167	0.846 3147	0.365 8945	0.366 8751
	19	-0.442 9379	-0.442 1077	+0.839 6255	+0.839 6235	+0.362 9591	+0.363 9746
	20	0.458 0844	0.457 2610	0.832 6966	0.832 6946	0.359 9208	0.360 9709
	21	0.473 1006	0.472 2843	0.825 5321	0.825 5301	0.356 7807	0.357 8650
	22	0.487 9820	0.487 1731	0.818 1342	0.818 1323	0.353 5395	0.354 6577
	23	0.502 7243	0.501 9231	0.810 5053	0.810 5034	0.350 1984	0.351 3502
	24	0.517 3233	0.516 5299	0.802 6476	0.802 6457	0.346 7583	0.347 9435
	25	-0.531 7748	-0.530 9894	+0.794 5637	+0.794 5618	+0.343 2205	+0.344 4386
	26	0.546 0748	0.545 2976	0.786 2559	0.786 2541	0.339 5860	0.340 8367
	27	0.560 2192	0.559 4505	0.777 7270	0.777 7252	0.335 8559	0.337 1389
	28	0.574 2042	0.573 4442	0.768 9794	0.768 9776	0.332 0316	0.333 3464
	29	0.588 0261	0.587 2750	0.760 0159	0.760 0141	0.328 1140	0.329 4604
	30	0.601 6813	0.600 9394	0.750 8390	0.750 8373	0.324 1045	0.325 4820
	31	-0.615 1663	-0.614 4337	+0.741 4515	+0.741 4498	+0.320 0042	+0.321 4125
Aug.	1	0.628 4777	0.627 7546	0.731 8558	0.731 8542	0.315 8142	0.317 2528
	2	0.641 6121	0.640 8988	0.722 0546	0.722 0529	0.311 5357	0.313 0043
	3	0.654 5662	0.653 8629	0.712 0502	0.712 0486	0.307 1697	0.308 6678
	4	0.667 3366	0.666 6433	0.701 8450	0.701 8434	0.302 7173	0.304 2445
	5	0.679 9197	0.679 2368	0.691 4415	0.691 4399	0.298 1794	0.299 7353
	6	-0.692 3120	-0.691 6396	+0.680 8421	+0.680 8406	+0.293 5572	+0.295 1413
	7	0.704 5097	0.703 8481	0.670 0493	0.670 0478	0.288 8516	0.290 4635
	8	0.716 5092	0.715 8585	0.659 0658	0.659 0643	0.284 0638	0.285 7031
	9	0.728 3067	0.727 6671	0.647 8943	0.647 8929	0.279 1949	0.280 8611
	10	0.739 8985	0.739 2701	0.636 5378	0.636 5364	0.274 2462	0.275 9388
	11	0.751 2808	0.750 6639	0.624 9992	0.624 9978	0.269 2190	0.270 9376
	12	-0.762 4500	-0.761 8447	+0.613 2816	+0.613 2803	+0.264 1146	+0.265 8586
	13	0.773 4025	0.772 8090	0.601 3885	0.601 3872	0.258 9344	0.260 7034
	14	0.784 1347	0.783 5532	0.589 3230	0.589 3217	0.253 6799	0.255 4733
	15	0.794 6432	0.794 0738	0.577 0886	0.577 0874	0.248 3526	0.250 1699
	16	-0.804 9246	-0.804 3675	+0.564 6889	+0.564 6877	+0.242 9539	+0.244 7947

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Date	$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
Aug. 16	-0.804 9246	-0.804 3675	+0.564 6889	+0.564 6877	+0.242 9539	+0.244 7947
17	0.814 9757	0.814 4310	0.552 1275	0.552 1264	0.237 4856	0.239 3492
18	0.824 7932	0.824 2612	0.539 4081	0.539 4071	0.231 9492	0.233 8352
19	0.834 3741	0.833 8549	0.526 5346	0.526 5335	0.226 3464	0.228 2542
20	0.843 7155	0.843 2092	0.513 5107	0.513 5097	0.220 6789	0.222 6079
21	0.852 8146	0.852 3213	0.500 3403	0.500 3394	0.214 9484	0.216 8981
22	-0.861 6686	-0.861 1886	+0.487 0275	+0.487 0266	+0.209 1567	+0.211 1266
23	0.870 2749	0.869 8083	0.473 5762	0.473 5753	0.203 3055	0.205 2950
24	0.878 6312	0.878 1780	0.459 9904	0.459 9895	0.197 3966	0.199 4052
25	0.886 7352	0.886 2956	0.446 2742	0.446 2733	0.191 4319	0.193 4589
26	0.894 5846	0.894 1587	0.432 4315	0.432 4307	0.185 4131	0.187 4579
27	0.902 1774	0.901 7653	0.418 4665	0.418 4657	0.179 3419	0.181 4040
28	-0.909 5117	-0.909 1136	+0.404 3830	+0.404 3823	+0.173 2201	+0.175 2989
29	0.916 5856	0.916 2016	0.390 1850	0.390 1844	0.167 0495	0.169 1443
30	0.923 3975	0.923 0277	0.375 8763	0.375 8757	0.160 8316	0.162 9420
31	0.929 9455	0.929 5900	0.361 4606	0.361 4600	0.154 5682	0.156 6934
Sept. 1	0.936 2279	0.935 8868	0.346 9417	0.346 9411	0.148 2607	0.150 4002
2	0.942 2428	0.941 9162	0.332 3231	0.332 3226	0.141 9108	0.144 0639
3	-0.947 9882	-0.947 6761	+0.317 6086	+0.317 6082	+0.135 5200	+0.137 6862
4	0.953 4621	0.953 1648	0.302 8021	0.302 8016	0.129 0898	0.131 2685
5	0.958 6626	0.958 3800	0.287 9073	0.287 9069	0.122 6221	0.124 8125
6	0.963 5876	0.963 3198	0.272 9283	0.272 9279	0.116 1184	0.118 3200
7	0.968 2351	0.967 9823	0.257 8692	0.257 8689	0.109 5805	0.111 7926
8	0.972 6033	0.972 3654	0.242 7342	0.242 7339	0.103 0102	0.105 2322
9	-0.976 6903	-0.976 4675	+0.227 5276	+0.227 5274	+0.096 4094	+0.098 6407
10	0.980 4944	0.980 2867	0.212 2539	0.212 2537	0.089 7800	0.092 0199
11	0.984 0140	0.983 8216	0.196 9175	0.196 9174	0.083 1239	0.085 3718
12	0.987 2476	0.987 0704	0.181 5229	0.181 5228	0.076 4431	0.078 6983
13	0.990 1939	0.990 0320	0.166 0748	0.166 0747	0.069 7396	0.072 0014
14	0.992 8515	0.992 7049	0.150 5777	0.150 5777	0.063 0155	0.065 2833
15	-0.995 2193	-0.995 0881	+0.135 0365	+0.135 0365	+0.056 2727	+0.058 5459
16	0.997 2963	0.997 1805	0.119 4558	0.119 4559	0.049 5134	0.051 7912
17	0.999 0816	0.998 9813	0.103 8405	0.103 8406	0.042 7397	0.045 0215
18	1.000 5745	1.000 4898	0.088 1952	0.088 1954	0.035 9537	0.038 2389
19	1.001 7745	1.001 7052	0.072 5249	0.072 5251	0.029 1575	0.031 4453
20	1.002 6810	1.002 6273	0.056 8344	0.056 8346	0.022 3532	0.024 6430
21	-1.003 2939	-1.003 2558	+0.041 1284	+0.041 1287	+0.015 5430	+0.017 8341
22	1.003 6130	1.003 5904	0.025 4117	0.025 4120	0.008 7289	0.011 0207
23	1.003 6382	1.003 6312	+0.009 6890	+0.009 6894	+0.001 9130	+0.004 2048
24	1.003 3698	1.003 3784	-0.006 0350	-0.006 0346	-0.004 9026	-0.002 6115
25	1.002 8080	1.002 8321	0.021 7558	0.021 7553	0.011 7160	0.009 4263
26	1.001 9531	1.001 9928	0.037 4688	0.037 4683	0.018 5251	0.016 2375
27	-1.000 8055	-1.000 8607	-0.053 1697	-0.053 1692	-0.025 3282	-0.023 0432
28	0.999 3656	0.999 4364	0.068 8541	0.068 8536	0.032 1234	0.029 8417
29	0.997 6338	0.997 7201	0.084 5180	0.084 5174	0.038 9088	0.036 6312
30	0.995 6103	0.995 7121	0.100 1569	0.100 1563	0.045 6827	0.043 4098
Oct. 1	-0.993 2956	-0.993 4128	-0.115 7669	-0.115 7662	-0.052 4433	-0.050 1757

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Date		$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
Oct.	1	-0.993 2956	-0.993 4128	-0.115 7669	-0.115 7662	-0.052 4433	-0.050 1757
	2	0.990 6897	0.990 8223	0.131 3435	0.131 3427	0.059 1888	0.056 9272
	3	0.987 7929	0.987 9409	0.146 8824	0.146 8817	0.065 9173	0.063 6625
	4	0.984 6055	0.984 7688	0.162 3793	0.162 3785	0.072 6271	0.070 3796
	5	0.981 1277	0.981 3064	0.177 8296	0.177 8287	0.079 3161	0.077 0767
	6	0.977 3601	0.977 5540	0.193 2287	0.193 2278	0.085 9824	0.083 7517
	7	-0.973 3031	-0.973 5121	-0.208 5719	-0.208 5710	-0.092 6241	-0.090 4026
	8	0.968 9574	0.969 1815	0.223 8547	0.223 8538	0.099 2389	0.097 0275
	9	0.964 3237	0.964 5629	0.239 0723	0.239 0713	0.105 8251	0.103 6243
	10	0.959 4029	0.959 6571	0.254 2199	0.254 2189	0.112 3803	0.110 1908
	11	0.954 1960	0.954 4651	0.269 2928	0.269 2917	0.118 9027	0.116 7252
	12	0.948 7043	0.948 9882	0.284 2862	0.284 2851	0.125 3901	0.123 2252
	13	-0.942 9289	-0.943 2276	-0.299 1953	-0.299 1942	-0.131 8403	-0.129 6887
	14	0.936 8713	0.937 1846	0.314 0153	0.314 0141	0.138 2514	0.136 1137
	15	0.930 5331	0.930 8610	0.328 7415	0.328 7403	0.144 6212	0.142 4980
	16	0.923 9159	0.924 2583	0.343 3691	0.343 3678	0.150 9476	0.148 8396
	17	0.917 0218	0.917 3786	0.357 8933	0.357 8920	0.157 2286	0.155 1364
	18	0.909 8527	0.910 2237	0.372 3096	0.372 3082	0.163 4620	0.161 3863
	19	-0.902 4109	-0.902 7960	-0.386 6132	-0.386 6119	-0.169 6460	-0.167 5873
	20	0.894 6986	0.895 0978	0.400 7998	0.400 7984	0.175 7784	0.173 7374
	21	0.886 7183	0.887 1314	0.414 8648	0.414 8634	0.181 8574	0.179 8347
	22	0.878 4726	0.878 8995	0.428 8041	0.428 8026	0.187 8811	0.185 8772
	23	0.869 9641	0.870 4047	0.442 6133	0.442 6118	0.193 8476	0.191 8633
	24	0.861 1956	0.861 6497	0.456 2884	0.456 2869	0.199 7552	0.197 7910
	25	-0.852 1697	-0.852 6372	-0.469 8255	-0.469 8240	-0.205 6023	-0.203 6588
	26	0.842 8893	0.843 3700	0.483 2208	0.483 2192	0.211 3872	0.209 4649
	27	0.833 3569	0.833 8507	0.496 4705	0.496 4689	0.217 1083	0.215 2078
	28	0.823 5753	0.824 0820	0.509 5708	0.509 5692	0.222 7641	0.220 8860
	29	0.813 5470	0.814 0665	0.522 5182	0.522 5165	0.228 3529	0.226 4978
	30	0.803 2747	0.803 8068	0.535 3088	0.535 3071	0.233 8733	0.232 0417
	31	-0.792 7609	-0.793 3055	-0.547 9390	-0.547 9373	-0.239 3237	-0.237 5162
Nov.	1	0.782 0082	0.782 5651	0.560 4050	0.560 4032	0.244 7025	0.242 9196
	2	0.771 0193	0.771 5883	0.572 7028	0.572 7010	0.250 0080	0.248 2502
	3	0.759 7970	0.760 3780	0.584 8287	0.584 8269	0.255 2385	0.253 5065
	4	0.748 3441	0.748 9370	0.596 7788	0.596 7770	0.260 3925	0.258 6866
	5	0.736 6637	0.737 2682	0.608 5492	0.608 5473	0.265 4682	0.263 7891
	6	-0.724 7589	-0.725 3749	-0.620 1359	-0.620 1341	-0.270 4640	-0.268 8121
	7	0.712 6329	0.713 2601	0.631 5353	0.631 5333	0.275 3781	0.273 7540
	8	0.700 2891	0.700 9274	0.642 7433	0.642 7414	0.280 2090	0.278 6131
	9	0.687 7309	0.688 3801	0.653 7562	0.653 7543	0.284 9549	0.283 3877
	10	0.674 9620	0.675 6218	0.664 5704	0.664 5684	0.289 6142	0.288 0762
	11	0.661 9860	0.662 6563	0.675 1819	0.675 1799	0.294 1852	0.292 6769
	12	-0.648 8069	-0.649 4874	-0.685 5872	-0.685 5852	-0.298 6664	-0.297 1883
	13	0.635 4286	0.636 1192	0.695 7827	0.695 7807	0.303 0562	0.301 6086
	14	0.621 8552	0.622 5557	0.705 7649	0.705 7628	0.307 3530	0.305 9365
	15	0.608 0912	0.608 8013	0.715 5303	0.715 5282	0.311 5553	0.310 1703
	16	-0.594 1408	-0.594 8603	-0.725 0756	-0.725 0735	-0.315 6617	-0.314 3085

SUN, 2023

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2023.5 AND J 2000.0

Date		$X_{2023.5}$	$X_{2000.0}$	$Y_{2023.5}$	$Y_{2000.0}$	$Z_{2023.5}$	$Z_{2000.0}$
Nov.	16	-0.594 1408	-0.594 8603	-0.725 0756	-0.725 0735	-0.315 6617	-0.314 3085
	17	0.580 0086	0.580 7373	0.734 3978	0.734 3956	0.319 6707	0.318 3499
	18	0.565 6992	0.566 4369	0.743 4937	0.743 4916	0.323 5812	0.322 2931
	19	0.551 2173	0.551 9637	0.752 3606	0.752 3584	0.327 3918	0.326 1368
	20	0.536 5676	0.537 3225	0.760 9958	0.760 9936	0.331 1013	0.329 8798
	21	0.521 7547	0.522 5179	0.769 3967	0.769 3945	0.334 7088	0.333 5212
	22	-0.506 7834	-0.507 5547	-0.777 5609	-0.777 5587	-0.338 2133	-0.337 0598
	23	0.491 6583	0.492 4374	0.785 4862	0.785 4840	0.341 6136	0.340 4948
	24	0.476 3839	0.477 1706	0.793 1703	0.793 1681	0.344 9091	0.343 8252
	25	0.460 9649	0.461 7588	0.800 6112	0.800 6089	0.348 0987	0.347 0501
	26	0.445 4055	0.446 2066	0.807 8067	0.807 8044	0.351 1817	0.350 1686
	27	0.429 7103	0.430 5182	0.814 7547	0.814 7524	0.354 1572	0.353 1799
	28	-0.413 8837	-0.414 6982	-0.821 4532	-0.821 4509	-0.357 0243	-0.356 0832
	29	0.397 9301	0.398 7509	0.827 9000	0.827 8977	0.359 7821	0.358 8775
	30	0.381 8540	0.382 6809	0.834 0931	0.834 0908	0.362 4298	0.361 5620
Dec.	1	0.365 6598	0.366 4926	0.840 0304	0.840 0281	0.364 9665	0.364 1357
	2	0.349 3523	0.350 1906	0.845 7098	0.845 7075	0.367 3913	0.366 5977
	3	0.332 9362	0.333 7798	0.851 1293	0.851 1269	0.369 7034	0.368 9473
	4	-0.316 4161	-0.317 2648	-0.856 2868	-0.856 2845	-0.371 9018	-0.371 1834
	5	0.299 7970	0.300 6505	0.861 1805	0.861 1781	0.373 9857	0.373 3053
	6	0.283 0839	0.283 9420	0.865 8084	0.865 8061	0.375 9543	0.375 3121
	7	0.266 2818	0.267 1441	0.870 1688	0.870 1665	0.377 8068	0.377 2030
	8	0.249 3958	0.250 2621	0.874 2599	0.874 2576	0.379 5424	0.378 9772
	9	0.232 4311	0.233 3012	0.878 0801	0.878 0778	0.381 1604	0.380 6340
	10	-0.215 3931	-0.216 2666	-0.881 6278	-0.881 6254	-0.382 6602	-0.382 1726
	11	0.198 2872	0.199 1639	0.884 9015	0.884 8991	0.384 0409	0.383 5925
	12	0.181 1188	0.181 9985	0.887 8999	0.887 8975	0.385 3021	0.384 8929
	13	0.163 8937	0.164 7760	0.890 6217	0.890 6193	0.386 4432	0.386 0733
	14	0.146 6175	0.147 5022	0.893 0659	0.893 0635	0.387 4637	0.387 1332
	15	0.129 2960	0.130 1828	0.895 2315	0.895 2292	0.388 3631	0.388 0722
	16	-0.111 9349	-0.112 8236	-0.897 1180	-0.897 1156	-0.389 1413	-0.388 8901
	17	0.094 5401	0.095 4303	0.898 7248	0.898 7224	0.389 7980	0.389 5865
	18	0.077 1173	0.078 0088	0.900 0515	0.900 0492	0.390 3330	0.390 1613
	19	0.059 6722	0.060 5646	0.901 0981	0.901 0957	0.390 7465	0.390 6146
	20	0.042 2102	0.043 1033	0.901 8644	0.901 8620	0.391 0383	0.390 9463
	21	0.024 7369	0.025 6304	0.902 3506	0.902 3482	0.391 2086	0.391 1565
	22	-0.007 2575	-0.008 1513	-0.902 5567	-0.902 5544	-0.391 2574	-0.391 2453
	23	+0.010 2225	+0.009 3289	0.902 4831	0.902 4808	0.391 1850	0.391 2128
	24	0.027 6981	0.026 8049	0.902 1299	0.902 1276	0.390 9915	0.391 0592
	25	0.045 1641	0.044 2716	0.901 4974	0.901 4951	0.390 6770	0.390 7846
	26	0.062 6155	0.061 7239	0.900 5859	0.900 5836	0.390 2418	0.390 3891
	27	0.080 0471	0.079 1568	0.899 3957	0.899 3934	0.389 6858	0.389 8730
	28	+0.097 4540	+0.096 5651	-0.897 9271	-0.897 9248	-0.389 0094	-0.389 2363
	29	0.114 8310	0.113 9439	0.896 1804	0.896 1781	0.388 2127	0.388 4793
	30	0.132 1730	0.131 2879	0.894 1560	0.894 1537	0.387 2958	0.387 6020
	31	0.149 4748	0.148 5921	0.891 8544	0.891 8521	0.386 2590	0.386 6047
	32	+0.166 7314	+0.165 8513	-0.889 2760	-0.889 2737	-0.385 1024	-0.385 4875

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EPHEMERIS FOR PHYSICAL OBSERVATIONS
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Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°
Jan. 0	+2.68	-2.85	18.15
1	2.19	2.97	4.98
2	1.71	3.09	351.81
3	1.22	3.20	338.64
4	0.74	3.32	325.47
5	+0.25	3.43	312.30
6	-0.23	-3.54	299.13
7	0.71	3.66	285.96
8	1.19	3.77	272.79
9	1.67	3.88	259.62
10	2.15	3.98	246.45
11	2.63	4.09	233.28
12	-3.11	-4.20	220.11
13	3.58	4.30	206.95
14	4.05	4.40	193.78
15	4.52	4.51	180.61
16	4.99	4.61	167.44
17	5.46	4.71	154.27
18	-5.92	-4.80	141.11
19	6.38	4.90	127.94
20	6.84	4.99	114.77
21	7.29	5.09	101.61
22	7.74	5.18	88.44
23	8.19	5.27	75.28
24	-8.63	-5.35	62.11
25	9.07	5.44	48.94
26	9.51	5.52	35.78
27	9.94	5.61	22.61
28	10.37	5.69	9.44
29	10.79	5.77	356.28
30	-11.21	-5.84	343.11
31	11.63	5.92	329.95
Feb. 1	12.04	5.99	316.78
2	12.44	6.06	303.61
3	12.85	6.13	290.45
4	13.24	6.20	277.28
5	-13.64	-6.27	264.11
6	14.02	6.33	250.95
7	14.40	6.39	237.78
8	14.78	6.45	224.61
9	15.15	6.51	211.44
10	15.52	6.56	198.28
11	-15.88	-6.62	185.11
12	16.24	6.67	171.94
13	16.59	6.72	158.78
14	16.94	6.77	145.61
15	-17.28	-6.81	132.44

Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°
Feb. 15	-17.28	-6.81	132.44
16	17.61	6.85	119.27
17	17.94	6.89	106.10
18	18.26	6.93	92.94
19	18.58	6.97	79.77
20	18.89	7.00	66.60
21	-19.20	-7.04	53.43
22	19.50	7.07	40.26
23	19.79	7.09	27.09
24	20.08	7.12	13.92
25	20.36	7.14	0.75
26	20.64	7.16	347.58
27	-20.91	-7.18	334.41
28	21.17	7.20	321.24
Mar. 1	21.43	7.21	308.07
2	21.68	7.23	294.89
3	21.92	7.24	281.72
4	22.16	7.24	268.55
5	-22.39	-7.25	255.37
6	22.62	7.25	242.20
7	22.84	7.25	229.02
8	23.05	7.25	215.85
9	23.25	7.25	202.67
10	23.45	7.24	189.49
11	-23.65	-7.23	176.32
12	23.83	7.22	163.14
13	24.01	7.21	149.96
14	24.18	7.20	136.78
15	24.35	7.18	123.60
16	24.51	7.16	110.42
17	-24.66	-7.14	97.24
18	24.81	7.12	84.06
19	24.95	7.09	70.88
20	25.08	7.06	57.70
21	25.21	7.03	44.51
22	25.32	7.00	31.33
23	-25.44	-6.97	18.15
24	25.54	6.93	4.96
25	25.64	6.89	351.78
26	25.73	6.85	338.59
27	25.81	6.81	325.40
28	25.89	6.77	312.21
29	-25.96	-6.72	299.02
30	26.02	6.67	285.83
31	26.07	6.62	272.64
Apr. 1	26.12	6.57	259.45
2	-26.16	-6.52	246.26

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EPHEMERIS FOR PHYSICAL OBSERVATIONS
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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
		°	°	°			°	°	°
Apr.	1	-26.12	-6.57	259.45	May	17	-20.48	-2.50	11.79
	2	26.16	6.52	246.26		18	20.19	2.38	358.57
	3	26.20	6.46	233.07		19	19.90	2.27	345.34
	4	26.22	6.41	219.87		20	19.60	2.15	332.11
	5	26.24	6.35	206.68		21	19.29	2.04	318.88
	6	26.25	6.28	193.48		22	18.98	1.92	305.66
	7	-26.26	-6.22	180.28		23	-18.66	-1.80	292.43
	8	26.26	6.16	167.09		24	18.33	1.68	279.20
	9	26.25	6.09	153.89		25	18.00	1.57	265.97
	10	26.23	6.02	140.69		26	17.67	1.45	252.74
	11	26.20	5.95	127.49		27	17.32	1.33	239.51
	12	26.17	5.88	114.29		28	16.98	1.21	226.27
	13	-26.13	-5.80	101.09		29	-16.62	-1.09	213.04
	14	26.09	5.73	87.89		30	16.27	0.97	199.81
	15	26.03	5.65	74.68		31	15.90	0.85	186.58
	16	25.97	5.57	61.48	June	1	15.53	0.73	173.34
	17	25.90	5.49	48.28		2	15.16	0.61	160.11
	18	25.83	5.41	35.07		3	14.78	0.49	146.88
	19	-25.75	-5.33	21.87		4	-14.40	-0.37	133.64
	20	25.65	5.24	8.66		5	14.01	0.25	120.41
	21	25.56	5.16	355.45		6	13.62	0.13	107.17
	22	25.45	5.07	342.24		7	13.23	-0.00	93.94
	23	25.34	4.98	329.04		8	12.83	+0.12	80.70
	24	25.22	4.89	315.83		9	12.42	0.24	67.47
	25	-25.09	-4.80	302.62		10	-12.01	+0.36	54.23
	26	24.96	4.71	289.40		11	11.60	0.48	40.99
	27	24.81	4.61	276.19		12	11.19	0.60	27.76
	28	24.66	4.52	262.98		13	10.77	0.72	14.52
	29	24.51	4.42	249.77		14	10.35	0.84	1.29
	30	24.34	4.32	236.55		15	9.92	0.96	348.05
May	1	-24.17	-4.22	223.34		16	-9.49	+1.08	334.81
	2	24.00	4.12	210.12		17	9.06	1.20	321.58
	3	23.81	4.02	196.90		18	8.63	1.32	308.34
	4	23.62	3.92	183.68		19	8.19	1.43	295.10
	5	23.42	3.81	170.47		20	7.75	1.55	281.87
	6	23.21	3.71	157.25		21	7.31	1.67	268.63
	7	-23.00	-3.60	144.03		22	-6.87	+1.79	255.39
	8	22.78	3.50	130.81		23	6.43	1.90	242.16
	9	22.55	3.39	117.58		24	5.98	2.02	228.92
	10	22.31	3.28	104.36		25	5.53	2.13	215.68
	11	22.07	3.17	91.14		26	5.09	2.25	202.45
	12	21.82	3.06	77.92		27	4.64	2.36	189.21
	13	-21.57	-2.95	64.69		28	-4.18	+2.48	175.97
	14	21.31	2.84	51.47		29	3.73	2.59	162.74
	15	21.04	2.73	38.24		30	3.28	2.70	149.50
	16	20.76	2.61	25.02	July	1	2.83	2.81	136.26
	17	-20.48	-2.50	11.79		2	-2.38	+2.92	123.03

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EPHEMERIS FOR PHYSICAL OBSERVATIONS
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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
		°	°	°			°	°	°
July	1	-2.83	+2.81	136.26	Aug.	16	+16.21	+6.66	247.74
	2	2.38	2.92	123.03		17	16.54	6.71	234.52
	3	1.92	3.03	109.79		18	16.87	6.76	221.30
	4	1.47	3.14	96.55		19	17.20	6.80	208.08
	5	1.02	3.25	83.32		20	17.52	6.84	194.87
	6	0.56	3.36	70.08		21	17.83	6.88	181.65
	7	-0.11	+3.46	56.85		22	+18.14	+6.92	168.44
	8	+0.34	3.57	43.61		23	18.45	6.95	155.22
	9	0.79	3.67	30.38		24	18.75	6.99	142.01
	10	1.24	3.78	17.14		25	19.04	7.02	128.79
	11	1.69	3.88	3.91		26	19.33	7.05	115.58
	12	2.14	3.98	350.67		27	19.62	7.08	102.37
	13	+2.59	+4.08	337.44		28	+19.90	+7.10	89.16
	14	3.03	4.18	324.21		29	20.17	7.13	75.94
	15	3.48	4.28	310.97		30	20.44	7.15	62.73
	16	3.92	4.38	297.74		31	20.70	7.17	49.52
	17	4.36	4.47	284.51	Sept.	1	20.96	7.19	36.31
	18	4.80	4.57	271.28		2	21.21	7.20	23.10
	19	+5.24	+4.66	258.05		3	+21.46	+7.21	9.89
	20	5.67	4.75	244.82		4	21.70	7.23	356.68
	21	6.11	4.84	231.58		5	21.94	7.24	343.47
	22	6.54	4.93	218.35		6	22.17	7.24	330.27
	23	6.96	5.02	205.12		7	22.39	7.25	317.06
	24	7.39	5.10	191.89		8	22.61	7.25	303.85
	25	+7.81	+5.19	178.66		9	+22.82	+7.25	290.65
	26	8.23	5.27	165.44		10	23.03	7.25	277.44
	27	8.65	5.36	152.21		11	23.23	7.25	264.24
	28	9.06	5.44	138.98		12	23.42	7.24	251.03
	29	9.47	5.52	125.75		13	23.61	7.24	237.83
	30	9.88	5.59	112.52		14	23.79	7.23	224.63
	31	+10.28	+5.67	99.30		15	+23.97	+7.21	211.42
Aug.	1	10.68	5.74	86.07		16	24.14	7.20	198.22
	2	11.07	5.82	72.84		17	24.31	7.18	185.02
	3	11.47	5.89	59.62		18	24.46	7.17	171.82
	4	11.86	5.96	46.39		19	24.61	7.15	158.62
	5	12.24	6.03	33.17		20	24.76	7.12	145.42
	6	+12.62	+6.09	19.94		21	+24.90	+7.10	132.22
	7	13.00	6.16	6.72		22	25.03	7.07	119.02
	8	13.37	6.22	353.50		23	25.16	7.05	105.82
	9	13.74	6.28	340.27		24	25.28	7.02	92.62
	10	14.11	6.34	327.05		25	25.39	6.98	79.42
	11	14.47	6.40	313.83		26	25.49	6.95	66.22
	12	+14.83	+6.46	300.61		27	+25.59	+6.91	53.03
	13	15.18	6.51	287.39		28	25.69	6.87	39.83
	14	15.53	6.56	274.17		29	25.77	6.83	26.63
	15	15.87	6.62	260.95		30	25.85	6.79	13.43
	16	+16.21	+6.66	247.74	Oct.	1	+25.92	+6.75	0.24

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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	+25.92	+6.75	0.24	Nov.	16	+21.20	+2.79	113.55
	2	25.99	6.70	347.04		17	20.92	2.68	100.37
	3	26.05	6.65	333.85		18	20.62	2.56	87.19
	4	26.10	6.60	320.65		19	20.33	2.44	74.01
	5	26.14	6.55	307.45		20	20.02	2.32	60.82
	6	26.18	6.49	294.26		21	19.71	2.20	47.64
	7	+26.21	+6.43	281.07		22	+19.39	+2.07	34.46
	8	26.23	6.38	267.87		23	19.06	1.95	21.28
	9	26.25	6.32	254.68		24	18.73	1.83	8.10
	10	26.26	6.25	241.49		25	18.39	1.70	354.92
	11	26.26	6.19	228.29		26	18.04	1.58	341.74
	12	26.25	6.12	215.10		27	17.69	1.46	328.56
	13	+26.24	+6.05	201.91		28	+17.33	+1.33	315.38
	14	26.22	5.98	188.72		29	16.96	1.20	302.20
	15	26.19	5.91	175.53		30	16.59	1.08	289.02
	16	26.15	5.84	162.34	Dec.	1	16.21	0.95	275.84
	17	26.11	5.76	149.15		2	15.83	0.82	262.66
	18	26.06	5.69	135.96		3	15.43	0.70	249.48
	19	+26.00	+5.61	122.77		4	+15.04	+0.57	236.30
	20	25.93	5.53	109.58		5	14.64	0.44	223.12
	21	25.86	5.44	96.39		6	14.23	0.31	209.94
	22	25.78	5.36	83.20		7	13.82	0.19	196.77
	23	25.69	5.28	70.01		8	13.40	+0.06	183.59
	24	25.59	5.19	56.82		9	12.97	-0.07	170.41
	25	+25.48	+5.10	43.63		10	+12.55	-0.20	157.24
	26	25.37	5.01	30.44		11	12.11	0.33	144.06
	27	25.25	4.92	17.26		12	11.68	0.46	130.88
	28	25.12	4.82	4.07		13	11.24	0.58	117.71
	29	24.99	4.73	350.88		14	10.79	0.71	104.53
	30	24.84	4.63	337.69		15	10.34	0.84	91.36
	31	+24.69	+4.53	324.51		16	+9.89	-0.97	78.18
Nov.	1	24.53	4.43	311.32		17	9.43	1.09	65.01
	2	24.36	4.33	298.13		18	8.97	1.22	51.84
	3	24.19	4.23	284.95		19	8.51	1.35	38.66
	4	24.00	4.13	271.76		20	8.04	1.47	25.49
	5	23.81	4.02	258.57		21	7.58	1.60	12.31
	6	+23.61	+3.92	245.39		22	+7.11	-1.72	359.14
	7	23.41	3.81	232.20		23	6.63	1.85	345.97
	8	23.19	3.70	219.02		24	6.16	1.97	332.79
	9	22.97	3.59	205.84		25	5.68	2.10	319.62
	10	22.74	3.48	192.65		26	5.20	2.22	306.45
	11	22.50	3.37	179.47		27	4.72	2.34	293.27
	12	+22.26	+3.26	166.28		28	+4.24	-2.46	280.10
	13	22.00	3.14	153.10		29	3.76	2.58	266.93
	14	21.74	3.03	139.92		30	3.28	2.70	253.76
	15	21.47	2.91	126.73		31	2.79	2.82	240.59
	16	+21.20	+2.79	113.55		32	+2.31	-2.94	227.42

MOON, 2023

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
1238	Dec.	23	10	17	Dec.	30	01	21	Jan.	06	23	08	Jan.	15	02	10
1239	Jan.	21	20	53	Jan.	28	15	19	Feb.	05	18	29	Feb.	13	16	01
1240	Feb.	20	07	06	Feb.	27	08	06	Mar.	07	12	40	Mar.	15	02	08
1241	Mar.	21	17	23	Mar.	29	02	32	Apr.	06	04	34	Apr.	13	09	11
1242	Apr.	20	04	12	Apr.	27	21	20	May	05	17	34	May	12	14	28
1243	May	19	15	53	May	27	15	22	June	04	03	42	June	10	19	31
1244	June	18	04	37	June	26	07	50	July	03	11	39	July	10	01	48
1245	July	17	18	32	July	25	22	07	Aug.	01	18	32	Aug.	08	10	28
1246	Aug.	16	09	38	Aug.	24	09	57	Aug.	31	01	36	Sept.	06	22	21
1247	Sept.	15	01	40	Sept.	22	19	32	Sept.	29	09	57	Oct.	06	13	48
1248	Oct.	14	17	55	Oct.	22	03	29	Oct.	28	20	24	Nov.	05	08	37
1249	Nov.	13	09	27	Nov.	20	10	50	Nov.	27	09	16	Dec.	05	05	49
1250	Dec.	12	23	32	Dec.	19	18	39	Dec.	27	00	33	Jan.	04	03	30

MOON AT PERIGEE

	d	h		d	h		d	h
Dec.	24	08	May	11	05	Sept.	28	01
Jan.	21	21	June	06	23	Oct.	26	03
Feb.	19	09	July	04	22	Nov.	21	21
Mar.	19	15	Aug.	02	06	Dec	16	19
Apr.	16	02	Aug.	30	16	Jan.	13	11

MOON AT APOGEE

	d	h		d	h		d	h
Jan.	08	09	May	26	02	Oct.	10	04
Feb.	04	09	June	22	19	Nov.	06	22
Mar.	03	18	July	20	07	Dec.	04	19
Mar.	31	11	Aug.	16	12	Jan	01	15
Apr.	28	07	Sept.	12	16	Jan	29	08

MOON, 2023
MEAN EQUATOR, ORBIT, LONGITUDE AND ELONGATION

Date		Mean Equator			Orbit Perigee			Node			Mean Longitude			Mean Elongation
		i	Δ	Ω'	Γ'			Ω			☾			D
		°	°	°	°	'	"	°	'	"	°	'	"	°
Jan.	1	22.170	222.624	357.374	299	11	52.74	40	12	23.6	26	38	06.5	106.235
	11	22.155	222.068	357.402	300	18	43.27	39	40	37.3	158	23	56.8	228.142
	21	22.139	221.513	357.430	301	25	33.79	39	08	51.0	290	09	47.1	350.050
	31	22.123	220.957	357.459	302	32	24.31	38	37	04.6	61	55	37.3	111.957
Feb.	10	22.107	220.401	357.488	303	39	14.83	38	05	18.3	193	41	27.6	233.865
	20	22.090	219.844	357.517	304	46	05.36	37	33	32.0	325	27	17.9	355.772
Mar.	2	22.074	219.288	357.547	305	52	55.88	37	01	45.6	97	13	08.2	117.680
	12	22.058	218.731	357.577	306	59	46.40	36	29	59.3	228	58	58.4	239.587
	22	22.041	218.174	357.607	308	06	36.92	35	58	13.0	0	44	48.7	1.494
Apr.	1	22.025	217.616	357.637	309	13	27.45	35	26	26.6	132	30	39.0	123.402
	11	22.008	217.058	357.668	310	20	17.97	34	54	40.3	264	16	29.2	245.309
	21	21.992	216.500	357.699	311	27	08.49	34	22	53.9	36	02	19.5	7.217
May	1	21.975	215.942	357.730	312	33	59.01	33	51	07.6	167	48	09.8	129.124
	11	21.958	215.384	357.762	313	40	49.54	33	19	21.3	299	34	00.1	251.031
	21	21.941	214.825	357.794	314	47	40.06	32	47	34.9	71	19	50.3	12.939
	31	21.924	214.266	357.826	315	54	30.58	32	15	48.6	203	05	40.6	134.846
June	10	21.907	213.706	357.859	317	01	21.10	31	44	02.3	334	51	30.9	256.754
	20	21.890	213.147	357.891	318	08	11.62	31	12	15.9	106	37	21.2	18.661
	30	21.873	212.587	357.924	319	15	02.15	30	40	29.6	238	23	11.4	140.568
July	10	21.855	212.026	357.958	320	21	52.67	30	08	43.3	10	09	01.7	262.476
	20	21.838	211.466	357.991	321	28	43.19	29	36	56.9	141	54	52.0	24.383
	30	21.821	210.905	358.025	322	35	33.71	29	05	10.6	273	40	42.2	146.291
Aug.	9	21.803	210.344	358.060	323	42	24.24	28	33	24.3	45	26	32.5	268.198
	19	21.785	209.783	358.094	324	49	14.76	28	01	37.9	177	12	22.8	30.105
	29	21.768	209.221	358.129	325	56	05.28	27	29	51.6	308	58	13.1	152.013
Sept.	8	21.750	208.659	358.164	327	02	55.80	26	58	05.3	80	44	03.3	273.920
	18	21.732	208.097	358.200	328	09	46.33	26	26	18.9	212	29	53.6	35.828
	28	21.714	207.535	358.235	329	16	36.85	25	54	32.6	344	15	43.9	157.735
Oct.	8	21.696	206.972	358.272	330	23	27.37	25	22	46.3	116	01	34.2	279.643
	18	21.678	206.409	358.308	331	30	17.89	24	50	59.9	247	47	24.4	41.550
	28	21.660	205.846	358.345	332	37	08.42	24	19	13.6	19	33	14.7	163.457
Nov.	7	21.641	205.283	358.381	333	43	58.94	23	47	27.3	151	19	05.0	285.365
	17	21.623	204.719	358.419	334	50	49.46	23	15	40.9	283	04	55.2	47.272
	27	21.604	204.155	358.456	335	57	39.98	22	43	54.6	54	50	45.5	169.180
Dec.	7	21.586	203.591	358.494	337	04	30.51	22	12	08.2	186	36	35.8	291.087
	17	21.567	203.026	358.532	338	11	21.03	21	40	21.9	318	22	26.1	52.994
	27	21.549	202.461	358.570	339	18	11.55	21	08	35.6	90	08	16.3	174.902
	37	21.530	201.896	358.609	340	25	02.07	20	36	49.2	221	54	06.6	296.809
	47	21.511	201.331	358.648	341	31	52.60	20	05	02.9	353	39	56.9	58.717

MOON, 2023

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	20	45	50.3	-1	49	56.8	2.5717	15	31.50
	0.5	27	14	25.8	1	16	54.9	2.5882	15	25.55
	1.0	33	38	15.9	0	43	19.6	2.6039	15	19.96
	1.5	39	57	49.6	-0	09	35.8	2.6187	15	14.77
	2.0	46	13	35.5	+0	23	53.1	2.6325	15	09.99
	2.5	52	26	01.1	0	56	45.0	2.6452	15	05.62
	3.0	58	35	32.5	+1	28	39.1	2.6568	15	01.66
	3.5	64	42	33.4	1	59	16.0	2.6674	14	58.08
	4.0	70	47	25.5	2	28	17.5	2.6769	14	54.89
	4.5	76	50	28.0	2	55	26.7	2.6854	14	52.07
	5.0	82	51	57.6	3	20	28.1	2.6928	14	49.60
	5.5	88	52	09.0	3	43	07.6	2.6993	14	47.47
	6.0	94	51	15.1	+4	03	12.7	2.7048	14	45.67
	6.5	100	49	26.9	4	20	32.2	2.7093	14	44.20
	7.0	106	46	54.5	4	34	56.7	2.7128	14	43.06
	7.5	112	43	47.4	4	46	18.6	2.7152	14	42.25
	8.0	118	40	14.8	4	54	31.8	2.7167	14	41.79
	8.5	124	36	26.4	4	59	32.1	2.7170	14	41.69
	9.0	130	32	32.6	+5	01	16.8	2.7161	14	41.96
	9.5	136	28	45.3	4	59	45.1	2.7140	14	42.64
	10.0	142	25	18.2	4	54	57.6	2.7106	14	43.75
	10.5	148	22	27.0	4	46	56.5	2.7058	14	45.31
	11.0	154	20	29.9	4	35	45.4	2.6996	14	47.36
	11.5	160	19	47.8	4	21	29.1	2.6918	14	49.92
	12.0	166	20	44.3	+4	04	14.0	2.6825	14	53.02
	12.5	172	23	45.6	3	44	07.4	2.6716	14	56.68
	13.0	178	29	20.7	3	21	18.4	2.6590	15	00.91
	13.5	184	38	00.9	2	55	57.2	2.6449	15	05.72
	14.0	190	50	19.2	2	28	15.6	2.6293	15	11.10
	14.5	197	06	50.5	1	58	27.2	2.6122	15	17.04
	15.0	203	28	09.8	+1	26	47.8	2.5939	15	23.51
	15.5	209	54	52.1	0	53	35.3	2.5746	15	30.46
	16.0	216	27	30.9	+0	19	10.5	2.5544	15	37.81
	16.5	223	06	36.5	-0	16	02.9	2.5337	15	45.47
	17.0	229	52	35.0	0	51	37.8	2.5128	15	53.33
	17.5	236	45	45.7	1	27	03.9	2.4921	16	01.25
	18.0	243	46	19.9	-2	01	47.3	2.4720	16	09.05
	18.5	250	54	18.2	2	35	11.2	2.4530	16	16.57
	19.0	258	09	29.0	3	06	36.6	2.4355	16	23.60
	19.5	265	31	26.8	3	35	23.4	2.4199	16	29.93
	20.0	272	59	31.6	4	00	51.6	2.4067	16	35.37
	20.5	280	32	48.6	4	22	23.8	2.3962	16	39.73
	21.0	288	10	09.6	-4	39	26.7	2.3887	16	42.86
	21.5	295	50	14.6	4	51	33.4	2.3845	16	44.64
	22.0	303	31	35.9	4	58	25.0	2.3836	16	44.99
	22.5	311	12	41.5	4	59	52.0	2.3862	16	43.92
	23.0	318	52	00.0	-4	55	54.9	2.3921	16	41.45

MOON, 2023

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	318	52	00.0	-4	55	54.9	2.3921	16	41.45
	23.5	326	28	05.0	4	46	43.8	2.4011	16	37.68
	24.0	333	59	39.2	4	32	37.3	2.4130	16	32.75
	24.5	341	25	37.4	4	14	01.5	2.4275	16	26.84
	25.0	348	45	08.5	3	51	27.6	2.4441	16	20.14
	25.5	355	57	36.3	3	25	30.4	2.4624	16	12.84
	26.0	3	02	39.4	-2	56	46.1	2.4820	16	05.16
	26.5	10	00	10.0	2	25	51.1	2.5024	15	57.29
	27.0	16	50	12.3	1	53	20.4	2.5232	15	49.39
	27.5	23	33	00.9	1	19	47.3	2.5441	15	41.62
	28.0	30	08	58.2	0	45	42.4	2.5645	15	34.10
	28.5	36	38	32.6	-0	11	33.8	2.5843	15	26.95
	29.0	43	02	17.0	+0	22	13.2	2.6031	15	20.24
	29.5	49	20	46.8	0	55	15.8	2.6208	15	14.04
	30.0	55	34	38.3	1	27	13.5	2.6372	15	08.37
	30.5	61	44	28.4	1	57	47.8	2.6520	15	03.28
	31.0	67	50	52.5	2	26	42.0	2.6654	14	58.75
	31.5	73	54	25.0	2	53	41.1	2.6771	14	54.81
Feb.	1.0	79	55	37.7	+3	18	31.3	2.6873	14	51.43
	1.5	85	55	00.0	3	41	00.2	2.6959	14	48.60
	2.0	91	52	58.7	4	00	56.5	2.7029	14	46.28
	2.5	97	49	57.6	4	18	10.0	2.7084	14	44.47
	3.0	103	46	17.4	4	32	31.9	2.7125	14	43.13
	3.5	109	42	16.4	4	43	54.3	2.7153	14	42.23
	4.0	115	38	10.1	+4	52	11.0	2.7168	14	41.75
	4.5	121	34	11.6	4	57	17.0	2.7171	14	41.65
	5.0	127	30	32.5	4	59	08.7	2.7162	14	41.93
	5.5	133	27	22.6	4	57	44.5	2.7143	14	42.56
	6.0	139	24	50.7	4	53	04.2	2.7113	14	43.53
	6.5	145	23	05.5	4	45	09.5	2.7073	14	44.84
	7.0	151	22	15.4	+4	34	03.7	2.7023	14	46.48
	7.5	157	22	29.8	4	19	52.2	2.6963	14	48.45
	8.0	163	23	59.1	4	02	42.0	2.6893	14	50.76
	8.5	169	26	55.2	3	42	41.8	2.6813	14	53.42
	9.0	175	31	32.1	3	20	02.2	2.6723	14	56.44
	9.5	181	38	06.1	2	54	55.2	2.6622	14	59.85
	10.0	187	46	55.9	+2	27	34.5	2.6510	15	03.64
	10.5	193	58	22.6	1	58	15.5	2.6387	15	07.83
	11.0	200	12	49.8	1	27	15.0	2.6254	15	12.44
	11.5	206	30	43.2	0	54	51.6	2.6111	15	17.46
	12.0	212	52	30.3	+0	21	25.5	2.5957	15	22.87
	12.5	219	18	39.5	-0	12	41.1	2.5795	15	28.68
	13.0	225	49	39.5	-0	47	04.4	2.5625	15	34.83
	13.5	232	25	58.2	1	21	18.4	2.5449	15	41.29
	14.0	239	08	01.3	1	54	55.1	2.5270	15	47.99
	14.5	245	56	10.8	2	27	24.4	2.5089	15	54.83
	15.0	252	50	43.4	-2	58	14.5	2.4909	16	01.71

MOON, 2023

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude °	'	"	Apparent Latitude °	'	"	True Geocentric Distance (A. U.) (X 10^{-3})	Semi Diameter '	"
Feb.	15.0	252	50	43.4	-2	58	14.5	2.4909	16	01.71
	15.5	259	51	48.4	3	26	52.2	2.4734	16	08.50
	16.0	266	59	26.2	3	52	43.4	2.4568	16	15.05
	16.5	274	13	26.5	4	15	14.4	2.4414	16	21.19
	17.0	281	33	26.5	4	33	52.5	2.4277	16	26.76
	17.5	288	58	50.7	-4	48	08.2	2.4159	16	31.57
	18.0	296	28	50.1	-4	57	36.4	2.4064	16	35.46
	18.5	304	02	23.7	5	01	58.0	2.3997	16	38.28
	19.0	311	38	19.9	5	01	01.7	2.3958	16	39.90
	19.5	319	15	19.1	4	54	45.0	2.3950	16	40.24
	20.0	326	51	57.7	4	43	14.3	2.3973	16	39.26
	20.5	334	26	52.0	4	26	45.6	2.4028	16	36.97
	21.0	341	58	41.7	-4	05	42.9	2.4113	16	33.44
	21.5	349	26	13.9	3	40	37.3	2.4227	16	28.76
	22.0	356	48	26.3	3	12	04.9	2.4367	16	23.09
	22.5	4	04	28.5	2	40	45.1	2.4529	16	16.59
	23.0	11	13	43.8	2	07	18.3	2.4710	16	09.45
	23.5	18	15	48.8	1	32	24.7	2.4905	16	01.87
	24.0	25	10	33.1	-0	56	42.2	2.5110	15	54.03
	24.5	31	57	57.7	-0	20	46.1	2.5320	15	46.12
	25.0	38	38	14.0	+0	14	51.6	2.5531	15	38.30
	25.5	45	11	41.6	0	49	42.8	2.5739	15	30.71
	26.0	51	38	46.6	1	23	22.9	2.5940	15	23.48
	26.5	58	00	00.3	1	55	30.7	2.6132	15	16.70
	27.0	64	15	57.4	+2	25	48.1	2.6311	15	10.46
	27.5	70	27	14.7	2	53	59.5	2.6475	15	04.82
	28.0	76	34	29.9	3	19	51.8	2.6623	14	59.80
	28.5	82	38	21.1	3	43	13.5	2.6752	14	55.45
Mar.	1.0	88	39	25.4	4	03	54.9	2.6863	14	51.76
	1.5	94	38	18.6	4	21	47.5	2.6954	14	48.74
	2.0	100	35	34.8	+4	36	43.9	2.7026	14	46.37
	2.5	106	31	45.9	4	48	37.9	2.7079	14	44.65
	3.0	112	27	21.0	4	57	24.1	2.7113	14	43.53
	3.5	118	22	46.9	5	02	58.0	2.7130	14	42.98
	4.0	124	18	27.4	5	05	16.4	2.7130	14	42.98
	4.5	130	14	43.6	5	04	17.1	2.7115	14	43.48
	5.0	136	11	53.8	+4	59	59.3	2.7085	14	44.44
	5.5	142	10	13.8	4	52	23.6	2.7043	14	45.82
	6.0	148	09	57.0	4	41	32.4	2.6989	14	47.58
	6.5	154	11	14.6	4	27	29.6	2.6926	14	49.68
	7.0	160	14	16.2	4	10	21.4	2.6853	14	52.09
	7.5	166	19	10.3	3	50	15.9	2.6772	14	54.78
	8.0	172	26	04.0	+3	27	23.3	2.6685	14	57.71
	8.5	178	35	04.6	3	01	56.1	2.6591	15	00.86
	9.0	184	46	19.0	2	34	08.8	2.6493	15	04.22
	9.5	190	59	54.9	2	04	18.1	2.6389	15	07.78
	10.0	197	16	00.6	+1	32	42.7	2.6281	15	11.51

MOON, 2023

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	197	16	00.6	+1	32	42.7	2.6281	15	11.51
	10.5	203	34	45.7	0	59	43.1	2.6168	15	15.43
	11.0	209	56	21.1	+0	25	41.8	2.6052	15	19.52
	11.5	216	20	59.1	-0	08	57.6	2.5932	15	23.78
	12.0	222	48	53.2	0	43	49.7	2.5808	15	28.21
	12.5	229	20	18.0	1	18	28.0	2.5681	15	32.81
	13.0	235	55	28.9	-1	52	25.0	2.5551	15	37.55
	13.5	242	34	41.2	2	25	12.3	2.5419	15	42.43
	14.0	249	18	09.2	2	56	20.9	2.5285	15	47.40
	14.5	256	06	05.8	3	25	21.5	2.5151	15	52.44
	15.0	262	58	41.0	3	51	44.6	2.5019	15	57.49
	15.5	269	56	00.7	4	15	01.6	2.4889	16	02.48
	16.0	276	58	05.5	-4	34	44.8	2.4765	16	07.32
	16.5	284	04	49.5	4	50	28.2	2.4647	16	11.92
	17.0	291	15	59.3	5	01	49.0	2.4540	16	16.17
	17.5	298	31	13.2	5	08	27.7	2.4445	16	19.95
	18.0	305	50	00.6	5	10	09.9	2.4366	16	23.14
	18.5	313	11	42.3	5	06	47.1	2.4305	16	25.62
	19.0	320	35	30.9	-4	58	17.4	2.4264	16	27.28
	19.5	328	00	32.6	4	44	46.3	2.4246	16	28.02
	20.0	335	25	48.2	4	26	27.1	2.4251	16	27.79
	20.5	342	50	16.1	4	03	40.5	2.4282	16	26.54
	21.0	350	12	54.2	3	36	53.9	2.4338	16	24.26
	21.5	357	32	42.9	3	06	40.6	2.4420	16	20.98
	22.0	4	48	47.1	-2	33	38.0	2.4525	16	16.78
	22.5	12	00	18.5	1	58	26.3	2.4652	16	11.74
	23.0	19	06	37.0	1	21	46.5	2.4799	16	06.00
	23.5	26	07	11.7	0	44	19.0	2.4962	15	59.68
	24.0	33	01	41.2	-0	06	42.4	2.5138	15	52.95
	24.5	39	49	53.9	+0	30	27.9	2.5324	15	45.97
	25.0	46	31	47.1	+1	06	39.9	2.5515	15	38.89
	25.5	53	07	26.4	1	41	25.8	2.5707	15	31.85
	26.0	59	37	05.0	2	14	21.8	2.5898	15	25.00
	26.5	66	01	02.1	2	45	07.6	2.6082	15	18.46
	27.0	72	19	42.1	3	13	27.0	2.6257	15	12.33
	27.5	78	33	33.8	3	39	06.6	2.6421	15	06.69
	28.0	84	43	08.6	+4	01	55.6	2.6569	15	01.63
	28.5	90	49	00.5	4	21	45.6	2.6700	14	57.19
	29.0	96	51	44.7	4	38	30.1	2.6813	14	53.42
	29.5	102	51	57.2	4	52	03.9	2.6906	14	50.34
	30.0	108	50	13.7	5	02	23.0	2.6978	14	47.97
	30.5	114	47	09.9	5	09	24.4	2.7028	14	46.30
	31.0	120	43	20.0	+5	13	06.2	2.7058	14	45.32
	31.5	126	39	17.1	5	13	27.0	2.7067	14	45.03
Apr.	1.0	132	35	32.6	5	10	26.5	2.7056	14	45.39
	1.5	138	32	35.5	5	04	05.3	2.7026	14	46.37
	2.0	144	30	53.0	+4	54	24.9	2.6979	14	47.92

MOON, 2023

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	132	35	32.6	+5	10	26.5	2.7056	14	45.39
	1.5	138	32	35.5	5	04	05.3	2.7026	14	46.37
	2.0	144	30	53.0	4	54	24.9	2.6979	14	47.92
	2.5	150	30	49.4	4	41	28.3	2.6916	14	50.00
	3.0	156	32	46.6	4	25	19.9	2.6839	14	52.56
	3.5	162	37	03.5	4	06	05.9	2.6750	14	55.53
	4.0	168	43	56.5	+3	43	54.6	2.6650	14	58.87
	4.5	174	53	39.0	3	18	56.2	2.6543	15	02.51
	5.0	181	06	21.8	2	51	23.8	2.6429	15	06.38
	5.5	187	22	13.0	2	21	32.6	2.6312	15	10.43
	6.0	193	41	18.7	1	49	40.7	2.6192	15	14.60
	6.5	200	03	42.4	1	16	08.9	2.6071	15	18.84
	7.0	206	29	26.0	+0	41	20.2	2.5951	15	23.09
	7.5	212	58	29.9	+0	05	40.2	2.5833	15	27.31
	8.0	219	30	53.1	-0	30	23.6	2.5718	15	31.46
	8.5	226	06	33.8	1	06	22.1	2.5606	15	35.52
	9.0	232	45	29.4	1	41	45.1	2.5499	15	39.46
	9.5	239	27	36.8	2	16	01.6	2.5396	15	43.27
	10.0	246	12	52.2	-2	48	40.6	2.5298	15	46.93
	10.5	253	01	11.8	3	19	11.5	2.5205	15	50.43
	11.0	259	52	30.9	3	47	04.8	2.5116	15	53.77
	11.5	266	46	44.1	4	11	52.4	2.5033	15	56.94
	12.0	273	43	45.3	4	33	08.4	2.4955	15	59.93
	12.5	280	43	26.5	4	50	29.7	2.4883	16	02.72
	13.0	287	45	38.5	-5	03	36.1	2.4817	16	05.29
	13.5	294	50	09.2	5	12	11.2	2.4757	16	07.61
	14.0	301	56	44.4	5	16	03.0	2.4705	16	09.64
	14.5	309	05	06.6	5	15	03.7	2.4662	16	11.33
	15.0	316	14	55.1	5	09	11.1	2.4629	16	12.64
	15.5	323	25	46.0	4	58	28.0	2.4607	16	13.52
	16.0	330	37	12.1	-4	43	03.2	2.4597	16	13.89
	16.5	337	48	43.2	4	23	11.0	2.4602	16	13.72
	17.0	344	59	46.7	3	59	11.2	2.4621	16	12.96
	17.5	352	09	48.4	3	31	29.0	2.4656	16	11.56
	18.0	359	18	13.2	3	00	34.1	2.4709	16	09.51
	18.5	6	24	26.0	2	27	00.0	2.4778	16	06.81
	19.0	13	27	53.0	-1	51	22.7	2.4864	16	03.47
	19.5	20	28	02.8	1	14	20.1	2.4966	15	59.53
	20.0	27	24	26.6	-0	36	30.3	2.5083	15	55.04
	20.5	34	16	40.3	+0	01	29.3	2.5214	15	50.08
	21.0	41	04	23.9	0	39	03.2	2.5356	15	44.74
	21.5	47	47	22.9	1	15	38.3	2.5508	15	39.13
	22.0	54	25	28.2	+1	50	45.0	2.5666	15	33.34
	22.5	60	58	36.3	2	23	57.1	2.5828	15	27.50
	23.0	67	26	49.3	2	54	52.5	2.5990	15	21.71
	23.5	73	50	14.5	3	23	12.6	2.6149	15	16.09
	24.0	80	09	04.2	+3	48	42.5	2.6303	15	10.74

MOON, 2023

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	80	09	04.2	+3	48	42.5	2.6303	15	10.74
	24.5	86	23	35.3	4	11	10.6	2.6448	15	05.74
	25.0	92	34	08.7	4	30	28.2	2.6582	15	01.20
	25.5	98	41	08.8	4	46	28.9	2.6701	14	57.16
	26.0	104	45	03.2	4	59	08.6	2.6804	14	53.71
	26.5	110	46	21.8	5	08	24.6	2.6889	14	50.88
	27.0	116	45	36.5	+5	14	15.9	2.6955	14	48.72
	27.5	122	43	20.6	5	16	42.3	2.6999	14	47.26
	28.0	128	40	08.6	5	15	44.7	2.7022	14	46.50
	28.5	134	36	35.2	5	11	24.7	2.7024	14	46.46
	29.0	140	33	15.2	5	03	44.7	2.7003	14	47.12
	29.5	146	30	43.1	4	52	47.8	2.6962	14	48.48
	30.0	152	29	32.5	+4	38	38.0	2.6901	14	50.51
	30.5	158	30	15.7	4	21	20.7	2.6821	14	53.16
May	1.0	164	33	23.4	4	01	02.2	2.6724	14	56.41
	1.5	170	39	24.1	3	37	50.5	2.6611	15	00.19
	2.0	176	48	43.5	3	11	55.6	2.6487	15	04.43
	2.5	183	01	44.6	2	43	29.7	2.6351	15	09.07
	3.0	189	18	46.6	+2	12	47.4	2.6209	15	14.02
	3.5	195	40	05.2	1	40	06.1	2.6061	15	19.19
	4.0	202	05	51.4	1	05	46.3	2.5912	15	24.50
	4.5	208	36	12.2	+0	30	11.6	2.5763	15	29.84
	5.0	215	11	09.5	-0	06	11.8	2.5617	15	35.12
	5.5	221	50	40.3	0	42	54.4	2.5477	15	40.25
	6.0	228	34	37.2	-1	19	24.8	2.5346	15	45.15
	6.5	235	22	47.6	1	55	09.3	2.5223	15	49.72
	7.0	242	14	55.0	2	29	33.7	2.5113	15	53.91
	7.5	249	10	38.8	3	02	03.1	2.5014	15	57.67
	8.0	256	09	35.1	3	32	03.8	2.4929	16	00.95
	8.5	263	11	17.5	3	59	03.7	2.4857	16	03.73
	9.0	270	15	18.0	-4	22	33.4	2.4798	16	06.00
	9.5	277	21	07.6	4	42	07.2	2.4753	16	07.77
	10.0	284	28	17.0	4	57	23.6	2.4720	16	09.05
	10.5	291	36	17.9	5	08	06.2	2.4700	16	09.86
	11.0	298	44	43.0	5	14	03.5	2.4690	16	10.24
	11.5	305	53	07.2	5	15	09.8	2.4691	16	10.21
	12.0	313	01	07.0	-5	11	24.4	2.4701	16	09.81
	12.5	320	08	21.6	5	02	52.3	2.4720	16	09.05
	13.0	327	14	32.1	4	49	43.2	2.4748	16	07.97
	13.5	334	19	22.0	4	32	11.6	2.4784	16	06.58
	14.0	341	22	36.4	4	10	36.6	2.4827	16	04.88
	14.5	348	24	02.0	3	45	20.7	2.4879	16	02.89
	15.0	355	23	26.6	-3	16	50.0	2.4938	16	00.61
	15.5	2	20	38.8	2	45	33.4	2.5005	15	58.03
	16.0	9	15	27.8	2	12	02.0	2.5080	15	55.15
	16.5	16	07	42.9	1	36	48.4	2.5163	15	51.99
	17.0	22	57	13.9	-1	00	26.0	2.5255	15	48.53

MOON, 2023

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	22	57	13.9	-1	00	26.0	2.5255	15	48.53
	17.5	29	43	50.5	-0	23	28.7	2.5355	15	44.81
	18.0	36	27	22.9	+0	13	30.3	2.5462	15	40.83
	18.5	43	07	42.0	0	49	59.0	2.5576	15	36.63
	19.0	49	44	39.1	1	25	27.1	2.5697	15	32.24
	19.5	56	18	07.3	1	59	26.6	2.5822	15	27.71
	20.0	62	48	00.9	+2	31	32.3	2.5951	15	23.10
	20.5	69	14	16.6	3	01	21.8	2.6082	15	18.47
	21.0	75	36	53.2	3	28	36.3	2.6213	15	13.89
	21.5	81	55	52.5	3	53	00.0	2.6341	15	09.42
	22.0	88	11	19.5	4	14	20.4	2.6465	15	05.15
	22.5	94	23	22.0	4	32	27.8	2.6583	15	01.15
	23.0	100	32	11.7	+4	47	15.6	2.6692	14	57.48
	23.5	106	38	03.3	4	58	39.4	2.6789	14	54.22
	24.0	112	41	15.1	5	06	37.1	2.6873	14	51.42
	24.5	118	42	08.5	5	11	08.2	2.6942	14	49.15
	25.0	124	41	07.8	5	12	14.0	2.6993	14	47.45
	25.5	130	38	40.3	5	09	56.7	2.7026	14	46.36
	26.0	136	35	15.6	+5	04	19.9	2.7040	14	45.93
	26.5	142	31	25.6	4	55	27.8	2.7032	14	46.18
	27.0	148	27	43.9	4	43	25.4	2.7003	14	47.13
	27.5	154	24	45.6	4	28	18.5	2.6953	14	48.78
	28.0	160	23	06.5	4	10	13.7	2.6882	14	51.13
	28.5	166	23	23.3	3	49	18.5	2.6791	14	54.17
	29.0	172	26	12.2	+3	25	41.7	2.6680	14	57.87
	29.5	178	32	09.0	2	59	33.1	2.6552	15	02.20
	30.0	184	41	48.3	2	31	04.6	2.6408	15	07.11
	30.5	190	55	42.4	2	00	29.8	2.6251	15	12.53
	31.0	197	14	20.9	1	28	04.8	2.6084	15	18.38
	31.5	203	38	09.7	0	54	08.5	2.5909	15	24.58
June	1.0	210	07	30.2	+0	19	02.7	2.5731	15	31.00
	1.5	216	42	37.8	-0	16	47.6	2.5551	15	37.55
	2.0	223	23	41.8	0	52	54.3	2.5374	15	44.08
	2.5	230	10	43.9	1	28	46.2	2.5204	15	50.46
	3.0	237	03	37.8	2	03	49.3	2.5043	15	56.57
	3.5	244	02	08.5	2	37	27.9	2.4895	16	02.25
	4.0	251	05	52.5	-3	09	05.0	2.4763	16	07.39
	4.5	258	14	17.9	3	38	04.2	2.4648	16	11.88
	5.0	265	26	45.0	4	03	50.1	2.4554	16	15.63
	5.5	272	42	27.8	4	25	50.7	2.4480	16	18.56
	6.0	280	00	35.4	4	43	38.0	2.4428	16	20.63
	6.5	287	20	14.2	4	56	49.8	2.4398	16	21.84
	7.0	294	40	29.7	-5	05	10.0	2.4390	16	22.20
	7.5	302	00	28.9	5	08	29.7	2.4401	16	21.74
	8.0	309	19	22.4	5	06	47.0	2.4431	16	20.53
	8.5	316	36	25.8	5	00	06.8	2.4478	16	18.64
	9.0	323	51	00.9	-4	48	40.4	2.4540	16	16.16

MOON, 2023

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	323	51	00.9	-4	48	40.4	2.4540	16	16.16
	9.5	331	02	37.0	4	32	44.8	2.4615	16	13.19
	10.0	338	10	50.3	4	12	41.3	2.4701	16	09.81
	10.5	345	15	24.3	3	48	55.2	2.4796	16	06.11
	11.0	352	16	09.2	3	21	54.4	2.4897	16	02.16
	11.5	359	13	00.7	2	52	08.6	2.5004	15	58.04
	12.0	6	05	59.1	-2	20	08.8	2.5115	15	53.81
	12.5	12	55	08.5	1	46	26.5	2.5229	15	49.51
	13.0	19	40	35.3	1	11	33.2	2.5345	15	45.17
	13.5	26	22	27.6	0	36	00.0	2.5462	15	40.84
	14.0	33	00	53.9	-0	00	16.9	2.5579	15	36.52
	14.5	39	36	02.8	+0	35	06.8	2.5697	15	32.23
	15.0	46	08	02.4	+1	09	43.6	2.5814	15	27.99
	15.5	52	36	59.8	1	43	07.4	2.5931	15	23.81
	16.0	59	03	00.9	2	14	54.3	2.6047	15	19.69
	16.5	65	26	10.9	2	44	42.4	2.6162	15	15.66
	17.0	71	46	33.6	3	12	12.2	2.6275	15	11.73
	17.5	78	04	12.7	3	37	06.6	2.6385	15	07.92
	18.0	84	19	11.2	+3	59	11.3	2.6492	15	04.25
	18.5	90	31	32.7	4	18	14.3	2.6594	15	00.77
	19.0	96	41	21.4	4	34	06.5	2.6691	14	57.50
	19.5	102	48	42.5	4	46	41.3	2.6781	14	54.48
	20.0	108	53	43.0	4	55	54.5	2.6863	14	51.75
	20.5	114	56	32.0	5	01	43.9	2.6935	14	49.36
	21.0	120	57	21.0	+5	04	09.8	2.6996	14	47.35
	21.5	126	56	23.9	5	03	13.8	2.7044	14	45.78
	22.0	132	53	57.9	4	58	59.4	2.7078	14	44.68
	22.5	138	50	22.9	4	51	31.3	2.7096	14	44.10
	23.0	144	46	01.9	4	40	55.3	2.7096	14	44.07
	23.5	150	41	20.8	4	27	18.4	2.7079	14	44.64
	24.0	156	36	48.4	+4	10	48.2	2.7042	14	45.84
	24.5	162	32	56.0	3	51	33.3	2.6986	14	47.69
	25.0	168	30	17.4	3	29	42.9	2.6910	14	50.20
	25.5	174	29	28.3	3	05	27.4	2.6814	14	53.39
	26.0	180	31	05.9	2	38	57.9	2.6698	14	57.25
	26.5	186	35	48.6	2	10	26.8	2.6564	15	01.78
	27.0	192	44	14.9	+1	40	07.9	2.6413	15	06.94
	27.5	198	57	03.1	1	08	17.0	2.6247	15	12.70
	28.0	205	14	50.3	0	35	11.6	2.6067	15	18.99
	28.5	211	38	10.9	+0	01	11.8	2.5877	15	25.75
	29.0	218	07	36.1	-0	33	19.6	2.5679	15	32.87
	29.5	224	43	31.8	1	07	56.9	2.5478	15	40.25
	30.0	231	26	17.6	-1	42	11.6	2.5276	15	47.75
	30.5	238	16	05.3	2	15	32.2	2.5078	15	55.23
July	1.0	245	12	56.9	2	47	24.5	2.4888	16	02.52
	1.5	252	16	43.9	3	17	13.0	2.4710	16	09.45
	2.0	259	27	05.8	-3	44	20.9	2.4548	16	15.84

MOON, 2023

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	245	12	56.9	-2	47	24.5	2.4888	16	02.52
	1.5	252	16	43.9	3	17	13.0	2.4710	16	09.45
	2.0	259	27	05.8	3	44	20.9	2.4548	16	15.84
	2.5	266	43	30.1	4	08	12.2	2.4406	16	21.54
	3.0	274	05	11.9	4	28	12.9	2.4286	16	26.38
	3.5	281	31	15.7	4	43	52.8	2.4192	16	30.23
	4.0	289	00	36.2	-4	54	47.3	2.4124	16	33.00
	4.5	296	32	01.9	5	00	38.8	2.4085	16	34.61
	5.0	304	04	17.4	5	01	17.4	2.4075	16	35.04
	5.5	311	36	07.6	4	56	42.3	2.4092	16	34.32
	6.0	319	06	20.4	4	47	00.9	2.4136	16	32.49
	6.5	326	33	50.3	4	32	28.7	2.4205	16	29.67
	7.0	333	57	40.6	-4	13	28.0	2.4297	16	25.95
	7.5	341	17	05.1	3	50	26.7	2.4407	16	21.49
	8.0	348	31	29.1	3	23	56.4	2.4534	16	16.42
	8.5	355	40	28.8	2	54	31.6	2.4673	16	10.90
	9.0	2	43	51.4	2	22	47.4	2.4823	16	05.06
	9.5	9	41	33.4	1	49	19.1	2.4979	15	59.04
	10.0	16	33	39.3	-1	14	41.2	2.5138	15	52.95
	10.5	23	20	20.1	0	39	26.4	2.5299	15	46.89
	11.0	30	01	51.6	-0	04	05.8	2.5459	15	40.95
	11.5	36	38	32.8	+0	30	52.0	2.5616	15	35.18
	12.0	43	10	44.6	1	05	00.5	2.5768	15	29.64
	12.5	49	38	48.8	1	37	55.4	2.5915	15	24.37
	13.0	56	03	06.7	+2	09	14.6	2.6056	15	19.39
	13.5	62	23	58.9	2	38	38.3	2.6189	15	14.70
	14.0	68	41	44.4	3	05	48.7	2.6315	15	10.32
	14.5	74	56	40.4	3	30	30.3	2.6433	15	06.25
	15.0	81	09	02.1	3	52	29.4	2.6544	15	02.48
	15.5	87	19	02.7	4	11	34.5	2.6646	14	59.02
	16.0	93	26	53.9	+4	27	36.3	2.6740	14	55.86
	16.5	99	32	45.5	4	40	27.3	2.6825	14	53.00
	17.0	105	36	46.4	4	50	02.3	2.6902	14	50.45
	17.5	111	39	04.7	4	56	18.0	2.6970	14	48.20
	18.0	117	39	48.4	4	59	13.2	2.7029	14	46.28
	18.5	123	39	05.7	4	58	48.7	2.7078	14	44.69
	19.0	129	37	05.9	+4	55	06.8	2.7116	14	43.45
	19.5	135	33	59.3	4	48	11.8	2.7142	14	42.58
	20.0	141	29	58.1	4	38	09.5	2.7156	14	42.12
	20.5	147	25	16.7	4	25	06.9	2.7158	14	42.09
	21.0	153	20	11.8	4	09	12.5	2.7144	14	42.51
	21.5	159	15	03.0	3	50	35.8	2.7116	14	43.42
	22.0	165	10	12.6	+3	29	27.3	2.7072	14	44.86
	22.5	171	06	05.7	3	05	58.4	2.7012	14	46.84
	23.0	177	03	10.4	2	40	21.4	2.6934	14	49.39
	23.5	183	01	57.4	2	12	49.6	2.6839	14	52.54
	24.0	189	02	59.9	+1	43	37.1	2.6727	14	56.30

MOON, 2023

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	189	02	59.9	+1	43	37.1	2.6727	14	56.30
	24.5	195	06	53.3	1	12	59.2	2.6597	15	00.67
	25.0	201	14	14.5	0	41	12.4	2.6451	15	05.66
	25.5	207	25	41.7	+0	08	34.6	2.6289	15	11.24
	26.0	213	41	52.9	-0	24	34.7	2.6113	15	17.39
	26.5	220	03	25.8	0	57	53.8	2.5924	15	24.05
	27.0	226	30	55.9	-1	30	59.1	2.5726	15	31.18
	27.5	233	04	55.7	2	03	24.7	2.5521	15	38.67
	28.0	239	45	52.4	2	34	42.2	2.5311	15	46.42
	28.5	246	34	07.0	3	04	21.3	2.5102	15	54.30
	29.0	253	29	51.6	3	31	49.6	2.4897	16	02.17
	29.5	260	33	08.1	3	56	33.5	2.4700	16	09.84
	30.0	267	43	46.3	-4	17	59.3	2.4516	16	17.14
	30.5	275	01	22.7	4	35	34.3	2.4348	16	23.87
	31.0	282	25	19.7	4	48	48.4	2.4201	16	29.84
	31.5	289	54	45.8	4	57	16.0	2.4079	16	34.86
Aug.	1.0	297	28	36.6	5	00	37.4	2.3985	16	38.77
	1.5	305	05	37.2	4	58	41.0	2.3921	16	41.44
	2.0	312	44	25.1	-4	51	23.8	2.3889	16	42.79
	2.5	320	23	33.8	4	38	52.4	2.3889	16	42.78
	3.0	328	01	37.5	4	21	22.9	2.3921	16	41.42
	3.5	335	37	14.5	3	59	19.6	2.3985	16	38.77
	4.0	343	09	11.3	3	33	14.1	2.4077	16	34.94
	4.5	350	36	25.3	3	03	43.2	2.4195	16	30.07
	5.0	357	58	06.1	-2	31	27.0	2.4336	16	24.34
	5.5	5	13	37.0	1	57	07.0	2.4496	16	17.92
	6.0	12	22	34.3	1	21	24.1	2.4671	16	11.00
	6.5	19	24	46.6	0	44	57.7	2.4856	16	03.76
	7.0	26	20	13.3	-0	08	24.3	2.5048	15	56.37
	7.5	33	09	03.0	+0	27	42.8	2.5243	15	48.98
	8.0	39	51	31.9	+1	02	53.8	2.5438	15	41.72
	8.5	46	28	01.3	1	36	42.6	2.5629	15	34.69
	9.0	52	58	56.8	2	08	46.5	2.5814	15	27.99
	9.5	59	24	46.0	2	38	46.0	2.5991	15	21.68
	10.0	65	45	57.9	3	06	24.3	2.6158	15	15.80
	10.5	72	03	01.5	3	31	27.3	2.6313	15	10.39
	11.0	78	16	25.1	+3	53	43.2	2.6456	15	05.47
	11.5	84	26	35.7	4	13	02.2	2.6586	15	01.04
	12.0	90	33	58.4	4	29	16.3	2.6703	14	57.10
	12.5	96	38	56.2	4	42	19.2	2.6807	14	53.63
	13.0	102	41	50.0	4	52	06.5	2.6897	14	50.64
	13.5	108	42	58.6	4	58	35.1	2.6974	14	48.09
	14.0	114	42	38.6	+5	01	43.7	2.7039	14	45.97
	14.5	120	41	04.8	5	01	32.5	2.7091	14	44.26
	15.0	126	38	30.4	4	58	03.4	2.7131	14	42.95
	15.5	132	35	07.7	4	51	19.8	2.7159	14	42.03
	16.0	138	31	07.8	+4	41	26.6	2.7176	14	41.48

MOON, 2023

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	138	31	07.8	+4	41	26.6	2.7176	14	41.48
	16.5	144	26	42.1	4	28	30.5	2.7182	14	41.30
	17.0	150	22	01.6	4	12	39.6	2.7176	14	41.48
	17.5	156	17	18.5	3	54	03.4	2.7159	14	42.04
	18.0	162	12	45.6	3	32	52.8	2.7130	14	42.98
	18.5	168	08	37.6	3	09	20.1	2.7089	14	44.30
	19.0	174	05	10.7	+2	43	38.6	2.7037	14	46.03
	19.5	180	02	43.5	2	16	02.8	2.6971	14	48.19
	20.0	186	01	36.5	1	46	48.3	2.6892	14	50.78
	20.5	192	02	13.1	1	16	11.5	2.6801	14	53.84
	21.0	198	04	58.7	0	44	30.0	2.6695	14	57.37
	21.5	204	10	21.2	+0	12	02.1	2.6576	15	01.39
	22.0	210	18	50.4	-0	20	52.5	2.6443	15	05.91
	22.5	216	30	57.8	0	53	53.3	2.6298	15	10.93
	23.0	222	47	16.1	1	26	38.5	2.6139	15	16.45
	23.5	229	08	18.3	1	58	45.0	2.5970	15	22.44
	24.0	235	34	36.9	2	29	48.2	2.5790	15	28.86
	24.5	242	06	42.8	2	59	22.3	2.5602	15	35.68
	25.0	248	45	03.9	-3	27	00.1	2.5408	15	42.81
	25.5	255	30	03.6	3	52	13.2	2.5212	15	50.16
	26.0	262	21	59.1	4	14	32.4	2.5015	15	57.63
	26.5	269	20	59.7	4	33	28.5	2.4822	16	05.08
	27.0	276	27	04.9	4	48	32.8	2.4637	16	12.34
	27.5	283	40	03.1	4	59	18.6	2.4463	16	19.25
	28.0	290	59	30.0	-5	05	22.4	2.4305	16	25.63
	28.5	298	24	48.3	5	06	25.4	2.4166	16	31.27
	29.0	305	55	07.7	5	02	14.9	2.4051	16	36.01
	29.5	313	29	26.0	4	52	46.2	2.3963	16	39.67
	30.0	321	06	31.0	4	38	03.2	2.3905	16	42.11
	30.5	328	45	03.3	4	18	19.0	2.3878	16	43.24
	31.0	336	23	39.7	-3	53	56.0	2.3883	16	43.01
	31.5	344	00	57.4	3	25	25.0	2.3922	16	41.40
Sept.	1.0	351	35	37.3	2	53	23.6	2.3992	16	38.46
	1.5	359	06	27.2	2	18	34.4	2.4092	16	34.31
	2.0	6	32	25.3	1	41	42.8	2.4220	16	29.07
	2.5	13	52	40.9	1	03	34.8	2.4372	16	22.91
	3.0	21	06	36.2	-0	24	55.1	2.4544	16	16.02
	3.5	28	13	45.9	+0	13	34.3	2.4732	16	08.60
	4.0	35	13	56.6	0	51	15.6	2.4932	16	00.84
	4.5	42	07	05.8	1	27	35.5	2.5138	15	52.93
	5.0	48	53	20.4	2	02	05.5	2.5348	15	45.04
	5.5	55	32	55.2	2	34	21.9	2.5558	15	37.31
	6.0	62	06	11.2	+3	04	05.2	2.5762	15	29.87
	6.5	68	33	34.0	3	31	00.0	2.5959	15	22.82
	7.0	74	55	32.8	3	54	54.5	2.6145	15	16.24
	7.5	81	12	38.5	4	15	39.5	2.6319	15	10.20
	8.0	87	25	23.2	+4	33	08.3	2.6478	15	04.73

MOON, 2023

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	87	25	23.2	+4	33	08.3	2.6478	15	04.73
	8.5	93	34	19.3	4	47	16.6	2.6621	14	59.87
	9.0	99	39	58.6	4	58	01.2	2.6747	14	55.62
	9.5	105	42	51.6	5	05	20.9	2.6856	14	51.98
	10.0	111	43	27.7	5	09	15.6	2.6948	14	48.94
	10.5	117	42	14.2	5	09	46.3	2.7022	14	46.50
	11.0	123	39	36.6	+5	06	55.2	2.7080	14	44.61
	11.5	129	35	58.3	5	00	45.9	2.7121	14	43.27
	12.0	135	31	40.8	4	51	22.9	2.7147	14	42.43
	12.5	141	27	03.4	4	38	52.3	2.7158	14	42.06
	13.0	147	22	23.9	4	23	21.2	2.7156	14	42.14
	13.5	153	17	58.2	4	04	58.4	2.7141	14	42.64
	14.0	159	14	01.1	+3	43	54.1	2.7113	14	43.52
	14.5	165	10	46.3	3	20	19.9	2.7075	14	44.76
	15.0	171	08	27.1	2	54	29.0	2.7027	14	46.35
	15.5	177	07	16.1	2	26	36.1	2.6969	14	48.25
	16.0	183	07	26.3	1	56	57.3	2.6902	14	50.47
	16.5	189	09	10.9	1	25	50.1	2.6826	14	52.99
	17.0	195	12	43.9	+0	53	33.3	2.6741	14	55.82
	17.5	201	18	20.3	+0	20	26.8	2.6648	14	58.94
	18.0	207	26	16.3	-0	13	08.4	2.6547	15	02.36
	18.5	213	36	49.2	0	46	50.4	2.6438	15	06.10
	19.0	219	50	17.8	1	20	16.3	2.6320	15	10.15
	19.5	226	07	02.0	1	53	02.8	2.6195	15	14.51
	20.0	232	27	22.9	-2	24	45.6	2.6061	15	19.20
	20.5	238	51	41.9	2	55	00.1	2.5920	15	24.20
	21.0	245	20	20.7	3	23	21.3	2.5772	15	29.50
	21.5	251	53	40.2	3	49	23.9	2.5618	15	35.08
	22.0	258	32	00.0	4	12	42.5	2.5460	15	40.90
	22.5	265	15	37.3	4	32	52.0	2.5298	15	46.91
	23.0	272	04	45.6	-4	49	28.1	2.5135	15	53.05
	23.5	278	59	33.4	5	02	07.5	2.4973	15	59.23
	24.0	286	00	03.3	5	10	29.0	2.4815	16	05.35
	24.5	293	06	10.6	5	14	14.2	2.4663	16	11.29
	25.0	300	17	42.0	5	13	08.4	2.4522	16	16.91
	25.5	307	34	15.2	5	07	01.8	2.4393	16	22.06
	26.0	314	55	18.2	-4	55	50.6	2.4281	16	26.59
	26.5	322	20	09.4	4	39	37.9	2.4189	16	30.35
	27.0	329	47	58.7	4	18	34.5	2.4119	16	33.20
	27.5	337	17	48.3	3	52	59.2	2.4075	16	35.02
	28.0	344	48	34.9	3	23	18.4	2.4059	16	35.70
	28.5	352	19	11.8	2	50	06.1	2.4071	16	35.20
	29.0	359	48	31.8	-2	14	01.9	2.4112	16	33.50
	29.5	7	15	29.5	1	35	49.9	2.4182	16	30.62
	30.0	14	39	03.9	0	56	16.5	2.4280	16	26.63
	30.5	21	58	20.5	-0	16	08.4	2.4403	16	21.65
Oct.	1.0	29	12	33.3	+0	23	49.1	2.4549	16	15.80

MOON, 2023

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	29	12	33.3	+0	23	49.1	2.4549	16	15.80
	1.5	36	21	05.4	1	02	53.8	2.4715	16	09.26
	2.0	43	23	29.6	1	40	28.0	2.4897	16	02.19
	2.5	50	19	28.9	2	15	59.0	2.5090	15	54.78
	3.0	57	08	55.6	2	48	59.4	2.5291	15	47.20
	3.5	63	51	50.7	3	19	07.5	2.5495	15	39.61
	4.0	70	28	23.1	+3	46	06.3	2.5698	15	32.17
	4.5	76	58	48.3	4	09	43.7	2.5897	15	25.01
	5.0	83	23	27.4	4	29	51.3	2.6088	15	18.24
	5.5	89	42	45.8	4	46	24.0	2.6268	15	11.95
	6.0	95	57	12.6	4	59	19.7	2.6434	15	06.22
	6.5	102	07	19.1	5	08	37.9	2.6585	15	01.10
	7.0	108	13	38.3	+5	14	20.3	2.6717	14	56.63
	7.5	114	16	44.0	5	16	29.6	2.6831	14	52.83
	8.0	120	17	10.4	5	15	09.7	2.6924	14	49.72
	8.5	126	15	30.9	5	10	25.2	2.6998	14	47.30
	9.0	132	12	18.6	5	02	21.8	2.7052	14	45.54
	9.5	138	08	05.2	4	51	05.7	2.7085	14	44.43
	10.0	144	03	20.8	+4	36	44.2	2.7100	14	43.95
	10.5	149	58	33.8	4	19	25.3	2.7097	14	44.06
	11.0	155	54	11.0	3	59	18.2	2.7077	14	44.72
	11.5	161	50	36.6	3	36	33.3	2.7041	14	45.89
	12.0	167	48	13.2	3	11	22.4	2.6991	14	47.51
	12.5	173	47	20.8	2	43	58.7	2.6929	14	49.56
	13.0	179	48	17.4	+2	14	37.0	2.6857	14	51.97
	13.5	185	51	19.2	1	43	33.9	2.6775	14	54.70
	14.0	191	56	39.9	1	11	07.6	2.6685	14	57.71
	14.5	198	04	31.9	0	37	38.3	2.6589	15	00.94
	15.0	204	15	05.5	+0	03	27.4	2.6488	15	04.38
	15.5	210	28	29.9	-0	31	01.9	2.6383	15	07.97
	16.0	216	44	53.0	-1	05	25.2	2.6276	15	11.69
	16.5	223	04	21.5	1	39	17.3	2.6166	15	15.53
	17.0	229	27	01.7	2	12	12.0	2.6054	15	19.45
	17.5	235	52	59.0	2	43	43.0	2.5941	15	23.45
	18.0	242	22	18.3	3	13	23.8	2.5827	15	27.52
	18.5	248	55	04.5	3	40	48.4	2.5713	15	31.64
	19.0	255	31	21.6	-4	05	31.5	2.5598	15	35.82
	19.5	262	11	13.5	4	27	09.1	2.5483	15	40.05
	20.0	268	54	43.3	4	45	18.6	2.5368	15	44.30
	20.5	275	41	53.1	4	59	39.5	2.5254	15	48.58
	21.0	282	32	43.7	5	09	53.5	2.5141	15	52.84
	21.5	289	27	14.0	5	15	45.4	2.5030	15	57.06
	22.0	296	25	20.9	-5	17	03.1	2.4922	16	01.20
	22.5	303	26	57.9	5	13	38.5	2.4819	16	05.18
	23.0	310	31	55.3	5	05	27.6	2.4723	16	08.96
	23.5	317	39	59.5	4	52	31.6	2.4634	16	12.43
	24.0	324	50	52.1	-4	34	56.9	2.4556	16	15.52

MOON, 2023

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude °	'	"	Apparent Latitude °	'	"	True Geocentric Distance (A. U.) (X 10^{-3})	Semi Diameter '	"
Oct.	24.0	324	50	52.1	-4	34	56.9	2.4556	16	15.52
	24.5	332	04	10.3	4	12	55.3	2.4491	16	18.13
	25.0	339	19	26.3	3	46	45.1	2.4440	16	20.17
	25.5	346	36	07.6	3	16	49.9	2.4406	16	21.53
	26.0	353	53	37.7	2	43	39.4	2.4391	16	22.14
	26.5	1	11	16.1	2	07	48.1	2.4396	16	21.93
	27.0	8	28	20.2	-1	29	54.6	2.4423	16	20.86
	27.5	15	44	05.6	0	50	40.4	2.4472	16	18.90
	28.0	22	57	47.8	-0	10	48.7	2.4543	16	16.06
	28.5	30	08	43.6	+0	28	57.6	2.4636	16	12.38
	29.0	37	16	12.6	1	07	56.7	2.4749	16	07.93
	29.5	44	19	38.1	1	45	29.9	2.4881	16	02.80
	30.0	51	18	28.5	+2	21	02.3	2.5029	15	57.11
	30.5	58	12	18.4	2	54	03.8	2.5190	15	50.97
	31.0	65	00	48.7	3	24	09.4	2.5362	15	44.54
	31.5	71	43	47.4	3	50	59.2	2.5540	15	37.94
Nov.	1.0	78	21	09.2	4	14	18.8	2.5722	15	31.32
	1.5	84	52	56.0	4	33	58.2	2.5903	15	24.82
	2.0	91	19	15.8	+4	49	51.8	2.6079	15	18.55
	2.5	97	40	22.6	5	01	57.3	2.6249	15	12.62
	3.0	103	56	35.7	5	10	15.5	2.6408	15	07.13
	3.5	110	08	18.9	5	14	49.6	2.6553	15	02.16
	4.0	116	15	59.7	5	15	44.5	2.6683	14	57.78
	4.5	122	20	09.0	5	13	06.3	2.6794	14	54.04
	5.0	128	21	19.7	+5	07	02.2	2.6887	14	50.98
	5.5	134	20	06.7	4	57	40.1	2.6958	14	48.61
	6.0	140	17	06.2	4	45	08.6	2.7008	14	46.96
	6.5	146	12	54.5	4	29	36.6	2.7037	14	46.03
	7.0	152	08	08.3	4	11	13.6	2.7043	14	45.81
	7.5	158	03	23.7	3	50	09.7	2.7029	14	46.27
	8.0	163	59	16.1	+3	26	35.7	2.6995	14	47.40
	8.5	169	56	19.3	3	00	43.5	2.6942	14	49.15
	9.0	175	55	05.3	2	32	45.9	2.6871	14	51.48
	9.5	181	56	04.1	2	02	57.2	2.6786	14	54.33
	10.0	187	59	43.0	1	31	33.2	2.6687	14	57.65
	10.5	194	06	26.2	0	58	51.5	2.6576	15	01.37
	11.0	200	16	34.8	+0	25	11.6	2.6458	15	05.42
	11.5	206	30	25.9	-0	09	05.0	2.6332	15	09.73
	12.0	212	48	12.9	0	43	34.8	2.6203	15	14.21
	12.5	219	10	05.0	1	17	52.5	2.6073	15	18.79
	13.0	225	36	06.9	1	51	31.4	2.5942	15	23.41
	13.5	232	06	19.2	2	24	03.3	2.5814	15	27.98
	14.0	238	40	38.2	-2	54	59.5	2.5691	15	32.45
	14.5	245	18	56.4	3	23	50.9	2.5573	15	36.76
	15.0	252	01	02.4	3	50	09.4	2.5461	15	40.86
	15.5	258	46	42.0	4	13	27.8	2.5357	15	44.72
	16.0	265	35	38.5	-4	33	21.0	2.5261	15	48.31

MOON, 2023

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	265	35	38.5	-4	33	21.0	2.5261	15	48.31
	16.5	272	27	33.2	4	49	26.9	2.5173	15	51.61
	17.0	279	22	06.6	5	01	26.5	2.5094	15	54.62
	17.5	286	18	58.5	5	09	04.8	2.5023	15	57.34
	18.0	293	17	49.3	5	12	10.9	2.4959	15	59.77
	18.5	300	18	19.8	5	10	38.8	2.4904	16	01.92
	19.0	307	20	12.4	-5	04	26.9	2.4855	16	03.79
	19.5	314	23	10.5	4	53	38.8	2.4814	16	05.39
	20.0	321	26	59.0	4	38	22.5	2.4780	16	06.71
	20.5	328	31	24.1	4	18	50.8	2.4754	16	07.75
	21.0	335	36	13.0	3	55	21.0	2.4734	16	08.50
	21.5	342	41	13.3	3	28	14.5	2.4723	16	08.93
	22.0	349	46	12.7	-2	57	56.6	2.4721	16	09.02
	22.5	356	50	58.4	2	24	56.3	2.4728	16	08.74
	23.0	3	55	16.4	1	49	45.3	2.4746	16	08.05
	23.5	10	58	51.6	1	12	57.9	2.4775	16	06.92
	24.0	18	01	26.8	-0	35	10.2	2.4816	16	05.32
	24.5	25	02	43.3	+0	03	00.9	2.4870	16	03.23
	25.0	32	02	20.5	+0	40	58.1	2.4937	16	00.64
	25.5	38	59	56.3	1	18	05.3	2.5017	15	57.55
	26.0	45	55	07.7	1	53	47.8	2.5111	15	53.98
	26.5	52	47	31.4	2	27	33.6	2.5217	15	49.96
	27.0	59	36	44.5	2	58	54.0	2.5335	15	45.53
	27.5	66	22	25.6	3	27	24.2	2.5464	15	40.76
	28.0	73	04	15.7	+3	52	43.8	2.5601	15	35.73
	28.5	79	41	58.8	4	14	36.7	2.5744	15	30.51
	29.0	86	15	22.8	4	32	51.5	2.5892	15	25.21
	29.5	92	44	20.2	4	47	20.9	2.6041	15	19.92
	30.0	99	08	48.5	4	58	01.5	2.6188	15	14.73
	30.5	105	28	50.1	5	04	53.7	2.6332	15	09.74
Dec.	1.0	111	44	32.9	+5	08	00.3	2.6469	15	05.04
	1.5	117	56	09.8	5	07	27.0	2.6596	15	00.72
	2.0	124	03	58.6	5	03	21.1	2.6710	14	56.85
	2.5	130	08	21.5	4	55	51.4	2.6810	14	53.51
	3.0	136	09	44.9	4	45	07.8	2.6893	14	50.75
	3.5	142	08	38.8	4	31	20.8	2.6958	14	48.62
	4.0	148	05	36.2	+4	14	41.5	2.7002	14	47.16
	4.5	154	01	12.5	3	55	21.3	2.7025	14	46.40
	5.0	159	56	05.3	3	33	32.0	2.7027	14	46.35
	5.5	165	50	53.5	3	09	25.6	2.7006	14	47.04
	6.0	171	46	17.0	2	43	14.8	2.6963	14	48.44
	6.5	177	42	55.7	2	15	12.7	2.6899	14	50.55
	7.0	183	41	29.6	+1	45	33.4	2.6815	14	53.35
	7.5	189	42	37.4	1	14	31.9	2.6712	14	56.79
	8.0	195	46	56.4	0	42	24.9	2.6592	15	00.83
	8.5	201	55	01.4	+0	09	30.2	2.6458	15	05.40
	9.0	208	07	24.1	-0	23	52.2	2.6312	15	10.44

MOON, 2023

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	208	07	24.1	-0	23	52.2	2.6312	15	10.44
	9.5	214	24	32.3	0	57	20.3	2.6156	15	15.86
	10.0	220	46	48.5	1	30	30.3	2.5994	15	21.56
	10.5	227	14	30.0	2	02	56.2	2.5830	15	27.44
	11.0	233	47	47.2	2	34	10.0	2.5665	15	33.38
	11.5	240	26	43.1	3	03	42.6	2.5504	15	39.26
	12.0	247	11	13.3	-3	31	03.9	2.5350	15	44.98
	12.5	254	01	05.0	3	55	43.7	2.5205	15	50.41
	13.0	260	55	57.6	4	17	12.8	2.5072	15	55.45
	13.5	267	55	22.9	4	35	04.0	2.4953	16	00.00
	14.0	274	58	46.1	4	48	53.3	2.4850	16	03.98
	14.5	282	05	27.3	4	58	20.6	2.4764	16	07.33
	15.0	289	14	42.6	-5	03	11.2	2.4696	16	10.01
	15.5	296	25	46.5	5	03	16.2	2.4645	16	12.00
	16.0	303	37	53.6	4	58	32.8	2.4612	16	13.32
	16.5	310	50	20.4	4	49	04.6	2.4595	16	13.98
	17.0	318	02	27.0	4	35	01.4	2.4594	16	14.03
	17.5	325	13	38.3	4	16	38.6	2.4607	16	13.51
	18.0	332	23	25.0	-3	54	16.5	2.4633	16	12.49
	18.5	339	31	23.7	3	28	19.8	2.4670	16	11.03
	19.0	346	37	17.2	2	59	16.4	2.4717	16	09.20
	19.5	353	40	53.6	2	27	36.7	2.4772	16	07.04
	20.0	0	42	06.1	1	53	52.8	2.4834	16	04.61
	20.5	7	40	51.5	1	18	38.0	2.4903	16	01.96
	21.0	14	37	09.5	-0	42	25.9	2.4976	15	59.12
	21.5	21	31	01.4	-0	05	50.0	2.5055	15	56.10
	22.0	28	22	29.2	+0	30	36.8	2.5138	15	52.94
	22.5	35	11	34.6	1	06	22.8	2.5226	15	49.64
	23.0	41	58	18.5	1	40	57.6	2.5317	15	46.20
	23.5	48	42	40.1	2	13	52.7	2.5413	15	42.64
	24.0	55	24	36.7	+2	44	41.9	2.5513	15	38.95
	24.5	62	04	04.1	3	13	01.6	2.5617	15	35.14
	25.0	68	40	55.9	3	38	31.1	2.5724	15	31.23
	25.5	75	15	04.6	4	00	53.1	2.5835	15	27.23
	26.0	81	46	21.9	4	19	53.5	2.5949	15	23.15
	26.5	88	14	39.3	4	35	21.8	2.6065	15	19.04
	27.0	94	39	48.9	+4	47	11.0	2.6183	15	14.93
	27.5	101	01	44.1	4	55	17.8	2.6299	15	10.87
	28.0	107	20	20.2	4	59	41.6	2.6415	15	06.90
	28.5	113	35	35.6	5	00	25.3	2.6526	15	03.08
	29.0	119	47	31.7	4	57	34.1	2.6633	14	59.47
	29.5	125	56	13.7	4	51	15.6	2.6732	14	56.13
	30.0	132	01	50.8	+4	41	39.2	2.6822	14	53.12
	30.5	138	04	36.2	4	28	55.6	2.6901	14	50.51
	31.0	144	04	47.5	4	13	16.8	2.6966	14	48.34
	31.5	150	02	46.2	3	54	55.6	2.7017	14	46.68
	32.0	155	58	57.8	+3	34	05.3	2.7050	14	45.58

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	0.0	1	19	29.63	+6	24	27.74	56	59.77
	0.5	1	43	00.16	9	17	36.84	56	37.90
	1.0	2	06	36.65	12	02	57.59	56	17.40
	1.5	2	30	25.92	14	39	01.16	55	58.34
	2.0	2	54	33.77	17	04	20.88	55	40.79
	2.5	3	19	04.68	19	17	31.53	55	24.74
	3.0	3	44	01.68	+21	17	09.56	55	10.18
	3.5	4	09	26.08	23	01	54.33	54	57.07
	4.0	4	35	17.25	24	30	30.19	54	45.35
	4.5	5	01	32.59	25	41	49.41	54	34.98
	5.0	5	28	07.49	26	34	55.54	54	25.91
	5.5	5	54	55.63	27	09	06.78	54	18.09
	6.0	6	21	49.34	+27	23	58.99	54	11.49
	6.5	6	48	40.25	27	19	27.56	54	06.09
	7.0	7	15	19.91	26	55	48.01	54	01.90
	7.5	7	41	40.56	26	13	35.06	53	58.94
	8.0	8	07	35.65	25	13	40.32	53	57.25
	8.5	8	33	00.30	23	57	08.99	53	56.87
	9.0	8	57	51.48	+22	25	16.09	53	57.89
	9.5	9	22	08.11	20	39	22.69	54	00.38
	10.0	9	45	50.88	18	40	52.57	54	04.45
	10.5	10	09	02.08	16	31	09.61	54	10.19
	11.0	10	31	45.37	14	11	35.95	54	17.71
	11.5	10	54	05.53	11	43	31.05	54	27.11
	12.0	11	16	08.27	+9	08	11.50	54	38.49
	12.5	11	38	00.05	6	26	51.53	54	51.91
	13.0	11	59	47.99	3	40	44.18	55	07.44
	13.5	12	21	39.76	+0	51	02.95	55	25.09
	14.0	12	43	43.55	-2	00	55.93	55	44.86
	14.5	13	06	08.03	4	53	50.97	56	06.67
	15.0	13	29	02.28	-7	46	12.32	56	30.42
	15.5	13	52	35.68	10	36	18.53	56	55.92
	16.0	14	16	57.78	13	22	13.12	57	22.91
	16.5	14	42	17.89	16	01	41.40	57	51.05
	17.0	15	08	44.64	18	32	08.08	58	19.91
	17.5	15	36	25.20	20	50	36.45	58	48.97
	18.0	16	05	24.25	-22	53	50.18	59	17.64
	18.5	16	35	42.81	24	38	19.01	59	45.23
	19.0	17	07	16.96	26	00	29.43	60	11.03
	19.5	17	39	56.97	26	57	00.42	60	34.29
	20.0	18	13	27.09	27	25	03.22	60	54.27
	20.5	18	47	26.49	27	22	41.71	61	10.28
	21.0	19	21	31.38	-26	49	09.11	61	21.77
	21.5	19	55	17.82	25	44	56.38	61	28.29
	22.0	20	28	24.66	24	11	49.93	61	29.60
	22.5	21	00	35.71	22	12	39.67	61	25.64
	23.0	21	31	40.79	-19	51	00.56	61	16.57

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	23.0	21	31	40.79	-19	51	00.56	61	16.57
	23.5	22	01	35.60	17	10	52.43	61	02.74
	24.0	22	30	20.91	14	16	21.73	60	44.65
	24.5	22	58	01.28	11	11	27.48	60	22.95
	25.0	23	24	43.89	7	59	51.92	59	58.33
	25.5	23	50	37.43	4	44	55.62	59	31.56
	26.0	0	15	51.34	-1	29	35.90	59	03.36
	26.5	0	40	35.23	+1	43	32.22	58	34.44
	27.0	1	04	58.50	4	52	13.75	58	05.43
	27.5	1	29	10.06	7	54	30.55	57	36.90
	28.0	1	53	18.19	10	48	38.04	57	09.32
	28.5	2	17	30.33	13	33	02.04	56	43.06
	29.0	2	41	52.96	+16	06	16.11	56	18.43
	29.5	3	06	31.40	18	26	59.54	55	55.64
	30.0	3	31	29.63	20	33	56.13	55	34.84
	30.5	3	56	50.12	22	25	53.92	55	16.13
	31.0	4	22	33.60	24	01	45.82	54	59.53
	31.5	4	48	38.94	25	20	31.10	54	45.05
Feb.	1.0	5	15	03.19	+26	21	17.62	54	32.64
	1.5	5	41	41.60	27	03	24.42	54	22.23
	2.0	6	08	27.98	27	26	24.34	54	13.75
	2.5	6	35	15.11	27	30	06.21	54	07.09
	3.0	7	01	55.33	27	14	36.20	54	02.17
	3.5	7	28	21.17	26	40	18.05	53	58.86
	4.0	7	54	25.90	+25	47	52.10	53	57.08
	4.5	8	20	04.07	24	38	13.36	53	56.74
	5.0	8	45	11.76	23	12	28.78	53	57.76
	5.5	9	09	46.80	21	31	54.22	54	00.07
	6.0	9	33	48.71	19	37	51.44	54	03.64
	6.5	9	57	18.59	17	31	45.47	54	08.44
	7.0	10	20	18.95	+15	15	02.49	54	14.45
	7.5	10	42	53.49	12	49	08.27	54	21.68
	8.0	11	05	06.88	10	15	27.34	54	30.17
	8.5	11	27	04.62	7	35	22.71	54	39.94
	9.0	11	48	52.87	4	50	16.08	54	51.05
	9.5	12	10	38.33	+2	01	28.61	55	03.54
	10.0	12	32	28.22	-0	49	37.91	55	17.46
	10.5	12	54	30.18	3	41	39.49	55	32.87
	11.0	13	16	52.23	6	33	08.07	55	49.77
	11.5	13	39	42.70	9	22	29.23	56	08.19
	12.0	14	03	10.14	12	07	59.82	56	28.09
	12.5	14	27	23.07	14	47	45.46	56	49.40
	13.0	14	52	29.76	-17	19	38.28	57	12.00
	13.5	15	18	37.66	19	41	15.31	57	35.71
	14.0	15	45	52.87	21	49	58.05	58	00.29
	14.5	16	14	19.18	23	42	54.19	58	25.40
	15.0	16	43	57.18	-25	17	02.18	58	50.67

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Feb.	15.0	16	43	57.18	-25	17	02.18	58	50.67
	15.5	17	14	43.30	26	29	19.42	59	15.59
	16.0	17	46	29.12	27	16	54.35	59	39.64
	16.5	18	19	01.30	27	37	21.41	60	02.20
	17.0	18	52	02.35	27	28	56.89	60	22.65
	17.5	19	25	12.21	26	50	52.57	60	40.32
	18.0	19	58	10.53	-25	43	23.91	60	54.60
	18.5	20	30	38.94	24	07	50.90	61	04.94
	19.0	21	02	22.92	22	06	31.51	61	10.89
	19.5	21	33	12.80	19	42	29.56	61	12.13
	20.0	22	03	03.91	16	59	19.97	61	08.54
	20.5	22	31	55.98	14	00	53.92	61	00.14
	21.0	22	59	52.33	-10	51	06.06	60	47.17
	21.5	23	26	58.78	7	33	44.60	60	30.01
	22.0	23	53	22.76	4	12	24.38	60	09.18
	22.5	0	19	12.62	-0	50	22.85	59	45.31
	23.0	0	44	36.97	+2	29	21.75	59	19.10
	23.5	1	09	44.32	5	44	10.48	58	51.25
	24.0	1	34	42.76	+8	51	42.59	58	22.47
	24.5	1	59	39.73	11	49	53.72	57	53.42
	25.0	2	24	41.79	14	36	53.82	57	24.71
	25.5	2	49	54.44	17	11	05.12	56	56.85
	26.0	3	15	21.91	19	31	00.49	56	30.30
	26.5	3	41	07.00	21	35	22.35	56	05.43
	27.0	4	07	10.88	+23	23	02.27	55	42.52
	27.5	4	33	32.99	24	53	01.27	55	21.78
	28.0	5	00	11.02	26	04	30.80	55	03.38
	28.5	5	27	01.00	26	56	54.12	54	47.38
Mar.	1.0	5	53	57.55	27	29	47.77	54	33.85
	1.5	6	20	54.27	27	43	02.93	54	22.76
	2.0	6	47	44.23	+27	36	46.18	54	14.08
	2.5	7	14	20.56	27	11	19.49	54	07.73
	3.0	7	40	36.97	26	27	19.43	54	03.62
	3.5	8	06	28.24	25	25	35.59	54	01.63
	4.0	8	31	50.47	24	07	08.46	54	01.62
	4.5	8	56	41.35	22	33	07.12	54	03.45
	5.0	9	21	00.11	+20	44	46.89	54	06.97
	5.5	9	44	47.48	18	43	27.32	54	12.04
	6.0	10	08	05.51	16	30	30.58	54	18.51
	6.5	10	30	57.42	14	07	20.28	54	26.23
	7.0	10	53	27.37	11	35	20.84	54	35.07
	7.5	11	15	40.31	8	55	57.22	54	44.93
	8.0	11	37	41.85	+6	10	35.09	54	55.69
	8.5	11	59	38.10	3	20	41.24	55	07.27
	9.0	12	21	35.63	+0	27	44.34	55	19.61
	9.5	12	43	41.39	-2	26	44.15	55	32.66
	10.0	13	06	02.60	-5	21	08.81	55	46.38

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Mar.	10.0	13	06	02.60	-5	21	08.81	55	46.38
	10.5	13	28	46.76	8	13	48.98	56	00.76
	11.0	13	52	01.46	11	02	57.36	56	15.77
	11.5	14	15	54.26	13	46	38.62	56	31.42
	12.0	14	40	32.45	16	22	48.16	56	47.69
	12.5	15	06	02.65	18	49	11.38	57	04.55
	13.0	15	32	30.36	-21	03	23.67	57	21.97
	13.5	15	59	59.33	23	02	51.79	57	39.87
	14.0	16	28	30.81	24	44	57.07	57	58.15
	14.5	16	58	02.87	26	07	00.88	58	16.65
	15.0	17	28	29.82	27	06	32.66	58	35.18
	15.5	17	59	42.03	27	41	19.95	58	53.49
	16.0	18	31	26.28	-27	49	39.49	59	11.27
	16.5	19	03	26.77	27	30	27.50	59	28.15
	17.0	19	35	26.64	26	43	27.25	59	43.75
	17.5	20	07	09.76	25	29	12.20	59	57.63
	18.0	20	38	22.32	23	49	04.36	60	09.34
	18.5	21	08	54.03	21	45	08.36	60	18.45
	19.0	21	38	38.59	-19	20	02.74	60	24.54
	19.5	22	07	33.65	16	36	50.28	60	27.29
	20.0	22	35	40.29	13	38	48.64	60	26.43
	20.5	23	03	02.31	10	29	22.32	60	21.83
	21.0	23	29	45.45	7	11	56.17	60	13.46
	21.5	23	55	56.74	3	49	50.50	60	01.44
	22.0	0	21	43.87	-0	26	17.52	59	46.00
	22.5	0	47	14.75	+2	55	41.07	59	27.51
	23.0	1	12	37.14	6	13	15.59	59	06.41
	23.5	1	37	58.33	9	23	49.22	58	43.23
	24.0	2	03	24.87	12	24	58.30	58	18.52
	24.5	2	29	02.37	15	14	32.38	57	52.88
	25.0	2	54	55.20	+17	50	34.16	57	26.88
	25.5	3	21	06.26	20	11	19.52	57	01.05
	26.0	3	47	36.82	22	15	17.84	56	35.90
	26.5	4	14	26.32	24	01	12.61	56	11.87
	27.0	4	41	32.37	25	28	02.36	55	49.36
	27.5	5	08	50.79	26	35	01.77	55	28.67
	28.0	5	36	15.91	+27	21	42.67	55	10.09
	28.5	6	03	40.97	27	47	54.67	54	53.80
	29.0	6	30	58.63	27	53	45.11	54	39.95
	29.5	6	58	01.63	27	39	38.19	54	28.64
	30.0	7	24	43.34	27	06	13.24	54	19.92
	30.5	7	50	58.27	26	14	22.37	54	13.79
	31.0	8	16	42.37	+25	05	07.68	54	10.22
	31.5	8	41	53.24	23	39	38.46	54	09.15
Apr.	1.0	9	06	30.14	21	59	08.67	54	10.46
	1.5	9	30	33.86	20	04	54.90	54	14.05
	2.0	9	54	06.57	+17	58	14.94	54	19.75

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	1.0	9	06	30.14	+21	59	08.67	54	10.46
	1.5	9	30	33.86	20	04	54.90	54	14.05
	2.0	9	54	06.57	17	58	14.94	54	19.75
	2.5	10	17	11.62	15	40	27.04	54	27.39
	3.0	10	39	53.29	13	12	49.66	54	36.78
	3.5	11	02	16.67	10	36	41.87	54	47.71
	4.0	11	24	27.44	+7	53	23.96	54	59.96
	4.5	11	46	31.79	5	04	18.50	55	13.32
	5.0	12	08	36.31	+2	10	51.49	55	27.54
	5.5	12	30	47.93	-0	45	26.33	55	42.42
	6.0	12	53	13.83	3	42	58.14	55	57.72
	6.5	13	16	01.38	6	39	59.72	56	13.27
	7.0	13	39	18.04	-9	34	38.26	56	28.87
	7.5	14	03	11.15	12	24	51.34	56	44.36
	8.0	14	27	47.74	15	08	26.37	56	59.61
	8.5	14	53	14.14	17	43	00.58	57	14.51
	9.0	15	19	35.53	20	06	01.95	57	28.98
	9.5	15	46	55.33	22	14	51.51	57	42.96
	10.0	16	15	14.55	-24	06	47.27	57	56.40
	10.5	16	44	31.12	25	39	10.15	58	09.27
	11.0	17	14	39.37	26	49	31.98	58	21.53
	11.5	17	45	29.93	27	35	44.80	58	33.17
	12.0	18	16	50.07	27	56	10.66	58	44.14
	12.5	18	48	24.68	27	49	50.05	58	54.39
	13.0	19	19	57.66	-27	16	27.48	59	03.81
	13.5	19	51	13.62	26	16	32.90	59	12.32
	14.0	20	21	59.37	24	51	18.92	59	19.77
	14.5	20	52	05.02	23	02	34.45	59	26.00
	15.0	21	21	24.46	20	52	36.51	59	30.82
	15.5	21	49	55.34	18	24	01.66	59	34.02
	16.0	22	17	38.62	-15	39	38.37	59	35.41
	16.5	22	44	37.94	12	42	21.03	59	34.78
	17.0	23	10	58.90	9	35	05.60	59	31.97
	17.5	23	36	48.43	6	20	46.81	59	26.84
	18.0	0	02	14.24	-3	02	16.47	59	19.33
	18.5	0	27	24.38	+0	17	37.58	59	09.40
	19.0	0	52	26.88	+3	36	12.12	58	57.14
	19.5	1	17	29.48	6	50	49.09	58	42.66
	20.0	1	42	39.30	9	58	56.18	58	26.19
	20.5	2	08	02.67	12	58	07.67	58	07.98
	21.0	2	33	44.77	15	46	05.44	57	48.38
	21.5	2	59	49.36	18	20	40.42	57	27.76
	22.0	3	26	18.55	+20	39	54.39	57	06.52
	22.5	3	53	12.46	22	42	02.19	56	45.07
	23.0	4	20	29.16	24	25	34.24	56	23.82
	23.5	4	48	04.56	25	49	19.11	56	03.18
	24.0	5	15	52.64	+26	52	25.89	55	43.52

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	24.0	5	15	52.64	+26	52	25.89	55	43.52
	24.5	5	43	45.86	27	34	25.89	55	25.19
	25.0	6	11	35.71	27	55	13.29	55	08.49
	25.5	6	39	13.44	27	55	04.43	54	53.69
	26.0	7	06	30.82	27	34	35.77	54	41.01
	26.5	7	33	20.80	26	54	40.65	54	30.64
	27.0	7	59	37.96	+25	56	25.29	54	22.71
	27.5	8	25	18.80	24	41	04.67	54	17.32
	28.0	8	50	21.77	23	09	58.66	54	14.54
	28.5	9	14	47.21	21	24	28.80	54	14.38
	29.0	9	38	37.08	19	25	56.05	54	16.82
	29.5	10	01	54.75	17	15	39.41	54	21.80
	30.0	10	24	44.67	+14	54	55.49	54	29.24
	30.5	10	47	12.22	12	24	58.79	54	39.01
May	1.0	11	09	23.43	9	47	02.70	54	50.92
	1.5	11	31	24.87	7	02	20.87	55	04.79
	2.0	11	53	23.57	4	12	08.96	55	20.37
	2.5	12	15	26.89	+1	17	46.75	55	37.40
	3.0	12	37	42.50	-1	39	19.80	55	55.57
	3.5	13	00	18.30	4	37	36.25	56	14.57
	4.0	13	23	22.32	7	35	17.60	56	34.05
	4.5	13	47	02.62	10	30	26.36	56	53.66
	5.0	14	11	27.02	13	20	51.10	57	13.06
	5.5	14	36	42.79	16	04	05.75	57	31.90
	6.0	15	02	56.15	-18	37	30.03	57	49.86
	6.5	15	30	11.66	20	58	11.61	58	06.66
	7.0	15	58	31.43	23	03	10.29	58	22.05
	7.5	16	27	54.28	24	49	24.89	58	35.83
	8.0	16	58	15.13	26	14	02.75	58	47.87
	8.5	17	29	24.53	27	14	31.28	58	58.08
	9.0	18	01	09.00	-27	48	50.39	59	06.42
	9.5	18	33	11.89	27	55	43.46	59	12.92
	10.0	19	05	15.02	27	34	44.75	59	17.62
	10.5	19	37	00.63	26	46	21.42	59	20.61
	11.0	20	08	13.22	25	31	49.75	59	22.00
	11.5	20	38	40.97	23	53	06.62	59	21.90
	12.0	21	08	16.40	-21	52	38.44	59	20.41
	12.5	21	36	56.36	19	33	09.71	59	17.64
	13.0	22	04	41.52	16	57	33.22	59	13.67
	13.5	22	31	35.62	14	08	42.63	59	08.54
	14.0	22	57	44.61	11	09	27.78	59	02.32
	14.5	23	23	15.96	8	02	32.24	58	55.01
	15.0	23	48	18.00	-4	50	32.66	58	46.62
	15.5	0	12	59.45	-1	35	59.21	58	37.15
	16.0	0	37	29.13	+1	38	43.43	58	26.60
	16.5	1	01	55.58	4	51	14.86	58	14.98
	17.0	1	26	26.92	+7	59	17.86	58	02.30

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
May	17.0	1	26	26.92	+7	59	17.86	58	02.30
	17.5	1	51	10.56	11	00	37.77	57	48.62
	18.0	2	16	12.98	13	53	02.33	57	34.01
	18.5	2	41	39.43	16	34	22.28	57	18.57
	19.0	3	07	33.64	19	02	32.76	57	02.46
	19.5	3	33	57.47	21	15	35.57	56	45.84
	20.0	4	00	50.64	+23	11	42.24	56	28.91
	20.5	4	28	10.54	24	49	17.78	56	11.91
	21.0	4	55	52.18	26	07	04.69	55	55.09
	21.5	5	23	48.43	27	04	06.76	55	38.71
	22.0	5	51	50.51	27	39	51.98	55	23.03
	22.5	6	19	48.64	27	54	14.04	55	08.33
	23.0	6	47	32.95	+27	47	31.90	54	54.86
	23.5	7	14	54.29	27	20	27.55	54	42.88
	24.0	7	41	44.99	26	34	02.08	54	32.60
	24.5	8	07	59.36	25	29	30.84	54	24.26
	25.0	8	33	33.90	24	08	18.24	54	18.02
	25.5	8	58	27.37	22	31	53.05	54	14.04
	26.0	9	22	40.51	+20	41	44.49	54	12.46
	26.5	9	46	15.88	18	39	19.41	54	13.37
	27.0	10	09	17.44	16	26	00.70	54	16.84
	27.5	10	31	50.29	14	03	06.66	54	22.90
	28.0	10	54	00.42	11	31	51.32	54	31.53
	28.5	11	15	54.47	8	53	25.51	54	42.69
	29.0	11	37	39.64	+6	08	58.48	54	56.29
	29.5	11	59	23.56	3	19	39.94	55	12.20
	30.0	12	21	14.21	+0	26	42.53	55	30.21
	30.5	12	43	19.93	-2	28	35.50	55	50.11
	31.0	13	05	49.34	5	24	47.40	56	11.60
	31.5	13	28	51.24	8	20	14.92	56	34.33
June	1.0	13	52	34.52	-11	13	05.48	56	57.93
	1.5	14	17	07.86	14	01	09.65	57	21.96
	2.0	14	42	39.40	16	41	59.43	57	45.94
	2.5	15	09	16.09	19	12	47.91	58	09.38
	3.0	15	37	02.98	21	30	31.05	58	31.79
	3.5	16	06	02.18	23	31	52.35	58	52.66
	4.0	16	36	11.91	-25	13	31.33	59	11.54
	4.5	17	07	25.58	26	32	15.65	59	28.03
	5.0	17	39	31.40	27	25	16.50	59	41.77
	5.5	18	12	12.79	27	50	24.99	59	52.53
	6.0	18	45	09.69	27	46	26.40	60	00.15
	6.5	19	18	00.72	27	13	09.09	60	04.58
	7.0	19	50	25.65	-26	11	25.57	60	05.89
	7.5	20	22	07.61	24	43	05.58	60	04.21
	8.0	20	52	54.55	22	50	43.34	59	59.76
	8.5	21	22	39.68	20	37	22.05	59	52.84
	9.0	21	51	21.16	-18	06	19.00	59	43.75

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
June	9.0	21	51	21.16	-18	06	19.00	59	43.75
	9.5	22	19	01.27	15	20	53.39	59	32.83
	10.0	22	45	45.36	12	24	17.86	59	20.41
	10.5	23	11	40.89	9	19	33.61	59	06.82
	11.0	23	36	56.55	6	09	28.47	58	52.33
	11.5	0	01	41.68	-2	56	37.02	58	37.21
	12.0	0	26	05.82	+0	16	37.91	58	21.67
	12.5	0	50	18.33	3	28	03.11	58	05.87
	13.0	1	14	28.20	6	35	32.59	57	49.96
	13.5	1	38	43.85	9	37	05.42	57	34.04
	14.0	2	03	12.86	12	30	43.99	57	18.18
	14.5	2	28	01.82	15	14	32.85	57	02.44
	15.0	2	53	16.00	+17	46	38.51	56	46.87
	15.5	3	18	59.09	20	05	10.14	56	31.51
	16.0	3	45	12.82	22	08	21.39	56	16.41
	16.5	4	11	56.73	23	54	33.28	56	01.60
	17.0	4	39	07.93	25	22	18.01	55	47.17
	17.5	5	06	41.16	26	30	23.23	55	33.18
	18.0	5	34	28.94	+27	17	56.34	55	19.73
	18.5	6	02	22.17	27	44	27.98	55	06.93
	19.0	6	30	10.78	27	49	54.03	54	54.91
	19.5	6	57	44.68	27	34	35.78	54	43.82
	20.0	7	24	54.58	26	59	17.92	54	33.81
	20.5	7	51	32.75	26	05	04.86	54	25.04
	21.0	8	17	33.51	+24	53	15.88	54	17.68
	21.5	8	42	53.45	23	25	19.87	54	11.89
	22.0	9	07	31.43	21	42	50.39	54	07.85
	22.5	9	31	28.35	19	47	21.52	54	05.72
	23.0	9	54	46.87	17	40	24.80	54	05.63
	23.5	10	17	31.09	15	23	27.33	54	07.72
	24.0	10	39	46.23	+12	57	50.87	54	12.11
	24.5	11	01	38.38	10	24	51.97	54	18.89
	25.0	11	23	14.31	7	45	42.71	54	28.12
	25.5	11	44	41.32	5	01	32.19	54	39.83
	26.0	12	06	07.16	+2	13	28.40	54	54.02
	26.5	12	27	39.97	-0	37	19.41	55	10.64
	27.0	12	49	28.30	-3	29	38.12	55	29.59
	27.5	13	11	40.98	6	22	07.67	55	50.72
	28.0	13	34	27.19	9	13	17.94	56	13.83
	28.5	13	57	56.21	12	01	25.40	56	38.63
	29.0	14	22	17.29	14	44	29.96	57	04.78
	29.5	14	47	39.23	17	20	12.32	57	31.87
	30.0	15	14	09.80	-19	45	52.50	57	59.42
	30.5	15	41	54.94	21	58	30.26	58	26.87
July	1.0	16	10	57.71	23	54	48.69	58	53.63
	1.5	16	41	17.11	25	31	21.69	59	19.08
	2.0	17	12	47.07	-26	44	46.28	59	42.57

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	1.0	16	10	57.71	-23	54	48.69	58	53.63
	1.5	16	41	17.11	25	31	21.69	59	19.08
	2.0	17	12	47.07	26	44	46.28	59	42.57
	2.5	17	45	15.80	27	31	59.09	60	03.49
	3.0	18	18	26.09	27	50	35.26	60	21.26
	3.5	18	51	56.63	27	39	06.19	60	35.40
	4.0	19	25	24.32	-26	57	11.90	60	45.54
	4.5	19	58	27.04	25	45	44.78	60	51.45
	5.0	20	30	46.23	24	06	43.64	60	53.05
	5.5	21	02	08.51	22	03	00.16	60	50.39
	6.0	21	32	26.29	19	38	01.23	60	43.70
	6.5	22	01	37.42	16	55	31.22	60	33.32
	7.0	22	29	44.23	-13	59	17.08	60	19.68
	7.5	22	56	52.34	10	52	57.43	60	03.29
	8.0	23	23	09.57	7	39	56.02	59	44.68
	8.5	23	48	45.02	4	23	18.62	59	24.40
	9.0	0	13	48.37	-1	05	52.73	59	02.96
	9.5	0	38	29.43	+2	09	51.13	58	40.85
	10.0	1	02	57.73	+5	21	36.95	58	18.50
	10.5	1	27	22.32	8	27	20.51	57	56.26
	11.0	1	51	51.56	11	25	06.58	57	34.44
	11.5	2	16	32.86	14	13	06.55	57	13.27
	12.0	2	41	32.54	16	49	36.71	56	52.95
	12.5	3	06	55.48	19	12	57.32	56	33.59
	13.0	3	32	44.91	+21	21	32.77	56	15.28
	13.5	3	59	02.08	23	13	52.79	55	58.07
	14.0	4	25	46.06	24	48	34.76	55	41.99
	14.5	4	52	53.58	26	04	26.92	55	27.04
	15.0	5	20	19.16	27	00	32.04	55	13.22
	15.5	5	47	55.37	27	36	11.16	55	00.51
	16.0	6	15	33.34	+27	51	06.58	54	48.91
	16.5	6	43	03.57	27	45	23.49	54	38.42
	17.0	7	10	16.67	27	19	30.04	54	29.04
	17.5	7	37	04.18	26	34	15.51	54	20.79
	18.0	8	03	19.23	25	30	47.02	54	13.72
	18.5	8	28	56.87	24	10	25.24	54	07.88
	19.0	8	53	54.32	+22	34	39.81	54	03.33
	19.5	9	18	10.86	20	45	04.96	54	00.16
	20.0	9	41	47.66	18	43	15.80	53	58.46
	20.5	10	04	47.49	16	30	45.54	53	58.33
	21.0	10	27	14.43	14	09	03.65	53	59.89
	21.5	10	49	13.57	11	39	34.89	54	03.24
	22.0	11	10	50.81	+9	03	39.24	54	08.51
	22.5	11	32	12.70	6	22	32.36	54	15.78
	23.0	11	53	26.25	3	37	26.71	54	25.16
	23.5	12	14	38.93	+0	49	33.06	54	36.72
	24.0	12	35	58.60	-1	59	57.55	54	50.52

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	24.0	12	35	58.60	-1	59	57.55	54	50.52
	24.5	12	57	33.48	4	49	51.59	55	06.57
	25.0	13	19	32.10	7	38	50.35	55	24.87
	25.5	13	42	03.33	10	25	27.19	55	45.37
	26.0	14	05	16.17	13	08	04.41	56	07.94
	26.5	14	29	19.62	15	44	50.34	56	32.41
	27.0	14	54	22.33	-18	13	36.57	56	58.56
	27.5	15	20	32.02	20	31	56.15	57	26.07
	28.0	15	47	54.80	22	37	03.32	57	54.54
	28.5	16	16	34.21	24	25	55.71	58	23.49
	29.0	16	46	30.05	25	55	20.24	58	52.36
	29.5	17	17	37.45	27	02	03.22	59	20.54
	30.0	17	49	46.14	-27	43	04.84	59	47.34
	30.5	18	22	40.57	27	55	56.77	60	12.04
	31.0	18	56	00.96	27	38	59.83	60	33.95
	31.5	19	29	25.32	26	51	38.16	60	52.37
Aug.	1.0	20	02	32.09	25	34	26.19	61	06.73
	1.5	20	35	02.57	23	49	06.72	61	16.54
	2.0	21	06	42.76	-21	38	20.94	61	21.50
	2.5	21	37	24.14	19	05	33.14	61	21.46
	3.0	22	07	03.54	16	14	33.69	61	16.46
	3.5	22	35	42.32	13	09	23.22	61	06.73
	4.0	23	03	25.26	9	53	59.98	60	52.68
	4.5	23	30	19.54	6	32	10.85	60	34.82
	5.0	23	56	33.74	-3	07	25.89	60	13.76
	5.5	0	22	17.12	+0	17	04.08	59	50.19
	6.0	0	47	39.09	3	38	27.79	59	24.79
	6.5	1	12	48.80	6	54	12.25	58	58.21
	7.0	1	37	54.85	10	02	00.67	58	31.07
	7.5	2	03	05.04	12	59	50.07	58	03.94
	8.0	2	28	26.14	+15	45	48.92	57	37.27
	8.5	2	54	03.63	18	18	15.33	57	11.48
	9.0	3	20	01.47	20	35	35.88	56	46.87
	9.5	3	46	21.79	22	36	25.45	56	23.69
	10.0	4	13	04.77	24	19	27.94	56	02.12
	10.5	4	40	08.43	25	43	37.94	55	42.26
	11.0	5	07	28.66	+26	48	03.10	55	24.19
	11.5	5	34	59.47	27	32	06.70	55	07.92
	12.0	6	02	33.33	27	55	30.10	54	53.44
	12.5	6	30	01.82	27	58	14.39	54	40.73
	13.0	6	57	16.34	27	40	40.84	54	29.72
	13.5	7	24	08.77	27	03	30.04	54	20.36
	14.0	7	50	32.19	+26	07	39.77	54	12.58
	14.5	8	16	21.28	24	54	21.83	54	06.32
	15.0	8	41	32.58	23	24	58.41	54	01.51
	15.5	9	06	04.55	21	40	58.39	53	58.12
	16.0	9	29	57.45	+19	43	54.03	53	56.10

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Aug.	16.0	9	29	57.45	+19	43	54.03	53	56.10
	16.5	9	53	13.11	17	35	18.24	53	55.43
	17.0	10	15	54.71	15	16	42.55	53	56.12
	17.5	10	38	06.51	12	49	35.84	53	58.16
	18.0	10	59	53.60	10	15	23.72	54	01.60
	18.5	11	21	21.72	7	35	28.45	54	06.47
	19.0	11	42	37.14	+4	51	09.43	54	12.82
	19.5	12	03	46.55	+2	03	43.95	54	20.73
	20.0	12	24	56.99	-0	45	31.59	54	30.26
	20.5	12	46	15.84	3	35	20.20	54	41.47
	21.0	13	07	50.76	6	24	22.58	54	54.43
	21.5	13	29	49.67	9	11	15.08	55	09.20
	22.0	13	52	20.67	-11	54	27.55	55	25.80
	22.5	14	15	31.95	14	32	21.00	55	44.24
	23.0	14	39	31.53	17	03	05.38	56	04.49
	23.5	15	04	26.97	19	24	37.66	56	26.48
	24.0	15	30	24.88	21	34	40.67	56	50.08
	24.5	15	57	30.24	23	30	43.22	57	15.09
	25.0	16	25	45.62	-25	10	02.38	57	41.28
	25.5	16	55	10.30	26	29	48.40	58	08.29
	26.0	17	25	39.48	27	27	13.06	58	35.71
	26.5	17	57	03.86	27	59	41.13	59	03.04
	27.0	18	29	09.82	28	05	04.18	59	29.71
	27.5	19	01	40.31	27	41	54.48	59	55.09
	28.0	19	34	16.57	-26	49	36.49	60	18.49
	28.5	20	06	40.18	25	28	33.42	60	39.22
	29.0	20	38	35.06	23	40	07.38	60	56.61
	29.5	21	09	48.96	21	26	33.60	61	10.05
	30.0	21	40	14.23	18	50	50.19	61	19.02
	30.5	22	09	47.77	15	56	25.75	61	23.17
	31.0	22	38	30.45	-12	47	06.96	61	22.30
	31.5	23	06	26.32	9	26	47.58	61	16.39
Sept.	1.0	23	33	41.64	5	59	19.46	61	05.62
	1.5	0	00	24.10	-2	28	25.89	60	50.36
	2.0	0	26	42.10	+1	02	22.90	60	31.12
	2.5	0	52	44.25	4	29	52.46	60	08.50
	3.0	1	18	38.89	+7	51	05.30	59	43.22
	3.5	1	44	33.77	11	03	20.97	59	15.97
	4.0	2	10	35.75	14	04	15.51	58	47.49
	4.5	2	36	50.46	16	51	40.51	58	18.45
	5.0	3	03	22.09	19	23	42.36	57	49.47
	5.5	3	30	13.05	21	38	41.78	57	21.08
	6.0	3	57	23.81	+23	35	13.93	56	53.76
	6.5	4	24	52.71	25	12	09.23	56	27.88
	7.0	4	52	36.04	26	28	34.53	56	03.74
	7.5	5	20	28.15	27	23	54.63	55	41.55
	8.0	5	48	21.93	+27	57	53.55	55	21.48

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Sept.	8.0	5	48	21.93	+27	57	53.55	55	21.48
	8.5	6	16	09.32	28	10	35.19	55	03.62
	9.0	6	43	42.01	28	02	23.06	54	48.01
	9.5	7	10	52.17	27	33	58.91	54	34.65
	10.0	7	37	33.02	26	46	20.35	54	23.51
	10.5	8	03	39.34	25	40	37.73	54	14.53
	11.0	8	29	07.67	+24	18	10.74	54	07.61
	11.5	8	53	56.39	22	40	25.08	54	02.67
	12.0	9	18	05.64	20	48	49.61	53	59.59
	12.5	9	41	37.10	18	44	54.01	53	58.25
	13.0	10	04	33.72	16	30	07.22	53	58.54
	13.5	10	26	59.51	14	05	56.49	54	00.36
	14.0	10	48	59.30	+11	33	47.05	54	03.60
	14.5	11	10	38.53	8	55	02.13	54	08.16
	15.0	11	32	03.12	6	11	03.43	54	13.97
	15.5	11	53	19.35	3	23	11.87	54	20.98
	16.0	12	14	33.82	+0	32	48.46	54	29.12
	16.5	12	35	53.37	-2	18	44.64	54	38.38
	17.0	12	57	25.05	-5	10	02.83	54	48.74
	17.5	13	19	16.07	7	59	37.80	55	00.21
	18.0	13	41	33.77	10	45	56.07	55	12.78
	18.5	14	04	25.46	13	27	17.61	55	26.50
	19.0	14	27	58.31	16	01	54.41	55	41.36
	19.5	14	52	19.04	18	27	49.40	55	57.39
	20.0	15	17	33.58	-20	42	55.87	56	14.59
	20.5	15	43	46.58	22	44	57.77	56	32.95
	21.0	16	11	00.78	24	31	31.30	56	52.41
	21.5	16	39	16.40	26	00	08.33	57	12.89
	22.0	17	08	30.49	27	08	21.99	57	34.27
	22.5	17	38	36.55	27	53	54.37	57	56.35
	23.0	18	09	24.52	-28	14	45.89	58	18.89
	23.5	18	40	41.28	28	09	25.32	58	41.58
	24.0	19	12	11.72	27	36	58.71	59	04.05
	24.5	19	43	40.27	26	37	15.66	59	25.85
	25.0	20	14	52.47	25	10	51.86	59	46.47
	25.5	20	45	36.37	23	19	07.49	60	05.39
	26.0	21	15	43.45	-21	04	02.28	60	22.03
	26.5	21	45	09.00	18	28	08.44	60	35.84
	27.0	22	13	51.92	15	34	22.89	60	46.30
	27.5	22	41	54.27	12	25	59.74	60	52.96
	28.0	23	09	20.57	9	06	23.67	60	55.48
	28.5	23	36	17.09	5	39	04.34	60	53.64
	29.0	0	02	51.26	-2	07	31.77	60	47.39
	29.5	0	29	11.06	+1	24	47.38	60	36.82
	30.0	0	55	24.55	4	54	33.00	60	22.18
	30.5	1	21	39.52	8	18	33.98	60	03.88
Oct.	1.0	1	48	03.03	+11	33	50.44	59	42.42

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Oct.	1.0	1	48	03.03	+11	33	50.44	59	42.42
	1.5	2	14	41.12	14	37	35.44	59	18.39
	2.0	2	41	38.39	17	27	16.69	58	52.44
	2.5	3	08	57.70	20	00	38.12	58	25.23
	3.0	3	36	39.81	22	15	41.68	57	57.39
	3.5	4	04	43.21	24	10	49.27	57	29.54
	4.0	4	33	04.04	+25	44	44.75	57	02.22
	4.5	5	01	36.21	26	56	35.86	56	35.93
	5.0	5	30	11.88	27	45	55.45	56	11.07
	5.5	5	58	42.03	28	12	41.80	55	47.98
	6.0	6	26	57.29	28	17	17.63	55	26.93
	6.5	6	54	48.75	28	00	27.61	55	08.14
	7.0	7	22	08.70	+27	23	14.70	54	51.73
	7.5	7	48	51.16	26	26	55.81	54	37.80
	8.0	8	14	52.19	25	12	57.09	54	26.37
	8.5	8	40	09.94	23	42	49.76	54	17.46
	9.0	9	04	44.52	21	58	06.53	54	11.01
	9.5	9	28	37.75	20	00	19.05	54	06.95
	10.0	9	51	52.84	+17	50	56.33	54	05.19
	10.5	10	14	34.11	15	31	24.05	54	05.58
	11.0	10	36	46.71	13	03	04.57	54	08.00
	11.5	10	58	36.38	10	27	17.55	54	12.28
	12.0	11	20	09.32	7	45	20.94	54	18.26
	12.5	11	41	32.04	4	58	32.19	54	25.77
	13.0	12	02	51.31	+2	08	09.63	54	34.62
	13.5	12	24	14.08	-0	44	26.02	54	44.64
	14.0	12	45	47.44	3	37	50.21	54	55.68
	14.5	13	07	38.58	6	30	33.15	55	07.57
	15.0	13	29	54.75	9	20	58.37	55	20.17
	15.5	13	52	43.09	12	07	21.61	55	33.37
	16.0	14	16	10.53	-14	47	49.83	55	47.04
	16.5	14	40	23.51	17	20	20.71	56	01.11
	17.0	15	05	27.60	19	42	42.77	56	15.52
	17.5	15	31	27.10	21	52	36.44	56	30.20
	18.0	15	58	24.43	23	47	36.39	56	45.14
	18.5	16	26	19.55	25	25	15.52	57	00.28
	19.0	16	55	09.44	-26	43	10.62	57	15.63
	19.5	17	24	47.73	27	39	09.75	57	31.14
	20.0	17	55	04.77	28	11	20.68	57	46.77
	20.5	18	25	48.08	28	18	19.28	58	02.46
	21.0	18	56	43.41	27	59	16.58	58	18.11
	21.5	19	27	36.08	27	14	03.06	58	33.61
	22.0	19	58	12.42	-26	03	09.51	58	48.79
	22.5	20	28	21.12	24	27	44.37	59	03.43
	23.0	20	57	54.01	22	29	28.45	59	17.28
	23.5	21	26	46.48	20	10	28.36	59	30.04
	24.0	21	54	57.36	-17	33	09.78	59	41.39

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Oct.	24.0	21	54	57.36	-17	33	09.78	59	41.39
	24.5	22	22	28.49	14	40	11.69	59	50.97
	25.0	22	49	24.15	11	34	21.91	59	58.44
	25.5	23	15	50.43	8	18	33.97	60	03.45
	26.0	23	41	54.65	4	55	45.08	60	05.69
	26.5	0	07	44.89	-1	28	54.75	60	04.92
	27.0	0	33	29.52	+1	58	56.19	60	00.98
	27.5	0	59	16.85	5	24	46.65	59	53.78
	28.0	1	25	14.76	8	45	36.57	59	43.36
	28.5	1	51	30.35	11	58	28.62	59	29.86
	29.0	2	18	09.54	15	00	30.46	59	13.53
	29.5	2	45	16.65	17	48	57.64	58	54.69
	30.0	3	12	53.97	+20	21	17.13	58	33.78
	30.5	3	41	01.34	22	35	11.51	58	11.25
	31.0	4	09	35.88	24	28	43.53	57	47.62
	31.5	4	38	31.97	26	00	20.74	57	23.40
Nov.	1.0	5	07	41.42	27	08	59.50	56	59.11
	1.5	5	36	54.07	27	54	07.74	56	35.23
	2.0	6	05	58.70	+28	15	45.69	56	12.20
	2.5	6	34	44.01	28	14	24.31	55	50.44
	3.0	7	02	59.69	27	51	01.43	55	30.29
	3.5	7	30	37.26	27	06	56.07	55	12.05
	4.0	7	57	30.62	26	03	42.01	54	55.97
	4.5	8	23	36.23	24	43	01.28	54	42.23
	5.0	8	48	53.07	+23	06	38.55	54	30.97
	5.5	9	13	22.32	21	16	16.81	54	22.29
	6.0	9	37	06.96	19	13	34.44	54	16.24
	6.5	10	00	11.43	17	00	03.74	54	12.82
	7.0	10	22	41.17	14	37	10.55	54	12.00
	7.5	10	44	42.41	12	06	14.84	54	13.70
	8.0	11	06	21.87	+9	28	31.91	54	17.84
	8.5	11	27	46.62	6	45	14.05	54	24.27
	9.0	11	49	04.00	3	57	32.47	54	32.82
	9.5	12	10	21.53	+1	06	39.47	54	43.30
	10.0	12	31	46.87	-1	46	09.40	54	55.49
	10.5	12	53	27.80	4	39	33.11	55	09.15
	11.0	13	15	32.17	-7	32	02.96	55	24.01
	11.5	13	38	07.81	10	22	00.61	55	39.81
	12.0	14	01	22.35	13	07	36.37	55	56.27
	12.5	14	25	23.03	15	46	48.02	56	13.10
	13.0	14	50	16.34	18	17	20.42	56	30.04
	13.5	15	16	07.51	20	36	46.26	56	46.83
	14.0	15	42	59.90	-22	42	28.45	57	03.24
	14.5	16	10	54.33	24	31	44.53	57	19.06
	15.0	16	39	48.36	26	01	53.32	57	34.12
	15.5	17	09	35.85	27	10	23.85	57	48.29
	16.0	17	40	06.75	-27	55	05.74	58	01.47

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Nov.	16.0	17	40	06.75	-27	55	05.74	58	01.47
	16.5	18	11	07.64	28	14	19.79	58	13.60
	17.0	18	42	22.70	28	07	06.86	58	24.66
	17.5	19	13	35.30	27	33	13.33	58	34.64
	18.0	19	44	29.72	26	33	11.78	58	43.56
	18.5	20	14	52.72	25	08	17.08	58	51.44
	19.0	20	44	34.60	-23	20	18.75	58	58.31
	19.5	21	13	29.66	21	11	31.70	59	04.17
	20.0	21	41	36.10	18	44	26.98	59	09.03
	20.5	22	08	55.55	16	01	43.92	59	12.85
	21.0	22	35	32.34	13	06	04.57	59	15.60
	21.5	23	01	32.86	10	00	10.15	59	17.19
	22.0	23	27	04.83	-6	46	39.51	59	17.52
	22.5	23	52	16.85	3	28	09.00	59	16.48
	23.0	0	17	17.91	-0	07	13.12	59	13.94
	23.5	0	42	17.12	+3	13	34.40	59	09.80
	24.0	1	07	23.32	6	31	39.48	59	03.93
	24.5	1	32	44.87	9	44	27.04	58	56.26
	25.0	1	58	29.28	+12	49	20.92	58	46.76
	25.5	2	24	42.83	15	43	44.77	58	35.42
	26.0	2	51	30.14	18	25	04.06	58	22.30
	26.5	3	18	53.67	20	50	49.40	58	07.53
	27.0	3	46	53.31	22	58	41.16	57	51.27
	27.5	4	15	25.94	24	46	35.18	57	33.77
	28.0	4	44	25.37	+26	12	49.14	57	15.28
	28.5	5	13	42.53	27	16	08.64	56	56.14
	29.0	5	43	06.06	27	55	52.06	56	36.67
	29.5	6	12	23.35	28	11	53.01	56	17.22
	30.0	6	41	21.64	28	04	39.89	55	58.17
	30.5	7	09	49.33	27	35	12.25	55	39.85
Dec.	1.0	7	37	36.87	+26	44	54.70	55	22.60
	1.5	8	04	37.43	25	35	29.43	55	06.74
	2.0	8	30	47.11	24	08	48.50	54	52.55
	2.5	8	56	04.83	22	26	46.99	54	40.27
	3.0	9	20	31.93	20	31	17.61	54	30.13
	3.5	9	44	11.77	18	24	07.10	54	22.31
	4.0	10	07	09.22	+16	06	54.19	54	16.95
	4.5	10	29	30.26	13	41	09.01	54	14.16
	5.0	10	51	21.64	11	08	13.56	54	14.00
	5.5	11	12	50.61	8	29	22.99	54	16.51
	6.0	11	34	04.82	5	45	47.42	54	21.66
	6.5	11	55	12.14	2	58	34.11	54	29.42
	7.0	12	16	20.68	+0	08	49.92	54	39.68
	7.5	12	37	38.70	-2	42	16.02	54	52.32
	8.0	12	59	14.65	5	33	29.59	55	07.15
	8.5	13	21	17.07	8	23	28.86	55	23.95
	9.0	13	43	54.56	-11	10	41.28	55	42.45

MOON, 2023
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Dec.	9.0	13	43	54.56	-11	10	41.28	55	42.45
	9.5	14	07	15.57	13	53	21.13	56	02.34
	10.0	14	31	28.20	16	29	27.41	56	23.26
	10.5	14	56	39.70	18	56	42.57	56	44.84
	11.0	15	22	55.96	21	12	32.70	57	06.65
	11.5	15	50	20.71	23	14	09.75	57	28.27
	12.0	16	18	54.66	-24	58	36.52	57	49.26
	12.5	16	48	34.63	26	22	54.94	58	09.19
	13.0	17	19	12.90	27	24	17.54	58	27.69
	13.5	17	50	37.18	28	00	21.19	58	44.39
	14.0	18	22	31.16	28	09	21.14	58	58.99
	14.5	18	54	35.98	27	50	22.64	59	11.29
	15.0	19	26	32.25	-27	03	27.33	59	21.14
	15.5	19	58	02.20	25	49	33.07	59	28.47
	16.0	20	28	51.49	24	10	27.28	59	33.31
	16.5	20	58	50.29	22	08	35.69	59	35.74
	17.0	21	27	53.53	19	46	49.30	59	35.91
	17.5	21	56	00.56	17	08	11.98	59	34.01
	18.0	22	23	14.35	-14	15	50.46	59	30.26
	18.5	22	49	40.63	11	12	47.32	59	24.90
	19.0	23	15	26.98	8	01	56.99	59	18.16
	19.5	23	40	42.21	4	46	04.21	59	10.24
	20.0	0	05	35.72	-1	27	44.24	59	01.33
	20.5	0	30	17.15	+1	50	35.74	58	51.59
	21.0	0	54	56.02	+5	06	34.62	58	41.15
	21.5	1	19	41.52	8	17	55.26	58	30.09
	22.0	1	44	42.19	11	22	22.57	58	18.48
	22.5	2	10	05.65	14	17	42.20	58	06.36
	23.0	2	35	58.28	17	01	40.12	57	53.75
	23.5	3	02	24.75	19	32	03.28	57	40.66
	24.0	3	29	27.61	+21	46	41.81	57	27.12
	24.5	3	57	06.84	23	43	32.63	57	13.14
	25.0	4	25	19.48	25	20	44.43	56	58.77
	25.5	4	53	59.53	26	36	43.74	56	44.06
	26.0	5	22	58.15	27	30	21.07	56	29.11
	26.5	5	52	04.20	28	00	56.29	56	14.02
	27.0	6	21	05.25	+28	08	21.98	55	58.93
	27.5	6	49	48.68	27	53	03.98	55	44.00
	28.0	7	18	02.89	27	15	58.98	55	29.43
	28.5	7	45	38.26	26	18	29.34	55	15.40
	29.0	8	12	27.82	25	02	16.28	55	02.15
	29.5	8	38	27.46	23	29	12.54	54	49.89
	30.0	9	03	35.83	+21	41	15.50	54	38.85
	30.5	9	27	54.05	19	40	21.57	54	29.25
	31.0	9	51	25.24	17	28	22.14	54	21.30
	31.5	10	14	14.06	15	07	01.08	54	15.21
	32.0	10	36	26.32	+12	37	53.65	54	11.16

MOON, 2023
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Jan.	0	7.57	L	0	06	54.4	+8	05.0
	0		U	0	19	16.6	10	58.9
	1	8.57	L	1	07	39.0	13	43.6
	1		U	1	20	01.8	16	17.5
	2	9.57	L	2	08	24.9	18	39.1
	2		U	2	20	48.5	20	46.7
	3	10.57	L	3	09	12.6	+22	38.9
	3		U	3	21	37.2	24	14.3
	4	11.57	L	4	10	02.2	25	31.4
	4		U	4	22	27.7	26	29.2
	5	12.57	L	5	10	53.4	27	06.7
	5		U	5	23	19.2	27	23.7
	6	13.57	L	6	11	44.9	+27	19.8
	7	14.57	U	7	00	10.5	26	55.3
	7		L	7	12	35.7	26	11.0
	8	15.57	U	8	01	00.5	25	07.9
	8		L	8	13	24.6	23	47.1
	9	16.57	U	9	01	48.2	22	10.2
	9		L	9	14	11.1	+20	18.7
	10	17.57	U	10	02	33.4	18	14.1
	10		L	10	14	55.2	15	58.1
	11	18.57	U	11	03	16.4	13	32.0
	11		L	11	15	37.3	10	57.3
	12	19.57	U	12	03	57.9	8	15.5
	12		L	12	16	18.3	+5	27.7
	13	20.57	U	13	04	38.7	+2	35.4
	13		L	13	16	59.2	-0	20.2
	14	21.57	U	14	05	20.0	3	17.8
	14		L	14	17	41.3	6	15.7
	15	22.57	U	15	06	03.2	9	12.4
	15		L	15	18	25.9	-12	05.9
	16	23.57	U	16	06	49.5	14	53.9
	16		L	16	19	14.4	17	33.7
	17	24.57	U	17	07	40.5	20	02.3
	17		L	17	20	08.1	22	16.0
	18	25.57	U	18	08	37.1	24	10.9
	18		L	18	21	07.6	-25	43.0
	19	26.57	U	19	09	39.4	26	48.0
	19		L	19	22	12.2	27	22.7
	20	27.57	U	20	10	45.6	27	24.3
	20		L	20	23	19.1	26	51.9
	21	28.57	U	21	11	52.5	25	45.8
	22	0.13	L	22	00	25.0	-24	08.1
	22		U	22	12	56.5	22	02.4
	23	1.13	L	23	01	26.8	19	32.6
	23		U	23	13	55.7	-16	43.8
Jan.	23		U	23	13	55.7	-16	43.8
	24	2.13	L	24	02	23.4	13	40.3
	24		U	24	14	49.8	10	26.8
	25	3.13	L	25	03	15.2	7	07.2
	25		U	25	15	39.7	3	45.2
	26	4.13	L	26	04	03.6	-0	23.9
	26		U	26	16	26.9	+2	54.1
	27	5.13	L	27	04	50.0	6	06.5
	27		U	27	17	12.9	9	11.3
	28	6.13	L	28	05	35.8	12	06.6
	28		U	28	17	58.8	14	50.9
	29	7.13	L	29	06	22.0	17	22.6
	29		U	29	18	45.6	+19	40.3
	30	8.13	L	30	07	09.6	21	42.6
	30		U	30	19	34.0	23	28.3
	31	9.13	L	31	07	58.8	24	56.1
	31		U	31	20	23.9	26	05.0
Feb.	1	10.13	L	1	08	49.4	26	54.1
	1		U	1	21	15.1	+27	22.8
	2	11.13	L	2	09	40.8	27	30.9
	2		U	2	22	06.4	27	18.3
	3	12.13	L	3	10	31.8	26	45.5
	3		U	3	22	56.8	25	53.2
	4	13.13	L	4	11	21.3	24	42.4
	4		U	4	23	45.2	+23	14.4
	5	14.13	L	5	12	08.6	21	30.6
	6	15.13	U	6	00	31.3	19	32.6
	6		L	6	12	53.5	17	22.0
	7	16.13	U	7	01	15.1	15	00.2
	7		L	7	13	36.3	12	29.0
	8	17.13	U	8	01	57.1	+9	49.8
	8		L	8	14	17.6	7	04.2
	9	18.13	U	9	02	38.0	4	13.5
	9		L	9	14	58.3	+1	19.3
	10	19.13	U	10	03	18.8	-1	37.1
	10		L	10	15	39.5	4	34.1
	11	20.13	U	11	04	00.7	-7	30.1
	11		L	11	16	22.4	10	23.4
	12	21.13	U	12	04	44.8	13	12.0
	12		L	12	17	08.1	15	53.9
	13	22.13	U	13	05	32.5	18	26.5
	13		L	13	17	58.1	20	47.1
	14	23.13	U	14	06	24.9	-22	52.5
	14		L	14	18	53.1	24	39.4
	15	24.13	U	15	07	22.6	26	04.2
	15		L	15	19	53.3	-27	03.5

MOON, 2023
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Feb.	15		L	15	19	53.3	-27	03.5
	16	25.13	U	16	08	24.9	27	34.1
	16		L	16	20	57.2	27	33.8
	17	26.13	U	17	09	29.8	27	01.3
	17		L	17	22	02.2	25	56.4
	18	27.13	U	18	10	34.2	24	20.7
	18		L	18	23	05.3	-22	16.6
	19	28.13	U	19	11	35.5	19	47.8
	20	29.13	L	20	00	04.5	16	58.3
	20		U	20	12	32.5	13	52.6
	21	0.70	L	21	00	59.4	10	35.1
	21		U	21	13	25.4	7	10.0
	22	1.70	L	22	01	50.6	-3	41.3
	22		U	22	14	15.2	-0	12.6
	23	2.70	L	23	02	39.4	+3	13.0
	23		U	23	15	03.2	6	32.7
	24	3.70	L	24	03	27.0	9	44.0
	24		U	24	15	50.7	12	44.7
	25	4.70	L	25	04	14.6	+15	33.0
	25		U	25	16	38.7	18	07.0
	26	5.70	L	26	05	03.1	20	25.3
	26		U	26	17	27.8	22	26.5
	27	6.70	L	27	05	52.9	24	09.4
	27		U	27	18	18.3	25	32.9
	28	7.70	L	28	06	43.9	+26	36.3
	28		U	28	19	09.7	27	18.9
Mar.	1	8.70	L	1	07	35.6	27	40.5
	1		U	1	20	01.4	27	41.0
	2	9.70	L	2	08	27.0	27	20.8
	2		U	2	20	52.3	26	40.5
	3	10.70	L	3	09	17.1	+25	41.1
	3		U	3	21	41.4	24	23.5
	4	11.70	L	4	10	05.1	22	49.1
	4		U	4	22	28.3	20	59.3
	5	12.70	L	5	10	50.8	18	55.6
	5		U	5	23	12.9	16	39.5
	6	13.70	L	6	11	34.4	+14	12.6
	6		U	6	23	55.5	11	36.3
	7	14.70	L	7	12	16.4	8	52.3
	8	15.70	U	8	00	37.0	6	02.0
	8		L	8	12	57.5	3	07.0
	9	16.70	U	9	01	18.1	+0	08.9
	9		L	9	13	38.8	-2	50.7
	10	17.70	U	10	01	59.9	5	50.1
	10		L	10	14	21.3	8	47.4
	11	18.70	U	11	02	43.4	-11	40.7

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Mar.	11	18.70	U	11	02	43.4	-11	40.7
	11		L	11	15	06.2	14	27.8
	12	19.70	U	12	03	29.8	17	06.6
	12		L	12	15	54.5	19	34.3
	13	20.70	U	13	04	20.2	21	48.4
	13		L	13	16	47.1	23	45.8
	14	21.70	U	14	05	15.1	-25	23.4
	14		L	14	17	44.2	26	38.4
	15	22.70	U	15	06	14.2	27	27.8
	15		L	15	18	45.1	27	49.3
	16	23.70	U	16	07	16.3	27	41.3
	16		L	16	19	47.6	27	03.1
	17	24.70	U	17	08	18.8	-25	54.9
	17		L	17	20	49.4	24	18.0
	18	25.70	U	18	09	19.4	22	14.8
	18		L	18	21	48.5	19	48.0
	19	26.70	U	19	10	16.7	17	01.3
	19		L	19	22	43.9	13	58.2
	20	27.70	U	20	11	10.3	-10	42.8
	20		L	20	23	36.0	7	18.6
	21	28.70	U	21	12	01.1	3	49.6
	22	0.28	L	22	00	25.7	-0	19.0
	22		U	22	12	50.0	+3	09.6
	23	1.28	L	23	01	14.2	6	33.3
	23		U	23	13	38.4	+9	49.2
	24	2.28	L	24	02	02.7	12	54.7
	24		U	24	14	27.2	15	47.6
	25	3.28	L	25	02	52.0	18	25.6
	25		U	25	15	17.1	20	47.0
	26	4.28	L	26	03	42.6	22	50.0
	26		U	26	16	08.4	+24	33.4
	27	5.28	L	27	04	34.5	25	56.0
	27		U	27	17	00.8	26	57.0
	28	6.28	L	28	05	27.2	27	36.2
	28		U	28	17	53.5	27	53.3
	29	7.28	L	29	06	19.7	27	48.8
	29		U	29	18	45.5	+27	23.2
	30	8.28	L	30	07	10.8	26	37.4
	30		U	30	19	35.6	25	32.5
	31	9.28	L	31	07	59.8	24	09.9
	31		U	31	20	23.4	22	30.9
Apr.	1	10.28	L	1	08	46.3	20	36.9
	1		U	1	21	08.7	+18	29.4
	2	11.28	L	2	09	30.6	16	09.9
	2		U	2	21	52.0	13	39.7
	3	12.28	L	3	10	13.1	+11	00.4

MOON, 2023
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Apr.	1		U	1	21	08.7	+18	29.4
	2	11.28	L	2	09	30.6	16	09.9
	2		U	2	21	52.0	13	39.7
	3	12.28	L	3	10	13.1	11	00.4
	3		U	3	22	33.9	8	13.3
	4	13.28	L	4	10	54.6	5	19.9
	4		U	4	23	15.2	+2	21.7
	5	14.28	L	5	11	36.0	-0	39.5
	5		U	5	23	57.1	3	42.3
	6	15.28	L	6	12	18.5	6	44.5
	7	16.28	U	7	00	40.5	9	44.4
	7		L	7	13	03.2	12	39.5
	8	17.28	U	8	01	26.6	-15	27.6
	8		L	8	13	51.0	18	05.9
	9	18.28	U	9	02	16.5	20	31.6
	9		L	9	14	43.0	22	41.7
	10	19.28	U	10	03	10.6	24	33.2
	10		L	10	15	39.2	26	03.0
	11	20.28	U	11	04	08.8	-27	08.3
	11		L	11	16	39.1	27	46.7
	12	21.28	U	12	05	09.8	27	56.8
	12		L	12	17	40.7	27	37.4
	13	22.28	U	13	06	11.4	26	48.8
	13		L	13	18	41.6	25	32.0
	14	23.28	U	14	07	11.3	-23	48.9
	14		L	14	19	40.0	21	41.9
	15	24.28	U	15	08	07.9	19	13.8
	15		L	15	20	34.9	16	27.9
	16	25.28	U	16	09	01.1	13	27.5
	16		L	16	21	26.4	10	15.7
	17	26.28	U	17	09	51.2	-6	55.9
	17		L	17	22	15.5	3	31.2
	18	27.28	U	18	10	39.5	-0	04.7
	18		L	18	23	03.4	+3	20.7
	19	28.28	U	19	11	27.2	6	42.1
	19		L	19	23	51.2	9	56.7
	20	29.28	U	20	12	15.4	+13	01.8
	21	0.83	L	21	00	39.9	15	55.0
	21		U	21	13	04.9	18	33.9
	22	1.83	L	22	01	30.3	20	56.2
	22		U	22	13	56.2	23	00.0
	23	2.83	L	23	02	22.4	24	43.7
	23		U	23	14	49.0	+26	06.0
	24	3.83	L	24	03	15.9	27	06.0
	24		U	24	15	42.7	27	43.1
	25	4.83	L	25	04	09.5	+27	57.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Apr.	25	4.83	L	25	04	09.5	+27	57.5
	25		U	25	16	36.0	27	49.6
	26	5.83	L	26	05	02.0	27	20.2
	26		U	26	17	27.6	26	30.4
	27	6.83	L	27	05	52.4	25	21.6
	27		U	27	18	16.6	23	55.3
	28	7.83	L	28	06	40.1	+22	13.1
	28		U	28	19	02.9	20	16.3
	29	8.83	L	29	07	25.1	18	06.7
	29		U	29	19	46.8	15	45.5
	30	9.83	L	30	08	08.0	13	14.2
	30		U	30	20	28.9	10	34.1
May	1	10.83	L	1	08	49.5	+7	46.5
	1		U	1	21	10.1	4	52.7
	2	11.83	L	2	09	30.8	+1	54.2
	2		U	2	21	51.6	-1	07.6
	3	12.83	L	3	10	12.7	4	11.1
	3		U	3	22	34.4	7	14.3
	4	13.83	L	4	10	56.7	-10	15.2
	4		U	4	23	19.8	13	11.5
	5	14.83	L	5	11	43.8	16	00.5
	6	15.83	U	6	00	08.9	18	39.3
	6		L	6	12	35.2	21	04.7
	7	16.83	U	7	01	02.6	23	13.2
	7		L	7	13	31.2	-25	01.3
	8	17.83	U	8	02	00.9	26	25.9
	8		L	8	14	31.4	27	23.9
	9	18.83	U	9	03	02.6	27	53.2
	9		L	9	15	34.0	27	52.4
	10	19.83	U	10	04	05.3	27	21.3
	10		L	10	16	36.1	-26	20.8
	11	20.83	U	11	05	06.4	24	52.7
	11		L	11	17	35.6	22	59.6
	12	21.83	U	12	06	03.9	20	44.4
	12		L	12	18	31.1	18	10.5
	13	22.83	U	13	06	57.3	15	21.1
	13		L	13	19	22.7	-12	19.6
	14	23.83	U	14	07	47.3	9	08.9
	14		L	14	20	11.2	5	51.9
	15	24.83	U	15	08	34.8	-2	31.5
	15		L	15	20	58.1	+0	49.7
	16	25.83	U	16	09	21.3	4	09.1
	16		L	16	21	44.6	+7	24.4
	17	26.83	U	17	10	08.0	10	33.0
	17		L	17	22	31.8	13	32.5
	18	27.83	U	18	10	56.0	+16	20.5

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
May	18	27.83	U	18	10	56.0	+16	20.5
	18		L	18	23	20.7	18	54.8
	19	28.83	U	19	11	45.9	21	13.1
	20	0.34	L	20	00	11.7	23	13.4
	20		U	20	12	38.0	24	53.9
	21	1.34	L	21	01	04.7	26	13.1
	21		U	21	13	31.6	+27	09.8
	22	2.34	L	22	01	58.6	27	43.7
	22		U	22	14	25.6	27	54.6
	23	3.34	L	23	02	52.2	27	42.9
	23		U	23	15	18.4	27	09.6
	24	4.34	L	24	03	44.0	26	15.9
	24		U	24	16	08.9	+25	03.3
	25	5.34	L	25	04	33.1	23	33.5
	25		U	25	16	56.5	21	48.1
	26	6.34	L	26	05	19.1	19	48.9
	26		U	26	17	41.2	17	37.4
	27	7.34	L	27	06	02.6	15	15.2
	27		U	27	18	23.6	+12	43.5
	28	8.34	L	28	06	44.2	10	03.7
	28		U	28	19	04.6	7	17.1
	29	9.34	L	29	07	24.9	4	24.8
	29		U	29	19	45.3	+1	28.2
	30	10.34	L	30	08	05.9	-1	31.4
	30		U	30	20	26.8	-4	32.6
	31	11.34	L	31	08	48.4	7	33.7
	31		U	31	21	10.6	10	32.8
June	1	12.34	L	1	09	33.7	13	27.5
	1		U	1	21	57.8	16	15.3
	2	13.34	L	2	10	23.2	18	53.2
	2		U	2	22	49.8	-21	17.7
	3	14.34	L	3	11	17.8	23	25.2
	3		U	3	23	47.0	25	11.9
	4	15.34	L	4	12	17.5	26	33.8
	5	16.34	U	5	00	49.0	27	27.9
	5		L	5	13	21.1	27	51.4
	6	17.34	U	6	01	53.5	-27	43.1
	6		L	6	14	25.6	27	02.9
	7	18.34	U	7	02	57.3	25	52.1
	7		L	7	15	28.0	24	13.1
	8	19.34	U	8	03	57.7	22	08.9
	8		L	8	16	26.2	19	43.5
	9	20.34	U	9	04	53.6	-17	00.4
	9		L	9	17	19.8	14	03.7
	10	21.34	U	10	05	45.0	10	56.6
	10		L	10	18	09.4	-7	42.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
June	10		L	10	18	09.4	-7	42.5
	11	22.34	U	11	06	33.2	4	24.3
	11		L	11	18	56.5	-1	04.7
	12	23.34	U	12	07	19.5	+2	13.8
	12		L	12	19	42.4	5	29.1
	13	24.34	U	13	08	05.4	8	38.7
	13		L	13	20	28.5	+11	40.7
	14	25.34	U	14	08	52.0	14	32.8
	14		L	14	21	15.9	17	13.1
	15	26.34	U	15	09	40.4	19	39.4
	15		L	15	22	05.4	21	49.8
	16	27.34	U	16	10	30.9	23	42.4
	16		L	16	22	57.0	+25	15.4
	17	28.34	U	17	11	23.4	26	27.4
	17		L	17	23	50.2	27	17.4
	18	29.34	U	18	12	17.1	27	44.8
	19	0.81	L	19	00	43.8	27	49.6
	19		U	19	13	10.4	27	32.0
	20	1.81	L	20	01	36.4	+26	53.1
	20		U	20	14	01.9	25	54.2
	21	2.81	L	21	02	26.6	24	36.6
	21		U	21	14	50.6	23	02.3
	22	3.81	L	22	03	13.8	21	13.0
	22		U	22	15	36.3	19	10.4
	23	4.81	L	23	03	58.1	+16	56.2
	23		U	23	16	19.4	14	31.9
	24	5.81	L	24	04	40.1	11	59.1
	24		U	24	17	00.4	9	19.1
	25	6.81	L	25	05	20.5	6	33.2
	25		U	25	17	40.5	3	42.5
	26	7.81	L	26	06	00.5	+0	48.2
	26		U	26	18	20.8	-2	08.4
	27	8.81	L	27	06	41.4	5	05.9
	27		U	27	19	02.5	8	02.9
	28	9.81	L	28	07	24.4	10	57.6
	28		U	28	19	47.1	13	48.0
	29	10.81	L	29	08	11.0	-16	31.6
	29		U	29	20	36.0	19	05.8
	30	11.81	L	30	09	02.4	21	27.1
	30		U	30	21	30.1	23	32.1
July	1	12.81	L	1	09	59.4	25	16.6
	1		U	1	22	30.0	26	36.9
	2	13.81	L	2	11	01.8	-27	29.1
	2		U	2	23	34.3	27	50.4
	3	14.81	L	3	12	07.3	27	38.8
	4	15.81	U	4	00	40.2	-26	54.0

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Date	Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
	d		d	h	m	°	'
July 4	15.81	U	4	00	40.2	-26	54.0
4		L	4	13	12.6	25	37.0
5	16.81	U	5	01	44.2	23	50.3
5		L	5	14	14.6	21	37.5
6	17.81	U	6	02	43.9	19	02.5
6		L	6	15	11.9	16	09.8
7	18.81	U	7	03	38.7	-13	03.6
7		L	7	16	04.5	9	48.0
8	19.81	U	8	04	29.4	6	26.6
8		L	8	16	53.6	-3	02.8
9	20.81	U	9	05	17.2	+0	20.7
9		L	9	17	40.6	3	41.2
10	21.81	U	10	06	03.7	+6	56.3
10		L	10	18	26.9	10	04.0
11	22.81	U	11	06	50.3	13	02.2
11		L	11	19	13.9	15	48.9
12	23.81	U	12	07	37.9	18	22.4
12		L	12	20	02.4	20	40.8
13	24.81	U	13	08	27.4	+22	42.5
13		L	13	20	52.9	24	25.7
14	25.81	U	14	09	18.9	25	49.1
14		L	14	21	45.2	26	51.6
15	26.81	U	15	10	11.7	27	32.1
15		L	15	22	38.3	27	50.5
16	27.81	U	16	11	04.8	+27	46.6
16		L	16	23	31.0	27	20.9
17	28.81	U	17	11	56.7	26	34.5
18	0.23	L	18	00	21.8	25	28.6
18		U	18	12	46.3	24	04.7
19	1.23	L	19	01	10.0	22	24.6
19		U	19	13	32.9	+20	30.0
20	2.23	L	20	01	55.2	18	22.7
20		U	20	14	16.7	16	04.5
21	3.23	L	21	02	37.7	13	36.9
21		U	21	14	58.2	11	01.5
22	4.23	L	22	03	18.3	8	19.7
22		U	22	15	38.2	+5	32.9
23	5.23	L	23	03	58.0	+2	42.2
23		U	23	16	17.8	-0	11.0
24	6.23	L	24	04	37.8	3	05.5
24		U	24	16	58.1	6	00.0
25	7.23	L	25	05	18.9	8	53.0
25		U	25	17	40.4	-11	42.9
26	8.23	L	26	06	02.7	14	27.9
26		U	26	18	26.0	17	05.7
27	9.23	L	27	06	50.5	-19	33.9

Date	Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
	d		d	h	m	°	'
July 27	9.23	L	27	06	50.5	-19	33.9
27		U	27	19	16.2	21	49.5
28	10.23	L	28	07	43.4	23	49.2
28		U	28	20	12.0	25	29.3
29	11.23	L	29	08	42.1	26	46.1
29		U	29	21	13.2	27	36.0
30	12.23	L	30	09	45.4	-27	55.7
30		U	30	22	18.1	27	43.2
31	13.23	L	31	10	51.0	26	57.5
31		U	31	23	23.6	25	39.0
Aug. 1	14.23	L	1	11	55.5	23	49.9
2	15.23	U	2	00	26.5	21	33.1
2		L	2	12	56.3	-18	52.9
3	16.23	U	3	01	25.0	15	53.4
3		L	3	13	52.6	12	39.5
4	17.23	U	4	02	19.1	9	15.4
4		L	4	14	44.8	5	45.5
5	18.23	U	5	03	09.8	-2	13.4
5		L	5	15	34.2	+1	17.4
6	19.23	U	6	03	58.3	4	44.0
6		L	6	16	22.2	8	03.7
7	20.23	U	7	04	46.2	11	14.0
7		L	7	17	10.2	14	12.9
8	21.23	U	8	05	34.5	16	58.4
8		L	8	17	59.1	+19	28.7
9	22.23	U	9	06	24.1	21	42.2
9		L	9	18	49.6	23	37.3
10	23.23	U	10	07	15.4	25	12.7
10		L	10	19	41.6	26	27.2
11	24.23	U	11	08	08.0	27	20.2
11		L	11	20	34.5	+27	50.9
12	25.23	U	12	09	01.0	27	59.5
12		L	12	21	27.2	27	46.1
13	26.23	U	13	09	53.1	27	11.5
13		L	13	22	18.5	26	16.6
14	27.23	U	14	10	43.2	25	03.0
14		L	14	23	07.3	+23	32.0
15	28.23	U	15	11	30.6	21	45.5
15		L	15	23	53.3	19	45.1
16	29.23	U	16	12	15.2	17	32.5
17	0.60	L	17	00	36.5	15	09.4
17		U	17	12	57.3	12	37.6
18	1.60	L	18	01	17.7	+9	58.4
18		U	18	13	37.7	7	13.4
19	2.60	L	19	01	57.5	4	24.0
19		U	19	14	17.2	+1	31.6

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Aug.	19		U	19	14	17.2	+1	31.6
	20	3.60	L	20	02	37.0	-1	22.5
	20		U	20	14	56.9	4	17.0
	21	4.60	L	21	03	17.1	7	10.4
	21		U	21	15	37.9	10	01.1
	22	5.60	L	22	03	59.2	12	47.6
	22		U	22	16	21.4	-15	28.0
	23	6.60	L	23	04	44.5	18	00.2
	23		U	23	17	08.6	20	21.9
	24	7.60	L	24	05	34.0	22	30.4
	24		U	24	18	00.6	24	22.7
	25	8.60	L	25	06	28.5	25	55.6
	25		U	25	18	57.6	-27	06.0
	26	9.60	L	26	07	28.0	27	50.4
	26		U	26	19	59.1	28	06.3
	27	10.60	L	27	08	30.9	27	51.6
	27		U	27	21	02.9	27	05.2
	28	11.60	L	28	09	34.7	25	47.2
	28		U	28	22	06.1	-23	59.0
	29	12.60	L	29	10	36.7	21	43.3
	29		U	29	23	06.5	19	03.1
	30	13.60	L	30	11	35.2	16	02.8
	31	14.60	U	31	00	03.0	12	46.3
	31		L	31	12	29.9	9	18.3
Sept.	1	15.60	U	1	00	56.1	-5	43.0
	1		L	1	13	21.7	-2	04.5
	2	16.60	U	2	01	46.8	+1	33.4
	2		L	2	14	11.7	5	07.2
	3	17.60	U	3	02	36.4	8	33.7
	3		L	3	15	01.2	11	50.0
	4	18.60	U	4	03	26.1	+14	53.7
	4		L	4	15	51.4	17	42.3
	5	19.60	U	5	04	16.9	20	13.9
	5		L	5	16	42.8	22	26.7
	6	20.60	U	6	05	09.0	24	19.3
	6		L	6	17	35.6	25	50.4
	7	21.60	U	7	06	02.4	+26	59.1
	7		L	7	18	29.3	27	44.9
	8	22.60	U	8	06	56.1	28	07.8
	8		L	8	19	22.7	28	08.0
	9	23.60	U	9	07	49.0	27	46.1
	9		L	9	20	14.8	27	03.3
	10	24.60	U	10	08	40.0	+26	00.6
	10		L	10	21	04.4	24	39.8
	11	25.60	U	11	09	28.2	23	02.2
	11		L	11	21	51.2	+21	09.7

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Sept.	11		L	11	21	51.2	+21	09.7
	12	26.60	U	12	10	13.6	19	03.9
	12		L	12	22	35.3	16	46.5
	13	27.60	U	13	10	56.4	14	19.0
	13		L	13	23	17.0	11	43.1
	14	28.60	U	14	11	37.3	9	00.1
	14		L	14	23	57.3	+6	11.7
	15	29.60	U	15	12	17.1	3	19.2
	16	0.93	L	16	00	36.9	+0	24.0
	16		U	16	12	56.8	-2	32.3
	17	1.93	L	17	01	16.9	5	28.3
	17		U	17	13	37.4	8	22.4
	18	2.93	L	18	01	58.4	-11	12.9
	18		U	18	14	20.1	13	58.0
	19	3.93	L	19	02	42.5	16	35.7
	19		U	19	15	05.8	19	03.8
	20	4.93	L	20	03	30.1	21	20.0
	20		U	20	15	55.5	23	21.6
	21	5.93	L	21	04	22.1	-25	06.0
	21		U	21	16	49.7	26	30.1
	22	6.93	L	22	05	18.5	27	31.4
	22		U	22	17	48.1	28	07.1
	23	7.93	L	23	06	18.4	28	15.3
	23		U	23	18	49.1	27	54.3
	24	8.93	L	24	07	19.9	-27	03.7
	24		U	24	19	50.5	25	43.8
	25	9.93	L	25	08	20.7	23	55.8
	25		U	25	20	50.2	21	41.8
	26	10.93	L	26	09	18.9	19	04.7
	26		U	26	21	46.9	16	07.7
	27	11.93	L	27	10	14.1	-12	54.5
	27		U	27	22	40.6	9	28.9
	28	12.93	L	28	11	06.5	5	54.7
	28		U	28	23	32.0	-2	15.8
	29	13.93	L	29	11	57.2	+1	23.9
	30	14.93	U	30	00	22.3	5	01.0
	30		L	30	12	47.4	+8	31.7
Oct.	1	15.93	U	1	01	12.7	11	53.0
	1		L	1	13	38.3	15	01.6
	2	16.93	U	2	02	04.2	17	55.0
	2		L	2	14	30.6	20	30.4
	3	17.93	U	3	02	57.3	22	46.0
	3		L	3	15	24.5	+24	39.7
	4	18.93	U	4	03	51.9	26	10.3
	4		L	4	16	19.5	27	17.0
	5	19.93	U	5	04	47.2	+27	59.3

MOON, 2023
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Oct.	1		L	1	13	38.3	+15	01.6
	2	16.93	U	2	02	04.2	17	55.0
	2		L	2	14	30.6	20	30.4
	3	17.93	U	3	02	57.3	22	46.0
	3		L	3	15	24.5	24	39.7
	4	18.93	U	4	03	51.9	26	10.3
	4		L	4	16	19.5	+27	17.0
	5	19.93	U	5	04	47.2	27	59.3
	5		L	5	17	14.6	28	17.4
	6	20.93	U	6	05	41.7	28	11.9
	6		L	6	18	08.3	27	43.9
	7	21.93	U	7	06	34.2	26	54.7
	7		L	7	18	59.4	+25	45.9
	8	22.93	U	8	07	23.9	24	19.2
	8		L	8	19	47.5	22	36.4
	9	23.93	U	9	08	10.4	20	39.2
	9		L	9	20	32.5	18	29.3
	10	24.93	U	10	08	54.0	16	08.3
	10		L	10	21	14.9	+13	37.8
	11	25.93	U	11	09	35.4	10	59.1
	11		L	11	21	55.6	8	13.7
	12	26.93	U	12	10	15.6	5	23.0
	12		L	12	22	35.5	+2	28.3
	13	27.93	U	13	10	55.4	-0	28.9
	13		L	13	23	15.5	-3	27.1
	14	28.93	U	14	11	36.0	6	24.8
	14		L	14	23	56.8	9	20.2
	15	0.25	U	15	12	18.3	12	11.5
	16	1.25	L	16	00	40.5	14	56.6
	16		U	16	13	03.5	17	33.3
	17	2.25	L	17	01	27.5	-19	59.2
	17		U	17	13	52.4	22	11.6
	18	3.25	L	18	02	18.5	24	07.8
	18		U	18	14	45.6	25	45.0
	19	4.25	L	19	03	13.7	27	00.5
	19		U	19	15	42.7	27	51.7
	20	5.25	L	20	04	12.3	-28	16.7
	20		U	20	16	42.3	28	14.0
	21	6.25	L	21	05	12.5	27	42.9
	21		U	21	17	42.5	26	43.5
	22	7.25	L	22	06	12.1	25	16.8
	22		U	22	18	41.1	23	24.6
	23	8.25	L	23	07	09.4	-21	09.0
	23		U	23	19	36.9	18	32.6
	24	9.25	L	24	08	03.7	15	38.5
	24		U	24	20	29.7	-12	29.8

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Oct.	24		U	24	20	29.7	-12	29.8
	25	10.25	L	25	08	55.2	9	09.6
	25		U	25	21	20.2	5	41.2
	26	11.25	L	26	09	44.9	-2	07.9
	26		U	26	22	09.5	+1	27.1
	27	12.25	L	27	10	34.1	5	00.4
	27		U	27	22	58.9	+8	28.8
	28	13.25	L	28	11	24.0	11	49.1
	28		U	28	23	49.6	14	58.0
	29	14.25	L	29	12	15.6	17	52.4
	30	15.25	U	30	00	42.2	20	29.7
	30		L	30	13	09.4	22	47.0
	31	16.25	U	31	01	37.1	+24	42.4
	31		L	31	14	05.2	26	13.9
Nov.	1	17.25	U	1	02	33.4	27	20.6
	1		L	1	15	01.7	28	01.8
	2	18.25	U	2	03	29.8	28	17.7
	2		L	2	15	57.4	28	09.1
	3	19.25	U	3	04	24.5	+27	37.2
	3		L	3	16	50.8	26	43.6
	4	20.25	U	4	05	16.3	25	30.3
	4		L	4	17	40.9	23	59.3
	5	21.25	U	5	06	04.6	22	12.4
	5		L	5	18	27.4	20	11.7
	6	22.25	U	6	06	49.4	+17	58.9
	6		L	6	19	10.8	15	35.6
	7	23.25	U	7	07	31.6	13	03.4
	7		L	7	19	52.0	10	23.5
	8	24.25	U	8	08	12.0	7	37.5
	8		L	8	20	31.9	4	46.4
	9	25.25	U	9	08	51.8	+1	51.6
	9		L	9	21	11.7	-1	05.7
	10	26.25	U	10	09	31.9	4	03.9
	10		L	10	21	52.5	7	01.6
	11	27.25	U	11	10	13.7	9	57.1
	11		L	11	22	35.5	12	48.5
	12	28.25	U	12	10	58.1	-15	33.4
	12		L	12	23	21.7	18	09.6
	13	29.25	U	13	11	46.4	20	34.2
	14	0.61	L	14	00	12.2	22	44.5
	14		U	14	12	39.1	24	37.1
	15	1.61	L	15	01	07.1	26	09.2
	15		U	15	13	36.1	-27	17.7
	16	2.61	L	16	02	05.9	28	00.3
	16		U	16	14	36.2	28	15.0
	17	3.61	L	17	03	06.7	-28	00.9

MOON, 2023
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Nov.	17	3.61	L	17	03	06.7	-28	00.9
	17		U	17	15	37.1	27	17.8
	18	4.61	L	18	04	07.1	26	06.8
	18		U	18	16	36.5	24	29.5
	19	5.61	L	19	05	05.0	22	28.2
	19		U	19	17	32.6	20	05.7
	20	6.61	L	20	05	59.4	-17	25.0
	20		U	20	18	25.3	14	29.2
	21	7.61	L	21	06	50.4	11	21.2
	21		U	21	19	15.0	8	04.0
	22	8.61	L	22	07	39.1	4	40.5
	22		U	22	20	03.0	-1	13.5
	23	9.61	L	23	08	26.7	+2	14.3
	23		U	23	20	50.6	5	40.0
	24	10.61	L	24	09	14.7	9	00.8
	24		U	24	21	39.2	12	13.9
	25	11.61	L	25	10	04.2	15	16.5
	25		U	25	22	29.7	18	05.6
	26	12.61	L	26	10	56.0	+20	38.5
	26		U	26	23	23.0	22	52.6
	27	13.61	L	27	11	50.6	24	45.3
	28	14.61	U	28	00	18.6	26	14.7
	28		L	28	12	47.0	27	19.4
	29	15.61	U	29	01	15.5	27	58.7
	29		L	29	13	43.9	+28	12.3
	30	16.61	U	30	02	11.8	28	00.9
	30		L	30	14	39.2	27	25.9
Dec.	1	17.61	U	1	03	05.8	26	28.8
	1		L	1	15	31.5	25	11.8
	2	18.61	U	2	03	56.2	23	36.9
	2		L	2	16	20.0	+21	46.6
	3	19.61	U	3	04	42.9	19	42.6
	3		L	3	17	05.0	17	27.1
	4	20.61	U	4	05	26.3	15	01.8
	4		L	4	17	47.0	12	28.3
	5	21.61	U	5	06	07.3	9	47.9
	5		L	5	18	27.2	+7	01.9
	6	22.61	U	6	06	46.9	4	11.7
	6		L	6	19	06.6	+1	18.2
	7	23.61	U	7	07	26.4	-1	37.2
	7		L	7	19	46.4	4	33.3
	8	24.61	U	8	08	06.9	7	28.7
	8		L	8	20	27.9	-10	21.8
	9	25.61	U	9	08	49.7	13	10.9
	9		L	9	21	12.5	15	53.8
	10	26.61	U	10	09	36.2	-18	28.1

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Dec.	10	26.61	U	10	09	36.2	-18	28.1
	10		L	10	22	01.2	20	51.0
	11	27.61	U	11	10	27.3	22	59.4
	11		L	11	22	54.8	24	49.9
	12	28.61	U	12	11	23.4	26	19.1
	12		L	12	23	53.3	27	23.8
	13	0.02	U	13	12	23.9	-28	01.0
	14	1.02	L	14	00	55.1	28	08.9
	14		U	14	13	26.5	27	46.2
	15	2.02	L	15	01	57.7	26	53.2
	15		U	15	14	28.4	25	31.2
	16	3.02	L	16	02	58.3	23	42.3
	16		U	16	15	27.2	-21	29.8
	17	4.02	L	17	03	55.1	18	56.8
	17		U	17	16	21.9	16	07.0
	18	5.02	L	18	04	47.8	13	03.8
	18		U	18	17	12.8	9	50.7
	19	6.02	L	19	05	37.2	6	30.7
	19		U	19	18	01.0	-3	06.8
	20	7.02	L	20	06	24.6	+0	18.4
	20		U	20	18	48.0	3	42.1
	21	8.02	L	21	07	11.4	7	01.9
	21		U	21	19	35.1	10	15.5
	22	9.02	L	22	07	59.2	13	20.2
	22		U	22	20	23.7	+16	13.7
	23	10.02	L	23	08	48.9	18	53.6
	23		U	23	21	14.6	21	17.3
	24	11.02	L	24	09	41.2	23	22.5
	24		U	24	22	08.3	25	07.0
	25	12.02	L	25	10	35.9	26	29.0
	25		U	25	23	03.9	+27	27.0
	26	13.02	L	26	11	32.1	28	00.2
	27	14.02	U	27	00	00.3	28	08.4
	27		L	27	12	28.0	27	52.0
	28	15.02	U	28	00	55.2	27	12.3
	28		L	28	13	21.7	26	10.8
	29	16.02	U	29	01	47.4	+24	49.4
	29		L	29	14	12.0	23	10.5
	30	17.02	U	30	02	35.8	21	16.1
	30		L	30	14	58.7	19	08.6
	31	18.02	U	31	03	20.7	16	49.8
	31		L	31	15	41.9	14	21.8
	32	19.02	U	32	04	02.6	+11	46.2
	32		L	32	16	22.7	9	04.4
	33	20.02	U	33	04	42.5	6	17.9
	33		L	33	17	02.1	+3	27.9

MOON, 2023
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	
		°	°	°	°	°	°	
Jan.	0	+7.369	+2.336	4.34	-1.32	339	248	0.601
	1	7.034	+0.887	16.49	1.34	342	250	0.699
	2	6.411	-0.574	28.63	1.36	345	254	0.787
	3	5.568	1.980	40.77	1.38	349	259	0.862
	4	4.566	3.274	52.91	1.40	353	266	0.921
	5	3.454	4.405	65.04	1.41	358	275	0.965
	6	+2.268	-5.331	77.17	-1.43	3	293	0.990
	7	+1.034	6.017	89.30	1.44	8	12	0.998
	8	-0.229	6.439	101.43	1.46	12	79	0.989
	9	1.503	6.581	113.56	1.46	16	94	0.962
	10	2.770	6.438	125.69	1.47	19	102	0.918
	11	4.002	6.014	137.83	1.48	21	107	0.860
	12	-5.160	-5.323	149.97	-1.48	22	110	0.788
	13	6.191	4.384	162.11	1.49	22	112	0.704
	14	7.030	3.226	174.26	1.49	22	112	0.611
	15	7.601	1.885	186.42	1.49	20	112	0.511
	16	7.821	-0.412	198.58	1.49	18	109	0.407
	17	7.616	+1.130	210.75	1.49	14	105	0.303
	18	-6.928	+2.658	222.93	-1.50	10	100	0.206
	19	5.735	4.069	235.11	1.50	4	92	0.121
	20	4.076	5.250	247.30	1.50	358	81	0.054
	21	-2.052	6.090	259.49	1.51	351	62	0.014
	22	+0.166	6.502	271.68	1.51	346	326	0.002
	23	2.372	6.445	283.87	1.52	342	268	0.022
	24	+4.357	+5.934	296.06	-1.52	339	256	0.070
	25	5.957	5.034	308.24	1.52	338	251	0.142
	26	7.070	3.840	320.43	1.53	338	248	0.231
	27	7.666	2.457	332.60	1.53	339	248	0.331
	28	7.771	+0.982	344.77	1.54	341	250	0.435
	29	7.448	-0.498	356.93	1.54	344	252	0.538
	30	+6.779	-1.915	9.09	-1.55	348	257	0.637
	31	5.849	3.212	21.24	1.56	352	262	0.728
Feb.	1	4.739	4.342	33.39	1.56	357	268	0.809
	2	3.520	5.269	45.53	1.56	2	275	0.877
	3	2.246	5.960	57.67	1.56	7	284	0.932
	4	+0.958	6.391	69.81	1.56	11	295	0.971
	5	-0.315	-6.546	81.94	-1.56	15	316	0.993
	6	1.557	6.416	94.08	1.56	18	46	0.998
	7	2.751	6.004	106.21	1.55	21	93	0.985
	8	3.883	5.322	118.35	1.54	22	104	0.954
	9	4.931	4.395	130.49	1.53	22	109	0.906
	10	5.862	3.254	142.63	1.52	22	111	0.843
	11	-6.631	-1.941	154.78	-1.50	21	111	0.764
	12	7.178	-0.509	166.93	1.49	18	110	0.673
	13	7.437	+0.983	179.09	1.48	15	107	0.572
	14	7.339	2.462	191.26	1.46	11	103	0.465
	15	-6.824	+3.844	203.43	-1.45	6	97	0.357

MOON, 2023
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
		°	°	°	°	°	°	
Feb.	15	-6.824	+3.844	203.43	-1.45	6	97	0.357
	16	5.858	5.037	215.61	1.44	0	89	0.252
	17	4.451	5.940	227.80	1.43	354	81	0.157
	18	2.671	6.466	239.99	1.42	348	71	0.081
	19	-0.647	6.549	252.19	1.41	344	59	0.028
	20	+1.442	6.169	264.39	1.40	340	21	0.003
	21	+3.402	+5.359	276.59	-1.39	338	270	0.009
	22	5.059	4.198	288.79	1.38	338	254	0.043
	23	6.289	2.793	300.99	1.37	338	250	0.102
	24	7.029	+1.261	313.18	1.36	340	249	0.180
	25	7.278	-0.294	325.37	1.35	343	251	0.270
	26	7.076	1.784	337.55	1.34	346	254	0.368
	27	+6.493	-3.144	349.73	-1.33	351	259	0.468
	28	5.613	4.324	1.90	1.32	355	265	0.566
Mar.	1	4.518	5.287	14.07	1.31	0	271	0.660
	2	3.291	6.008	26.23	1.30	5	277	0.746
	3	2.002	6.466	38.39	1.29	10	284	0.823
	4	+0.707	6.645	50.54	1.27	14	291	0.889
	5	-0.547	-6.539	62.69	-1.26	18	297	0.940
	6	1.729	6.146	74.84	1.24	20	306	0.977
	7	2.816	5.476	86.99	1.22	22	328	0.996
	8	3.792	4.550	99.14	1.20	22	80	0.997
	9	4.641	3.400	111.28	1.18	22	105	0.979
	10	-5.345	2.071	123.43	1.15	21	110	0.941
	11	-5.882	-0.621	135.59	-1.13	19	110	0.885
	12	6.218	+0.886	147.74	1.10	16	108	0.811
	13	6.317	2.374	159.91	1.07	12	105	0.722
	14	6.138	3.765	172.08	1.05	8	100	0.621
	15	5.644	4.973	184.25	1.02	2	93	0.511
	16	-4.818	5.914	196.44	1.00	356	86	0.399
	17	-3.666	+6.512	208.63	-0.98	350	78	0.289
	18	2.235	6.704	220.83	0.95	345	71	0.189
	19	-0.613	6.458	233.03	0.93	341	65	0.105
	20	+1.079	5.778	245.24	0.91	339	58	0.044
	21	2.699	4.713	257.45	0.89	338	47	0.008
	22	4.111	3.350	269.67	0.87	338	281	0.002
	23	+5.206	+1.800	281.88	-0.85	339	252	0.022
	24	5.911	+0.179	294.10	0.83	342	250	0.067
	25	6.199	-1.407	306.31	0.81	345	252	0.132
	26	6.081	2.873	318.52	0.79	349	256	0.211
	27	5.598	4.155	330.72	0.77	354	261	0.300
	28	4.810	5.209	342.92	0.75	359	267	0.395
	29	+3.789	-6.007	355.11	-0.73	4	273	0.491
	30	2.611	6.531	7.30	0.71	9	279	0.586
	31	1.350	6.770	19.48	0.69	13	285	0.677
Apr.	1	+0.076	6.720	31.65	0.66	17	290	0.762
	2	-1.149	-6.380	43.83	-0.64	19	294	0.837

MOON, 2023
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	
		°	°	°	°	°	°	
Apr.	1	+0.076	-6.720	31.65	-0.66	17	290	0.762
	2	-1.149	6.380	43.83	0.64	19	294	0.837
	3	2.273	5.757	56.00	0.61	21	298	0.902
	4	3.256	4.867	68.16	0.59	22	301	0.952
	5	4.065	3.737	80.32	0.56	22	305	0.985
	6	4.680	2.407	92.49	0.53	21	332	0.999
	7	-5.086	-0.935	104.65	-0.50	20	107	0.993
	8	5.275	+0.612	116.81	0.46	17	110	0.965
	9	5.243	2.153	128.98	0.43	13	107	0.915
	10	4.987	3.599	141.15	0.40	9	103	0.845
	11	4.511	4.864	153.33	0.37	3	97	0.758
	12	3.823	5.863	165.51	0.34	358	90	0.656
	13	-2.941	+6.526	177.70	-0.31	352	83	0.545
	14	1.893	6.800	189.90	0.28	347	76	0.431
	15	-0.726	6.657	202.10	0.25	342	70	0.319
	16	+0.502	6.097	214.31	0.22	340	66	0.216
	17	1.719	5.153	226.53	0.20	338	63	0.128
	18	2.847	3.891	238.75	0.17	338	61	0.061
	19	+3.810	+2.401	250.98	-0.14	339	60	0.018
	20	4.542	+0.788	263.21	0.12	341	54	0.000
	21	4.994	-0.840	275.44	0.09	343	248	0.008
	22	5.135	2.385	287.67	0.07	347	251	0.040
	23	4.960	3.769	299.90	0.04	352	256	0.091
	24	4.481	4.931	312.13	-0.02	357	262	0.158
	25	+3.731	-5.834	324.35	+0.00	2	268	0.237
	26	2.758	6.454	336.57	0.03	7	275	0.325
	27	1.620	6.781	348.78	0.05	12	281	0.417
	28	+0.386	6.814	0.99	0.08	16	286	0.512
	29	-0.874	6.555	13.19	0.10	19	290	0.606
	30	2.089	6.012	25.38	0.13	21	293	0.697
May	1	-3.189	-5.200	37.57	+0.15	22	296	0.781
	2	4.113	4.140	49.76	0.18	22	297	0.856
	3	4.805	2.864	61.94	0.21	22	297	0.919
	4	5.226	-1.419	74.12	0.24	20	295	0.966
	5	5.350	+0.132	86.30	0.27	18	289	0.994
	6	5.172	1.710	98.48	0.30	15	128	0.999
	7	-4.704	+3.222	110.65	+0.33	10	110	0.980
	8	3.982	4.570	122.83	0.37	5	102	0.937
	9	3.056	5.658	135.02	0.40	359	95	0.870
	10	1.991	6.408	147.20	0.43	353	87	0.784
	11	-0.855	6.765	159.40	0.45	348	80	0.682
	12	+0.283	6.703	171.60	0.48	343	74	0.571
	13	+1.365	+6.230	183.81	+0.51	340	69	0.456
	14	2.343	5.381	196.02	0.53	338	66	0.344
	15	3.182	4.216	208.25	0.56	338	65	0.240
	16	3.855	2.814	220.48	0.58	338	65	0.151
	17	+4.344	+1.267	232.71	+0.61	340	67	0.081

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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
		°	°	°	°	°	°	
May	17	+4.344	+1.267	232.71	+0.61	340	67	0.081
	18	4.633	-0.329	244.95	0.63	342	71	0.031
	19	4.710	1.881	257.19	0.66	346	84	0.005
	20	4.564	3.306	269.44	0.68	350	227	0.002
	21	4.191	4.537	281.68	0.70	355	252	0.020
	22	3.593	5.522	293.92	0.72	0	261	0.058
	23	+2.783	-6.229	306.16	+0.75	5	269	0.113
	24	1.786	6.643	318.40	0.77	10	276	0.181
	25	+0.640	6.760	330.63	0.79	14	282	0.261
	26	-0.602	6.583	342.86	0.81	18	286	0.348
	27	1.879	6.124	355.08	0.83	20	290	0.440
	28	3.117	5.400	7.30	0.85	22	293	0.536
	29	-4.240	-4.432	19.51	+0.87	22	294	0.631
	30	5.169	3.246	31.72	0.89	22	295	0.723
	31	5.829	1.880	43.92	0.92	21	294	0.808
June	1	6.153	-0.386	56.11	0.94	19	291	0.883
	2	6.096	+1.171	68.30	0.96	16	286	0.942
	3	5.637	2.704	80.49	0.99	12	276	0.982
	4	-4.793	+4.113	92.68	+1.01	7	221	0.999
	5	3.620	5.294	104.86	1.04	1	112	0.989
	6	2.211	6.151	117.05	1.06	355	96	0.952
	7	-0.686	6.610	129.24	1.08	349	86	0.889
	8	+0.828	6.636	141.44	1.10	344	78	0.805
	9	2.215	6.235	153.64	1.12	341	72	0.704
	10	+3.392	+5.446	165.85	+1.14	339	69	0.594
	11	4.308	4.337	178.06	1.15	338	67	0.480
	12	4.948	2.992	190.28	1.17	338	66	0.369
	13	5.320	+1.502	202.51	1.19	339	67	0.267
	14	5.447	-0.045	214.75	1.20	342	70	0.177
	15	5.355	1.563	226.99	1.22	345	75	0.104
	16	+5.068	-2.975	239.24	+1.24	349	82	0.050
	17	4.604	4.215	251.49	1.25	353	95	0.015
	18	3.972	5.231	263.74	1.27	358	148	0.002
	19	3.181	5.985	275.99	1.28	4	247	0.008
	20	2.236	6.453	288.24	1.30	9	265	0.033
	21	+1.152	6.627	300.49	1.31	13	275	0.076
	22	-0.049	-6.508	312.73	+1.33	17	282	0.134
	23	1.331	6.109	324.98	1.34	19	286	0.204
	24	2.645	5.448	337.21	1.35	21	290	0.285
	25	3.926	4.550	349.44	1.36	22	292	0.374
	26	5.098	3.443	1.67	1.37	22	293	0.469
	27	6.078	2.161	13.89	1.38	21	293	0.567
	28	-6.775	-0.748	26.10	+1.40	20	292	0.665
	29	7.107	+0.742	38.31	1.41	17	289	0.759
	30	7.004	2.239	50.51	1.42	14	284	0.844
July	1	6.424	3.656	62.71	1.43	9	276	0.916
	2	-5.369	+4.892	74.90	+1.45	4	265	0.968

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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
		°	°	°	°	°	°	
July	1	-6.424	+3.656	62.71	+1.43	9	276	0.916
	2	5.369	4.892	74.90	1.45	4	265	0.968
	3	3.894	5.844	87.09	1.46	357	235	0.995
	4	2.114	6.419	99.28	1.47	351	116	0.994
	5	-0.188	6.556	111.47	1.47	346	89	0.964
	6	+1.710	6.239	123.66	1.48	342	78	0.907
	7	+3.415	+5.503	135.86	+1.49	339	72	0.826
	8	4.810	4.420	148.06	1.49	338	69	0.728
	9	5.828	3.085	160.27	1.50	338	67	0.621
	10	6.454	1.600	172.49	1.50	339	68	0.510
	11	6.714	+0.062	184.71	1.50	341	69	0.401
	12	6.651	-1.443	196.94	1.51	344	73	0.300
	13	+6.321	-2.841	209.17	+1.51	348	78	0.209
	14	5.773	4.073	221.41	1.52	352	84	0.133
	15	5.051	5.090	233.66	1.53	357	92	0.073
	16	4.186	5.855	245.91	1.53	2	104	0.031
	17	3.199	6.343	258.16	1.54	7	126	0.007
	18	2.103	6.543	270.41	1.54	12	219	0.002
	19	+0.913	-6.453	282.66	+1.54	16	266	0.016
	20	-0.355	6.082	294.91	1.54	19	279	0.047
	21	1.677	5.450	307.16	1.55	21	286	0.094
	22	3.015	4.583	319.40	1.55	22	290	0.155
	23	4.317	3.513	331.64	1.55	22	292	0.230
	24	5.516	2.277	343.88	1.55	22	292	0.315
	25	-6.535	-0.918	356.10	+1.55	20	292	0.409
	26	7.285	+0.515	8.33	1.55	18	290	0.509
	27	7.676	1.962	20.54	1.55	15	286	0.612
	28	7.627	3.352	32.75	1.54	11	281	0.713
	29	7.079	4.599	44.95	1.54	6	274	0.807
	30	6.014	5.609	57.14	1.54	0	266	0.889
	31	-4.470	+6.285	69.33	+1.54	354	254	0.951
Aug.	1	2.552	6.547	81.52	1.53	348	234	0.989
	2	-0.423	6.350	93.71	1.52	343	129	0.997
	3	+1.719	5.699	105.89	1.51	340	83	0.975
	4	3.682	4.653	118.08	1.50	338	73	0.925
	5	5.313	3.309	130.27	1.49	338	69	0.850
	6	+6.519	+1.785	142.47	+1.48	339	68	0.758
	7	7.269	+0.197	154.67	1.47	340	69	0.655
	8	7.579	-1.356	166.88	1.46	343	71	0.548
	9	7.498	2.791	179.09	1.45	347	75	0.442
	10	7.089	4.049	191.31	1.45	351	81	0.342
	11	6.419	5.083	203.54	1.44	356	87	0.250
	12	+5.548	-5.863	215.77	+1.43	1	94	0.170
	13	4.526	6.366	228.01	1.42	6	102	0.104
	14	3.393	6.581	240.25	1.42	11	111	0.054
	15	2.180	6.507	252.50	1.41	15	123	0.020
	16	+0.908	-6.151	264.74	+1.40	18	155	0.003

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Date 0^h TT		The Earth's Selenographic		The Sun's Selenographic		Position Angle of		Fraction Illuminated
		Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
		°	°	°	°	°	°	
Aug.	16	+0.908	-6.151	264.74	+1.40	18	155	0.003
	17	-0.402	5.529	276.99	1.39	20	258	0.005
	18	1.727	4.668	289.23	1.38	22	281	0.024
	19	3.037	3.602	301.47	1.37	22	288	0.061
	20	4.293	2.370	313.71	1.36	22	291	0.114
	21	5.442	-1.018	325.95	1.35	21	292	0.182
	22	-6.422	+0.401	338.17	+1.34	19	291	0.264
	23	7.157	1.830	350.40	1.33	16	288	0.356
	24	7.570	3.205	2.61	1.31	13	284	0.458
	25	7.584	4.453	14.82	1.30	8	279	0.564
	26	7.141	5.493	27.02	1.29	3	272	0.670
	27	6.210	6.241	39.22	1.27	357	264	0.772
	28	-4.809	+6.617	51.41	+1.25	351	255	0.862
	29	3.016	6.559	63.59	1.23	345	246	0.934
	30	-0.966	6.043	75.77	1.21	342	234	0.981
	31	+1.164	5.094	87.94	1.19	339	172	0.999
Sept.	1	3.185	3.788	100.12	1.16	338	79	0.986
	2	4.933	2.238	112.29	1.14	338	70	0.945
	3	+6.292	+0.576	124.47	+1.12	340	68	0.879
	4	7.200	-1.074	136.66	1.09	342	70	0.795
	5	7.649	2.611	148.85	1.07	345	73	0.699
	6	7.668	3.959	161.04	1.05	350	78	0.597
	7	7.311	5.066	173.24	1.03	354	83	0.494
	8	6.643	5.902	185.45	1.01	360	90	0.395
	9	+5.733	-6.449	197.67	+0.99	5	97	0.302
	10	4.646	6.700	209.88	0.97	10	103	0.218
	11	3.438	6.657	222.11	0.95	14	109	0.145
	12	2.158	6.327	234.34	0.93	17	115	0.085
	13	+0.847	5.727	246.57	0.92	20	121	0.040
	14	-0.462	4.878	258.80	0.90	21	130	0.011
	15	-1.737	-3.814	271.03	+0.88	22	188	0.001
	16	2.949	2.573	283.26	0.86	22	283	0.008
	17	4.066	-1.205	295.49	0.84	21	290	0.035
	18	5.052	+0.235	307.72	0.82	20	291	0.079
	19	5.862	1.686	319.94	0.80	17	290	0.141
	20	6.448	3.082	332.16	0.78	14	287	0.219
	21	-6.756	+4.352	344.38	+0.76	9	282	0.311
	22	6.737	5.425	356.58	0.74	4	276	0.413
	23	6.349	6.226	8.78	0.72	358	269	0.522
	24	5.571	6.688	20.97	0.69	353	261	0.633
	25	4.412	6.754	33.15	0.66	347	254	0.739
	26	2.923	6.387	45.33	0.64	343	248	0.836
	27	-1.195	+5.588	57.50	+0.60	340	243	0.915
	28	+0.645	4.400	69.66	0.57	338	238	0.970
	29	2.452	2.909	81.83	0.54	338	226	0.997
	30	4.086	+1.234	93.99	0.51	339	74	0.995
Oct.	1	+5.428	-0.492	106.15	+0.47	341	68	0.965

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		°	°	°	°	°	°	
Oct.	1	+5.428	-0.492	106.15	+0.47	341	68	0.965
	2	6.398	2.146	118.31	0.44	344	70	0.911
	3	6.955	3.625	130.48	0.41	348	74	0.837
	4	7.095	4.860	142.65	0.37	353	79	0.751
	5	6.845	5.808	154.83	0.35	358	86	0.656
	6	6.253	6.448	167.01	0.32	3	92	0.558
	7	+5.381	-6.776	179.20	+0.29	8	98	0.460
	8	4.297	6.797	191.40	0.27	13	104	0.365
	9	3.070	6.523	203.60	0.24	16	109	0.277
	10	1.767	5.972	215.80	0.22	19	113	0.197
	11	+0.448	5.166	228.01	0.20	21	116	0.127
	12	-0.831	4.133	240.23	0.17	22	118	0.071
	13	-2.023	-2.911	252.44	+0.15	22	120	0.029
	14	3.088	1.543	264.66	0.13	21	121	0.006
	15	3.992	-0.086	276.87	0.11	20	290	0.001
	16	4.707	+1.398	289.09	0.08	18	293	0.016
	17	5.211	2.837	301.30	0.06	15	290	0.052
	18	5.484	4.156	313.51	0.04	10	286	0.107
	19	-5.511	+5.281	325.72	+0.01	5	280	0.181
	20	5.282	6.139	337.92	-0.01	360	273	0.271
	21	4.795	6.670	350.11	0.04	354	266	0.374
	22	4.055	6.824	2.30	0.07	349	259	0.485
	23	3.083	6.573	14.48	0.10	344	253	0.598
	24	1.915	5.913	26.65	0.13	341	248	0.708
	25	-0.603	+4.871	38.81	-0.16	339	245	0.808
	26	+0.782	3.510	50.96	0.19	338	243	0.892
	27	2.157	1.920	63.12	0.23	338	244	0.954
	28	3.434	+0.215	75.26	0.26	340	247	0.990
	29	4.525	-1.481	87.41	0.30	342	41	1.000
	30	5.357	3.055	99.56	0.34	346	66	0.983
	31	+5.872	-4.414	111.70	-0.37	351	73	0.942
Nov.	1	6.038	5.493	123.85	0.40	356	80	0.882
	2	5.848	6.258	136.01	0.43	1	87	0.807
	3	5.324	6.694	148.17	0.46	6	94	0.722
	4	4.504	6.809	160.33	0.49	11	100	0.630
	5	3.449	6.616	172.50	0.52	15	105	0.536
	6	+2.227	-6.139	184.67	-0.54	18	109	0.441
	7	+0.915	5.402	196.86	0.56	20	113	0.349
	8	-0.409	4.435	209.04	0.59	22	115	0.262
	9	1.669	3.270	221.23	0.61	22	116	0.182
	10	2.793	1.947	233.43	0.63	22	115	0.114
	11	3.722	-0.514	245.62	0.65	21	113	0.059
	12	-4.407	+0.970	257.82	-0.67	19	108	0.021
	13	4.817	2.435	270.03	0.69	16	86	0.002
	14	4.940	3.803	282.23	0.71	12	305	0.005
	15	4.781	4.991	294.43	0.73	7	288	0.030
	16	-4.368	+5.920	306.63	-0.75	1	279	0.079

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		°	°	°	°	°	°	
Nov.	16	-4.368	+5.920	306.63	-0.75	1	279	0.079
	17	3.742	6.521	318.82	0.77	355	271	0.148
	18	2.952	6.746	331.01	0.79	350	263	0.236
	19	2.050	6.570	343.19	0.81	345	257	0.339
	20	1.083	5.998	355.36	0.84	342	251	0.450
	21	-0.091	5.059	7.53	0.86	339	248	0.564
	22	+0.894	+3.811	19.69	-0.89	338	246	0.675
	23	1.846	2.332	31.84	0.92	338	245	0.777
	24	2.738	+0.717	43.98	0.95	339	247	0.864
	25	3.538	-0.930	56.12	0.98	341	251	0.932
	26	4.209	2.504	68.26	1.01	344	259	0.977
	27	4.707	3.909	80.39	1.03	349	289	0.998
	28	+4.987	-5.069	92.53	-1.06	354	56	0.995
	29	5.009	5.933	104.66	1.09	359	76	0.969
	30	4.750	6.471	116.80	1.11	4	86	0.924
Dec.	1	4.202	6.680	128.94	1.14	10	94	0.863
	2	3.382	6.572	141.08	1.16	14	101	0.790
	3	2.329	6.169	153.23	1.18	17	106	0.707
	4	+1.100	-5.502	165.38	-1.19	20	110	0.617
	5	-0.232	4.603	177.54	1.21	21	112	0.524
	6	1.582	3.508	189.70	1.22	22	114	0.430
	7	2.861	2.253	201.87	1.24	22	114	0.338
	8	3.977	-0.882	214.05	1.25	21	113	0.250
	9	4.848	+0.556	226.23	1.26	19	111	0.169
	10	-5.400	+2.000	238.41	-1.28	17	106	0.101
	11	5.585	3.380	250.60	1.29	13	99	0.047
	12	5.380	4.612	262.79	1.30	9	84	0.013
	13	4.803	5.610	274.98	1.31	3	1	0.001
	14	3.907	6.292	287.17	1.32	357	287	0.015
	15	2.781	6.596	299.36	1.33	351	272	0.055
	16	-1.532	+6.488	311.55	-1.34	346	262	0.118
	17	-0.267	5.969	323.73	1.35	342	255	0.203
	18	+0.922	5.076	335.90	1.36	340	250	0.303
	19	1.975	3.874	348.07	1.38	338	248	0.413
	20	2.858	2.448	0.23	1.39	338	246	0.526
	21	3.567	+0.893	12.39	1.40	339	247	0.637
	22	+4.109	-0.696	24.53	-1.42	341	249	0.740
	23	4.497	2.225	36.67	1.44	343	253	0.829
	24	4.737	3.610	48.81	1.45	347	260	0.902
	25	4.827	4.779	60.94	1.47	352	269	0.955
	26	4.751	5.677	73.07	1.48	357	286	0.987
	27	4.489	6.269	85.20	1.50	3	359	0.998
	28	+4.019	-6.538	97.32	-1.51	8	74	0.988
	29	3.329	6.488	109.45	1.52	12	91	0.959
	30	2.419	6.138	121.58	1.53	16	100	0.913
	31	1.309	5.517	133.72	1.53	19	106	0.853
	32	+0.041	-4.661	145.86	-1.54	21	109	0.780

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Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Jan. 0	59 46 28.5	+1 21 49.8	0.310 0775	Feb. 15	255 21 22.6	-3 09 57.2	0.466 6011
1	66 00 26.3	2 06 17.8	0.308 5916	16	258 06 01.8	3 27 44.1	0.466 6934
2	72 17 36.5	2 49 35.5	0.307 7306	17	260 50 49.1	3 45 02.7	0.466 5063
3	78 36 34.3	3 30 59.4	0.307 5085	18	263 35 56.8	4 01 51.7	0.466 0401
4	84 55 49.9	4 09 48.4	0.307 9289	19	266 21 36.9	4 18 09.9	0.465 2952
5	91 13 52.2	4 45 25.6	0.308 9849	20	269 08 01.9	4 33 55.7	0.464 2726
6	97 29 11.6	+5 17 20.5	0.310 6595	21	271 55 24.2	-4 49 07.6	0.462 9735
7	103 40 22.7	5 45 09.8	0.312 9264	22	274 43 56.4	5 03 43.8	0.461 3993
8	109 46 07.0	6 08 38.1	0.315 7508	23	277 33 51.4	5 17 42.5	0.459 5520
9	115 45 15.3	6 27 37.8	0.319 0917	24	280 25 22.4	5 31 01.5	0.457 4339
10	121 36 48.9	6 42 08.9	0.322 9026	25	283 18 42.8	5 43 38.5	0.455 0478
11	127 20 00.7	6 52 17.7	0.327 1337	26	286 14 06.5	5 55 31.0	0.452 3970
12	132 54 15.1	+6 58 15.9	0.331 7333	27	289 11 47.8	-6 06 36.0	0.449 4852
13	138 19 07.6	7 00 19.0	0.336 6491	28	292 12 01.6	6 16 50.6	0.446 3168
14	143 34 24.2	6 58 45.5	0.341 8293	Mar. 1	295 15 03.1	6 26 11.3	0.442 8970
15	148 39 60.0	6 53 55.1	0.347 2239	2	298 21 08.3	6 34 34.3	0.439 2313
16	153 35 58.0	6 46 08.6	0.352 7848	3	301 30 33.7	6 41 55.4	0.435 3266
17	158 22 28.0	6 35 46.2	0.358 4670	4	304 43 36.4	6 48 10.2	0.431 1902
18	162 59 44.7	+6 23 07.8	0.364 2282	5	308 00 34.3	-6 53 13.5	0.426 8307
19	167 28 07.0	6 08 31.7	0.370 0294	6	311 21 46.1	6 57 00.2	0.422 2579
20	171 47 56.6	5 52 15.3	0.375 8351	7	314 47 30.8	6 59 24.1	0.417 4827
21	175 59 37.6	5 34 34.1	0.381 6126	8	318 18 08.6	7 00 19.1	0.412 5175
22	180 03 34.9	5 15 42.3	0.387 3324	9	321 54 00.1	6 59 38.1	0.407 3762
23	184 00 14.4	4 55 52.6	0.392 9678	10	325 35 26.6	6 57 14.1	0.402 0748
24	187 50 01.9	+4 35 16.0	0.398 4951	11	329 22 49.9	-6 52 59.0	0.396 6308
25	191 33 23.4	4 14 02.4	0.403 8927	12	333 16 32.4	6 46 45.0	0.391 0642
26	195 10 44.0	3 52 20.3	0.409 1415	13	337 16 56.4	6 38 23.5	0.385 3972
27	198 42 28.3	3 30 17.3	0.414 2246	14	341 24 24.6	6 27 46.0	0.379 6546
28	202 09 00.0	3 07 59.7	0.419 1267	15	345 39 19.0	6 14 43.8	0.373 8640
29	205 30 42.2	2 45 33.3	0.423 8344	16	350 02 01.3	5 59 08.7	0.368 0559
30	208 47 56.6	+2 23 02.7	0.428 3359	17	354 32 51.9	-5 40 52.9	0.362 2639
31	212 01 04.3	2 00 32.2	0.432 6206	18	359 12 09.4	5 19 49.7	0.356 5249
Feb. 1	215 10 25.4	1 38 05.3	0.436 6791	19	4 00 09.8	4 55 53.6	0.350 8790
2	218 16 19.0	1 15 45.1	0.440 5035	20	8 57 06.1	4 29 01.4	0.345 3692
3	221 19 03.4	0 53 34.4	0.444 0863	21	14 03 07.0	3 59 12.4	0.340 0419
4	224 18 56.2	0 31 35.3	0.447 4213	22	19 18 15.8	3 26 29.4	0.334 9457
5	227 16 13.9	+0 09 49.9	0.450 5031	23	24 42 29.6	-2 50 59.2	0.330 1314
6	230 11 12.7	-0 11 40.0	0.453 3267	24	30 15 38.1	2 12 53.4	0.325 6510
7	233 04 07.8	0 32 52.9	0.455 8880	25	35 57 22.1	1 32 29.1	0.321 5568
8	235 55 14.2	0 53 47.4	0.458 1834	26	41 47 13.1	0 50 09.2	0.317 9001
9	238 44 46.1	-1 14 22.3	0.460 2098	27	47 44 32.3	-0 06 22.0	0.314 7296
10	241 32 57.4	1 34 36.4	0.461 9646	28	53 48 30.1	+0 38 18.1	0.312 0902
11	244 20 01.3	-1 54 28.5	0.463 4456	29	59 58 06.5	+1 23 12.5	0.310 0210
12	247 06 11.2	2 13 57.7	0.464 6510	30	66 12 11.6	2 07 39.1	0.308 5541
13	249 51 39.6	2 33 02.9	0.465 5793	31	72 29 26.7	2 50 54.0	0.307 7126
14	252 36 39.3	2 51 43.1	0.466 2296	Apr. 1	78 48 26.6	3 32 13.8	0.307 5103
15	255 21 22.6	-3 09 57.2	0.466 6011	2	85 07 41.5	4 10 57.3	0.307 9504

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Date	Heliocentric Longitude ° ′ ″	Heliocentric Latitude ° ′ ″	Radius Vector	Date	Heliocentric Longitude ° ′ ″	Heliocentric Latitude ° ′ ″	Radius Vector
Apr. 1	78 48 26.6	+3 32 13.8	0.307 5103	May 17	263 41 13.5	-4 02 22.5	0.466 0223
2	85 07 41.5	4 10 57.3	0.307 9504	18	266 26 54.8	4 18 39.6	0.465 2689
3	91 25 40.4	4 46 28.2	0.309 0258	19	269 13 21.3	4 34 24.4	0.464 2377
4	97 40 53.5	5 18 15.9	0.310 7192	20	272 00 45.5	4 49 35.2	0.462 9300
5	103 51 55.9	5 45 57.3	0.313 0038	21	274 49 20.1	5 04 10.3	0.461 3474
6	109 57 29.1	6 09 17.4	0.315 8449	22	277 39 17.8	5 18 07.8	0.459 4917
7	115 56 24.4	+6 28 08.8	0.319 2011	23	280 30 51.8	-5 31 25.5	0.457 3652
8	121 47 43.3	6 42 31.7	0.323 0258	24	283 24 15.8	5 44 01.2	0.454 9709
9	127 30 39.2	6 52 32.6	0.327 2692	25	286 19 43.5	5 55 52.2	0.452 3119
10	133 04 36.6	6 58 23.2	0.331 8794	26	289 17 29.2	6 06 55.8	0.449 3921
11	138 29 11.6	7 00 19.4	0.336 8042	27	292 17 47.9	6 17 08.8	0.446 2158
12	143 44 10.4	6 58 39.4	0.341 9919	28	295 20 54.8	6 26 27.8	0.442 7882
13	148 49 28.4	+6 53 43.3	0.347 3924	29	298 27 05.8	-6 34 48.9	0.439 1150
14	153 45 08.8	6 45 51.7	0.352 9579	30	301 36 37.6	6 42 08.1	0.435 2029
15	158 31 21.5	6 35 24.8	0.358 6432	31	304 49 47.3	6 48 20.7	0.431 0594
16	163 08 21.4	6 22 42.4	0.364 4063	June 1	308 06 52.7	6 53 21.8	0.426 6931
17	167 36 27.5	6 08 03.0	0.370 2084	2	311 28 12.6	6 57 05.9	0.422 1138
18	171 56 01.8	5 51 43.7	0.376 0138	3	314 54 06.0	6 59 27.3	0.417 3324
19	176 07 28.0	+5 34 00.1	0.381 7900	4	318 24 53.1	-7 00 19.4	0.412 3614
20	180 11 11.4	5 15 06.4	0.387 5076	5	322 00 54.7	6 59 35.4	0.407 2149
21	184 07 37.7	4 55 15.0	0.393 1402	6	325 42 31.8	6 57 08.0	0.401 9087
22	187 57 13.0	4 34 37.1	0.398 6639	7	329 30 06.5	6 52 49.5	0.396 4605
23	191 40 22.9	4 13 22.5	0.404 0572	8	333 24 01.0	6 46 31.6	0.390 8903
24	195 17 32.7	3 51 39.7	0.409 3013	9	337 24 37.8	6 38 06.1	0.385 2204
25	198 49 07.0	+3 29 36.1	0.414 3790	10	341 32 19.4	-6 27 24.2	0.379 4758
26	202 15 29.4	3 07 18.2	0.419 2754	11	345 47 28.1	6 14 17.4	0.373 6840
27	205 37 02.9	2 44 51.5	0.423 9770	12	350 10 25.2	5 58 37.5	0.367 8758
28	208 54 09.4	2 22 20.9	0.428 4720	13	354 41 31.2	5 40 16.6	0.362 0847
29	212 07 09.8	1 59 50.5	0.432 7499	14	359 21 04.6	5 19 08.1	0.356 3479
30	215 16 24.2	1 37 23.7	0.436 8014	15	4 09 21.5	4 55 06.6	0.350 7053
May 1	218 22 11.6	+1 15 03.8	0.440 6184	16	9 06 34.7	-4 28 09.0	0.345 2004
2	221 24 50.4	0 52 53.4	0.444 1937	17	14 12 52.6	3 58 14.6	0.339 8793
3	224 24 38.0	0 30 54.7	0.447 5211	18	19 28 18.5	3 25 26.2	0.334 7909
4	227 21 51.2	+0 09 09.8	0.450 5950	19	24 52 49.2	2 49 51.0	0.329 9861
5	230 16 45.9	-0 12 19.6	0.453 4106	20	30 26 14.1	2 11 40.6	0.325 5168
6	233 09 37.4	0 33 32.0	0.455 9638	21	36 08 13.8	1 31 12.4	0.321 4352
7	236 00 40.6	-0 54 25.9	0.458 2509	22	41 58 19.6	-0 48 49.2	0.317 7927
8	238 50 09.8	1 15 00.2	0.460 2690	23	47 55 52.1	-0 04 59.8	0.314 6380
9	241 38 18.7	1 35 13.5	0.462 0154	24	54 00 01.5	+0 39 41.4	0.312 0156
10	244 25 20.7	1 55 05.0	0.463 4879	25	60 09 47.6	1 24 35.6	0.309 9647
11	247 11 29.0	2 14 33.5	0.464 6848	26	66 24 00.0	2 09 00.7	0.308 5167
12	249 56 56.3	2 33 37.9	0.465 6046	27	72 41 20.0	2 52 12.7	0.307 6949
13	252 41 55.3	-2 52 17.3	0.466 2463	28	79 00 21.9	+3 33 28.3	0.307 5125
14	255 26 38.3	3 10 30.6	0.466 6092	29	85 19 36.0	4 12 06.4	0.307 9725
15	258 11 17.5	3 28 16.6	0.466 6928	30	91 37 31.3	4 47 30.8	0.309 0675
16	260 56 05.2	3 45 34.4	0.466 4971	July 1	97 52 38.2	5 19 11.2	0.310 7797
17	263 41 13.5	-4 02 22.5	0.466 0223	2	104 03 31.6	+5 46 44.8	0.313 0822

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Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
July 1	97 52 38.2	+5 19 11.2	0.310 7797	Aug. 16	272 06 08.3	-4 50 02.9	0.462 8852
2	104 03 31.6	5 46 44.8	0.313 0822	17	274 54 45.2	5 04 36.8	0.461 2940
3	110 08 53.7	6 09 56.6	0.315 9400	18	277 44 45.7	5 18 33.1	0.459 4298
4	116 07 35.8	6 28 39.6	0.319 3115	19	280 36 23.0	5 31 49.6	0.457 2950
5	121 58 39.9	6 42 54.3	0.323 1501	20	283 29 50.5	5 44 24.0	0.454 8923
6	127 41 19.7	6 52 47.2	0.327 4058	21	286 25 22.3	5 56 13.6	0.452 2251
7	133 15 00.1	+6 58 30.4	0.332 0267	22	289 23 12.6	-6 07 15.6	0.449 2972
8	138 39 17.5	7 00 19.5	0.336 9605	23	292 23 36.3	6 17 27.0	0.446 1130
9	143 53 58.3	6 58 33.2	0.342 1557	24	295 26 48.7	6 26 44.2	0.442 6776
10	148 58 58.4	6 53 31.3	0.347 5621	25	298 33 05.7	6 35 03.5	0.438 9969
11	153 54 21.0	6 45 34.5	0.353 1321	26	301 42 44.0	6 42 20.7	0.435 0775
12	158 40 16.4	6 35 03.2	0.358 8205	27	304 56 00.7	6 48 31.2	0.430 9269
13	163 16 59.5	+6 22 16.9	0.364 5855	28	308 13 13.9	-6 53 30.0	0.426 5538
14	167 44 49.4	6 07 34.1	0.370 3883	29	311 34 41.9	6 57 11.7	0.421 9680
15	172 04 08.1	5 51 12.0	0.376 1934	30	315 00 44.2	6 59 30.3	0.417 1806
16	176 15 19.6	5 33 26.0	0.381 9683	31	318 31 40.8	7 00 19.5	0.412 2039
17	180 18 49.0	5 14 30.3	0.387 6838	Sept. 1	322 07 52.5	6 59 32.4	0.407 0522
18	184 15 02.2	4 54 37.3	0.393 3134	2	325 49 40.4	6 57 01.7	0.401 7412
19	188 04 25.1	+4 33 58.2	0.398 8334	3	329 37 26.6	-6 52 39.6	0.396 2890
20	191 47 23.4	4 12 42.6	0.404 2225	4	333 31 33.4	6 46 18.0	0.390 7154
21	195 24 22.4	3 50 59.0	0.409 4617	5	337 32 23.0	6 37 48.3	0.385 0428
22	198 55 46.6	3 28 54.9	0.414 5341	6	341 40 18.3	6 27 02.1	0.379 2964
23	202 21 59.7	3 06 36.6	0.419 4247	7	345 55 41.2	6 13 50.7	0.373 5037
24	205 43 24.6	2 44 09.7	0.424 1201	8	350 18 53.2	5 58 05.8	0.367 6955
25	209 00 23.1	+2 21 39.0	0.428 6085	9	354 50 14.7	-5 39 39.9	0.361 9057
26	212 13 16.1	1 59 08.7	0.432 8796	10	359 30 04.2	5 18 26.0	0.356 1713
27	215 22 23.7	1 36 42.1	0.436 9240	11	4 18 37.6	4 54 19.1	0.350 5325
28	218 28 05.0	1 14 22.5	0.440 7336	12	9 16 07.5	4 27 16.0	0.345 0327
29	221 30 38.2	0 52 12.4	0.444 3013	13	14 22 42.4	3 57 16.1	0.339 7182
30	224 30 20.8	0 30 14.1	0.447 6209	14	19 38 25.3	3 24 22.4	0.334 6380
31	227 27 29.3	+0 08 29.6	0.450 6869	15	25 03 12.8	-2 48 42.1	0.329 8429
Aug. 1	230 22 19.9	-0 12 59.3	0.453 4944	16	30 36 53.9	2 10 27.2	0.325 3851
2	233 15 07.9	0 34 11.1	0.456 0394	17	36 19 09.1	1 29 55.0	0.321 3166
3	236 06 07.9	0 55 04.4	0.458 3182	18	42 09 29.1	0 47 28.7	0.317 6887
4	238 55 34.3	1 15 38.1	0.460 3279	19	48 07 14.6	-0 03 37.3	0.314 5500
5	241 43 40.9	1 35 50.8	0.462 0658	20	54 11 35.3	+0 41 05.0	0.311 9449
6	244 30 41.1	-1 55 41.5	0.463 5298	21	60 21 30.5	+1 25 58.9	0.309 9124
7	247 16 47.9	2 15 09.3	0.464 7181	22	66 35 49.7	2 10 22.4	0.308 4837
8	250 02 14.1	2 34 13.0	0.465 6292	23	72 53 13.9	2 53 31.4	0.307 6817
9	252 47 12.3	2 52 51.5	0.466 2623	24	79 12 17.3	3 34 42.6	0.307 5193
10	255 31 54.9	3 11 04.0	0.466 6165	25	85 31 30.1	4 13 15.3	0.307 9992
11	258 16 34.2	3 28 49.2	0.466 6914	26	91 49 21.1	4 48 33.1	0.309 1137
12	261 01 22.4	-3 46 06.0	0.466 4870	27	98 04 21.1	+5 20 06.2	0.310 8446
13	263 46 31.5	4 02 53.2	0.466 0034	28	104 15 05.1	5 47 31.8	0.313 1649
14	266 32 14.0	4 19 09.4	0.465 2413	29	110 20 15.4	6 10 35.4	0.316 0393
15	269 18 42.1	4 34 53.1	0.464 2015	30	116 18 43.9	6 29 10.1	0.319 4259
16	272 06 08.3	-4 50 02.9	0.462 8852	Oct. 1	122 09 32.8	+6 43 16.6	0.323 2781

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Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Oct.	1	122	09	32.8	+6	43	16.6	0.323 2781	Nov.	16	283	35	22.6	-5	44	46.5	0.454 8149
	2	127	51	56.1	6	53	01.6	0.327 5458		17	286	30	58.4	5	56	34.7	0.452 1398
	3	133	25	19.1	6	58	37.2	0.332 1771		18	289	28	53.1	6	07	35.2	0.449 2040
	4	138	49	18.6	7	00	19.4	0.337 1196		19	292	29	21.7	6	17	45.0	0.446 0122
	5	144	03	41.3	6	58	26.8	0.342 3220		20	295	32	39.5	6	27	00.5	0.442 5693
	6	149	08	23.2	6	53	19.2	0.347 7340		21	298	39	02.5	6	35	18.0	0.438 8812
	7	154	03	28.0	+6	45	17.4	0.353 3082		22	301	48	47.2	-6	42	33.2	0.434 9547
	8	158	49	05.9	6	34	41.6	0.358 9995		23	305	02	10.9	6	48	41.5	0.430 7973
	9	163	25	32.1	6	21	51.4	0.364 7660		24	308	19	31.4	6	53	38.0	0.426 4177
	10	167	53	05.8	6	07	05.4	0.370 5693		25	311	41	07.5	6	57	17.3	0.421 8257
	11	172	12	09.0	5	50	40.5	0.376 3737		26	315	07	18.4	6	59	33.3	0.417 0323
	12	176	23	05.7	5	32	52.2	0.382 1471		27	318	38	24.3	7	00	19.6	0.412 0502
	13	180	26	21.2	+5	13	54.5	0.387 8602		28	322	14	45.9	-6	59	29.5	0.406 8934
	14	184	22	21.3	4	53	60.0	0.393 4866		29	325	56	44.4	6	56	55.5	0.401 5780
	15	188	11	32.0	4	33	19.5	0.399 0027		30	329	44	41.8	6	52	29.8	0.396 1217
	16	191	54	18.8	4	12	03.0	0.404 3873	Dec.	1	333	39	00.4	6	46	04.4	0.390 5448
	17	195	31	07.1	3	50	18.7	0.409 6215		2	337	40	02.6	6	37	30.7	0.384 8697
	18	199	02	21.3	3	28	14.0	0.414 6884		3	341	48	11.0	6	26	40.1	0.379 1215
	19	202	28	25.2	+3	05	55.4	0.419 5730		4	346	03	47.8	-6	13	24.2	0.373 3279
	20	205	49	41.5	2	43	28.4	0.424 2621		5	350	27	14.4	5	57	34.5	0.367 5198
	21	209	06	32.1	2	20	57.6	0.428 7439		6	354	58	51.0	5	39	03.5	0.361 7311
	22	212	19	17.9	1	58	27.3	0.433 0080		7	359	38	56.1	5	17	44.5	0.355 9989
	23	215	28	18.9	1	36	00.9	0.437 0452		8	4	27	45.6	4	53	32.3	0.350 3636
	24	218	33	54.2	1	13	41.5	0.440 8474		9	9	25	31.9	4	26	23.7	0.344 8687
	25	221	36	21.9	+0	51	31.8	0.444 4075		10	14	32	23.3	-3	56	18.4	0.339 5606
	26	224	35	59.5	0	29	33.9	0.447 7192		11	19	48	22.8	3	23	19.6	0.334 4883
	27	227	33	03.6	+0	07	49.9	0.450 7772		12	25	13	26.6	2	47	34.4	0.329 7026
	28	230	27	50.2	-0	13	38.6	0.453 5767		13	30	47	23.6	2	09	15.0	0.325 2557
	29	233	20	34.6	0	34	49.8	0.456 1135		14	36	29	54.0	1	28	39.0	0.321 1997
	30	236	11	31.6	0	55	42.6	0.458 3841		15	42	20	28.2	0	46	09.6	0.317 5859
	31	239	00	55.4	-1	16	15.6	0.460 3854		16	48	18	26.5	-0	02		0.314 4626
Nov.	1	241	48	59.8	1	36	27.7	0.462 1149		17	54	22	58.3	+0	42	27.1	0.311 8744
	2	244	35	58.1	1	56	17.7	0.463 5704		18	60	33	02.7	1	27	20.8	0.309 8596
	3	247	22	03.5	2	15	44.8	0.464 7502		19	66	47	28.7	2	11	42.6	0.308 4496
	4	250	07	28.7	2	34	47.7	0.465 6528		20	73	04	57.2	2	54	48.7	0.307 6668
	5	252	52	26.3	2	53	25.5	0.466 2773		21	79	24	02.3	3	35	55.7	0.307 5238
	6	255	37	08.7	-3	11	37.1	0.466 6229		22	85	43	14.1	+4	14	23.0	0.308 0231
	7	258	21	48.1	3	29	21.5	0.466 6893		23	92	01	01.4	4	49	34.4	0.309 1565
	8	261	06	36.7	3	46	37.4	0.466 4763		24	98	15	54.9	5	21	00.2	0.310 9058
	9	263	51	46.8	4	03	23.7	0.465 9843		25	104	26	29.9	5	48	18.0	0.313 2434
	10	266	37	30.5	4	19	38.9	0.465 2137		26	110	31	29.2	6	11	13.4	0.316 1340
	11	269	24	00.2	4	35	21.6	0.464 1654		27	116	29	44.6	6	29	40.0	0.319 5355
	12	272	11	28.4	-4	50	30.3	0.462 8407		28	122	20	18.9	+6	43	38.3	0.323 4010
	13	275	00	07.7	5	05	03.2	0.461 2412		29	128	02	26.3	6	53	15.5	0.327 6805
	14	277	50	11.0	5	18	58.2	0.459 3687		30	133	35	32.6	6	58	43.7	0.332 3220
	15	280	41	51.4	5	32	13.5	0.457 2257		31	138	59	14.8	7	00	19.1	0.337 2733
	16	283	35	22.6	-5	44	46.5	0.454 8149		32	144	13	20.0	+6	58	20.2	0.342 4827

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		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	294	06	39.9	+0	32	51.9	Feb.	15	304	57	23.9	-1	12	21.4
	1	293	42	08.4	0	51	56.0		16	306	24	12.3	1	18	27.0
	2	293	05	47.8	1	11	22.5		17	307	52	02.3	1	24	14.2
	3	292	18	05.5	1	30	49.9		18	309	20	52.8	1	29	42.7
	4	291	19	59.2	1	49	53.4		19	310	50	42.7	1	34	52.1
	5	290	12	57.4	2	08	06.1		20	312	21	31.3	1	39	42.0
	6	288	58	57.6	+2	25	00.5		21	313	53	18.0	-1	44	12.0
	7	287	40	20.3	2	40	11.1		22	315	26	02.7	1	48	21.8
	8	286	19	40.2	2	53	16.1		23	316	59	45.2	1	52	10.8
	9	284	59	34.5	3	03	59.8		24	318	34	25.6	1	55	38.6
	10	283	42	32.3	3	12	12.9		25	320	10	04.2	1	58	44.9
	11	282	30	44.8	3	17	53.6		26	321	46	41.3	2	01	29.1
	12	281	25	58.6	+3	21	06.0		27	323	24	17.4	-2	03	50.6
	13	280	29	32.8	3	21	59.3		28	325	02	53.1	2	05	49.1
	14	279	42	18.8	3	20	46.4	Mar.	1	326	42	29.0	2	07	24.0
	15	279	04	43.1	3	17	41.8		2	328	23	05.9	2	08	34.7
	16	278	36	51.4	3	13	01.0		3	330	04	44.5	2	09	20.7
	17	278	18	33.1	3	06	59.1		4	331	47	25.8	2	09	41.2
	18	278	09	25.6	+2	59	50.1		5	333	31	10.4	-2	09	35.9
	19	278	08	58.6	2	51	46.8		6	335	15	59.3	2	09	03.9
	20	278	16	37.2	2	43	00.5		7	337	01	53.3	2	08	04.8
	21	278	31	44.4	2	33	40.8		8	338	48	53.2	2	06	37.8
	22	278	53	43.0	2	23	56.0		9	340	36	59.5	2	04	42.3
	23	279	21	56.8	2	13	53.2		10	342	26	12.7	2	02	17.7
	24	279	55	51.7	+2	03	38.1		11	344	16	33.2	-1	59	23.4
	25	280	34	55.7	1	53	15.7		12	346	08	01.0	1	55	58.6
	26	281	18	39.6	1	42	50.0		13	348	00	35.7	1	52	02.9
	27	282	06	37.0	1	32	24.3		14	349	54	16.6	1	47	35.7
	28	282	58	23.8	1	22	01.4		15	351	49	02.4	1	42	36.6
	29	283	53	38.6	1	11	43.6		16	353	44	51.2	1	37	05.0
	30	284	52	02.1	+1	01	32.7		17	355	41	40.3	-1	31	00.9
	31	285	53	17.3	0	51	30.4		18	357	39	26.0	1	24	23.8
Feb.	1	286	57	09.1	0	41	37.9		19	359	38	03.7	1	17	14.0
	2	288	03	23.9	0	31	56.5		20	1	37	27.5	1	09	31.5
	3	289	11	49.9	0	22	27.0		21	3	37	30.3	1	01	17.0
	4	290	22	16.8	0	13	10.2		22	5	38	03.3	0	52	31.0
	5	291	34	35.3	+0	04	06.8		23	7	38	56.1	-0	43	14.7
	6	292	48	37.3	-0	04	42.6		24	9	39	56.4	0	33	29.4
	7	294	04	15.8	0	13	17.4		25	11	40	50.2	0	23	17.1
	8	295	21	24.6	0	21	37.2		26	13	41	21.3	0	12	40.0
	9	296	39	58.4	0	29	41.6		27	15	41	11.5	-0	01	40.8
	10	297	59	52.5	0	37	30.0		28	17	40	01.2	+0	09	37.1
	11	299	21	02.8	-0	45	02.2		29	19	37	28.8	+0	21	10.2
	12	300	43	25.9	0	52	17.8		30	21	33	11.5	0	32	54.2
	13	302	06	58.7	0	59	16.5		31	23	26	45.7	0	44	44.5
	14	303	31	38.8	1	05	57.8	Apr.	1	25	17	47.2	0	56	36.4
	15	304	57	23.9	-1	12	21.4		2	27	05	51.8	+1	08	24.6

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		°	′	″	°	′	″			°	′	″	°	′	″
Apr.	1	25	17	47.2	+0	56	36.4	May	17	35	58	59.6	-2	56	42.3
	2	27	05	51.8	1	08	24.6		18	36	09	51.5	3	04	49.3
	3	28	50	35.8	1	20	03.7		19	36	25	14.3	3	11	56.3
	4	30	31	36.3	1	31	28.5		20	36	45	03.1	3	18	04.1
	5	32	08	31.7	1	42	33.3		21	37	09	12.2	3	23	13.7
	6	33	41	01.8	1	53	12.9		22	37	37	35.1	3	27	26.3
	7	35	08	48.2	+2	03	22.0		23	38	10	04.8	-3	30	43.4
	8	36	31	34.4	2	12	55.6		24	38	46	34.6	3	33	06.4
	9	37	49	05.6	2	21	48.7		25	39	26	57.2	3	34	36.9
	10	39	01	08.6	2	29	56.7		26	40	11	05.8	3	35	16.6
	11	40	07	32.1	2	37	15.2		27	40	58	53.6	3	35	07.0
	12	41	08	06.3	2	43	39.9		28	41	50	14.3	3	34	09.9
	13	42	02	43.0	+2	49	06.7		29	42	45	01.8	-3	32	26.8
	14	42	51	15.2	2	53	31.7		30	43	43	10.5	3	29	59.3
	15	43	33	37.6	2	56	51.5		31	44	44	35.1	3	26	49.0
	16	44	09	46.3	2	59	02.4	June	1	45	49	10.9	3	22	57.5
	17	44	39	39.2	3	00	01.3		2	46	56	53.6	3	18	26.3
	18	45	03	15.6	2	59	45.3		3	48	07	39.5	3	13	16.9
	19	45	20	37.3	+2	58	11.8		4	49	21	25.1	-3	07	30.8
	20	45	31	48.0	2	55	18.6		5	50	38	07.5	3	01	09.5
	21	45	36	54.1	2	51	04.2		6	51	57	44.3	2	54	14.6
	22	45	36	05.0	2	45	27.6		7	53	20	13.2	2	46	47.6
	23	45	29	33.2	2	38	28.5		8	54	45	32.3	2	38	50.0
	24	45	17	34.9	2	30	07.6		9	56	13	40.2	2	30	23.6
	25	45	00	30.1	+2	20	26.7		10	57	44	35.6	-2	21	29.8
	26	44	38	42.6	2	09	28.5		11	59	18	17.4	2	12	10.7
	27	44	12	40.2	1	57	17.0		12	60	54	44.4	2	02	27.9
	28	43	42	54.4	1	43	57.6		13	62	33	55.7	1	52	23.5
	29	43	10	00.2	1	29	36.7		14	64	15	49.9	1	41	59.7
	30	42	34	35.6	1	14	21.8		15	66	00	25.7	1	31	18.7
May	1	41	57	20.9	+0	58	21.6		16	67	47	41.0	-1	20	23.1
	2	41	18	57.6	0	41	45.6		17	69	37	33.2	1	09	15.6
	3	40	40	08.0	0	24	43.7		18	71	29	59.0	0	57	59.0
	4	40	01	34.1	+0	07	26.4		19	73	24	54.1	0	46	36.5
	5	39	23	56.4	-0	09	56.1		20	75	22	12.9	0	35	11.6
	6	38	47	53.3	0	27	13.6		21	77	21	48.6	0	23	47.8
	7	38	14	00.5	-0	44	16.5		22	79	23	32.9	-0	12	28.9
	8	37	42	50.0	1	00	55.8		23	81	27	16.0	-0	01	18.9
	9	37	14	49.8	1	17	03.6		24	83	32	46.4	+0	09	38.0
	10	36	50	23.9	1	32	32.8		25	85	39	51.2	0	20	17.8
	11	36	29	52.0	1	47	17.5		26	87	48	16.0	0	30	36.3
	12	36	13	29.9	2	01	12.7		27	89	57	45.2	0	40	29.5
	13	36	01	29.2	-2	14	14.6		28	92	08	02.4	+0	49	53.6
	14	35	53	58.2	2	26	20.1		29	94	18	50.5	0	58	45.1
	15	35	51	01.8	2	37	27.4		30	96	29	52.6	1	07	00.8
	16	35	52	42.4	2	47	34.9	July	1	98	40	51.8	1	14	38.0
	17	35	58	59.6	-2	56	42.3		2	100	51	32.0	+1	21	34.3

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		°	'	"	°	'	"			°	'	"	°	'	"
July	1	98	40	51.8	+1	14	38.0	Aug.	16	169	15	53.1	-2	46	22.4
	2	100	51	32.0	1	21	34.3		17	169	51	10.7	2	57	12.7
	3	103	01	37.9	1	27	48.0		18	170	22	23.6	3	07	51.5
	4	105	10	55.7	1	33	17.9		19	170	49	18.2	3	18	15.3
	5	107	19	12.8	1	38	03.2		20	171	11	40.5	3	28	20.2
	6	109	26	18.5	1	42	03.3		21	171	29	16.2	3	38	01.8
	7	111	32	03.2	+1	45	18.3		22	171	41	51.1	-3	47	15.3
	8	113	36	19.2	1	47	48.6		23	171	49	11.0	3	55	55.3
	9	115	39	00.1	1	49	34.7		24	171	51	02.7	4	03	55.6
	10	117	40	00.8	1	50	37.6		25	171	47	14.5	4	11	09.6
	11	119	39	17.3	1	50	58.2		26	171	37	36.6	4	17	30.0
	12	121	36	46.6	1	50	37.7		27	171	22	02.1	4	22	49.0
	13	123	32	26.5	+1	49	37.3		28	171	00	28.2	-4	26	58.5
	14	125	26	15.6	1	47	58.6		29	170	32	57.0	4	29	49.8
	15	127	18	12.8	1	45	42.7		30	169	59	36.7	4	31	14.4
	16	129	08	17.6	1	42	51.2		31	169	20	43.1	4	31	04.2
	17	130	56	29.8	1	39	25.4	Sept.	1	168	36	40.2	4	29	11.7
	18	132	42	49.3	1	35	26.8		2	167	48	01.1	4	25	30.4
	19	134	27	16.3	+1	30	56.7		3	166	55	28.6	-4	19	55.8
	20	136	09	50.9	1	25	56.5		4	165	59	55.1	4	12	25.1
	21	137	50	33.3	1	20	27.5		5	165	02	21.8	4	02	58.4
	22	139	29	23.7	1	14	31.1		6	164	03	57.5	3	51	38.6
	23	141	06	22.1	1	08	08.4		7	163	05	56.9	3	38	31.5
	24	142	41	28.4	1	01	20.8		8	162	09	38.1	3	23	46.0
	25	144	14	42.3	+0	54	09.3		9	161	16	19.8	-3	07	33.5
	26	145	46	03.5	0	46	35.2		10	160	27	18.6	2	50	08.0
	27	147	15	31.0	0	38	39.7		11	159	43	46.2	2	31	44.7
	28	148	43	04.0	0	30	23.7		12	159	06	47.1	2	12	40.1
	29	150	08	41.3	0	21	48.5		13	158	37	17.0	1	53	10.7
	30	151	32	21.2	0	12	55.1		14	158	16	01.0	1	33	32.8
	31	152	54	01.7	+0	03	44.5		15	158	03	33.5	-1	14	01.8
Aug.	1	154	13	40.7	-0	05	42.2		16	158	00	17.9	0	54	51.9
	2	155	31	15.5	0	15	24.0		17	158	06	26.8	0	36	15.4
	3	156	46	43.0	0	25	19.7		18	158	22	02.8	0	18	23.4
	4	157	59	59.8	0	35	28.3		19	158	46	59.5	-0	01	25.0
	5	159	11	01.9	0	45	48.8		20	159	21	02.2	+0	14	32.4
	6	160	19	45.1	-0	56	19.9		21	160	03	49.4	+0	29	23.1
	7	161	26	04.3	1	07	00.6		22	160	54	53.7	0	43	02.7
	8	162	29	53.9	1	17	49.7		23	161	53	42.9	0	55	28.4
	9	163	31	07.8	1	28	45.7		24	162	59	41.4	1	06	38.7
	10	164	29	39.0	1	39	47.4		25	164	12	11.1	1	16	33.2
	11	165	25	20.0	1	50	53.3		26	165	30	32.8	1	25	12.5
	12	166	18	02.5	-2	02	01.7		27	166	54	06.9	+1	32	38.2
	13	167	07	37.3	2	13	10.9		28	168	22	14.5	1	38	52.4
	14	167	53	54.5	2	24	18.9		29	169	54	18.1	1	43	57.9
	15	168	36	43.6	2	35	23.6		30	171	29	42.3	1	47	58.1
	16	169	15	53.1	-2	46	22.4	Oct.	1	173	07	54.0	+1	50	56.4

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		°	′	″	°	′	″			°	′	″	°	′	″
Oct.	1	173	07	54.0	+1	50	56.4	Nov.	16	248	34	00.4	-1	58	03.6
	2	174	48	23.2	1	52	56.7		17	250	02	18.2	2	02	25.0
	3	176	30	42.5	1	54	02.9		18	251	30	07.9	2	06	30.6
	4	178	14	27.6	1	54	18.9		19	252	57	27.0	2	10	19.3
	5	179	59	17.2	1	53	48.5		20	254	24	13.0	2	13	49.9
	6	181	44	52.8	1	52	35.5		21	255	50	22.5	2	17	01.3
	7	183	30	58.3	+1	50	43.5		22	257	15	51.7	-2	19	51.9
	8	185	17	20.1	1	48	15.9		23	258	40	35.8	2	22	20.3
	9	187	03	46.9	1	45	15.9		24	260	04	29.5	2	24	25.0
	10	188	50	09.1	1	41	46.6		25	261	27	26.3	2	26	04.1
	11	190	36	18.8	1	37	50.9		26	262	49	18.7	2	27	15.8
	12	192	22	09.6	1	33	31.2		27	264	09	57.8	2	27	58.0
	13	194	07	36.5	+1	28	50.2		28	265	29	13.3	-2	28	08.6
	14	195	52	35.3	1	23	49.9		29	266	46	53.1	2	27	45.1
	15	197	37	03.0	1	18	32.6		30	268	02	43.4	2	26	44.8
	16	199	20	57.1	1	13	00.2	Dec.	1	269	16	27.8	2	25	05.0
	17	201	04	16.0	1	07	14.4		2	270	27	47.7	2	22	42.4
	18	202	46	58.4	1	01	16.9		3	271	36	21.6	2	19	33.8
	19	204	29	03.7	+0	55	09.3		4	272	41	44.9	-2	15	35.6
	20	206	10	31.6	0	48	52.9		5	273	43	29.5	2	10	43.8
	21	207	51	22.0	0	42	28.9		6	274	41	03.6	2	04	54.6
	22	209	31	34.9	0	35	58.6		7	275	33	51.2	1	58	03.6
	23	211	11	10.9	0	29	23.3		8	276	21	12.3	1	50	06.7
	24	212	50	10.6	0	22	43.9		9	277	02	23.0	1	40	59.6
	25	214	28	34.8	+0	16	01.5		10	277	36	35.5	-1	30	38.4
	26	216	06	24.2	0	09	16.9		11	278	02	59.2	1	18	59.7
	27	217	43	40.0	+0	02	31.1		12	278	20	41.9	1	06	01.1
	28	219	20	23.2	-0	04	15.1		13	278	28	52.1	0	51	41.6
	29	220	56	34.7	0	11	00.9		14	278	26	42.0	0	36	02.2
	30	222	32	15.8	0	17	45.5		15	278	13	31.3	0	19	06.6
	31	224	07	27.4	-0	24	28.3		16	277	48	52.8	-0	01	02.2
Nov.	1	225	42	10.6	0	31	08.4		17	277	12	37.6	+0	17	59.4
	2	227	16	26.2	0	37	45.2		18	276	25	01.4	0	37	42.0
	3	228	50	15.4	0	44	18.0		19	275	26	49.5	0	57	44.4
	4	230	23	38.8	0	50	46.2		20	274	19	19.9	1	17	41.4
	5	231	56	37.4	0	57	08.9		21	273	04	23.5	1	37	04.4
	6	233	29	11.8	-1	03	25.6		22	271	44	19.2	+1	55	24.3
	7	235	01	22.7	1	09	35.6		23	270	21	46.1	2	12	12.9
	8	236	33	10.5	1	15	38.2		24	268	59	31.7	2	27	06.4
	9	238	04	35.8	1	21	32.7		25	267	40	18.9	2	39	46.7
	10	239	35	38.8	1	27	18.4		26	266	26	34.3	2	50	02.7
	11	241	06	19.6	1	32	54.5		27	265	20	18.9	2	57	50.8
	12	242	36	38.1	-1	38	20.3		28	264	23	03.2	+3	03	13.6
	13	244	06	34.1	1	43	34.9		29	263	35	46.6	3	06	19.0
	14	245	36	07.1	1	48	37.6		30	262	58	59.1	3	07	18.5
	15	247	05	16.2	1	53	27.5		31	262	32	46.3	3	06	25.4
	16	248	34	00.4	-1	58	03.6		32	262	16	54.7	+3	03	54.1

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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	19	43	36.26	-20	44	55.0	0.769 873	11.42	4.36	13	02	53
	1	19	41	38.98	20	30	21.3	0.749 045	11.74	4.49	12	56	34
	2	19	38	52.14	20	17	19.0	0.730 089	12.05	4.60	12	49	27
	3	19	35	18.05	20	05	55.3	0.713 324	12.33	4.71	12	41	36
	4	19	31	01.11	19	56	14.2	0.699 041	12.58	4.81	12	33	06
	5	19	26	07.79	19	48	16.9	0.687 484	12.79	4.89	12	24	04
	6	19	20	46.53	-19	42	01.6	0.678 838	12.95	4.95	12	14	39
	7	19	15	07.30	19	37	25.0	0.673 211	13.06	4.99	12	05	02
	8	19	09	20.94	19	34	22.8	0.670 631	13.11	5.01	11	55	24
	9	19	03	38.42	19	32	50.3	0.671 044	13.11	5.01	11	45	54
	10	18	58	10.06	19	32	42.7	0.674 322	13.04	4.98	11	36	43
	11	18	53	04.89	19	33	55.4	0.680 273	12.93	4.94	11	27	58
	12	18	48	30.23	-19	36	23.6	0.688 658	12.77	4.88	11	19	46
	13	18	44	31.45	19	40	01.9	0.699 211	12.58	4.81	11	12	11
	14	18	41	12.04	19	44	44.3	0.711 648	12.36	4.72	11	05	16
	15	18	38	33.77	19	50	23.7	0.725 690	12.12	4.63	10	59	02
	16	18	36	36.99	19	56	52.5	0.741 065	11.87	4.53	10	53	28
	17	18	35	20.93	20	04	02.0	0.757 520	11.61	4.44	10	48	35
	18	18	34	44.03	-20	11	43.3	0.774 827	11.35	4.34	10	44	19
	19	18	34	44.19	20	19	47.3	0.792 780	11.09	4.24	10	40	39
	20	18	35	18.98	20	28	04.9	0.811 200	10.84	4.14	10	37	32
	21	18	36	25.84	20	36	27.3	0.829 931	10.60	4.05	10	34	56
	22	18	38	02.20	20	44	46.1	0.848 839	10.36	3.96	10	32	48
	23	18	40	05.54	20	52	53.4	0.867 812	10.13	3.87	10	31	06
	24	18	42	33.46	-21	00	41.8	0.886 756	9.92	3.79	10	29	48
	25	18	45	23.72	21	08	04.7	0.905 592	9.71	3.71	10	28	50
	26	18	48	34.25	21	14	55.9	0.924 255	9.51	3.64	10	28	13
	27	18	52	03.16	21	21	10.0	0.942 692	9.33	3.56	10	27	53
	28	18	55	48.73	21	26	42.1	0.960 859	9.15	3.50	10	27	48
	29	18	59	49.38	21	31	27.8	0.978 723	8.99	3.43	10	27	59
	30	19	04	03.69	-21	35	23.1	0.996 255	8.83	3.37	10	28	22
	31	19	08	30.40	21	38	24.6	1.013 434	8.68	3.32	10	28	57
Feb.	1	19	13	08.35	21	40	29.1	1.030 244	8.54	3.26	10	29	43
	2	19	17	56.50	21	41	34.0	1.046 670	8.40	3.21	10	30	39
	3	19	22	53.92	21	41	36.9	1.062 706	8.28	3.16	10	31	44
	4	19	27	59.75	21	40	35.4	1.078 343	8.16	3.12	10	32	56
	5	19	33	13.25	-21	38	27.8	1.093 578	8.04	3.07	10	34	17
	6	19	38	33.74	21	35	12.5	1.108 409	7.93	3.03	10	35	43
	7	19	44	00.58	21	30	47.8	1.122 834	7.83	2.99	10	37	16
	8	19	49	33.23	21	25	12.4	1.136 854	7.74	2.96	10	38	55
	9	19	55	11.18	21	18	25.3	1.150 469	7.64	2.92	10	40	39
	10	20	00	53.99	21	10	25.4	1.163 682	7.56	2.89	10	42	27
	11	20	06	41.23	-21	01	11.9	1.176 494	7.47	2.86	10	44	20
	12	20	12	32.54	20	50	43.8	1.188 907	7.40	2.83	10	46	17
	13	20	18	27.58	20	39	00.6	1.200 925	7.32	2.80	10	48	17
	14	20	24	26.05	20	26	01.7	1.212 548	7.25	2.77	10	50	20
	15	20	30	27.68	-20	11	46.6	1.223 779	7.19	2.75	10	52	27

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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	20	30	27.68	-20	11	46.6	1.223 779	7.19	2.75	10	52	27
	16	20	36	32.21	19	56	14.8	1.234 621	7.12	2.72	10	54	36
	17	20	42	39.43	19	39	26.0	1.245 073	7.06	2.70	10	56	48
	18	20	48	49.14	19	21	19.8	1.255 138	7.01	2.68	10	59	03
	19	20	55	01.14	19	01	56.1	1.264 816	6.95	2.66	11	01	19
	20	21	01	15.30	18	41	14.6	1.274 106	6.90	2.64	11	03	38
	21	21	07	31.46	-18	19	15.2	1.283 009	6.85	2.62	11	05	59
	22	21	13	49.51	17	55	57.6	1.291 522	6.81	2.60	11	08	22
	23	21	20	09.37	17	31	21.9	1.299 644	6.77	2.59	11	10	46
	24	21	26	30.94	17	05	27.8	1.307 371	6.73	2.57	11	13	12
	25	21	32	54.17	16	38	15.4	1.314 699	6.69	2.56	11	15	40
	26	21	39	19.01	16	09	44.7	1.321 623	6.65	2.54	11	18	09
	27	21	45	45.42	-15	39	55.8	1.328 135	6.62	2.53	11	20	40
	28	21	52	13.39	15	08	48.5	1.334 227	6.59	2.52	11	23	12
Mar.	1	21	58	42.91	14	36	23.1	1.339 889	6.56	2.51	11	25	46
	2	22	05	13.99	14	02	39.7	1.345 110	6.54	2.50	11	28	22
	3	22	11	46.63	13	27	38.4	1.349 876	6.51	2.49	11	30	59
	4	22	18	20.88	12	51	19.5	1.354 172	6.49	2.48	11	33	38
	5	22	24	56.77	-12	13	43.1	1.357 980	6.48	2.47	11	36	18
	6	22	31	34.35	11	34	49.8	1.361 280	6.46	2.47	11	39	00
	7	22	38	13.66	10	54	39.8	1.364 049	6.45	2.46	11	41	44
	8	22	44	54.79	10	13	13.7	1.366 264	6.44	2.46	11	44	30
	9	22	51	37.78	9	30	32.3	1.367 895	6.43	2.46	11	47	18
	10	22	58	22.72	8	46	36.2	1.368 913	6.42	2.45	11	50	07
	11	23	05	09.66	-8	01	26.5	1.369 284	6.42	2.45	11	52	59
	12	23	11	58.68	7	15	04.4	1.368 970	6.42	2.45	11	55	53
	13	23	18	49.83	6	27	31.4	1.367 933	6.43	2.46	11	58	49
	14	23	25	43.15	5	38	49.3	1.366 129	6.44	2.46	12	01	47
	15	23	32	38.68	4	49	00.3	1.363 511	6.45	2.46	12	04	48
	16	23	39	36.41	3	58	07.0	1.360 032	6.47	2.47	12	07	50
	17	23	46	36.33	-3	06	12.4	1.355 640	6.49	2.48	12	10	55
	18	23	53	38.36	2	13	20.4	1.350 281	6.51	2.49	12	14	02
	19	0	00	42.39	1	19	35.1	1.343 902	6.54	2.50	12	17	11
	20	0	07	48.26	-0	25	02.0	1.336 448	6.58	2.51	12	20	22
	21	0	14	55.74	+0	30	13.3	1.327 865	6.62	2.53	12	23	34
	22	0	22	04.52	1	26	03.7	1.318 104	6.67	2.55	12	26	47
	23	0	29	14.19	+2	22	21.4	1.307 119	6.73	2.57	12	30	01
	24	0	36	24.27	3	18	57.7	1.294 870	6.79	2.59	12	33	15
	25	0	43	34.15	4	15	42.4	1.281 328	6.86	2.62	12	36	28
	26	0	50	43.10	5	12	24.7	1.266 474	6.94	2.65	12	39	40
	27	0	57	50.28	6	08	52.7	1.250 304	7.03	2.69	12	42	50
	28	1	04	54.73	7	04	53.5	1.232 830	7.13	2.73	12	45	56
	29	1	11	55.37	+8	00	13.7	1.214 082	7.24	2.77	12	48	58
	30	1	18	51.01	8	54	39.4	1.194 108	7.36	2.81	12	51	54
	31	1	25	40.40	9	47	56.3	1.172 977	7.50	2.86	12	54	43
Apr.	1	1	32	22.18	10	39	50.4	1.150 777	7.64	2.92	12	57	24
	2	1	38	54.98	+11	30	08.0	1.127 614	7.80	2.98	12	59	55

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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	1	32	22.18	+10	39	50.4	1.150 777	7.64	2.92	12	57	24
	2	1	38	54.98	11	30	08.0	1.127 614	7.80	2.98	12	59	55
	3	1	45	17.39	12	18	36.1	1.103 607	7.97	3.04	13	02	15
	4	1	51	28.01	13	05	02.5	1.078 889	8.15	3.11	13	04	23
	5	1	57	25.46	13	49	16.1	1.053 602	8.35	3.19	13	06	16
	6	2	03	08.41	14	31	07.0	1.027 892	8.56	3.27	13	07	54
	7	2	08	35.60	+15	10	26.7	1.001 907	8.78	3.35	13	09	16
	8	2	13	45.85	15	47	07.6	0.975 793	9.01	3.44	13	10	19
	9	2	18	38.03	16	21	03.8	0.949 691	9.26	3.54	13	11	05
	10	2	23	11.14	16	52	09.8	0.923 737	9.52	3.64	13	11	30
	11	2	27	24.24	17	20	21.7	0.898 058	9.79	3.74	13	11	36
	12	2	31	16.50	17	45	35.9	0.872 771	10.08	3.85	13	11	20
	13	2	34	47.18	+18	07	49.7	0.847 986	10.37	3.96	13	10	42
	14	2	37	55.65	18	27	00.9	0.823 802	10.68	4.08	13	09	41
	15	2	40	41.38	18	43	07.8	0.800 311	10.99	4.20	13	08	18
	16	2	43	03.97	18	56	08.8	0.777 595	11.31	4.32	13	06	31
	17	2	45	03.13	19	06	03.1	0.755 728	11.64	4.45	13	04	21
	18	2	46	38.75	19	12	50.0	0.734 781	11.97	4.57	13	01	48
	19	2	47	50.85	+19	16	29.5	0.714 815	12.30	4.70	12	58	51
	20	2	48	39.66	19	17	02.2	0.695 885	12.64	4.83	12	55	31
	21	2	49	05.59	19	14	29.2	0.678 045	12.97	4.96	12	51	49
	22	2	49	09.28	19	08	53.0	0.661 341	13.30	5.08	12	47	45
	23	2	48	51.62	19	00	17.1	0.645 814	13.62	5.20	12	43	21
	24	2	48	13.73	18	48	46.7	0.631 501	13.93	5.32	12	38	38
	25	2	47	17.01	+18	34	28.6	0.618 436	14.22	5.43	12	33	36
	26	2	46	03.11	18	17	31.7	0.606 646	14.50	5.54	12	28	19
	27	2	44	33.92	17	58	07.0	0.596 152	14.75	5.64	12	22	47
	28	2	42	51.56	17	36	27.9	0.586 970	14.98	5.72	12	17	04
	29	2	40	58.36	17	12	50.0	0.579 110	15.19	5.80	12	11	11
	30	2	38	56.78	16	47	31.3	0.572 575	15.36	5.87	12	05	11
May	1	2	36	49.39	+16	20	51.3	0.567 361	15.50	5.92	11	59	07
	2	2	34	38.80	15	53	11.5	0.563 458	15.61	5.96	11	53	00
	3	2	32	27.62	15	24	54.3	0.560 849	15.68	5.99	11	46	55
	4	2	30	18.38	14	56	22.6	0.559 508	15.72	6.01	11	40	52
	5	2	28	13.50	14	27	59.4	0.559 407	15.72	6.01	11	34	55
	6	2	26	15.20	14	00	07.1	0.560 510	15.69	5.99	11	29	06
	7	2	24	25.53	+13	33	06.7	0.562 775	15.63	5.97	11	23	26
	8	2	22	46.29	13	07	18.0	0.566 160	15.53	5.93	11	17	57
	9	2	21	19.01	12	42	58.3	0.570 616	15.41	5.89	11	12	40
	10	2	20	05.01	12	20	23.0	0.576 094	15.27	5.83	11	07	37
	11	2	19	05.33	11	59	44.9	0.582 543	15.10	5.77	11	02	49
	12	2	18	20.77	11	41	14.5	0.589 913	14.91	5.70	10	58	15
	13	2	17	51.92	+11	24	59.7	0.598 154	14.70	5.62	10	53	58
	14	2	17	39.17	11	11	06.4	0.607 214	14.48	5.53	10	49	57
	15	2	17	42.76	10	59	38.3	0.617 048	14.25	5.45	10	46	12
	16	2	18	02.74	10	50	37.4	0.627 609	14.01	5.35	10	42	43
	17	2	18	39.08	+10	44	03.8	0.638 855	13.77	5.26	10	39	31

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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	2	18	39.08	+10	44	03.8	0.638 855	13.77	5.26	10	39	31
	18	2	19	31.62	10	39	56.6	0.650 743	13.51	5.16	10	36	34
	19	2	20	40.16	10	38	13.5	0.663 237	13.26	5.07	10	33	53
	20	2	22	04.41	10	38	51.3	0.676 300	13.00	4.97	10	31	28
	21	2	23	44.07	10	41	46.3	0.689 900	12.75	4.87	10	29	18
	22	2	25	38.79	10	46	53.8	0.704 007	12.49	4.77	10	27	23
	23	2	27	48.24	+10	54	09.0	0.718 591	12.24	4.68	10	25	42
	24	2	30	12.08	11	03	26.7	0.733 628	11.99	4.58	10	24	16
	25	2	32	49.97	11	14	41.4	0.749 092	11.74	4.49	10	23	03
	26	2	35	41.61	11	27	47.4	0.764 960	11.50	4.39	10	22	04
	27	2	38	46.70	11	42	39.2	0.781 212	11.26	4.30	10	21	18
	28	2	42	04.99	11	59	10.8	0.797 827	11.02	4.21	10	20	46
	29	2	45	36.25	+12	17	16.6	0.814 786	10.79	4.12	10	20	26
	30	2	49	20.28	12	36	50.8	0.832 069	10.57	4.04	10	20	19
	31	2	53	16.93	12	57	47.6	0.849 657	10.35	3.95	10	20	24
June	1	2	57	26.07	13	20	01.3	0.867 531	10.14	3.87	10	20	42
	2	3	01	47.62	13	43	26.1	0.885 672	9.93	3.79	10	21	12
	3	3	06	21.54	14	07	56.1	0.904 058	9.73	3.72	10	21	55
	4	3	11	07.80	+14	33	25.5	0.922 668	9.53	3.64	10	22	50
	5	3	16	06.44	14	59	48.5	0.941 477	9.34	3.57	10	23	58
	6	3	21	17.51	15	26	58.9	0.960 459	9.16	3.50	10	25	18
	7	3	26	41.09	15	54	50.5	0.979 586	8.98	3.43	10	26	50
	8	3	32	17.29	16	23	17.0	0.998 825	8.80	3.36	10	28	36
	9	3	38	06.24	16	52	11.5	1.018 140	8.64	3.30	10	30	34
	10	3	44	08.09	+17	21	27.3	1.037 490	8.48	3.24	10	32	45
	11	3	50	23.02	17	50	57.0	1.056 832	8.32	3.18	10	35	09
	12	3	56	51.18	18	20	32.9	1.076 113	8.17	3.12	10	37	47
	13	4	03	32.74	18	50	07.0	1.095 278	8.03	3.07	10	40	39
	14	4	10	27.84	19	19	30.7	1.114 264	7.89	3.02	10	43	44
	15	4	17	36.60	19	48	34.9	1.133 002	7.76	2.97	10	47	02
	16	4	24	59.08	+20	17	10.0	1.151 417	7.64	2.92	10	50	35
	17	4	32	35.29	20	45	05.8	1.169 424	7.52	2.87	10	54	22
	18	4	40	25.15	21	12	11.6	1.186 936	7.41	2.83	10	58	22
	19	4	48	28.47	21	38	16.2	1.203 857	7.30	2.79	11	02	35
	20	4	56	44.95	22	03	08.0	1.220 087	7.21	2.75	11	07	02
	21	5	05	14.15	22	26	35.1	1.235 524	7.12	2.72	11	11	41
	22	5	13	55.45	+22	48	25.5	1.250 063	7.03	2.69	11	16	32
	23	5	22	48.08	23	08	27.3	1.263 602	6.96	2.66	11	21	34
	24	5	31	51.09	23	26	28.8	1.276 042	6.89	2.63	11	26	46
	25	5	41	03.33	23	42	19.1	1.287 292	6.83	2.61	11	32	07
	26	5	50	23.51	23	55	48.3	1.297 270	6.78	2.59	11	37	35
	27	5	59	50.15	24	06	47.4	1.305 911	6.73	2.57	11	43	09
	28	6	09	21.70	+24	15	09.0	1.313 162	6.70	2.56	11	48	48
	29	6	18	56.49	24	20	47.7	1.318 990	6.67	2.55	11	54	28
	30	6	28	32.81	24	23	39.5	1.323 380	6.65	2.54	12	00	09
July	1	6	38	08.98	24	23	42.7	1.326 336	6.63	2.53	12	05	50
	2	6	47	43.34	+24	20	57.0	1.327 879	6.62	2.53	12	11	27

MERCURY, 2023

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	6	38	08.98	+24	23	42.7	1.326 336	6.63	2.53	12	05	50
	2	6	47	43.34	24	20	57.0	1.327 879	6.62	2.53	12	11	27
	3	6	57	14.30	24	15	24.5	1.328 049	6.62	2.53	12	17	01
	4	7	06	40.42	24	07	08.5	1.326 898	6.63	2.53	12	22	28
	5	7	16	00.39	23	56	14.0	1.324 488	6.64	2.54	12	27	49
	6	7	25	13.05	23	42	46.9	1.320 892	6.66	2.54	12	33	02
	7	7	34	17.41	+23	26	54.4	1.316 189	6.68	2.55	12	38	06
	8	7	43	12.64	23	08	44.0	1.310 458	6.71	2.56	12	43	01
	9	7	51	58.07	22	48	23.9	1.303 781	6.75	2.58	12	47	45
	10	8	00	33.18	22	26	02.6	1.296 239	6.78	2.59	12	52	19
	11	8	08	57.58	22	01	48.6	1.287 911	6.83	2.61	12	56	42
	12	8	17	11.00	21	35	50.5	1.278 871	6.88	2.63	13	00	54
	13	8	25	13.26	+21	08	16.6	1.269 189	6.93	2.65	13	04	54
	14	8	33	04.28	20	39	15.2	1.258 930	6.99	2.67	13	08	43
	15	8	40	44.04	20	08	54.2	1.248 157	7.05	2.69	13	12	20
	16	8	48	12.57	19	37	21.0	1.236 922	7.11	2.72	13	15	47
	17	8	55	29.98	19	04	43.1	1.225 278	7.18	2.74	13	19	02
	18	9	02	36.37	18	31	07.2	1.213 268	7.25	2.77	13	22	06
	19	9	09	31.89	+17	56	40.0	1.200 935	7.32	2.80	13	24	59
	20	9	16	16.72	17	21	27.7	1.188 314	7.40	2.83	13	27	42
	21	9	22	51.01	16	45	36.2	1.175 438	7.48	2.86	13	30	14
	22	9	29	14.94	16	09	11.1	1.162 335	7.57	2.89	13	32	36
	23	9	35	28.70	15	32	17.9	1.149 032	7.65	2.92	13	34	48
	24	9	41	32.44	14	55	01.6	1.135 551	7.74	2.96	13	36	49
	25	9	47	26.33	+14	17	27.1	1.121 912	7.84	2.99	13	38	41
	26	9	53	10.51	13	39	39.1	1.108 133	7.94	3.03	13	40	24
	27	9	58	45.11	13	01	42.1	1.094 229	8.04	3.07	13	41	56
	28	10	04	10.24	12	23	40.6	1.080 214	8.14	3.11	13	43	20
	29	10	09	25.98	11	45	38.9	1.066 101	8.25	3.15	13	44	34
	30	10	14	32.40	11	07	41.0	1.051 900	8.36	3.19	13	45	38
	31	10	19	29.55	+10	29	51.3	1.037 622	8.48	3.24	13	46	33
Aug.	1	10	24	17.42	9	52	13.7	1.023 276	8.59	3.28	13	47	19
	2	10	28	56.01	9	14	52.3	1.008 871	8.72	3.33	13	47	56
	3	10	33	25.28	8	37	51.2	0.994 415	8.84	3.38	13	48	23
	4	10	37	45.14	8	01	14.5	0.979 916	8.97	3.43	13	48	41
	5	10	41	55.49	7	25	06.3	0.965 381	9.11	3.48	13	48	50
	6	10	45	56.19	+6	49	31.0	0.950 818	9.25	3.53	13	48	48
	7	10	49	47.06	6	14	32.9	0.936 236	9.39	3.59	13	48	37
	8	10	53	27.88	5	40	16.6	0.921 644	9.54	3.65	13	48	15
	9	10	56	58.37	5	06	47.0	0.907 051	9.70	3.70	13	47	43
	10	11	00	18.24	4	34	09.1	0.892 468	9.85	3.76	13	46	60
	11	11	03	27.12	4	02	28.2	0.877 907	10.02	3.83	13	46	06
	12	11	06	24.61	+3	31	49.9	0.863 382	10.19	3.89	13	45	00
	13	11	09	10.26	3	02	20.4	0.848 909	10.36	3.96	13	43	42
	14	11	11	43.58	2	34	06.0	0.834 507	10.54	4.03	13	42	12
	15	11	14	04.00	2	07	13.6	0.820 196	10.72	4.10	13	40	28
	16	11	16	10.95	+1	41	50.4	0.806 001	10.91	4.17	13	38	31

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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	11	16	10.95	+1	41	50.4	0.806 001	10.91	4.17	13	38	31
	17	11	18	03.78	1	18	04.4	0.791 948	11.10	4.24	13	36	19
	18	11	19	41.81	0	56	03.7	0.778 070	11.30	4.32	13	33	52
	19	11	21	04.35	0	35	57.3	0.764 403	11.50	4.40	13	31	09
	20	11	22	10.65	0	17	54.6	0.750 988	11.71	4.47	13	28	10
	21	11	22	59.99	+0	02	05.5	0.737 871	11.92	4.55	13	24	53
	22	11	23	31.64	-0	11	19.8	0.725 104	12.13	4.63	13	21	19
	23	11	23	44.89	0	22	10.5	0.712 748	12.34	4.71	13	17	26
	24	11	23	39.11	0	30	16.0	0.700 869	12.55	4.79	13	13	13
	25	11	23	13.77	0	35	25.3	0.689 540	12.75	4.87	13	08	41
	26	11	22	28.47	0	37	28.1	0.678 844	12.95	4.95	13	03	49
	27	11	21	22.98	0	36	14.8	0.668 869	13.15	5.02	12	58	38
	28	11	19	57.36	-0	31	37.1	0.659 714	13.33	5.09	12	53	06
	29	11	18	11.94	0	23	28.2	0.651 484	13.50	5.16	12	47	15
	30	11	16	07.43	-0	11	44.3	0.644 291	13.65	5.22	12	41	06
	31	11	13	44.97	+0	03	35.4	0.638 251	13.78	5.26	12	34	40
Sept.	1	11	11	06.19	0	22	27.7	0.633 487	13.88	5.30	12	27	59
	2	11	08	13.22	0	44	44.7	0.630 119	13.96	5.33	12	21	05
	3	11	05	08.74	+1	10	13.3	0.628 270	14.00	5.35	12	14	01
	4	11	01	55.94	1	38	34.8	0.628 055	14.00	5.35	12	06	51
	5	10	58	38.49	2	09	25.0	0.629 583	13.97	5.34	11	59	39
	6	10	55	20.49	2	42	14.3	0.632 950	13.89	5.31	11	52	28
	7	10	52	06.29	3	16	28.6	0.638 237	13.78	5.26	11	45	23
	8	10	49	00.46	3	51	30.3	0.645 507	13.62	5.21	11	38	28
	9	10	46	07.53	+4	26	39.4	0.654 799	13.43	5.13	11	31	48
	10	10	43	31.92	5	01	15.4	0.666 130	13.20	5.04	11	25	27
	11	10	41	17.74	5	34	38.0	0.679 490	12.94	4.94	11	19	30
	12	10	39	28.68	6	06	09.4	0.694 843	12.66	4.84	11	13	58
	13	10	38	07.88	6	35	14.6	0.712 125	12.35	4.72	11	08	56
	14	10	37	17.87	7	01	22.9	0.731 250	12.03	4.59	11	04	25
	15	10	37	00.55	+7	24	07.9	0.752 101	11.69	4.47	11	00	27
	16	10	37	17.12	7	43	08.1	0.774 543	11.35	4.34	10	57	03
	17	10	38	08.14	7	58	06.8	0.798 417	11.01	4.21	10	54	14
	18	10	39	33.54	8	08	52.2	0.823 546	10.68	4.08	10	51	58
	19	10	41	32.69	8	15	16.7	0.849 736	10.35	3.95	10	50	16
	20	10	44	04.45	8	17	17.3	0.876 783	10.03	3.83	10	49	05
	21	10	47	07.25	+8	14	54.4	0.904 473	9.72	3.71	10	48	25
	22	10	50	39.16	8	08	12.2	0.932 586	9.43	3.60	10	48	13
	23	10	54	37.98	7	57	18.2	0.960 907	9.15	3.50	10	48	26
	24	10	59	01.30	7	42	22.4	0.989 222	8.89	3.40	10	49	03
	25	11	03	46.61	7	23	37.2	1.017 331	8.64	3.30	10	50	01
	26	11	08	51.36	7	01	17.0	1.045 046	8.42	3.22	10	51	17
	27	11	14	13.03	+6	35	37.6	1.072 198	8.20	3.13	10	52	50
	28	11	19	49.18	6	06	55.7	1.098 639	8.00	3.06	10	54	35
	29	11	25	37.51	5	35	28.6	1.124 241	7.82	2.99	10	56	32
	30	11	31	35.90	5	01	33.8	1.148 903	7.65	2.92	10	58	38
Oct.	1	11	37	42.42	+4	25	28.5	1.172 543	7.50	2.87	11	00	51

MERCURY, 2023
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	37	42.42	+4	25	28.5	1.172 543	7.50	2.87	11	00	51
	2	11	43	55.35	3	47	29.2	1.195 101	7.36	2.81	11	03	10
	3	11	50	13.18	3	07	51.9	1.216 537	7.23	2.76	11	05	34
	4	11	56	34.60	2	26	51.5	1.236 828	7.11	2.72	11	07	60
	5	12	02	58.52	1	44	41.9	1.255 965	7.00	2.68	11	10	28
	6	12	09	24.00	1	01	35.9	1.273 951	6.90	2.64	11	12	58
	7	12	15	50.28	+0	17	45.0	1.290 800	6.81	2.60	11	15	28
	8	12	22	16.75	-0	26	40.1	1.306 533	6.73	2.57	11	17	58
	9	12	28	42.93	1	11	30.1	1.321 177	6.66	2.54	11	20	28
	10	12	35	08.45	1	56	36.4	1.334 762	6.59	2.52	11	22	57
	11	12	41	33.03	2	41	51.5	1.347 322	6.53	2.49	11	25	24
	12	12	47	56.47	1	27	08.6	1.358 892	6.47	2.47	11	27	51
	13	12	54	18.66	-4	12	21.8	1.369 508	6.42	2.45	11	30	16
	14	13	00	39.53	4	57	25.8	1.379 204	6.38	2.44	11	32	40
	15	13	06	59.03	5	42	15.9	1.388 015	6.34	2.42	11	35	03
	16	13	13	17.20	6	26	47.9	1.395 975	6.30	2.41	11	37	24
	17	13	19	34.07	7	10	58.1	1.403 116	6.27	2.39	11	39	44
	18	13	25	49.70	7	54	43.2	1.409 468	6.24	2.38	11	42	03
	19	13	32	04.18	-8	38	00.1	1.415 060	6.21	2.37	11	44	20
	20	13	38	17.61	9	20	46.3	1.419 918	6.19	2.37	11	46	37
	21	13	44	30.10	10	02	59.5	1.424 067	6.18	2.36	11	48	53
	22	13	50	41.74	10	44	37.3	1.427 531	6.16	2.35	11	51	07
	23	13	56	52.67	11	25	37.7	1.430 331	6.15	2.35	11	53	22
	24	14	03	03.00	12	05	58.9	1.432 487	6.14	2.35	11	55	35
	25	14	09	12.87	-12	45	39.1	1.434 015	6.13	2.34	11	57	49
	26	14	15	22.40	13	24	36.9	1.434 932	6.13	2.34	12	00	02
	27	14	21	31.71	14	02	50.7	1.435 252	6.13	2.34	12	02	15
	28	14	27	40.93	14	40	19.2	1.434 988	6.13	2.34	12	04	28
	29	14	33	50.18	15	17	01.0	1.434 151	6.13	2.34	12	06	41
	30	14	39	59.56	15	52	54.8	1.432 750	6.14	2.35	12	08	54
	31	14	46	09.19	-16	27	59.4	1.430 794	6.15	2.35	12	11	07
Nov.	1	14	52	19.14	17	02	13.5	1.428 288	6.16	2.35	12	13	21
	2	14	58	29.53	17	35	35.9	1.425 239	6.17	2.36	12	15	35
	3	15	04	40.41	18	08	05.3	1.421 651	6.19	2.36	12	17	50
	4	15	10	51.86	18	39	40.5	1.417 526	6.20	2.37	12	20	06
	5	15	17	03.93	19	10	20.3	1.412 867	6.22	2.38	12	22	22
	6	15	23	16.67	-19	40	03.4	1.407 674	6.25	2.39	12	24	38
	7	15	29	30.11	20	08	48.5	1.401 946	6.27	2.40	12	26	56
	8	15	35	44.28	20	36	34.4	1.395 684	6.30	2.41	12	29	14
	9	15	41	59.16	21	03	19.7	1.388 885	6.33	2.42	12	31	33
	10	15	48	14.76	21	29	03.1	1.381 545	6.37	2.43	12	33	53
	11	15	54	31.03	21	53	43.3	1.373 660	6.40	2.45	12	36	13
	12	16	00	47.92	-22	17	19.0	1.365 227	6.44	2.46	12	38	34
	13	16	07	05.36	22	39	48.7	1.356 239	6.48	2.48	12	40	55
	14	16	13	23.25	23	01	11.0	1.346 690	6.53	2.50	12	43	17
	15	16	19	41.46	23	21	24.6	1.336 574	6.58	2.51	12	45	39
	16	16	25	59.84	-23	40	28.1	1.325 882	6.63	2.53	12	48	01

MERCURY, 2023

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	16	25	59.84	-23	40	28.1	1.325 882	6.63	2.53	12	48	01
	17	16	32	18.18	23	58	20.0	1.314 607	6.69	2.56	12	50	23
	18	16	38	36.26	24	14	58.8	1.302 741	6.75	2.58	12	52	44
	19	16	44	53.81	24	30	23.3	1.290 273	6.82	2.60	12	55	05
	20	16	51	10.52	24	44	32.0	1.277 196	6.89	2.63	12	57	25
	21	16	57	26.03	24	57	23.5	1.263 500	6.96	2.66	12	59	43
	22	17	03	39.93	-25	08	56.6	1.249 176	7.04	2.69	13	01	60
	23	17	09	51.74	25	19	09.9	1.234 215	7.13	2.72	13	04	14
	24	17	16	00.92	25	28	02.4	1.218 609	7.22	2.76	13	06	25
	25	17	22	06.84	25	35	32.9	1.202 350	7.31	2.79	13	08	32
	26	17	28	08.80	25	41	40.6	1.185 431	7.42	2.83	13	10	35
	27	17	34	06.00	25	46	24.6	1.167 848	7.53	2.88	13	12	33
	28	17	39	57.50	-25	49	44.4	1.149 598	7.65	2.92	13	14	25
	29	17	45	42.26	25	51	39.5	1.130 682	7.78	2.97	13	16	09
	30	17	51	19.10	25	52	10.0	1.111 102	7.91	3.02	13	17	44
Dec.	1	17	56	46.65	25	51	15.8	1.090 869	8.06	3.08	13	19	10
	2	18	02	03.40	25	48	57.6	1.069 997	8.22	3.14	13	20	23
	3	18	07	07.61	25	45	16.3	1.048 509	8.39	3.20	13	21	23
	4	18	11	57.35	-25	40	13.1	1.026 435	8.57	3.27	13	22	07
	5	18	16	30.42	25	33	50.1	1.003 819	8.76	3.35	13	22	33
	6	18	20	44.40	25	26	09.5	0.980 717	8.97	3.43	13	22	39
	7	18	24	36.58	25	17	14.4	0.957 202	9.19	3.51	13	22	21
	8	18	28	03.98	25	07	08.3	0.933 365	9.42	3.60	13	21	37
	9	18	31	03.38	24	55	55.5	0.909 320	9.67	3.70	13	20	23
	10	18	33	31.30	-24	43	40.6	0.885 205	9.93	3.80	13	18	35
	11	18	35	24.14	24	30	28.7	0.861 188	10.21	3.90	13	16	11
	12	18	36	38.21	24	16	25.4	0.837 465	10.50	4.01	13	13	06
	13	18	37	09.95	24	01	36.4	0.814 266	10.80	4.13	13	09	17
	14	18	36	56.09	23	46	07.2	0.791 853	11.11	4.24	13	04	41
	15	18	35	54.02	23	30	03.4	0.770 517	11.41	4.36	12	59	17
	16	18	34	02.08	-23	13	30.4	0.750 575	11.72	4.48	12	53	03
	17	18	31	20.02	22	56	33.7	0.732 359	12.01	4.59	12	46	00
	18	18	27	49.37	22	39	18.9	0.716 207	12.28	4.69	12	38	11
	19	18	23	33.79	22	21	53.1	0.702 441	12.52	4.78	12	29	41
	20	18	18	39.27	22	04	25.1	0.691 355	12.72	4.86	12	20	37
	21	18	13	14.04	21	47	06.8	0.683 187	12.87	4.92	12	11	07
	22	18	07	28.25	-21	30	13.3	0.678 106	12.97	4.95	12	01	22
	23	18	01	33.34	21	14	03.4	0.676 198	13.01	4.97	11	51	35
	24	17	55	41.17	20	58	58.1	0.677 457	12.98	4.96	11	41	55
	25	17	50	03.11	20	45	19.0	0.681 786	12.90	4.93	11	32	35
	26	17	44	49.26	20	33	26.7	0.689 009	12.76	4.88	11	23	42
	27	17	40	07.87	20	23	38.0	0.698 888	12.58	4.81	11	15	25
	28	17	36	04.99	-20	16	05.1	0.711 138	12.37	4.72	11	07	47
	29	17	32	44.53	20	10	54.2	0.725 449	12.12	4.63	11	00	52
	30	17	30	08.39	20	08	05.8	0.741 506	11.86	4.53	10	54	41
	31	17	28	16.84	20	07	35.0	0.759 000	11.59	4.43	10	49	14
	32	17	27	08.86	-20	09	13.0	0.777 640	11.31	4.32	10	44	30

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Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Jan.	1	320	50	01.3	-3	03	02.0	0.728 1563	Apr.	3	108	02	43.3	+1	45	28.3	0.718 8458
	3	323	59	58.2	3	07	41.2	0.728 1048		5	111	17	16.2	1	55	09.8	0.718 7435
	5	327	09	58.6	3	11	46.1	0.728 0385		7	114	31	54.4	2	04	29.4	0.718 6557
	7	330	20	02.6	3	15	16.0	0.727 9577		9	117	46	37.5	2	13	25.1	0.718 5826
	9	333	30	10.6	3	18	10.2	0.727 8626		11	121	01	25.0	2	21	55.3	0.718 5245
	11	336	40	22.8	3	20	28.2	0.727 7535		13	124	16	16.5	2	29	58.3	0.718 4816
	13	339	50	39.4	-3	22	09.4	0.727 6308		15	127	31	11.4	+2	37	32.4	0.718 4541
	15	343	01	00.7	3	23	13.6	0.727 4947		17	130	46	09.3	2	44	36.2	0.718 4420
	17	346	11	26.7	3	23	40.6	0.727 3457		19	134	01	09.5	2	51	08.3	0.718 4454
	19	349	21	57.6	3	23	30.1	0.727 1843		21	137	16	11.5	2	57	07.4	0.718 4642
	21	352	32	33.6	3	22	42.2	0.727 0110		23	140	31	14.6	3	02	32.3	0.718 4984
	23	355	43	14.8	3	21	16.9	0.726 8263		25	143	46	18.2	3	07	22.1	0.718 5479
	25	358	54	01.3	-3	19	14.5	0.726 6307		27	147	01	21.6	+3	11	35.6	0.718 6125
	27	2	04	53.3	3	16	35.3	0.726 4248		29	150	16	24.2	3	15	12.2	0.718 6921
	29	5	15	50.8	3	13	19.7	0.726 2093	May	1	153	31	25.2	3	18	11.2	0.718 7863
	31	8	26	53.8	3	09	28.2	0.725 9848		3	156	46	24.0	3	20	31.9	0.718 8949
Feb.	2	11	38	02.6	3	05	01.6	0.725 7521		5	160	01	19.8	3	22	14.0	0.719 0175
	4	14	49	17.1	3	00	00.4	0.725 5117		7	163	16	12.0	3	23	17.2	0.719 1537
	6	18	00	37.6	-2	54	25.7	0.725 2646		9	166	30	59.8	+3	23	41.3	0.719 3031
	8	21	12	03.9	2	48	18.4	0.725 0113		11	169	45	42.6	3	23	26.3	0.719 4651
	10	24	23	36.3	2	41	39.6	0.724 7528		13	173	00	19.7	3	22	32.2	0.719 6394
	12	27	35	14.8	2	34	30.4	0.724 4898		15	176	14	50.4	3	20	59.4	0.719 8253
	14	30	46	59.4	2	26	52.0	0.724 2230		17	179	29	14.2	3	18	48.1	0.720 0221
	16	33	58	50.4	2	18	46.0	0.723 9534		19	182	43	30.5	3	15	58.9	0.720 2294
	18	37	10	47.7	-2	10	13.6	0.723 6818		21	185	57	38.7	+3	12	32.4	0.720 4464
	20	40	22	51.4	2	01	16.5	0.723 4090		23	189	11	38.3	3	08	29.3	0.720 6724
	22	43	35	01.7	1	51	56.3	0.723 1359		25	192	25	28.9	3	03	50.4	0.720 9067
	24	46	47	18.6	1	42	14.7	0.722 8632		27	195	39	10.1	2	58	36.8	0.721 1485
	26	49	59	42.2	1	32	13.5	0.722 5920		29	198	52	41.3	2	52	49.4	0.721 3972
	28	53	12	12.6	1	21	54.5	0.722 3229		31	202	06	02.5	2	46	29.6	0.721 6518
Mar.	2	56	24	49.9	-1	11	19.6	0.722 0569	June	2	205	19	13.2	+2	39	38.6	0.721 9117
	4	59	37	34.2	1	00	30.8	0.721 7949		4	208	32	13.3	2	32	17.7	0.722 1759
	6	62	50	25.5	0	49	30.1	0.721 5375		6	211	45	02.5	2	24	28.3	0.722 4436
	8	66	03	23.8	0	38	19.6	0.721 2857		8	214	57	40.9	2	16	12.2	0.722 7140
	10	69	16	29.3	0	27	01.4	0.721 0402		10	218	10	08.4	2	07	30.8	0.722 9863
	12	72	29	42.0	0	15	37.6	0.720 8018		12	221	22	24.9	1	58	25.9	0.723 2595
	14	75	43	01.9	-0	04	10.4	0.720 5713		14	224	34	30.6	+1	48	59.2	0.723 5329
	16	78	56	29.0	+0	07	18.0	0.720 3494		16	227	46	25.5	1	39	12.6	0.723 8055
	18	82	10	03.2	0	18	45.5	0.720 1368		18	230	58	09.9	1	29	07.9	0.724 0766
	20	85	23	44.6	0	30	09.8	0.719 9342		20	234	09	43.9	1	18	47.1	0.724 3452
	22	88	37	33.0	0	41	28.7	0.719 7422		22	237	21	07.9	1	08	12.0	0.724 6106
	24	91	51	28.3	0	52	40.0	0.719 5615		24	240	32	22.1	0	57	24.8	0.724 8719
	26	95	05	30.5	+1	03	41.6	0.719 3927		26	243	43	26.9	+0	46	27.4	0.725 1283
	28	98	19	39.3	1	14	31.3	0.719 2362		28	246	54	22.6	0	35	21.9	0.725 3791
	30	101	33	54.5	1	25	07.1	0.719 0926		30	250	05	09.9	0	24	10.2	0.725 6234
Apr.	1	104	48	16.0	1	35	26.7	0.718 9623	July	2	253	15	48.9	0	12	54.6	0.725 8605
	3	108	02	43.3	+1	45	28.3	0.718 8458		4	256	26	20.4	+0	01	37.0	0.726 0897

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Date	Heliocentric Longitude ° ′ ″	Heliocentric Latitude ° ′ ″	Radius Vector	Date	Heliocentric Longitude ° ′ ″	Heliocentric Latitude ° ′ ″	Radius Vector
July 2	253 15 48.9	+0 12 54.6	0.725 8605	Oct. 2	39 15 59.1	-2 04 26.6	0.723 5401
4	256 26 20.4	+0 01 37.0	0.726 0897	4	42 28 06.0	1 55 14.4	0.723 2672
6	259 36 44.7	-0 09 40.5	0.726 3103	6	45 40 19.4	1 45 40.1	0.722 9945
8	262 47 02.5	0 20 55.8	0.726 5216	8	48 52 39.5	1 35 45.6	0.722 7227
10	265 57 14.2	0 32 06.9	0.726 7230	10	52 05 06.5	1 25 32.6	0.722 4527
12	269 07 20.5	0 43 11.7	0.726 9137	12	55 17 40.2	1 15 03.1	0.722 1854
14	272 17 21.9	-0 54 08.2	0.727 0934	14	58 30 20.9	-1 04 19.0	0.721 9216
16	275 27 18.9	1 04 54.5	0.727 2614	16	61 43 08.6	0 53 22.3	0.721 6621
18	278 37 12.3	1 15 28.7	0.727 4172	18	64 56 03.4	0 42 15.1	0.721 4078
20	281 47 02.4	1 25 48.8	0.727 5604	20	68 09 05.3	0 30 59.4	0.721 1595
22	284 56 50.0	1 35 53.0	0.727 6905	22	71 22 14.4	0 19 37.4	0.720 9179
24	288 06 35.5	1 45 39.5	0.727 8071	24	74 35 30.7	-0 08 11.2	0.720 6838
26	291 16 19.6	-1 55 06.5	0.727 9100	26	77 48 54.3	+0 03 16.9	0.720 4580
28	294 26 02.7	2 04 12.3	0.727 9987	28	81 02 25.0	0 14 44.9	0.720 2411
30	297 35 45.4	2 12 55.3	0.728 0730	30	84 16 02.9	0 26 10.5	0.720 0340
Aug. 1	300 45 28.3	2 21 14.0	0.728 1327	Nov. 1	87 29 47.9	0 37 31.5	0.719 8371
3	303 55 11.6	2 29 06.9	0.728 1776	3	90 43 39.9	0 48 45.6	0.719 6513
5	307 04 56.0	2 36 32.5	0.728 2077	5	93 57 38.8	0 59 50.8	0.719 4769
7	310 14 41.9	-2 43 29.4	0.728 2227	7	97 11 44.5	+1 10 44.9	0.719 3147
9	313 24 29.7	2 49 56.6	0.728 2227	9	100 25 56.7	1 21 25.8	0.719 1652
11	316 34 19.7	2 55 52.7	0.728 2076	11	103 40 15.2	1 31 51.3	0.719 0287
13	319 44 12.4	3 01 16.7	0.728 1776	13	106 54 39.8	1 41 59.3	0.718 9058
15	322 54 08.0	3 06 07.7	0.728 1327	15	110 09 10.2	1 51 48.1	0.718 7969
17	326 04 06.9	3 10 24.6	0.728 0730	17	113 23 46.0	2 01 15.5	0.718 7023
19	329 14 09.4	-3 14 06.8	0.727 9987	19	116 38 26.8	+2 10 19.8	0.718 6222
21	332 24 15.7	3 17 13.5	0.727 9101	21	119 53 12.3	2 18 59.2	0.718 5571
23	335 34 26.1	3 19 44.1	0.727 8074	23	123 08 02.0	2 27 11.8	0.718 5070
25	338 44 40.7	3 21 38.2	0.727 6908	25	126 22 55.4	2 34 56.2	0.718 4722
27	341 54 59.9	3 22 55.3	0.727 5609	27	129 37 52.0	2 42 10.8	0.718 4528
29	345 05 23.7	3 23 35.2	0.727 4179	29	132 52 51.2	2 48 54.2	0.718 4487
31	348 15 52.3	-3 23 37.8	0.727 2623	Dec. 1	136 07 52.4	+2 55 05.0	0.718 4601
Sept. 2	351 26 25.9	3 23 02.9	0.727 0946	3	139 22 55.1	3 00 42.1	0.718 4870
4	354 37 04.7	3 21 50.6	0.726 9152	5	142 37 58.5	3 05 44.3	0.718 5291
6	357 47 48.6	3 20 01.1	0.726 7247	7	145 53 02.1	3 10 10.6	0.718 5864
8	0 58 37.9	3 17 34.6	0.726 5237	9	149 08 05.1	3 14 00.3	0.718 6587
10	4 09 32.7	3 14 31.7	0.726 3127	11	152 23 06.9	3 17 12.6	0.718 7457
12	7 20 32.9	-3 10 52.7	0.726 0925	13	155 38 06.7	+3 19 46.8	0.718 8472
14	10 31 38.8	3 06 38.2	0.725 8637	15	158 53 03.9	3 21 42.5	0.718 9629
16	13 42 50.5	3 01 49.0	0.725 6270	17	162 07 57.7	3 22 59.4	0.719 0924
18	16 54 07.9	2 56 26.0	0.725 3831	19	165 22 47.6	3 23 37.2	0.719 2352
20	20 05 31.1	2 50 29.9	0.725 1328	21	168 37 32.6	3 23 35.9	0.719 3909
22	23 17 00.4	2 44 02.0	0.724 8768	23	171 52 12.3	3 22 55.5	0.719 5590
24	26 28 35.7	-2 37 03.3	0.724 6160	25	175 06 46.0	+3 21 36.2	0.719 7389
26	29 40 17.1	2 29 35.0	0.724 3510	27	178 21 13.0	3 19 38.4	0.719 9302
28	32 52 04.8	2 21 38.5	0.724 0829	29	181 35 32.7	3 17 02.4	0.720 1321
30	36 03 58.7	2 13 15.2	0.723 8123	31	184 49 44.5	3 13 48.9	0.720 3440
Oct. 2	39 15 59.1	-2 04 26.6	0.723 5401	33	188 03 48.1	+3 09 58.5	0.720 5652

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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	296	07	44.2	-1	21	34.8	Feb.	15	353	25	43.5	-1	11	51.7
	1	297	22	53.8	1	22	52.3		16	354	39	46.3	1	10	00.6
	2	298	38	02.7	1	24	06.3		17	355	53	46.8	1	08	05.6
	3	299	53	10.9	1	25	16.9		18	357	07	44.8	1	06	06.7
	4	301	08	18.3	1	26	23.9		19	358	21	40.2	1	04	04.1
	5	302	23	25.0	1	27	27.2		20	359	35	33.0	1	01	57.7
	6	303	38	30.8	-1	28	27.0		21	0	49	23.1	-0	59	47.6
	7	304	53	35.8	1	29	23.0		22	2	03	10.2	0	57	33.8
	8	306	08	40.0	1	30	15.2		23	3	16	54.5	0	55	16.6
	9	307	23	43.3	1	31	03.6		24	4	30	35.8	0	52	55.8
	10	308	38	45.7	1	31	48.2		25	5	44	14.0	0	50	31.7
	11	309	53	47.3	1	32	28.8		26	6	57	49.0	0	48	04.2
	12	311	08	47.9	-1	33	05.5		27	8	11	20.7	-0	45	33.4
	13	312	23	47.8	1	33	38.2		28	9	24	49.1	0	42	59.5
	14	313	38	46.7	1	34	06.8	Mar.	1	10	38	14.0	0	40	22.5
	15	314	53	44.8	1	34	31.4		2	11	51	35.4	0	37	42.5
	16	316	08	42.0	1	34	51.8		3	13	04	53.2	0	34	59.6
	17	317	23	38.4	1	35	08.0		4	14	18	07.2	0	32	13.8
	18	318	38	33.9	-1	35	20.1		5	15	31	17.6	-0	29	25.3
	19	319	53	28.5	1	35	27.9		6	16	44	24.0	0	26	34.2
	20	321	08	22.1	1	35	31.5		7	17	57	26.7	0	23	40.5
	21	322	23	14.6	1	35	30.8		8	19	10	25.4	0	20	44.3
	22	323	38	05.9	1	35	25.8		9	20	23	20.2	0	17	45.7
	23	324	52	55.9	1	35	16.5		10	21	36	11.1	0	14	44.8
	24	326	07	44.4	-1	35	02.8		11	22	48	58.0	-0	11	41.8
	25	327	22	31.5	1	34	44.8		12	24	01	40.9	0	08	36.6
	26	328	37	16.9	1	34	22.4		13	25	14	19.9	0	05	29.5
	27	329	52	00.8	1	33	55.7		14	26	26	54.9	-0	02	20.5
	28	331	06	43.0	1	33	24.6		15	27	39	25.8	+0	00	50.3
	29	332	21	23.4	1	32	49.1		16	28	51	52.6	0	04	02.7
	30	333	36	02.1	-1	32	09.3		17	30	04	15.3	+0	07	16.8
	31	334	50	39.0	1	31	25.1		18	31	16	33.7	0	10	32.3
Feb.	1	336	05	14.0	1	30	36.6		19	32	28	47.7	0	13	49.1
	2	337	19	47.0	1	29	43.8		20	33	40	57.3	0	17	07.2
	3	338	34	18.0	1	28	46.6		21	34	53	02.4	0	20	26.4
	4	339	48	47.0	1	27	45.2		22	36	05	02.9	0	23	46.5
	5	341	03	13.9	-1	26	39.4		23	37	16	58.6	+0	27	07.6
	6	342	17	38.7	1	25	29.4		24	38	28	49.6	0	30	29.3
	7	343	32	01.3	1	24	15.2		25	39	40	35.6	0	33	51.7
	8	344	46	21.8	1	22	56.7		26	40	52	16.5	0	37	14.5
	9	346	00	40.0	1	21	34.0		27	42	03	52.2	0	40	37.7
	10	347	14	56.1	1	20	07.2		28	43	15	22.6	0	44	01.1
	11	348	29	10.0	-1	18	36.2		29	44	26	47.4	+0	47	24.5
	12	349	43	21.7	1	17	01.2		30	45	38	06.7	0	50	47.9
	13	350	57	31.2	1	15	22.0		31	46	49	20.1	0	54	11.1
	14	352	11	38.5	1	13	38.9	Apr.	1	48	00	27.7	0	57	34.0
	15	353	25	43.5	-1	11	51.7		2	49	11	29.3	+1	00	56.4

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	′	″	°	′	″			°	′	″	°	′	″
Apr.	1	48	00	27.7	+0	57	34.0	May	17	100	10	14.5	+2	46	49.6
	2	49	11	29.3	1	00	56.4		18	101	13	56.8	2	47	16.8
	3	50	22	24.7	1	04	18.2		19	102	17	23.6	2	47	36.8
	4	51	33	14.0	1	07	39.3		20	103	20	34.5	2	47	49.3
	5	52	43	56.9	1	10	59.5		21	104	23	28.8	2	47	54.1
	6	53	54	33.6	1	14	18.7		22	105	26	06.2	2	47	51.2
	7	55	05	03.7	+1	17	36.8		23	106	28	25.9	+2	47	40.4
	8	56	15	27.5	1	20	53.6		24	107	30	27.4	2	47	21.5
	9	57	25	44.6	1	24	09.0		25	108	32	10.1	2	46	54.3
	10	58	35	55.2	1	27	22.9		26	109	33	33.4	2	46	18.7
	11	59	45	59.0	1	30	35.1		27	110	34	36.6	2	45	34.5
	12	60	55	56.1	1	33	45.4		28	111	35	19.1	2	44	41.5
	13	62	05	46.4	+1	36	53.9		29	112	35	40.2	+2	43	39.7
	14	63	15	29.6	1	40	00.2		30	113	35	39.2	2	42	28.8
	15	64	25	05.7	1	43	04.3		31	114	35	15.4	2	41	08.7
	16	65	34	34.6	1	46	06.0	June	1	115	34	28.1	2	39	39.2
	17	66	43	56.1	1	49	05.2		2	116	33	16.6	2	38	00.2
	18	67	53	10.2	1	52	01.8		3	117	31	40.0	2	36	11.4
	19	69	02	16.6	+1	54	55.5		4	118	29	37.7	+2	34	12.7
	20	70	11	15.3	1	57	46.3		5	119	27	08.8	2	32	04.0
	21	71	20	06.1	2	00	34.0		6	120	24	12.5	2	29	45.1
	22	72	28	48.6	2	03	18.3		7	121	20	47.9	2	27	15.8
	23	73	37	22.8	2	05	59.3		8	122	16	54.2	2	24	35.9
	24	74	45	48.4	2	08	36.7		9	123	12	30.5	2	21	45.3
	25	75	54	05.0	+2	11	10.4		10	124	07	35.8	+2	18	43.7
	26	77	02	12.5	2	13	40.2		11	125	02	09.3	2	15	31.0
	27	78	10	10.5	2	16	06.0		12	125	56	09.9	2	12	07.0
	28	79	17	58.9	2	18	27.6		13	126	49	36.5	2	08	31.5
	29	80	25	37.4	2	20	44.9		14	127	42	28.1	2	04	44.2
	30	81	33	05.7	2	22	57.7		15	128	34	43.4	2	00	45.1
May	1	82	40	23.5	+2	25	05.9		16	129	26	21.2	+1	56	33.7
	2	83	47	30.7	2	27	09.3		17	130	17	19.9	1	52	10.1
	3	84	54	27.0	2	29	07.9		18	131	07	38.1	1	47	33.9
	4	86	01	12.2	2	31	01.3		19	131	57	14.3	1	42	44.9
	5	87	07	46.0	2	32	49.6		20	132	46	06.9	1	37	42.9
	6	88	14	08.2	2	34	32.5		21	133	34	14.0	1	32	27.7
	7	89	20	18.6	+2	36	09.9		22	134	21	33.9	+1	26	59.0
	8	90	26	16.9	2	37	41.6		23	135	08	04.7	1	21	16.7
	9	91	32	02.9	2	39	07.6		24	135	53	44.5	1	15	20.6
	10	92	37	36.3	2	40	27.6		25	136	38	31.2	1	09	10.3
	11	93	42	56.9	2	41	41.6		26	137	22	22.8	1	02	45.7
	12	94	48	04.4	2	42	49.4		27	138	05	17.1	0	56	06.6
	13	95	52	58.4	+2	43	50.8		28	138	47	11.8	+0	49	12.7
	14	96	57	38.8	2	44	45.6		29	139	28	04.5	0	42	03.9
	15	98	02	05.1	2	45	33.8		30	140	07	52.9	0	34	39.9
	16	99	06	17.1	2	46	15.2	July	1	140	46	34.3	0	27	00.6
	17	100	10	14.5	+2	46	49.6		2	141	24	06.2	+0	19	05.7

VENUS, 2023

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	140	46	34.3	+0	27	00.6	Aug.	16	138	54	27.0	-7	54	50.2
	2	141	24	06.2	0	19	05.7		17	138	18	11.0	7	58	40.1
	3	142	00	25.9	0	10	55.1		18	137	42	42.5	8	01	37.9
	4	142	35	30.7	+0	02	28.7		19	137	08	14.6	8	03	43.8
	5	143	09	17.7	-0	06	13.8		20	136	34	59.4	8	04	58.5
	6	143	41	44.2	0	15	12.5		21	136	03	08.4	8	05	22.9
	7	144	12	47.2	-0	24	27.4		22	135	32	52.0	-8	04	58.3
	8	144	42	23.8	0	33	58.7		23	135	04	19.7	8	03	46.5
	9	145	10	30.9	0	43	46.5		24	134	37	40.0	8	01	49.1
	10	145	37	05.6	0	53	50.8		25	134	13	00.5	7	59	08.4
	11	146	02	04.4	1	04	11.6		26	133	50	27.5	7	55	46.6
	12	146	25	24.1	1	14	48.9		27	133	30	06.5	7	51	45.9
	13	146	47	01.2	-1	25	42.5		28	133	12	01.9	-7	47	09.0
	14	147	06	52.3	1	36	52.4		29	132	56	17.1	7	41	58.3
	15	147	24	53.7	1	48	18.2		30	132	42	54.7	7	36	16.3
	16	147	41	01.9	1	59	59.8		31	132	31	56.6	7	30	05.6
	17	147	55	13.1	2	11	56.6	Sept.	1	132	23	23.6	7	23	28.7
	18	148	07	23.9	2	24	08.3		2	132	17	15.9	7	16	28.0
	19	148	17	30.6	-2	36	34.2		3	132	13	33.0	-7	09	05.9
	20	148	25	29.9	2	49	13.5		4	132	12	13.8	7	01	24.6
	21	148	31	18.5	3	02	05.4		5	132	13	16.3	6	53	26.3
	22	148	34	53.3	3	15	08.9		6	132	16	38.5	6	45	13.1
	23	148	36	11.5	3	28	22.7		7	132	22	17.5	6	36	46.6
	24	148	35	10.7	3	41	45.6		8	132	30	10.5	6	28	08.9
	25	148	31	48.7	-3	55	15.8		9	132	40	14.1	-6	19	21.3
	26	148	26	04.1	4	08	51.8		10	132	52	24.9	6	10	25.5
	27	148	17	55.6	4	22	31.4		11	133	06	39.5	6	01	22.8
	28	148	07	22.9	4	36	12.5		12	133	22	54.1	5	52	14.4
	29	147	54	26.3	4	49	52.8		13	133	41	05.0	5	43	01.6
	30	147	39	06.9	5	03	29.5		14	134	01	08.6	5	33	45.2
	31	147	21	26.7	-5	16	59.8		15	134	23	01.2	-5	24	26.5
Aug.	1	147	01	28.8	5	30	20.8		16	134	46	39.1	5	15	06.0
	2	146	39	17.1	5	43	29.2		17	135	11	58.7	5	05	44.8
	3	146	14	57.1	5	56	21.7		18	135	38	56.6	4	56	23.4
	4	145	48	35.0	6	08	55.0		19	136	07	29.3	4	47	02.6
	5	145	20	18.3	6	21	05.5		20	136	37	33.5	4	37	42.9
	6	144	50	15.7	-6	32	49.8		21	137	09	05.9	-4	28	24.9
	7	144	18	36.7	6	44	04.4		22	137	42	03.4	4	19	09.0
	8	143	45	31.9	6	54	46.0		23	138	16	23.0	4	09	55.7
	9	143	11	12.6	7	04	51.2		24	138	52	01.7	4	00	45.4
	10	142	35	51.1	7	14	17.2		25	139	28	56.9	3	51	38.6
	11	141	59	40.3	7	23	00.9		26	140	07	05.8	3	42	35.5
	12	141	22	53.5	-7	31	00.0		27	140	46	25.9	-3	33	36.4
	13	140	45	44.7	7	38	12.0		28	141	26	54.8	3	24	41.8
	14	140	08	27.9	7	44	35.4		29	142	08	30.1	3	15	51.8
	15	139	31	17.3	7	50	08.4		30	142	51	09.7	3	07	06.8
	16	138	54	27.0	-7	54	50.2	Oct.	1	143	34	51.3	-2	58	26.9

VENUS, 2023

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	143	34	51.3	-2	58	26.9	Nov.	16	188	24	00.8	+1	36	41.4
	2	144	19	32.8	2	49	52.5		17	189	31	19.8	1	39	43.3
	3	145	05	12.0	2	41	23.7		18	190	38	51.7	1	42	37.7
	4	145	51	46.9	2	33	00.7		19	191	46	36.0	1	45	24.5
	5	146	39	15.4	2	24	43.7		20	192	54	32.5	1	48	03.7
	6	147	27	35.5	2	16	32.8		21	194	02	40.9	1	50	35.4
	7	148	16	45.4	-2	08	28.2		22	195	11	00.8	+1	52	59.6
	8	149	06	43.1	2	00	30.0		23	196	19	32.0	1	55	16.2
	9	149	57	26.9	1	52	38.3		24	197	28	14.3	1	57	25.4
	10	150	48	55.2	1	44	53.1		25	198	37	07.5	1	59	27.2
	11	151	41	06.3	1	37	14.6		26	199	46	11.5	2	01	21.5
	12	152	33	58.7	1	29	42.9		27	200	55	25.8	2	03	08.5
	13	153	27	30.9	-1	22	18.1		28	202	04	50.4	+2	04	48.1
	14	154	21	41.4	1	15	00.1		29	203	14	24.9	2	06	20.5
	15	155	16	29.1	1	07	49.1		30	204	24	09.1	2	07	45.6
	16	156	11	52.5	1	00	45.1	Dec.	1	205	34	02.7	2	09	03.5
	17	157	07	50.5	0	53	48.1		2	206	44	05.4	2	10	14.4
	18	158	04	21.9	0	46	58.3		3	207	54	16.9	2	11	18.1
	19	159	01	25.6	-0	40	15.6		4	209	04	37.0	+2	12	14.9
	20	159	59	00.5	0	33	40.2		5	210	15	05.4	2	13	04.8
	21	160	57	05.6	0	27	12.0		6	211	25	41.8	2	13	47.8
	22	161	55	39.9	0	20	51.1		7	212	36	26.1	2	14	24.0
	23	162	54	42.6	0	14	37.5		8	213	47	17.9	2	14	53.5
	24	163	54	12.9	0	08	31.3		9	214	58	17.1	2	15	16.4
	25	164	54	09.9	-0	02	32.5		10	216	09	23.3	+2	15	32.8
	26	165	54	32.9	+0	03	18.7		11	217	20	36.4	2	15	42.7
	27	166	55	21.3	0	09	02.5		12	218	31	56.1	2	15	46.3
	28	167	56	34.5	0	14	38.7		13	219	43	22.1	2	15	43.5
	29	168	58	11.8	0	20	07.3		14	220	54	54.2	2	15	34.6
	30	170	00	12.5	0	25	28.3		15	222	06	32.1	2	15	19.6
	31	171	02	36.0	+0	30	41.5		16	223	18	15.6	+2	14	58.6
Nov.	1	172	05	21.7	0	35	47.1		17	224	30	04.4	2	14	31.6
	2	173	08	28.9	0	40	45.0		18	225	41	58.4	2	13	58.8
	3	174	11	56.8	0	45	35.1		19	226	53	57.5	2	13	20.2
	4	175	15	44.8	0	50	17.4		20	228	06	01.4	2	12	36.0
	5	176	19	52.4	0	54	52.0		21	229	18	10.2	2	11	46.2
	6	177	24	18.8	+0	59	18.9		22	230	30	23.8	+2	10	51.0
	7	178	29	03.6	1	03	37.9		23	231	42	42.1	2	09	50.3
	8	179	34	06.0	1	07	49.2		24	232	55	04.9	2	08	44.4
	9	180	39	25.6	1	11	52.8		25	234	07	32.3	2	07	33.3
	10	181	45	01.9	1	15	48.6		26	235	20	04.1	2	06	17.1
	11	182	50	54.2	1	19	36.6		27	236	32	40.2	2	04	55.9
	12	183	57	02.2	+1	23	16.9		28	237	45	20.4	+2	03	29.9
	13	185	03	25.3	1	26	49.6		29	238	58	04.7	2	01	59.1
	14	186	10	03.1	1	30	14.5		30	240	10	53.0	2	00	23.7
	15	187	16	55.1	1	33	31.8		31	241	23	45.0	1	58	43.7
	16	188	24	00.8	+1	36	41.4		32	242	36	40.8	+1	56	59.4

VENUS, 2023
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	53	37.43	-22	15	29.2	1.610 325	5.46	5.18	13	16	47
	1	19	58	56.89	22	02	13.6	1.607 444	5.47	5.19	13	18	09
	2	20	04	15.25	21	48	18.6	1.604 528	5.48	5.20	13	19	30
	3	20	09	32.49	21	33	44.6	1.601 575	5.49	5.21	13	20	50
	4	20	14	48.57	21	18	32.4	1.598 587	5.50	5.22	13	22	09
	5	20	20	03.46	21	02	42.5	1.595 563	5.51	5.23	13	23	27
	6	20	25	17.14	-20	46	15.6	1.592 503	5.52	5.24	13	24	44
	7	20	30	29.58	20	29	12.3	1.589 408	5.53	5.25	13	25	59
	8	20	35	40.76	20	11	33.3	1.586 278	5.54	5.26	13	27	13
	9	20	40	50.66	19	53	19.3	1.583 113	5.55	5.27	13	28	26
	10	20	45	59.27	19	34	30.9	1.579 912	5.57	5.28	13	29	37
	11	20	51	06.58	19	15	08.8	1.576 676	5.58	5.29	13	30	47
	12	20	56	12.57	-18	55	13.8	1.573 404	5.59	5.30	13	31	56
	13	21	01	17.25	18	34	46.5	1.570 096	5.60	5.31	13	33	03
	14	21	06	20.61	18	13	47.7	1.566 753	5.61	5.32	13	34	09
	15	21	11	22.64	17	52	18.1	1.563 373	5.63	5.33	13	35	14
	16	21	16	23.36	17	30	18.5	1.559 957	5.64	5.35	13	36	18
	17	21	21	22.77	17	07	49.5	1.556 505	5.65	5.36	13	37	20
	18	21	26	20.87	-16	44	52.0	1.553 015	5.66	5.37	13	38	21
	19	21	31	17.66	16	21	26.8	1.549 488	5.68	5.38	13	39	20
	20	21	36	13.17	15	57	34.5	1.545 923	5.69	5.39	13	40	18
	21	21	41	07.38	15	33	16.1	1.542 320	5.70	5.41	13	41	15
	22	21	46	00.32	15	08	32.3	1.538 678	5.72	5.42	13	42	11
	23	21	50	51.98	14	43	23.9	1.534 998	5.73	5.43	13	43	05
	24	21	55	42.39	-14	17	51.8	1.531 278	5.74	5.45	13	43	59
	25	22	00	31.56	13	51	56.6	1.527 519	5.76	5.46	13	44	50
	26	22	05	19.50	13	25	39.3	1.523 721	5.77	5.47	13	45	41
	27	22	10	06.25	12	59	00.6	1.519 885	5.79	5.49	13	46	31
	28	22	14	51.82	12	32	01.3	1.516 009	5.80	5.50	13	47	19
	29	22	19	36.24	12	04	42.3	1.512 095	5.82	5.52	13	48	06
	30	22	24	19.54	-11	37	04.2	1.508 142	5.83	5.53	13	48	52
	31	22	29	01.74	11	09	08.0	1.504 151	5.85	5.54	13	49	38
Feb.	1	22	33	42.88	10	40	54.4	1.500 122	5.86	5.56	13	50	22
	2	22	38	22.98	10	12	24.3	1.496 054	5.88	5.57	13	51	05
	3	22	43	02.07	9	43	38.3	1.491 949	5.89	5.59	13	51	47
	4	22	47	40.20	9	14	37.3	1.487 805	5.91	5.61	13	52	28
	5	22	52	17.38	-8	45	22.0	1.483 624	5.93	5.62	13	53	08
	6	22	56	53.66	8	15	53.3	1.479 405	5.94	5.64	13	53	47
	7	23	01	29.07	7	46	11.8	1.475 148	5.96	5.65	13	54	25
	8	23	06	03.66	7	16	18.4	1.470 854	5.98	5.67	13	55	03
	9	23	10	37.46	6	46	13.8	1.466 521	6.00	5.69	13	55	40
	10	23	15	10.50	6	15	58.7	1.462 150	6.01	5.70	13	56	16
	11	23	19	42.84	-5	45	33.8	1.457 741	6.03	5.72	13	56	51
	12	23	24	14.52	5	15	00.0	1.453 294	6.05	5.74	13	57	26
	13	23	28	45.57	4	44	17.9	1.448 807	6.07	5.76	13	58	00
	14	23	33	16.04	4	13	28.3	1.444 283	6.09	5.77	13	58	34
	15	23	37	45.96	-3	42	32.0	1.439 718	6.11	5.79	13	59	07

VENUS, 2023
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	37	45.96	-3	42	32.0	1.439 718	6.11	5.79	13	59	07
	16	23	42	15.39	3	11	29.5	1.435 114	6.13	5.81	13	59	39
	17	23	46	44.36	2	40	21.8	1.430 470	6.15	5.83	14	00	12
	18	23	51	12.90	2	09	09.5	1.425 786	6.17	5.85	14	00	43
	19	23	55	41.06	1	37	53.5	1.421 060	6.19	5.87	14	01	15
	20	0	00	08.87	1	06	34.4	1.416 293	6.21	5.89	14	01	46
	21	0	04	36.37	-0	35	13.0	1.411 485	6.23	5.91	14	02	17
	22	0	09	03.60	-0	03	50.2	1.406 634	6.25	5.93	14	02	47
	23	0	13	30.60	+0	27	33.4	1.401 741	6.27	5.95	14	03	18
	24	0	17	57.40	0	58	57.1	1.396 806	6.30	5.97	14	03	48
	25	0	22	24.06	1	30	20.0	1.391 828	6.32	5.99	14	04	18
	26	0	26	50.61	2	01	41.4	1.386 809	6.34	6.01	14	04	48
	27	0	31	17.08	+2	33	00.6	1.381 747	6.36	6.04	14	05	18
	28	0	35	43.52	3	04	16.9	1.376 644	6.39	6.06	14	05	48
Mar.	1	0	40	09.96	3	35	29.4	1.371 499	6.41	6.08	14	06	17
	2	0	44	36.44	4	06	37.5	1.366 313	6.44	6.10	14	06	47
	3	0	49	03.00	4	37	40.4	1.361 085	6.46	6.13	14	07	17
	4	0	53	29.68	5	08	37.4	1.355 816	6.49	6.15	14	07	48
	5	0	57	56.51	+5	39	27.8	1.350 507	6.51	6.18	14	08	18
	6	1	02	23.53	6	10	10.8	1.345 156	6.54	6.20	14	08	49
	7	1	06	50.79	6	40	45.8	1.339 764	6.56	6.22	14	09	20
	8	1	11	18.32	7	11	12.0	1.334 332	6.59	6.25	14	09	51
	9	1	15	46.15	7	41	28.6	1.328 859	6.62	6.28	14	10	22
	10	1	20	14.33	8	11	35.1	1.323 346	6.65	6.30	14	10	54
	11	1	24	42.90	+8	41	30.7	1.317 793	6.67	6.33	14	11	26
	12	1	29	11.89	9	11	14.7	1.312 199	6.70	6.36	14	11	59
	13	1	33	41.34	9	40	46.4	1.306 565	6.73	6.38	14	12	32
	14	1	38	11.28	10	10	05.1	1.300 890	6.76	6.41	14	13	06
	15	1	42	41.75	10	39	10.2	1.295 174	6.79	6.44	14	13	40
	16	1	47	12.77	11	08	00.8	1.289 418	6.82	6.47	14	14	15
	17	1	51	44.38	+11	36	36.3	1.283 621	6.85	6.50	14	14	50
	18	1	56	16.61	12	04	56.0	1.277 782	6.88	6.53	14	15	27
	19	2	00	49.47	12	32	59.1	1.271 902	6.91	6.56	14	16	03
	20	2	05	22.99	13	00	44.9	1.265 979	6.95	6.59	14	16	41
	21	2	09	57.20	13	28	12.7	1.260 015	6.98	6.62	14	17	19
	22	2	14	32.12	13	55	21.7	1.254 008	7.01	6.65	14	17	58
	23	2	19	07.77	+14	22	11.1	1.247 958	7.05	6.68	14	18	37
	24	2	23	44.17	14	48	40.4	1.241 865	7.08	6.72	14	19	17
	25	2	28	21.32	15	14	48.7	1.235 730	7.12	6.75	14	19	59
	26	2	32	59.26	15	40	35.4	1.229 553	7.15	6.78	14	20	40
	27	2	37	37.98	16	05	59.6	1.223 333	7.19	6.82	14	21	23
	28	2	42	17.49	16	31	00.7	1.217 071	7.23	6.85	14	22	07
	29	2	46	57.80	+16	55	38.1	1.210 768	7.26	6.89	14	22	51
	30	2	51	38.92	17	19	50.9	1.204 423	7.30	6.92	14	23	36
	31	2	56	20.85	17	43	38.4	1.198 037	7.34	6.96	14	24	22
Apr.	1	3	01	03.59	18	07	00.1	1.191 610	7.38	7.00	14	25	08
	2	3	05	47.15	+18	29	55.2	1.185 143	7.42	7.04	14	25	56

VENUS, 2023

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	3	01	03.59	+18	07	00.1	1.191 610	7.38	7.00	14	25	08
	2	3	05	47.15	18	29	55.2	1.185 143	7.42	7.04	14	25	56
	3	3	10	31.51	18	52	23.0	1.178 637	7.46	7.08	14	26	44
	4	3	15	16.69	19	14	22.9	1.172 091	7.50	7.12	14	27	33
	5	3	20	02.68	19	35	54.3	1.165 506	7.55	7.16	14	28	23
	6	3	24	49.47	19	56	56.5	1.158 882	7.59	7.20	14	29	14
	7	3	29	37.05	+20	17	28.9	1.152 220	7.63	7.24	14	30	06
	8	3	34	25.42	20	37	30.9	1.145 520	7.68	7.28	14	30	58
	9	3	39	14.56	20	57	01.9	1.138 783	7.72	7.32	14	31	51
	10	3	44	04.46	21	16	01.3	1.132 009	7.77	7.37	14	32	45
	11	3	48	55.10	21	34	28.7	1.125 198	7.82	7.41	14	33	39
	12	3	53	46.47	21	52	23.5	1.118 351	7.86	7.46	14	34	35
	13	3	58	38.53	+22	09	45.0	1.111 467	7.91	7.50	14	35	31
	14	4	03	31.27	22	26	32.9	1.104 548	7.96	7.55	14	36	27
	15	4	08	24.64	22	42	46.5	1.097 592	8.01	7.60	14	37	25
	16	4	13	18.62	22	58	25.4	1.090 599	8.06	7.65	14	38	22
	17	4	18	13.18	23	13	29.0	1.083 571	8.12	7.70	14	39	21
	18	4	23	08.28	23	27	57.0	1.076 507	8.17	7.75	14	40	20
	19	4	28	03.87	+23	41	48.7	1.069 406	8.22	7.80	14	41	19
	20	4	32	59.91	23	55	03.9	1.062 270	8.28	7.85	14	42	19
	21	4	37	56.35	24	07	42.2	1.055 097	8.33	7.90	14	43	19
	22	4	42	53.15	24	19	43.1	1.047 889	8.39	7.96	14	44	19
	23	4	47	50.23	24	31	06.2	1.040 646	8.45	8.01	14	45	20
	24	4	52	47.55	24	41	51.4	1.033 368	8.51	8.07	14	46	21
	25	4	57	45.04	+24	51	58.2	1.026 056	8.57	8.13	14	47	22
	26	5	02	42.64	25	01	26.5	1.018 709	8.63	8.19	14	48	23
	27	5	07	40.28	25	10	15.8	1.011 330	8.70	8.25	14	49	24
	28	5	12	37.88	25	18	26.2	1.003 917	8.76	8.31	14	50	25
	29	5	17	35.40	25	25	57.2	0.996 473	8.83	8.37	14	51	26
	30	5	22	32.74	25	32	48.9	0.988 997	8.89	8.43	14	52	27
May	1	5	27	29.85	+25	39	01.1	0.981 491	8.96	8.50	14	53	27
	2	5	32	26.65	25	44	33.6	0.973 955	9.03	8.56	14	54	27
	3	5	37	23.07	25	49	26.5	0.966 390	9.10	8.63	14	55	27
	4	5	42	19.03	25	53	39.7	0.958 796	9.17	8.70	14	56	26
	5	5	47	14.47	25	57	13.3	0.951 176	9.25	8.77	14	57	25
	6	5	52	09.31	26	00	07.3	0.943 528	9.32	8.84	14	58	23
	7	5	57	03.48	+26	02	21.8	0.935 855	9.40	8.91	14	59	20
	8	6	01	56.91	26	03	56.9	0.928 158	9.47	8.99	15	00	16
	9	6	06	49.51	26	04	52.8	0.920 436	9.55	9.06	15	01	12
	10	6	11	41.22	26	05	09.7	0.912 691	9.64	9.14	15	02	06
	11	6	16	31.96	26	04	47.7	0.904 923	9.72	9.22	15	02	60
	12	6	21	21.65	26	03	47.1	0.897 133	9.80	9.30	15	03	52
	13	6	26	10.22	+26	02	08.2	0.889 321	9.89	9.38	15	04	44
	14	6	30	57.60	25	59	51.1	0.881 488	9.98	9.46	15	05	34
	15	6	35	43.72	25	56	56.3	0.873 635	10.07	9.55	15	06	23
	16	6	40	28.49	25	53	24.0	0.865 761	10.16	9.63	15	07	10
	17	6	45	11.85	+25	49	14.6	0.857 867	10.25	9.72	15	07	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
May	17	6	45	11.85	+25	49	14.6	0.857 867	10.25	9.72	15	07	56
	18	6	49	53.72	25	44	28.6	0.849 954	10.35	9.81	15	08	40
	19	6	54	34.02	25	39	06.3	0.842 022	10.44	9.90	15	09	23
	20	6	59	12.67	25	33	08.2	0.834 072	10.54	10.00	15	10	04
	21	7	03	49.59	25	26	34.8	0.826 104	10.65	10.10	15	10	43
	22	7	08	24.71	25	19	26.7	0.818 119	10.75	10.19	15	11	21
	23	7	12	57.94	+25	11	44.4	0.810 118	10.86	10.29	15	11	56
	24	7	17	29.21	25	03	28.4	0.802 102	10.96	10.40	15	12	29
	25	7	21	58.43	24	54	39.4	0.794 071	11.07	10.50	15	13	01
	26	7	26	25.53	24	45	18.0	0.786 027	11.19	10.61	15	13	30
	27	7	30	50.43	24	35	24.8	0.777 970	11.30	10.72	15	13	57
	28	7	35	13.07	24	25	00.4	0.769 902	11.42	10.83	15	14	21
	29	7	39	33.36	+24	14	05.7	0.761 825	11.54	10.95	15	14	44
	30	7	43	51.24	24	02	41.2	0.753 738	11.67	11.06	15	15	03
	31	7	48	06.64	23	50	47.7	0.745 643	11.79	11.18	15	15	21
June	1	7	52	19.48	23	38	26.0	0.737 542	11.92	11.31	15	15	35
	2	7	56	29.71	23	25	36.8	0.729 436	12.06	11.43	15	15	47
	3	8	00	37.25	23	12	21.0	0.721 327	12.19	11.56	15	15	57
	4	8	04	42.04	+22	58	39.3	0.713 216	12.33	11.69	15	16	03
	5	8	08	44.01	22	44	32.5	0.705 104	12.47	11.83	15	16	07
	6	8	12	43.11	22	30	01.5	0.696 993	12.62	11.97	15	16	07
	7	8	16	39.27	22	15	07.1	0.688 885	12.77	12.11	15	16	05
	8	8	20	32.42	21	59	50.1	0.680 780	12.92	12.25	15	15	60
	9	8	24	22.51	21	44	11.4	0.672 680	13.07	12.40	15	15	51
	10	8	28	09.47	+21	28	11.8	0.664 587	13.23	12.55	15	15	39
	11	8	31	53.25	21	11	52.1	0.656 502	13.40	12.70	15	15	25
	12	8	35	33.78	20	55	13.3	0.648 425	13.56	12.86	15	15	07
	13	8	39	10.99	20	38	16.1	0.640 358	13.73	13.02	15	14	45
	14	8	42	44.82	20	21	01.5	0.632 303	13.91	13.19	15	14	20
	15	8	46	15.20	20	03	30.4	0.624 260	14.09	13.36	15	13	52
	16	8	49	42.04	+19	45	43.8	0.616 231	14.27	13.53	15	13	20
	17	8	53	05.27	19	27	42.5	0.608 217	14.46	13.71	15	12	44
	18	8	56	24.80	19	09	27.7	0.600 221	14.65	13.89	15	12	05
	19	8	59	40.54	18	51	00.2	0.592 242	14.85	14.08	15	11	21
	20	9	02	52.40	18	32	21.2	0.584 284	15.05	14.27	15	10	34
	21	9	06	00.28	18	13	31.7	0.576 348	15.26	14.47	15	09	43
	22	9	09	04.08	+17	54	32.7	0.568 436	15.47	14.67	15	08	48
	23	9	12	03.70	17	35	25.3	0.560 550	15.69	14.88	15	07	48
	24	9	14	59.03	17	16	10.6	0.552 692	15.91	15.09	15	06	44
	25	9	17	49.96	16	56	49.7	0.544 866	16.14	15.31	15	05	36
	26	9	20	36.38	16	37	23.7	0.537 072	16.37	15.53	15	04	23
	27	9	23	18.15	16	17	53.9	0.529 314	16.61	15.76	15	03	05
	28	9	25	55.17	+15	58	21.4	0.521 594	16.86	15.99	15	01	43
	29	9	28	27.29	15	38	47.4	0.513 916	17.11	16.23	15	00	15
	30	9	30	54.39	15	19	13.1	0.506 283	17.37	16.47	14	58	43
July	1	9	33	16.33	14	59	39.9	0.498 697	17.63	16.72	14	57	05
	2	9	35	32.97	+14	40	09.1	0.491 163	17.90	16.98	14	55	22

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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	9	33	16.33	+14	59	39.9	0.498 697	17.63	16.72	14	57	05
	2	9	35	32.97	14	40	09.1	0.491 163	17.90	16.98	14	55	22
	3	9	37	44.16	14	20	41.8	0.483 684	18.18	17.24	14	53	33
	4	9	39	49.75	14	01	19.6	0.476 263	18.46	17.51	14	51	39
	5	9	41	49.58	13	42	03.7	0.468 905	18.75	17.79	14	49	38
	6	9	43	43.51	13	22	55.4	0.461 613	19.05	18.07	14	47	32
	7	9	45	31.38	+13	03	56.2	0.454 391	19.35	18.35	14	45	20
	8	9	47	13.01	12	45	07.4	0.447 243	19.66	18.65	14	43	01
	9	9	48	48.26	12	26	30.5	0.440 174	19.98	18.95	14	40	36
	10	9	50	16.94	12	08	06.9	0.433 187	20.30	19.25	14	38	05
	11	9	51	38.89	11	49	58.1	0.426 287	20.63	19.56	14	35	26
	12	9	52	53.92	11	32	05.7	0.419 479	20.96	19.88	14	32	40
	13	9	54	01.83	+11	14	31.4	0.412 766	21.31	20.21	14	29	48
	14	9	55	02.45	10	57	16.9	0.406 154	21.65	20.53	14	26	48
	15	9	55	55.57	10	40	23.8	0.399 649	22.00	20.87	14	23	40
	16	9	56	41.00	10	23	54.1	0.393 255	22.36	21.21	14	20	25
	17	9	57	18.55	10	07	49.5	0.386 979	22.73	21.55	14	17	01
	18	9	57	48.01	9	52	12.0	0.380 826	23.09	21.90	14	13	30
	19	9	58	09.22	+9	37	03.4	0.374 802	23.46	22.25	14	09	50
	20	9	58	21.99	9	22	25.9	0.368 916	23.84	22.61	14	06	02
	21	9	58	26.17	9	08	21.4	0.363 172	24.21	22.96	14	02	05
	22	9	58	21.59	8	54	52.0	0.357 579	24.59	23.32	13	57	60
	23	9	58	08.14	8	41	59.7	0.352 143	24.97	23.68	13	53	45
	24	9	57	45.71	8	29	46.5	0.346 874	25.35	24.04	13	49	22
	25	9	57	14.22	+8	18	14.5	0.341 778	25.73	24.40	13	44	49
	26	9	56	33.64	8	07	25.7	0.336 864	26.11	24.76	13	40	08
	27	9	55	43.95	7	57	22.1	0.332 141	26.48	25.11	13	35	17
	28	9	54	45.18	7	48	05.6	0.327 616	26.84	25.46	13	30	18
	29	9	53	37.43	7	39	37.8	0.323 299	27.20	25.80	13	25	10
	30	9	52	20.84	7	32	00.6	0.319 199	27.55	26.13	13	19	53
	31	9	50	55.59	+7	25	15.3	0.315 324	27.89	26.45	13	14	28
Aug.	1	9	49	21.96	7	19	23.3	0.311 683	28.22	26.76	13	08	54
	2	9	47	40.28	7	14	25.6	0.308 284	28.53	27.05	13	03	13
	3	9	45	50.94	7	10	22.8	0.305 136	28.82	27.33	12	57	25
	4	9	43	54.42	7	07	15.5	0.302 245	29.10	27.59	12	51	30
	5	9	41	51.25	7	05	03.8	0.299 619	29.35	27.84	12	45	28
	6	9	39	42.06	+7	03	47.4	0.297 265	29.58	28.06	12	39	21
	7	9	37	27.49	7	03	25.8	0.295 188	29.79	28.25	12	33	09
	8	9	35	08.28	7	03	58.2	0.293 393	29.97	28.43	12	26	53
	9	9	32	45.20	7	05	23.5	0.291 884	30.13	28.57	12	20	33
	10	9	30	19.05	7	07	40.1	0.290 666	30.26	28.69	12	14	11
	11	9	27	50.68	7	10	46.3	0.289 740	30.35	28.78	12	07	47
	12	9	25	20.98	+7	14	40.0	0.289 109	30.42	28.85	12	01	22
	13	9	22	50.85	7	19	18.7	0.288 773	30.45	28.88	11	54	57
	14	9	20	21.17	7	24	39.7	0.288 734	30.46	28.88	11	48	33
	15	9	17	52.87	7	30	40.2	0.288 990	30.43	28.86	11	42	11
	16	9	15	26.83	+7	37	17.0	0.289 539	30.37	28.80	11	35	51

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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	9	15	26.83	+7	37	17.0	0.289 539	30.37	28.80	11	35	51
	17	9	13	03.92	7	44	26.7	0.290 380	30.28	28.72	11	29	35
	18	9	10	44.99	7	52	06.0	0.291 509	30.17	28.61	11	23	24
	19	9	08	30.82	8	00	11.3	0.292 922	30.02	28.47	11	17	17
	20	9	06	22.18	8	08	39.0	0.294 614	29.85	28.31	11	11	16
	21	9	04	19.76	8	17	25.5	0.296 580	29.65	28.12	11	05	22
	22	9	02	24.20	+8	26	27.4	0.298 814	29.43	27.91	10	59	35
	23	9	00	36.07	8	35	41.0	0.301 310	29.19	27.68	10	53	55
	24	8	58	55.89	8	45	02.9	0.304 060	28.92	27.43	10	48	23
	25	8	57	24.11	8	54	29.9	0.307 057	28.64	27.16	10	42	60
	26	8	56	01.09	9	03	58.7	0.310 294	28.34	26.88	10	37	45
	27	8	54	47.17	9	13	26.3	0.313 762	28.03	26.58	10	32	40
	28	8	53	42.59	+9	22	49.8	0.317 454	27.70	26.27	10	27	44
	29	8	52	47.55	9	32	06.3	0.321 360	27.37	25.95	10	22	58
	30	8	52	02.18	9	41	13.3	0.325 474	27.02	25.62	10	18	21
	31	8	51	26.58	9	50	08.3	0.329 785	26.67	25.29	10	13	54
Sept.	1	8	51	00.79	9	58	48.9	0.334 286	26.31	24.95	10	09	36
	2	8	50	44.78	10	07	13.0	0.338 968	25.94	24.60	10	05	28
	3	8	50	38.50	+10	15	18.5	0.343 822	25.58	24.26	10	01	30
	4	8	50	41.86	10	23	03.8	0.348 839	25.21	23.91	9	57	42
	5	8	50	54.73	10	30	27.1	0.354 012	24.84	23.56	9	54	03
	6	8	51	16.92	10	37	27.2	0.359 332	24.47	23.21	9	50	32
	7	8	51	48.27	10	44	02.6	0.364 791	24.11	22.86	9	47	11
	8	8	52	28.54	10	50	12.3	0.370 383	23.74	22.52	9	43	59
	9	8	53	17.52	+10	55	55.3	0.376 099	23.38	22.18	9	40	55
	10	8	54	14.97	11	01	10.5	0.381 934	23.03	21.84	9	37	60
	11	8	55	20.63	11	05	57.3	0.387 880	22.67	21.50	9	35	13
	12	8	56	34.25	11	10	14.9	0.393 932	22.32	21.17	9	32	33
	13	8	57	55.57	11	14	02.7	0.400 084	21.98	20.85	9	30	01
	14	8	59	24.34	11	17	20.0	0.406 330	21.64	20.53	9	27	36
	15	9	01	00.28	+11	20	06.5	0.412 665	21.31	20.21	9	25	19
	16	9	02	43.16	11	22	21.7	0.419 085	20.98	19.90	9	23	08
	17	9	04	32.70	11	24	05.2	0.425 584	20.66	19.60	9	21	04
	18	9	06	28.67	11	25	16.8	0.432 159	20.35	19.30	9	19	06
	19	9	08	30.82	11	25	56.0	0.438 805	20.04	19.01	9	17	14
	20	9	10	38.90	11	26	02.8	0.445 518	19.74	18.72	9	15	28
	21	9	12	52.70	+11	25	36.9	0.452 294	19.44	18.44	9	13	47
	22	9	15	11.97	11	24	38.1	0.459 131	19.15	18.16	9	12	12
	23	9	17	36.49	11	23	06.4	0.466 026	18.87	17.90	9	10	42
	24	9	20	06.07	11	21	01.7	0.472 974	18.59	17.63	9	09	17
	25	9	22	40.49	11	18	23.7	0.479 972	18.32	17.38	9	07	57
	26	9	25	19.55	11	15	12.6	0.487 020	18.06	17.12	9	06	41
	27	9	28	03.06	+11	11	28.2	0.494 112	17.80	16.88	9	05	30
	28	9	30	50.85	11	07	10.5	0.501 247	17.54	16.64	9	04	23
	29	9	33	42.73	11	02	19.5	0.508 422	17.30	16.40	9	03	19
	30	9	36	38.54	10	56	55.2	0.515 634	17.06	16.17	9	02	20
Oct.	1	9	39	38.10	+10	50	57.6	0.522 880	16.82	15.95	9	01	25

VENUS, 2023
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	9	39	38.10	+10	50	57.6	0.522 880	16.82	15.95	9	01	25
	2	9	42	41.27	10	44	26.8	0.530 158	16.59	15.73	9	00	33
	3	9	45	47.87	10	37	23.1	0.537 465	16.36	15.52	8	59	44
	4	9	48	57.75	10	29	46.6	0.544 800	16.14	15.31	8	58	58
	5	9	52	10.75	10	21	37.5	0.552 158	15.93	15.10	8	58	16
	6	9	55	26.73	10	12	56.2	0.559 539	15.72	14.91	8	57	36
	7	9	58	45.53	+10	03	42.9	0.566 941	15.51	14.71	8	56	60
	8	10	02	07.03	9	53	58.0	0.574 361	15.31	14.52	8	56	26
	9	10	05	31.10	9	43	41.8	0.581 798	15.12	14.33	8	55	54
	10	10	08	57.60	9	32	54.7	0.589 250	14.92	14.15	8	55	25
	11	10	12	26.42	9	21	37.1	0.596 715	14.74	13.98	8	54	58
	12	10	15	57.44	9	09	49.4	0.604 193	14.56	13.80	8	54	33
	13	10	19	30.56	+8	57	32.1	0.611 681	14.38	13.63	8	54	11
	14	10	23	05.67	8	44	45.5	0.619 179	14.20	13.47	8	53	50
	15	10	26	42.68	8	31	30.2	0.626 686	14.03	13.31	8	53	31
	16	10	30	21.50	8	17	46.6	0.634 200	13.87	13.15	8	53	14
	17	10	34	02.04	8	03	35.3	0.641 720	13.70	13.00	8	52	59
	18	10	37	44.22	7	48	56.7	0.649 246	13.55	12.85	8	52	45
	19	10	41	27.96	+7	33	51.3	0.656 776	13.39	12.70	8	52	33
	20	10	45	13.20	7	18	19.7	0.664 311	13.24	12.55	8	52	22
	21	10	48	59.86	7	02	22.4	0.671 849	13.09	12.41	8	52	12
	22	10	52	47.88	6	45	60.0	0.679 389	12.94	12.28	8	52	04
	23	10	56	37.22	6	29	12.9	0.686 931	12.80	12.14	8	51	58
	24	11	00	27.80	6	12	01.7	0.694 475	12.66	12.01	8	51	52
	25	11	04	19.60	+5	54	27.0	0.702 019	12.53	11.88	8	51	48
	26	11	08	12.56	5	36	29.3	0.709 563	12.39	11.75	8	51	45
	27	11	12	06.66	5	18	09.0	0.717 106	12.26	11.63	8	51	43
	28	11	16	01.85	4	59	26.8	0.724 648	12.14	11.51	8	51	42
	29	11	19	58.11	4	40	23.3	0.732 186	12.01	11.39	8	51	42
	30	11	23	55.39	4	20	58.9	0.739 721	11.89	11.27	8	51	43
	31	11	27	53.69	+4	01	14.3	0.747 250	11.77	11.16	8	51	45
Nov.	1	11	31	52.95	3	41	10.2	0.754 774	11.65	11.05	8	51	48
	2	11	35	53.16	3	20	47.2	0.762 291	11.54	10.94	8	51	52
	3	11	39	54.28	3	00	06.0	0.769 800	11.42	10.83	8	51	57
	4	11	43	56.30	2	39	07.3	0.777 300	11.31	10.73	8	52	03
	5	11	47	59.18	2	17	51.8	0.784 791	11.21	10.63	8	52	09
	6	11	52	02.92	+1	56	20.2	0.792 272	11.10	10.53	8	52	17
	7	11	56	07.49	1	34	33.2	0.799 741	11.00	10.43	8	52	25
	8	12	00	12.87	1	12	31.6	0.807 199	10.89	10.33	8	52	34
	9	12	04	19.06	0	50	16.0	0.814 644	10.80	10.24	8	52	44
	10	12	08	26.04	0	27	47.3	0.822 076	10.70	10.15	8	52	55
	11	12	12	33.81	+0	05	06.1	0.829 495	10.60	10.05	8	53	06
	12	12	16	42.37	-0	17	46.8	0.836 899	10.51	9.97	8	53	19
	13	12	20	51.69	0	40	50.6	0.844 289	10.42	9.88	8	53	32
	14	12	25	01.79	1	04	04.6	0.851 664	10.33	9.79	8	53	46
	15	12	29	12.66	1	27	28.0	0.859 024	10.24	9.71	8	54	00
	16	12	33	24.30	-1	51	00.1	0.866 368	10.15	9.63	8	54	16

VENUS, 2023
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	12	33	24.30	-1	51	00.1	0.866 368	10.15	9.63	8	54	16
	17	12	37	36.72	2	14	40.0	0.873 697	10.07	9.55	8	54	32
	18	12	41	49.91	2	38	27.1	0.881 010	9.98	9.47	8	54	49
	19	12	46	03.88	3	02	20.6	0.888 307	9.90	9.39	8	55	06
	20	12	50	18.64	3	26	19.7	0.895 589	9.82	9.31	8	55	25
	21	12	54	34.19	3	50	23.7	0.902 854	9.74	9.24	8	55	44
	22	12	58	50.57	-4	14	31.8	0.910 103	9.66	9.16	8	56	04
	23	13	03	07.77	4	38	43.3	0.917 335	9.59	9.09	8	56	25
	24	13	07	25.82	5	02	57.5	0.924 550	9.51	9.02	8	56	47
	25	13	11	44.75	5	27	13.7	0.931 748	9.44	8.95	8	57	10
	26	13	16	04.56	5	51	31.1	0.938 929	9.37	8.88	8	57	33
	27	13	20	25.27	6	15	49.0	0.946 091	9.30	8.82	8	57	58
	28	13	24	46.90	-6	40	06.6	0.953 235	9.23	8.75	8	58	23
	29	13	29	09.48	7	04	23.0	0.960 359	9.16	8.68	8	58	50
	30	13	33	33.01	7	28	37.7	0.967 463	9.09	8.62	8	59	17
Dec.	1	13	37	57.50	7	52	49.6	0.974 547	9.02	8.56	8	59	45
	2	13	42	22.98	8	16	58.1	0.981 609	8.96	8.50	9	00	15
	3	13	46	49.46	8	41	02.2	0.988 650	8.90	8.44	9	00	45
	4	13	51	16.96	-9	05	01.2	0.995 669	8.83	8.38	9	01	16
	5	13	55	45.48	9	28	54.3	1.002 664	8.77	8.32	9	01	49
	6	14	00	15.05	9	52	40.5	1.009 636	8.71	8.26	9	02	22
	7	14	04	45.68	10	16	19.2	1.016 585	8.65	8.20	9	02	57
	8	14	09	17.39	10	39	49.4	1.023 509	8.59	8.15	9	03	32
	9	14	13	50.20	11	03	10.4	1.030 409	8.53	8.09	9	04	09
	10	14	18	24.10	-11	26	21.2	1.037 284	8.48	8.04	9	04	47
	11	14	22	59.13	11	49	21.1	1.044 133	8.42	7.99	9	05	25
	12	14	27	35.28	12	12	09.2	1.050 957	8.37	7.94	9	06	06
	13	14	32	12.57	12	34	44.8	1.057 755	8.31	7.88	9	06	47
	14	14	36	51.01	12	57	06.9	1.064 528	8.26	7.83	9	07	29
	15	14	41	30.61	13	19	14.7	1.071 274	8.21	7.79	9	08	13
	16	14	46	11.37	-13	41	07.4	1.077 995	8.16	7.74	9	08	57
	17	14	50	53.30	14	02	44.1	1.084 690	8.11	7.69	9	09	43
	18	14	55	36.40	14	24	04.1	1.091 359	8.06	7.64	9	10	30
	19	15	00	20.70	14	45	06.5	1.098 003	8.01	7.60	9	11	18
	20	15	05	06.20	15	05	50.6	1.104 621	7.96	7.55	9	12	08
	21	15	09	52.91	15	26	15.6	1.111 215	7.91	7.51	9	12	58
	22	15	14	40.84	-15	46	20.7	1.117 782	7.87	7.46	9	13	50
	23	15	19	29.99	16	06	05.1	1.124 324	7.82	7.42	9	14	43
	24	15	24	20.39	16	25	28.1	1.130 841	7.78	7.38	9	15	38
	25	15	29	12.02	16	44	28.8	1.137 332	7.73	7.33	9	16	33
	26	15	34	04.89	17	03	06.7	1.143 796	7.69	7.29	9	17	30
	27	15	38	59.00	17	21	20.8	1.150 235	7.65	7.25	9	18	28
	28	15	43	54.34	-17	39	10.4	1.156 646	7.60	7.21	9	19	27
	29	15	48	50.91	17	56	34.7	1.163 031	7.56	7.17	9	20	28
	30	15	53	48.70	18	13	33.1	1.169 388	7.52	7.13	9	21	30
	31	15	58	47.70	18	30	04.6	1.175 717	7.48	7.09	9	22	33
	32	16	03	47.90	-18	46	08.6	1.182 018	7.44	7.06	9	23	37

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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	88 05 25.6	+1 08 53.0	1.564 2509	Apr. 3	131 01 17.6	+1 49 42.1	1.649 4902
3	89 04 44.1	1 10 22.5	1.566 6737	5	131 54 42.7	1 49 56.9	1.650 5942
5	90 03 51.7	1 11 50.4	1.569 0791	7	132 48 03.5	1 50 10.2	1.651 6612
7	91 02 48.6	1 13 16.8	1.571 4666	9	133 41 20.4	1 50 21.9	1.652 6911
9	92 01 34.8	1 14 41.6	1.573 8353	11	134 34 33.3	1 50 31.9	1.653 6837
11	93 00 10.5	1 16 04.9	1.576 1847	13	135 27 42.5	1 50 40.4	1.654 6387
13	93 58 35.9	+1 17 26.6	1.578 5141	15	136 20 48.1	+1 50 47.3	1.655 5560
15	94 56 51.0	1 18 46.8	1.580 8230	17	137 13 50.2	1 50 52.5	1.656 4354
17	95 54 56.1	1 20 05.3	1.583 1108	19	138 06 49.1	1 50 56.3	1.657 2768
19	96 52 51.2	1 21 22.3	1.585 3768	21	138 59 44.8	1 50 58.4	1.658 0800
21	97 50 36.5	1 22 37.7	1.587 6204	23	139 52 37.5	1 50 58.9	1.658 8447
23	98 48 12.2	1 23 51.5	1.589 8412	25	140 45 27.3	1 50 57.9	1.659 5710
25	99 45 38.3	+1 25 03.6	1.592 0385	27	141 38 14.5	+1 50 55.3	1.660 2586
27	100 42 55.0	1 26 14.1	1.594 2118	29	142 30 59.1	1 50 51.1	1.660 9075
29	101 40 02.5	1 27 23.1	1.596 3606	May 1	143 23 41.3	1 50 45.4	1.661 5174
31	102 37 00.8	1 28 30.4	1.598 4843	3	144 16 21.2	1 50 38.1	1.662 0884
Feb. 2	103 33 50.3	1 29 36.0	1.600 5825	5	145 08 59.0	1 50 29.3	1.662 6202
4	104 30 30.8	1 30 40.1	1.602 6545	7	146 01 34.9	1 50 18.9	1.663 1128
6	105 27 02.8	+1 31 42.5	1.604 7000	9	146 54 09.0	+1 50 07.0	1.663 5661
8	106 23 26.2	1 32 43.2	1.606 7184	11	147 46 41.4	1 49 53.5	1.663 9800
10	107 19 41.2	1 33 42.3	1.608 7093	13	148 39 12.4	1 49 38.6	1.664 3544
12	108 15 48.0	1 34 39.8	1.610 6722	15	149 31 42.0	1 49 22.0	1.664 6894
14	109 11 46.7	1 35 35.6	1.612 6067	17	150 24 10.3	1 49 04.0	1.664 9847
16	110 07 37.5	1 36 29.8	1.614 5122	19	151 16 37.6	1 48 44.5	1.665 2403
18	111 03 20.5	+1 37 22.4	1.616 3884	21	152 09 04.0	+1 48 23.4	1.665 4563
20	111 58 55.9	1 38 13.3	1.618 2349	23	153 01 29.6	1 48 00.8	1.665 6325
22	112 54 23.8	1 39 02.5	1.620 0512	25	153 53 54.7	1 47 36.8	1.665 7690
24	113 49 44.2	1 39 50.1	1.621 8370	27	154 46 19.3	1 47 11.2	1.665 8657
26	114 44 57.6	1 40 36.0	1.623 5918	29	155 38 43.5	1 46 44.1	1.665 9225
28	115 40 03.8	1 41 20.3	1.625 3152	31	156 31 07.6	1 46 15.6	1.665 9396
Mar. 2	116 35 03.2	+1 42 02.9	1.627 0069	June 2	157 23 31.6	+1 45 45.6	1.665 9168
4	117 29 55.9	1 42 43.9	1.628 6665	4	158 15 55.8	1 45 14.1	1.665 8542
6	118 24 41.9	1 43 23.3	1.630 2937	6	159 08 20.3	1 44 41.1	1.665 7518
8	119 19 21.5	1 44 00.9	1.631 8881	8	160 00 45.2	1 44 06.7	1.665 6097
10	120 13 54.8	1 44 37.0	1.633 4494	10	160 53 10.7	1 43 30.8	1.665 4278
12	121 08 21.9	1 45 11.4	1.634 9772	12	161 45 37.0	1 42 53.5	1.665 2061
14	122 02 43.0	+1 45 44.2	1.636 4713	14	162 38 04.1	+1 42 14.7	1.664 9448
16	122 56 58.3	1 46 15.3	1.637 9312	16	163 30 32.2	1 41 34.5	1.664 6439
18	123 51 07.9	1 46 44.8	1.639 3568	18	164 23 01.5	1 40 52.8	1.664 3034
20	124 45 12.0	1 47 12.6	1.640 7477	20	165 15 32.2	1 40 09.7	1.663 9233
22	125 39 10.6	1 47 38.8	1.642 1036	22	166 08 04.3	1 39 25.2	1.663 5039
24	126 33 04.0	1 48 03.4	1.643 4243	24	167 00 38.0	1 38 39.3	1.663 0451
26	127 26 52.4	+1 48 26.4	1.644 7095	26	167 53 13.5	+1 37 52.0	1.662 5470
28	128 20 35.7	1 48 47.7	1.645 9590	28	168 45 51.0	1 37 03.2	1.662 0097
30	129 14 14.3	1 49 07.5	1.647 1724	30	169 38 30.4	1 36 13.0	1.661 4334
Apr. 1	130 07 48.2	1 49 25.6	1.648 3495	July 2	170 31 12.2	1 35 21.5	1.660 8181
3	131 01 17.6	+1 49 42.1	1.649 4902	4	171 23 56.3	+1 34 28.6	1.660 1639

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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	170 31 12.2	+1 35 21.5	1.660 8181	Oct. 2	212 18 40.9	+0 33 15.5	1.593 9676
4	171 23 56.3	1 34 28.6	1.660 1639	4	213 15 57.0	0 31 29.4	1.591 7937
6	172 16 43.0	1 33 34.3	1.659 4711	6	214 13 22.5	0 29 42.4	1.589 5960
8	173 09 32.2	1 32 38.6	1.658 7396	8	215 10 57.6	0 27 54.7	1.587 3750
10	174 02 24.4	1 31 41.6	1.657 9697	10	216 08 42.3	0 26 06.2	1.585 1312
12	174 55 19.5	1 30 43.2	1.657 1614	12	217 06 37.0	0 24 16.9	1.582 8653
14	175 48 17.7	+1 29 43.5	1.656 3150	14	218 04 41.6	+0 22 26.9	1.580 5778
16	176 41 19.2	1 28 42.4	1.655 4306	16	219 02 56.3	0 20 36.2	1.578 2692
18	177 34 24.2	1 27 40.0	1.654 5084	18	220 01 21.3	0 18 44.8	1.575 9403
20	178 27 32.7	1 26 36.2	1.653 5485	20	220 59 56.7	0 16 52.8	1.573 5916
22	179 20 44.9	1 25 31.2	1.652 5512	22	221 58 42.6	0 15 00.1	1.571 2237
24	180 14 01.0	1 24 24.8	1.651 5166	24	222 57 39.2	0 13 06.8	1.568 8373
26	181 07 21.2	+1 23 17.2	1.650 4450	26	223 56 46.6	+0 11 12.9	1.566 4330
28	182 00 45.5	1 22 08.2	1.649 3365	28	224 56 04.9	0 09 18.5	1.564 0115
30	182 54 14.1	1 20 57.9	1.648 1914	30	225 55 34.3	0 07 23.6	1.561 5734
Aug. 1	183 47 47.3	1 19 46.4	1.647 0099	Nov. 1	226 55 14.8	0 05 28.1	1.559 1195
3	184 41 25.0	1 18 33.6	1.645 7922	3	227 55 06.8	0 03 32.2	1.556 6503
5	185 35 07.5	1 17 19.6	1.644 5386	5	228 55 10.1	+0 01 35.9	1.554 1667
7	186 28 55.0	+1 16 04.3	1.643 2493	7	229 55 25.0	-0 00 20.8	1.551 6694
9	187 22 47.6	1 14 47.7	1.641 9246	9	230 55 51.6	0 02 17.9	1.549 1590
11	188 16 45.4	1 13 30.0	1.640 5647	11	231 56 29.9	0 04 15.4	1.546 6363
13	189 10 48.6	1 12 11.0	1.639 1700	13	232 57 20.2	0 06 13.1	1.544 1020
15	190 04 57.3	1 10 50.8	1.637 7407	15	233 58 22.6	0 08 11.1	1.541 5569
17	190 59 11.7	1 09 29.4	1.636 2772	17	234 59 37.1	0 10 09.4	1.539 0018
19	191 53 32.0	+1 08 06.8	1.634 7796	19	236 01 03.8	-0 12 07.8	1.536 4374
21	192 47 58.2	1 06 43.0	1.633 2484	21	237 02 42.9	0 14 06.4	1.533 8646
23	193 42 30.6	1 05 18.1	1.631 6838	23	238 04 34.5	0 16 05.2	1.531 2841
25	194 37 09.3	1 03 52.0	1.630 0862	25	239 06 38.6	0 18 04.0	1.528 6967
27	195 31 54.5	1 02 24.8	1.628 4560	27	240 08 55.4	0 20 02.9	1.526 1033
29	196 26 46.2	1 00 56.4	1.626 7934	29	241 11 25.0	0 22 01.7	1.523 5048
31	197 21 44.7	+0 59 27.0	1.625 0988	Dec. 1	242 14 07.4	-0 24 00.6	1.520 9018
Sept. 2	198 16 50.1	0 57 56.4	1.623 3727	3	243 17 02.7	0 25 59.4	1.518 2954
4	199 12 02.5	0 56 24.7	1.621 6153	5	244 20 11.1	0 27 58.0	1.515 6863
6	200 07 22.2	0 54 52.0	1.619 8271	7	245 23 32.6	0 29 56.5	1.513 0754
8	201 02 49.2	0 53 18.2	1.618 0084	9	246 27 07.2	0 31 54.8	1.510 4637
10	201 58 23.7	0 51 43.4	1.616 1597	11	247 30 55.1	0 33 52.9	1.507 8519
12	202 54 05.8	+0 50 07.5	1.614 2814	13	248 34 56.3	-0 35 50.7	1.505 2411
14	203 49 55.8	0 48 30.6	1.612 3739	15	249 39 11.0	0 37 48.0	1.502 6321
16	204 45 53.7	0 46 52.7	1.610 4376	17	250 43 39.0	0 39 45.1	1.500 0258
18	205 41 59.7	0 45 13.8	1.608 4730	19	251 48 20.6	0 41 41.7	1.497 4232
20	206 38 13.9	0 43 33.9	1.606 4806	21	252 53 15.7	0 43 37.8	1.494 8251
22	207 34 36.6	0 41 53.2	1.604 4607	23	253 58 24.5	0 45 33.4	1.492 2326
24	208 31 07.8	+0 40 11.4	1.602 4140	25	255 03 46.9	-0 47 28.3	1.489 6467
26	209 27 47.6	0 38 28.8	1.600 3408	27	256 09 22.9	0 49 22.7	1.487 0681
28	210 24 36.3	0 36 45.2	1.598 2417	29	257 15 12.7	0 51 16.4	1.484 4980
30	211 21 34.1	0 35 00.8	1.596 1171	31	258 21 16.2	0 53 09.3	1.481 9373
Oct. 2	212 18 40.9	+0 33 15.5	1.593 9676	33	259 27 33.5	-0 55 01.4	1.479 3870

MARS, 2023

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	69	13	56.9	+2	48	21.9	Feb.	15	74	02	56.4	+2	33	58.2
	1	69	03	57.2	2	48	49.9		16	74	22	20.9	2	33	18.3
	2	68	54	47.0	2	49	14.1		17	74	42	08.5	2	32	38.3
	3	68	46	26.3	2	49	34.9		18	75	02	18.6	2	31	58.2
	4	68	38	55.0	2	49	52.2		19	75	22	50.7	2	31	18.0
	5	68	32	13.3	2	50	06.2		20	75	43	44.3	2	30	37.6
	6	68	26	20.7	+2	50	17.1		21	76	04	58.9	+2	29	57.2
	7	68	21	17.2	2	50	25.0		22	76	26	34.0	2	29	16.8
	8	68	17	02.4	2	50	29.9		23	76	48	29.2	2	28	36.3
	9	68	13	35.9	2	50	32.1		24	77	10	44.0	2	27	55.7
	10	68	10	57.4	2	50	31.6		25	77	33	17.9	2	27	15.1
	11	68	09	06.5	2	50	28.5		26	77	56	10.4	2	26	34.6
	12	68	08	02.6	+2	50	23.0		27	78	19	20.9	+2	25	54.0
	13	68	07	45.3	2	50	15.1		28	78	42	48.9	2	25	13.4
	14	68	08	14.1	2	50	05.1	Mar.	1	79	06	34.0	2	24	32.7
	15	68	09	28.5	2	49	53.0		2	79	30	35.7	2	23	52.1
	16	68	11	27.9	2	49	38.8		3	79	54	53.5	2	23	11.5
	17	68	14	11.8	2	49	22.9		4	80	19	26.9	2	22	31.0
	18	68	17	39.6	+2	49	05.1		5	80	44	15.6	+2	21	50.4
	19	68	21	50.7	2	48	45.7		6	81	09	19.2	2	21	09.9
	20	68	26	44.6	2	48	24.7		7	81	34	37.2	2	20	29.4
	21	68	32	20.5	2	48	02.3		8	82	00	09.3	2	19	48.9
	22	68	38	37.8	2	47	38.5		9	82	25	55.2	2	19	08.5
	23	68	45	35.8	2	47	13.4		10	82	51	54.6	2	18	28.2
	24	68	53	13.7	+2	46	47.1		11	83	18	07.1	+2	17	47.9
	25	69	01	30.8	2	46	19.7		12	83	44	32.6	2	17	07.7
	26	69	10	26.3	2	45	51.3		13	84	11	10.7	2	16	27.5
	27	69	19	59.5	2	45	21.8		14	84	38	01.2	2	15	47.5
	28	69	30	09.5	2	44	51.5		15	85	05	03.9	2	15	07.5
	29	69	40	55.4	2	44	20.2		16	85	32	18.4	2	14	27.7
	30	69	52	16.6	+2	43	48.2		17	85	59	44.7	+2	13	47.9
	31	70	04	12.0	2	43	15.3		18	86	27	22.3	2	13	08.3
Feb.	1	70	16	40.9	2	42	41.8		19	86	55	11.1	2	12	28.8
	2	70	29	42.4	2	42	07.6		20	87	23	10.9	2	11	49.4
	3	70	43	15.7	2	41	32.7		21	87	51	21.5	2	11	10.1
	4	70	57	20.1	2	40	57.2		22	88	19	42.6	2	10	31.0
	5	71	11	54.8	+2	40	21.2		23	88	48	14.0	+2	09	51.9
	6	71	26	59.0	2	39	44.6		24	89	16	55.5	2	09	13.0
	7	71	42	32.0	2	39	07.6		25	89	45	46.9	2	08	34.2
	8	71	58	33.1	2	38	30.1		26	90	14	48.0	2	07	55.5
	9	72	15	01.6	2	37	52.3		27	90	43	58.3	2	07	16.9
	10	72	31	57.0	2	37	14.0		28	91	13	17.8	2	06	38.5
	11	72	49	18.7	+2	36	35.4		29	91	42	46.1	+2	06	00.1
	12	73	07	06.0	2	35	56.5		30	92	12	22.9	2	05	21.8
	13	73	25	18.4	2	35	17.3		31	92	42	08.0	2	04	43.6
	14	73	43	55.3	2	34	37.8	Apr.	1	93	12	01.3	2	04	05.5
	15	74	02	56.4	+2	33	58.2		2	93	42	02.4	+2	03	27.6

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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	93	12	01.3	+2	04	05.5	May	17	117	55	35.9	+1	36	40.7
	2	93	42	02.4	2	03	27.6		18	118	29	37.4	1	36	06.9
	3	94	12	11.2	2	02	49.7		19	119	03	42.5	1	35	33.1
	4	94	42	27.5	2	02	11.9		20	119	37	51.3	1	34	59.5
	5	95	12	51.2	2	01	34.2		21	120	12	03.5	1	34	25.8
	6	95	43	22.0	2	00	56.6		22	120	46	19.2	1	33	52.3
	7	96	13	59.9	+2	00	19.1		23	121	20	38.2	+1	33	18.8
	8	96	44	44.8	1	59	41.7		24	121	55	00.5	1	32	45.3
	9	97	15	36.4	1	59	04.5		25	122	29	25.9	1	32	11.8
	10	97	46	34.8	1	58	27.3		26	123	03	54.4	1	31	38.4
	11	98	17	39.8	1	57	50.3		27	123	38	26.0	1	31	05.1
	12	98	48	51.2	1	57	13.3		28	124	13	00.6	1	30	31.8
	13	99	20	09.1	+1	56	36.5		29	124	47	38.0	+1	29	58.5
	14	99	51	33.2	1	55	59.8		30	125	22	18.4	1	29	25.2
	15	100	23	03.4	1	55	23.2		31	125	57	01.6	1	28	52.0
	16	100	54	39.8	1	54	46.7	June	1	126	31	47.7	1	28	18.9
	17	101	26	22.1	1	54	10.4		2	127	06	36.5	1	27	45.8
	18	101	58	10.4	1	53	34.2		3	127	41	28.2	1	27	12.7
	19	102	30	04.5	+1	52	58.0		4	128	16	22.6	+1	26	39.7
	20	103	02	04.4	1	52	22.0		5	128	51	19.8	1	26	06.7
	21	103	34	10.0	1	51	46.1		6	129	26	19.7	1	25	33.8
	22	104	06	21.2	1	51	10.3		7	130	01	22.4	1	25	00.9
	23	104	38	37.7	1	50	34.5		8	130	36	27.6	1	24	28.0
	24	105	10	59.6	1	49	58.9		9	131	11	35.6	1	23	55.2
	25	105	43	26.6	+1	49	23.3		10	131	46	46.3	+1	23	22.5
	26	106	15	58.6	1	48	47.9		11	132	21	59.7	1	22	49.8
	27	106	48	35.4	1	48	12.5		12	132	57	15.8	1	22	17.1
	28	107	21	16.9	1	47	37.1		13	133	32	34.8	1	21	44.5
	29	107	54	03.1	1	47	01.9		14	134	07	56.5	1	21	11.9
	30	108	26	53.7	1	46	26.7		15	134	43	21.1	1	20	39.3
May	1	108	59	48.7	+1	45	51.6		16	135	18	48.5	+1	20	06.7
	2	109	32	48.0	1	45	16.6		17	135	54	18.7	1	19	34.2
	3	110	05	51.5	1	44	41.7		18	136	29	51.5	1	19	01.7
	4	110	38	59.1	1	44	06.8		19	137	05	27.1	1	18	29.2
	5	111	12	10.9	1	43	32.0		20	137	41	05.3	1	17	56.7
	6	111	45	26.7	1	42	57.3		21	138	16	46.0	1	17	24.2
	7	112	18	46.6	+1	42	22.6		22	138	52	29.3	+1	16	51.7
	8	112	52	10.4	1	41	48.1		23	139	28	15.0	1	16	19.2
	9	113	25	38.1	1	41	13.6		24	140	04	03.2	1	15	46.8
	10	113	59	09.7	1	40	39.2		25	140	39	53.7	1	15	14.3
	11	114	32	45.1	1	40	04.9		26	141	15	46.7	1	14	41.9
	12	115	06	24.2	1	39	30.6		27	141	51	42.1	1	14	09.5
	13	115	40	07.1	+1	38	56.5		28	142	27	39.8	+1	13	37.0
	14	116	13	53.7	1	38	22.4		29	143	03	39.9	1	13	04.6
	15	116	47	44.1	1	37	48.4		30	143	39	42.3	1	12	32.2
	16	117	21	38.1	1	37	14.5	July	1	144	15	47.1	1	11	59.9
	17	117	55	35.9	+1	36	40.7		2	144	51	54.2	+1	11	27.5

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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	144	15	47.1	+1	11	59.9	Aug.	16	172	38	35.7	+0	47	08.6
	2	144	51	54.2	1	11	27.5		17	173	16	34.2	0	46	35.8
	3	145	28	03.7	1	10	55.2		18	173	54	35.3	0	46	02.9
	4	146	04	15.4	1	10	22.8		19	174	32	38.8	0	45	30.0
	5	146	40	29.4	1	09	50.5		20	175	10	44.9	0	44	57.1
	6	147	16	45.7	1	09	18.2		21	175	48	53.4	0	44	24.1
	7	147	53	04.3	+1	08	46.0		22	176	27	04.5	+0	43	51.2
	8	148	29	25.3	1	08	13.7		23	177	05	18.1	0	43	18.2
	9	149	05	48.7	1	07	41.4		24	177	43	34.2	0	42	45.1
	10	149	42	14.5	1	07	09.2		25	178	21	52.7	0	42	12.1
	11	150	18	42.9	1	06	37.0		26	179	00	13.8	0	41	39.0
	12	150	55	13.8	1	06	04.7		27	179	38	37.4	0	41	05.9
	13	151	31	47.3	+1	05	32.5		28	180	17	03.4	+0	40	32.8
	14	152	08	23.3	1	05	00.2		29	180	55	31.8	0	39	59.7
	15	152	45	01.9	1	04	27.9		30	181	34	02.6	0	39	26.5
	16	153	21	43.0	1	03	55.7		31	182	12	35.8	0	38	53.3
	17	153	58	26.5	1	03	23.4	Sept.	1	182	51	11.6	0	38	20.1
	18	154	35	12.5	1	02	51.1		2	183	29	49.9	0	37	46.9
	19	155	12	00.9	+1	02	18.8		3	184	08	30.8	+0	37	13.7
	20	155	48	51.7	1	01	46.4		4	184	47	14.5	0	36	40.4
	21	156	25	44.8	1	01	14.1		5	185	26	00.9	0	36	07.0
	22	157	02	40.3	1	00	41.7		6	186	04	50.1	0	35	33.7
	23	157	39	38.1	1	00	09.3		7	186	43	42.1	0	35	00.3
	24	158	16	38.3	0	59	36.9		8	187	22	36.9	0	34	26.8
	25	158	53	40.8	+0	59	04.5		9	188	01	34.5	+0	33	53.3
	26	159	30	45.6	0	58	32.1		10	188	40	34.8	0	33	19.8
	27	160	07	52.7	0	57	59.6		11	189	19	38.0	0	32	46.2
	28	160	45	02.2	0	57	27.2		12	189	58	43.8	0	32	12.5
	29	161	22	14.0	0	56	54.8		13	190	37	52.5	0	31	38.8
	30	161	59	28.1	0	56	22.3		14	191	17	03.9	0	31	05.1
	31	162	36	44.5	+0	55	49.9		15	191	56	18.0	+0	30	31.3
Aug.	1	163	14	03.2	0	55	17.4		16	192	35	34.9	0	29	57.5
	2	163	51	24.1	0	54	44.9		17	193	14	54.5	0	29	23.6
	3	164	28	47.3	0	54	12.5		18	193	54	16.9	0	28	49.7
	4	165	06	12.7	0	53	40.0		19	194	33	42.1	0	28	15.8
	5	165	43	40.6	0	53	07.5		20	195	13	10.0	0	27	41.8
	6	166	21	10.9	+0	52	35.0		21	195	52	40.7	+0	27	07.8
	7	166	58	43.7	0	52	02.5		22	196	32	14.1	0	26	33.8
	8	167	36	19.1	0	51	30.0		23	197	11	50.2	0	25	59.7
	9	168	13	57.1	0	50	57.4		24	197	51	29.0	0	25	25.6
	10	168	51	37.7	0	50	24.8		25	198	31	10.5	0	24	51.5
	11	169	29	21.0	0	49	52.2		26	199	10	54.5	0	24	17.3
	12	170	07	06.8	+0	49	19.5		27	199	50	41.2	+0	23	43.2
	13	170	44	55.2	0	48	46.8		28	200	30	30.6	0	23	09.0
	14	171	22	46.1	0	48	14.1		29	201	10	22.6	0	22	34.7
	15	172	00	39.6	0	47	41.4		30	201	50	17.5	0	22	00.5
	16	172	38	35.7	+0	47	08.6	Oct.	1	202	30	15.2	+0	21	26.2

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude °	′	″	Apparent Geocentric Latitude °	′	″
Oct.	1	202	30	15.2	+0	21	26.2
	2	203	10	15.8	0	20	51.8
	3	203	50	19.4	0	20	17.4
	4	204	30	26.0	0	19	43.0
	5	205	10	35.6	0	19	08.5
	6	205	50	48.1	0	18	33.9
	7	206	31	03.6	+0	17	59.4
	8	207	11	22.2	0	17	24.7
	9	207	51	43.6	0	16	50.0
	10	208	32	08.1	0	16	15.3
	11	209	12	35.5	0	15	40.5
	12	209	53	05.9	0	15	05.6
	13	210	33	39.2	+0	14	30.8
	14	211	14	15.6	0	13	55.8
	15	211	54	54.9	0	13	20.9
	16	212	35	37.3	0	12	45.9
	17	213	16	22.6	0	12	10.8
	18	213	57	10.9	0	11	35.8
	19	214	38	02.1	+0	11	00.7
	20	215	18	56.3	0	10	25.5
	21	215	59	53.3	0	09	50.4
	22	216	40	53.2	0	09	15.2
	23	217	21	55.9	0	08	40.0
	24	218	03	01.3	0	08	04.8
	25	218	44	09.6	+0	07	29.5
	26	219	25	20.7	0	06	54.2
	27	220	06	34.7	0	06	18.9
	28	220	47	51.6	0	05	43.6
	29	221	29	11.5	0	05	08.2
	30	222	10	34.4	0	04	32.8
	31	222	52	00.5	+0	03	57.4
Nov.	1	223	33	29.6	0	03	21.9
	2	224	15	01.9	0	02	46.4
	3	224	56	37.2	0	02	10.8
	4	225	38	15.6	0	01	35.2
	5	226	19	57.1	0	00	59.6
	6	227	01	41.6	+0	00	23.9
	7	227	43	29.3	-0	00	11.8
	8	228	25	20.0	0	00	47.6
	9	229	07	13.8	0	01	23.4
	10	229	49	10.8	0	01	59.2
	11	230	31	10.8	0	02	35.1
	12	231	13	14.0	-0	03	10.9
	13	231	55	20.3	0	03	46.8
	14	232	37	29.6	0	04	22.7
	15	233	19	42.1	0	04	58.7
	16	234	01	57.6	-0	05	34.6

Date		Apparent Geocentric Longitude °	′	″	Apparent Geocentric Latitude °	′	″
Nov.	16	234	01	57.6	-0	05	34.6
	17	234	44	16.3	0	06	10.7
	18	235	26	38.1	0	06	48.3
	19	236	09	00.1	0	07	23.0
	20	236	51	27.6	0	07	58.5
	21	237	33	57.6	0	08	34.4
	22	238	16	30.4	-0	09	10.3
	23	238	59	05.9	0	09	46.3
	24	239	41	44.4	0	10	22.3
	25	240	24	25.8	0	10	58.2
	26	241	07	10.2	0	11	34.2
	27	241	49	57.6	0	12	10.2
	28	242	32	48.0	-0	12	46.2
	29	243	15	41.4	0	13	22.2
	30	243	58	37.9	0	13	58.3
Dec.	1	244	41	37.4	0	14	34.3
	2	245	24	39.9	0	15	10.4
	3	246	07	45.5	0	15	46.4
	4	246	50	54.0	-0	16	22.5
	5	247	34	05.6	0	16	58.5
	6	248	17	20.2	0	17	34.6
	7	249	00	37.9	0	18	10.7
	8	249	43	58.6	0	18	46.7
	9	250	27	22.3	0	19	22.8
	10	251	10	49.1	-0	19	58.8
	11	251	54	18.9	0	20	34.8
	12	252	37	51.7	0	21	10.8
	13	253	21	27.4	0	21	46.7
	14	254	05	06.1	0	22	22.7
	15	254	48	47.6	0	22	58.5
	16	255	32	31.9	-0	23	34.4
	17	256	16	18.8	0	24	10.2
	18	257	00	08.4	0	24	45.9
	19	257	44	00.7	0	25	21.7
	20	258	27	55.6	0	25	57.3
	21	259	11	53.3	0	26	32.9
	22	259	55	53.6	-0	27	08.5
	23	260	39	56.7	0	27	44.1
	24	261	24	02.5	0	28	19.5
	25	262	08	11.1	0	28	55.0
	26	262	52	22.4	0	29	30.4
	27	263	36	36.5	0	30	05.8
	28	264	20	53.3	-0	30	41.1
	29	265	05	12.9	0	31	16.3
	30	265	49	35.2	0	31	51.5
	31	266	34	00.2	0	32	26.7
	32	267	18	27.9	-0	33	01.8

MARS, 2023
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	4	28	18.01	+24	36	23.7	0.632 644	13.90	7.40	21	46	27
	1	4	27	34.31	24	35	18.0	0.638 402	13.78	7.33	21	41	51
	2	4	26	54.24	24	34	15.8	0.644 311	13.65	7.26	21	37	18
	3	4	26	17.80	24	33	17.3	0.650 368	13.52	7.20	21	32	49
	4	4	25	44.99	24	32	22.8	0.656 568	13.39	7.13	21	28	24
	5	4	25	15.79	24	31	32.6	0.662 908	13.27	7.06	21	24	02
	6	4	24	50.20	+24	30	46.9	0.669 385	13.14	6.99	21	19	44
	7	4	24	28.18	24	30	05.9	0.675 996	13.01	6.92	21	15	29
	8	4	24	09.72	24	29	29.8	0.682 737	12.88	6.85	21	11	18
	9	4	23	54.79	24	28	58.5	0.689 605	12.75	6.79	21	07	11
	10	4	23	43.35	24	28	32.4	0.696 597	12.62	6.72	21	03	06
	11	4	23	35.38	24	28	11.4	0.703 710	12.50	6.65	20	59	06
	12	4	23	30.84	+24	27	55.6	0.710 940	12.37	6.58	20	55	08
	13	4	23	29.68	24	27	45.1	0.718 286	12.24	6.52	20	51	14
	14	4	23	31.88	24	27	39.9	0.725 744	12.12	6.45	20	47	23
	15	4	23	37.39	24	27	40.0	0.733 311	11.99	6.38	20	43	35
	16	4	23	46.18	24	27	45.4	0.740 984	11.87	6.32	20	39	51
	17	4	23	58.20	24	27	56.2	0.748 761	11.74	6.25	20	36	10
	18	4	24	13.41	+24	28	12.2	0.756 638	11.62	6.19	20	32	32
	19	4	24	31.78	24	28	33.5	0.764 613	11.50	6.12	20	28	57
	20	4	24	53.24	24	29	00.0	0.772 683	11.38	6.06	20	25	25
	21	4	25	17.77	24	29	31.7	0.780 845	11.26	5.99	20	21	56
	22	4	25	45.30	24	30	08.4	0.789 096	11.14	5.93	20	18	30
	23	4	26	15.79	24	30	50.0	0.797 432	11.03	5.87	20	15	07
	24	4	26	49.19	+24	31	36.3	0.805 851	10.91	5.81	20	11	46
	25	4	27	25.44	24	32	27.3	0.814 350	10.80	5.75	20	08	29
	26	4	28	04.48	24	33	22.7	0.822 924	10.69	5.69	20	05	14
	27	4	28	46.28	24	34	22.3	0.831 572	10.58	5.63	20	02	02
	28	4	29	30.75	24	35	26.0	0.840 291	10.47	5.57	19	58	53
	29	4	30	17.86	24	36	33.5	0.849 077	10.36	5.51	19	55	46
	30	4	31	07.53	+24	37	44.7	0.857 929	10.25	5.45	19	52	41
	31	4	31	59.72	24	38	59.3	0.866 843	10.15	5.40	19	49	39
Feb.	1	4	32	54.35	24	40	17.2	0.875 818	10.04	5.34	19	46	40
	2	4	33	51.37	24	41	38.0	0.884 851	9.94	5.29	19	43	42
	3	4	34	50.73	24	43	01.7	0.893 941	9.84	5.24	19	40	47
	4	4	35	52.37	24	44	27.9	0.903 085	9.74	5.18	19	37	55
	5	4	36	56.23	+24	45	56.4	0.912 281	9.64	5.13	19	35	04
	6	4	38	02.27	24	47	26.9	0.921 527	9.54	5.08	19	32	16
	7	4	39	10.44	24	48	59.4	0.930 823	9.45	5.03	19	29	29
	8	4	40	20.67	24	50	33.4	0.940 165	9.35	4.98	19	26	45
	9	4	41	32.94	24	52	08.9	0.949 553	9.26	4.93	19	24	03
	10	4	42	47.20	24	53	45.5	0.958 984	9.17	4.88	19	21	22
	11	4	44	03.40	+24	55	23.2	0.968 457	9.08	4.83	19	18	44
	12	4	45	21.51	24	57	01.5	0.977 972	8.99	4.79	19	16	07
	13	4	46	41.48	24	58	40.4	0.987 525	8.91	4.74	19	13	32
	14	4	48	03.28	25	00	19.7	0.997 116	8.82	4.69	19	10	59
	15	4	49	26.87	+25	01	59.2	1.006 743	8.74	4.65	19	08	28

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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	4	49	26.87	+25	01	59.2	1.006 743	8.74	4.65	19	08	28
	16	4	50	52.22	25	03	38.6	1.016 405	8.65	4.60	19	05	58
	17	4	52	19.28	25	05	17.8	1.026 100	8.57	4.56	19	03	30
	18	4	53	48.03	25	06	56.6	1.035 825	8.49	4.52	19	01	04
	19	4	55	18.43	25	08	34.7	1.045 581	8.41	4.48	18	58	39
	20	4	56	50.44	25	10	12.0	1.055 363	8.33	4.43	18	56	16
	21	4	58	24.03	+25	11	48.2	1.065 172	8.26	4.39	18	53	55
	22	4	59	59.16	25	13	23.1	1.075 004	8.18	4.35	18	51	35
	23	5	01	35.81	25	14	56.5	1.084 858	8.11	4.31	18	49	16
	24	5	03	13.92	25	16	28.1	1.094 732	8.03	4.28	18	46	59
	25	5	04	53.48	25	17	57.9	1.104 624	7.96	4.24	18	44	44
	26	5	06	34.44	25	19	25.5	1.114 533	7.89	4.20	18	42	29
	27	5	08	16.76	+25	20	50.8	1.124 457	7.82	4.16	18	40	16
	28	5	10	00.41	25	22	13.6	1.134 395	7.75	4.13	18	38	05
Mar.	1	5	11	45.35	25	23	33.7	1.144 346	7.68	4.09	18	35	54
	2	5	13	31.55	25	24	50.9	1.154 308	7.62	4.05	18	33	45
	3	5	15	18.96	25	26	05.0	1.164 280	7.55	4.02	18	31	37
	4	5	17	07.57	25	27	15.9	1.174 261	7.49	3.99	18	29	30
	5	5	18	57.33	+25	28	23.3	1.184 251	7.43	3.95	18	27	24
	6	5	20	48.21	25	29	27.1	1.194 248	7.36	3.92	18	25	20
	7	5	22	40.19	25	30	27.0	1.204 251	7.30	3.89	18	23	16
	8	5	24	33.24	25	31	23.1	1.214 259	7.24	3.85	18	21	13
	9	5	26	27.33	25	32	15.0	1.224 272	7.18	3.82	18	19	12
	10	5	28	22.44	25	33	02.6	1.234 289	7.12	3.79	18	17	11
	11	5	30	18.55	+25	33	45.7	1.244 308	7.07	3.76	18	15	12
	12	5	32	15.63	25	34	24.3	1.254 331	7.01	3.73	18	13	13
	13	5	34	13.67	25	34	58.2	1.264 354	6.96	3.70	18	11	16
	14	5	36	12.63	25	35	27.3	1.274 378	6.90	3.67	18	09	19
	15	5	38	12.51	25	35	51.4	1.284 402	6.85	3.64	18	07	23
	16	5	40	13.28	25	36	10.5	1.294 426	6.79	3.62	18	05	28
	17	5	42	14.92	+25	36	24.4	1.304 447	6.74	3.59	18	03	34
	18	5	44	17.41	25	36	32.9	1.314 465	6.69	3.56	18	01	41
	19	5	46	20.72	25	36	35.9	1.324 479	6.64	3.53	17	59	48
	20	5	48	24.85	25	36	33.4	1.334 487	6.59	3.51	17	57	57
	21	5	50	29.77	25	36	25.1	1.344 489	6.54	3.48	17	56	06
	22	5	52	35.46	25	36	10.9	1.354 483	6.49	3.46	17	54	16
	23	5	54	41.91	+25	35	50.8	1.364 467	6.45	3.43	17	52	26
	24	5	56	49.10	25	35	24.5	1.374 441	6.40	3.41	17	50	37
	25	5	58	56.99	25	34	52.0	1.384 403	6.35	3.38	17	48	49
	26	6	01	05.58	25	34	13.2	1.394 353	6.31	3.36	17	47	02
	27	6	03	14.83	25	33	28.0	1.404 288	6.26	3.33	17	45	15
	28	6	05	24.73	25	32	36.2	1.414 209	6.22	3.31	17	43	29
	29	6	07	35.25	+25	31	37.9	1.424 115	6.18	3.29	17	41	44
	30	6	09	46.36	25	30	32.9	1.434 004	6.13	3.26	17	39	59
	31	6	11	58.05	25	29	21.1	1.443 876	6.09	3.24	17	38	15
Apr.	1	6	14	10.30	25	28	02.4	1.453 731	6.05	3.22	17	36	31
	2	6	16	23.08	+25	26	36.7	1.463 567	6.01	3.20	17	34	48

MARS, 2023
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	6	14	10.30	+25	28	02.4	1.453 731	6.05	3.22	17	36	31
	2	6	16	23.08	25	26	36.7	1.463 567	6.01	3.20	17	34	48
	3	6	18	36.37	25	25	04.0	1.473 385	5.97	3.18	17	33	05
	4	6	20	50.16	25	23	24.2	1.483 184	5.93	3.16	17	31	22
	5	6	23	04.43	25	21	37.2	1.492 962	5.89	3.13	17	29	41
	6	6	25	19.17	25	19	42.9	1.502 721	5.85	3.11	17	27	59
	7	6	27	34.35	+25	17	41.2	1.512 459	5.81	3.09	17	26	18
	8	6	29	49.98	25	15	32.1	1.522 176	5.78	3.07	17	24	38
	9	6	32	06.02	25	13	15.7	1.531 872	5.74	3.06	17	22	58
	10	6	34	22.48	25	10	51.7	1.541 546	5.70	3.04	17	21	18
	11	6	36	39.34	25	08	20.1	1.551 198	5.67	3.02	17	19	39
	12	6	38	56.58	25	05	41.0	1.560 828	5.63	3.00	17	17	60
	13	6	41	14.19	+25	02	54.3	1.570 434	5.60	2.98	17	16	21
	14	6	43	32.16	24	59	59.9	1.580 017	5.57	2.96	17	14	43
	15	6	45	50.48	24	56	57.8	1.589 576	5.53	2.94	17	13	05
	16	6	48	09.13	24	53	47.9	1.599 109	5.50	2.93	17	11	28
	17	6	50	28.11	24	50	30.2	1.608 616	5.47	2.91	17	09	50
	18	6	52	47.40	24	47	04.6	1.618 096	5.43	2.89	17	08	13
	19	6	55	06.99	+24	43	31.0	1.627 549	5.40	2.88	17	06	37
	20	6	57	26.87	24	39	49.4	1.636 972	5.37	2.86	17	05	00
	21	6	59	47.04	24	35	59.9	1.646 366	5.34	2.84	17	03	24
	22	7	02	07.47	24	32	02.3	1.655 729	5.31	2.83	17	01	49
	23	7	04	28.16	24	27	56.7	1.665 060	5.28	2.81	17	00	13
	24	7	06	49.08	24	23	43.0	1.674 359	5.25	2.80	16	58	38
	25	7	09	10.22	+24	19	21.2	1.683 625	5.22	2.78	16	57	02
	26	7	11	31.56	24	14	51.4	1.692 857	5.19	2.76	16	55	27
	27	7	13	53.10	24	10	13.5	1.702 056	5.17	2.75	16	53	53
	28	7	16	14.81	24	05	27.5	1.711 220	5.14	2.73	16	52	18
	29	7	18	36.68	24	00	33.3	1.720 349	5.11	2.72	16	50	43
	30	7	20	58.71	23	55	31.1	1.729 442	5.08	2.71	16	49	09
May	1	7	23	20.87	+23	50	20.7	1.738 500	5.06	2.69	16	47	35
	2	7	25	43.15	23	45	02.2	1.747 522	5.03	2.68	16	46	01
	3	7	28	05.55	23	39	35.6	1.756 508	5.01	2.66	16	44	27
	4	7	30	28.06	23	34	00.8	1.765 457	4.98	2.65	16	42	53
	5	7	32	50.67	23	28	17.9	1.774 370	4.96	2.64	16	41	19
	6	7	35	13.37	23	22	26.9	1.783 246	4.93	2.62	16	39	46
	7	7	37	36.16	+23	16	27.8	1.792 085	4.91	2.61	16	38	12
	8	7	39	59.02	23	10	20.6	1.800 887	4.88	2.60	16	36	38
	9	7	42	21.95	23	04	05.4	1.809 653	4.86	2.59	16	35	05
	10	7	44	44.94	22	57	42.2	1.818 381	4.84	2.57	16	33	31
	11	7	47	07.99	22	51	10.9	1.827 071	4.81	2.56	16	31	58
	12	7	49	31.08	22	44	31.7	1.835 724	4.79	2.55	16	30	25
	13	7	51	54.21	+22	37	44.4	1.844 338	4.77	2.54	16	28	51
	14	7	54	17.38	22	30	49.1	1.852 913	4.75	2.53	16	27	18
	15	7	56	40.59	22	23	45.8	1.861 448	4.72	2.51	16	25	45
	16	7	59	03.82	22	16	34.6	1.869 943	4.70	2.50	16	24	12
	17	8	01	27.07	+22	09	15.3	1.878 396	4.68	2.49	16	22	39

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

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		h	m	s	°	'	"		"	"	h	m	s
May	17	8	01	27.07	+22	09	15.3	1.878 396	4.68	2.49	16	22	39
	18	8	03	50.35	22	01	48.1	1.886 808	4.66	2.48	16	21	05
	19	8	06	13.64	21	54	12.9	1.895 178	4.64	2.47	16	19	32
	20	8	08	36.94	21	46	29.8	1.903 504	4.62	2.46	16	17	59
	21	8	11	00.23	21	38	38.9	1.911 786	4.60	2.45	16	16	26
	22	8	13	23.52	21	30	40.2	1.920 023	4.58	2.44	16	14	53
	23	8	15	46.78	+21	22	33.7	1.928 216	4.56	2.43	16	13	20
	24	8	18	10.02	21	14	19.5	1.936 363	4.54	2.42	16	11	46
	25	8	20	33.22	21	05	57.6	1.944 464	4.52	2.41	16	10	13
	26	8	22	56.37	20	57	28.1	1.952 519	4.50	2.40	16	08	40
	27	8	25	19.48	20	48	51.0	1.960 528	4.49	2.39	16	07	06
	28	8	27	42.52	20	40	06.3	1.968 489	4.47	2.38	16	05	33
	29	8	30	05.51	+20	31	14.1	1.976 404	4.45	2.37	16	03	59
	30	8	32	28.42	20	22	14.5	1.984 272	4.43	2.36	16	02	26
	31	8	34	51.27	20	13	07.4	1.992 092	4.41	2.35	16	00	52
June	1	8	37	14.04	20	03	53.0	1.999 865	4.40	2.34	15	59	18
	2	8	39	36.73	19	54	31.2	2.007 591	4.38	2.33	15	57	45
	3	8	41	59.34	19	45	02.2	2.015 270	4.36	2.32	15	56	11
	4	8	44	21.87	+19	35	26.0	2.022 901	4.35	2.31	15	54	37
	5	8	46	44.32	19	25	42.6	2.030 486	4.33	2.30	15	53	03
	6	8	49	06.67	19	15	52.2	2.038 023	4.32	2.30	15	51	28
	7	8	51	28.94	19	05	54.7	2.045 513	4.30	2.29	15	49	54
	8	8	53	51.12	18	55	50.3	2.052 956	4.28	2.28	15	48	20
	9	8	56	13.20	18	45	38.9	2.060 352	4.27	2.27	15	46	45
	10	8	58	35.19	+18	35	20.6	2.067 700	4.25	2.26	15	45	11
	11	9	00	57.08	18	24	55.4	2.075 000	4.24	2.26	15	43	36
	12	9	03	18.89	18	14	23.4	2.082 251	4.22	2.25	15	42	02
	13	9	05	40.61	18	03	44.5	2.089 453	4.21	2.24	15	40	27
	14	9	08	02.24	17	52	59.0	2.096 605	4.19	2.23	15	38	52
	15	9	10	23.78	17	42	06.7	2.103 707	4.18	2.22	15	37	17
	16	9	12	45.24	+17	31	07.7	2.110 758	4.17	2.22	15	35	42
	17	9	15	06.61	17	20	02.2	2.117 758	4.15	2.21	15	34	07
	18	9	17	27.88	17	08	50.2	2.124 705	4.14	2.20	15	32	31
	19	9	19	49.06	16	57	31.8	2.131 601	4.13	2.20	15	30	56
	20	9	22	10.15	16	46	07.0	2.138 443	4.11	2.19	15	29	21
	21	9	24	31.13	16	34	35.9	2.145 233	4.10	2.18	15	27	45
	22	9	26	52.00	+16	22	58.6	2.151 968	4.09	2.17	15	26	09
	23	9	29	12.77	16	11	15.2	2.158 651	4.07	2.17	15	24	34
	24	9	31	33.44	15	59	25.7	2.165 279	4.06	2.16	15	22	58
	25	9	33	53.99	15	47	30.1	2.171 853	4.05	2.15	15	21	22
	26	9	36	14.44	15	35	28.6	2.178 372	4.04	2.15	15	19	46
	27	9	38	34.78	15	23	21.3	2.184 838	4.03	2.14	15	18	10
	28	9	40	55.01	+15	11	08.1	2.191 249	4.01	2.14	15	16	33
	29	9	43	15.14	14	58	49.2	2.197 606	4.00	2.13	15	14	57
	30	9	45	35.17	14	46	24.7	2.203 908	3.99	2.12	15	13	21
July	1	9	47	55.09	14	33	54.5	2.210 157	3.98	2.12	15	11	44
	2	9	50	14.91	+14	21	18.9	2.216 352	3.97	2.11	15	10	07

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

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		h	m	s	°	'	"		"	"	h	m	s
July	1	9	47	55.09	+14	33	54.5	2.210 157	3.98	2.12	15	11	44
	2	9	50	14.91	14	21	18.9	2.216 352	3.97	2.11	15	10	07
	3	9	52	34.63	14	08	37.8	2.222 493	3.96	2.11	15	08	30
	4	9	54	54.25	13	55	51.4	2.228 581	3.95	2.10	15	06	54
	5	9	57	13.77	13	42	59.7	2.234 615	3.94	2.09	15	05	17
	6	9	59	33.20	13	30	02.8	2.240 596	3.92	2.09	15	03	39
	7	10	01	52.54	+13	17	00.7	2.246 524	3.91	2.08	15	02	02
	8	10	04	11.78	13	03	53.5	2.252 398	3.90	2.08	15	00	25
	9	10	06	30.95	12	50	41.3	2.258 219	3.89	2.07	14	58	48
	10	10	08	50.04	12	37	24.0	2.263 985	3.88	2.07	14	57	10
	11	10	11	09.07	12	24	01.7	2.269 697	3.87	2.06	14	55	33
	12	10	13	28.02	12	10	34.5	2.275 354	3.86	2.06	14	53	55
	13	10	15	46.92	+11	57	02.5	2.280 956	3.86	2.05	14	52	18
	14	10	18	05.76	11	43	25.7	2.286 501	3.85	2.05	14	50	40
	15	10	20	24.55	11	29	44.3	2.291 991	3.84	2.04	14	49	02
	16	10	22	43.28	11	15	58.2	2.297 424	3.83	2.04	14	47	25
	17	10	25	01.95	11	02	07.6	2.302 799	3.82	2.03	14	45	47
	18	10	27	20.58	10	48	12.6	2.308 118	3.81	2.03	14	44	09
	19	10	29	39.15	+10	34	13.2	2.313 378	3.80	2.02	14	42	31
	20	10	31	57.67	10	20	09.6	2.318 581	3.79	2.02	14	40	53
	21	10	34	16.14	10	06	01.7	2.323 726	3.78	2.01	14	39	15
	22	10	36	34.57	9	51	49.8	2.328 812	3.78	2.01	14	37	37
	23	10	38	52.96	9	37	33.8	2.333 840	3.77	2.01	14	35	59
	24	10	41	11.31	9	23	13.9	2.338 809	3.76	2.00	14	34	21
	25	10	43	29.63	+9	08	50.1	2.343 720	3.75	2.00	14	32	43
	26	10	45	47.91	8	54	22.5	2.348 573	3.74	1.99	14	31	05
	27	10	48	06.17	8	39	51.2	2.353 367	3.74	1.99	14	29	26
	28	10	50	24.41	8	25	16.3	2.358 104	3.73	1.98	14	27	48
	29	10	52	42.63	8	10	37.9	2.362 782	3.72	1.98	14	26	10
	30	10	55	00.83	7	55	56.0	2.367 402	3.71	1.98	14	24	32
	31	10	57	19.03	+7	41	10.7	2.371 966	3.71	1.97	14	22	53
Aug.	1	10	59	37.21	7	26	22.2	2.376 472	3.70	1.97	14	21	15
	2	11	01	55.39	7	11	30.5	2.380 922	3.69	1.97	14	19	37
	3	11	04	13.57	6	56	35.7	2.385 315	3.69	1.96	14	17	59
	4	11	06	31.75	6	41	37.9	2.389 651	3.68	1.96	14	16	20
	5	11	08	49.95	6	26	37.0	2.393 931	3.67	1.95	14	14	42
	6	11	11	08.18	+6	11	33.2	2.398 155	3.67	1.95	14	13	04
	7	11	13	26.44	5	56	26.5	2.402 322	3.66	1.95	14	11	26
	8	11	15	44.74	5	41	17.0	2.406 432	3.65	1.94	14	09	48
	9	11	18	03.09	5	26	04.7	2.410 484	3.65	1.94	14	08	10
	10	11	20	21.49	5	10	49.7	2.414 479	3.64	1.94	14	06	32
	11	11	22	39.96	4	55	32.2	2.418 416	3.64	1.94	14	04	54
	12	11	24	58.48	+4	40	12.1	2.422 294	3.63	1.93	14	03	16
	13	11	27	17.08	4	24	49.6	2.426 114	3.62	1.93	14	01	38
	14	11	29	35.74	4	09	24.8	2.429 874	3.62	1.93	14	00	00
	15	11	31	54.48	3	53	57.7	2.433 576	3.61	1.92	13	58	23
	16	11	34	13.29	+3	38	28.6	2.437 217	3.61	1.92	13	56	45

MARS, 2023

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	34	13.29	+3	38	28.6	2.437 217	3.61	1.92	13	56	45
	17	11	36	32.19	3	22	57.3	2.440 799	3.60	1.92	13	55	07
	18	11	38	51.18	3	07	24.1	2.444 322	3.60	1.91	13	53	30
	19	11	41	10.26	2	51	49.1	2.447 784	3.59	1.91	13	51	53
	20	11	43	29.44	2	36	12.3	2.451 187	3.59	1.91	13	50	16
	21	11	45	48.73	2	20	33.7	2.454 529	3.58	1.91	13	48	38
	22	11	48	08.12	+2	04	53.6	2.457 812	3.58	1.90	13	47	01
	23	11	50	27.63	1	49	12.0	2.461 034	3.57	1.90	13	45	25
	24	11	52	47.26	1	33	29.0	2.464 198	3.57	1.90	13	43	48
	25	11	55	07.02	1	17	44.7	2.467 301	3.56	1.90	13	42	11
	26	11	57	26.91	1	01	59.2	2.470 346	3.56	1.89	13	40	35
	27	11	59	46.94	0	46	12.6	2.473 332	3.56	1.89	13	38	58
	28	12	02	07.11	+0	30	25.0	2.476 259	3.55	1.89	13	37	22
	29	12	04	27.42	+0	14	36.5	2.479 128	3.55	1.89	13	35	46
	30	12	06	47.88	-0	01	12.8	2.481 940	3.54	1.89	13	34	10
	31	12	09	08.50	0	17	02.8	2.484 694	3.54	1.88	13	32	35
Sept.	1	12	11	29.28	0	32	53.5	2.487 392	3.54	1.88	13	30	59
	2	12	13	50.24	0	48	44.7	2.490 033	3.53	1.88	13	29	24
	3	12	16	11.39	-1	04	36.4	2.492 617	3.53	1.88	13	27	48
	4	12	18	32.74	1	20	28.6	2.495 144	3.52	1.88	13	26	13
	5	12	20	54.29	1	36	21.1	2.497 614	3.52	1.87	13	24	39
	6	12	23	16.06	1	52	13.9	2.500 027	3.52	1.87	13	23	04
	7	12	25	38.05	2	08	06.9	2.502 382	3.51	1.87	13	21	30
	8	12	28	00.26	2	24	00.0	2.504 680	3.51	1.87	13	19	56
	9	12	30	22.71	-2	39	53.1	2.506 920	3.51	1.87	13	18	22
	10	12	32	45.39	2	55	46.0	2.509 102	3.50	1.87	13	16	48
	11	12	35	08.32	3	11	38.7	2.511 226	3.50	1.86	13	15	15
	12	12	37	31.50	3	27	31.1	2.513 291	3.50	1.86	13	13	42
	13	12	39	54.93	3	43	23.0	2.515 297	3.50	1.86	13	12	09
	14	12	42	18.62	3	59	14.3	2.517 245	3.49	1.86	13	10	36
	15	12	44	42.58	-4	15	05.0	2.519 134	3.49	1.86	13	09	04
	16	12	47	06.81	4	30	54.9	2.520 964	3.49	1.86	13	07	32
	17	12	49	31.32	4	46	43.9	2.522 735	3.49	1.86	13	05	60
	18	12	51	56.12	5	02	31.8	2.524 447	3.48	1.85	13	04	28
	19	12	54	21.22	5	18	18.7	2.526 101	3.48	1.85	13	02	57
	20	12	56	46.61	5	34	04.4	2.527 696	3.48	1.85	13	01	26
	21	12	59	12.31	-5	49	48.7	2.529 233	3.48	1.85	12	59	56
	22	13	01	38.32	6	05	31.6	2.530 712	3.47	1.85	12	58	25
	23	13	04	04.64	6	21	12.8	2.532 133	3.47	1.85	12	56	55
	24	13	06	31.28	6	36	52.4	2.533 497	3.47	1.85	12	55	26
	25	13	08	58.25	6	52	30.2	2.534 804	3.47	1.85	12	53	56
	26	13	11	25.55	7	08	05.9	2.536 055	3.47	1.85	12	52	28
	27	13	13	53.18	-7	23	39.6	2.537 250	3.47	1.84	12	50	59
	28	13	16	21.15	7	39	11.1	2.538 390	3.46	1.84	12	49	31
	29	13	18	49.48	7	54	40.3	2.539 475	3.46	1.84	12	48	03
	30	13	21	18.17	8	10	07.2	2.540 505	3.46	1.84	12	46	35
Oct.	1	13	23	47.23	-8	25	31.5	2.541 481	3.46	1.84	12	45	08

MARS, 2023
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	13	23	47.23	-8	25	31.5	2.541 481	3.46	1.84	12	45	08
	2	13	26	16.68	8	40	53.3	2.542 403	3.46	1.84	12	43	41
	3	13	28	46.53	8	56	12.5	2.543 271	3.46	1.84	12	42	15
	4	13	31	16.77	9	11	28.8	2.544 085	3.46	1.84	12	40	49
	5	13	33	47.42	9	26	42.3	2.544 844	3.46	1.84	12	39	23
	6	13	36	18.49	9	41	52.7	2.545 549	3.45	1.84	12	37	58
	7	13	38	49.97	-9	56	60.0	2.546 199	3.45	1.84	12	36	33
	8	13	41	21.87	10	12	04.0	2.546 795	3.45	1.84	12	35	09
	9	13	43	54.21	10	27	04.6	2.547 336	3.45	1.84	12	33	45
	10	13	46	26.98	10	42	01.7	2.547 822	3.45	1.84	12	32	21
	11	13	49	00.19	10	56	55.0	2.548 254	3.45	1.84	12	30	58
	12	13	51	33.85	11	11	44.6	2.548 630	3.45	1.84	12	29	36
	13	13	54	07.96	-11	26	30.2	2.548 952	3.45	1.84	12	28	14
	14	13	56	42.53	11	41	11.7	2.549 218	3.45	1.84	12	26	52
	15	13	59	17.57	11	55	49.0	2.549 430	3.45	1.84	12	25	31
	16	14	01	53.08	12	10	21.9	2.549 587	3.45	1.84	12	24	10
	17	14	04	29.07	12	24	50.3	2.549 690	3.45	1.84	12	22	50
	18	14	07	05.54	12	39	14.0	2.549 738	3.45	1.84	12	21	30
	19	14	09	42.50	-12	53	33.0	2.549 733	3.45	1.84	12	20	11
	20	14	12	19.94	13	07	47.1	2.549 674	3.45	1.84	12	18	52
	21	14	14	57.88	13	21	56.0	2.549 561	3.45	1.84	12	17	34
	22	14	17	36.30	13	35	59.7	2.549 396	3.45	1.84	12	16	16
	23	14	20	15.23	13	49	58.1	2.549 179	3.45	1.84	12	14	59
	24	14	22	54.65	14	03	50.8	2.548 910	3.45	1.84	12	13	42
	25	14	25	34.58	-14	17	37.9	2.548 591	3.45	1.84	12	12	25
	26	14	28	15.02	14	31	19.1	2.548 221	3.45	1.84	12	11	10
	27	14	30	55.98	14	44	54.4	2.547 802	3.45	1.84	12	09	54
	28	14	33	37.46	14	58	23.5	2.547 333	3.45	1.84	12	08	40
	29	14	36	19.49	15	11	46.5	2.546 816	3.45	1.84	12	07	25
	30	14	39	02.05	15	25	03.1	2.546 250	3.45	1.84	12	06	12
	31	14	41	45.16	-15	38	13.2	2.545 635	3.45	1.84	12	04	59
Nov.	1	14	44	28.83	15	51	16.7	2.544 973	3.46	1.84	12	03	46
	2	14	47	13.05	16	04	13.5	2.544 262	3.46	1.84	12	02	34
	3	14	49	57.83	16	17	03.4	2.543 504	3.46	1.84	12	01	23
	4	14	52	43.18	16	29	46.2	2.542 697	3.46	1.84	12	00	12
	5	14	55	29.09	16	42	21.8	2.541 843	3.46	1.84	11	59	02
	6	14	58	15.57	-16	54	50.0	2.540 940	3.46	1.84	11	57	52
	7	15	01	02.61	17	07	10.6	2.539 990	3.46	1.84	11	56	43
	8	15	03	50.24	17	19	23.6	2.538 992	3.46	1.84	11	55	34
	9	15	06	38.44	17	31	28.7	2.537 945	3.47	1.84	11	54	26
	10	15	09	27.22	17	43	25.8	2.536 852	3.47	1.84	11	53	19
	11	15	12	16.59	17	55	14.7	2.535 710	3.47	1.85	11	52	12
	12	15	15	06.53	-18	06	55.3	2.534 521	3.47	1.85	11	51	06
	13	15	17	57.07	18	18	27.4	2.533 285	3.47	1.85	11	49	60
	14	15	20	48.19	18	29	50.9	2.532 001	3.47	1.85	11	48	55
	15	15	23	39.90	18	41	05.6	2.530 671	3.48	1.85	11	47	50
	16	15	26	32.19	-18	52	11.3	2.529 295	3.48	1.85	11	46	46

MARS, 2023

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	26	32.19	-18	52	11.3	2.529 295	3.48	1.85	11	46	46
	17	15	29	25.08	19	03	08.0	2.527 872	3.48	1.85	11	45	43
	18	15	32	18.52	19	13	56.9	2.526 404	3.48	1.85	11	44	40
	19	15	35	12.41	19	24	32.9	2.524 891	3.48	1.85	11	43	38
	20	15	38	07.03	19	35	00.8	2.523 334	3.49	1.85	11	42	36
	21	15	41	02.20	19	45	19.1	2.521 733	3.49	1.86	11	41	35
	22	15	43	57.92	-19	55	27.4	2.520 090	3.49	1.86	11	40	35
	23	15	46	54.22	20	05	25.6	2.518 404	3.49	1.86	11	39	35
	24	15	49	51.08	20	15	13.5	2.516 678	3.49	1.86	11	38	35
	25	15	52	48.52	20	24	51.1	2.514 910	3.50	1.86	11	37	36
	26	15	55	46.53	20	34	18.0	2.513 102	3.50	1.86	11	36	38
	27	15	58	45.11	20	43	34.4	2.511 255	3.50	1.86	11	35	41
	28	16	01	44.26	-20	52	39.9	2.509 368	3.50	1.87	11	34	43
	29	16	04	43.98	21	01	34.4	2.507 443	3.51	1.87	11	33	47
	30	16	07	44.27	21	10	17.8	2.505 478	3.51	1.87	11	32	51
Dec.	1	16	10	45.12	21	18	50.0	2.503 475	3.51	1.87	11	31	56
	2	16	13	46.52	21	27	10.8	2.501 434	3.52	1.87	11	31	01
	3	16	16	48.48	21	35	20.0	2.499 355	3.52	1.87	11	30	06
	4	16	19	50.98	-21	43	17.5	2.497 237	3.52	1.87	11	29	13
	5	16	22	54.03	21	51	03.2	2.495 082	3.52	1.88	11	28	19
	6	16	25	57.62	21	58	36.8	2.492 889	3.53	1.88	11	27	27
	7	16	29	01.75	22	05	58.2	2.490 658	3.53	1.88	11	26	35
	8	16	32	06.40	22	13	07.3	2.488 390	3.53	1.88	11	25	43
	9	16	35	11.58	22	20	04.0	2.486 085	3.54	1.88	11	24	52
	10	16	38	17.28	-22	26	48.1	2.483 742	3.54	1.88	11	24	01
	11	16	41	23.49	22	33	19.4	2.481 363	3.54	1.89	11	23	11
	12	16	44	30.20	22	39	37.9	2.478 947	3.55	1.89	11	22	22
	13	16	47	37.40	22	45	43.4	2.476 494	3.55	1.89	11	21	33
	14	16	50	45.09	22	51	35.8	2.474 006	3.55	1.89	11	20	44
	15	16	53	53.23	22	57	14.9	2.471 483	3.56	1.89	11	19	56
	16	16	57	01.84	-23	02	40.6	2.468 924	3.56	1.90	11	19	08
	17	17	00	10.88	23	07	52.9	2.466 331	3.57	1.90	11	18	21
	18	17	03	20.35	23	12	51.5	2.463 705	3.57	1.90	11	17	34
	19	17	06	30.25	23	17	36.3	2.461 046	3.57	1.90	11	16	47
	20	17	09	40.55	23	22	07.2	2.458 355	3.58	1.90	11	16	01
	21	17	12	51.26	23	26	24.1	2.455 634	3.58	1.91	11	15	16
	22	17	16	02.36	-23	30	26.9	2.452 882	3.59	1.91	11	14	31
	23	17	19	13.85	23	34	15.5	2.450 100	3.59	1.91	11	13	46
	24	17	22	25.71	23	37	49.8	2.447 289	3.59	1.91	11	13	01
	25	17	25	37.95	23	41	09.9	2.444 450	3.60	1.91	11	12	17
	26	17	28	50.54	23	44	15.4	2.441 584	3.60	1.92	11	11	33
	27	17	32	03.48	23	47	06.5	2.438 690	3.61	1.92	11	10	50
	28	17	35	16.74	-23	49	42.9	2.435 769	3.61	1.92	11	10	07
	29	17	38	30.33	23	52	04.7	2.432 821	3.61	1.92	11	09	24
	30	17	41	44.23	23	54	11.7	2.429 847	3.62	1.93	11	08	41
	31	17	44	58.43	23	56	03.8	2.426 847	3.62	1.93	11	07	59
	32	17	48	12.91	-23	57	40.9	2.423 821	3.63	1.93	11	07	17

JUPITER, 2023

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	12 30 43.4	-1 18 07.6	4.951 121	Apr. 3	20 56 52.3	-1 16 55.3	4.952 542
3	12 41 43.7	1 18 07.1	4.951 100	5	21 07 52.2	1 16 52.6	4.952 628
5	12 52 44.0	1 18 06.6	4.951 081	7	21 18 52.1	1 16 49.9	4.952 715
7	13 03 44.3	1 18 06.0	4.951 064	9	21 29 51.9	1 16 47.1	4.952 806
9	13 14 44.6	1 18 05.4	4.951 049	11	21 40 51.7	1 16 44.3	4.952 898
11	13 25 44.9	1 18 04.7	4.951 037	13	21 51 51.5	1 16 41.4	4.952 993
13	13 36 45.2	-1 18 04.0	4.951 027	15	22 02 51.2	-1 16 38.5	4.953 090
15	13 47 45.5	1 18 03.2	4.951 020	17	22 13 50.9	1 16 35.5	4.953 190
17	13 58 45.8	1 18 02.3	4.951 014	19	22 24 50.6	1 16 32.5	4.953 291
19	14 09 46.1	1 18 01.5	4.951 011	21	22 35 50.3	1 16 29.5	4.953 395
21	14 20 46.4	1 18 00.5	4.951 011	23	22 46 49.9	1 16 26.3	4.953 502
23	14 31 46.7	1 17 59.6	4.951 013	25	22 57 49.5	1 16 23.2	4.953 610
25	14 42 47.1	-1 17 58.5	4.951 017	27	23 08 49.1	-1 16 20.0	4.953 722
27	14 53 47.4	1 17 57.5	4.951 023	29	23 19 48.6	1 16 16.7	4.953 835
29	15 04 47.7	1 17 56.3	4.951 032	May 1	23 30 48.1	1 16 13.4	4.953 950
31	15 15 48.0	1 17 55.2	4.951 043	3	23 41 47.6	1 16 10.1	4.954 068
Feb. 2	15 26 48.3	1 17 54.0	4.951 056	5	23 52 47.1	1 16 06.7	4.954 189
4	15 37 48.6	1 17 52.7	4.951 072	7	24 03 46.5	1 16 03.3	4.954 311
6	15 48 48.9	-1 17 51.4	4.951 090	9	24 14 45.8	-1 15 59.8	4.954 436
8	15 59 49.1	1 17 50.0	4.951 111	11	24 25 45.2	1 15 56.2	4.954 563
10	16 10 49.4	1 17 48.6	4.951 133	13	24 36 44.5	1 15 52.7	4.954 693
12	16 21 49.7	1 17 47.2	4.951 158	15	24 47 43.8	1 15 49.0	4.954 824
14	16 32 49.9	1 17 45.7	4.951 186	17	24 58 43.0	1 15 45.4	4.954 959
16	16 43 50.2	1 17 44.1	4.951 216	19	25 09 42.2	1 15 41.7	4.955 095
18	16 54 50.4	-1 17 42.5	4.951 248	21	25 20 41.4	-1 15 37.9	4.955 234
20	17 05 50.7	1 17 40.9	4.951 282	23	25 31 40.5	1 15 34.1	4.955 374
22	17 16 50.9	1 17 39.2	4.951 319	25	25 42 39.6	1 15 30.2	4.955 518
24	17 27 51.1	1 17 37.4	4.951 358	27	25 53 38.7	1 15 26.3	4.955 663
26	17 38 51.3	1 17 35.6	4.951 399	29	26 04 37.7	1 15 22.4	4.955 811
28	17 49 51.5	1 17 33.8	4.951 443	31	26 15 36.7	1 15 18.4	4.955 961
Mar. 2	18 00 51.7	-1 17 31.9	4.951 489	June 2	26 26 35.6	-1 15 14.4	4.956 114
4	18 11 51.8	1 17 30.0	4.951 537	4	26 37 34.5	1 15 10.3	4.956 268
6	18 22 52.0	1 17 28.0	4.951 588	6	26 48 33.3	1 15 06.2	4.956 425
8	18 33 52.2	1 17 26.0	4.951 641	8	26 59 32.1	1 15 02.0	4.956 584
10	18 44 52.3	1 17 23.9	4.951 697	10	27 10 30.9	1 14 57.8	4.956 746
12	18 55 52.4	1 17 21.8	4.951 754	12	27 21 29.6	1 14 53.5	4.956 910
14	19 06 52.5	-1 17 19.6	4.951 814	14	27 32 28.3	-1 14 49.2	4.957 076
16	19 17 52.6	1 17 17.4	4.951 877	16	27 43 26.9	1 14 44.8	4.957 244
18	19 28 52.6	1 17 15.1	4.951 941	18	27 54 25.5	1 14 40.4	4.957 415
20	19 39 52.7	1 17 12.8	4.952 008	20	28 05 24.0	1 14 36.0	4.957 588
22	19 50 52.7	1 17 10.5	4.952 078	22	28 16 22.5	1 14 31.5	4.957 763
24	20 01 52.7	1 17 08.1	4.952 149	24	28 27 21.0	1 14 26.9	4.957 940
26	20 12 52.6	-1 17 05.6	4.952 223	26	28 38 19.3	-1 14 22.4	4.958 120
28	20 23 52.6	1 17 03.1	4.952 299	28	28 49 17.7	1 14 17.7	4.958 302
30	20 34 52.5	1 17 00.6	4.952 378	30	29 00 16.0	1 14 13.1	4.958 486
Apr. 1	20 45 52.5	1 16 58.0	4.952 459	July 2	29 11 14.3	1 14 08.4	4.958 672
3	20 56 52.3	-1 16 55.3	4.952 542	4	29 22 12.4	-1 14 03.6	4.958 861

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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	29 11 14.3	-1 14 08.4	4.958 672	Oct.	2	37 34 49.9	-1 09 43.9	4.969 640
	4	29 22 12.4	1 14 03.6	4.958 861		4	37 45 45.2	1 09 37.2	4.969 929
	6	29 33 10.6	1 13 58.8	4.959 052		6	37 56 40.4	1 09 30.4	4.970 220
	8	29 44 08.7	1 13 53.9	4.959 245		8	38 07 35.5	1 09 23.6	4.970 514
	10	29 55 06.8	1 13 49.0	4.959 440		10	38 18 30.5	1 09 16.7	4.970 809
	12	30 06 04.7	1 13 44.1	4.959 638		12	38 29 25.4	1 09 09.8	4.971 107
	14	30 17 02.7	-1 13 39.1	4.959 838		14	38 40 20.3	-1 09 02.8	4.971 407
	16	30 28 00.6	1 13 34.1	4.960 040		16	38 51 15.1	1 08 55.8	4.971 709
	18	30 38 58.4	1 13 29.0	4.960 245		18	39 02 09.8	1 08 48.8	4.972 013
	20	30 49 56.1	1 13 23.9	4.960 451		20	39 13 04.4	1 08 41.7	4.972 319
	22	31 00 53.9	1 13 18.7	4.960 660		22	39 23 59.0	1 08 34.6	4.972 627
	24	31 11 51.6	1 13 13.5	4.960 871		24	39 34 53.4	1 08 27.4	4.972 938
	26	31 22 49.2	-1 13 08.3	4.961 084		26	39 45 47.8	-1 08 20.2	4.973 250
	28	31 33 46.7	1 13 03.0	4.961 300		28	39 56 42.1	1 08 13.0	4.973 565
	30	31 44 44.2	1 12 57.6	4.961 518		30	40 07 36.3	1 08 05.7	4.973 881
Aug.	1	31 55 41.6	1 12 52.3	4.961 738	Nov.	1	40 18 30.4	1 07 58.4	4.974 200
	3	32 06 39.0	1 12 46.8	4.961 960		3	40 29 24.5	1 07 51.0	4.974 521
	5	32 17 36.3	-1 12 41.4	4.962 184		5	40 40 18.4	1 07 43.6	4.974 843
	7	32 28 33.6	-1 12 35.8	4.962 411		7	40 51 12.3	-1 07 36.2	4.975 168
	9	32 39 30.8	1 12 30.3	4.962 640		9	41 02 06.1	1 07 28.7	4.975 495
	11	32 50 27.9	1 12 24.7	4.962 871		11	41 12 59.8	1 07 21.2	4.975 824
	13	33 01 25.0	1 12 19.0	4.963 104		13	41 23 53.4	1 07 13.6	4.976 155
	15	33 12 22.0	1 12 13.3	4.963 339		15	41 34 46.9	1 07 06.0	4.976 488
	17	33 23 18.9	1 12 07.6	4.963 577		17	41 45 40.3	1 06 58.4	4.976 823
	19	33 34 15.8	-1 12 01.8	4.963 816		19	41 56 33.6	-1 06 50.7	4.977 160
	21	33 45 12.6	1 11 56.0	4.964 058		21	42 07 26.9	1 06 43.0	4.977 500
	23	33 56 09.4	1 11 50.2	4.964 303		23	42 18 20.1	1 06 35.3	4.977 841
	25	34 07 06.1	1 11 44.2	4.964 549		25	42 29 13.1	1 06 27.5	4.978 184
	27	34 18 02.7	1 11 38.3	4.964 797		27	42 40 06.1	1 06 19.6	4.978 529
	29	34 28 59.2	1 11 32.3	4.965 048		29	42 50 59.0	1 06 11.7	4.978 877
	31	34 39 55.7	-1 11 26.2	4.965 301	Dec.	1	43 01 51.8	-1 06 03.8	4.979 226
Sept.	2	34 50 52.2	1 11 20.2	4.965 556		3	43 12 44.5	1 05 55.9	4.979 578
	4	35 01 48.5	1 11 14.1	4.965 813		5	43 23 37.1	1 05 47.9	4.979 931
	6	35 12 44.8	1 11 07.9	4.966 073		7	43 34 29.6	1 05 39.9	4.980 286
	8	35 23 41.0	1 11 01.7	4.966 334		9	43 45 22.0	1 05 31.8	4.980 644
	10	35 34 37.2	1 10 55.4	4.966 598		11	43 56 14.3	1 05 23.7	4.981 003
	12	35 45 33.2	-1 10 49.1	4.966 864		13	44 07 06.5	-1 05 15.5	4.981 365
	14	35 56 29.2	1 10 42.8	4.967 132		15	44 17 58.7	1 05 07.4	4.981 728
	16	36 07 25.1	1 10 36.4	4.967 402		17	44 28 50.7	1 04 59.2	4.982 093
	18	36 18 21.0	1 10 30.0	4.967 674		19	44 39 42.6	1 04 50.9	4.982 461
	20	36 29 16.8	1 10 23.6	4.967 948		21	44 50 34.5	1 04 42.6	4.982 830
	22	36 40 12.5	1 10 17.1	4.968 225		23	45 01 26.2	1 04 34.3	4.983 201
	24	36 51 08.1	-1 10 10.5	4.968 504		25	45 12 17.9	-1 04 25.9	4.983 575
	26	37 02 03.7	1 10 03.9	4.968 784		27	45 23 09.4	1 04 17.5	4.983 950
	28	37 12 59.2	1 09 57.3	4.969 067		29	45 34 00.9	1 04 09.1	4.984 327
	30	37 23 54.6	1 09 50.6	4.969 352		31	45 44 52.2	1 04 00.6	4.984 707
Oct.	2	37 34 49.9	-1 09 43.9	4.969 640		33	45 55 43.4	-1 03 52.1	4.985 088

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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	1	04	25.0	-1	17	27.6	Feb.	15	8	50	09.4	-1	08	22.9
	1	1	11	34.4	1	17	12.7		16	9	02	42.6	1	08	14.4
	2	1	18	53.4	1	16	58.0		17	9	15	20.4	1	08	06.0
	3	1	26	21.9	1	16	43.4		18	9	28	02.6	1	07	57.7
	4	1	33	59.8	1	16	28.9		19	9	40	49.1	1	07	49.5
	5	1	41	46.9	1	16	14.5		20	9	53	39.8	1	07	41.5
	6	1	49	43.1	-1	16	00.3		21	10	06	34.5	-1	07	33.7
	7	1	57	48.4	1	15	46.2		22	10	19	33.2	1	07	25.9
	8	2	06	02.4	1	15	32.2		23	10	32	35.8	1	07	18.3
	9	2	14	25.2	1	15	18.4		24	10	45	42.3	1	07	10.8
	10	2	22	56.7	1	15	04.7		25	10	58	52.5	1	07	03.5
	11	2	31	36.6	1	14	51.1		26	11	12	06.3	1	06	56.3
	12	2	40	24.9	-1	14	37.7		27	11	25	23.6	-1	06	49.2
	13	2	49	21.5	1	14	24.4		28	11	38	44.4	1	06	42.3
	14	2	58	26.4	1	14	11.2	Mar.	1	11	52	08.5	1	06	35.5
	15	3	07	39.3	1	13	58.2		2	12	05	35.7	1	06	28.9
	16	3	17	00.4	1	13	45.3		3	12	19	06.1	1	06	22.4
	17	3	26	29.3	1	13	32.5		4	12	32	39.5	1	06	16.0
	18	3	36	06.2	-1	13	19.9		5	12	46	15.7	-1	06	09.8
	19	3	45	50.8	1	13	07.4		6	12	59	54.8	1	06	03.7
	20	3	55	43.1	1	12	55.1		7	13	13	36.6	1	05	57.7
	21	4	05	42.8	1	12	42.8		8	13	27	21.1	1	05	51.9
	22	4	15	49.9	1	12	30.7		9	13	41	08.1	1	05	46.2
	23	4	26	04.1	1	12	18.8		10	13	54	57.7	1	05	40.7
	24	4	36	25.4	-1	12	07.0		11	14	08	49.8	-1	05	35.3
	25	4	46	53.6	1	11	55.3		12	14	22	44.3	1	05	30.0
	26	4	57	28.6	1	11	43.7		13	14	36	41.2	1	05	24.8
	27	5	08	10.3	1	11	32.3		14	14	50	40.4	1	05	19.8
	28	5	18	58.6	1	11	21.1		15	15	04	41.8	1	05	14.9
	29	5	29	53.5	1	11	09.9		16	15	18	45.4	1	05	10.1
	30	5	40	54.8	-1	10	59.0		17	15	32	50.9	-1	05	05.5
	31	5	52	02.3	1	10	48.1		18	15	46	58.4	1	05	00.9
Feb.	1	6	03	16.0	1	10	37.4		19	16	01	07.6	1	04	56.5
	2	6	14	35.7	1	10	26.9		20	16	15	18.6	1	04	52.2
	3	6	26	01.2	1	10	16.5		21	16	29	31.1	1	04	48.1
	4	6	37	32.6	1	10	06.2		22	16	43	45.2	1	04	44.0
	5	6	49	09.6	-1	09	56.1		23	16	58	00.8	-1	04	40.1
	6	7	00	52.1	1	09	46.1		24	17	12	17.9	1	04	36.3
	7	7	12	40.1	1	09	36.3		25	17	26	36.3	1	04	32.7
	8	7	24	33.4	1	09	26.7		26	17	40	55.9	1	04	29.2
	9	7	36	31.9	1	09	17.1		27	17	55	16.8	1	04	25.7
	10	7	48	35.7	1	09	07.7		28	18	09	38.7	1	04	22.5
	11	8	00	44.5	-1	08	58.5		29	18	24	01.5	-1	04	19.3
	12	8	12	58.4	1	08	49.4		30	18	38	25.3	1	04	16.3
	13	8	25	17.2	1	08	40.4		31	18	52	49.8	1	04	13.4
	14	8	37	40.9	1	08	31.6	Apr.	1	19	07	15.0	1	04	10.7
	15	8	50	09.4	-1	08	22.9		2	19	21	40.9	-1	04	08.0

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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		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	19	07	15.0	-1	04	10.7	May	17	30	03	47.8	-1	04	12.7
	2	19	21	40.9	1	04	08.0		18	30	17	28.7	1	04	15.4
	3	19	36	07.3	1	04	05.5		19	30	31	07.0	1	04	18.3
	4	19	50	34.2	1	04	03.1		20	30	44	42.6	1	04	21.3
	5	20	05	01.5	1	04	00.9		21	30	58	15.3	1	04	24.4
	6	20	19	29.2	1	03	58.8		22	31	11	45.2	1	04	27.7
	7	20	33	57.3	-1	03	56.8		23	31	25	12.1	-1	04	31.0
	8	20	48	25.7	1	03	54.9		24	31	38	35.8	1	04	34.5
	9	21	02	54.4	1	03	53.1		25	31	51	56.4	1	04	38.1
	10	21	17	23.3	1	03	51.6		26	32	05	13.7	1	04	41.8
	11	21	31	52.2	1	03	50.1		27	32	18	27.6	1	04	45.6
	12	21	46	21.1	1	03	48.8		28	32	31	38.1	1	04	49.6
	13	22	00	49.9	-1	03	47.4		29	32	44	45.1	-1	04	53.6
	14	22	15	18.8	1	03	46.1		30	32	57	48.6	1	04	57.8
	15	22	29	47.5	1	03	45.0		31	33	10	48.5	1	05	02.1
	16	22	44	15.8	1	03	44.0	June	1	33	23	44.7	1	05	06.6
	17	22	58	43.7	1	03	43.1		2	33	36	37.3	1	05	11.1
	18	23	13	11.2	1	03	42.4		3	33	49	26.1	1	05	15.7
	19	23	27	38.1	-1	03	41.8		4	34	02	11.1	-1	05	20.5
	20	23	42	04.5	1	03	41.3		5	34	14	52.2	1	05	25.3
	21	23	56	30.2	1	03	40.9		6	34	27	29.4	1	05	30.3
	22	24	10	55.3	1	03	40.6		7	34	40	02.4	1	05	35.4
	23	24	25	19.5	1	03	40.5		8	34	52	31.3	1	05	40.6
	24	24	39	42.9	1	03	40.5		9	35	04	55.9	1	05	45.9
	25	24	54	05.3	-1	03	40.6		10	35	17	16.1	-1	05	51.3
	26	25	08	26.6	1	03	40.8		11	35	29	31.8	1	05	56.8
	27	25	22	46.8	1	03	41.1		12	35	41	43.0	1	06	02.5
	28	25	37	05.7	1	03	41.6		13	35	53	49.7	1	06	08.2
	29	25	51	23.2	1	03	42.2		14	36	05	51.7	1	06	14.1
	30	26	05	39.4	1	03	42.9		15	36	17	48.9	1	06	20.0
May	1	26	19	54.2	-1	03	43.8		16	36	29	41.3	-1	06	26.1
	2	26	34	07.4	1	03	44.7		17	36	41	28.7	1	06	32.3
	3	26	48	19.1	1	03	45.8		18	36	53	11.1	1	06	38.6
	4	27	02	29.2	1	03	47.0		19	37	04	48.4	1	06	45.1
	5	27	16	37.6	1	03	48.3		20	37	16	20.3	1	06	51.6
	6	27	30	44.4	1	03	49.7		21	37	27	46.8	1	06	58.3
	7	27	44	49.5	-1	03	51.2		22	37	39	07.9	-1	07	05.1
	8	27	58	52.7	1	03	52.9		23	37	50	23.3	1	07	12.0
	9	28	12	54.2	1	03	54.6		24	38	01	33.1	1	07	19.0
	10	28	26	53.6	1	03	56.5		25	38	12	37.1	1	07	26.2
	11	28	40	51.1	1	03	58.5		26	38	23	35.3	1	07	33.4
	12	28	54	46.3	1	04	00.6		27	38	34	27.6	1	07	40.8
	13	29	08	39.4	-1	04	02.8		28	38	45	13.9	-1	07	48.3
	14	29	22	30.1	1	04	05.1		29	38	55	54.2	1	07	55.9
	15	29	36	18.4	1	04	07.5		30	39	06	28.4	1	08	03.6
	16	29	50	04.4	1	04	10.0	July	1	39	16	56.4	1	08	11.4
	17	30	03	47.8	-1	04	12.7		2	39	27	18.2	-1	08	19.3

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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	39	16	56.4	-1	08	11.4	Aug.	16	44	57	21.1	-1	15	52.4
	2	39	27	18.2	1	08	19.3		17	45	01	02.5	1	16	04.1
	3	39	37	33.6	1	08	27.3		18	45	04	32.7	1	16	15.8
	4	39	47	42.6	1	08	35.4		19	45	07	51.8	1	16	27.5
	5	39	57	45.0	1	08	43.6		20	45	10	59.6	1	16	39.3
	6	40	07	40.6	1	08	51.9		21	45	13	56.1	1	16	51.0
	7	40	17	29.5	-1	09	00.4		22	45	16	41.2	-1	17	02.8
	8	40	27	11.4	1	09	08.9		23	45	19	15.0	1	17	14.6
	9	40	36	46.3	1	09	17.5		24	45	21	37.4	1	17	26.4
	10	40	46	14.1	1	09	26.2		25	45	23	48.2	1	17	38.1
	11	40	55	34.8	1	09	35.1		26	45	25	47.6	1	17	49.9
	12	41	04	48.2	1	09	44.0		27	45	27	35.4	1	18	01.6
	13	41	13	54.3	-1	09	53.0		28	45	29	11.5	-1	18	13.3
	14	41	22	52.9	1	10	02.2		29	45	30	35.8	1	18	25.0
	15	41	31	43.8	1	10	11.4		30	45	31	48.4	1	18	36.7
	16	41	40	27.0	1	10	20.8		31	45	32	49.1	1	18	48.3
	17	41	49	02.3	1	10	30.2	Sept.	1	45	33	37.9	1	18	59.8
	18	41	57	29.6	1	10	39.8		2	45	34	14.7	1	19	11.3
	19	42	05	48.8	-1	10	49.4		3	45	34	39.7	-1	19	22.8
	20	42	13	59.8	1	10	59.2		4	45	34	52.8	1	19	34.2
	21	42	22	02.4	1	11	09.1		5	45	34	53.9	1	19	45.5
	22	42	29	56.6	1	11	19.0		6	45	34	43.0	1	19	56.8
	23	42	37	42.2	1	11	29.1		7	45	34	20.0	1	20	08.0
	24	42	45	19.2	1	11	39.2		8	45	33	45.0	1	20	19.1
	25	42	52	47.6	-1	11	49.5		9	45	32	57.9	-1	20	30.1
	26	43	00	07.2	1	11	59.8		10	45	31	58.6	1	20	41.1
	27	43	07	18.0	1	12	10.2		11	45	30	47.2	1	20	52.0
	28	43	14	19.8	1	12	20.7		12	45	29	23.7	1	21	02.7
	29	43	21	12.7	1	12	31.3		13	45	27	48.0	1	21	13.3
	30	43	27	56.4	1	12	41.9		14	45	26	00.3	1	21	23.9
	31	43	34	30.9	-1	12	52.6		15	45	24	00.5	-1	21	34.3
Aug.	1	43	40	56.1	1	13	03.4		16	45	21	48.8	1	21	44.5
	2	43	47	11.9	1	13	14.2		17	45	19	25.1	1	21	54.6
	3	43	53	18.0	1	13	25.1		18	45	16	49.7	1	22	04.6
	4	43	59	14.4	1	13	36.1		19	45	14	02.6	1	22	14.4
	5	44	05	01.0	1	13	47.2		20	45	11	03.9	1	22	24.0
	6	44	10	37.8	-1	13	58.3		21	45	07	53.6	-1	22	33.4
	7	44	16	04.7	1	14	09.4		22	45	04	32.0	1	22	42.7
	8	44	21	21.5	1	14	20.7		23	45	00	59.1	1	22	51.7
	9	44	26	28.2	1	14	31.9		24	44	57	15.0	1	23	00.5
	10	44	31	24.7	1	14	43.3		25	44	53	19.8	1	23	09.1
	11	44	36	10.7	1	14	54.7		26	44	49	13.7	1	23	17.5
	12	44	40	46.3	-1	15	06.1		27	44	44	56.6	-1	23	25.7
	13	44	45	11.2	1	15	17.6		28	44	40	28.9	1	23	33.6
	14	44	49	25.4	1	15	29.2		29	44	35	50.6	1	23	41.2
	15	44	53	28.7	1	15	40.8		30	44	31	01.9	1	23	48.6
	16	44	57	21.1	-1	15	52.4	Oct.	1	44	26	03.0	-1	23	55.8

JUPITER, 2023

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	44	26	03.0	-1	23	55.8	Nov.	16	38	48	25.7	-1	23	08.2
	2	44	20	54.1	1	24	02.7		17	38	40	50.6	1	22	58.0
	3	44	15	35.3	1	24	09.3		18	38	33	20.9	1	22	47.5
	4	44	10	06.9	1	24	15.6		19	38	25	56.7	1	22	36.6
	5	44	04	28.9	1	24	21.7		20	38	18	38.5	1	22	25.4
	6	43	58	41.6	1	24	27.5		21	38	11	26.5	1	22	13.8
	7	43	52	45.2	-1	24	33.0		22	38	04	21.1	-1	22	01.9
	8	43	46	39.8	1	24	38.1		23	37	57	22.5	1	21	49.6
	9	43	40	25.7	1	24	43.0		24	37	50	31.2	1	21	37.1
	10	43	34	03.1	1	24	47.6		25	37	43	47.5	1	21	24.2
	11	43	27	32.3	1	24	51.8		26	37	37	11.5	1	21	11.0
	12	43	20	53.5	1	24	55.7		27	37	30	43.7	1	20	57.6
	13	43	14	07.1	-1	24	59.2		28	37	24	24.2	-1	20	43.8
	14	43	07	13.4	1	25	02.4		29	37	18	13.3	1	20	29.8
	15	43	00	12.6	1	25	05.3		30	37	12	11.1	1	20	15.6
	16	42	53	05.2	1	25	07.8	Dec.	1	37	06	18.0	1	20	01.0
	17	42	45	51.4	1	25	09.9		2	37	00	34.1	1	19	46.3
	18	42	38	31.6	1	25	11.6		3	36	54	59.7	1	19	31.3
	19	42	31	06.1	-1	25	13.0		4	36	49	35.0	-1	19	16.0
	20	42	23	35.2	1	25	13.9		5	36	44	20.1	1	19	00.5
	21	42	15	59.4	1	25	14.5		6	36	39	15.4	1	18	44.9
	22	42	08	18.8	1	25	14.7		7	36	34	21.1	1	18	29.0
	23	42	00	33.8	1	25	14.4		8	36	29	37.4	1	18	12.9
	24	41	52	44.8	1	25	13.8		9	36	25	04.4	1	17	56.6
	25	41	44	52.1	-1	25	12.7		10	36	20	42.5	-1	17	40.1
	26	41	36	56.1	1	25	11.3		11	36	16	31.7	1	17	23.5
	27	41	28	57.2	1	25	09.4		12	36	12	32.3	1	17	06.7
	28	41	20	55.7	1	25	07.2		13	36	08	44.4	1	16	49.7
	29	41	12	52.0	1	25	04.5		14	36	05	08.2	1	16	32.6
	30	41	04	46.5	1	25	01.4		15	36	01	43.7	1	16	15.3
	31	40	56	39.6	-1	24	57.9		16	35	58	31.1	-1	15	57.9
Nov.	1	40	48	31.5	1	24	54.0		17	35	55	30.3	1	15	40.3
	2	40	40	22.6	1	24	49.7		18	35	52	41.6	1	15	22.6
	3	40	32	13.3	1	24	45.1		19	35	50	05.0	1	15	04.8
	4	40	24	04.0	1	24	40.0		20	35	47	40.6	1	14	47.0
	5	40	15	54.9	1	24	34.5		21	35	45	28.5	1	14	29.0
	6	40	07	46.4	-1	24	28.6		22	35	43	28.8	-1	14	10.9
	7	39	59	39.0	1	24	22.3		23	35	41	41.5	1	13	52.8
	8	39	51	33.1	1	24	15.6		24	35	40	06.6	1	13	34.6
	9	39	43	29.0	1	24	08.6		25	35	38	44.3	1	13	16.3
	10	39	35	27.1	1	24	01.1		26	35	37	34.4	1	12	58.0
	11	39	27	27.9	1	23	53.2		27	35	36	37.0	1	12	39.7
	12	39	19	31.8	-1	23	45.0		28	35	35	52.0	-1	12	21.4
	13	39	11	39.1	1	23	36.4		29	35	35	19.5	1	12	03.0
	14	39	03	50.2	1	23	27.3		30	35	34	59.5	1	11	44.6
	15	38	56	05.7	1	23	17.9		31	35	34	51.8	1	11	26.2
	16	38	48	25.7	-1	23	08.2		32	35	34	56.7	-1	11	07.7

JUPITER, 2023
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	0	05	59.64	-0	45	26.9	4.994 616	1.76	18.43	17	25	50
	1	0	06	25.50	0	42	22.6	5.010 332	1.76	18.37	17	22	20
	2	0	06	51.96	0	39	14.6	5.026 008	1.75	18.32	17	18	51
	3	0	07	19.00	0	36	02.9	5.041 642	1.74	18.26	17	15	22
	4	0	07	46.62	0	32	47.5	5.057 229	1.74	18.20	17	11	54
	5	0	08	14.81	0	29	28.7	5.072 767	1.73	18.15	17	08	27
	6	0	08	43.56	-0	26	06.3	5.088 253	1.73	18.09	17	04	60
	7	0	09	12.86	0	22	40.5	5.103 682	1.72	18.04	17	01	34
	8	0	09	42.71	0	19	11.3	5.119 053	1.72	17.98	16	58	08
	9	0	10	13.09	0	15	38.8	5.134 362	1.71	17.93	16	54	42
	10	0	10	44.01	0	12	03.0	5.149 605	1.71	17.88	16	51	18
	11	0	11	15.45	0	08	24.0	5.164 780	1.70	17.82	16	47	53
	12	0	11	47.40	-0	04	41.8	5.179 884	1.70	17.77	16	44	30
	13	0	12	19.87	-0	00	56.4	5.194 913	1.69	17.72	16	41	06
	14	0	12	52.85	+0	02	52.0	5.209 864	1.69	17.67	16	37	44
	15	0	13	26.33	0	06	43.6	5.224 735	1.68	17.62	16	34	21
	16	0	14	00.31	0	10	38.2	5.239 522	1.68	17.57	16	30	60
	17	0	14	34.78	0	14	35.8	5.254 222	1.67	17.52	16	27	38
	18	0	15	09.73	+0	18	36.3	5.268 831	1.67	17.47	16	24	17
	19	0	15	45.16	0	22	39.8	5.283 347	1.66	17.42	16	20	57
	20	0	16	21.07	0	26	46.1	5.297 766	1.66	17.38	16	17	37
	21	0	16	57.44	0	30	55.3	5.312 085	1.66	17.33	16	14	18
	22	0	17	34.26	0	35	07.1	5.326 301	1.65	17.28	16	10	59
	23	0	18	11.53	0	39	21.7	5.340 409	1.65	17.24	16	07	40
	24	0	18	49.24	+0	43	38.9	5.354 408	1.64	17.19	16	04	22
	25	0	19	27.37	0	47	58.6	5.368 294	1.64	17.15	16	01	04
	26	0	20	05.93	0	52	20.8	5.382 064	1.63	17.10	15	57	47
	27	0	20	44.90	0	56	45.5	5.395 716	1.63	17.06	15	54	30
	28	0	21	24.29	1	01	12.7	5.409 247	1.63	17.02	15	51	14
	29	0	22	04.08	1	05	42.2	5.422 655	1.62	16.98	15	47	58
	30	0	22	44.27	+1	10	14.1	5.435 937	1.62	16.94	15	44	42
	31	0	23	24.85	1	14	48.2	5.449 092	1.61	16.89	15	41	27
Feb.	1	0	24	05.82	1	19	24.5	5.462 118	1.61	16.85	15	38	12
	2	0	24	47.16	1	24	03.0	5.475 011	1.61	16.81	15	34	57
	3	0	25	28.87	1	28	43.6	5.487 771	1.60	16.78	15	31	43
	4	0	26	10.94	1	33	26.3	5.500 395	1.60	16.74	15	28	29
	5	0	26	53.36	+1	38	11.0	5.512 881	1.60	16.70	15	25	16
	6	0	27	36.14	1	42	57.6	5.525 227	1.59	16.66	15	22	03
	7	0	28	19.25	1	47	46.1	5.537 432	1.59	16.63	15	18	50
	8	0	29	02.70	1	52	36.5	5.549 494	1.58	16.59	15	15	38
	9	0	29	46.48	1	57	28.8	5.561 410	1.58	16.55	15	12	25
	10	0	30	30.59	2	02	22.8	5.573 179	1.58	16.52	15	09	14
	11	0	31	15.02	+2	07	18.6	5.584 799	1.57	16.48	15	06	02
	12	0	31	59.77	2	12	16.1	5.596 267	1.57	16.45	15	02	51
	13	0	32	44.84	2	17	15.2	5.607 583	1.57	16.42	14	59	40
	14	0	33	30.21	2	22	16.1	5.618 744	1.57	16.38	14	56	30
	15	0	34	15.89	+2	27	18.5	5.629 747	1.56	16.35	14	53	19

JUPITER, 2023
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	0	34	15.89	+2	27	18.5	5.629 747	1.56	16.35	14	53	19
	16	0	35	01.87	2	32	22.6	5.640 592	1.56	16.32	14	50	09
	17	0	35	48.14	2	37	28.1	5.651 275	1.56	16.29	14	46	60
	18	0	36	34.69	2	42	35.2	5.661 795	1.55	16.26	14	43	50
	19	0	37	21.51	2	47	43.6	5.672 150	1.55	16.23	14	40	41
	20	0	38	08.61	2	52	53.4	5.682 337	1.55	16.20	14	37	32
	21	0	38	55.97	+2	58	04.5	5.692 354	1.54	16.17	14	34	24
	22	0	39	43.58	3	03	16.8	5.702 200	1.54	16.14	14	31	15
	23	0	40	31.44	3	08	30.3	5.711 874	1.54	16.12	14	28	07
	24	0	41	19.56	3	13	45.0	5.721 373	1.54	16.09	14	24	59
	25	0	42	07.92	3	19	00.9	5.730 697	1.53	16.06	14	21	51
	26	0	42	56.51	3	24	17.8	5.739 843	1.53	16.04	14	18	44
	27	0	43	45.34	+3	29	35.8	5.748 812	1.53	16.01	14	15	37
	28	0	44	34.39	3	34	54.8	5.757 602	1.53	15.99	14	12	30
Mar.	1	0	45	23.66	3	40	14.8	5.766 213	1.53	15.97	14	09	23
	2	0	46	13.14	3	45	35.6	5.774 642	1.52	15.94	14	06	17
	3	0	47	02.82	3	50	57.3	5.782 890	1.52	15.92	14	03	10
	4	0	47	52.71	3	56	19.8	5.790 955	1.52	15.90	14	00	04
	5	0	48	42.79	+4	01	43.0	5.798 837	1.52	15.88	13	56	58
	6	0	49	33.06	4	07	07.0	5.806 534	1.51	15.85	13	53	52
	7	0	50	23.51	4	12	31.6	5.814 047	1.51	15.83	13	50	47
	8	0	51	14.15	4	17	56.9	5.821 373	1.51	15.81	13	47	41
	9	0	52	04.96	4	23	22.8	5.828 514	1.51	15.79	13	44	36
	10	0	52	55.95	4	28	49.3	5.835 466	1.51	15.78	13	41	31
	11	0	53	47.11	+4	34	16.3	5.842 231	1.51	15.76	13	38	26
	12	0	54	38.43	4	39	43.9	5.848 806	1.50	15.74	13	35	21
	13	0	55	29.92	4	45	11.9	5.855 191	1.50	15.72	13	32	17
	14	0	56	21.58	4	50	40.5	5.861 386	1.50	15.71	13	29	12
	15	0	57	13.38	4	56	09.4	5.867 388	1.50	15.69	13	26	08
	16	0	58	05.34	5	01	38.8	5.873 197	1.50	15.67	13	23	04
	17	0	58	57.44	+5	07	08.5	5.878 811	1.50	15.66	13	20	00
	18	0	59	49.68	5	12	38.6	5.884 231	1.49	15.65	13	16	56
	19	1	00	42.05	5	18	08.8	5.889 454	1.49	15.63	13	13	52
	20	1	01	34.55	5	23	39.3	5.894 480	1.49	15.62	13	10	49
	21	1	02	27.16	5	29	10.0	5.899 308	1.49	15.61	13	07	45
	22	1	03	19.90	5	34	40.7	5.903 937	1.49	15.59	13	04	42
	23	1	04	12.74	+5	40	11.6	5.908 367	1.49	15.58	13	01	39
	24	1	05	05.70	5	45	42.5	5.912 596	1.49	15.57	12	58	36
	25	1	05	58.77	5	51	13.4	5.916 625	1.49	15.56	12	55	33
	26	1	06	51.93	5	56	44.4	5.920 454	1.49	15.55	12	52	30
	27	1	07	45.19	6	02	15.2	5.924 082	1.48	15.54	12	49	27
	28	1	08	38.54	6	07	46.0	5.927 510	1.48	15.53	12	46	24
	29	1	09	31.97	+6	13	16.7	5.930 736	1.48	15.52	12	43	21
	30	1	10	25.49	6	18	47.1	5.933 762	1.48	15.51	12	40	19
	31	1	11	19.07	6	24	17.4	5.936 588	1.48	15.51	12	37	16
Apr.	1	1	12	12.72	6	29	47.4	5.939 213	1.48	15.50	12	34	14
	2	1	13	06.43	+6	35	17.1	5.941 637	1.48	15.49	12	31	11

JUPITER, 2023
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	1	12	12.72	+6	29	47.4	5.939 213	1.48	15.50	12	34	14
	2	1	13	06.43	6	35	17.1	5.941 637	1.48	15.49	12	31	11
	3	1	14	00.21	6	40	46.4	5.943 861	1.48	15.49	12	28	09
	4	1	14	54.04	6	46	15.4	5.945 885	1.48	15.48	12	25	07
	5	1	15	47.92	6	51	44.0	5.947 709	1.48	15.48	12	22	04
	6	1	16	41.85	6	57	12.2	5.949 333	1.48	15.47	12	19	02
	7	1	17	35.83	+7	02	40.0	5.950 756	1.48	15.47	12	15	60
	8	1	18	29.86	7	08	07.3	5.951 980	1.48	15.47	12	12	58
	9	1	19	23.93	7	13	34.1	5.953 004	1.48	15.46	12	09	56
	10	1	20	18.04	7	19	00.4	5.953 828	1.48	15.46	12	06	54
	11	1	21	12.18	7	24	26.1	5.954 452	1.48	15.46	12	03	52
	12	1	22	06.34	7	29	51.2	5.954 876	1.48	15.46	12	00	50
	13	1	23	00.53	+7	35	15.9	5.955 099	1.48	15.46	11	57	48
	14	1	23	54.74	7	40	40.1	5.955 121	1.48	15.46	11	54	46
	15	1	24	48.97	7	46	03.5	5.954 942	1.48	15.46	11	51	44
	16	1	25	43.20	7	51	26.2	5.954 562	1.48	15.46	11	48	42
	17	1	26	37.44	7	56	48.2	5.953 981	1.48	15.46	11	45	40
	18	1	27	31.68	8	02	09.3	5.953 199	1.48	15.46	11	42	38
	19	1	28	25.91	+8	07	29.6	5.952 215	1.48	15.47	11	39	36
	20	1	29	20.14	8	12	49.1	5.951 030	1.48	15.47	11	36	34
	21	1	30	14.36	8	18	07.7	5.949 645	1.48	15.47	11	33	32
	22	1	31	08.56	8	23	25.4	5.948 060	1.48	15.48	11	30	30
	23	1	32	02.74	8	28	42.2	5.946 275	1.48	15.48	11	27	28
	24	1	32	56.90	8	33	58.0	5.944 291	1.48	15.49	11	24	26
	25	1	33	51.02	+8	39	12.8	5.942 109	1.48	15.49	11	21	24
	26	1	34	45.11	8	44	26.6	5.939 730	1.48	15.50	11	18	22
	27	1	35	39.15	8	49	39.3	5.937 154	1.48	15.51	11	15	20
	28	1	36	33.15	8	54	50.9	5.934 383	1.48	15.51	11	12	18
	29	1	37	27.09	9	00	01.4	5.931 416	1.48	15.52	11	09	15
	30	1	38	20.97	9	05	10.7	5.928 256	1.48	15.53	11	06	13
May	1	1	39	14.79	+9	10	18.8	5.924 903	1.48	15.54	11	03	11
	2	1	40	08.55	9	15	25.7	5.921 357	1.49	15.55	11	00	08
	3	1	41	02.24	9	20	31.3	5.917 620	1.49	15.56	10	57	06
	4	1	41	55.86	9	25	35.7	5.913 692	1.49	15.57	10	54	03
	5	1	42	49.41	9	30	38.9	5.909 574	1.49	15.58	10	51	01
	6	1	43	42.89	9	35	40.7	5.905 268	1.49	15.59	10	47	58
	7	1	44	36.29	+9	40	41.3	5.900 773	1.49	15.60	10	44	55
	8	1	45	29.60	9	45	40.5	5.896 091	1.49	15.61	10	41	52
	9	1	46	22.83	9	50	38.4	5.891 221	1.49	15.63	10	38	49
	10	1	47	15.97	9	55	34.9	5.886 165	1.49	15.64	10	35	46
	11	1	48	09.00	10	00	30.1	5.880 922	1.50	15.65	10	32	43
	12	1	49	01.93	10	05	23.8	5.875 494	1.50	15.67	10	29	40
	13	1	49	54.75	+10	10	16.0	5.869 881	1.50	15.68	10	26	36
	14	1	50	47.46	10	15	06.7	5.864 084	1.50	15.70	10	23	33
	15	1	51	40.04	10	19	55.9	5.858 102	1.50	15.71	10	20	29
	16	1	52	32.50	10	24	43.5	5.851 937	1.50	15.73	10	17	25
	17	1	53	24.84	+10	29	29.6	5.845 589	1.50	15.75	10	14	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	1	53	24.84	+10	29	29.6	5.845 589	1.50	15.75	10	14	21
	18	1	54	17.05	10	34	14.0	5.839 061	1.51	15.77	10	11	17
	19	1	55	09.12	10	38	56.8	5.832 351	1.51	15.78	10	08	13
	20	1	56	01.05	10	43	38.0	5.825 463	1.51	15.80	10	05	09
	21	1	56	52.83	10	48	17.5	5.818 396	1.51	15.82	10	02	04
	22	1	57	44.46	10	52	55.3	5.811 154	1.51	15.84	9	58	60
	23	1	58	35.92	+10	57	31.4	5.803 736	1.52	15.86	9	55	55
	24	1	59	27.22	11	02	05.7	5.796 144	1.52	15.88	9	52	50
	25	2	00	18.35	11	06	38.2	5.788 380	1.52	15.90	9	49	45
	26	2	01	09.30	11	11	08.8	5.780 446	1.52	15.93	9	46	40
	27	2	02	00.06	11	15	37.6	5.772 342	1.52	15.95	9	43	34
	28	2	02	50.64	11	20	04.6	5.764 071	1.53	15.97	9	40	29
	29	2	03	41.02	+11	24	29.6	5.755 634	1.53	15.99	9	37	23
	30	2	04	31.21	11	28	52.7	5.747 032	1.53	16.02	9	34	17
	31	2	05	21.19	11	33	13.9	5.738 268	1.53	16.04	9	31	11
June	1	2	06	10.98	11	37	33.1	5.729 342	1.53	16.07	9	28	04
	2	2	07	00.56	11	41	50.4	5.720 256	1.54	16.09	9	24	57
	3	2	07	49.92	11	46	05.8	5.711 012	1.54	16.12	9	21	51
	4	2	08	39.08	+11	50	19.1	5.701 611	1.54	16.15	9	18	43
	5	2	09	28.01	11	54	30.5	5.692 054	1.54	16.17	9	15	36
	6	2	10	16.71	11	58	39.9	5.682 342	1.55	16.20	9	12	29
	7	2	11	05.19	12	02	47.3	5.672 477	1.55	16.23	9	09	21
	8	2	11	53.41	12	06	52.6	5.662 460	1.55	16.26	9	06	13
	9	2	12	41.40	12	10	55.8	5.652 292	1.56	16.29	9	03	05
	10	2	13	29.12	+12	14	56.9	5.641 974	1.56	16.32	8	59	56
	11	2	14	16.59	12	18	55.8	5.631 507	1.56	16.35	8	56	47
	12	2	15	03.80	12	22	52.6	5.620 893	1.56	16.38	8	53	38
	13	2	15	50.74	12	26	47.2	5.610 133	1.57	16.41	8	50	29
	14	2	16	37.40	12	30	39.5	5.599 229	1.57	16.44	8	47	19
	15	2	17	23.79	12	34	29.7	5.588 183	1.57	16.47	8	44	10
	16	2	18	09.89	+12	38	17.6	5.576 995	1.58	16.51	8	40	59
	17	2	18	55.70	12	42	03.2	5.565 669	1.58	16.54	8	37	49
	18	2	19	41.21	12	45	46.6	5.554 206	1.58	16.57	8	34	38
	19	2	20	26.41	12	49	27.6	5.542 609	1.59	16.61	8	31	27
	20	2	21	11.29	12	53	06.3	5.530 879	1.59	16.64	8	28	16
	21	2	21	55.85	12	56	42.6	5.519 018	1.59	16.68	8	25	04
	22	2	22	40.07	+13	00	16.6	5.507 030	1.60	16.72	8	21	52
	23	2	23	23.96	13	03	48.1	5.494 915	1.60	16.75	8	18	40
	24	2	24	07.51	13	07	17.2	5.482 677	1.60	16.79	8	15	27
	25	2	24	50.71	13	10	43.8	5.470 318	1.61	16.83	8	12	14
	26	2	25	33.55	13	14	07.9	5.457 840	1.61	16.87	8	09	01
	27	2	26	16.03	13	17	29.5	5.445 245	1.62	16.91	8	05	47
	28	2	26	58.15	+13	20	48.7	5.432 536	1.62	16.95	8	02	33
	29	2	27	39.90	13	24	05.3	5.419 714	1.62	16.99	7	59	18
	30	2	28	21.28	13	27	19.4	5.406 783	1.63	17.03	7	56	03
July	1	2	29	02.27	13	30	31.0	5.393 744	1.63	17.07	7	52	48
	2	2	29	42.88	+13	33	40.2	5.380 600	1.63	17.11	7	49	32

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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	2	29	02.27	+13	30	31.0	5.393 744	1.63	17.07	7	52	48
	2	2	29	42.88	13	33	40.2	5.380 600	1.63	17.11	7	49	32
	3	2	30	23.10	13	36	46.7	5.367 353	1.64	17.15	7	46	16
	4	2	31	02.92	13	39	50.7	5.354 003	1.64	17.19	7	42	60
	5	2	31	42.33	13	42	52.2	5.340 555	1.65	17.24	7	39	43
	6	2	32	21.32	13	45	51.0	5.327 009	1.65	17.28	7	36	26
	7	2	32	59.88	+13	48	47.2	5.313 367	1.66	17.33	7	33	08
	8	2	33	38.01	13	51	40.7	5.299 632	1.66	17.37	7	29	50
	9	2	34	15.71	13	54	31.5	5.285 805	1.66	17.42	7	26	32
	10	2	34	52.96	13	57	19.7	5.271 889	1.67	17.46	7	23	13
	11	2	35	29.76	14	00	05.1	5.257 886	1.67	17.51	7	19	53
	12	2	36	06.11	14	02	47.7	5.243 798	1.68	17.56	7	16	33
	13	2	36	41.99	+14	05	27.7	5.229 628	1.68	17.60	7	13	13
	14	2	37	17.40	14	08	04.9	5.215 380	1.69	17.65	7	09	52
	15	2	37	52.32	14	10	39.3	5.201 055	1.69	17.70	7	06	31
	16	2	38	26.76	14	13	10.8	5.186 656	1.70	17.75	7	03	09
	17	2	39	00.69	14	15	39.6	5.172 187	1.70	17.80	6	59	47
	18	2	39	34.11	14	18	05.5	5.157 651	1.71	17.85	6	56	24
	19	2	40	07.02	+14	20	28.5	5.143 050	1.71	17.90	6	53	01
	20	2	40	39.40	14	22	48.7	5.128 388	1.71	17.95	6	49	37
	21	2	41	11.25	14	25	05.9	5.113 668	1.72	18.00	6	46	12
	22	2	41	42.55	14	27	20.1	5.098 894	1.72	18.05	6	42	47
	23	2	42	13.31	14	29	31.4	5.084 067	1.73	18.11	6	39	22
	24	2	42	43.52	14	31	39.7	5.069 193	1.73	18.16	6	35	56
	25	2	43	13.17	+14	33	45.1	5.054 273	1.74	18.21	6	32	29
	26	2	43	42.26	14	35	47.5	5.039 311	1.75	18.27	6	29	02
	27	2	44	10.77	14	37	46.9	5.024 311	1.75	18.32	6	25	35
	28	2	44	38.72	14	39	43.3	5.009 275	1.76	18.38	6	22	06
	29	2	45	06.08	14	41	36.7	4.994 207	1.76	18.43	6	18	37
	30	2	45	32.85	14	43	27.1	4.979 110	1.77	18.49	6	15	08
	31	2	45	59.02	+14	45	14.6	4.963 987	1.77	18.55	6	11	38
Aug.	1	2	46	24.59	14	46	59.0	4.948 841	1.78	18.60	6	08	07
	2	2	46	49.54	14	48	40.3	4.933 674	1.78	18.66	6	04	36
	3	2	47	13.87	14	50	18.6	4.918 490	1.79	18.72	6	01	04
	4	2	47	37.56	14	51	53.8	4.903 292	1.79	18.78	5	57	32
	5	2	48	00.62	14	53	25.8	4.888 082	1.80	18.83	5	53	59
	6	2	48	23.04	+14	54	54.7	4.872 863	1.80	18.89	5	50	25
	7	2	48	44.81	14	56	20.4	4.857 640	1.81	18.95	5	46	50
	8	2	49	05.93	14	57	43.0	4.842 415	1.82	19.01	5	43	15
	9	2	49	26.38	14	59	02.4	4.827 192	1.82	19.07	5	39	40
	10	2	49	46.16	15	00	18.6	4.811 975	1.83	19.13	5	36	03
	11	2	50	05.27	15	01	31.6	4.796 767	1.83	19.19	5	32	26
	12	2	50	23.68	+15	02	41.4	4.781 573	1.84	19.25	5	28	48
	13	2	50	41.40	15	03	47.9	4.766 396	1.85	19.31	5	25	10
	14	2	50	58.41	15	04	51.2	4.751 240	1.85	19.38	5	21	31
	15	2	51	14.71	15	05	51.2	4.736 110	1.86	19.44	5	17	51
	16	2	51	30.28	+15	06	47.9	4.721 010	1.86	19.50	5	14	10

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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	2	51	30.28	+15	06	47.9	4.721 010	1.86	19.50	5	14	10
	17	2	51	45.14	15	07	41.3	4.705 943	1.87	19.56	5	10	29
	18	2	51	59.26	15	08	31.3	4.690 915	1.87	19.63	5	06	47
	19	2	52	12.64	15	09	18.0	4.675 929	1.88	19.69	5	03	04
	20	2	52	25.29	15	10	01.3	4.660 990	1.89	19.75	4	59	21
	21	2	52	37.19	15	10	41.3	4.646 101	1.89	19.81	4	55	37
	22	2	52	48.34	+15	11	18.0	4.631 268	1.90	19.88	4	51	52
	23	2	52	58.74	15	11	51.2	4.616 495	1.90	19.94	4	48	06
	24	2	53	08.39	15	12	21.2	4.601 785	1.91	20.01	4	44	20
	25	2	53	17.28	15	12	47.8	4.587 143	1.92	20.07	4	40	32
	26	2	53	25.40	15	13	11.0	4.572 573	1.92	20.13	4	36	44
	27	2	53	32.76	15	13	31.0	4.558 079	1.93	20.20	4	32	56
	28	2	53	39.35	+15	13	47.6	4.543 666	1.94	20.26	4	29	06
	29	2	53	45.16	15	14	00.8	4.529 336	1.94	20.33	4	25	16
	30	2	53	50.19	15	14	10.6	4.515 095	1.95	20.39	4	21	25
	31	2	53	54.43	15	14	17.1	4.500 945	1.95	20.45	4	17	33
Sept.	1	2	53	57.89	15	14	20.2	4.486 891	1.96	20.52	4	13	40
	2	2	54	00.56	15	14	19.8	4.472 936	1.97	20.58	4	09	47
	3	2	54	02.44	+15	14	16.1	4.459 086	1.97	20.65	4	05	53
	4	2	54	03.53	15	14	08.9	4.445 343	1.98	20.71	4	01	58
	5	2	54	03.83	15	13	58.3	4.431 713	1.98	20.77	3	58	02
	6	2	54	03.34	15	13	44.4	4.418 199	1.99	20.84	3	54	06
	7	2	54	02.04	15	13	27.0	4.404 807	2.00	20.90	3	50	08
	8	2	53	59.95	15	13	06.2	4.391 541	2.00	20.96	3	46	10
	9	2	53	57.05	+15	12	42.1	4.378 406	2.01	21.03	3	42	11
	10	2	53	53.35	15	12	14.5	4.365 407	2.01	21.09	3	38	11
	11	2	53	48.85	15	11	43.5	4.352 548	2.02	21.15	3	34	11
	12	2	53	43.54	15	11	09.1	4.339 834	2.03	21.21	3	30	10
	13	2	53	37.42	15	10	31.4	4.327 271	2.03	21.27	3	26	08
	14	2	53	30.51	15	09	50.2	4.314 862	2.04	21.34	3	22	05
	15	2	53	22.80	+15	09	05.6	4.302 614	2.04	21.40	3	18	01
	16	2	53	14.30	15	08	17.7	4.290 530	2.05	21.46	3	13	56
	17	2	53	05.01	15	07	26.4	4.278 615	2.06	21.52	3	09	51
	18	2	52	54.94	15	06	31.9	4.266 874	2.06	21.58	3	05	45
	19	2	52	44.09	15	05	34.0	4.255 312	2.07	21.63	3	01	38
	20	2	52	32.48	15	04	32.9	4.243 934	2.07	21.69	2	57	31
	21	2	52	20.11	+15	03	28.6	4.232 743	2.08	21.75	2	53	23
	22	2	52	06.98	15	02	21.2	4.221 745	2.08	21.81	2	49	14
	23	2	51	53.11	15	01	10.6	4.210 943	2.09	21.86	2	45	04
	24	2	51	38.49	14	59	56.9	4.200 341	2.09	21.92	2	40	53
	25	2	51	23.14	14	58	40.1	4.189 944	2.10	21.97	2	36	42
	26	2	51	07.07	14	57	20.3	4.179 756	2.10	22.03	2	32	30
	27	2	50	50.28	+14	55	57.5	4.169 780	2.11	22.08	2	28	17
	28	2	50	32.77	14	54	31.6	4.160 021	2.11	22.13	2	24	04
	29	2	50	14.58	14	53	02.8	4.150 481	2.12	22.18	2	19	50
	30	2	49	55.69	14	51	31.1	4.141 165	2.12	22.23	2	15	35
Oct.	1	2	49	36.14	+14	49	56.5	4.132 076	2.13	22.28	2	11	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
Oct.	1	2	49	36.14	+14	49	56.5	4.132 076	2.13	22.28	2	11	20
	2	2	49	15.93	14	48	19.1	4.123 219	2.13	22.33	2	07	04
	3	2	48	55.06	14	46	38.9	4.114 597	2.14	22.37	2	02	47
	4	2	48	33.56	14	44	56.0	4.106 214	2.14	22.42	1	58	30
	5	2	48	11.44	14	43	10.4	4.098 075	2.15	22.46	1	54	12
	6	2	47	48.69	14	41	22.3	4.090 183	2.15	22.51	1	49	53
	7	2	47	25.35	+14	39	31.5	4.082 543	2.15	22.55	1	45	34
	8	2	47	01.42	14	37	38.2	4.075 157	2.16	22.59	1	41	14
	9	2	46	36.91	14	35	42.5	4.068 031	2.16	22.63	1	36	54
	10	2	46	11.85	14	33	44.4	4.061 167	2.17	22.67	1	32	33
	11	2	45	46.25	14	31	44.0	4.054 570	2.17	22.71	1	28	12
	12	2	45	20.13	14	29	41.3	4.048 243	2.17	22.74	1	23	50
	13	2	44	53.51	+14	27	36.4	4.042 190	2.18	22.77	1	19	27
	14	2	44	26.41	14	25	29.4	4.036 413	2.18	22.81	1	15	04
	15	2	43	58.85	14	23	20.5	4.030 916	2.18	22.84	1	10	41
	16	2	43	30.86	14	21	09.6	4.025 702	2.18	22.87	1	06	17
	17	2	43	02.45	14	18	57.0	4.020 774	2.19	22.90	1	01	53
	18	2	42	33.64	14	16	42.7	4.016 135	2.19	22.92	0	57	29
	19	2	42	04.47	+14	14	26.8	4.011 786	2.19	22.95	0	53	04
	20	2	41	34.95	14	12	09.4	4.007 731	2.19	22.97	0	48	38
	21	2	41	05.10	14	09	50.6	4.003 970	2.20	22.99	0	44	13
	22	2	40	34.94	14	07	30.6	4.000 507	2.20	23.01	0	39	47
	23	2	40	04.50	14	05	09.3	3.997 342	2.20	23.03	0	35	21
	24	2	39	33.80	14	02	46.9	3.994 477	2.20	23.05	0	30	54
	25	2	39	02.86	+14	00	23.6	3.991 914	2.20	23.06	0	26	28
	26	2	38	31.71	13	57	59.3	3.989 653	2.20	23.07	0	22	01
	27	2	38	00.37	13	55	34.2	3.987 695	2.21	23.09	0	17	34
	28	2	37	28.86	13	53	08.4	3.986 042	2.21	23.10	0	13	06
	29	2	36	57.21	13	50	42.0	3.984 694	2.21	23.10	0	08	39
	30	2	36	25.45	13	48	15.2	3.983 652	2.21	23.11	0	04	12
	31	2	35	53.60	+13	45	48.0	3.982 918	2.21	23.11	23	55	16
Nov.	1	2	35	21.68	13	43	20.6	3.982 492	2.21	23.12	23	50	49
	2	2	34	49.70	13	40	53.1	3.982 375	2.21	23.12	23	46	21
	3	2	34	17.71	13	38	25.5	3.982 567	2.21	23.12	23	41	53
	4	2	33	45.71	13	35	58.0	3.983 070	2.21	23.11	23	37	25
	5	2	33	13.73	13	33	30.7	3.983 884	2.21	23.11	23	32	58
	6	2	32	41.80	+13	31	03.7	3.985 008	2.21	23.10	23	28	30
	7	2	32	09.93	13	28	37.2	3.986 443	2.21	23.09	23	24	03
	8	2	31	38.17	13	26	11.2	3.988 190	2.21	23.08	23	19	35
	9	2	31	06.53	13	23	45.8	3.990 247	2.20	23.07	23	15	08
	10	2	30	35.04	13	21	21.3	3.992 615	2.20	23.06	23	10	41
	11	2	30	03.72	13	18	57.6	3.995 292	2.20	23.04	23	06	14
	12	2	29	32.60	+13	16	35.1	3.998 278	2.20	23.02	23	01	48
	13	2	29	01.71	13	14	13.7	4.001 573	2.20	23.01	22	57	21
	14	2	28	31.08	13	11	53.7	4.005 174	2.20	22.99	22	52	55
	15	2	28	00.72	13	09	35.1	4.009 080	2.19	22.96	22	48	29
	16	2	27	30.66	+13	07	18.1	4.013 290	2.19	22.94	22	44	04

JUPITER, 2023

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	2	27	30.66	+13	07	18.1	4.013 290	2.19	22.94	22	44	04
	17	2	27	00.92	13	05	02.8	4.017 801	2.19	22.91	22	39	39
	18	2	26	31.53	13	02	49.3	4.022 612	2.19	22.89	22	35	14
	19	2	26	02.50	13	00	37.8	4.027 720	2.18	22.86	22	30	49
	20	2	25	33.85	12	58	28.2	4.033 123	2.18	22.83	22	26	25
	21	2	25	05.61	12	56	20.8	4.038 817	2.18	22.79	22	22	02
	22	2	24	37.80	+12	54	15.5	4.044 801	2.17	22.76	22	17	39
	23	2	24	10.44	12	52	12.6	4.051 071	2.17	22.72	22	13	16
	24	2	23	43.54	12	50	12.1	4.057 623	2.17	22.69	22	08	54
	25	2	23	17.13	12	48	14.1	4.064 457	2.16	22.65	22	04	32
	26	2	22	51.23	12	46	18.8	4.071 567	2.16	22.61	22	00	11
	27	2	22	25.86	12	44	26.1	4.078 952	2.16	22.57	21	55	50
	28	2	22	01.02	+12	42	36.3	4.086 608	2.15	22.53	21	51	30
	29	2	21	36.74	12	40	49.3	4.094 533	2.15	22.48	21	47	11
	30	2	21	13.02	12	39	05.4	4.102 723	2.14	22.44	21	42	52
Dec.	1	2	20	49.89	12	37	24.4	4.111 175	2.14	22.39	21	38	33
	2	2	20	27.35	12	35	46.6	4.119 887	2.13	22.35	21	34	15
	3	2	20	05.42	12	34	11.9	4.128 854	2.13	22.30	21	29	58
	4	2	19	44.12	+12	32	40.5	4.138 073	2.13	22.25	21	25	42
	5	2	19	23.46	12	31	12.4	4.147 542	2.12	22.20	21	21	26
	6	2	19	03.45	12	29	47.7	4.157 255	2.12	22.14	21	17	11
	7	2	18	44.11	12	28	26.5	4.167 210	2.11	22.09	21	12	56
	8	2	18	25.45	12	27	08.9	4.177 403	2.11	22.04	21	08	42
	9	2	18	07.48	12	25	54.8	4.187 829	2.10	21.98	21	04	29
	10	2	17	50.22	+12	24	44.5	4.198 485	2.09	21.93	21	00	17
	11	2	17	33.69	12	23	37.9	4.209 366	2.09	21.87	20	56	05
	12	2	17	17.88	12	22	35.1	4.220 468	2.08	21.81	20	51	54
	13	2	17	02.81	12	21	36.3	4.231 787	2.08	21.75	20	47	44
	14	2	16	48.50	12	20	41.3	4.243 317	2.07	21.70	20	43	34
	15	2	16	34.93	12	19	50.4	4.255 055	2.07	21.64	20	39	25
	16	2	16	22.13	+12	19	03.4	4.266 994	2.06	21.57	20	35	17
	17	2	16	10.10	12	18	20.5	4.279 131	2.06	21.51	20	31	10
	18	2	15	58.83	12	17	41.6	4.291 459	2.05	21.45	20	27	04
	19	2	15	48.35	12	17	06.7	4.303 974	2.04	21.39	20	22	58
	20	2	15	38.65	12	16	36.0	4.316 671	2.04	21.33	20	18	53
	21	2	15	29.74	12	16	09.3	4.329 545	2.03	21.26	20	14	49
	22	2	15	21.62	+12	15	46.8	4.342 590	2.03	21.20	20	10	46
	23	2	15	14.31	12	15	28.4	4.355 803	2.02	21.14	20	06	43
	24	2	15	07.79	12	15	14.2	4.369 177	2.01	21.07	20	02	42
	25	2	15	02.08	12	15	04.2	4.382 710	2.01	21.01	19	58	41
	26	2	14	57.17	12	14	58.3	4.396 395	2.00	20.94	19	54	41
	27	2	14	53.06	12	14	56.6	4.410 228	1.99	20.87	19	50	41
	28	2	14	49.75	+12	14	59.1	4.424 205	1.99	20.81	19	46	43
	29	2	14	47.24	12	15	05.7	4.438 321	1.98	20.74	19	42	45
	30	2	14	45.54	12	15	16.4	4.452 572	1.98	20.68	19	38	48
	31	2	14	44.63	12	15	31.3	4.466 953	1.97	20.61	19	34	52
	32	2	14	44.52	+12	15	50.3	4.481 460	1.96	20.54	19	30	56

SATURN, 2023

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	326 16 29.3	-1 19 58.0	9.835 574	Apr. 3	329 10 52.0	-1 26 14.4	9.812 048
3	326 20 16.2	1 20 06.3	9.835 071	5	329 14 40.0	1 26 22.4	9.811 527
5	326 24 03.2	1 20 14.5	9.834 568	7	329 18 28.1	1 26 30.5	9.811 007
7	326 27 50.2	1 20 22.9	9.834 065	9	329 22 16.1	1 26 38.5	9.810 486
9	326 31 37.2	1 20 31.1	9.833 561	11	329 26 04.2	1 26 46.6	9.809 964
11	326 35 24.2	1 20 39.4	9.833 057	13	329 29 52.3	1 26 54.6	9.809 442
13	326 39 11.2	-1 20 47.7	9.832 553	15	329 33 40.4	-1 27 02.6	9.808 920
15	326 42 58.3	1 20 55.9	9.832 048	17	329 37 28.6	1 27 10.7	9.808 397
17	326 46 45.4	1 21 04.2	9.831 542	19	329 41 16.8	1 27 18.7	9.807 874
19	326 50 32.5	1 21 12.5	9.831 036	21	329 45 05.0	1 27 26.7	9.807 351
21	326 54 19.6	1 21 20.7	9.830 530	23	329 48 53.2	1 27 34.7	9.806 827
23	326 58 06.8	1 21 29.0	9.830 024	25	329 52 41.4	1 27 42.7	9.806 303
25	327 01 53.9	-1 21 37.2	9.829 517	27	329 56 29.7	-1 27 50.7	9.805 779
27	327 05 41.1	1 21 45.5	9.829 009	29	330 00 18.0	1 27 58.7	9.805 254
29	327 09 28.3	1 21 53.7	9.828 502	May 1	330 04 06.3	1 28 06.7	9.804 729
31	327 13 15.6	1 22 01.9	9.827 993	3	330 07 54.7	1 28 14.7	9.804 203
Feb. 2	327 17 02.9	1 22 10.1	9.827 485	5	330 11 43.0	1 28 22.6	9.803 678
4	327 20 50.2	1 22 18.4	9.826 976	7	330 15 31.4	1 28 30.6	9.803 151
6	327 24 37.5	-1 22 26.6	9.826 466	9	330 19 19.8	-1 28 38.6	9.802 625
8	327 28 24.8	1 22 34.8	9.825 957	11	330 23 08.3	1 28 46.5	9.802 098
10	327 32 12.2	1 22 43.0	9.825 447	13	330 26 56.8	1 28 54.5	9.801 571
12	327 35 59.6	1 22 51.2	9.824 936	15	330 30 45.2	1 29 02.4	9.801 043
14	327 39 47.0	1 22 59.3	9.824 425	17	330 34 33.8	1 29 10.4	9.800 515
16	327 43 34.4	1 23 07.5	9.823 914	19	330 38 22.3	1 29 18.3	9.799 987
18	327 47 21.9	-1 23 15.7	9.823 402	21	330 42 10.9	-1 29 26.2	9.799 458
20	327 51 09.4	1 23 23.9	9.822 890	23	330 45 59.5	1 29 34.2	9.798 929
22	327 54 56.9	1 23 32.1	9.822 378	25	330 49 48.1	1 29 42.1	9.798 399
24	327 58 44.4	1 23 40.2	9.821 865	27	330 53 36.7	1 29 50.0	9.797 870
26	328 02 32.0	1 23 48.4	9.821 351	29	330 57 25.4	1 29 57.9	9.797 340
28	328 06 19.6	1 23 56.6	9.820 838	31	331 01 14.1	1 30 05.8	9.796 809
Mar. 2	328 10 07.2	-1 24 04.7	9.820 324	June 2	331 05 02.8	-1 30 13.7	9.796 278
4	328 13 54.8	1 24 12.8	9.819 809	4	331 08 51.5	1 30 21.6	9.795 747
6	328 17 42.4	1 24 21.0	9.819 295	6	331 12 40.3	1 30 29.5	9.795 216
8	328 21 30.1	1 24 29.1	9.818 779	8	331 16 29.1	1 30 37.4	9.794 684
10	328 25 17.8	1 24 37.3	9.818 264	10	331 20 17.9	1 30 45.2	9.794 151
12	328 29 05.5	1 24 45.4	9.817 748	12	331 24 06.7	1 30 53.1	9.793 619
14	328 32 53.3	-1 24 53.5	9.817 232	14	331 27 55.6	-1 31 00.9	9.793 086
16	328 36 41.0	1 25 01.6	9.816 715	16	331 31 44.5	1 31 08.8	9.792 553
18	328 40 28.8	1 25 09.7	9.816 198	18	331 35 33.4	1 31 16.7	9.792 019
20	328 44 16.7	1 25 17.8	9.815 680	20	331 39 22.3	1 31 24.5	9.791 485
22	328 48 04.5	1 25 25.9	9.815 163	22	331 43 11.3	1 31 32.3	9.790 951
24	328 51 52.4	1 25 34.0	9.814 644	24	331 47 00.3	1 31 40.2	9.790 416
26	328 55 40.2	-1 25 42.1	9.814 126	26	331 50 49.3	-1 31 48.0	9.789 881
28	328 59 28.2	1 25 50.2	9.813 607	28	331 54 38.3	1 31 55.8	9.789 345
30	329 03 16.1	1 25 58.2	9.813 088	30	331 58 27.4	1 32 03.6	9.788 810
Apr. 1	329 07 04.0	1 26 06.3	9.812 568	July 2	332 02 16.5	1 32 11.5	9.788 274
3	329 10 52.0	-1 26 14.4	9.812 048	4	332 06 05.6	-1 32 19.3	9.787 737

SATURN, 2023

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	332 02 16.5	-1 32 11.5	9.788 274	Oct. 2	334 58 21.8	-1 38 03.9	9.763 244
4	332 06 05.6	1 32 19.3	9.787 737	4	335 02 12.1	1 38 11.5	9.762 692
6	332 09 54.7	1 32 27.0	9.787 200	6	335 06 02.4	1 38 19.0	9.762 140
8	332 13 43.9	1 32 34.8	9.786 663	8	335 09 52.8	1 38 26.5	9.761 587
10	332 17 33.1	1 32 42.6	9.786 126	10	335 13 43.1	1 38 34.0	9.761 035
12	332 21 22.3	1 32 50.4	9.785 588	12	335 17 33.5	1 38 41.5	9.760 481
14	332 25 11.5	-1 32 58.2	9.785 050	14	335 21 23.9	-1 38 49.0	9.759 928
16	332 29 00.8	1 33 05.9	9.784 511	16	335 25 14.3	1 38 56.4	9.759 374
18	332 32 50.1	1 33 13.7	9.783 972	18	335 29 04.8	1 39 03.9	9.758 820
20	332 36 39.4	1 33 21.4	9.783 433	20	335 32 55.3	1 39 11.3	9.758 266
22	332 40 28.8	1 33 29.2	9.782 893	22	335 36 45.8	1 39 18.8	9.757 711
24	332 44 18.1	1 33 36.9	9.782 354	24	335 40 36.4	1 39 26.3	9.757 156
26	332 48 07.5	-1 33 44.6	9.781 813	26	335 44 26.9	-1 39 33.7	9.756 601
28	332 51 56.9	1 33 52.4	9.781 273	28	335 48 17.5	1 39 41.1	9.756 045
30	332 55 46.3	1 34 00.1	9.780 732	30	335 52 08.1	1 39 48.6	9.755 489
Aug. 1	332 59 35.8	1 34 07.8	9.780 191	Nov. 1	335 55 58.7	1 39 56.0	9.754 933
3	333 03 25.3	1 34 15.5	9.779 649	3	335 59 49.4	1 40 03.4	9.754 376
5	333 07 14.8	1 34 23.3	9.779 107	5	336 03 40.1	1 40 10.8	9.753 819
7	333 11 04.4	-1 34 30.9	9.778 565	7	336 07 30.8	-1 40 18.2	9.753 262
9	333 14 53.9	1 34 38.6	9.778 022	9	336 11 21.6	1 40 25.6	9.752 705
11	333 18 43.5	1 34 46.3	9.777 479	11	336 15 12.3	1 40 33.0	9.752 147
13	333 22 33.2	1 34 54.0	9.776 936	13	336 19 03.1	1 40 40.4	9.751 589
15	333 26 22.8	1 35 01.7	9.776 392	15	336 22 54.0	1 40 47.8	9.751 031
17	333 30 12.5	1 35 09.3	9.775 848	17	336 26 44.8	1 40 55.1	9.750 472
19	333 34 02.2	-1 35 17.0	9.775 304	19	336 30 35.7	-1 41 02.5	9.749 913
21	333 37 51.9	1 35 24.7	9.774 759	21	336 34 26.6	1 41 09.9	9.749 354
23	333 41 41.6	1 35 32.3	9.774 214	23	336 38 17.5	1 41 17.2	9.748 794
25	333 45 31.4	1 35 39.9	9.773 669	25	336 42 08.5	1 41 24.5	9.748 234
27	333 49 21.2	1 35 47.6	9.773 123	27	336 45 59.4	1 41 31.9	9.747 674
29	333 53 11.0	1 35 55.2	9.772 577	29	336 49 50.4	1 41 39.2	9.747 114
31	333 57 00.9	-1 36 02.8	9.772 031	Dec. 1	336 53 41.5	-1 41 46.5	9.746 553
Sept. 2	334 00 50.7	1 36 10.5	9.771 484	3	336 57 32.5	1 41 53.9	9.745 992
4	334 04 40.6	1 36 18.1	9.770 937	5	337 01 23.6	1 42 01.2	9.745 431
6	334 08 30.5	1 36 25.7	9.770 390	7	337 05 14.7	1 42 08.5	9.744 869
8	334 12 20.5	1 36 33.2	9.769 842	9	337 09 05.9	1 42 15.8	9.744 308
10	334 16 10.5	1 36 40.9	9.769 294	11	337 12 57.0	-1 42 23.0	9.743 745
12	334 20 00.4	-1 36 48.5	9.768 746	13	337 16 48.2	-1 42 30.3	9.743 183
14	334 23 50.5	1 36 56.0	9.768 197	15	337 20 39.4	1 42 37.6	9.742 620
16	334 27 40.5	1 37 03.6	9.767 648	17	337 24 30.7	1 42 44.9	9.742 057
18	334 31 30.6	1 37 11.2	9.767 098	19	337 28 21.9	1 42 52.1	9.741 494
20	334 35 20.7	1 37 18.7	9.766 549	21	337 32 13.2	1 42 59.4	9.740 931
22	334 39 10.8	1 37 26.3	9.765 999	23	337 36 04.6	1 43 06.6	9.740 367
24	334 43 01.0	-1 37 33.8	9.765 449	25	337 39 55.9	-1 43 13.9	9.739 803
26	334 46 51.1	1 37 41.4	9.764 898	27	337 43 47.3	1 43 21.1	9.739 238
28	334 50 41.4	1 37 48.9	9.764 347	29	337 47 38.7	1 43 28.3	9.738 674
30	334 54 31.6	1 37 56.4	9.763 796	31	337 51 30.1	1 43 35.5	9.738 109
Oct. 2	334 58 21.8	-1 38 03.9	9.763 244	33	337 55 21.5	-1 43 42.8	9.737 544

SATURN, 2023

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	322	19	10.1	-1	14	37.3	Feb.	15	327	31	56.2	-1	15	28.4
	1	322	25	07.6	1	14	36.3		16	327	39	11.8	1	15	32.0
	2	322	31	08.4	1	14	35.4		17	327	46	27.5	1	15	35.7
	3	322	37	12.3	1	14	34.5		18	327	53	43.2	1	15	39.3
	4	322	43	19.5	1	14	33.8		19	328	00	58.9	1	15	43.0
	5	322	49	29.6	1	14	33.1		20	328	08	14.4	1	15	46.8
	6	322	55	42.8	-1	14	32.5		21	328	15	29.6	-1	15	50.8
	7	323	01	58.8	1	14	32.0		22	328	22	44.5	1	15	55.0
	8	323	08	17.6	1	14	31.6		23	328	29	59.0	1	15	59.2
	9	323	14	39.2	1	14	31.3		24	328	37	13.0	1	16	03.5
	10	323	21	03.5	1	14	31.1		25	328	44	26.6	1	16	07.9
	11	323	27	30.3	1	14	31.0		26	328	51	39.6	1	16	12.5
	12	323	33	59.7	-1	14	30.9		27	328	58	52.1	-1	16	17.2
	13	323	40	31.6	1	14	31.0		28	329	06	03.8	1	16	21.9
	14	323	47	05.9	1	14	31.2	Mar.	1	329	13	14.7	1	16	26.8
	15	323	53	42.6	1	14	31.4		2	329	20	24.8	1	16	31.8
	16	324	00	21.7	1	14	31.8		3	329	27	34.0	1	16	36.9
	17	324	07	03.1	1	14	32.2		4	329	34	42.2	1	16	42.1
	18	324	13	46.7	-1	14	32.8		5	329	41	49.2	-1	16	47.5
	19	324	20	32.5	1	14	33.4		6	329	48	55.2	1	16	52.9
	20	324	27	20.4	1	14	34.1		7	329	55	59.9	1	16	58.4
	21	324	34	10.3	1	14	34.9		8	330	03	03.4	1	17	04.1
	22	324	41	02.1	1	14	35.9		9	330	10	05.5	1	17	09.9
	23	324	47	55.6	1	14	36.9		10	330	17	06.4	1	17	15.7
	24	324	54	50.7	-1	14	38.0		11	330	24	05.8	-1	17	21.7
	25	325	01	47.4	1	14	39.2		12	330	31	03.8	1	17	27.8
	26	325	08	45.7	1	14	40.5		13	330	38	00.3	1	17	34.0
	27	325	15	45.5	1	14	41.9		14	330	44	55.3	1	17	40.3
	28	325	22	46.7	1	14	43.4		15	330	51	48.7	1	17	46.8
	29	325	29	49.4	1	14	45.0		16	330	58	40.4	1	17	53.3
	30	325	36	53.3	-1	14	46.7		17	331	05	30.2	-1	17	59.9
	31	325	43	58.5	1	14	48.5		18	331	12	18.2	1	18	06.7
Feb.	1	325	51	04.9	1	14	50.5		19	331	19	04.2	1	18	13.5
	2	325	58	12.4	1	14	52.5		20	331	25	48.1	1	18	20.5
	3	326	05	20.8	1	14	54.6		21	331	32	29.8	1	18	27.5
	4	326	12	30.2	1	14	56.8		22	331	39	09.4	1	18	34.7
	5	326	19	40.5	-1	14	59.1		23	331	45	46.7	-1	18	42.0
	6	326	26	51.5	1	15	01.6		24	331	52	21.8	1	18	49.3
	7	326	34	03.2	1	15	04.1		25	331	58	54.5	1	18	56.8
	8	326	41	15.6	1	15	06.8		26	332	05	24.9	1	19	04.4
	9	326	48	28.5	1	15	09.5		27	332	11	52.8	1	19	12.1
	10	326	55	42.0	1	15	12.4		28	332	18	18.1	1	19	20.0
	11	327	02	56.1	-1	15	15.4		29	332	24	40.9	-1	19	27.9
	12	327	10	10.5	1	15	18.4		30	332	31	00.9	1	19	35.9
	13	327	17	25.4	1	15	21.6		31	332	37	18.2	1	19	44.1
	14	327	24	40.6	1	15	25.0	Apr.	1	332	43	32.7	1	19	52.3
	15	327	31	56.2	-1	15	28.4		2	332	49	44.3	-1	20	00.7

SATURN, 2023

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	332	43	32.7	-1	19	52.3	May	17	336	23	37.8	-1	27	57.4
	2	332	49	44.3	1	20	00.7		18	336	26	37.2	1	28	09.9
	3	332	55	52.9	1	20	09.1		19	336	29	31.2	1	28	22.4
	4	333	01	58.5	1	20	17.7		20	336	32	19.8	1	28	35.1
	5	333	08	01.1	1	20	26.4		21	336	35	03.1	1	28	47.8
	6	333	14	00.6	1	20	35.2		22	336	37	40.9	1	29	00.5
	7	333	19	56.9	-1	20	44.1		23	336	40	13.2	-1	29	13.3
	8	333	25	50.2	1	20	53.0		24	336	42	39.9	1	29	26.2
	9	333	31	40.2	1	21	02.1		25	336	45	01.0	1	29	39.1
	10	333	37	27.0	1	21	11.3		26	336	47	16.4	1	29	52.1
	11	333	43	10.5	1	21	20.6		27	336	49	26.2	1	30	05.1
	12	333	48	50.6	1	21	30.0		28	336	51	30.3	1	30	18.2
	13	333	54	27.2	-1	21	39.5		29	336	53	28.7	-1	30	31.3
	14	334	00	00.3	1	21	49.1		30	336	55	21.4	1	30	44.5
	15	334	05	29.7	1	21	58.8		31	336	57	08.3	1	30	57.7
	16	334	10	55.3	1	22	08.6	June	1	336	58	49.6	1	31	10.9
	17	334	16	17.1	1	22	18.5		2	337	00	25.1	1	31	24.2
	18	334	21	35.1	1	22	28.5		3	337	01	55.0	1	31	37.5
	19	334	26	49.2	-1	22	38.6		4	337	03	19.1	-1	31	50.8
	20	334	31	59.4	1	22	48.8		5	337	04	37.5	1	32	04.2
	21	334	37	05.7	1	22	59.0		6	337	05	50.1	1	32	17.6
	22	334	42	07.9	1	23	09.4		7	337	06	56.8	1	32	31.0
	23	334	47	06.1	1	23	19.9		8	337	07	57.6	1	32	44.4
	24	334	52	00.1	1	23	30.4		9	337	08	52.5	1	32	57.8
	25	334	56	49.9	-1	23	41.1		10	337	09	41.4	-1	33	11.3
	26	335	01	35.4	1	23	51.9		11	337	10	24.3	1	33	24.7
	27	335	06	16.6	1	24	02.7		12	337	11	01.2	1	33	38.2
	28	335	10	53.3	1	24	13.6		13	337	11	32.3	1	33	51.7
	29	335	15	25.6	1	24	24.7		14	337	11	57.4	1	34	05.1
	30	335	19	53.4	1	24	35.8		15	337	12	16.5	1	34	18.6
May	1	335	24	16.6	-1	24	47.0		16	337	12	29.8	-1	34	32.1
	2	335	28	35.3	1	24	58.3		17	337	12	37.1	1	34	45.6
	3	335	32	49.3	1	25	09.7		18	337	12	38.4	1	34	59.0
	4	335	36	58.7	1	25	21.2		19	337	12	33.8	1	35	12.5
	5	335	41	03.4	1	25	32.7		20	337	12	23.3	1	35	25.9
	6	335	45	03.4	1	25	44.4		21	337	12	06.7	1	35	39.3
	7	335	48	58.7	-1	25	56.1		22	337	11	44.2	-1	35	52.7
	8	335	52	49.3	1	26	07.9		23	337	11	15.7	1	36	06.1
	9	335	56	35.0	1	26	19.8		24	337	10	41.4	1	36	19.5
	10	336	00	15.7	1	26	31.7		25	337	10	01.1	1	36	32.8
	11	336	03	51.5	1	26	43.8		26	337	09	14.9	1	36	46.1
	12	336	07	22.2	1	26	55.8		27	337	08	23.0	1	36	59.3
	13	336	10	47.8	-1	27	08.0		28	337	07	25.3	-1	37	12.5
	14	336	14	08.1	1	27	20.3		29	337	06	21.8	1	37	25.7
	15	336	17	23.3	1	27	32.6		30	337	05	12.7	1	37	38.8
	16	336	20	33.2	1	27	44.9	July	1	337	03	58.0	1	37	51.8
	17	336	23	37.8	-1	27	57.4		2	337	02	37.8	-1	38	04.8

SATURN, 2023

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	337	03	58.0	-1	37	51.8	Aug.	16	334	41	07.2	-1	45	50.5
	2	337	02	37.8	1	38	04.8		17	334	36	42.7	1	45	57.0
	3	337	01	11.9	1	38	17.8		18	334	32	16.7	1	46	03.3
	4	336	59	40.5	1	38	30.6		19	334	27	49.4	1	46	09.4
	5	336	58	03.5	1	38	43.4		20	334	23	20.9	1	46	15.2
	6	336	56	20.9	1	38	56.1		21	334	18	51.3	1	46	20.9
	7	336	54	32.8	-1	39	08.8		22	334	14	20.9	-1	46	26.3
	8	336	52	39.2	1	39	21.3		23	334	09	49.8	1	46	31.5
	9	336	50	40.2	1	39	33.8		24	334	05	18.2	1	46	36.5
	10	336	48	35.8	1	39	46.2		25	334	00	46.2	1	46	41.2
	11	336	46	26.1	1	39	58.5		26	333	56	13.9	1	46	45.8
	12	336	44	11.3	1	40	10.7		27	333	51	41.5	1	46	50.1
	13	336	41	51.3	-1	40	22.8		28	333	47	09.0	-1	46	54.2
	14	336	39	26.2	1	40	34.8		29	333	42	36.7	1	46	58.1
	15	336	36	56.0	1	40	46.7		30	333	38	04.5	1	47	01.7
	16	336	34	20.9	1	40	58.5		31	333	33	32.6	1	47	05.1
	17	336	31	40.9	1	41	10.2	Sept.	1	333	29	01.2	1	47	08.3
	18	336	28	55.9	1	41	21.8		2	333	24	30.4	1	47	11.2
	19	336	26	06.2	-1	41	33.2		3	333	20	00.3	-1	47	14.0
	20	336	23	11.7	1	41	44.6		4	333	15	31.2	1	47	16.5
	21	336	20	12.6	1	41	55.8		5	333	11	03.2	1	47	18.8
	22	336	17	08.9	1	42	06.8		6	333	06	36.5	1	47	20.9
	23	336	14	00.8	1	42	17.8		7	333	02	11.1	1	47	22.7
	24	336	10	48.4	1	42	28.6		8	332	57	47.1	1	47	24.3
	25	336	07	31.8	-1	42	39.2		9	332	53	24.8	-1	47	25.7
	26	336	04	11.0	1	42	49.7		10	332	49	04.2	1	47	26.9
	27	336	00	46.3	1	43	00.1		11	332	44	45.5	1	47	27.9
	28	335	57	17.6	1	43	10.3		12	332	40	28.8	1	47	28.7
	29	335	53	45.3	1	43	20.3		13	332	36	14.2	1	47	29.2
	30	335	50	09.2	1	43	30.2		14	332	32	01.8	1	47	29.6
	31	335	46	29.6	-1	43	39.9		15	332	27	51.9	-1	47	29.7
Aug.	1	335	42	46.4	1	43	49.5		16	332	23	44.6	1	47	29.6
	2	335	38	59.7	1	43	58.8		17	332	19	40.0	1	47	29.3
	3	335	35	09.7	1	44	08.0		18	332	15	38.2	1	47	28.8
	4	335	31	16.3	1	44	17.1		19	332	11	39.6	1	47	28.1
	5	335	27	19.8	1	44	25.9		20	332	07	44.0	1	47	27.2
	6	335	23	20.3	-1	44	34.5		21	332	03	51.8	-1	47	26.1
	7	335	19	17.9	1	44	43.0		22	332	00	03.0	1	47	24.8
	8	335	15	12.8	1	44	51.3		23	331	56	17.7	1	47	23.3
	9	335	11	05.0	1	44	59.4		24	331	52	36.0	1	47	21.6
	10	335	06	54.8	1	45	07.3		25	331	48	58.1	1	47	19.7
	11	335	02	42.1	1	45	15.0		26	331	45	23.8	1	47	17.6
	12	334	58	27.2	-1	45	22.5		27	331	41	53.5	-1	47	15.3
	13	334	54	10.2	1	45	29.8		28	331	38	27.0	1	47	12.8
	14	334	49	51.0	1	45	36.9		29	331	35	04.7	1	47	10.2
	15	334	45	30.0	1	45	43.8		30	331	31	46.5	1	47	07.4
	16	334	41	07.2	-1	45	50.5	Oct.	1	331	28	32.7	-1	47	04.4

SATURN, 2023

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	331	28	32.7	-1	47	04.4	Nov.	16	330	37	57.4	-1	42	42.2
	2	331	25	23.3	1	47	01.2		17	330	39	14.0	1	42	35.2
	3	331	22	18.4	1	46	57.9		18	330	40	36.8	1	42	28.2
	4	331	19	18.2	1	46	54.4		19	330	42	05.7	1	42	21.2
	5	331	16	22.7	1	46	50.7		20	330	43	40.8	1	42	14.2
	6	331	13	31.9	1	46	46.9		21	330	45	21.9	1	42	07.2
	7	331	10	45.9	-1	46	43.0		22	330	47	09.1	-1	42	00.3
	8	331	08	04.9	1	46	38.9		23	330	49	02.3	1	41	53.3
	9	331	05	28.9	1	46	34.6		24	330	51	01.6	1	41	46.4
	10	331	02	57.9	1	46	30.2		25	330	53	06.9	1	41	39.4
	11	331	00	32.1	1	46	25.7		26	330	55	18.2	1	41	32.6
	12	330	58	11.5	1	46	21.1		27	330	57	35.5	1	41	25.7
	13	330	55	56.3	-1	46	16.3		28	330	59	58.7	-1	41	18.9
	14	330	53	46.4	1	46	11.4		29	331	02	27.8	1	41	12.1
	15	330	51	42.1	1	46	06.3		30	331	05	02.8	1	41	05.3
	16	330	49	43.4	1	46	01.2	Dec.	1	331	07	43.5	1	40	58.6
	17	330	47	50.4	1	45	55.9		2	331	10	30.0	1	40	52.0
	18	330	46	03.2	1	45	50.5		3	331	13	22.2	1	40	45.4
	19	330	44	21.7	-1	45	45.0		4	331	16	20.0	-1	40	38.8
	20	330	42	46.1	1	45	39.4		5	331	19	23.4	1	40	32.3
	21	330	41	16.3	1	45	33.7		6	331	22	32.4	1	40	25.8
	22	330	39	52.4	1	45	27.9		7	331	25	47.0	1	40	19.4
	23	330	38	34.4	1	45	21.9		8	331	29	07.1	1	40	13.1
	24	330	37	22.3	1	45	15.9		9	331	32	32.8	1	40	06.8
	25	330	36	16.1	-1	45	09.9		10	331	36	03.9	-1	40	00.5
	26	330	35	15.9	1	45	03.7		11	331	39	40.5	1	39	54.4
	27	330	34	21.7	1	44	57.4		12	331	43	22.6	1	39	48.3
	28	330	33	33.6	1	44	51.1		13	331	47	10.0	1	39	42.2
	29	330	32	51.6	1	44	44.7		14	331	51	02.6	1	39	36.3
	30	330	32	15.8	1	44	38.3		15	331	55	00.5	1	39	30.4
	31	330	31	46.1	-1	44	31.8		16	331	59	03.5	-1	39	24.5
Nov.	1	330	31	22.6	1	44	25.2		17	332	03	11.5	1	39	18.8
	2	330	31	05.4	1	44	18.6		18	332	07	24.5	1	39	13.1
	3	330	30	54.3	1	44	11.9		19	332	11	42.3	1	39	07.5
	4	330	30	49.4	1	44	05.2		20	332	16	05.0	1	39	02.0
	5	330	30	50.6	1	43	58.4		21	332	20	32.5	1	38	56.6
	6	330	30	58.1	-1	43	51.6		22	332	25	04.8	-1	38	51.2
	7	330	31	11.8	1	43	44.8		23	332	29	41.8	1	38	46.0
	8	330	31	31.7	1	43	37.9		24	332	34	23.5	1	38	40.8
	9	330	31	57.9	1	43	31.0		25	332	39	09.8	1	38	35.7
	10	330	32	30.3	1	43	24.1		26	332	44	00.7	1	38	30.7
	11	330	33	09.0	1	43	17.2		27	332	48	56.0	1	38	25.8
	12	330	33	54.0	-1	43	10.2		28	332	53	55.6	-1	38	21.1
	13	330	34	45.4	1	43	03.2		29	332	58	59.6	1	38	16.4
	14	330	35	43.1	1	42	56.2		30	333	04	07.8	1	38	11.8
	15	330	36	47.1	1	42	49.3		31	333	09	20.1	1	38	07.3
	16	330	37	57.4	-1	42	42.2		32	333	14	36.6	-1	38	02.9

SATURN, 2023
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	21	40	23.09	-15	14	51.1	10.531 238	0.84	7.01	15	00	33
	1	21	40	46.41	15	12	53.5	10.542 437	0.83	7.00	14	57	00
	2	21	41	09.94	15	10	54.7	10.553 438	0.83	6.99	14	53	28
	3	21	41	33.67	15	08	54.8	10.564 238	0.83	6.99	14	49	56
	4	21	41	57.60	15	06	53.8	10.574 835	0.83	6.98	14	46	24
	5	21	42	21.72	15	04	51.8	10.585 227	0.83	6.97	14	42	52
	6	21	42	46.04	-15	02	48.7	10.595 411	0.83	6.97	14	39	20
	7	21	43	10.53	15	00	44.6	10.605 385	0.83	6.96	14	35	49
	8	21	43	35.21	14	58	39.6	10.615 147	0.83	6.95	14	32	18
	9	21	44	00.05	14	56	33.6	10.624 696	0.83	6.95	14	28	47
	10	21	44	25.07	14	54	26.6	10.634 028	0.83	6.94	14	25	16
	11	21	44	50.25	14	52	18.7	10.643 142	0.83	6.94	14	21	45
	12	21	45	15.59	-14	50	09.9	10.652 035	0.83	6.93	14	18	14
	13	21	45	41.08	14	48	00.2	10.660 705	0.82	6.92	14	14	44
	14	21	46	06.73	14	45	49.6	10.669 151	0.82	6.92	14	11	14
	15	21	46	32.53	14	43	38.1	10.677 370	0.82	6.91	14	07	43
	16	21	46	58.47	14	41	25.8	10.685 360	0.82	6.91	14	04	13
	17	21	47	24.56	14	39	12.6	10.693 119	0.82	6.90	14	00	44
	18	21	47	50.78	-14	36	58.6	10.700 644	0.82	6.90	13	57	14
	19	21	48	17.14	14	34	43.8	10.707 934	0.82	6.89	13	53	44
	20	21	48	43.64	14	32	28.2	10.714 986	0.82	6.89	13	50	15
	21	21	49	10.25	14	30	11.9	10.721 799	0.82	6.89	13	46	45
	22	21	49	36.98	14	27	54.9	10.728 371	0.82	6.88	13	43	16
	23	21	50	03.81	14	25	37.3	10.734 699	0.82	6.88	13	39	47
	24	21	50	30.75	-14	23	19.0	10.740 783	0.82	6.87	13	36	18
	25	21	50	57.78	14	21	00.1	10.746 621	0.82	6.87	13	32	49
	26	21	51	24.91	14	18	40.6	10.752 211	0.82	6.87	13	29	20
	27	21	51	52.12	14	16	20.4	10.757 554	0.82	6.86	13	25	51
	28	21	52	19.43	14	13	59.7	10.762 648	0.82	6.86	13	22	23
	29	21	52	46.81	14	11	38.4	10.767 493	0.82	6.86	13	18	54
	30	21	53	14.28	-14	09	16.6	10.772 087	0.82	6.85	13	15	25
	31	21	53	41.82	14	06	54.3	10.776 431	0.82	6.85	13	11	57
Feb.	1	21	54	09.42	14	04	31.5	10.780 523	0.82	6.85	13	08	28
	2	21	54	37.10	14	02	08.3	10.784 363	0.82	6.85	13	05	00
	3	21	55	04.83	13	59	44.7	10.787 950	0.82	6.84	13	01	32
	4	21	55	32.61	13	57	20.7	10.791 284	0.81	6.84	12	58	04
	5	21	56	00.44	-13	54	56.3	10.794 365	0.81	6.84	12	54	35
	6	21	56	28.32	13	52	31.6	10.797 192	0.81	6.84	12	51	07
	7	21	56	56.23	13	50	06.5	10.799 764	0.81	6.84	12	47	39
	8	21	57	24.18	13	47	41.2	10.802 081	0.81	6.83	12	44	11
	9	21	57	52.16	13	45	15.5	10.804 143	0.81	6.83	12	40	43
	10	21	58	20.17	13	42	49.6	10.805 948	0.81	6.83	12	37	15
	11	21	58	48.20	-13	40	23.5	10.807 498	0.81	6.83	12	33	47
	12	21	59	16.26	13	37	57.0	10.808 790	0.81	6.83	12	30	19
	13	21	59	44.34	13	35	30.4	10.809 825	0.81	6.83	12	26	51
	14	22	00	12.43	13	33	03.6	10.810 603	0.81	6.83	12	23	23
	15	22	00	40.54	-13	30	36.6	10.811 122	0.81	6.83	12	19	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
Feb.	15	22	00	40.54	-13	30	36.6	10.811 122	0.81	6.83	12	19	55
	16	22	01	08.65	13	28	09.6	10.811 383	0.81	6.83	12	16	27
	17	22	01	36.74	13	25	42.5	10.811 384	0.81	6.83	12	12	59
	18	22	02	04.84	13	23	15.1	10.811 127	0.81	6.83	12	09	31
	19	22	02	32.93	13	20	47.6	10.810 610	0.81	6.83	12	06	03
	20	22	03	01.00	13	18	20.2	10.809 833	0.81	6.83	12	02	35
	21	22	03	29.04	-13	15	52.9	10.808 798	0.81	6.83	11	59	07
	22	22	03	57.06	13	13	25.6	10.807 504	0.81	6.83	11	55	39
	23	22	04	25.05	13	10	58.3	10.805 952	0.81	6.83	11	52	11
	24	22	04	53.00	13	08	31.1	10.804 142	0.81	6.83	11	48	43
	25	22	05	20.91	13	06	04.1	10.802 076	0.81	6.83	11	45	15
	26	22	05	48.78	13	03	37.1	10.799 754	0.81	6.84	11	41	47
	27	22	06	16.61	-13	01	10.3	10.797 178	0.81	6.84	11	38	18
	28	22	06	44.39	12	58	43.6	10.794 348	0.81	6.84	11	34	50
Mar.	1	22	07	12.11	12	56	17.2	10.791 266	0.81	6.84	11	31	22
	2	22	07	39.77	12	53	51.0	10.787 932	0.82	6.84	11	27	53
	3	22	08	07.37	12	51	25.1	10.784 348	0.82	6.85	11	24	25
	4	22	08	34.89	12	48	59.6	10.780 515	0.82	6.85	11	20	56
	5	22	09	02.34	-12	46	34.3	10.776 433	0.82	6.85	11	17	28
	6	22	09	29.71	12	44	09.4	10.772 105	0.82	6.85	11	13	59
	7	22	09	57.00	12	41	44.8	10.767 531	0.82	6.86	11	10	30
	8	22	10	24.21	12	39	20.7	10.762 712	0.82	6.86	11	07	01
	9	22	10	51.32	12	36	56.9	10.757 649	0.82	6.86	11	03	32
	10	22	11	18.34	12	34	33.6	10.752 344	0.82	6.87	11	00	03
	11	22	11	45.27	-12	32	10.7	10.746 798	0.82	6.87	10	56	34
	12	22	12	12.11	12	29	48.2	10.741 011	0.82	6.87	10	53	05
	13	22	12	38.84	12	27	26.2	10.734 985	0.82	6.88	10	49	35
	14	22	13	05.47	12	25	04.8	10.728 720	0.82	6.88	10	46	06
	15	22	13	31.99	12	22	43.8	10.722 219	0.82	6.88	10	42	36
	16	22	13	58.40	12	20	23.5	10.715 482	0.82	6.89	10	39	07
	17	22	14	24.69	-12	18	03.7	10.708 510	0.82	6.89	10	35	37
	18	22	14	50.85	12	15	44.6	10.701 305	0.82	6.90	10	32	07
	19	22	15	16.88	12	13	26.2	10.693 868	0.82	6.90	10	28	37
	20	22	15	42.78	12	11	08.5	10.686 201	0.82	6.91	10	25	07
	21	22	16	08.53	12	08	51.5	10.678 305	0.82	6.91	10	21	36
	22	22	16	34.14	12	06	35.2	10.670 183	0.82	6.92	10	18	06
	23	22	16	59.60	-12	04	19.7	10.661 836	0.82	6.92	10	14	35
	24	22	17	24.92	12	02	05.0	10.653 267	0.83	6.93	10	11	04
	25	22	17	50.08	11	59	51.1	10.644 479	0.83	6.94	10	07	33
	26	22	18	15.09	11	57	38.0	10.635 473	0.83	6.94	10	04	02
	27	22	18	39.93	11	55	25.8	10.626 252	0.83	6.95	10	00	31
	28	22	19	04.62	11	53	14.4	10.616 819	0.83	6.95	9	56	60
	29	22	19	29.13	-11	51	04.0	10.607 176	0.83	6.96	9	53	28
	30	22	19	53.47	11	48	54.6	10.597 325	0.83	6.97	9	49	56
	31	22	20	17.63	11	46	46.2	10.587 270	0.83	6.97	9	46	24
Apr.	1	22	20	41.61	11	44	38.8	10.577 012	0.83	6.98	9	42	52
	2	22	21	05.40	-11	42	32.4	10.566 555	0.83	6.99	9	39	20

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		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	22	20	41.61	-11	44	38.8	10.577 012	0.83	6.98	9	42	52
	2	22	21	05.40	11	42	32.4	10.566 555	0.83	6.99	9	39	20
	3	22	21	29.00	11	40	27.1	10.555 900	0.83	6.99	9	35	47
	4	22	21	52.40	11	38	22.8	10.545 050	0.83	7.00	9	32	15
	5	22	22	15.61	11	36	19.7	10.534 008	0.83	7.01	9	28	42
	6	22	22	38.63	11	34	17.6	10.522 776	0.84	7.02	9	25	09
	7	22	23	01.44	-11	32	16.7	10.511 357	0.84	7.02	9	21	35
	8	22	23	24.05	11	30	16.9	10.499 752	0.84	7.03	9	18	02
	9	22	23	46.45	11	28	18.2	10.487 965	0.84	7.04	9	14	28
	10	22	24	08.65	11	26	20.8	10.475 998	0.84	7.05	9	10	54
	11	22	24	30.64	11	24	24.5	10.463 853	0.84	7.05	9	07	20
	12	22	24	52.40	11	22	29.5	10.451 532	0.84	7.06	9	03	46
	13	22	25	13.95	-11	20	35.8	10.439 039	0.84	7.07	9	00	11
	14	22	25	35.27	11	18	43.4	10.426 375	0.84	7.08	8	56	37
	15	22	25	56.36	11	16	52.3	10.413 543	0.84	7.09	8	53	01
	16	22	26	17.20	11	15	02.7	10.400 547	0.85	7.10	8	49	26
	17	22	26	37.81	11	13	14.4	10.387 388	0.85	7.11	8	45	51
	18	22	26	58.17	11	11	27.5	10.374 071	0.85	7.12	8	42	15
	19	22	27	18.28	-11	09	42.1	10.360 598	0.85	7.13	8	38	39
	20	22	27	38.14	11	07	58.1	10.346 973	0.85	7.13	8	35	03
	21	22	27	57.75	11	06	15.5	10.333 199	0.85	7.14	8	31	26
	22	22	28	17.11	11	04	34.5	10.319 280	0.85	7.15	8	27	50
	23	22	28	36.21	11	02	54.9	10.305 220	0.85	7.16	8	24	13
	24	22	28	55.04	11	01	16.9	10.291 022	0.85	7.17	8	20	35
	25	22	29	13.61	-10	59	40.5	10.276 690	0.86	7.18	8	16	58
	26	22	29	31.91	10	58	05.7	10.262 227	0.86	7.19	8	13	20
	27	22	29	49.93	10	56	32.5	10.247 638	0.86	7.20	8	09	42
	28	22	30	07.68	10	55	01.0	10.232 926	0.86	7.21	8	06	03
	29	22	30	25.14	10	53	31.2	10.218 094	0.86	7.22	8	02	25
	30	22	30	42.32	10	52	03.0	10.203 146	0.86	7.24	7	58	46
May	1	22	30	59.20	-10	50	36.6	10.188 086	0.86	7.25	7	55	07
	2	22	31	15.80	10	49	11.8	10.172 918	0.86	7.26	7	51	27
	3	22	31	32.11	10	47	48.8	10.157 644	0.87	7.27	7	47	47
	4	22	31	48.12	10	46	27.6	10.142 269	0.87	7.28	7	44	07
	5	22	32	03.84	10	45	08.1	10.126 796	0.87	7.29	7	40	27
	6	22	32	19.27	10	43	50.3	10.111 228	0.87	7.30	7	36	46
	7	22	32	34.39	-10	42	34.3	10.095 570	0.87	7.31	7	33	05
	8	22	32	49.22	10	41	20.1	10.079 823	0.87	7.32	7	29	24
	9	22	33	03.74	10	40	07.8	10.063 993	0.87	7.34	7	25	43
	10	22	33	17.95	10	38	57.3	10.048 081	0.88	7.35	7	22	01
	11	22	33	31.85	10	37	48.7	10.032 092	0.88	7.36	7	18	19
	12	22	33	45.42	10	36	42.0	10.016 029	0.88	7.37	7	14	36
	13	22	33	58.68	-10	35	37.3	9.999 897	0.88	7.38	7	10	53
	14	22	34	11.60	10	34	34.5	9.983 698	0.88	7.39	7	07	10
	15	22	34	24.20	10	33	33.7	9.967 437	0.88	7.41	7	03	27
	16	22	34	36.47	10	32	34.8	9.951 118	0.88	7.42	6	59	43
	17	22	34	48.41	-10	31	38.0	9.934 745	0.89	7.43	6	55	59

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		h	m	s	°	'	"		"	"	h	m	s
May	17	22	34	48.41	-10	31	38.0	9.934 745	0.89	7.43	6	55	59
	18	22	35	00.01	10	30	43.1	9.918 323	0.89	7.44	6	52	14
	19	22	35	11.28	10	29	50.2	9.901 855	0.89	7.46	6	48	29
	20	22	35	22.21	10	28	59.3	9.885 348	0.89	7.47	6	44	44
	21	22	35	32.80	10	28	10.5	9.868 804	0.89	7.48	6	40	59
	22	22	35	43.05	10	27	23.8	9.852 229	0.89	7.49	6	37	13
	23	22	35	52.96	-10	26	39.2	9.835 627	0.89	7.51	6	33	27
	24	22	36	02.51	10	25	56.7	9.819 003	0.90	7.52	6	29	40
	25	22	36	11.72	10	25	16.3	9.802 361	0.90	7.53	6	25	53
	26	22	36	20.56	10	24	38.0	9.785 705	0.90	7.54	6	22	06
	27	22	36	29.06	10	24	01.9	9.769 041	0.90	7.56	6	18	19
	28	22	36	37.19	10	23	27.9	9.752 372	0.90	7.57	6	14	31
	29	22	36	44.97	-10	22	56.1	9.735 702	0.90	7.58	6	10	43
	30	22	36	52.39	10	22	26.4	9.719 037	0.90	7.60	6	06	54
	31	22	36	59.44	10	21	58.8	9.702 380	0.91	7.61	6	03	05
June	1	22	37	06.15	10	21	33.4	9.685 735	0.91	7.62	5	59	16
	2	22	37	12.49	10	21	10.2	9.669 107	0.91	7.63	5	55	26
	3	22	37	18.47	10	20	49.1	9.652 500	0.91	7.65	5	51	36
	4	22	37	24.10	-10	20	30.1	9.635 918	0.91	7.66	5	47	45
	5	22	37	29.36	10	20	13.3	9.619 365	0.91	7.67	5	43	55
	6	22	37	34.26	10	19	58.7	9.602 844	0.92	7.69	5	40	04
	7	22	37	38.80	10	19	46.4	9.586 361	0.92	7.70	5	36	12
	8	22	37	42.96	10	19	36.2	9.569 918	0.92	7.71	5	32	20
	9	22	37	46.75	10	19	28.2	9.553 521	0.92	7.73	5	28	28
	10	22	37	50.16	-10	19	22.5	9.537 174	0.92	7.74	5	24	35
	11	22	37	53.20	10	19	19.0	9.520 880	0.92	7.75	5	20	42
	12	22	37	55.86	10	19	17.8	9.504 645	0.93	7.77	5	16	49
	13	22	37	58.15	10	19	18.7	9.488 473	0.93	7.78	5	12	55
	14	22	38	00.07	10	19	21.8	9.472 370	0.93	7.79	5	09	01
	15	22	38	01.61	10	19	27.2	9.456 339	0.93	7.81	5	05	07
	16	22	38	02.79	-10	19	34.7	9.440 386	0.93	7.82	5	01	12
	17	22	38	03.58	10	19	44.5	9.424 515	0.93	7.83	4	57	17
	18	22	38	04.01	10	19	56.5	9.408 732	0.93	7.85	4	53	21
	19	22	38	04.06	10	20	10.7	9.393 042	0.94	7.86	4	49	25
	20	22	38	03.74	10	20	27.1	9.377 448	0.94	7.87	4	45	29
	21	22	38	03.03	10	20	45.7	9.361 956	0.94	7.89	4	41	32
	22	22	38	01.96	-10	21	06.5	9.346 571	0.94	7.90	4	37	35
	23	22	38	00.51	10	21	29.6	9.331 297	0.94	7.91	4	33	38
	24	22	37	58.68	10	21	54.8	9.316 139	0.94	7.92	4	29	40
	25	22	37	56.49	10	22	22.2	9.301 101	0.95	7.94	4	25	42
	26	22	37	53.92	10	22	51.7	9.286 187	0.95	7.95	4	21	43
	27	22	37	50.99	10	23	23.3	9.271 402	0.95	7.96	4	17	44
	28	22	37	47.70	-10	23	57.1	9.256 751	0.95	7.97	4	13	45
	29	22	37	44.04	10	24	32.9	9.242 237	0.95	7.99	4	09	46
	30	22	37	40.03	10	25	10.8	9.227 865	0.95	8.00	4	05	46
July	1	22	37	35.66	10	25	50.7	9.213 638	0.95	8.01	4	01	45
	2	22	37	30.94	-10	26	32.6	9.199 561	0.96	8.02	3	57	45

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		h	m	s	°	'	"		"	"	h	m	s
July	1	22	37	35.66	-10	25	50.7	9.213 638	0.95	8.01	4	01	45
	2	22	37	30.94	10	26	32.6	9.199 561	0.96	8.02	3	57	45
	3	22	37	25.86	10	27	16.6	9.185 637	0.96	8.04	3	53	44
	4	22	37	20.44	10	28	02.6	9.171 870	0.96	8.05	3	49	42
	5	22	37	14.66	10	28	50.6	9.158 265	0.96	8.06	3	45	40
	6	22	37	08.53	10	29	40.6	9.144 824	0.96	8.07	3	41	38
	7	22	37	02.05	-10	30	32.5	9.131 552	0.96	8.08	3	37	36
	8	22	36	55.22	10	31	26.5	9.118 453	0.96	8.10	3	33	33
	9	22	36	48.05	10	32	22.3	9.105 531	0.97	8.11	3	29	30
	10	22	36	40.53	10	33	20.1	9.092 791	0.97	8.12	3	25	27
	11	22	36	32.69	10	34	19.7	9.080 237	0.97	8.13	3	21	23
	12	22	36	24.51	10	35	21.1	9.067 872	0.97	8.14	3	17	19
	13	22	36	16.00	-10	36	24.4	9.055 702	0.97	8.15	3	13	14
	14	22	36	07.17	10	37	29.4	9.043 731	0.97	8.16	3	09	10
	15	22	35	58.02	10	38	36.2	9.031 963	0.97	8.17	3	05	05
	16	22	35	48.55	10	39	44.7	9.020 402	0.97	8.18	3	00	59
	17	22	35	38.77	10	40	55.0	9.009 051	0.98	8.19	2	56	54
	18	22	35	28.67	10	42	07.0	8.997 917	0.98	8.20	2	52	48
	19	22	35	18.27	-10	43	20.6	8.987 001	0.98	8.21	2	48	41
	20	22	35	07.57	10	44	35.8	8.976 308	0.98	8.22	2	44	35
	21	22	34	56.57	10	45	52.7	8.965 842	0.98	8.23	2	40	28
	22	22	34	45.28	10	47	11.0	8.955 605	0.98	8.24	2	36	21
	23	22	34	33.70	10	48	30.9	8.945 603	0.98	8.25	2	32	13
	24	22	34	21.85	10	49	52.2	8.935 837	0.98	8.26	2	28	06
	25	22	34	09.72	-10	51	14.9	8.926 311	0.99	8.27	2	23	58
	26	22	33	57.33	10	52	39.0	8.917 029	0.99	8.28	2	19	49
	27	22	33	44.69	10	54	04.3	8.907 992	0.99	8.29	2	15	41
	28	22	33	31.79	10	55	31.0	8.899 205	0.99	8.30	2	11	32
	29	22	33	18.65	10	56	58.8	8.890 669	0.99	8.30	2	07	23
	30	22	33	05.27	10	58	27.8	8.882 387	0.99	8.31	2	03	14
	31	22	32	51.66	-10	59	58.0	8.874 362	0.99	8.32	1	59	04
Aug.	1	22	32	37.83	11	01	29.3	8.866 596	0.99	8.33	1	54	55
	2	22	32	23.76	11	03	01.7	8.859 091	0.99	8.33	1	50	45
	3	22	32	09.48	11	04	35.2	8.851 850	0.99	8.34	1	46	35
	4	22	31	54.98	11	06	09.7	8.844 876	0.99	8.35	1	42	24
	5	22	31	40.27	11	07	45.1	8.838 170	1.00	8.35	1	38	14
	6	22	31	25.36	-11	09	21.4	8.831 735	1.00	8.36	1	34	03
	7	22	31	10.27	11	10	58.5	8.825 574	1.00	8.36	1	29	52
	8	22	30	55.00	11	12	36.5	8.819 690	1.00	8.37	1	25	41
	9	22	30	39.55	11	14	15.2	8.814 085	1.00	8.38	1	21	30
	10	22	30	23.94	11	15	54.5	8.808 761	1.00	8.38	1	17	18
	11	22	30	08.17	11	17	34.6	8.803 721	1.00	8.39	1	13	07
	12	22	29	52.25	-11	19	15.3	8.798 967	1.00	8.39	1	08	55
	13	22	29	36.18	11	20	56.5	8.794 501	1.00	8.39	1	04	43
	14	22	29	19.98	11	22	38.3	8.790 325	1.00	8.40	1	00	31
	15	22	29	03.65	11	24	20.5	8.786 441	1.00	8.40	0	56	19
	16	22	28	47.19	-11	26	03.1	8.782 851	1.00	8.41	0	52	06

SATURN, 2023
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	22	28	47.19	-11	26	03.1	8.782 851	1.00	8.41	0	52	06
	17	22	28	30.63	11	27	46.2	8.779 555	1.00	8.41	0	47	54
	18	22	28	13.96	11	29	29.5	8.776 555	1.00	8.41	0	43	42
	19	22	27	57.20	11	31	13.0	8.773 854	1.00	8.41	0	39	29
	20	22	27	40.35	11	32	56.8	8.771 450	1.00	8.42	0	35	16
	21	22	27	23.43	11	34	40.6	8.769 346	1.00	8.42	0	31	04
	22	22	27	06.45	-11	36	24.6	8.767 542	1.00	8.42	0	26	51
	23	22	26	49.41	11	38	08.5	8.766 038	1.00	8.42	0	22	38
	24	22	26	32.33	11	39	52.3	8.764 835	1.00	8.42	0	18	25
	25	22	26	15.22	11	41	36.0	8.763 933	1.00	8.42	0	14	12
	26	22	25	58.08	11	43	19.6	8.763 333	1.00	8.42	0	09	59
	27	22	25	40.93	11	45	02.9	8.763 033	1.00	8.42	0	05	46
	28	22	25	23.76	-11	46	46.1	8.763 034	1.00	8.42	0	01	33
	29	22	25	06.59	11	48	28.9	8.763 336	1.00	8.42	23	53	07
	30	22	24	49.43	11	50	11.4	8.763 938	1.00	8.42	23	48	54
	31	22	24	32.27	11	51	53.5	8.764 840	1.00	8.42	23	44	41
Sept.	1	22	24	15.14	11	53	35.2	8.766 042	1.00	8.42	23	40	28
	2	22	23	58.03	11	55	16.4	8.767 544	1.00	8.42	23	36	16
	3	22	23	40.96	-11	56	57.1	8.769 344	1.00	8.42	23	32	03
	4	22	23	23.95	11	58	37.1	8.771 444	1.00	8.42	23	27	50
	5	22	23	06.99	12	00	16.5	8.773 842	1.00	8.41	23	23	37
	6	22	22	50.11	12	01	55.1	8.776 539	1.00	8.41	23	19	25
	7	22	22	33.30	12	03	33.0	8.779 534	1.00	8.41	23	15	12
	8	22	22	16.58	12	05	10.1	8.782 826	1.00	8.41	23	10	60
	9	22	21	59.95	-12	06	46.4	8.786 415	1.00	8.40	23	06	47
	10	22	21	43.43	12	08	21.9	8.790 299	1.00	8.40	23	02	35
	11	22	21	27.01	12	09	56.4	8.794 478	1.00	8.39	22	58	23
	12	22	21	10.71	12	11	29.9	8.798 950	1.00	8.39	22	54	11
	13	22	20	54.54	12	13	02.4	8.803 715	1.00	8.39	22	49	59
	14	22	20	38.51	12	14	33.9	8.808 769	1.00	8.38	22	45	47
	15	22	20	22.62	-12	16	04.2	8.814 112	1.00	8.38	22	41	36
	16	22	20	06.89	12	17	33.3	8.819 742	1.00	8.37	22	37	24
	17	22	19	51.32	12	19	01.2	8.825 656	1.00	8.36	22	33	13
	18	22	19	35.93	12	20	27.8	8.831 853	1.00	8.36	22	29	02
	19	22	19	20.73	12	21	53.1	8.838 330	1.00	8.35	22	24	51
	20	22	19	05.71	12	23	17.0	8.845 084	0.99	8.35	22	20	41
	21	22	18	50.90	-12	24	39.5	8.852 113	0.99	8.34	22	16	30
	22	22	18	36.30	12	26	00.5	8.859 414	0.99	8.33	22	12	20
	23	22	18	21.92	12	27	20.1	8.866 985	0.99	8.33	22	08	10
	24	22	18	07.76	12	28	38.1	8.874 821	0.99	8.32	22	04	00
	25	22	17	53.83	12	29	54.6	8.882 921	0.99	8.31	21	59	51
	26	22	17	40.14	12	31	09.6	8.891 281	0.99	8.30	21	55	41
	27	22	17	26.68	-12	32	22.9	8.899 897	0.99	8.29	21	51	32
	28	22	17	13.46	12	33	34.7	8.908 768	0.99	8.29	21	47	24
	29	22	17	00.50	12	34	44.7	8.917 889	0.99	8.28	21	43	15
	30	22	16	47.80	12	35	53.1	8.927 258	0.99	8.27	21	39	07
Oct.	1	22	16	35.37	-12	36	59.6	8.936 871	0.98	8.26	21	34	59

SATURN, 2023

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	22	16	35.37	-12	36	59.6	8.936 871	0.98	8.26	21	34	59
	2	22	16	23.22	12	38	04.5	8.946 727	0.98	8.25	21	30	51
	3	22	16	11.35	12	39	07.4	8.956 822	0.98	8.24	21	26	43
	4	22	15	59.77	12	40	08.6	8.967 152	0.98	8.23	21	22	36
	5	22	15	48.48	12	41	07.9	8.977 716	0.98	8.22	21	18	29
	6	22	15	37.49	12	42	05.4	8.988 509	0.98	8.21	21	14	23
	7	22	15	26.81	-12	43	01.0	8.999 528	0.98	8.20	21	10	17
	8	22	15	16.44	12	43	54.6	9.010 769	0.98	8.19	21	06	11
	9	22	15	06.38	12	44	46.4	9.022 230	0.97	8.18	21	02	05
	10	22	14	56.63	12	45	36.2	9.033 905	0.97	8.17	20	57	60
	11	22	14	47.22	12	46	24.0	9.045 792	0.97	8.16	20	53	55
	12	22	14	38.13	12	47	09.7	9.057 886	0.97	8.15	20	49	50
	13	22	14	29.38	-12	47	53.5	9.070 183	0.97	8.14	20	45	46
	14	22	14	20.97	12	48	35.1	9.082 679	0.97	8.13	20	41	42
	15	22	14	12.91	12	49	14.7	9.095 369	0.97	8.12	20	37	38
	16	22	14	05.21	12	49	52.1	9.108 250	0.97	8.10	20	33	35
	17	22	13	57.86	12	50	27.4	9.121 315	0.96	8.09	20	29	32
	18	22	13	50.88	12	51	00.5	9.134 562	0.96	8.08	20	25	29
	19	22	13	44.26	-12	51	31.4	9.147 984	0.96	8.07	20	21	27
	20	22	13	38.02	12	52	00.2	9.161 578	0.96	8.06	20	17	25
	21	22	13	32.14	12	52	26.8	9.175 337	0.96	8.05	20	13	24
	22	22	13	26.64	12	52	51.2	9.189 259	0.96	8.03	20	09	23
	23	22	13	21.52	12	53	13.4	9.203 336	0.96	8.02	20	05	22
	24	22	13	16.76	12	53	33.4	9.217 565	0.95	8.01	20	01	22
	25	22	13	12.39	-12	53	51.3	9.231 942	0.95	8.00	19	57	22
	26	22	13	08.39	12	54	06.9	9.246 460	0.95	7.98	19	53	22
	27	22	13	04.77	12	54	20.3	9.261 116	0.95	7.97	19	49	23
	28	22	13	01.55	12	54	31.5	9.275 905	0.95	7.96	19	45	24
	29	22	12	58.71	12	54	40.4	9.290 823	0.95	7.95	19	41	26
	30	22	12	56.26	12	54	47.1	9.305 865	0.95	7.93	19	37	28
	31	22	12	54.20	-12	54	51.5	9.321 027	0.94	7.92	19	33	30
Nov.	1	22	12	52.55	12	54	53.6	9.336 305	0.94	7.91	19	29	33
	2	22	12	51.28	12	54	53.6	9.351 694	0.94	7.89	19	25	36
	3	22	12	50.41	12	54	51.3	9.367 189	0.94	7.88	19	21	40
	4	22	12	49.93	12	54	46.7	9.382 785	0.94	7.87	19	17	44
	5	22	12	49.85	12	54	40.0	9.398 479	0.94	7.85	19	13	48
	6	22	12	50.16	-12	54	31.0	9.414 265	0.93	7.84	19	09	53
	7	22	12	50.87	12	54	19.7	9.430 139	0.93	7.83	19	05	58
	8	22	12	51.98	12	54	06.3	9.446 095	0.93	7.81	19	02	03
	9	22	12	53.48	12	53	50.5	9.462 129	0.93	7.80	18	58	09
	10	22	12	55.38	12	53	32.5	9.478 235	0.93	7.79	18	54	16
	11	22	12	57.69	12	53	12.3	9.494 408	0.93	7.78	18	50	22
	12	22	13	00.40	-12	52	49.8	9.510 644	0.92	7.76	18	46	29
	13	22	13	03.51	12	52	25.0	9.526 936	0.92	7.75	18	42	37
	14	22	13	07.02	12	51	57.9	9.543 280	0.92	7.74	18	38	45
	15	22	13	10.94	12	51	28.6	9.559 671	0.92	7.72	18	34	53
	16	22	13	15.26	-12	50	57.0	9.576 102	0.92	7.71	18	31	02

SATURN, 2023

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	22	13	15.26	-12	50	57.0	9.576 102	0.92	7.71	18	31	02
	17	22	13	19.99	12	50	23.3	9.592 569	0.92	7.70	18	27	11
	18	22	13	25.10	12	49	47.3	9.609 067	0.92	7.68	18	23	20
	19	22	13	30.61	12	49	09.1	9.625 590	0.91	7.67	18	19	30
	20	22	13	36.52	12	48	28.8	9.642 132	0.91	7.66	18	15	40
	21	22	13	42.80	12	47	46.3	9.658 690	0.91	7.64	18	11	51
	22	22	13	49.48	-12	47	01.7	9.675 258	0.91	7.63	18	08	02
	23	22	13	56.54	12	46	14.9	9.691 830	0.91	7.62	18	04	14
	24	22	14	03.98	12	45	25.9	9.708 404	0.91	7.60	18	00	25
	25	22	14	11.81	12	44	34.8	9.724 974	0.90	7.59	17	56	37
	26	22	14	20.02	12	43	41.6	9.741 535	0.90	7.58	17	52	50
	27	22	14	28.62	12	42	46.2	9.758 083	0.90	7.57	17	49	03
	28	22	14	37.59	-12	41	48.8	9.774 614	0.90	7.55	17	45	16
	29	22	14	46.95	12	40	49.3	9.791 124	0.90	7.54	17	41	30
	30	22	14	56.67	12	39	47.7	9.807 608	0.90	7.53	17	37	44
Dec.	1	22	15	06.76	12	38	44.1	9.824 061	0.90	7.51	17	33	58
	2	22	15	17.22	12	37	38.5	9.840 479	0.89	7.50	17	30	13
	3	22	15	28.04	12	36	30.8	9.856 859	0.89	7.49	17	26	28
	4	22	15	39.22	-12	35	21.2	9.873 194	0.89	7.48	17	22	44
	5	22	15	50.75	12	34	09.6	9.889 481	0.89	7.46	17	18	59
	6	22	16	02.65	12	32	56.0	9.905 715	0.89	7.45	17	15	16
	7	22	16	14.90	12	31	40.4	9.921 892	0.89	7.44	17	11	32
	8	22	16	27.50	12	30	22.9	9.938 006	0.88	7.43	17	07	49
	9	22	16	40.45	12	29	03.4	9.954 054	0.88	7.42	17	04	06
	10	22	16	53.75	-12	27	41.9	9.970 030	0.88	7.40	17	00	24
	11	22	17	07.40	12	26	18.6	9.985 930	0.88	7.39	16	56	42
	12	22	17	21.39	12	24	53.2	10.001 750	0.88	7.38	16	52	60
	13	22	17	35.72	12	23	26.0	10.017 484	0.88	7.37	16	49	19
	14	22	17	50.39	12	21	57.0	10.033 128	0.88	7.36	16	45	37
	15	22	18	05.40	12	20	26.1	10.048 677	0.88	7.35	16	41	57
	16	22	18	20.72	-12	18	53.4	10.064 127	0.87	7.33	16	38	16
	17	22	18	36.36	12	17	18.9	10.079 474	0.87	7.32	16	34	36
	18	22	18	52.32	12	15	42.7	10.094 712	0.87	7.31	16	30	56
	19	22	19	08.59	12	14	04.7	10.109 839	0.87	7.30	16	27	17
	20	22	19	25.16	12	12	25.0	10.124 849	0.87	7.29	16	23	37
	21	22	19	42.04	12	10	43.6	10.139 740	0.87	7.28	16	19	59
	22	22	19	59.22	-12	09	00.5	10.154 508	0.87	7.27	16	16	20
	23	22	20	16.70	12	07	15.7	10.169 148	0.86	7.26	16	12	42
	24	22	20	34.48	12	05	29.2	10.183 659	0.86	7.25	16	09	04
	25	22	20	52.55	12	03	41.1	10.198 035	0.86	7.24	16	05	26
	26	22	21	10.91	12	01	51.4	10.212 275	0.86	7.23	16	01	48
	27	22	21	29.54	12	00	00.1	10.226 374	0.86	7.22	15	58	11
	28	22	21	48.46	-11	58	07.2	10.240 330	0.86	7.21	15	54	34
	29	22	22	07.64	11	56	12.8	10.254 138	0.86	7.20	15	50	58
	30	22	22	27.09	11	54	17.0	10.267 796	0.86	7.19	15	47	21
	31	22	22	46.81	11	52	19.6	10.281 301	0.86	7.18	15	43	45
	32	22	23	06.78	-11	50	20.8	10.294 649	0.85	7.17	15	40	09

URANUS, 2023

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	47 29 59.0	-0 20 46.8	19.669 89	Apr.	3	48 31 55.8	-0 20 01.9	19.656 00
	3	47 31 19.7	0 20 45.9	19.669 59		5	48 33 16.7	0 20 01.0	19.655 69
	5	47 32 40.4	0 20 44.9	19.669 29		7	48 34 37.6	0 19 60.0	19.655 39
	7	47 34 01.2	0 20 43.9	19.668 99		9	48 35 58.4	0 19 59.0	19.655 08
	9	47 35 21.9	0 20 43.0	19.668 69		11	48 37 19.3	0 19 58.0	19.654 78
	11	47 36 42.7	0 20 42.0	19.668 39		13	48 38 40.2	0 19 57.1	19.654 47
	13	47 38 03.4	-0 20 41.0	19.668 09		15	48 40 01.1	-0 19 56.0	19.654 17
	15	47 39 24.2	0 20 40.0	19.667 79		17	48 41 22.0	0 19 55.1	19.653 86
	17	47 40 45.0	0 20 39.1	19.667 49		19	48 42 42.8	0 19 54.1	19.653 56
	19	47 42 05.7	0 20 38.1	19.667 19		21	48 44 03.7	0 19 53.1	19.653 25
	21	47 43 26.5	0 20 37.1	19.666 89		23	48 45 24.6	0 19 52.1	19.652 94
	23	47 44 47.3	0 20 36.1	19.666 59		25	48 46 45.5	0 19 51.2	19.652 64
	25	47 46 08.0	-0 20 35.2	19.666 29		27	48 48 06.4	-0 19 50.2	19.652 33
	27	47 47 28.8	0 20 34.2	19.665 98		29	48 49 27.3	0 19 49.2	19.652 03
	29	47 48 49.6	0 20 33.2	19.665 68	May	1	48 50 48.2	0 19 48.2	19.651 72
	31	47 50 10.4	0 20 32.3	19.665 38		3	48 52 09.1	0 19 47.2	19.651 42
Feb.	2	47 51 31.1	0 20 31.3	19.665 08		5	48 53 30.0	0 19 46.2	19.651 11
	4	47 52 51.9	0 20 30.3	19.664 78		7	48 54 50.9	0 19 45.2	19.650 80
	6	47 54 12.7	-0 20 29.3	19.664 48		9	48 56 11.9	-0 19 44.3	19.650 50
	8	47 55 33.5	0 20 28.3	19.664 18		11	48 57 32.8	0 19 43.3	19.650 19
	10	47 56 54.3	0 20 27.4	19.663 88		13	48 58 53.7	0 19 42.3	19.649 88
	12	47 58 15.1	0 20 26.4	19.663 57		15	49 00 14.6	0 19 41.3	19.649 58
	14	47 59 35.9	0 20 25.4	19.663 27		17	49 01 35.5	0 19 40.3	19.649 27
	16	48 00 56.7	0 20 24.4	19.662 97		19	49 02 56.4	0 19 39.3	19.648 96
	18	48 02 17.5	-0 20 23.5	19.662 67		21	49 04 17.4	-0 19 38.4	19.648 66
	20	48 03 38.3	0 20 22.5	19.662 37		23	49 05 38.3	0 19 37.4	19.648 35
	22	48 04 59.1	0 20 21.5	19.662 06		25	49 06 59.2	0 19 36.4	19.648 04
	24	48 06 19.9	0 20 20.5	19.661 76		27	49 08 20.2	0 19 35.4	19.647 73
	26	48 07 40.7	0 20 19.6	19.661 46		29	49 09 41.1	0 19 34.4	19.647 43
	28	48 09 01.5	0 20 18.6	19.661 16		31	49 11 02.0	0 19 33.4	19.647 12
Mar.	2	48 10 22.4	-0 20 17.6	19.660 85	June	2	49 12 23.0	-0 19 32.4	19.646 81
	4	48 11 43.2	0 20 16.6	19.660 55		4	49 13 43.9	0 19 31.5	19.646 50
	6	48 13 04.0	0 20 15.7	19.660 25		6	49 15 04.9	0 19 30.5	19.646 20
	8	48 14 24.8	0 20 14.7	19.659 95		8	49 16 25.8	0 19 29.5	19.645 89
	10	48 15 45.7	0 20 13.7	19.659 64		10	49 17 46.8	0 19 28.5	19.645 58
	12	48 17 06.5	0 20 12.7	19.659 34		12	49 19 07.7	0 19 27.5	19.645 27
	14	48 18 27.3	-0 20 11.7	19.659 04		14	49 20 28.7	-0 19 26.5	19.644 96
	16	48 19 48.2	0 20 10.8	19.658 73		16	49 21 49.7	0 19 25.5	19.644 65
	18	48 21 09.0	0 20 09.8	19.658 43		18	49 23 10.6	0 19 24.5	19.644 35
	20	48 22 29.9	0 20 08.8	19.658 12		20	49 24 31.6	0 19 23.5	19.644 04
	22	48 23 50.7	0 20 07.8	19.657 82		22	49 25 52.6	0 19 22.6	19.643 73
	24	48 25 11.6	0 20 06.9	19.657 52		24	49 27 13.6	0 19 21.5	19.643 42
	26	48 26 32.4	-0 20 05.9	19.657 21		26	49 28 34.5	-0 19 20.6	19.643 11
	28	48 27 53.3	0 20 04.9	19.656 91		28	49 29 55.5	0 19 19.6	19.642 80
	30	48 29 14.1	0 20 03.9	19.656 60		30	49 31 16.5	0 19 18.6	19.642 49
Apr.	1	48 30 35.0	0 20 02.9	19.656 30	July	2	49 32 37.5	0 19 17.6	19.642 18
	3	48 31 55.8	-0 20 01.9	19.656 00		4	49 33 58.5	-0 19 16.6	19.641 88

URANUS, 2023

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	49 32 37.5	-0 19 17.6	19.642 18	Oct. 2	50 34 45.8	-0 18 31.8	19.627 85
4	49 33 58.5	0 19 16.6	19.641 88	4	50 36 06.9	0 18 30.8	19.627 53
6	49 35 19.4	0 19 15.6	19.641 57	6	50 37 28.0	0 18 29.8	19.627 22
8	49 36 40.4	0 19 14.6	19.641 26	8	50 38 49.2	0 18 28.8	19.626 90
10	49 38 01.4	0 19 13.6	19.640 95	10	50 40 10.3	0 18 27.8	19.626 59
12	49 39 22.4	0 19 12.6	19.640 64	12	50 41 31.4	0 18 26.8	19.626 27
14	49 40 43.4	-0 19 11.7	19.640 33	14	50 42 52.5	-0 18 25.8	19.625 96
16	49 42 04.5	0 19 10.7	19.640 02	16	50 44 13.7	0 18 24.8	19.625 64
18	49 43 25.4	0 19 09.7	19.639 71	18	50 45 34.8	0 18 23.8	19.625 33
20	49 44 46.5	0 19 08.7	19.639 40	20	50 46 56.0	0 18 22.8	19.625 01
22	49 46 07.5	0 19 07.7	19.639 09	22	50 48 17.1	0 18 21.8	19.624 70
24	49 47 28.5	0 19 06.7	19.638 78	24	50 49 38.2	0 18 20.8	19.624 38
26	49 48 49.5	-0 19 05.7	19.638 47	26	50 50 59.4	-0 18 19.8	19.624 07
28	49 50 10.5	0 19 04.7	19.638 16	28	50 52 20.5	0 18 18.8	19.623 75
30	49 51 31.5	0 19 03.7	19.637 84	30	50 53 41.7	0 18 17.8	19.623 43
Aug. 1	49 52 52.6	0 19 02.7	19.637 53	Nov. 1	50 55 02.8	0 18 16.8	19.623 12
3	49 54 13.6	0 19 01.7	19.637 22	3	50 56 24.0	0 18 15.8	19.622 80
5	49 55 34.6	0 19 00.7	19.636 91	5	50 57 45.1	0 18 14.8	19.622 49
7	49 56 55.7	-0 18 59.7	19.636 60	7	50 59 06.3	-0 18 13.8	19.622 17
9	49 58 16.7	0 18 58.8	19.636 29	9	51 00 27.5	0 18 12.8	19.621 85
11	49 59 37.8	0 18 57.7	19.635 98	11	51 01 48.6	0 18 11.7	19.621 54
13	50 00 58.8	0 18 56.8	19.635 67	13	51 03 09.8	0 18 10.7	19.621 22
15	50 02 19.8	0 18 55.8	19.635 36	15	51 04 31.0	0 18 09.8	19.620 90
17	50 03 40.9	0 18 54.7	19.635 04	17	51 05 52.2	0 18 08.7	19.620 59
19	50 05 01.9	-0 18 53.8	19.634 73	19	51 07 13.3	-0 18 07.7	19.620 27
21	50 06 23.0	0 18 52.8	19.634 42	21	51 08 34.5	0 18 06.7	19.619 95
23	50 07 44.0	0 18 51.8	19.634 11	23	51 09 55.7	0 18 05.7	19.619 64
25	50 09 05.1	0 18 50.8	19.633 80	25	51 11 16.9	0 18 04.7	19.619 32
27	50 10 26.2	0 18 49.8	19.633 48	27	51 12 38.1	0 18 03.7	19.619 00
29	50 11 47.3	0 18 48.8	19.633 17	29	51 13 59.3	0 18 02.7	19.618 68
31	50 13 08.3	-0 18 47.8	19.632 86	Dec. 1	51 15 20.5	-0 18 01.7	19.618 37
Sept. 2	50 14 29.4	0 18 46.8	19.632 55	3	51 16 41.7	0 18 00.7	19.618 05
4	50 15 50.5	0 18 45.8	19.632 24	5	51 18 02.8	0 17 59.7	19.617 73
6	50 17 11.5	0 18 44.8	19.631 92	7	51 19 24.0	0 17 58.7	19.617 41
8	50 18 32.6	0 18 43.8	19.631 61	9	51 20 45.3	0 17 57.7	19.617 09
10	50 19 53.7	0 18 42.8	19.631 30	11	51 22 06.5	0 17 56.7	19.616 78
12	50 21 14.8	-0 18 41.8	19.630 98	13	51 23 27.7	-0 17 55.6	19.616 46
14	50 22 35.9	0 18 40.8	19.630 67	15	51 24 48.9	0 17 54.6	19.616 14
16	50 23 57.0	0 18 39.8	19.630 36	17	51 26 10.1	0 17 53.6	19.615 82
18	50 25 18.1	0 18 38.8	19.630 04	19	51 27 31.3	0 17 52.6	19.615 50
20	50 26 39.2	0 18 37.8	19.629 73	21	51 28 52.5	0 17 51.6	19.615 18
22	50 28 00.3	0 18 36.8	19.629 42	23	51 30 13.8	0 17 50.6	19.614 86
24	50 29 21.4	-0 18 35.8	19.629 10	25	51 31 35.0	-0 17 49.6	19.614 54
26	50 30 42.4	0 18 34.8	19.628 79	27	51 32 56.2	0 17 48.6	19.614 23
28	50 32 03.6	0 18 33.8	19.628 47	29	51 34 17.5	0 17 47.6	19.613 91
30	50 33 24.7	0 18 32.8	19.628 16	31	51 35 38.7	0 17 46.6	19.613 59
Oct. 2	50 34 45.8	-0 18 31.8	19.627 85	33	51 36 59.9	-0 17 45.6	19.613 27

URANUS, 2023

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	45	09	59.6	-0	21	26.2	Feb.	15	45	10	19.8	-0	20	15.1
	1	45	08	51.6	0	21	24.8		16	45	11	33.1	0	20	13.6
	2	45	07	46.4	0	21	23.3		17	45	12	49.4	0	20	12.1
	3	45	06	44.1	0	21	21.8		18	45	14	08.6	0	20	10.6
	4	45	05	44.7	0	21	20.4		19	45	15	30.7	0	20	09.1
	5	45	04	48.2	0	21	18.9		20	45	16	55.7	0	20	07.6
	6	45	03	54.6	-0	21	17.4		21	45	18	23.5	-0	20	06.1
	7	45	03	04.0	0	21	15.9		22	45	19	54.1	0	20	04.6
	8	45	02	16.3	0	21	14.4		23	45	21	27.5	0	20	03.2
	9	45	01	31.5	0	21	12.8		24	45	23	03.7	0	20	01.7
	10	45	00	49.6	0	21	11.3		25	45	24	42.8	0	20	00.2
	11	45	00	10.7	0	21	09.8		26	45	26	24.7	0	19	58.8
	12	44	59	34.9	-0	21	08.3		27	45	28	09.4	-0	19	57.3
	13	44	59	02.0	0	21	06.7		28	45	29	56.8	0	19	55.9
	14	44	58	32.2	0	21	05.2	Mar.	1	45	31	46.9	0	19	54.5
	15	44	58	05.5	0	21	03.6		2	45	33	39.6	0	19	53.0
	16	44	57	41.9	0	21	02.1		3	45	35	34.9	0	19	51.6
	17	44	57	21.4	0	21	00.5		4	45	37	32.8	0	19	50.3
	18	44	57	04.2	-0	20	59.0		5	45	39	33.2	-0	19	48.9
	19	44	56	50.2	0	20	57.4		6	45	41	36.0	0	19	47.5
	20	44	56	39.3	0	20	55.8		7	45	43	41.3	0	19	46.1
	21	44	56	31.7	0	20	54.3		8	45	45	49.1	0	19	44.8
	22	44	56	27.1	0	20	52.7		9	45	47	59.2	0	19	43.5
	23	44	56	25.7	0	20	51.1		10	45	50	11.8	0	19	42.1
	24	44	56	27.4	-0	20	49.5		11	45	52	26.7	-0	19	40.8
	25	44	56	32.2	0	20	48.0		12	45	54	44.0	0	19	39.5
	26	44	56	40.2	0	20	46.4		13	45	57	03.7	0	19	38.2
	27	44	56	51.3	0	20	44.8		14	45	59	25.7	0	19	37.0
	28	44	57	05.7	0	20	43.2		15	46	01	50.0	0	19	35.7
	29	44	57	23.2	0	20	41.6		16	46	04	16.6	0	19	34.4
	30	44	57	44.0	-0	20	40.0		17	46	06	45.3	-0	19	33.2
	31	44	58	08.0	0	20	38.4		18	46	09	16.2	0	19	31.9
Feb.	1	44	58	35.2	0	20	36.9		19	46	11	49.1	0	19	30.7
	2	44	59	05.5	0	20	35.3		20	46	14	24.1	0	19	29.5
	3	44	59	38.9	0	20	33.7		21	46	17	01.0	0	19	28.3
	4	45	00	15.5	0	20	32.1		22	46	19	39.9	0	19	27.1
	5	45	00	55.1	-0	20	30.6		23	46	22	20.8	-0	19	25.9
	6	45	01	37.9	0	20	29.0		24	46	25	03.7	0	19	24.8
	7	45	02	23.6	0	20	27.4		25	46	27	48.5	0	19	23.6
	8	45	03	12.5	0	20	25.9		26	46	30	35.2	0	19	22.5
	9	45	04	04.3	0	20	24.3		27	46	33	23.7	0	19	21.3
	10	45	04	59.3	0	20	22.8		28	46	36	14.0	0	19	20.2
	11	45	05	57.2	-0	20	21.2		29	46	39	06.1	-0	19	19.1
	12	45	06	58.3	0	20	19.7		30	46	41	59.8	0	19	18.0
	13	45	08	02.4	0	20	18.2		31	46	44	55.2	0	19	17.0
	14	45	09	09.6	0	20	16.7	Apr.	1	46	47	52.1	0	19	15.9
	15	45	10	19.8	-0	20	15.1		2	46	50	50.5	-0	19	14.9

URANUS, 2023
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	46	47	52.1	-0	19	15.9	May	17	49	21	02.9	-0	18	43.0
	2	46	50	50.5	0	19	14.9		18	49	24	30.4	0	18	42.6
	3	46	53	50.4	0	19	13.8		19	49	27	57.6	0	18	42.2
	4	46	56	51.8	0	19	12.8		20	49	31	24.4	0	18	41.9
	5	46	59	54.6	0	19	11.8		21	49	34	51.0	0	18	41.6
	6	47	02	58.8	0	19	10.9		22	49	38	17.1	0	18	41.2
	7	47	06	04.4	-0	19	09.9		23	49	41	42.6	-0	18	40.9
	8	47	09	11.4	0	19	08.9		24	49	45	07.7	0	18	40.6
	9	47	12	19.7	0	19	08.0		25	49	48	32.1	0	18	40.4
	10	47	15	29.4	0	19	07.1		26	49	51	55.9	0	18	40.1
	11	47	18	40.3	0	19	06.2		27	49	55	19.0	0	18	39.9
	12	47	21	52.5	0	19	05.3		28	49	58	41.3	0	18	39.6
	13	47	25	05.8	-0	19	04.4		29	50	02	02.9	-0	18	39.4
	14	47	28	20.2	0	19	03.5		30	50	05	23.7	0	18	39.2
	15	47	31	35.6	0	19	02.7		31	50	08	43.7	0	18	39.1
	16	47	34	52.0	0	19	01.8	June	1	50	12	02.9	0	18	38.9
	17	47	38	09.4	0	19	01.0		2	50	15	21.3	0	18	38.7
	18	47	41	27.6	0	19	00.2		3	50	18	38.8	0	18	38.6
	19	47	44	46.7	-0	18	59.4		4	50	21	55.4	-0	18	38.5
	20	47	48	06.8	0	18	58.6		5	50	25	11.1	0	18	38.3
	21	47	51	27.7	0	18	57.8		6	50	28	25.7	0	18	38.2
	22	47	54	49.4	0	18	57.0		7	50	31	39.4	0	18	38.1
	23	47	58	12.0	0	18	56.3		8	50	34	51.9	0	18	38.1
	24	48	01	35.2	0	18	55.6		9	50	38	03.2	0	18	38.0
	25	48	04	59.1	-0	18	54.8		10	50	41	13.2	-0	18	37.9
	26	48	08	23.6	0	18	54.1		11	50	44	22.1	0	18	37.9
	27	48	11	48.6	0	18	53.5		12	50	47	29.6	0	18	37.8
	28	48	15	14.1	0	18	52.8		13	50	50	36.0	0	18	37.8
	29	48	18	40.1	0	18	52.1		14	50	53	41.0	0	18	37.8
	30	48	22	06.4	0	18	51.5		15	50	56	44.7	0	18	37.8
May	1	48	25	33.1	-0	18	50.9		16	50	59	47.1	-0	18	37.8
	2	48	29	00.1	0	18	50.3		17	51	02	48.1	0	18	37.9
	3	48	32	27.4	0	18	49.7		18	51	05	47.7	0	18	37.9
	4	48	35	55.0	0	18	49.1		19	51	08	45.7	0	18	37.9
	5	48	39	22.9	0	18	48.6		20	51	11	42.2	0	18	38.0
	6	48	42	51.1	0	18	48.0		21	51	14	37.1	0	18	38.1
	7	48	46	19.4	-0	18	47.5		22	51	17	30.3	-0	18	38.2
	8	48	49	48.0	0	18	47.0		23	51	20	21.9	0	18	38.3
	9	48	53	16.9	0	18	46.7		24	51	23	11.7	0	18	38.4
	10	48	56	44.6	0	18	47.1		25	51	25	59.7	0	18	38.5
	11	49	00	13.4	0	18	45.7		26	51	28	46.0	0	18	38.7
	12	49	03	42.2	0	18	45.1		27	51	31	30.5	0	18	38.8
	13	49	07	10.8	-0	18	44.7		28	51	34	13.1	-0	18	39.0
	14	49	10	39.1	0	18	44.2		29	51	36	54.0	0	18	39.2
	15	49	14	07.3	0	18	43.8		30	51	39	33.1	0	18	39.3
	16	49	17	35.2	0	18	43.4	July	1	51	42	10.3	0	18	39.5
	17	49	21	02.9	-0	18	43.0		2	51	44	45.6	-0	18	39.8

URANUS, 2023

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	51	42	10.3	-0	18	39.5	Aug.	16	53	00	13.7	-0	18	56.6
	2	51	44	45.6	0	18	39.8		17	53	00	51.5	0	18	57.1
	3	51	47	19.0	0	18	40.0		18	53	01	26.3	0	18	57.5
	4	51	49	50.4	0	18	40.2		19	53	01	58.0	0	18	58.0
	5	51	52	19.7	0	18	40.4		20	53	02	26.7	0	18	58.5
	6	51	54	47.0	0	18	40.7		21	53	02	52.5	0	18	59.0
	7	51	57	12.0	-0	18	40.9		22	53	03	15.2	-0	18	59.5
	8	51	59	34.9	0	18	41.2		23	53	03	35.0	0	18	59.9
	9	52	01	55.7	0	18	41.4		24	53	03	51.8	0	19	00.4
	10	52	04	14.2	0	18	41.7		25	53	04	05.6	0	19	00.9
	11	52	06	30.6	0	18	42.0		26	53	04	16.5	0	19	01.4
	12	52	08	44.8	0	18	42.3		27	53	04	24.4	0	19	01.8
	13	52	10	56.8	-0	18	42.6		28	53	04	29.3	-0	19	02.3
	14	52	13	06.5	0	18	42.9		29	53	04	31.2	0	19	02.8
	15	52	15	13.9	0	18	43.2		30	53	04	30.0	0	19	03.2
	16	52	17	19.0	0	18	43.5		31	53	04	25.7	0	19	03.7
	17	52	19	21.6	0	18	43.8	Sept.	1	53	04	18.4	0	19	04.1
	18	52	21	21.9	0	18	44.2		2	53	04	08.1	0	19	04.6
	19	52	23	19.6	-0	18	44.5		3	53	03	54.8	-0	19	05.0
	20	52	25	14.8	0	18	44.9		4	53	03	38.6	0	19	05.4
	21	52	27	07.5	0	18	45.3		5	53	03	19.4	0	19	05.9
	22	52	28	57.6	0	18	45.6		6	53	02	57.3	0	19	06.3
	23	52	30	45.1	0	18	46.0		7	53	02	32.3	0	19	06.7
	24	52	32	30.0	0	18	46.4		8	53	02	04.3	0	19	07.1
	25	52	34	12.4	-0	18	46.8		9	53	01	33.4	-0	19	07.5
	26	52	35	52.2	0	18	47.2		10	53	00	59.5	0	19	08.0
	27	52	37	29.3	0	18	47.6		11	53	00	22.6	0	19	08.4
	28	52	39	03.9	0	18	48.0		12	52	59	42.8	0	19	08.8
	29	52	40	35.9	0	18	48.5		13	52	59	00.0	0	19	09.1
	30	52	42	05.2	0	18	48.9		14	52	58	14.3	0	19	09.5
	31	52	43	31.9	-0	18	49.3		15	52	57	25.7	-0	19	09.9
Aug.	1	52	44	55.8	0	18	49.8		16	52	56	34.3	0	19	10.3
	2	52	46	16.9	0	18	50.2		17	52	55	40.0	0	19	10.6
	3	52	47	35.2	0	18	50.6		18	52	54	42.9	0	19	11.0
	4	52	48	50.6	0	18	51.1		19	52	53	43.0	0	19	11.4
	5	52	50	03.2	0	18	51.5		20	52	52	40.5	0	19	11.7
	6	52	51	13.0	-0	18	52.0		21	52	51	35.2	-0	19	12.0
	7	52	52	20.0	0	18	52.4		22	52	50	27.3	0	19	12.3
	8	52	53	24.2	0	18	52.9		23	52	49	16.8	0	19	12.6
	9	52	54	25.5	0	18	53.3		24	52	48	03.6	0	19	12.9
	10	52	55	24.0	0	18	53.8		25	52	46	47.8	0	19	13.2
	11	52	56	19.7	0	18	54.2		26	52	45	29.4	0	19	13.5
	12	52	57	12.4	-0	18	54.7		27	52	44	08.4	-0	19	13.7
	13	52	58	02.2	0	18	55.2		28	52	42	44.7	0	19	14.0
	14	52	58	49.0	0	18	55.6		29	52	41	18.6	0	19	14.2
	15	52	59	32.9	0	18	56.1		30	52	39	50.0	0	19	14.4
	16	53	00	13.7	-0	18	56.6	Oct.	1	52	38	19.0	-0	19	14.6

URANUS, 2023

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	52	38	19.0	-0	19	14.6	Nov.	16	50	58	04.4	-0	19	07.1
	2	52	36	45.6	0	19	14.8		17	50	55	35.1	0	19	06.5
	3	52	35	10.0	0	19	15.0		18	50	53	06.0	0	19	05.9
	4	52	33	32.1	0	19	15.2		19	50	50	37.1	0	19	05.2
	5	52	31	51.9	0	19	15.3		20	50	48	08.5	0	19	04.6
	6	52	30	09.5	0	19	15.4		21	50	45	40.4	0	19	03.9
	7	52	28	24.8	-0	19	15.6		22	50	43	12.6	-0	19	03.2
	8	52	26	37.9	0	19	15.7		23	50	40	45.4	0	19	02.5
	9	52	24	48.9	0	19	15.8		24	50	38	18.8	0	19	01.8
	10	52	22	57.7	0	19	15.9		25	50	35	53.0	0	19	01.0
	11	52	21	04.4	0	19	16.0		26	50	33	27.9	0	19	00.3
	12	52	19	09.1	0	19	16.0		27	50	31	03.7	0	18	59.5
	13	52	17	11.8	-0	19	16.1		28	50	28	40.4	-0	18	58.7
	14	52	15	12.6	0	19	16.1		29	50	26	18.1	0	18	57.8
	15	52	13	11.6	0	19	16.1		30	50	23	56.8	0	18	57.0
	16	52	11	08.8	0	19	16.1	Dec.	1	50	21	36.5	0	18	56.1
	17	52	09	04.3	0	19	16.1		2	50	19	17.2	0	18	55.3
	18	52	06	58.2	0	19	16.1		3	50	16	59.1	0	18	54.4
	19	52	04	50.5	-0	19	16.0		4	50	14	42.2	-0	18	53.5
	20	52	02	41.2	0	19	15.9		5	50	12	26.5	0	18	52.6
	21	52	00	30.5	0	19	15.9		6	50	10	12.1	0	18	51.6
	22	51	58	18.2	0	19	15.8		7	50	07	59.2	0	18	50.7
	23	51	56	04.6	0	19	15.6		8	50	05	47.7	0	18	49.7
	24	51	53	49.5	0	19	15.5		9	50	03	37.8	0	18	48.7
	25	51	51	33.0	-0	19	15.3		10	50	01	29.5	-0	18	47.7
	26	51	49	15.3	0	19	15.1		11	49	59	22.9	0	18	46.7
	27	51	46	56.4	0	19	14.9		12	49	57	18.1	0	18	45.7
	28	51	44	36.3	0	19	14.7		13	49	55	15.1	0	18	44.6
	29	51	42	15.3	0	19	14.5		14	49	53	14.0	0	18	43.6
	30	51	39	53.3	0	19	14.2		15	49	51	14.8	0	18	42.5
	31	51	37	30.5	-0	19	13.9		16	49	49	17.5	-0	18	41.4
Nov.	1	51	35	06.7	0	19	13.6		17	49	47	22.1	0	18	40.3
	2	51	32	42.2	0	19	13.3		18	49	45	28.8	0	18	39.1
	3	51	30	16.9	0	19	13.0		19	49	43	37.4	0	18	38.0
	4	51	27	50.8	0	19	12.7		20	49	41	48.2	0	18	36.8
	5	51	25	24.0	0	19	12.3		21	49	40	01.2	0	18	35.7
	6	51	22	56.6	-0	19	11.9		22	49	38	16.5	-0	18	34.5
	7	51	20	28.7	0	19	11.5		23	49	36	34.1	0	18	33.3
	8	51	18	00.2	0	19	11.1		24	49	34	54.0	0	18	32.1
	9	51	15	31.3	0	19	10.7		25	49	33	16.4	0	18	30.9
	10	51	13	02.1	0	19	10.2		26	49	31	41.2	0	18	29.6
	11	51	10	32.6	0	19	09.7		27	49	30	08.5	0	18	28.4
	12	51	08	03.0	-0	19	09.2		28	49	28	38.2	-0	18	27.1
	13	51	05	33.3	0	19	08.7		29	49	27	10.5	0	18	25.9
	14	51	03	03.6	0	19	08.2		30	49	25	45.2	0	18	24.6
	15	51	00	33.9	0	19	07.7		31	49	24	22.5	0	18	23.3
	16	50	58	04.4	-0	19	07.1		32	49	23	02.3	-0	18	22.0

URANUS, 2023
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	51	14.58	+16	02	32.3	19.077 367	0.46	1.84	20	10	15
	1	2	51	10.03	16	02	13.9	19.091 335	0.46	1.83	20	06	15
	2	2	51	05.68	16	01	56.2	19.105 478	0.46	1.83	20	02	15
	3	2	51	01.52	16	01	39.4	19.119 790	0.46	1.83	19	58	15
	4	2	50	57.55	16	01	23.5	19.134 267	0.46	1.83	19	54	15
	5	2	50	53.77	16	01	08.4	19.148 905	0.46	1.83	19	50	16
	6	2	50	50.19	+16	00	54.2	19.163 699	0.46	1.83	19	46	16
	7	2	50	46.80	16	00	40.8	19.178 643	0.46	1.83	19	42	17
	8	2	50	43.60	16	00	28.3	19.193 734	0.46	1.82	19	38	18
	9	2	50	40.60	16	00	16.7	19.208 967	0.46	1.82	19	34	20
	10	2	50	37.79	16	00	06.0	19.224 336	0.46	1.82	19	30	21
	11	2	50	35.18	15	59	56.1	19.239 838	0.46	1.82	19	26	23
	12	2	50	32.77	+15	59	47.1	19.255 466	0.46	1.82	19	22	25
	13	2	50	30.56	15	59	39.0	19.271 218	0.46	1.82	19	18	27
	14	2	50	28.55	15	59	31.7	19.287 087	0.46	1.82	19	14	29
	15	2	50	26.75	15	59	25.4	19.303 069	0.46	1.81	19	10	31
	16	2	50	25.15	15	59	19.9	19.319 158	0.46	1.81	19	06	34
	17	2	50	23.76	15	59	15.4	19.335 350	0.45	1.81	19	02	37
	18	2	50	22.59	+15	59	11.8	19.351 639	0.45	1.81	18	58	40
	19	2	50	21.63	15	59	09.2	19.368 021	0.45	1.81	18	54	43
	20	2	50	20.88	15	59	07.5	19.384 489	0.45	1.81	18	50	47
	21	2	50	20.34	15	59	06.8	19.401 039	0.45	1.81	18	46	50
	22	2	50	20.00	15	59	07.0	19.417 664	0.45	1.80	18	42	54
	23	2	50	19.88	15	59	08.2	19.434 359	0.45	1.80	18	38	59
	24	2	50	19.95	+15	59	10.3	19.451 117	0.45	1.80	18	35	03
	25	2	50	20.24	15	59	13.2	19.467 934	0.45	1.80	18	31	07
	26	2	50	20.74	15	59	17.1	19.484 803	0.45	1.80	18	27	12
	27	2	50	21.44	15	59	21.9	19.501 718	0.45	1.80	18	23	17
	28	2	50	22.36	15	59	27.6	19.518 675	0.45	1.79	18	19	22
	29	2	50	23.49	15	59	34.2	19.535 668	0.45	1.79	18	15	28
	30	2	50	24.84	+15	59	41.8	19.552 691	0.45	1.79	18	11	33
	31	2	50	26.40	15	59	50.4	19.569 740	0.45	1.79	18	07	39
Feb.	1	2	50	28.17	15	59	59.8	19.586 808	0.45	1.79	18	03	45
	2	2	50	30.15	16	00	10.2	19.603 892	0.45	1.79	17	59	51
	3	2	50	32.33	16	00	21.5	19.620 986	0.45	1.78	17	55	58
	4	2	50	34.73	16	00	33.8	19.638 084	0.45	1.78	17	52	04
	5	2	50	37.32	+16	00	46.9	19.655 183	0.45	1.78	17	48	11
	6	2	50	40.12	16	01	00.9	19.672 277	0.45	1.78	17	44	18
	7	2	50	43.13	16	01	15.9	19.689 361	0.45	1.78	17	40	25
	8	2	50	46.33	16	01	31.7	19.706 430	0.45	1.78	17	36	33
	9	2	50	49.74	16	01	48.3	19.723 480	0.45	1.78	17	32	40
	10	2	50	53.35	16	02	05.9	19.740 506	0.45	1.77	17	28	48
	11	2	50	57.17	+16	02	24.3	19.757 502	0.45	1.77	17	24	56
	12	2	51	01.19	16	02	43.6	19.774 464	0.44	1.77	17	21	05
	13	2	51	05.41	16	03	03.8	19.791 387	0.44	1.77	17	17	13
	14	2	51	09.84	16	03	24.8	19.808 267	0.44	1.77	17	13	22
	15	2	51	14.47	+16	03	46.8	19.825 097	0.44	1.77	17	09	30

URANUS, 2023

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	51	14.47	+16	03	46.8	19.825 097	0.44	1.77	17	09	30
	16	2	51	19.30	16	04	09.6	19.841 874	0.44	1.76	17	05	39
	17	2	51	24.33	16	04	33.3	19.858 591	0.44	1.76	17	01	49
	18	2	51	29.56	16	04	57.9	19.875 245	0.44	1.76	16	57	58
	19	2	51	34.98	16	05	23.3	19.891 828	0.44	1.76	16	54	08
	20	2	51	40.58	16	05	49.5	19.908 337	0.44	1.76	16	50	18
	21	2	51	46.38	+16	06	16.6	19.924 766	0.44	1.76	16	46	28
	22	2	51	52.36	16	06	44.4	19.941 110	0.44	1.76	16	42	38
	23	2	51	58.53	16	07	13.0	19.957 364	0.44	1.75	16	38	48
	24	2	52	04.90	16	07	42.4	19.973 522	0.44	1.75	16	34	59
	25	2	52	11.45	16	08	12.6	19.989 581	0.44	1.75	16	31	09
	26	2	52	18.18	16	08	43.6	20.005 535	0.44	1.75	16	27	20
	27	2	52	25.11	+16	09	15.4	20.021 381	0.44	1.75	16	23	31
	28	2	52	32.21	16	09	47.9	20.037 113	0.44	1.75	16	19	43
Mar.	1	2	52	39.49	16	10	21.2	20.052 727	0.44	1.75	16	15	54
	2	2	52	46.95	16	10	55.3	20.068 221	0.44	1.75	16	12	06
	3	2	52	54.59	16	11	30.1	20.083 588	0.44	1.74	16	08	18
	4	2	53	02.39	16	12	05.6	20.098 827	0.44	1.74	16	04	29
	5	2	53	10.36	+16	12	41.8	20.113 931	0.44	1.74	16	00	42
	6	2	53	18.50	16	13	18.7	20.128 899	0.44	1.74	15	56	54
	7	2	53	26.80	16	13	56.3	20.143 725	0.44	1.74	15	53	06
	8	2	53	35.26	16	14	34.5	20.158 407	0.44	1.74	15	49	19
	9	2	53	43.88	16	15	13.4	20.172 940	0.44	1.74	15	45	32
	10	2	53	52.67	16	15	53.0	20.187 321	0.44	1.73	15	41	45
	11	2	54	01.62	+16	16	33.2	20.201 547	0.44	1.73	15	37	58
	12	2	54	10.72	16	17	14.0	20.215 613	0.44	1.73	15	34	11
	13	2	54	19.99	16	17	55.4	20.229 516	0.43	1.73	15	30	24
	14	2	54	29.41	16	18	37.6	20.243 253	0.43	1.73	15	26	38
	15	2	54	38.98	16	19	20.3	20.256 819	0.43	1.73	15	22	52
	16	2	54	48.71	16	20	03.7	20.270 211	0.43	1.73	15	19	06
	17	2	54	58.58	+16	20	47.6	20.283 426	0.43	1.73	15	15	20
	18	2	55	08.60	16	21	32.2	20.296 459	0.43	1.73	15	11	34
	19	2	55	18.75	16	22	17.3	20.309 306	0.43	1.72	15	07	48
	20	2	55	29.04	16	23	03.0	20.321 965	0.43	1.72	15	04	02
	21	2	55	39.46	16	23	49.1	20.334 430	0.43	1.72	15	00	17
	22	2	55	50.02	16	24	35.8	20.346 699	0.43	1.72	14	56	32
	23	2	56	00.71	+16	25	23.0	20.358 769	0.43	1.72	14	52	46
	24	2	56	11.53	16	26	10.6	20.370 635	0.43	1.72	14	49	01
	25	2	56	22.49	16	26	58.8	20.382 295	0.43	1.72	14	45	16
	26	2	56	33.57	16	27	47.5	20.393 746	0.43	1.72	14	41	32
	27	2	56	44.78	16	28	36.6	20.404 985	0.43	1.72	14	37	47
	28	2	56	56.11	16	29	26.2	20.416 009	0.43	1.72	14	34	02
	29	2	57	07.55	+16	30	16.3	20.426 816	0.43	1.71	14	30	18
	30	2	57	19.11	16	31	06.8	20.437 404	0.43	1.71	14	26	34
	31	2	57	30.78	16	31	57.7	20.447 770	0.43	1.71	14	22	49
Apr.	1	2	57	42.55	16	32	49.0	20.457 912	0.43	1.71	14	19	05
	2	2	57	54.43	+16	33	40.7	20.467 828	0.43	1.71	14	15	21

URANUS, 2023
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	2	57	42.55	+16	32	49.0	20.457 912	0.43	1.71	14	19	05
	2	2	57	54.43	16	33	40.7	20.467 828	0.43	1.71	14	15	21
	3	2	58	06.41	16	34	32.8	20.477 516	0.43	1.71	14	11	37
	4	2	58	18.49	16	35	25.2	20.486 973	0.43	1.71	14	07	53
	5	2	58	30.66	16	36	17.9	20.496 198	0.43	1.71	14	04	10
	6	2	58	42.94	16	37	11.0	20.505 189	0.43	1.71	14	00	26
	7	2	58	55.31	+16	38	04.3	20.513 944	0.43	1.71	13	56	42
	8	2	59	07.77	16	38	58.0	20.522 461	0.43	1.71	13	52	59
	9	2	59	20.32	16	39	52.0	20.530 738	0.43	1.71	13	49	16
	10	2	59	32.97	16	40	46.3	20.538 773	0.43	1.71	13	45	32
	11	2	59	45.70	16	41	41.0	20.546 565	0.43	1.70	13	41	49
	12	2	59	58.52	16	42	35.9	20.554 111	0.43	1.70	13	38	06
	13	3	00	11.41	+16	43	31.1	20.561 410	0.43	1.70	13	34	23
	14	3	00	24.38	16	44	26.5	20.568 459	0.43	1.70	13	30	40
	15	3	00	37.43	16	45	22.2	20.575 257	0.43	1.70	13	26	57
	16	3	00	50.53	16	46	18.2	20.581 801	0.43	1.70	13	23	14
	17	3	01	03.71	16	47	14.2	20.588 090	0.43	1.70	13	19	32
	18	3	01	16.94	16	48	10.5	20.594 122	0.43	1.70	13	15	49
	19	3	01	30.25	+16	49	06.9	20.599 895	0.43	1.70	13	12	06
	20	3	01	43.61	16	50	03.5	20.605 408	0.43	1.70	13	08	24
	21	3	01	57.03	16	51	00.3	20.610 659	0.43	1.70	13	04	41
	22	3	02	10.52	16	51	57.2	20.615 648	0.43	1.70	13	00	59
	23	3	02	24.05	16	52	54.3	20.620 372	0.43	1.70	12	57	16
	24	3	02	37.64	16	53	51.5	20.624 832	0.43	1.70	12	53	34
	25	3	02	51.27	+16	54	48.8	20.629 026	0.43	1.70	12	49	52
	26	3	03	04.95	16	55	46.2	20.632 955	0.43	1.70	12	46	09
	27	3	03	18.66	16	56	43.7	20.636 616	0.43	1.70	12	42	27
	28	3	03	32.41	16	57	41.3	20.640 011	0.43	1.70	12	38	45
	29	3	03	46.19	16	58	39.0	20.643 138	0.43	1.70	12	35	03
	30	3	04	00.00	16	59	36.6	20.645 998	0.43	1.70	12	31	20
May	1	3	04	13.84	+17	00	34.3	20.648 589	0.43	1.70	12	27	38
	2	3	04	27.70	17	01	32.0	20.650 913	0.43	1.70	12	23	56
	3	3	04	41.59	17	02	29.7	20.652 968	0.43	1.70	12	20	14
	4	3	04	55.49	17	03	27.4	20.654 755	0.43	1.70	12	16	32
	5	3	05	09.42	17	04	25.0	20.656 274	0.43	1.70	12	12	50
	6	3	05	23.37	17	05	22.7	20.657 525	0.43	1.70	12	09	08
	7	3	05	37.34	+17	06	20.3	20.658 506	0.43	1.70	12	05	26
	8	3	05	51.32	17	07	17.9	20.659 220	0.43	1.70	12	01	44
	9	3	06	05.33	17	08	15.4	20.659 665	0.43	1.70	11	58	02
	10	3	06	19.27	17	09	11.8	20.659 841	0.43	1.70	11	54	20
	11	3	06	33.26	17	10	10.3	20.659 747	0.43	1.70	11	50	38
	12	3	06	47.27	17	11	07.8	20.659 385	0.43	1.70	11	46	56
	13	3	07	01.26	+17	12	05.2	20.658 753	0.43	1.70	11	43	14
	14	3	07	15.24	17	13	02.4	20.657 852	0.43	1.70	11	39	32
	15	3	07	29.21	17	13	59.4	20.656 681	0.43	1.70	11	35	50
	16	3	07	43.17	17	14	56.3	20.655 241	0.43	1.70	11	32	08
	17	3	07	57.12	+17	15	53.1	20.653 531	0.43	1.70	11	28	26

URANUS, 2023
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	3	07	57.12	+17	15	53.1	20.653 531	0.43	1.70	11	28	26
	18	3	08	11.06	17	16	49.7	20.651 552	0.43	1.70	11	24	44
	19	3	08	24.98	17	17	46.1	20.649 305	0.43	1.70	11	21	02
	20	3	08	38.88	17	18	42.4	20.646 790	0.43	1.70	11	17	20
	21	3	08	52.76	17	19	38.5	20.644 008	0.43	1.70	11	13	38
	22	3	09	06.61	17	20	34.4	20.640 960	0.43	1.70	11	09	55
	23	3	09	20.43	+17	21	30.1	20.637 647	0.43	1.70	11	06	13
	24	3	09	34.22	17	22	25.7	20.634 070	0.43	1.70	11	02	31
	25	3	09	47.97	17	23	21.0	20.630 231	0.43	1.70	10	58	49
	26	3	10	01.67	17	24	16.0	20.626 130	0.43	1.70	10	55	06
	27	3	10	15.33	17	25	10.8	20.621 769	0.43	1.70	10	51	24
	28	3	10	28.95	17	26	05.3	20.617 150	0.43	1.70	10	47	42
	29	3	10	42.52	+17	26	59.6	20.612 274	0.43	1.70	10	43	59
	30	3	10	56.04	17	27	53.5	20.607 143	0.43	1.70	10	40	17
	31	3	11	09.50	17	28	47.1	20.601 758	0.43	1.70	10	36	34
June	1	3	11	22.92	17	29	40.5	20.596 120	0.43	1.70	10	32	52
	2	3	11	36.28	17	30	33.5	20.590 233	0.43	1.70	10	29	09
	3	3	11	49.58	17	31	26.2	20.584 096	0.43	1.70	10	25	26
	4	3	12	02.83	+17	32	18.6	20.577 712	0.43	1.70	10	21	44
	5	3	12	16.02	17	33	10.8	20.571 082	0.43	1.70	10	18	01
	6	3	12	29.14	17	34	02.6	20.564 208	0.43	1.70	10	14	18
	7	3	12	42.19	17	34	54.1	20.557 091	0.43	1.70	10	10	35
	8	3	12	55.17	17	35	45.2	20.549 732	0.43	1.70	10	06	52
	9	3	13	08.07	17	36	36.0	20.542 134	0.43	1.70	10	03	09
	10	3	13	20.89	+17	37	26.4	20.534 297	0.43	1.71	9	59	26
	11	3	13	33.63	17	38	16.3	20.526 223	0.43	1.71	9	55	42
	12	3	13	46.28	17	39	05.9	20.517 913	0.43	1.71	9	51	59
	13	3	13	58.86	17	39	55.1	20.509 370	0.43	1.71	9	48	15
	14	3	14	11.35	17	40	43.8	20.500 595	0.43	1.71	9	44	32
	15	3	14	23.75	17	41	32.1	20.491 590	0.43	1.71	9	40	48
	16	3	14	36.06	+17	42	20.0	20.482 357	0.43	1.71	9	37	05
	17	3	14	48.29	17	43	07.5	20.472 900	0.43	1.71	9	33	21
	18	3	15	00.41	17	43	54.5	20.463 219	0.43	1.71	9	29	37
	19	3	15	12.44	17	44	41.2	20.453 318	0.43	1.71	9	25	53
	20	3	15	24.37	17	45	27.3	20.443 199	0.43	1.71	9	22	09
	21	3	15	36.18	17	46	13.0	20.432 865	0.43	1.71	9	18	25
	22	3	15	47.89	+17	46	58.2	20.422 320	0.43	1.71	9	14	40
	23	3	15	59.49	17	47	43.0	20.411 565	0.43	1.72	9	10	56
	24	3	16	10.96	17	48	27.2	20.400 603	0.43	1.72	9	07	11
	25	3	16	22.33	17	49	10.9	20.389 439	0.43	1.72	9	03	27
	26	3	16	33.57	17	49	54.0	20.378 074	0.43	1.72	8	59	42
	27	3	16	44.70	17	50	36.7	20.366 512	0.43	1.72	8	55	57
	28	3	16	55.70	+17	51	18.8	20.354 755	0.43	1.72	8	52	12
	29	3	17	06.59	17	52	00.3	20.342 808	0.43	1.72	8	48	27
	30	3	17	17.35	17	52	41.4	20.330 673	0.43	1.72	8	44	42
July	1	3	17	27.99	17	53	21.9	20.318 352	0.43	1.72	8	40	56
	2	3	17	38.50	+17	54	01.9	20.305 850	0.43	1.72	8	37	11

URANUS, 2023

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	17	27.99	+17	53	21.9	20.318 352	0.43	1.72	8	40	56
	2	3	17	38.50	17	54	01.9	20.305 850	0.43	1.72	8	37	11
	3	3	17	48.89	17	54	41.4	20.293 169	0.43	1.73	8	33	25
	4	3	17	59.14	17	55	20.3	20.280 312	0.43	1.73	8	29	39
	5	3	18	09.25	17	55	58.7	20.267 282	0.43	1.73	8	25	53
	6	3	18	19.22	17	56	36.5	20.254 081	0.43	1.73	8	22	07
	7	3	18	29.05	+17	57	13.7	20.240 713	0.43	1.73	8	18	21
	8	3	18	38.73	17	57	50.3	20.227 180	0.43	1.73	8	14	35
	9	3	18	48.27	17	58	26.3	20.213 485	0.44	1.73	8	10	48
	10	3	18	57.66	17	59	01.7	20.199 631	0.44	1.73	8	07	02
	11	3	19	06.90	17	59	36.4	20.185 622	0.44	1.73	8	03	15
	12	3	19	16.00	18	00	10.6	20.171 460	0.44	1.74	7	59	28
	13	3	19	24.94	+18	00	44.1	20.157 150	0.44	1.74	7	55	41
	14	3	19	33.74	18	01	17.1	20.142 694	0.44	1.74	7	51	54
	15	3	19	42.38	18	01	49.4	20.128 097	0.44	1.74	7	48	06
	16	3	19	50.86	18	02	21.1	20.113 362	0.44	1.74	7	44	19
	17	3	19	59.18	18	02	52.2	20.098 494	0.44	1.74	7	40	31
	18	3	20	07.34	18	03	22.6	20.083 496	0.44	1.74	7	36	43
	19	3	20	15.32	+18	03	52.4	20.068 372	0.44	1.75	7	32	55
	20	3	20	23.14	18	04	21.5	20.053 126	0.44	1.75	7	29	07
	21	3	20	30.78	18	04	49.9	20.037 763	0.44	1.75	7	25	19
	22	3	20	38.26	18	05	17.6	20.022 287	0.44	1.75	7	21	30
	23	3	20	45.56	18	05	44.7	20.006 702	0.44	1.75	7	17	42
	24	3	20	52.68	18	06	11.0	19.991 012	0.44	1.75	7	13	53
	25	3	20	59.63	+18	06	36.7	19.975 221	0.44	1.75	7	10	04
	26	3	21	06.41	18	07	01.7	19.959 334	0.44	1.75	7	06	14
	27	3	21	13.01	18	07	25.9	19.943 356	0.44	1.76	7	02	25
	28	3	21	19.43	18	07	49.5	19.927 290	0.44	1.76	6	58	36
	29	3	21	25.68	18	08	12.4	19.911 140	0.44	1.76	6	54	46
	30	3	21	31.75	18	08	34.7	19.894 911	0.44	1.76	6	50	56
	31	3	21	37.64	+18	08	56.3	19.878 606	0.44	1.76	6	47	06
Aug.	1	3	21	43.34	18	09	17.2	19.862 231	0.44	1.76	6	43	15
	2	3	21	48.85	18	09	37.4	19.845 788	0.44	1.76	6	39	25
	3	3	21	54.17	18	09	56.8	19.829 281	0.44	1.77	6	35	34
	4	3	21	59.30	18	10	15.6	19.812 715	0.44	1.77	6	31	43
	5	3	22	04.23	18	10	33.5	19.796 093	0.44	1.77	6	27	52
	6	3	22	08.98	+18	10	50.8	19.779 419	0.44	1.77	6	24	01
	7	3	22	13.53	18	11	07.2	19.762 697	0.44	1.77	6	20	10
	8	3	22	17.90	18	11	23.0	19.745 933	0.45	1.77	6	16	18
	9	3	22	22.07	18	11	38.0	19.729 129	0.45	1.78	6	12	26
	10	3	22	26.06	18	11	52.3	19.712 290	0.45	1.78	6	08	34
	11	3	22	29.84	18	12	05.9	19.695 422	0.45	1.78	6	04	42
	12	3	22	33.43	+18	12	18.8	19.678 529	0.45	1.78	6	00	50
	13	3	22	36.82	18	12	30.9	19.661 615	0.45	1.78	5	56	57
	14	3	22	40.01	18	12	42.3	19.644 686	0.45	1.78	5	53	04
	15	3	22	42.99	18	12	52.9	19.627 746	0.45	1.78	5	49	11
	16	3	22	45.77	+18	13	02.8	19.610 801	0.45	1.79	5	45	18

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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	3	22	45.77	+18	13	02.8	19.610 801	0.45	1.79	5	45	18
	17	3	22	48.35	18	13	11.9	19.593 855	0.45	1.79	5	41	25
	18	3	22	50.72	18	13	20.3	19.576 913	0.45	1.79	5	37	31
	19	3	22	52.88	18	13	27.8	19.559 981	0.45	1.79	5	33	37
	20	3	22	54.84	18	13	34.6	19.543 062	0.45	1.79	5	29	43
	21	3	22	56.60	18	13	40.6	19.526 164	0.45	1.79	5	25	49
	22	3	22	58.15	+18	13	45.9	19.509 289	0.45	1.80	5	21	55
	23	3	22	59.50	18	13	50.4	19.492 443	0.45	1.80	5	18	00
	24	3	23	00.65	18	13	54.1	19.475 632	0.45	1.80	5	14	05
	25	3	23	01.60	18	13	57.1	19.458 860	0.45	1.80	5	10	10
	26	3	23	02.35	18	13	59.4	19.442 131	0.45	1.80	5	06	15
	27	3	23	02.90	18	14	00.9	19.425 450	0.45	1.80	5	02	20
	28	3	23	03.24	+18	14	01.7	19.408 823	0.45	1.80	4	58	24
	29	3	23	03.37	18	14	01.8	19.392 253	0.45	1.81	4	54	28
	30	3	23	03.30	18	14	01.1	19.375 745	0.45	1.81	4	50	32
	31	3	23	03.02	18	13	59.7	19.359 303	0.45	1.81	4	46	36
Sept.	1	3	23	02.53	18	13	57.5	19.342 931	0.45	1.81	4	42	40
	2	3	23	01.83	18	13	54.5	19.326 635	0.46	1.81	4	38	43
	3	3	23	00.94	+18	13	50.7	19.310 417	0.46	1.81	4	34	46
	4	3	22	59.84	18	13	46.1	19.294 283	0.46	1.82	4	30	49
	5	3	22	58.55	18	13	40.9	19.278 238	0.46	1.82	4	26	52
	6	3	22	57.05	18	13	34.9	19.262 285	0.46	1.82	4	22	54
	7	3	22	55.36	18	13	28.1	19.246 431	0.46	1.82	4	18	57
	8	3	22	53.47	18	13	20.7	19.230 680	0.46	1.82	4	14	59
	9	3	22	51.38	+18	13	12.5	19.215 036	0.46	1.82	4	11	01
	10	3	22	49.08	18	13	03.6	19.199 505	0.46	1.82	4	07	03
	11	3	22	46.58	18	12	54.0	19.184 092	0.46	1.83	4	03	04
	12	3	22	43.89	18	12	43.6	19.168 802	0.46	1.83	3	59	06
	13	3	22	40.99	18	12	32.5	19.153 640	0.46	1.83	3	55	07
	14	3	22	37.89	18	12	20.6	19.138 611	0.46	1.83	3	51	08
	15	3	22	34.60	+18	12	08.0	19.123 719	0.46	1.83	3	47	09
	16	3	22	31.11	18	11	54.7	19.108 970	0.46	1.83	3	43	09
	17	3	22	27.43	18	11	40.6	19.094 368	0.46	1.83	3	39	10
	18	3	22	23.56	18	11	25.8	19.079 919	0.46	1.84	3	35	10
	19	3	22	19.50	18	11	10.4	19.065 627	0.46	1.84	3	31	10
	20	3	22	15.26	18	10	54.2	19.051 496	0.46	1.84	3	27	10
	21	3	22	10.84	+18	10	37.4	19.037 532	0.46	1.84	3	23	09
	22	3	22	06.23	18	10	19.9	19.023 739	0.46	1.84	3	19	09
	23	3	22	01.45	18	10	01.7	19.010 120	0.46	1.84	3	15	08
	24	3	21	56.49	18	09	42.9	18.996 681	0.46	1.84	3	11	07
	25	3	21	51.35	18	09	23.5	18.983 426	0.46	1.84	3	07	06
	26	3	21	46.03	18	09	03.4	18.970 357	0.46	1.85	3	03	05
	27	3	21	40.53	+18	08	42.7	18.957 480	0.46	1.85	2	59	04
	28	3	21	34.86	18	08	21.3	18.944 797	0.46	1.85	2	55	02
	29	3	21	29.02	18	07	59.2	18.932 313	0.46	1.85	2	51	00
	30	3	21	23.01	18	07	36.5	18.920 032	0.46	1.85	2	46	58
Oct.	1	3	21	16.84	+18	07	13.2	18.907 956	0.47	1.85	2	42	56

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

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		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	3	21	16.84	+18	07	13.2	18.907 956	0.47	1.85	2	42	56
	2	3	21	10.51	18	06	49.3	18.896 090	0.47	1.85	2	38	54
	3	3	21	04.03	18	06	24.7	18.884 437	0.47	1.85	2	34	52
	4	3	20	57.39	18	05	59.6	18.873 003	0.47	1.86	2	30	49
	5	3	20	50.60	18	05	34.0	18.861 789	0.47	1.86	2	26	47
	6	3	20	43.65	18	05	07.7	18.850 802	0.47	1.86	2	22	44
	7	3	20	36.56	+18	04	41.0	18.840 044	0.47	1.86	2	18	41
	8	3	20	29.31	18	04	13.6	18.829 519	0.47	1.86	2	14	38
	9	3	20	21.92	18	03	45.7	18.819 231	0.47	1.86	2	10	34
	10	3	20	14.38	18	03	17.3	18.809 185	0.47	1.86	2	06	31
	11	3	20	06.71	18	02	48.3	18.799 384	0.47	1.86	2	02	27
	12	3	19	58.89	18	02	18.8	18.789 831	0.47	1.86	1	58	24
	13	3	19	50.94	+18	01	48.7	18.780 531	0.47	1.86	1	54	20
	14	3	19	42.87	18	01	18.2	18.771 487	0.47	1.87	1	50	16
	15	3	19	34.67	18	00	47.1	18.762 702	0.47	1.87	1	46	12
	16	3	19	26.35	18	00	15.6	18.754 179	0.47	1.87	1	42	08
	17	3	19	17.91	17	59	43.7	18.745 922	0.47	1.87	1	38	03
	18	3	19	09.37	17	59	11.3	18.737 934	0.47	1.87	1	33	59
	19	3	19	00.72	+17	58	38.5	18.730 217	0.47	1.87	1	29	54
	20	3	18	51.96	17	58	05.3	18.722 775	0.47	1.87	1	25	50
	21	3	18	43.11	17	57	31.7	18.715 609	0.47	1.87	1	21	45
	22	3	18	34.15	17	56	57.8	18.708 723	0.47	1.87	1	17	40
	23	3	18	25.09	17	56	23.5	18.702 118	0.47	1.87	1	13	35
	24	3	18	15.95	17	55	48.8	18.695 797	0.47	1.87	1	09	30
	25	3	18	06.71	+17	55	13.8	18.689 760	0.47	1.87	1	05	25
	26	3	17	57.38	17	54	38.4	18.684 011	0.47	1.87	1	01	20
	27	3	17	47.97	17	54	02.7	18.678 551	0.47	1.87	0	57	15
	28	3	17	38.50	17	53	26.7	18.673 381	0.47	1.88	0	53	09
	29	3	17	28.95	17	52	50.3	18.668 503	0.47	1.88	0	49	04
	30	3	17	19.34	17	52	13.7	18.663 919	0.47	1.88	0	44	59
	31	3	17	09.67	+17	51	36.9	18.659 631	0.47	1.88	0	40	53
Nov.	1	3	16	59.95	17	50	59.8	18.655 640	0.47	1.88	0	36	47
	2	3	16	50.16	17	50	22.6	18.651 948	0.47	1.88	0	32	42
	3	3	16	40.33	17	49	45.1	18.648 557	0.47	1.88	0	28	36
	4	3	16	30.45	17	49	07.4	18.645 469	0.47	1.88	0	24	30
	5	3	16	20.52	17	48	29.6	18.642 685	0.47	1.88	0	20	25
	6	3	16	10.55	+17	47	51.6	18.640 206	0.47	1.88	0	16	19
	7	3	16	00.54	17	47	13.4	18.638 034	0.47	1.88	0	12	13
	8	3	15	50.50	17	46	35.0	18.636 170	0.47	1.88	0	08	07
	9	3	15	40.43	17	45	56.5	18.634 615	0.47	1.88	0	04	01
	10	3	15	30.34	17	45	18.0	18.633 370	0.47	1.88	23	55	49
	11	3	15	20.23	17	44	39.3	18.632 436	0.47	1.88	23	51	43
	12	3	15	10.12	+17	44	00.5	18.631 814	0.47	1.88	23	47	37
	13	3	14	60.00	17	43	21.7	18.631 504	0.47	1.88	23	43	31
	14	3	14	49.88	17	42	42.9	18.631 507	0.47	1.88	23	39	25
	15	3	14	39.76	17	42	04.1	18.631 823	0.47	1.88	23	35	19
	16	3	14	29.66	+17	41	25.3	18.632 451	0.47	1.88	23	31	13

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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	3	14	29.66	+17	41	25.3	18.632 451	0.47	1.88	23	31	13
	17	3	14	19.57	17	40	46.6	18.633 393	0.47	1.88	23	27	07
	18	3	14	09.49	17	40	07.9	18.634 646	0.47	1.88	23	23	01
	19	3	13	59.43	17	39	29.3	18.636 211	0.47	1.88	23	18	56
	20	3	13	49.39	17	38	50.8	18.638 086	0.47	1.88	23	14	50
	21	3	13	39.38	17	38	12.4	18.640 272	0.47	1.88	23	10	44
	22	3	13	29.40	+17	37	34.1	18.642 766	0.47	1.88	23	06	38
	23	3	13	19.46	17	36	55.8	18.645 568	0.47	1.88	23	02	32
	24	3	13	09.56	17	36	17.7	18.648 676	0.47	1.88	22	58	27
	25	3	12	59.71	17	35	39.8	18.652 090	0.47	1.88	22	54	21
	26	3	12	49.91	17	35	02.1	18.655 807	0.47	1.88	22	50	15
	27	3	12	40.17	17	34	24.5	18.659 827	0.47	1.88	22	46	10
	28	3	12	30.50	+17	33	47.2	18.664 149	0.47	1.88	22	42	04
	29	3	12	20.89	17	33	10.2	18.668 771	0.47	1.88	22	37	59
	30	3	12	11.35	17	32	33.4	18.673 692	0.47	1.88	22	33	54
Dec.	1	3	12	01.88	17	31	56.9	18.678 910	0.47	1.87	22	29	48
	2	3	11	52.48	17	31	20.7	18.684 424	0.47	1.87	22	25	43
	3	3	11	43.15	17	30	44.8	18.690 234	0.47	1.87	22	21	38
	4	3	11	33.91	+17	30	09.2	18.696 336	0.47	1.87	22	17	33
	5	3	11	24.75	17	29	33.9	18.702 729	0.47	1.87	22	13	28
	6	3	11	15.69	17	28	58.9	18.709 412	0.47	1.87	22	09	23
	7	3	11	06.71	17	28	24.3	18.716 383	0.47	1.87	22	05	19
	8	3	10	57.84	17	27	50.1	18.723 638	0.47	1.87	22	01	14
	9	3	10	49.07	17	27	16.2	18.731 177	0.47	1.87	21	57	09
	10	3	10	40.42	+17	26	42.8	18.738 997	0.47	1.87	21	53	05
	11	3	10	31.88	17	26	09.8	18.747 095	0.47	1.87	21	49	01
	12	3	10	23.46	17	25	37.3	18.755 468	0.47	1.87	21	44	56
	13	3	10	15.16	17	25	05.3	18.764 114	0.47	1.87	21	40	52
	14	3	10	06.99	17	24	33.8	18.773 029	0.47	1.87	21	36	48
	15	3	09	58.95	17	24	02.8	18.782 211	0.47	1.86	21	32	45
	16	3	09	51.03	+17	23	32.4	18.791 655	0.47	1.86	21	28	41
	17	3	09	43.25	17	23	02.5	18.801 359	0.47	1.86	21	24	37
	18	3	09	35.60	17	22	33.1	18.811 318	0.47	1.86	21	20	34
	19	3	09	28.09	17	22	04.2	18.821 528	0.47	1.86	21	16	31
	20	3	09	20.72	17	21	35.9	18.831 986	0.47	1.86	21	12	28
	21	3	09	13.50	17	21	08.2	18.842 687	0.47	1.86	21	08	25
	22	3	09	06.44	+17	20	41.1	18.853 629	0.47	1.86	21	04	22
	23	3	08	59.53	17	20	14.5	18.864 806	0.47	1.86	21	00	19
	24	3	08	52.78	17	19	48.6	18.876 215	0.47	1.86	20	56	17
	25	3	08	46.19	17	19	23.4	18.887 852	0.47	1.85	20	52	15
	26	3	08	39.77	17	18	58.8	18.899 713	0.47	1.85	20	48	12
	27	3	08	33.51	17	18	35.0	18.911 795	0.47	1.85	20	44	10
	28	3	08	27.42	+17	18	11.7	18.924 093	0.46	1.85	20	40	09
	29	3	08	21.50	17	17	49.2	18.936 604	0.46	1.85	20	36	07
	30	3	08	15.74	17	17	27.4	18.949 323	0.46	1.85	20	32	05
	31	3	08	10.16	17	17	06.2	18.962 247	0.46	1.85	20	28	04
	32	3	08	04.75	+17	16	45.8	18.975 371	0.46	1.85	20	24	03

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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	354 40 27.0	-1 11 52.0	29.912 58	Apr. 3	355 14 07.6	-1 12 37.3	29.910 45
3	354 41 10.9	1 11 53.0	29.912 53	5	355 14 51.6	1 12 38.2	29.910 40
5	354 41 54.8	1 11 54.0	29.912 48	7	355 15 35.5	1 12 39.3	29.910 35
7	354 42 38.7	1 11 54.9	29.912 44	9	355 16 19.4	1 12 40.2	29.910 31
9	354 43 22.7	1 11 55.9	29.912 39	11	355 17 03.3	1 12 41.2	29.910 26
11	354 44 06.6	1 11 56.9	29.912 35	13	355 17 47.3	1 12 42.2	29.910 21
13	354 44 50.5	-1 11 57.9	29.912 30	15	355 18 31.2	-1 12 43.2	29.910 16
15	354 45 34.5	1 11 58.9	29.912 26	17	355 19 15.1	1 12 44.1	29.910 12
17	354 46 18.4	1 11 59.9	29.912 21	19	355 19 59.0	1 12 45.1	29.910 07
19	354 47 02.3	1 12 00.9	29.912 16	21	355 20 43.0	1 12 46.1	29.910 02
21	354 47 46.2	1 12 01.9	29.912 12	23	355 21 26.9	1 12 47.1	29.909 98
23	354 48 30.2	1 12 02.8	29.912 07	25	355 22 10.8	1 12 48.1	29.909 93
25	354 49 14.1	-1 12 03.8	29.912 03	27	355 22 54.8	-1 12 49.0	29.909 88
27	354 49 58.0	1 12 04.8	29.911 98	29	355 23 38.7	1 12 50.0	29.909 83
29	354 50 41.9	1 12 05.8	29.911 93	May 1	355 24 22.6	1 12 51.0	29.909 79
31	354 51 25.9	1 12 06.8	29.911 89	3	355 25 06.5	1 12 52.0	29.909 74
Feb. 2	354 52 09.8	1 12 07.8	29.911 84	5	355 25 50.5	1 12 52.9	29.909 69
4	354 52 53.7	1 12 08.8	29.911 80	7	355 26 34.4	1 12 53.9	29.909 64
6	354 53 37.7	-1 12 09.8	29.911 75	9	355 27 18.3	-1 12 54.9	29.909 60
8	354 54 21.6	1 12 10.7	29.911 70	11	355 28 02.2	1 12 55.9	29.909 55
10	354 55 05.5	1 12 11.7	29.911 66	13	355 28 46.2	1 12 56.9	29.909 50
12	354 55 49.4	1 12 12.7	29.911 61	15	355 29 30.1	1 12 57.8	29.909 46
14	354 56 33.4	1 12 13.7	29.911 57	17	355 30 14.0	1 12 58.8	29.909 41
16	354 57 17.3	1 12 14.7	29.911 52	19	355 30 58.0	1 12 59.8	29.909 36
18	354 58 01.2	-1 12 15.7	29.911 47	21	355 31 41.9	-1 13 00.8	29.909 31
20	354 58 45.1	1 12 16.7	29.911 43	23	355 32 25.8	1 13 01.7	29.909 27
22	354 59 29.1	1 12 17.6	29.911 38	25	355 33 09.7	1 13 02.7	29.909 22
24	355 00 13.0	1 12 18.6	29.911 33	27	355 33 53.7	1 13 03.7	29.909 17
26	355 00 56.9	1 12 19.6	29.911 29	29	355 34 37.6	1 13 04.6	29.909 12
28	355 01 40.9	1 12 20.6	29.911 24	31	355 35 21.5	1 13 05.6	29.909 08
Mar. 2	355 02 24.8	-1 12 21.6	29.911 19	June 2	355 36 05.5	-1 13 06.6	29.909 03
4	355 03 08.7	1 12 22.6	29.911 15	4	355 36 49.4	1 13 07.6	29.908 98
6	355 03 52.6	1 12 23.5	29.911 10	6	355 37 33.3	1 13 08.6	29.908 93
8	355 04 36.6	1 12 24.5	29.911 05	8	355 38 17.2	1 13 09.5	29.908 88
10	355 05 20.5	1 12 25.5	29.911 01	10	355 39 01.2	1 13 10.5	29.908 84
12	355 06 04.4	1 12 26.5	29.910 96	12	355 39 45.1	1 13 11.5	29.908 79
14	355 06 48.4	-1 12 27.5	29.910 91	14	355 40 29.0	-1 13 12.4	29.908 74
16	355 07 32.3	1 12 28.4	29.910 87	16	355 41 13.0	1 13 13.4	29.908 69
18	355 08 16.2	1 12 29.4	29.910 82	18	355 41 56.9	1 13 14.4	29.908 65
20	355 09 00.1	1 12 30.4	29.910 77	20	355 42 40.8	1 13 15.3	29.908 60
22	355 09 44.1	1 12 31.4	29.910 73	22	355 43 24.7	1 13 16.4	29.908 55
24	355 10 28.0	1 12 32.4	29.910 68	24	355 44 08.7	1 13 17.3	29.908 50
26	355 11 11.9	-1 12 33.4	29.910 63	26	355 44 52.6	-1 13 18.3	29.908 45
28	355 11 55.8	1 12 34.3	29.910 59	28	355 45 36.5	1 13 19.3	29.908 41
30	355 12 39.8	1 12 35.3	29.910 54	30	355 46 20.5	1 13 20.2	29.908 36
Apr. 1	355 13 23.7	1 12 36.3	29.910 49	July 2	355 47 04.4	1 13 21.2	29.908 31
3	355 14 07.6	-1 12 37.3	29.910 45	4	355 47 48.3	-1 13 22.2	29.908 26

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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 47 04.4	-1 13 21.2	29.908 31	Oct. 2	356 20 45.1	-1 14 05.7	29.906 07
4	355 47 48.3	1 13 22.2	29.908 26	4	356 21 29.0	1 14 06.6	29.906 02
6	355 48 32.2	1 13 23.1	29.908 21	6	356 22 12.9	1 14 07.6	29.905 97
8	355 49 16.2	1 13 24.1	29.908 17	8	356 22 56.9	1 14 08.6	29.905 92
10	355 50 00.1	1 13 25.1	29.908 12	10	356 23 40.8	1 14 09.5	29.905 87
12	355 50 44.0	1 13 26.0	29.908 07	12	356 24 24.7	1 14 10.5	29.905 82
14	355 51 28.0	-1 13 27.0	29.908 02	14	356 25 08.6	-1 14 11.4	29.905 77
16	355 52 11.9	1 13 28.0	29.907 97	16	356 25 52.6	1 14 12.4	29.905 72
18	355 52 55.8	1 13 29.0	29.907 92	18	356 26 36.5	1 14 13.4	29.905 67
20	355 53 39.7	1 13 29.9	29.907 88	20	356 27 20.4	1 14 14.3	29.905 62
22	355 54 23.7	1 13 30.9	29.907 83	22	356 28 04.4	1 14 15.3	29.905 57
24	355 55 07.6	1 13 31.9	29.907 78	24	356 28 48.3	1 14 16.3	29.905 52
26	355 55 51.5	-1 13 32.8	29.907 73	26	356 29 32.2	-1 14 17.2	29.905 47
28	355 56 35.5	1 13 33.8	29.907 68	28	356 30 16.1	1 14 18.2	29.905 42
30	355 57 19.4	1 13 34.8	29.907 63	30	356 31 00.1	1 14 19.1	29.905 37
Aug. 1	355 58 03.3	1 13 35.7	29.907 59	Nov. 1	356 31 44.0	1 14 20.1	29.905 32
3	355 58 47.2	1 13 36.7	29.907 54	3	356 32 27.9	1 14 21.1	29.905 27
5	355 59 31.2	1 13 37.7	29.907 49	5	356 33 11.8	1 14 22.0	29.905 22
7	356 00 15.1	-1 13 38.7	29.907 44	7	356 33 55.8	-1 14 23.0	29.905 17
9	356 00 59.0	1 13 39.6	29.907 39	9	356 34 39.7	1 14 23.9	29.905 12
11	356 01 43.0	1 13 40.6	29.907 34	11	356 35 23.6	1 14 24.9	29.905 07
13	356 02 26.9	1 13 41.6	29.907 30	13	356 36 07.5	1 14 25.8	29.905 02
15	356 03 10.8	1 13 42.5	29.907 25	15	356 36 51.5	1 14 26.8	29.904 97
17	356 03 54.7	1 13 43.5	29.907 20	17	356 37 35.4	1 14 27.8	29.904 92
19	356 04 38.7	-1 13 44.5	29.907 15	19	356 38 19.3	-1 14 28.7	29.904 87
21	356 05 22.6	1 13 45.4	29.907 10	21	356 39 03.2	1 14 29.7	29.904 82
23	356 06 06.5	1 13 46.4	29.907 05	23	356 39 47.2	1 14 30.7	29.904 77
25	356 06 50.4	1 13 47.3	29.907 00	25	356 40 31.1	1 14 31.6	29.904 72
27	356 07 34.4	1 13 48.3	29.906 95	27	356 41 15.0	1 14 32.6	29.904 67
29	356 08 18.3	1 13 49.3	29.906 90	29	356 41 58.9	1 14 33.5	29.904 62
31	356 09 02.2	-1 13 50.3	29.906 86	Dec. 1	356 42 42.9	-1 14 34.5	29.904 57
Sept. 2	356 09 46.2	1 13 51.2	29.906 81	3	356 43 26.8	1 14 35.4	29.904 52
4	356 10 30.1	1 13 52.2	29.906 76	5	356 44 10.7	1 14 36.4	29.904 47
6	356 11 14.0	1 13 53.2	29.906 71	7	356 44 54.6	1 14 37.3	29.904 42
8	356 11 57.9	1 13 54.1	29.906 66	9	356 45 38.6	1 14 38.3	29.904 37
10	356 12 41.9	1 13 55.1	29.906 61	11	356 46 22.5	1 14 39.2	29.904 32
12	356 13 25.8	-1 13 56.0	29.906 56	13	356 47 06.4	-1 14 40.2	29.904 27
14	356 14 09.7	1 13 57.0	29.906 51	15	356 47 50.3	1 14 41.2	29.904 22
16	356 14 53.6	1 13 58.0	29.906 46	17	356 48 34.3	1 14 42.1	29.904 17
18	356 15 37.6	1 13 58.9	29.906 41	19	356 49 18.2	1 14 43.1	29.904 12
20	356 16 21.5	1 13 59.9	29.906 36	21	356 50 02.1	1 14 44.0	29.904 07
22	356 17 05.4	1 14 00.9	29.906 32	23	356 50 46.1	1 14 45.0	29.904 02
24	356 17 49.4	-1 14 01.8	29.906 27	25	356 51 30.0	-1 14 45.9	29.903 97
26	356 18 33.3	1 14 02.8	29.906 22	27	356 52 13.9	1 14 46.9	29.903 92
28	356 19 17.2	1 14 03.8	29.906 17	29	356 52 57.8	1 14 47.9	29.903 87
30	356 20 01.1	1 14 04.7	29.906 12	31	356 53 41.8	1 14 48.8	29.903 81
Oct. 2	356 20 45.1	-1 14 05.7	29.906 07	33	356 54 25.7	-1 14 49.8	29.903 76

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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	352	51	17.7	-1	11	14.2	Feb.	15	354	03	02.7	-1	10	12.1
	1	352	52	14.0	1	11	12.4		16	354	05	06.8	1	10	11.4
	2	352	53	12.3	1	11	10.5		17	354	07	11.9	1	10	10.8
	3	352	54	12.5	1	11	08.7		18	354	09	17.8	1	10	10.3
	4	352	55	14.7	1	11	06.9		19	354	11	24.5	1	10	09.7
	5	352	56	18.8	1	11	05.1		20	354	13	31.9	1	10	09.2
	6	352	57	24.8	-1	11	03.3		21	354	15	39.9	-1	10	08.7
	7	352	58	32.6	1	11	01.5		22	354	17	48.7	1	10	08.3
	8	352	59	42.2	1	10	59.7		23	354	19	58.1	1	10	07.9
	9	353	00	53.6	1	10	58.0		24	354	22	08.1	1	10	07.6
	10	353	02	06.8	1	10	56.3		25	354	24	18.8	1	10	07.2
	11	353	03	21.7	1	10	54.6		26	354	26	30.2	1	10	07.0
	12	353	04	38.4	-1	10	52.9		27	354	28	42.1	-1	10	06.7
	13	353	05	56.7	1	10	51.3		28	354	30	54.6	1	10	06.5
	14	353	07	16.8	1	10	49.7	Mar.	1	354	33	07.6	1	10	06.3
	15	353	08	38.7	1	10	48.1		2	354	35	21.1	1	10	06.2
	16	353	10	02.2	1	10	46.5		3	354	37	35.0	1	10	06.1
	17	353	11	27.5	1	10	44.9		4	354	39	49.2	1	10	06.1
	18	353	12	54.5	-1	10	43.4		5	354	42	03.8	-1	10	06.0
	19	353	14	23.3	1	10	41.9		6	354	44	18.7	1	10	06.1
	20	353	15	53.7	1	10	40.4		7	354	46	33.9	1	10	06.1
	21	353	17	25.6	1	10	39.0		8	354	48	49.2	1	10	06.2
	22	353	18	59.2	1	10	37.5		9	354	51	04.9	1	10	06.4
	23	353	20	34.2	1	10	36.1		10	354	53	20.7	1	10	06.6
	24	353	22	10.6	-1	10	34.7		11	354	55	36.8	-1	10	06.8
	25	353	23	48.5	1	10	33.4		12	354	57	53.1	1	10	07.1
	26	353	25	27.8	1	10	32.1		13	355	00	09.6	1	10	07.4
	27	353	27	08.6	1	10	30.8		14	355	02	26.3	1	10	07.8
	28	353	28	50.7	1	10	29.5		15	355	04	43.0	1	10	08.3
	29	353	30	34.4	1	10	28.2		16	355	06	59.7	1	10	08.9
	30	353	32	19.4	-1	10	27.0		17	355	09	16.3	-1	10	09.2
	31	353	34	05.8	1	10	25.9		18	355	11	33.1	1	10	09.5
Feb.	1	353	35	53.5	1	10	24.7		19	355	13	49.8	1	10	10.0
	2	353	37	42.5	1	10	23.6		20	355	16	06.4	1	10	10.5
	3	353	39	32.8	1	10	22.5		21	355	18	22.7	1	10	11.1
	4	353	41	24.3	1	10	21.4		22	355	20	38.9	1	10	11.8
	5	353	43	16.9	-1	10	20.4		23	355	22	54.9	-1	10	12.4
	6	353	45	10.7	1	10	19.4		24	355	25	10.7	1	10	13.2
	7	353	47	05.6	1	10	18.5		25	355	27	26.3	1	10	13.9
	8	353	49	01.5	1	10	17.6		26	355	29	41.7	1	10	14.7
	9	353	50	58.6	1	10	16.7		27	355	31	56.8	1	10	15.5
	10	353	52	56.7	1	10	15.8		28	355	34	11.6	1	10	16.4
	11	353	54	55.8	-1	10	15.0		29	355	36	26.1	-1	10	17.3
	12	353	56	56.0	1	10	14.2		30	355	38	40.1	1	10	18.3
	13	353	58	57.2	1	10	13.5		31	355	40	53.6	1	10	19.3
	14	354	00	59.4	1	10	12.8	Apr.	1	355	43	06.7	1	10	20.3
	15	354	03	02.7	-1	10	12.1		2	355	45	19.2	-1	10	21.4

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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	355	43	06.7	-1	10	20.3	May	17	357	09	09.8	-1	11	44.6
	2	355	45	19.2	1	10	21.4		18	357	10	32.0	1	11	47.1
	3	355	47	31.2	1	10	22.5		19	357	11	52.7	1	11	49.6
	4	355	49	42.6	1	10	23.6		20	357	13	11.8	1	11	52.2
	5	355	51	53.4	1	10	24.8		21	357	14	29.2	1	11	54.8
	6	355	54	03.6	1	10	26.0		22	357	15	45.1	1	11	57.4
	7	355	56	13.3	-1	10	27.3		23	357	16	59.2	-1	12	00.0
	8	355	58	22.3	1	10	28.6		24	357	18	11.6	1	12	02.6
	9	356	00	30.7	1	10	29.9		25	357	19	22.2	1	12	05.3
	10	356	02	38.4	1	10	31.3		26	357	20	31.1	1	12	08.0
	11	356	04	45.5	1	10	32.6		27	357	21	38.2	1	12	10.7
	12	356	06	51.8	1	10	34.1		28	357	22	43.5	1	12	13.4
	13	356	08	57.4	-1	10	35.6		29	357	23	47.0	-1	12	16.1
	14	356	11	02.1	1	10	37.1		30	357	24	48.7	1	12	18.9
	15	356	13	06.0	1	10	38.6		31	357	25	48.6	1	12	21.6
	16	356	15	08.9	1	10	40.2	June	1	357	26	46.7	1	12	24.4
	17	356	17	10.9	1	10	41.8		2	357	27	43.1	1	12	27.2
	18	356	19	11.8	1	10	43.4		3	357	28	37.7	1	12	30.1
	19	356	21	11.9	-1	10	45.1		4	357	29	30.6	-1	12	32.9
	20	356	23	11.0	1	10	46.8		5	357	30	21.6	1	12	35.7
	21	356	25	09.1	1	10	48.5		6	357	31	10.9	1	12	38.6
	22	356	27	06.2	1	10	50.3		7	357	31	58.2	1	12	41.4
	23	356	29	02.3	1	10	52.1		8	357	32	43.7	1	12	44.3
	24	356	30	57.4	1	10	54.0		9	357	33	27.2	1	12	47.2
	25	356	32	51.4	-1	10	55.8		10	357	34	08.7	-1	12	50.1
	26	356	34	44.2	1	10	57.7		11	357	34	48.3	1	12	53.0
	27	356	36	35.8	1	10	59.7		12	357	35	26.0	1	12	55.9
	28	356	38	26.2	1	11	01.7		13	357	36	01.7	1	12	58.8
	29	356	40	15.4	1	11	03.7		14	357	36	35.6	1	13	01.8
	30	356	42	03.3	1	11	05.7		15	357	37	07.5	1	13	04.7
May	1	356	43	49.9	-1	11	07.8		16	357	37	37.6	-1	13	07.6
	2	356	45	35.2	1	11	09.9		17	357	38	05.8	1	13	10.6
	3	356	47	19.1	1	11	12.0		18	357	38	32.0	1	13	13.5
	4	356	49	01.8	1	11	14.1		19	357	38	56.3	1	13	16.5
	5	356	50	43.2	1	11	16.3		20	357	39	18.6	1	13	19.5
	6	356	52	23.3	1	11	18.5		21	357	39	38.9	1	13	22.4
	7	356	54	02.1	-1	11	20.8		22	357	39	57.3	-1	13	25.4
	8	356	55	39.6	1	11	23.0		23	357	40	13.6	1	13	28.4
	9	356	57	15.6	1	11	25.3		24	357	40	27.9	1	13	31.3
	10	356	58	50.3	1	11	27.6		25	357	40	40.2	1	13	34.3
	11	357	00	23.5	1	11	30.0		26	357	40	50.5	1	13	37.3
	12	357	01	55.1	1	11	32.4		27	357	40	58.8	1	13	40.2
	13	357	03	25.2	-1	11	34.8		28	357	41	05.3	-1	13	43.2
	14	357	04	53.7	1	11	37.2		29	357	41	09.8	1	13	46.2
	15	357	06	20.7	1	11	39.6		30	357	41	12.3	1	13	49.1
	16	357	07	46.0	1	11	42.1	July	1	357	41	13.1	1	13	52.1
	17	357	09	09.8	-1	11	44.6		2	357	41	11.9	-1	13	55.0

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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	357	41	13.1	-1	13	52.1	Aug.	16	357	09	11.0	-1	15	50.9
	2	357	41	11.9	1	13	55.0		17	357	07	52.7	1	15	52.8
	3	357	41	08.8	1	13	58.0		18	357	06	33.2	1	15	54.7
	4	357	41	03.8	1	14	00.9		19	357	05	12.5	1	15	56.6
	5	357	40	56.9	1	14	03.9		20	357	03	50.7	1	15	58.5
	6	357	40	47.9	1	14	06.8		21	357	02	27.8	1	16	00.3
	7	357	40	37.0	-1	14	09.7		22	357	01	03.9	-1	16	02.0
	8	357	40	24.0	1	14	12.6		23	356	59	39.0	1	16	03.7
	9	357	40	09.1	1	14	15.5		24	356	58	13.1	1	16	05.4
	10	357	39	52.3	1	14	18.4		25	356	56	46.4	1	16	07.1
	11	357	39	33.7	1	14	21.2		26	356	55	18.8	1	16	08.7
	12	357	39	13.2	1	14	24.1		27	356	53	50.3	1	16	10.2
	13	357	38	50.8	-1	14	26.9		28	356	52	21.0	-1	16	11.7
	14	357	38	26.6	1	14	29.8		29	356	50	50.9	1	16	13.2
	15	357	38	00.5	1	14	32.6		30	356	49	19.8	1	16	14.6
	16	357	37	32.6	1	14	35.4		31	356	47	48.0	1	16	16.0
	17	357	37	02.9	1	14	38.2	Sept.	1	356	46	15.3	1	16	17.3
	18	357	36	31.2	1	14	40.9		2	356	44	42.0	1	16	18.6
	19	357	35	57.8	-1	14	43.7		3	356	43	07.9	-1	16	19.9
	20	357	35	22.4	1	14	46.4		4	356	41	33.3	1	16	21.1
	21	357	34	45.2	1	14	49.2		5	356	39	58.2	1	16	22.2
	22	357	34	06.2	1	14	51.9		6	356	38	22.6	1	16	23.3
	23	357	33	25.5	1	14	54.5		7	356	36	46.4	1	16	24.4
	24	357	32	42.9	1	14	57.2		8	356	35	09.8	1	16	25.4
	25	357	31	58.7	-1	14	59.8		9	356	33	32.7	-1	16	26.4
	26	357	31	12.7	1	15	02.4		10	356	31	55.2	1	16	27.4
	27	357	30	25.2	1	15	05.0		11	356	30	17.3	1	16	28.2
	28	357	29	36.0	1	15	07.6		12	356	28	39.1	1	16	29.1
	29	357	28	45.2	1	15	10.1		13	356	27	00.4	1	16	29.9
	30	357	27	52.8	1	15	12.7		14	356	25	21.5	1	16	30.6
	31	357	26	58.9	-1	15	15.2		15	356	23	42.4	-1	16	31.3
Aug.	1	357	26	03.3	1	15	17.6		16	356	22	03.0	1	16	32.0
	2	357	25	06.1	1	15	20.0		17	356	20	23.5	1	16	32.6
	3	357	24	07.3	1	15	22.5		18	356	18	43.9	1	16	33.1
	4	357	23	06.9	1	15	24.8		19	356	17	04.3	1	16	33.7
	5	357	22	04.9	1	15	27.2		20	356	15	24.8	1	16	34.1
	6	357	21	01.5	-1	15	29.5		21	356	13	45.3	-1	16	34.5
	7	357	19	56.5	1	15	31.8		22	356	12	05.9	1	16	34.9
	8	357	18	50.2	1	15	34.0		23	356	10	26.7	1	16	35.2
	9	357	17	42.5	1	15	36.3		24	356	08	47.7	1	16	35.5
	10	357	16	33.4	1	15	38.4		25	356	07	08.7	1	16	35.7
	11	357	15	23.0	1	15	40.6		26	356	05	30.0	1	16	35.9
	12	357	14	11.2	-1	15	42.7		27	356	03	51.5	-1	16	36.0
	13	357	12	58.1	1	15	44.8		28	356	02	13.1	1	16	36.1
	14	357	11	43.7	1	15	46.9		29	356	00	35.1	1	16	36.1
	15	357	10	28.0	1	15	48.9		30	355	58	57.4	1	16	36.1
	16	357	09	11.0	-1	15	50.9	Oct.	1	355	57	20.2	-1	16	36.0

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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		
		°	′	″	°	′	″			°	′	″	°	′	″
Oct.	1	355	57	20.2	-1	16	36.0	Nov.	16	355	00	21.9	-1	15	48.3
	2	355	55	43.4	1	16	35.9		17	354	59	42.2	1	15	46.5
	3	355	54	07.2	1	16	35.8		18	354	59	04.5	1	15	44.7
	4	355	52	31.6	1	16	35.6		19	354	58	28.5	1	15	42.8
	5	355	50	56.5	1	16	35.3		20	354	57	54.5	1	15	40.9
	6	355	49	22.0	1	16	35.0		21	354	57	22.3	1	15	39.0
	7	355	47	48.1	-1	16	34.7		22	354	56	52.0	-1	15	37.1
	8	355	46	14.8	1	16	34.3		23	354	56	23.6	1	15	35.2
	9	355	44	42.2	1	16	33.9		24	354	55	57.1	1	15	33.2
	10	355	43	10.3	1	16	33.4		25	354	55	32.7	1	15	31.2
	11	355	41	39.1	1	16	32.9		26	354	55	10.3	1	15	29.2
	12	355	40	08.7	1	16	32.3		27	354	54	49.9	1	15	27.2
	13	355	38	39.2	-1	16	31.7		28	354	54	31.6	-1	15	25.2
	14	355	37	10.5	1	16	31.1		29	354	54	15.3	1	15	23.2
	15	355	35	42.8	1	16	30.4		30	354	54	01.1	1	15	21.1
	16	355	34	16.0	1	16	29.6	Dec.	1	354	53	48.8	1	15	19.1
	17	355	32	50.4	1	16	28.8		2	354	53	38.6	1	15	17.0
	18	355	31	25.8	1	16	28.0		3	354	53	30.3	1	15	14.9
	19	355	30	02.3	-1	16	27.2		4	354	53	24.1	-1	15	12.9
	20	355	28	40.0	1	16	26.3		5	354	53	19.9	1	15	10.8
	21	355	27	18.9	1	16	25.3		6	354	53	17.7	1	15	08.7
	22	355	25	58.9	1	16	24.3		7	354	53	17.6	1	15	06.6
	23	355	24	40.1	1	16	23.3		8	354	53	19.5	1	15	04.5
	24	355	23	22.4	1	16	22.2		9	354	53	23.6	1	15	02.3
	25	355	22	06.0	-1	16	21.1		10	354	53	29.8	-1	15	00.2
	26	355	20	50.8	1	16	20.0		11	354	53	38.2	1	14	58.1
	27	355	19	36.9	1	16	18.8		12	354	53	48.7	1	14	56.0
	28	355	18	24.4	1	16	17.6		13	354	54	01.4	1	14	53.8
	29	355	17	13.3	1	16	16.3		14	354	54	16.2	1	14	51.7
	30	355	16	03.7	1	16	15.0		15	354	54	33.1	1	14	49.6
	31	355	14	55.6	-1	16	13.7		16	354	54	52.0	-1	14	47.4
Nov.	1	355	13	49.0	1	16	12.3		17	354	55	13.0	1	14	45.3
	2	355	12	43.9	1	16	10.9		18	354	55	36.1	1	14	43.2
	3	355	11	40.3	1	16	09.5		19	354	56	01.1	1	14	41.1
	4	355	10	38.2	1	16	08.1		20	354	56	28.2	1	14	38.9
	5	355	09	37.6	1	16	06.6		21	354	56	57.4	1	14	36.8
	6	355	08	38.6	-1	16	05.0		22	354	57	28.6	-1	14	34.7
	7	355	07	41.2	1	16	03.5		23	354	58	02.0	1	14	32.6
	8	355	06	45.4	1	16	01.9		24	354	58	37.4	1	14	30.5
	9	355	05	51.3	1	16	00.3		25	354	59	15.0	1	14	28.4
	10	355	04	58.8	1	15	58.7		26	354	59	54.6	1	14	26.3
	11	355	04	08.1	1	15	57.0		27	355	00	36.2	1	14	24.2
	12	355	03	19.1	-1	15	55.3		28	355	01	19.9	-1	14	22.2
	13	355	02	32.0	1	15	53.6		29	355	02	05.5	1	14	20.1
	14	355	01	46.8	1	15	51.9		30	355	02	53.0	1	14	18.1
	15	355	01	03.4	1	15	50.1		31	355	03	42.5	1	14	16.0
	16	355	00	21.9	-1	15	48.3		32	355	04	34.0	-1	14	14.0

NEPTUNE, 2023
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	35	38.24	-3	55	35.0	30.175 505	0.29	1.11	16	55	17
	1	23	35	41.64	3	55	11.0	30.192 105	0.29	1.11	16	51	25
	2	23	35	45.17	3	54	46.2	30.208 613	0.29	1.11	16	47	32
	3	23	35	48.82	3	54	20.7	30.225 026	0.29	1.11	16	43	40
	4	23	35	52.59	3	53	54.4	30.241 339	0.29	1.11	16	39	48
	5	23	35	56.47	3	53	27.4	30.257 547	0.29	1.11	16	35	56
	6	23	36	00.47	-3	52	59.6	30.273 646	0.29	1.11	16	32	04
	7	23	36	04.59	3	52	31.2	30.289 632	0.29	1.11	16	28	12
	8	23	36	08.81	3	52	02.0	30.305 499	0.29	1.11	16	24	21
	9	23	36	13.15	3	51	32.2	30.321 245	0.29	1.10	16	20	29
	10	23	36	17.59	3	51	01.7	30.336 863	0.29	1.10	16	16	38
	11	23	36	22.14	3	50	30.5	30.352 350	0.29	1.10	16	12	47
	12	23	36	26.80	-3	49	58.7	30.367 701	0.29	1.10	16	08	55
	13	23	36	31.56	3	49	26.1	30.382 913	0.29	1.10	16	05	04
	14	23	36	36.44	3	48	52.9	30.397 980	0.29	1.10	16	01	13
	15	23	36	41.41	3	48	19.1	30.412 897	0.29	1.10	15	57	22
	16	23	36	46.50	3	47	44.6	30.427 662	0.29	1.10	15	53	32
	17	23	36	51.69	3	47	09.4	30.442 269	0.29	1.10	15	49	41
	18	23	36	56.99	-3	46	33.5	30.456 713	0.29	1.10	15	45	50
	19	23	37	02.39	3	45	57.0	30.470 991	0.29	1.10	15	41	60
	20	23	37	07.89	3	45	19.9	30.485 097	0.29	1.10	15	38	10
	21	23	37	13.50	3	44	42.2	30.499 027	0.29	1.10	15	34	19
	22	23	37	19.20	3	44	03.8	30.512 777	0.29	1.10	15	30	29
	23	23	37	24.99	3	43	25.0	30.526 342	0.29	1.10	15	26	39
	24	23	37	30.87	-3	42	45.5	30.539 718	0.29	1.10	15	22	49
	25	23	37	36.83	3	42	05.5	30.552 901	0.29	1.10	15	18	59
	26	23	37	42.89	3	41	25.0	30.565 888	0.29	1.10	15	15	09
	27	23	37	49.03	3	40	43.9	30.578 674	0.29	1.10	15	11	19
	28	23	37	55.27	3	40	02.3	30.591 256	0.29	1.10	15	07	30
	29	23	38	01.59	3	39	20.1	30.603 631	0.29	1.09	15	03	40
	30	23	38	08.00	-3	38	37.4	30.615 796	0.29	1.09	14	59	51
	31	23	38	14.49	3	37	54.2	30.627 748	0.29	1.09	14	56	01
Feb.	1	23	38	21.07	3	37	10.5	30.639 483	0.29	1.09	14	52	12
	2	23	38	27.72	3	36	26.3	30.650 998	0.29	1.09	14	48	23
	3	23	38	34.46	3	35	41.7	30.662 292	0.29	1.09	14	44	34
	4	23	38	41.27	3	34	56.5	30.673 361	0.29	1.09	14	40	45
	5	23	38	48.15	-3	34	11.0	30.684 201	0.29	1.09	14	36	55
	6	23	38	55.10	3	33	25.0	30.694 811	0.29	1.09	14	33	07
	7	23	39	02.12	3	32	38.7	30.705 188	0.29	1.09	14	29	18
	8	23	39	09.20	3	31	51.9	30.715 329	0.29	1.09	14	25	29
	9	23	39	16.35	3	31	04.7	30.725 232	0.29	1.09	14	21	40
	10	23	39	23.57	3	30	17.2	30.734 893	0.29	1.09	14	17	51
	11	23	39	30.86	-3	29	29.2	30.744 311	0.29	1.09	14	14	03
	12	23	39	38.20	3	28	40.9	30.753 482	0.29	1.09	14	10	14
	13	23	39	45.61	3	27	52.2	30.762 405	0.29	1.09	14	06	26
	14	23	39	53.09	3	27	03.1	30.771 075	0.29	1.09	14	02	37
	15	23	40	00.63	-3	26	13.6	30.779 492	0.29	1.09	13	58	49

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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	23	40	00.63	-3	26	13.6	30.779 492	0.29	1.09	13	58	49
	16	23	40	08.22	3	25	23.8	30.787 652	0.29	1.09	13	55	01
	17	23	40	15.87	3	24	33.7	30.795 553	0.29	1.09	13	51	12
	18	23	40	23.58	3	23	43.3	30.803 192	0.29	1.09	13	47	24
	19	23	40	31.33	3	22	52.6	30.810 566	0.29	1.09	13	43	36
	20	23	40	39.12	3	22	01.6	30.817 675	0.29	1.09	13	39	48
	21	23	40	46.96	-3	21	10.5	30.824 515	0.29	1.09	13	35	60
	22	23	40	54.84	3	20	19.1	30.831 084	0.29	1.09	13	32	12
	23	23	41	02.76	3	19	27.4	30.837 382	0.29	1.09	13	28	24
	24	23	41	10.72	3	18	35.5	30.843 406	0.29	1.09	13	24	36
	25	23	41	18.72	3	17	43.4	30.849 155	0.29	1.09	13	20	48
	26	23	41	26.77	3	16	51.1	30.854 629	0.29	1.09	13	16	60
	27	23	41	34.85	-3	15	58.5	30.859 826	0.28	1.09	13	13	12
	28	23	41	42.96	3	15	05.8	30.864 745	0.28	1.09	13	09	24
Mar.	1	23	41	51.11	3	14	12.9	30.869 385	0.28	1.09	13	05	36
	2	23	41	59.29	3	13	19.8	30.873 746	0.28	1.09	13	01	49
	3	23	42	07.49	3	12	26.7	30.877 827	0.28	1.08	12	58	01
	4	23	42	15.71	3	11	33.4	30.881 627	0.28	1.08	12	54	13
	5	23	42	23.96	-3	10	40.0	30.885 146	0.28	1.08	12	50	25
	6	23	42	32.23	3	09	46.6	30.888 383	0.28	1.08	12	46	38
	7	23	42	40.51	3	08	53.0	30.891 338	0.28	1.08	12	42	50
	8	23	42	48.81	3	07	59.4	30.894 010	0.28	1.08	12	39	03
	9	23	42	57.12	3	07	05.7	30.896 399	0.28	1.08	12	35	15
	10	23	43	05.45	3	06	12.0	30.898 505	0.28	1.08	12	31	27
	11	23	43	13.80	-3	05	18.3	30.900 326	0.28	1.08	12	27	40
	12	23	43	22.16	3	04	24.4	30.901 863	0.28	1.08	12	23	52
	13	23	43	30.53	3	03	30.6	30.903 115	0.28	1.08	12	20	05
	14	23	43	38.91	3	02	36.7	30.904 081	0.28	1.08	12	16	17
	15	23	43	47.30	3	01	42.9	30.904 762	0.28	1.08	12	12	29
	16	23	43	55.69	3	00	49.2	30.905 157	0.28	1.08	12	08	42
	17	23	44	04.07	-2	59	55.3	30.905 266	0.28	1.08	12	04	54
	18	23	44	12.46	2	59	01.3	30.905 088	0.28	1.08	12	01	07
	19	23	44	20.85	2	58	07.5	30.904 624	0.28	1.08	11	57	19
	20	23	44	29.22	2	57	13.8	30.903 873	0.28	1.08	11	53	32
	21	23	44	37.59	2	56	20.3	30.902 835	0.28	1.08	11	49	44
	22	23	44	45.95	2	55	26.8	30.901 512	0.28	1.08	11	45	56
	23	23	44	54.30	-2	54	33.4	30.899 904	0.28	1.08	11	42	09
	24	23	45	02.64	2	53	40.2	30.898 011	0.28	1.08	11	38	21
	25	23	45	10.97	2	52	47.0	30.895 834	0.28	1.08	11	34	33
	26	23	45	19.28	2	51	54.0	30.893 375	0.28	1.08	11	30	46
	27	23	45	27.58	2	51	01.2	30.890 635	0.28	1.08	11	26	58
	28	23	45	35.86	2	50	08.5	30.887 616	0.28	1.08	11	23	10
	29	23	45	44.11	-2	49	15.9	30.884 317	0.28	1.08	11	19	23
	30	23	45	52.35	2	48	23.6	30.880 742	0.28	1.08	11	15	35
	31	23	46	00.55	2	47	31.5	30.876 891	0.28	1.08	11	11	47
Apr.	1	23	46	08.73	2	46	39.6	30.872 767	0.28	1.09	11	07	59
	2	23	46	16.87	-2	45	48.0	30.868 369	0.28	1.09	11	04	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
Apr.	1	23	46	08.73	-2	46	39.6	30.872 767	0.28	1.09	11	07	59
	2	23	46	16.87	2	45	48.0	30.868 369	0.28	1.09	11	04	12
	3	23	46	24.99	2	44	56.6	30.863 701	0.28	1.09	11	00	24
	4	23	46	33.06	2	44	05.4	30.858 764	0.28	1.09	10	56	36
	5	23	46	41.11	2	43	14.6	30.853 559	0.29	1.09	10	52	48
	6	23	46	49.11	2	42	24.0	30.848 088	0.29	1.09	10	49	00
	7	23	46	57.08	-2	41	33.7	30.842 353	0.29	1.09	10	45	12
	8	23	47	05.02	2	40	43.6	30.836 355	0.29	1.09	10	41	24
	9	23	47	12.91	2	39	53.8	30.830 096	0.29	1.09	10	37	36
	10	23	47	20.77	2	39	04.4	30.823 577	0.29	1.09	10	33	48
	11	23	47	28.59	2	38	15.2	30.816 801	0.29	1.09	10	29	60
	12	23	47	36.37	2	37	26.3	30.809 768	0.29	1.09	10	26	11
	13	23	47	44.09	-2	36	37.8	30.802 481	0.29	1.09	10	22	23
	14	23	47	51.77	2	35	49.6	30.794 941	0.29	1.09	10	18	35
	15	23	47	59.39	2	35	01.8	30.787 150	0.29	1.09	10	14	47
	16	23	48	06.96	2	34	14.5	30.779 110	0.29	1.09	10	10	58
	17	23	48	14.47	2	33	27.5	30.770 822	0.29	1.09	10	07	10
	18	23	48	21.92	2	32	40.9	30.762 291	0.29	1.09	10	03	21
	19	23	48	29.32	-2	31	54.8	30.753 517	0.29	1.09	9	59	33
	20	23	48	36.65	2	31	09.0	30.744 503	0.29	1.09	9	55	44
	21	23	48	43.93	2	30	23.7	30.735 252	0.29	1.09	9	51	55
	22	23	48	51.15	2	29	38.8	30.725 768	0.29	1.09	9	48	07
	23	23	48	58.31	2	28	54.3	30.716 053	0.29	1.09	9	44	18
	24	23	49	05.40	2	28	10.3	30.706 109	0.29	1.09	9	40	29
	25	23	49	12.42	2	27	26.7	30.695 941	0.29	1.09	9	36	40
	26	23	49	19.38	-2	26	43.6	30.685 552	0.29	1.09	9	32	51
	27	23	49	26.27	2	26	01.1	30.674 945	0.29	1.09	9	29	02
	28	23	49	33.08	2	25	19.0	30.664 122	0.29	1.09	9	25	13
	29	23	49	39.81	2	24	37.5	30.653 088	0.29	1.09	9	21	23
	30	23	49	46.47	2	23	56.5	30.641 845	0.29	1.09	9	17	34
May	1	23	49	53.05	-2	23	16.0	30.630 398	0.29	1.09	9	13	45
	2	23	49	59.55	2	22	36.1	30.618 748	0.29	1.09	9	09	55
	3	23	50	05.98	2	21	56.7	30.606 900	0.29	1.09	9	06	06
	4	23	50	12.32	2	21	17.9	30.594 857	0.29	1.09	9	02	16
	5	23	50	18.58	2	20	39.6	30.582 622	0.29	1.10	8	58	26
	6	23	50	24.77	2	20	01.8	30.570 199	0.29	1.10	8	54	37
	7	23	50	30.87	-2	19	24.6	30.557 589	0.29	1.10	8	50	47
	8	23	50	36.90	2	18	48.0	30.544 798	0.29	1.10	8	46	57
	9	23	50	42.84	2	18	11.9	30.531 827	0.29	1.10	8	43	07
	10	23	50	48.70	2	17	36.4	30.518 680	0.29	1.10	8	39	17
	11	23	50	54.46	2	17	01.5	30.505 360	0.29	1.10	8	35	26
	12	23	51	00.13	2	16	27.3	30.491 871	0.29	1.10	8	31	36
	13	23	51	05.71	-2	15	53.7	30.478 216	0.29	1.10	8	27	46
	14	23	51	11.19	2	15	20.7	30.464 397	0.29	1.10	8	23	55
	15	23	51	16.58	2	14	48.4	30.450 420	0.29	1.10	8	20	05
	16	23	51	21.87	2	14	16.7	30.436 287	0.29	1.10	8	16	14
	17	23	51	27.06	-2	13	45.7	30.422 003	0.29	1.10	8	12	23

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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	23	51	27.06	-2	13	45.7	30.422 003	0.29	1.10	8	12	23
	18	23	51	32.16	2	13	15.3	30.407 572	0.29	1.10	8	08	32
	19	23	51	37.17	2	12	45.6	30.392 998	0.29	1.10	8	04	41
	20	23	51	42.07	2	12	16.5	30.378 285	0.29	1.10	8	00	50
	21	23	51	46.88	2	11	48.1	30.363 437	0.29	1.10	7	56	59
	22	23	51	51.59	2	11	20.3	30.348 459	0.29	1.10	7	53	08
	23	23	51	56.20	-2	10	53.3	30.333 356	0.29	1.10	7	49	16
	24	23	52	00.70	2	10	26.9	30.318 131	0.29	1.10	7	45	25
	25	23	52	05.09	2	10	01.3	30.302 790	0.29	1.11	7	41	33
	26	23	52	09.38	2	09	36.3	30.287 337	0.29	1.11	7	37	42
	27	23	52	13.56	2	09	12.2	30.271 776	0.29	1.11	7	33	50
	28	23	52	17.63	2	08	48.7	30.256 111	0.29	1.11	7	29	58
	29	23	52	21.58	-2	08	26.0	30.240 348	0.29	1.11	7	26	06
	30	23	52	25.43	2	08	04.0	30.224 490	0.29	1.11	7	22	14
	31	23	52	29.17	2	07	42.7	30.208 542	0.29	1.11	7	18	22
June	1	23	52	32.81	2	07	22.1	30.192 507	0.29	1.11	7	14	29
	2	23	52	36.33	2	07	02.3	30.176 392	0.29	1.11	7	10	37
	3	23	52	39.75	2	06	43.2	30.160 199	0.29	1.11	7	06	44
	4	23	52	43.05	-2	06	24.7	30.143 932	0.29	1.11	7	02	52
	5	23	52	46.26	2	06	07.1	30.127 597	0.29	1.11	6	58	59
	6	23	52	49.34	2	05	50.1	30.111 196	0.29	1.11	6	55	06
	7	23	52	52.32	2	05	33.9	30.094 735	0.29	1.11	6	51	13
	8	23	52	55.18	2	05	18.5	30.078 216	0.29	1.11	6	47	20
	9	23	52	57.91	2	05	03.8	30.061 644	0.29	1.11	6	43	27
	10	23	53	00.53	-2	04	50.0	30.045 024	0.29	1.11	6	39	33
	11	23	53	03.03	2	04	36.9	30.028 360	0.29	1.12	6	35	40
	12	23	53	05.42	2	04	24.6	30.011 656	0.29	1.12	6	31	46
	13	23	53	07.68	2	04	13.1	29.994 917	0.29	1.12	6	27	53
	14	23	53	09.83	2	04	02.3	29.978 148	0.29	1.12	6	23	59
	15	23	53	11.86	2	03	52.3	29.961 354	0.29	1.12	6	20	05
	16	23	53	13.78	-2	03	43.0	29.944 539	0.29	1.12	6	16	11
	17	23	53	15.58	2	03	34.5	29.927 708	0.29	1.12	6	12	17
	18	23	53	17.27	2	03	26.8	29.910 867	0.29	1.12	6	08	22
	19	23	53	18.83	2	03	19.8	29.894 021	0.29	1.12	6	04	28
	20	23	53	20.28	2	03	13.7	29.877 174	0.29	1.12	6	00	34
	21	23	53	21.60	2	03	08.3	29.860 331	0.29	1.12	5	56	39
	22	23	53	22.80	-2	03	03.8	29.843 498	0.29	1.12	5	52	44
	23	23	53	23.88	2	02	60.0	29.826 680	0.29	1.12	5	48	49
	24	23	53	24.83	2	02	57.0	29.809 881	0.30	1.12	5	44	54
	25	23	53	25.66	2	02	54.9	29.793 105	0.30	1.12	5	40	59
	26	23	53	26.37	2	02	53.5	29.776 359	0.30	1.13	5	37	04
	27	23	53	26.96	2	02	52.9	29.759 647	0.30	1.13	5	33	09
	28	23	53	27.43	-2	02	53.1	29.742 972	0.30	1.13	5	29	13
	29	23	53	27.79	2	02	54.0	29.726 341	0.30	1.13	5	25	18
	30	23	53	28.02	2	02	55.7	29.709 757	0.30	1.13	5	21	22
July	1	23	53	28.15	2	02	58.1	29.693 225	0.30	1.13	5	17	26
	2	23	53	28.15	-2	03	01.3	29.676 750	0.30	1.13	5	13	30

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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	53	28.15	-2	02	58.1	29.693 225	0.30	1.13	5	17	26
	2	23	53	28.15	2	03	01.3	29.676 750	0.30	1.13	5	13	30
	3	23	53	28.04	2	03	05.2	29.660 335	0.30	1.13	5	09	34
	4	23	53	27.82	2	03	09.9	29.643 984	0.30	1.13	5	05	38
	5	23	53	27.47	2	03	15.4	29.627 702	0.30	1.13	5	01	42
	6	23	53	27.00	2	03	21.6	29.611 494	0.30	1.13	4	57	45
	7	23	53	26.40	-2	03	28.6	29.595 363	0.30	1.13	4	53	49
	8	23	53	25.69	2	03	36.4	29.579 313	0.30	1.13	4	49	52
	9	23	53	24.86	2	03	45.0	29.563 350	0.30	1.13	4	45	55
	10	23	53	23.90	2	03	54.3	29.547 477	0.30	1.13	4	41	58
	11	23	53	22.84	2	04	04.4	29.531 701	0.30	1.13	4	38	01
	12	23	53	21.66	2	04	15.2	29.516 024	0.30	1.13	4	34	04
	13	23	53	20.36	-2	04	26.7	29.500 452	0.30	1.14	4	30	07
	14	23	53	18.96	2	04	38.9	29.484 991	0.30	1.14	4	26	10
	15	23	53	17.44	2	04	51.8	29.469 644	0.30	1.14	4	22	12
	16	23	53	15.81	2	05	05.5	29.454 416	0.30	1.14	4	18	15
	17	23	53	14.06	2	05	19.9	29.439 313	0.30	1.14	4	14	17
	18	23	53	12.20	2	05	35.0	29.424 338	0.30	1.14	4	10	19
	19	23	53	10.22	-2	05	50.8	29.409 498	0.30	1.14	4	06	21
	20	23	53	08.13	2	06	07.4	29.394 795	0.30	1.14	4	02	23
	21	23	53	05.93	2	06	24.7	29.380 236	0.30	1.14	3	58	25
	22	23	53	03.61	2	06	42.7	29.365 823	0.30	1.14	3	54	27
	23	23	53	01.19	2	07	01.3	29.351 562	0.30	1.14	3	50	29
	24	23	52	58.66	2	07	20.7	29.337 457	0.30	1.14	3	46	30
	25	23	52	56.02	-2	07	40.7	29.323 512	0.30	1.14	3	42	32
	26	23	52	53.28	2	08	01.4	29.309 731	0.30	1.14	3	38	33
	27	23	52	50.43	2	08	22.7	29.296 118	0.30	1.14	3	34	34
	28	23	52	47.49	2	08	44.6	29.282 678	0.30	1.14	3	30	35
	29	23	52	44.45	2	09	07.1	29.269 412	0.30	1.14	3	26	37
	30	23	52	41.31	2	09	30.2	29.256 327	0.30	1.15	3	22	37
	31	23	52	38.08	-2	09	54.0	29.243 424	0.30	1.15	3	18	38
Aug.	1	23	52	34.74	2	10	18.3	29.230 707	0.30	1.15	3	14	39
	2	23	52	31.31	2	10	43.3	29.218 180	0.30	1.15	3	10	40
	3	23	52	27.77	2	11	08.9	29.205 846	0.30	1.15	3	06	40
	4	23	52	24.14	2	11	35.1	29.193 709	0.30	1.15	3	02	41
	5	23	52	20.41	2	12	01.9	29.181 772	0.30	1.15	2	58	41
	6	23	52	16.59	-2	12	29.2	29.170 038	0.30	1.15	2	54	41
	7	23	52	12.67	2	12	57.1	29.158 512	0.30	1.15	2	50	42
	8	23	52	08.67	2	13	25.6	29.147 198	0.30	1.15	2	46	42
	9	23	52	04.59	2	13	54.5	29.136 098	0.30	1.15	2	42	42
	10	23	52	00.42	2	14	24.0	29.125 217	0.30	1.15	2	38	42
	11	23	51	56.17	2	14	54.0	29.114 559	0.30	1.15	2	34	42
	12	23	51	51.83	-2	15	24.4	29.104 127	0.30	1.15	2	30	41
	13	23	51	47.41	2	15	55.4	29.093 924	0.30	1.15	2	26	41
	14	23	51	42.91	2	16	26.9	29.083 955	0.30	1.15	2	22	41
	15	23	51	38.33	2	16	58.8	29.074 223	0.30	1.15	2	18	40
	16	23	51	33.67	-2	17	31.3	29.064 731	0.30	1.15	2	14	40

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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	51	33.67	-2	17	31.3	29.064 731	0.30	1.15	2	14	40
	17	23	51	28.93	2	18	04.2	29.055 483	0.30	1.15	2	10	39
	18	23	51	24.12	2	18	37.5	29.046 480	0.30	1.15	2	06	38
	19	23	51	19.23	2	19	11.3	29.037 728	0.30	1.15	2	02	37
	20	23	51	14.27	2	19	45.5	29.029 228	0.30	1.15	1	58	37
	21	23	51	09.24	2	20	20.1	29.020 982	0.30	1.15	1	54	36
	22	23	51	04.15	-2	20	55.1	29.012 995	0.30	1.15	1	50	35
	23	23	50	59.00	2	21	30.4	29.005 268	0.30	1.15	1	46	34
	24	23	50	53.79	2	22	06.1	28.997 804	0.30	1.16	1	42	33
	25	23	50	48.53	2	22	42.1	28.990 604	0.30	1.16	1	38	31
	26	23	50	43.21	2	23	18.3	28.983 672	0.30	1.16	1	34	30
	27	23	50	37.83	2	23	54.9	28.977 008	0.30	1.16	1	30	29
	28	23	50	32.41	-2	24	31.8	28.970 615	0.30	1.16	1	26	28
	29	23	50	26.93	2	25	09.0	28.964 494	0.30	1.16	1	22	26
	30	23	50	21.39	2	25	46.5	28.958 647	0.30	1.16	1	18	25
	31	23	50	15.81	2	26	24.3	28.953 077	0.30	1.16	1	14	23
Sept.	1	23	50	10.17	2	27	02.3	28.947 783	0.30	1.16	1	10	22
	2	23	50	04.49	2	27	40.6	28.942 768	0.30	1.16	1	06	20
	3	23	49	58.77	-2	28	19.1	28.938 035	0.30	1.16	1	02	19
	4	23	49	53.01	2	28	57.8	28.933 584	0.30	1.16	0	58	17
	5	23	49	47.21	2	29	36.7	28.929 418	0.30	1.16	0	54	15
	6	23	49	41.39	2	30	15.7	28.925 539	0.30	1.16	0	50	14
	7	23	49	35.53	2	30	54.9	28.921 948	0.30	1.16	0	46	12
	8	23	49	29.64	2	31	34.2	28.918 646	0.30	1.16	0	42	10
	9	23	49	23.73	-2	32	13.7	28.915 637	0.30	1.16	0	38	08
	10	23	49	17.78	2	32	53.3	28.912 920	0.30	1.16	0	34	07
	11	23	49	11.81	2	33	33.0	28.910 498	0.30	1.16	0	30	05
	12	23	49	05.82	2	34	12.8	28.908 372	0.30	1.16	0	26	03
	13	23	48	59.80	2	34	52.7	28.906 542	0.30	1.16	0	22	01
	14	23	48	53.77	2	35	32.7	28.905 010	0.30	1.16	0	17	59
	15	23	48	47.71	-2	36	12.8	28.903 777	0.30	1.16	0	13	57
	16	23	48	41.65	2	36	52.8	28.902 843	0.30	1.16	0	09	55
	17	23	48	35.57	2	37	32.9	28.902 209	0.30	1.16	0	05	53
	18	23	48	29.49	2	38	13.0	28.901 875	0.30	1.16	0	01	51
	19	23	48	23.41	2	38	53.0	28.901 842	0.30	1.16	23	53	47
	20	23	48	17.32	2	39	33.0	28.902 109	0.30	1.16	23	49	45
	21	23	48	11.24	-2	40	12.9	28.902 677	0.30	1.16	23	45	44
	22	23	48	05.17	2	40	52.7	28.903 545	0.30	1.16	23	41	42
	23	23	47	59.10	2	41	32.4	28.904 712	0.30	1.16	23	37	40
	24	23	47	53.04	2	42	12.0	28.906 179	0.30	1.16	23	33	38
	25	23	47	46.99	2	42	51.5	28.907 945	0.30	1.16	23	29	36
	26	23	47	40.95	2	43	30.9	28.910 008	0.30	1.16	23	25	34
	27	23	47	34.92	-2	44	10.1	28.912 369	0.30	1.16	23	21	32
	28	23	47	28.90	2	44	49.3	28.915 026	0.30	1.16	23	17	30
	29	23	47	22.90	2	45	28.2	28.917 978	0.30	1.16	23	13	28
	30	23	47	16.92	2	46	07.0	28.921 226	0.30	1.16	23	09	26
Oct.	1	23	47	10.96	-2	46	45.5	28.924 767	0.30	1.16	23	05	25

NEPTUNE, 2023
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	47	10.96	-2	46	45.5	28.924 767	0.30	1.16	23	05	25
	2	23	47	05.03	2	47	23.9	28.928 602	0.30	1.16	23	01	23
	3	23	46	59.14	2	48	01.9	28.932 730	0.30	1.16	22	57	21
	4	23	46	53.27	2	48	39.7	28.937 150	0.30	1.16	22	53	19
	5	23	46	47.44	2	49	17.3	28.941 861	0.30	1.16	22	49	18
	6	23	46	41.65	2	49	54.5	28.946 863	0.30	1.16	22	45	16
	7	23	46	35.89	-2	50	31.5	28.952 154	0.30	1.16	22	41	14
	8	23	46	30.17	2	51	08.2	28.957 733	0.30	1.16	22	37	13
	9	23	46	24.48	2	51	44.5	28.963 600	0.30	1.16	22	33	11
	10	23	46	18.84	2	52	20.6	28.969 751	0.30	1.16	22	29	10
	11	23	46	13.24	2	52	56.3	28.976 187	0.30	1.16	22	25	08
	12	23	46	07.69	2	53	31.7	28.982 905	0.30	1.16	22	21	07
	13	23	46	02.19	-2	54	06.7	28.989 903	0.30	1.16	22	17	06
	14	23	45	56.74	2	54	41.3	28.997 180	0.30	1.16	22	13	05
	15	23	45	51.35	2	55	15.5	29.004 733	0.30	1.15	22	09	03
	16	23	45	46.02	2	55	49.3	29.012 560	0.30	1.15	22	05	02
	17	23	45	40.75	2	56	22.6	29.020 658	0.30	1.15	22	01	01
	18	23	45	35.55	2	56	55.4	29.029 026	0.30	1.15	21	57	00
	19	23	45	30.41	-2	57	27.7	29.037 659	0.30	1.15	21	52	59
	20	23	45	25.35	2	57	59.6	29.046 555	0.30	1.15	21	48	58
	21	23	45	20.35	2	58	30.9	29.055 712	0.30	1.15	21	44	57
	22	23	45	15.43	2	59	01.7	29.065 125	0.30	1.15	21	40	57
	23	23	45	10.57	2	59	32.1	29.074 792	0.30	1.15	21	36	56
	24	23	45	05.79	3	00	01.9	29.084 710	0.30	1.15	21	32	55
	25	23	45	01.08	-3	00	31.3	29.094 874	0.30	1.15	21	28	55
	26	23	44	56.44	3	01	00.0	29.105 283	0.30	1.15	21	24	54
	27	23	44	51.88	3	01	28.3	29.115 932	0.30	1.15	21	20	54
	28	23	44	47.41	3	01	55.9	29.126 819	0.30	1.15	21	16	54
	29	23	44	43.02	3	02	23.0	29.137 940	0.30	1.15	21	12	54
	30	23	44	38.72	3	02	49.4	29.149 293	0.30	1.15	21	08	53
	31	23	44	34.51	-3	03	15.2	29.160 873	0.30	1.15	21	04	53
Nov.	1	23	44	30.40	3	03	40.4	29.172 679	0.30	1.15	21	00	53
	2	23	44	26.37	3	04	05.0	29.184 706	0.30	1.15	20	56	54
	3	23	44	22.44	3	04	28.9	29.196 951	0.30	1.15	20	52	54
	4	23	44	18.59	3	04	52.2	29.209 412	0.30	1.15	20	48	54
	5	23	44	14.84	3	05	14.9	29.222 084	0.30	1.15	20	44	55
	6	23	44	11.19	-3	05	36.9	29.234 963	0.30	1.15	20	40	55
	7	23	44	07.63	3	05	58.3	29.248 047	0.30	1.15	20	36	56
	8	23	44	04.17	3	06	19.0	29.261 330	0.30	1.14	20	32	57
	9	23	44	00.81	3	06	39.0	29.274 810	0.30	1.14	20	28	57
	10	23	43	57.55	3	06	58.3	29.288 481	0.30	1.14	20	24	58
	11	23	43	54.40	3	07	16.9	29.302 340	0.30	1.14	20	20	59
	12	23	43	51.36	-3	07	34.7	29.316 382	0.30	1.14	20	17	01
	13	23	43	48.42	3	07	51.9	29.330 603	0.30	1.14	20	13	02
	14	23	43	45.61	3	08	08.2	29.344 998	0.30	1.14	20	09	03
	15	23	43	42.90	3	08	23.8	29.359 562	0.30	1.14	20	05	05
	16	23	43	40.31	-3	08	38.6	29.374 291	0.30	1.14	20	01	06

NEPTUNE, 2023
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	43	40.31	-3	08	38.6	29.374 291	0.30	1.14	20	01	06
	17	23	43	37.83	3	08	52.7	29.389 179	0.30	1.14	19	57	08
	18	23	43	35.47	3	09	06.0	29.404 221	0.30	1.14	19	53	10
	19	23	43	33.22	3	09	18.5	29.419 413	0.30	1.14	19	49	12
	20	23	43	31.08	3	09	30.3	29.434 748	0.30	1.14	19	45	14
	21	23	43	29.06	3	09	41.4	29.450 223	0.30	1.14	19	41	16
	22	23	43	27.15	-3	09	51.6	29.465 832	0.30	1.14	19	37	18
	23	23	43	25.36	3	10	01.1	29.481 570	0.30	1.14	19	33	21
	24	23	43	23.69	3	10	09.8	29.497 433	0.30	1.14	19	29	23
	25	23	43	22.14	3	10	17.7	29.513 415	0.30	1.14	19	25	26
	26	23	43	20.71	3	10	24.7	29.529 511	0.30	1.13	19	21	29
	27	23	43	19.41	3	10	30.9	29.545 718	0.30	1.13	19	17	32
	28	23	43	18.24	-3	10	36.4	29.562 030	0.30	1.13	19	13	35
	29	23	43	17.19	3	10	40.9	29.578 442	0.30	1.13	19	09	38
	30	23	43	16.26	3	10	44.7	29.594 950	0.30	1.13	19	05	41
Dec.	1	23	43	15.45	3	10	47.7	29.611 550	0.30	1.13	19	01	44
	2	23	43	14.77	3	10	49.9	29.628 235	0.30	1.13	18	57	48
	3	23	43	14.21	3	10	51.2	29.645 002	0.30	1.13	18	53	51
	4	23	43	13.77	-3	10	51.8	29.661 846	0.30	1.13	18	49	55
	5	23	43	13.46	3	10	51.6	29.678 760	0.30	1.13	18	45	59
	6	23	43	13.27	3	10	50.5	29.695 741	0.30	1.13	18	42	03
	7	23	43	13.21	3	10	48.6	29.712 782	0.30	1.13	18	38	07
	8	23	43	13.27	3	10	45.9	29.729 879	0.30	1.13	18	34	12
	9	23	43	13.46	3	10	42.4	29.747 026	0.30	1.13	18	30	16
	10	23	43	13.79	-3	10	37.9	29.764 218	0.30	1.13	18	26	20
	11	23	43	14.24	3	10	32.7	29.781 449	0.30	1.12	18	22	25
	12	23	43	14.83	3	10	26.5	29.798 714	0.30	1.12	18	18	30
	13	23	43	15.55	3	10	19.6	29.816 007	0.29	1.12	18	14	35
	14	23	43	16.40	3	10	11.7	29.833 322	0.29	1.12	18	10	40
	15	23	43	17.38	3	10	03.1	29.850 654	0.29	1.12	18	06	45
	16	23	43	18.49	-3	09	53.6	29.867 996	0.29	1.12	18	02	50
	17	23	43	19.72	3	09	43.3	29.885 344	0.29	1.12	17	58	56
	18	23	43	21.07	3	09	32.2	29.902 691	0.29	1.12	17	55	01
	19	23	43	22.55	3	09	20.3	29.920 031	0.29	1.12	17	51	07
	20	23	43	24.15	3	09	07.6	29.937 360	0.29	1.12	17	47	13
	21	23	43	25.89	3	08	54.1	29.954 673	0.29	1.12	17	43	18
	22	23	43	27.74	-3	08	39.8	29.971 963	0.29	1.12	17	39	24
	23	23	43	29.73	3	08	24.6	29.989 226	0.29	1.12	17	35	31
	24	23	43	31.85	3	08	08.6	30.006 457	0.29	1.12	17	31	37
	25	23	43	34.09	3	07	51.8	30.023 651	0.29	1.12	17	27	43
	26	23	43	36.47	3	07	34.1	30.040 803	0.29	1.12	17	23	50
	27	23	43	38.96	3	07	15.7	30.057 908	0.29	1.11	17	19	56
	28	23	43	41.58	-3	06	56.5	30.074 962	0.29	1.11	17	16	03
	29	23	43	44.32	3	06	36.5	30.091 959	0.29	1.11	17	12	10
	30	23	43	47.18	3	06	15.8	30.108 895	0.29	1.11	17	08	17
	31	23	43	50.16	3	05	54.3	30.125 765	0.29	1.11	17	04	24
	32	23	43	53.26	-3	05	32.1	30.142 563	0.29	1.11	17	00	32

PLUTO, 2023

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	298 09 10.6	-2 18 47.5	34.677 38	July 5	299 02 30.0	-2 34 55.0	34.801 50
6	298 10 37.4	2 19 13.8	34.680 72	10	299 03 56.2	2 35 21.0	34.804 87
11	298 12 04.1	2 19 40.0	34.684 07	15	299 05 22.3	2 35 47.0	34.808 23
16	298 13 30.9	2 20 06.3	34.687 42	20	299 06 48.4	2 36 13.0	34.811 59
21	298 14 57.6	2 20 32.5	34.690 77	25	299 08 14.5	2 36 39.0	34.814 95
26	298 16 24.3	2 20 58.8	34.694 12	30	299 09 40.6	2 37 05.0	34.818 32
31	298 17 51.0	-2 21 25.0	34.697 47	Aug. 4	299 11 06.6	-2 37 31.0	34.821 68
Feb. 5	298 19 17.7	2 21 51.2	34.700 82	9	299 12 32.7	2 37 57.0	34.825 04
10	298 20 44.4	2 22 17.5	34.704 17	14	299 13 58.7	2 38 23.0	34.828 41
15	298 22 11.0	2 22 43.7	34.707 52	19	299 15 24.7	2 38 48.9	34.831 77
20	298 23 37.6	2 23 09.9	34.710 87	24	299 16 50.7	2 39 14.9	34.835 14
25	298 25 04.3	2 23 36.1	34.714 22	29	299 18 16.7	2 39 40.8	34.838 50
Mar. 2	298 26 30.9	-2 24 02.3	34.717 58	Sept. 3	299 19 42.6	-2 40 06.8	34.841 87
7	298 27 57.4	2 24 28.5	34.720 93	8	299 21 08.5	2 40 32.7	34.845 23
12	298 29 24.0	2 24 54.6	34.724 28	13	299 22 34.5	2 40 58.6	34.848 60
17	298 30 50.5	2 25 20.8	34.727 63	18	299 24 00.4	2 41 24.6	34.851 97
22	298 32 17.1	2 25 47.0	34.730 99	23	299 25 26.3	2 41 50.5	34.855 33
27	298 33 43.5	2 26 13.1	34.734 34	28	299 26 52.1	2 42 16.4	34.858 70
Apr. 1	298 35 10.0	-2 26 39.3	34.737 70	Oct. 3	299 28 18.0	-2 42 42.3	34.862 07
6	298 36 36.5	2 27 05.4	34.741 05	8	299 29 43.8	2 43 08.2	34.865 44
11	298 38 03.0	2 27 31.6	34.744 41	13	299 31 09.6	2 43 34.1	34.868 81
16	298 39 29.4	2 27 57.7	34.747 76	18	299 32 35.4	2 44 00.0	34.872 18
21	298 40 55.8	2 28 23.8	34.751 12	23	299 34 01.2	2 44 25.9	34.875 55
26	298 42 22.2	2 28 50.0	34.754 47	28	299 35 27.0	2 44 51.8	34.878 92
May 1	298 43 48.6	-2 29 16.1	34.757 83	Nov. 2	299 36 52.7	-2 45 17.7	34.882 29
6	298 45 15.0	2 29 42.2	34.761 19	7	299 38 18.4	2 45 43.5	34.885 66
11	298 46 41.3	2 30 08.3	34.764 55	12	299 39 44.2	2 46 09.4	34.889 03
16	298 48 07.6	2 30 34.4	34.767 90	17	299 41 09.8	2 46 35.2	34.892 40
21	298 49 34.0	2 31 00.5	34.771 26	22	299 42 35.5	2 47 01.1	34.895 77
26	298 51 00.3	2 31 26.5	34.774 62	27	299 44 01.2	2 47 26.9	34.899 14
31	298 52 26.6	-2 31 52.6	34.777 98	Dec. 2	299 45 26.8	-2 47 52.7	34.902 52
June 5	298 53 52.8	2 32 18.7	34.781 34	7	299 46 52.4	2 48 18.5	34.905 89
10	298 55 19.0	2 32 44.7	34.784 70	12	299 48 18.1	2 48 44.4	34.909 27
15	298 56 45.3	2 33 10.8	34.788 06	17	299 49 43.6	2 49 10.2	34.912 64
20	298 58 11.5	2 33 36.8	34.791 42	22	299 51 09.2	2 49 35.9	34.916 01
25	298 59 37.7	2 34 02.9	34.794 78	27	299 52 34.7	2 50 01.8	34.919 39
30	299 01 03.9	-2 34 28.9	34.798 14	32	299 54 00.3	-2 50 27.5	34.922 77
July 5	299 02 30.0	-2 34 55.0	34.801 50	37	299 55 25.8	-2 50 53.3	34.926 14

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

PLUTO, 2023

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	297	39	28.5	-2	15	07.6	July	5	299	31	37.7	-2	39	21.4
	6	297	49	02.5	2	15	28.0		10	299	24	46.4	2	39	54.1
	11	297	58	45.4	2	15	50.1		15	299	17	45.7	2	40	24.8
	16	298	08	33.3	2	16	13.8		20	299	10	39.5	2	40	53.5
	21	298	18	23.9	2	16	39.2		25	299	03	30.7	2	41	20.1
	26	298	28	12.7	2	17	06.2		30	298	56	25.0	2	41	44.5
	31	298	37	55.8	-2	17	34.9	Aug.	4	298	49	25.7	-2	42	06.9
Feb.	5	298	47	30.5	2	18	05.3		9	298	42	35.3	2	42	27.2
	10	298	56	52.4	2	18	37.4		14	298	35	59.2	2	42	45.4
	15	299	05	59.2	2	19	11.1		19	298	29	39.9	2	43	01.7
	20	299	14	48.0	2	19	46.4		24	298	23	41.5	2	43	16.0
	25	299	23	14.0	2	20	23.3		29	298	18	08.5	2	43	28.5
Mar.	2	299	31	15.5	-2	21	01.6	Sept.	3	298	13	01.9	-2	43	39.3
	7	299	38	49.1	2	21	41.4		8	298	08	26.0	2	43	48.5
	12	299	45	52.1	2	22	22.5		13	298	04	23.1	2	43	56.1
	17	299	52	23.6	2	23	04.9		18	298	00	55.0	2	44	02.5
	22	299	58	19.7	2	23	48.4		23	297	58	05.5	2	44	07.6
	27	300	03	38.8	2	24	33.0		28	297	55	55.6	2	44	11.8
Apr.	1	300	08	19.6	-2	25	18.5	Oct.	3	297	54	25.9	-2	44	15.0
	6	300	12	19.6	2	26	04.8		8	297	53	39.0	2	44	17.6
	11	300	15	39.0	2	26	51.7		13	297	53	34.3	2	44	19.7
	16	300	18	16.9	2	27	39.2		18	297	54	13.5	2	44	21.4
	21	300	20	11.1	2	28	27.0		23	297	55	37.4	2	44	23.0
	26	300	21	22.7	2	29	15.1		28	297	57	44.0	2	44	24.6
May	1	300	21	50.8	-2	30	03.2	Nov.	2	298	00	34.3	-2	44	26.4
	6	300	21	35.8	2	30	51.2		7	298	04	06.8	2	44	28.7
	11	300	20	39.7	2	31	39.0		12	298	08	20.1	2	44	31.5
	16	300	19	01.6	2	32	26.3		17	298	13	14.5	2	44	35.0
	21	300	16	43.3	2	33	13.1		22	298	18	47.1	2	44	39.4
	26	300	13	46.7	2	33	59.0		27	298	24	55.5	2	44	44.8
	31	300	10	12.5	-2	34	44.1	Dec.	2	298	31	38.8	-2	44	51.4
June	5	300	06	04.5	2	35	28.1		7	298	38	53.2	2	44	59.3
	10	300	01	24.5	2	36	10.8		12	298	46	37.1	2	45	08.7
	15	299	56	14.0	2	36	52.2		17	298	54	48.4	2	45	19.6
	20	299	50	37.2	2	37	32.0		22	299	03	22.1	2	45	32.1
	25	299	44	36.3	2	38	10.3		27	299	12	16.6	2	45	46.5
	30	299	38	14.8	-2	38	46.7		32	299	21	27.9	-2	46	02.6
July	5	299	31	37.7	-2	39	21.4		37	299	30	52.4	-2	46	20.7

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

PLUTO, 2023

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	20	00	52.13	+79.88	-22	50	08.7	-218.85	35.613 853	0.25	13	17
	6	20	01	33.07	79.89	22	48	33.4	220.30	35.639 525	0.25	12	58
	11	20	02	14.64	79.92	22	46	57.6	221.49	35.658 041	0.25	12	39
	16	20	02	56.58	79.91	22	45	21.7	222.67	35.669 292	0.25	12	20
	21	20	03	38.72	79.96	22	43	46.1	224.19	35.673 193	0.25	12	01
	26	20	04	20.74	80.00	22	42	12.2	225.43	35.669 718	0.25	11	42
	31	20	05	02.36	+80.03	-22	40	40.2	-226.94	35.658 945	0.25	11	23
Feb.	5	20	05	43.41	80.11	22	39	11.1	228.36	35.641 028	0.25	11	04
	10	20	06	23.56	80.15	22	37	45.9	229.54	35.616 142	0.25	10	45
	15	20	07	02.65	80.21	22	36	24.6	231.05	35.584 485	0.25	10	26
	20	20	07	40.50	80.33	22	35	08.4	232.39	35.546 281	0.25	10	07
	25	20	08	16.74	80.38	22	33	57.9	233.63	35.501 836	0.25	9	48
Mar.	2	20	08	51.27	+80.49	-22	32	53.4	-235.13	35.451 547	0.25	9	29
	7	20	09	23.85	80.60	22	31	56.1	236.26	35.395 841	0.25	9	10
	12	20	09	54.28	80.68	22	31	06.1	237.46	35.335 147	0.25	8	51
	17	20	10	22.51	80.82	22	30	23.7	238.88	35.269 904	0.25	8	32
	22	20	10	48.26	80.94	22	29	50.0	239.85	35.200 584	0.25	8	13
	27	20	11	11.41	81.07	22	29	24.7	241.13	35.127 741	0.25	7	53
Apr.	1	20	11	31.89	+81.23	-22	29	08.6	-242.22	35.051 971	0.25	7	34
	6	20	11	49.51	81.35	22	29	01.9	243.05	34.973 860	0.25	7	15
	11	20	12	04.27	81.50	22	29	04.4	244.19	34.893 973	0.25	6	55
	16	20	12	16.13	81.69	22	29	16.6	245.03	34.812 874	0.25	6	36
	21	20	12	24.91	81.82	22	29	38.4	245.77	34.731 170	0.25	6	16
	26	20	12	30.70	82.01	22	30	09.6	246.70	34.649 514	0.25	5	57
May	1	20	12	33.43	+82.19	-22	30	50.5	-247.19	34.568 545	0.25	5	37
	6	20	12	33.13	82.33	22	31	40.5	247.73	34.488 864	0.25	5	17
	11	20	12	29.93	82.55	22	32	39.2	248.38	34.411 031	0.26	4	58
	16	20	12	23.77	82.72	22	33	46.8	248.54	34.335 606	0.26	4	38
	21	20	12	14.76	82.90	22	35	02.2	248.98	34.263 180	0.26	4	18
	26	20	12	03.04	83.10	22	36	25.4	249.15	34.194 340	0.26	3	58
	31	20	11	48.67	+83.26	-22	37	55.8	-249.05	34.129 618	0.26	3	38
June	5	20	11	31.88	83.44	22	39	32.2	249.22	34.069 480	0.26	3	18
	10	20	11	12.82	83.64	22	41	14.4	248.98	34.014 349	0.26	2	58
	15	20	10	51.57	83.78	22	43	01.6	248.71	33.964 652	0.26	2	38
	20	20	10	28.44	83.97	22	44	52.7	248.53	33.920 818	0.26	2	18
	25	20	10	03.57	84.13	22	46	47.5	247.92	33.883 217	0.26	1	58
	30	20	09	37.21	+84.25	-22	48	44.5	-247.40	33.852 141	0.26	1	38
July	5	20	09	09.71	84.43	22	50	42.9	246.94	33.827 809	0.26	1	18
	10	20	08	41.17	84.54	22	52	42.3	246.05	33.810 404	0.26	0	58
	15	20	08	11.92	84.66	22	54	41.2	245.46	33.800 115	0.26	0	38
	20	20	07	42.23	84.79	22	56	39.2	244.60	33.797 084	0.26	0	18
	25	20	07	12.32	84.85	22	58	35.3	243.56	33.801 372	0.26	23	53
	30	20	06	42.58	+84.94	-23	00	28.2	-242.84	33.812 952	0.26	23	33
Aug.	4	20	06	13.25	85.04	23	02	17.9	241.76	33.831 735	0.26	23	13
	9	20	05	44.51	85.06	23	04	03.0	240.80	33.857 620	0.26	22	53
	14	20	05	16.73	85.13	23	05	42.9	239.96	33.890 494	0.26	22	33
	19	20	04	50.11	+85.14	-23	07	17.3	-238.78	33.930 169	0.26	22	13

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

PLUTO, 2023

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	20	04	50.11	+85.14	-23	07	17.3	-238.78	33.930 169	0.26	22	13
	24	20	04	24.92	85.13	23	08	45.1	237.87	33.976 370	0.26	21	53
	29	20	04	01.51	85.17	23	10	05.7	237.06	34.028 752	0.26	21	33
Sept.	3	20	03	39.94	85.14	23	11	19.2	235.96	34.086 941	0.26	21	13
	8	20	03	20.50	85.12	23	12	24.3	235.33	34.150 573	0.26	20	53
	13	20	03	03.39	85.10	23	13	21.5	234.47	34.219 245	0.26	20	33
	18	20	02	48.72	+85.01	-23	14	10.1	-233.63	34.292 480	0.26	20	13
	23	20	02	36.77	84.97	23	14	49.4	233.21	34.369 737	0.26	19	53
	28	20	02	27.61	84.92	23	15	19.9	232.53	34.450 440	0.26	19	33
Oct.	3	20	02	21.29	84.83	23	15	41.1	232.15	34.534 027	0.25	19	13
	8	20	02	17.99	84.78	23	15	53.1	231.92	34.619 953	0.25	18	54
	13	20	02	17.70	84.68	23	15	56.2	231.49	34.707 626	0.25	18	34
	18	20	02	20.50	+84.57	-23	15	49.8	-231.47	34.796 404	0.25	18	14
	23	20	02	26.48	84.52	23	15	34.3	231.54	34.885 618	0.25	17	55
	28	20	02	35.49	84.41	23	15	10.3	231.48	34.974 614	0.25	17	35
Nov.	2	20	02	47.59	84.34	23	14	37.3	231.93	35.062 793	0.25	17	16
	7	20	03	02.70	84.26	23	13	56.3	232.17	35.149 560	0.25	16	57
	12	20	03	20.72	84.14	23	13	07.4	232.52	35.234 293	0.25	16	37
	17	20	03	41.64	+84.09	-23	12	10.5	-233.30	35.316 355	0.25	16	18
	22	20	04	05.29	84.03	23	11	06.9	233.79	35.395 129	0.25	15	59
	27	20	04	31.49	83.94	23	09	56.3	234.63	35.470 066	0.25	15	39
Dec.	2	20	05	00.17	83.91	23	08	39.6	235.59	35.540 679	0.25	15	20
	7	20	05	31.06	83.84	23	07	17.7	236.32	35.606 484	0.25	15	01
	12	20	06	04.06	83.77	23	05	50.4	237.46	35.667 000	0.25	14	42
	17	20	06	39.00	+83.77	-23	04	18.8	-238.59	35.721 766	0.25	14	23
	22	20	07	15.54	83.72	23	02	43.6	239.61	35.770 392	0.25	14	04
	27	20	07	53.57	83.71	23	01	05.1	241.03	35.812 580	0.25	13	45
	32	20	08	32.80	83.71	22	59	24.7	242.17	35.848 082	0.25	13	26
	37	20	09	12.98	+83.67	-22	57	42.7	-243.40	35.876 660	0.25	13	07

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

MAJOR PLANETS, 2023
HELIOCENTRIC OSCULATING ORBITAL ELEMENTS
REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date	Julian Date 245/246	Inclina-tion i	Longitude Asc. Node Ω	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
				MERCURY				
		°	°	°		°		°
Dec'22 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
Feb 25	0000.5	7.0036	48.302	77.49289525	0.387 098	4.092 35	0.205 636	295.0202
Apr 6	0040.5	7.0036	48.302	77.49306922	0.387 099	4.092 33	0.205 636	98.7131
May 16	0080.5	7.0036	48.302	77.49324319	0.387 097	4.092 37	0.205 637	262.4071
Jun 25	0120.5	7.0036	48.301	77.49341717	0.387 098	4.092 34	0.205 637	66.1016
Aug 4	0160.5	7.0036	48.301	77.49359114	0.387 097	4.092 36	0.205 637	229.7938
Sep 13	0200.5	7.0036	48.301	77.49376511	0.387 097	4.092 36	0.205 637	33.4894
Oct 23	0240.5	7.0036	48.301	77.49393908	0.387 101	4.092 31	0.205 637	197.1805
Dec 2	0280.5	7.0036	48.301	77.49411305	0.387 097	4.092 36	0.205 637	0.8749
Jan'24 11	0320.5	7.0036	48.301	77.49428702	0.387 101	4.092 30	0.205 637	164.5675
Feb'24 20	0360.5	7.0035	48.301	77.494461	0.387 099	4.092 33	0.205 637	328.2599
				VENUS				
Dec'22 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
Feb 25	0000.5	3.3945	76.616	131.5647573	0.723 306	1.602 22	0.006 761	48.7948
Apr 6	0040.5	3.3945	76.615	131.5647619	0.723 324	1.602 16	0.006 761	112.8826
May 16	0080.5	3.3945	76.615	131.5647665	0.723 338	1.602 11	0.006 761	176.9678
Jun 25	0120.5	3.3945	76.615	131.5647712	0.723 339	1.602 11	0.006 761	241.0518
Aug 4	0160.5	3.3945	76.614	131.5647758	0.723 335	1.602 12	0.006 761	305.1361
Sep 13	0200.5	3.3945	76.614	131.5647804	0.723 338	1.602 11	0.006 761	9.2200
Oct 23	0240.5	3.3945	76.614	131.564785	0.723 348	1.602 08	0.006 761	73.3027
Dec 2	0280.5	3.3945	76.613	131.5647896	0.723 336	1.602 12	0.006 760	137.3859
Jan'24 11	0320.5	3.3945	76.613	131.5647942	0.723 306	1.602 22	0.006 760	201.4728
Feb'24 20	0360.5	3.3945	76.613	131.5647989	0.723 302	1.602 23	0.006 760	265.5631
				EARTH*				
Dec'22 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
Feb 25	0000.5	0.0030	174.817	103.0120296	0.999 976	0.985 64	0.016 699	154.2784
Apr 6	0040.5	0.0030	174.817	103.0123829	0.999 951	0.985 68	0.016 699	193.7057
May 16	0080.5	0.0031	174.817	103.0127362	0.999 961	0.985 67	0.016 699	233.1332
Jun 25	0120.5	0.0031	174.817	103.0130895	0.999 994	0.985 62	0.016 699	272.5586
Aug 4	0160.5	0.0031	174.816	103.0134429	1.000 022	0.985 58	0.016 699	311.9816
Sep 13	0200.5	0.0031	174.816	103.0137962	1.000 024	0.985 57	0.016 699	351.4041
Oct 23	0240.5	0.0031	174.816	103.0141495	1.000 011	0.985 59	0.016 699	30.8276
Dec 2	0280.5	0.0031	174.816	103.0145029	1.000 004	0.985 60	0.016 699	70.2522
Jan'24 11	0320.5	0.0031	174.815	103.0148562	1.000 006	0.985 60	0.016 699	109.6768
Feb'24 20	0360.5	0.0032	174.815	103.0152095	1.000 004	0.985 60	0.016 698	149.1010

* 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, 2023

HELIOCENTRIC OSCULATING ORBITAL ELEMENTS

REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date	Julian Date 245/246	Inclina-tion i	Longitude Asc. Node Ω	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
		MARS						
		°	°	°		°		°
Dec'22 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
Feb 25	0000.5	1.8478	49.490	336.1629874	1.523 715	0.524 02	0.093 422	106.4006
Apr 6	0040.5	1.8478	49.489	336.1634735	1.523 681	0.524 04	0.093 422	127.3617
May 16	0080.5	1.8478	49.489	336.1639595	1.523 628	0.524 07	0.093 422	148.3237
Jun 25	0120.5	1.8478	49.489	336.1644456	1.523 572	0.524 09	0.093 422	169.2872
Aug 4	0160.5	1.8478	49.488	336.1649316	1.523 532	0.524 12	0.093 422	190.2518
Sep 13	0200.5	1.8478	49.488	336.1654177	1.523 522	0.524 12	0.093 422	211.2171
Oct 23	0240.5	1.8478	49.488	336.1659037	1.523 549	0.524 11	0.093 422	232.1820
Dec 2	0280.5	1.8478	49.487	336.1663898	1.523 608	0.524 08	0.093 422	253.1456
Jan'24 11	0320.5	1.8478	49.487	336.1668758	1.523 684	0.524 04	0.093 422	274.1071
Feb'24 20	0360.5	1.8478	49.487	336.1673618	1.523 757	0.524 00	0.093 422	295.0665
		JUPITER						
Dec'22 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
Feb 25	0000.5	1.3028	100.505	14.38113843	5.203 358	0.083 08	0.048 536	16.9685
Apr 6	0040.5	1.3028	100.506	14.38137482	5.203 469	0.083 08	0.048 536	20.2909
May 16	0080.5	1.3028	100.506	14.38161122	5.203 576	0.083 07	0.048 536	23.6132
Jun 25	0120.5	1.3028	100.506	14.38184761	5.203 679	0.083 07	0.048 536	26.9353
Aug 4	0160.5	1.3028	100.506	14.38208401	5.203 777	0.083 07	0.048 536	30.2573
Sep 13	0200.5	1.3028	100.506	14.38232041	5.203 870	0.083 07	0.048 537	33.5790
Oct 23	0240.5	1.3028	100.507	14.38255681	5.203 956	0.083 06	0.048 537	36.9007
Dec 2	0280.5	1.3028	100.507	14.38279322	5.204 036	0.083 06	0.048 537	40.2222
Jan'24 11	0320.5	1.3028	100.507	14.38302962	5.204 109	0.083 06	0.048 537	43.5435
Feb'24 20	0360.5	1.3028	100.507	14.38326603	5.204 174	0.083 06	0.048 537	46.8648
		SATURN						
Dec'22 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
Feb 25	0000.5	2.4895	113.606	93.18841958	9.534 911	0.033 48	0.055 468	333.0074
Apr 6	0040.5	2.4895	113.606	93.18904029	9.534 760	0.033 48	0.055 467	334.3494
May 16	0080.5	2.4895	113.606	93.189661	9.534 610	0.033 48	0.055 467	335.6915
Jun 25	0120.5	2.4895	113.605	93.19028172	9.534 461	0.033 48	0.055 467	337.0335
Aug 4	0160.5	2.4895	113.605	93.19090243	9.534 314	0.033 48	0.055 466	338.3756
Sep 13	0200.5	2.4895	113.605	93.19152315	9.534 170	0.033 48	0.055 466	339.7176
Oct 23	0240.5	2.4895	113.604	93.19214387	9.534 029	0.033 49	0.055 466	341.0597
Dec 2	0280.5	2.4895	113.604	93.19276459	9.533 892	0.033 49	0.055 465	342.4018
Jan'24 11	0320.5	2.4895	113.604	93.19338531	9.533 759	0.033 49	0.055 465	343.7438
Feb'24 20	0360.5	2.4895	113.604	93.19400603	9.533 631	0.033 49	0.055 464	345.0858
		URANUS						
Dec'22 7	9920.5	0.7728	74.023	173.0257682	19.175 192	0.011 74	0.046 375	51.2933
Feb'23 21	0000.5	0.7728	74.023	173.0259637	19.175 103	0.011 74	0.046 375	52.2323
May 16	0080.5	0.7728	74.023	173.0261593	19.174 978	0.011 74	0.046 375	53.1712
Aug 4	0160.5	0.7728	74.023	173.0263548	19.174 816	0.011 74	0.046 375	54.1101
Oct 23	0240.5	0.7728	74.024	173.0265504	19.174 614	0.011 74	0.046 375	55.0491
Jan'24 11	0320.5	0.7728	74.024	173.0267459	19.174 371	0.011 74	0.046 375	55.9881
Mar'24 31	0400.5	0.7728	74.024	173.0269414	19.174 084	0.011 74	0.046 375	56.9272
		NEPTUNE						
Dec'22 7	9920.5	1.77000	131.783	48.12697229	30.082 946	0.005 97	0.009 457	355.0879
Feb'23 21	0000.5	1.77000	131.783	48.1270363	30.083 036	0.005 97	0.009 457	355.5675
May 16	0080.5	1.77001	131.783	48.1271003	30.083 070	0.005 97	0.009 457	356.0470
Aug 4	0160.5	1.77001	131.783	48.12716431	30.083 049	0.005 97	0.009 457	356.5264
Oct 23	0240.5	1.77001	131.783	48.12722831	30.082 976	0.005 97	0.009 457	357.0058
Jan'24 11	0320.5	1.77001	131.783	48.12729232	30.082 856	0.005 97	0.009 457	357.4851
Mar'24 31	0400.5	1.77001	131.783	48.12735633	30.082 692	0.005 97	0.009 457	357.9644

Distances are in astronomical units.

CENTRE OF MASS OF THE SOLAR SYSTEM, 2023

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	+90562528	-00099455	-02333156	+9055380	-0012118	-0234169
	10	90459374	+00729933	01979107	9045410	+0070556	0198875
	20	90342786	01555928	01626163	9034169	0152957	0163666
	30	90213144	02378378	01274356	9021678	0235069	0128547
Feb.	9	90070530	03196933	00923793	9007942	0316866	0093527
	19	89915204	04011098	00574668	8992978	0398315	0058619
Mar.	1	+89747546	+04820400	-00227193	+8976806	+0479384	-0023837
	11	89568063	05624464	+00118429	8959455	0560046	+0010804
	21	89377244	06422936	00462043	8940952	0640275	0045294
	31	89175706	07215365	00803363	8921330	0720041	0079615
Apr.	10	88964749	08001380	01142075	8900658	0799316	0113747
	20	88745873	08781629	01478348	8879014	0878126	0147695
	30	+88519747	+09557176	+01812675	+8856434	+0956515	+0181481
May	10	88286538	10328963	02145478	8832931	1034523	0215122
	20	88046155	11097785	02477140	8808504	1112181	0248634
	30	87798256	11864420	02808016	8783139	1189521	0282031
June	9	87542231	12629473	03138428	8756810	1266565	0315326
	19	87277188	13393287	03468563	8729476	1343323	0348525
	29	+87002255	+14155676	+03798339	+8701098	+1419777	+0381620
July	9	86717217	14916394	04127588	8671670	1495909	0414600
	19	86421822	15675743	04456460	8641183	1571725	0447469
	29	86115159	16433953	04785134	8609597	1647230	0480232
Aug.	8	85796127	17190731	05113590	8576861	1722402	0512886
	18	85463767	17945477	05441611	8542932	1797204	0545416
	28	+85117273	+18697327	+05768887	+8507775	+1871585	+0577804
Sept.	7	84756015	19445258	06094988	8471364	1945488	0610025
	17	84379522	20187934	06419353	8433680	2018838	0642048
	27	83987904	20923691	06741167	8394734	2091546	0673829
Oct.	7	83582321	21651202	07059735	8354590	2163539	0705331
	17	83163926	22369998	07374784	8313311	2234786	0736536
	27	+82733459	+23079718	+07686185	+8270940	+2305263	+0767436
Nov.	6	82291675	23779951	07993733	8227520	2374943	0798017
	16	81839431	24470396	08297279	8183100	2443805	0828269
	26	81377631	25150904	08596738	8137732	2511835	0858185
Dec.	6	80907048	25821497	08892105	8091460	2579028	0887762
	16	80428332	26482138	09183334	8044323	2645376	0916995
	26	+79942449	+27132666	+09470263	+7996376	+2710865	+0945873
	36	+79450823	+27773583	+09753014	+7947696	+2775515	+0974400

The heliocentric equatorial rectangular co-ordinates of the barycentre of the solar system referred to the mean equator and equinox of J 2023.5 are given by $\mathbf{r} = \mathbf{P}\mathbf{r_0}$, 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 2023.5 and J 2000.0 respectively.

PART - II

STARS

LONGITUDE AND LATITUDE OF STARS, 2023.5

MEAN PLACES FOR JULY 2^d.875 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	49	23.32	50.92	+0.025	-32	30	46.71	+0.050	-0.007
9	74	ι Ceti	3.56	1	14	41.13	50.43	-0.028	-10	01	17.57	+0.040	-0.028
82	674	φ Eridani	3.56	1	20	02.36	51.96	+0.110	-58	59	09.21	-0.020	-0.082
902	9072	ω Piscium	4.01	2	54	43.77	50.29	+0.095	+6	21	44.08	-0.080	-0.167
22	188	β Ceti	2.04	2	54	52.37	50.90	+0.242	-20	47	00.90	+0.020	-0.068
783	7957	η Cephei	3.43	5	00	42.69	49.82	+2.354	+71	46	57.77	+0.500	+0.368
156	1336	α Reticuli	3.35	7	51	01.44	54.94	+0.298	-78	02	23.66	+0.150	-0.015
869	8762	*o* Andromedae	3.62	8	06	18.09	49.44	+0.022	+43	45	02.90	+0.150	-0.017
848	8585	α Lacertae	3.77	8	28	07.69	49.27	+0.200	+53	17	26.91	+0.110	-0.070
7	39	γ Pegasi	2.83	9	29	01.22	50.09	+0.001	+12	36	02.10	+0.190	-0.011
40	334	η Ceti	3.45	12	05	51.53	50.71	+0.151	-16	07	08.00	+0.030	-0.213
803	8162	α Cephei	2.44	13	06	03.74	48.29	+0.340	+68	54	50.38	+0.150	-0.100
836	8465	ζ Cephei	3.35	14	17	09.70	48.69	+0.028	+61	08	53.18	+0.260	-0.008
1	15	α Andromedae*	2.06	14	38	08.77	49.93	+0.056	+25	40	48.43	+0.070	-0.207
47	402	θ Ceti	3.6	16	33	14.93	50.38	-0.163	-15	46	02.73	+0.130	-0.171
723	7310	δ Draconis	3.07	17	28	19.46	43.98	+0.757	+82	53	12.67	+0.230	-0.093
59	509	τ Ceti	3.5	18	08	21.58	49.33	-1.371	-24	48	18.37	+1.790	+1.463
890	8961	λ Andromedae	3.82v	18	36	42.20	49.32	-0.133	+43	46	27.20	-0.110	-0.441
1075	794	ι Eridani	4.11	19	06	16.51	51.57	+0.169	-51	42	49.59	+0.250	-0.095
71	585	ν Ceti	4	19	45	31.62	50.96	+0.134	-31	01	59.94	+0.280	-0.076
1033	361	ζ Piscium*	5.24	20	12	23.69	50.41	+0.112	-0	12	46.25	+0.250	-0.106
20	165	δ Andromedae	3.27	22	08	28.31	50.00	+0.092	+24	21	04.21	+0.250	-0.141
62	539	ζ Ceti	3.73	22	16	46.56	50.64	+0.025	-20	20	00.66	+0.340	-0.051
106	897	θ Eridani p	3.25	23	36	14.58	51.39	-0.051	-53	44	18.68	+0.450	+0.038
101	841	β Fornacis	4.46	26	34	01.32	51.35	+0.212	-45	51	13.64	+0.550	+0.103
1154	2015	δ Doradus	4.35	26	51	20.75	76.81	-0.279	-88	15	07.21	+0.490	+0.030
50	437	η Piscium	3.62	27	08	38.99	50.25	+0.024	+5	22	44.94	+0.450	-0.015
33	269	μ Andromedae	3.87	29	30	11.78	50.02	+0.173	+29	39	36.81	+0.450	-0.038
42	337	β Andromedae	2.06	30	43	59.37	50.04	+0.126	+25	56	38.28	+0.330	-0.178
863	8694	ι Cephei	3.52	33	33	44.44	48.53	-0.304	+62	37	04.19	+0.530	-0.017
66	553	β Arietis*	2.64	34	17	53.69	50.23	+0.051	+8	29	17.81	+0.420	-0.138
1085	919	τ^5 Eridani	4.09	34	51	48.87	50.70	-0.198	-38	54	14.62	+0.570	+0.001
17	153	ζ Cassiopeiae	3.66	35	23	28.81	49.58	+0.016	+44	43	17.96	+0.560	-0.018
2	21	β Cassiopeiae	2.27	35	26	42.29	49.84	+0.462	+51	12	49.89	+0.100	-0.472
809	8238	β Cephei	3.23	35	52	04.71	48.17	+0.028	+71	09	17.00	+0.570	-0.008
64	544	α Trianguli	3.41	37	11	16.78	50.00	-0.079	+16	48	04.02	+0.380	-0.223
91	779	δ Ceti	4.07	37	54	01.11	50.50	+0.013	-14	27	34.88	+0.600	-0.008
74	617	α Arietis	2	37	59	28.40	50.30	+0.130	+9	57	57.10	+0.400	-0.204
21	168	α Cassiopeiae	2.23	38	06	35.57	49.58	+0.036	+46	37	26.05	+0.560	-0.056
171	1465	α Doradus	3.27	38	10	00.50	53.03	+0.155	-74	34	47.72	+0.580	-0.031
104	874	η Eridani	3.89	39	04	45.57	50.62	+0.008	-24	32	46.08	+0.390	-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, 2023.5

MEAN PLACES FOR JULY $2^d.875$ 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	51.47	50.18	+0.134	+20	34	56.48	+0.580	-0.091
79	664	γ Trianguli	4.01	43	50	45.27	50.10	+0.028	+18	57	00.58	+0.610	-0.064
32	264	γ Cassiopeiae	var.	44	15	26.23	49.59	+0.027	+48	49	01.52	+0.660	-0.019
73	603	γ Andromed. p	2.26	44	33	10.24	49.98	+0.024	+27	48	29.25	+0.620	-0.065
107	911	α Ceti	2.53	44	38	55.23	50.41	-0.032	-12	35	01.46	+0.610	-0.072
155	1326	α Horologii	3.86	46	09	19.45	51.38	-0.073	-61	43	47.49	+0.490	-0.211
48	403	δ Cassiopeiae	2.68	48	15	30.47	50.00	+0.323	+46	24	16.53	+0.520	-0.202
127	1084	ε Eridani	3.73	48	29	24.62	49.56	-1.054	-27	42	41.22	+1.010	+0.280
100	838	41 Arietis*	3.63	48	31	54.03	50.22	+0.029	+10	27	04.69	+0.590	-0.132
135	1136	δ Eridani	3.54	51	11	31.43	50.72	+0.113	-28	40	08.31	+1.500	+0.744
121	1030	*o* Tauri	3.6	51	29	29.95	50.30	-0.084	-9	19	55.50	+0.700	-0.059
123	1038	ξ Tauri	3.74	52	14	27.25	50.43	+0.049	-8	47	46.98	+0.710	-0.052
212	1922	β Doradus	3.48v	52	28	12.58	56.58	+0.072	-85	02	29.76	+0.780	+0.007
149	1231	γ Eridani	2.95	54	11	49.50	50.67	+0.039	-33	12	01.11	+0.660	-0.123
63	542	ε Cassiopeiae	3.38	55	05	25.42	49.77	+0.024	+47	33	02.36	+0.760	-0.034
109	921	ρ Persei	var.	55	14	21.11	50.21	+0.099	+20	34	35.00	+0.650	-0.139
1129	1502	α Caeli	4.45	56	28	36.96	50.90	-0.346	-62	59	08.54	+0.770	-0.032
111	936	β Persei	var.	56	29	43.10	50.10	+0.003	+22	25	52.49	+0.800	-0.002
103	854	τ Persei	3.95	58	14	20.93	49.98	-0.003	+34	22	26.38	+0.820	-0.005
99	834	η Persei	3.76	59	01	45.04	49.97	+0.013	+37	29	04.23	+0.800	-0.019
136	1142	17 Tauri	3.7	59	44	24.57	50.27	+0.009	+4	11	32.29	+0.780	-0.049
170	1464	ν^2 Eridani	3.82	60	12	53.05	50.77	-0.076	-51	48	51.96	+0.830	-0.002
151	1251	ν Tauri	3.91	60	14	52.12	50.41	+0.005	-14	26	56.14	+0.830	-0.004
139	1165	η Tauri*	2.87	60	19	14.31	50.27	+0.008	+4	03	12.23	+0.780	-0.049
108	915	γ Persei	2.93	60	20	55.95	50.00	-0.002	+34	31	58.78	+0.820	-0.004
893	8974	γ Cephei	3.21	60	25	14.04	49.66	+0.268	+64	40	24.50	+0.960	+0.119
150	1239	λ Tauri	3.47v	60	57	46.60	50.34	-0.009	-7	57	25.45	+0.830	-0.011
120	1017	α Persei	1.79	62	24	31.18	50.08	+0.018	+30	07	41.31	+0.820	-0.030
144	1203	ζ Persei	2.85	63	27	07.01	50.23	+0.004	+11	20	10.57	+0.840	-0.011
134	1135	ν Persei	3.77	64	09	03.27	50.12	-0.015	+22	09	23.27	+0.860	+0.002
131	1122	δ Persei	3.01	65	07	47.85	50.13	+0.021	+27	18	15.87	+0.830	-0.040
148	1228	ξ Persei	4.04	65	18	01.72	50.20	+0.002	+14	56	48.13	+0.870	0.000
147	1220	ε Persei	2.89	66	00	20.93	50.19	+0.013	+19	07	02.17	+0.840	-0.029
159	1346	γ Tauri	3.65	66	08	05.58	50.44	+0.110	-5	43	46.79	+0.830	-0.044
162	1373	δ Tauri	3.76	67	11	59.05	50.42	+0.101	-3	58	00.84	+0.840	-0.046
164	1409	ε Tauri	3.54	68	47	38.49	50.41	+0.100	-2	33	52.49	+0.830	-0.054
168	1457	α Tauri*	0.85	70	07	04.04	50.36	+0.036	-5	27	56.39	+0.690	-0.197
1134	1543	π^3 Orionis	3.19	72	15	22.89	50.84	+0.481	-15	22	53.39	+0.860	-0.045
186	1654	ε Leporis	3.19	72	23	04.96	50.56	+0.021	-44	57	43.64	+0.830	-0.076
179	1552	π^4 Orionis	3.69	72	25	45.51	50.37	-0.001	-16	46	08.07	+0.900	+0.001
180	1567	π^5 Orionis	3.72	72	49	09.51	50.38	+0.000	-20	00	07.52	+0.910	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, 2023.5

MEAN PLACES FOR JULY 2^d.875 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	36	13.16	50.28	-0.116	-27	51	33.12	+0.850	-0.071
1144	1702	μ Leporis	3.31v	75	43	23.80	50.50	+0.051	-39	02	50.06	+0.890	-0.030
695	6927	χ Draconis	3.57	76	13	07.78	43.16	+3.501	+83	34	19.15	+1.080	-0.501
181	1577	ι Aurigae	2.69	76	58	03.66	50.27	+0.001	+10	27	26.70	+0.900	-0.018
194	1713	β Orionis	0.12	77	09	29.28	50.40	0.000	-31	07	11.09	+0.920	-0.001
195	1735	τ Orionis	3.6	78	10	32.14	50.37	-0.018	-29	50	04.78	+0.910	-0.007
1137	1612	ζ Aurigae	3.75	78	57	41.86	50.26	+0.007	+18	12	18.73	+0.910	-0.023
183	1605	ε Aurigae	var.	79	10	10.50	50.24	-0.001	+20	56	50.65	+0.930	-0.004
185	1641	η Aurigae	3.17	79	46	28.31	50.28	+0.024	+18	17	11.17	+0.850	-0.070
204	1829	β Leporis	2.84	80	00	03.08	50.40	-0.015	-43	54	43.46	+0.840	-0.088
201	1790	γ Orionis	1.64	81	16	29.05	50.31	-0.010	-16	48	47.19	+0.910	-0.013
178	1542	α Camelopardi	4.29	81	18	27.79	50.20	+0.001	+43	25	19.25	+0.940	+0.006
182	1603	β Camelopardi	4.03	81	35	45.23	50.21	-0.010	+37	26	02.39	+0.920	-0.015
207	1865	α Leporis	2.58	81	42	32.33	50.38	+0.001	-41	03	17.02	+0.940	+0.002
193	1708	α Aurigae	0.08	82	11	11.16	50.30	+0.046	+22	51	52.48	+0.510	-0.429
215	1956	α Columbae	2.64	82	29	52.28	50.44	+0.009	-57	22	20.42	+0.910	-0.027
206	1852	δ Orionis	2.23	82	43	29.41	50.34	+0.002	-22	57	09.24	+0.940	-0.002
202	1791	β Tauri	1.65	82	54	11.88	50.31	+0.012	+5	23	13.18	+0.760	-0.176
209	1899	ι Orionis	2.77	83	19	33.06	50.33	+0.000	-29	11	48.93	+0.940	+0.001
210	1903	ε Orionis	1.7	83	47	31.09	50.33	+0.001	-24	30	12.06	+0.930	-0.002
(GC)	1879	λ Orionis*	3.56	84	02	06.50	50.31	-0.001	-13	21	58.99	+0.940	-0.002
211	1910	ζ Tauri	3	85	06	46.50	50.29	+0.000	-2	11	33.74	+0.920	-0.021
217	1983	γ Leporis	3.6	85	10	17.24	49.90	-0.439	-45	49	03.00	+0.580	-0.359
219	1998	ζ Leporis	3.55	86	18	52.05	50.29	-0.020	-38	12	45.95	+0.940	0.000
220	2004	κ Orionis	2.06	86	43	36.78	50.31	+0.002	-33	04	03.44	+0.940	-0.002
223	2040	β Columbae	3.12	86	44	54.78	50.45	+0.136	-59	10	26.06	+1.330	+0.400
222	2035	δ Leporis	3.81	87	29	50.41	50.59	+0.301	-44	17	53.82	+0.280	-0.653
907	424	α Ursae Mins.	2.02	88	53	47.56	50.38	+0.038	+66	06	15.38	+0.890	-0.035
224	2061	α Orionis*	var.	89	04	58.89	50.31	+0.027	-16	01	26.05	+0.940	+0.009
226	2085	η Leporis	3.71	89	13	40.08	50.22	-0.052	-37	35	58.62	+1.080	+0.140
229	2120	η Columbae	3.96	89	56	22.20	50.27	+0.055	-66	15	04.53	+0.920	-0.014
227	2088	β Aurigae	1.9	90	14	18.13	50.25	-0.062	+21	30	40.52	+0.940	+0.000
225	2077	δ Aurigae	3.72	90	14	55.38	50.42	+0.095	+30	50	51.72	+0.810	-0.125
1168	2219	κ Aurigae	4.35	93	41	33.28	50.24	-0.066	+6	06	17.87	+0.660	-0.264
241	2286	μ Geminorum	2.88	95	37	49.98	50.36	+0.059	-0	49	04.22	+0.820	-0.109
244	2298	8ε Monocerotis	4.44	96	34	58.31	50.23	-0.019	-18	42	51.97	+0.940	+0.010
1173	2343	ν Geminorum	4.15	97	07	50.33	50.28	-0.007	-3	03	12.44	+0.910	-0.014
243	2294	β Canis Maj.	1.98	97	30	55.92	50.14	-0.008	-41	15	02.62	+0.920	0.000
240	2282	ζ Canis Maj.	3.02	97	42	18.36	50.09	+0.015	-53	22	10.89	+0.920	+0.003
251	2421	γ Geminorum	1.93	99	25	59.48	50.32	+0.045	-6	44	23.25	+0.880	-0.039
254	2473	ε Geminorum	2.98	100	16	01.51	50.30	-0.005	+2	04	22.13	+0.900	-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, 2023.5

MEAN PLACES FOR JULY 2^{d}.875 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 27 06.82	50.34	+0.003	+11 01 58.02	+0.860	-0.048
256	2484	ξ Geminorum	3.36	101 32 12.06	50.16	-0.101	-10 06 09.35	+0.710	-0.200
257	2491	α Canis Maj cg	-1.46	104 24 18.95	49.52	-0.552	-39 36 37.96	-0.360	-1.256
245	2326	α Carinae	-0.72	105 17 06.89	49.24	+0.075	-75 49 15.10	+0.920	+0.024
269	2650	ζ Geminorum	3.79v	105 19 06.27	50.28	-0.009	-2 02 09.52	+0.890	-0.002
252	2451	ν Puppis	3.17	107 28 25.23	49.59	+0.008	-66 04 17.08	+0.880	-0.006
279	2777	δ Geminorum	3.53	108 50 50.66	50.27	-0.024	-0 10 32.52	+0.850	-0.016
1180	2538	κ Canis Maj.	3.96	108 53 33.54	49.79	-0.013	-55 08 40.98	+0.880	+0.003
277	2763	λ Geminorum	3.58	109 06 24.18	50.22	-0.042	-5 37 57.70	+0.830	-0.043
282	2821	ι Geminorum	3.79	109 17 05.95	50.22	-0.109	+5 45 37.51	+0.770	-0.103
1187	2714	22 δ Monocerotis	4.15	109 43 20.49	50.15	-0.002	-21 44 31.83	+0.870	+0.005
287	2891	α Gemino. *Cg**	1.95	110 34 05.29	50.21	-0.155	+10 05 52.75	+0.740	-0.126
268	2618	ε Canis Maj.	1.5	111 05 22.30	49.83	+0.006	-51 21 26.71	+0.860	+0.003
270	2653	*o*^{2} Canis Maj.	3.02	111 19 46.53	49.90	-0.007	-46 07 39.44	+0.860	+0.002
1183	2646	σ Canis Maj.	3.47	111 52 57.62	49.83	-0.009	-50 13 23.09	+0.860	+0.004
285	2845	β Canis Min.	2.9	112 31 09.69	50.16	-0.047	-13 29 05.26	+0.800	-0.046
317	3323	*o* Ursae Maj.	3.36	113 19 28.40	50.52	-0.121	+40 14 42.67	+0.700	-0.145
295	2990	β Geminorum	1.14	113 32 24.36	49.73	-0.614	+6 41 09.09	+0.690	-0.158
273	2693	δ Canis Maj.	1.86	113 43 21.39	49.82	-0.006	-48 27 01.74	+0.840	+0.004
294	2985	κ Geminorum	3.57	113 59 38.31	50.30	-0.024	+3 04 51.04	+0.780	-0.057
291	2943	α C. Min. *cg*	0.38	116 06 35.32	49.63	-0.541	-16 01 27.60	-0.300	-1.132
263	2553	τ Puppis	2.93	118 03 02.57	48.94	+0.188	-72 51 03.86	+0.750	-0.056
293	2970	26 α Monocerotis	3.93	119 36 27.83	49.92	-0.078	-30 27 04.46	+0.760	-0.033
283	2827	η Canis Maj.	2.45	119 51 45.31	49.68	-0.008	-50 36 22.36	+0.800	+0.004
278	2773	π Puppis	2.7	120 37 33.46	49.44	-0.019	-58 31 20.84	+0.790	+0.002
335	3569	ι Ursae Maj.	3.14	123 07 35.76	50.21	-0.399	+29 34 30.83	+0.400	-0.359
341	3594	κ Ursae Maj.	3.6	124 15 57.59	50.59	-0.015	+28 58 53.40	+0.690	-0.062
312	3249	β Cancri	3.52	124 35 06.33	50.16	-0.032	-10 17 08.16	+0.700	-0.058
321	3366	η Cancri	5.33	125 44 09.01	50.28	-0.035	+1 34 23.99	+0.680	-0.054
1204	3045	ξ Puppis	3.34	126 22 04.59	49.71	-0.003	-44 56 13.84	+0.730	-0.003
368	3888	*ν* Ursae Maj.	3.8	126 35 46.43	50.58	-0.261	+42 39 10.44	+0.460	-0.269
328	3475	ι Cancri	4.02	126 40 28.91	50.39	-0.013	+10 25 42.60	+0.680	-0.047
358	3775	θ Ursae Maj.	3.17	127 35 18.43	49.89	-0.820	+34 53 33.56	-0.140	-0.862
1228	3449	γ Cancri	4.66	127 51 58.52	50.24	-0.092	+3 11 32.30	+0.650	-0.066
1194	2878	ρ Puppis	3.25	129 00 46.79	48.78	-0.262	-63 46 16.69	+0.860	+0.157
326	3461	δ Cancri*	3.94	129 03 02.05	50.33	+0.043	+0 04 40.43	+0.480	-0.225
1223	3410	δ Hydrae	4.16	130 37 54.41	50.09	-0.064	-12 23 26.06	+0.660	-0.024
433	4434	λ Draconis	3.84	130 39 55.12	51.26	-0.026	+57 14 35.14	+0.650	-0.040
1224	3418	σ Hydrae	4.44	131 32 14.81	50.11	-0.013	-14 35 59.61	+0.650	-0.022
308	3185	ρ Puppis	2.81	131 42 51.22	49.55	-0.128	-43 16 04.14	+0.690	+0.023
352	3705	α Lyncis	3.13	132 10 12.15	50.29	-0.227	+17 57 56.74	+0.610	-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, 2023.5

MEAN PLACES FOR JULY 2^{d}.875 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	32	21.31	50.36	0.000	+5	25	33.52	+0.650	+0.005
550	5563	β Ursae Min.	2.08	133	39	18.36	52.47	-0.044	+72	59	22.04	+0.620	-0.031
337	3572	α Cancri	4.25	133	58	12.05	50.28	+0.041	-5	04	42.69	+0.620	-0.020
334	3547	ζ Hydrae	3.11	134	54	10.38	50.07	-0.101	-10	58	03.76	+0.620	-0.014
417	4301	α Ursae Maj.	1.79	135	31	40.94	51.03	-0.087	+49	40	52.81	+0.500	-0.125
(329)	3482	ε Hydrae m*	3.38	136	24	51.66	49.76	-0.228	-23	26	06.91	+0.510	-0.105
472	4787	κ Draconis	3.87v	136	35	19.39	51.53	-0.090	+61	45	49.92	+0.570	-0.042
306	3165	ζ Puppis	2.25	138	52	29.14	49.05	-0.057	-58	20	45.58	+0.590	0.000
416	4295	β Ursae Maj.	2.37	139	45	57.55	51.11	+0.071	+45	08	06.87	+0.650	+0.073
383	4033	λ Ursae Maj.	3.45	139	52	42.91	50.57	-0.155	+29	53	11.17	+0.480	-0.103
347	3665	θ Hydrae	3.88	140	37	03.60	50.34	+0.224	-13	03	07.60	+0.300	-0.255
367	3873	ε Leonis	2.98	141	02	00.05	50.39	-0.040	+9	43	00.88	+0.530	-0.026
386	4069	μ Ursae Maj.	3.05	141	33	50.38	50.62	-0.101	+28	59	59.16	+0.550	-0.003
371	3905	μ Leonis	3.88	141	45	27.66	50.28	-0.188	+12	20	58.93	+0.420	-0.127
569	5735	γ Ursae Min.	3.05	141	56	08.52	53.12	-0.080	+75	14	33.67	+0.530	-0.019
262	2550	α Pictoris	3.27	144	24	33.43	41.93	-1.938	-83	02	14.28	+0.660	+0.148
365	3852	*o* Leonis	3.52	144	34	27.88	50.13	-0.122	-3	45	22.20	+0.430	-0.081
327	3468	α Pyxidis	3.68	146	49	32.00	49.35	-0.022	-48	55	17.02	+0.490	+0.006
354	3748	α Hydrae	1.98	147	36	22.53	49.93	-0.026	-22	22	51.02	+0.490	+0.026
309	3207	γ^2 Velorum	1.78	147	40	20.01	48.58	-0.015	-64	27	45.91	+0.470	+0.004
384	4031	ζ Leonis	3.44	147	53	40.08	50.49	+0.020	+11	51	59.25	+0.460	0.000
1250	3845	ι Hydrae	3.91	147	58	11.68	50.16	+0.070	-14	16	34.15	+0.420	-0.044
379	3975	η Leonis	3.52	148	14	01.12	50.37	-0.001	+4	52	01.51	+0.460	-0.001
420	4335	ψ Ursae Maj.	3.01	149	08	34.68	50.83	-0.054	+35	32	19.41	+0.390	-0.055
380	3982	α Leonis*	1.35	150	09	21.42	50.07	-0.235	+0	27	56.16	+0.350	-0.082
447	4554	γ Ursae Maj.	2.44	150	48	32.22	51.30	+0.104	+47	08	35.54	+0.490	+0.065
303	3117	χ Carinae	3.47	151	02	55.77	47.84	-0.105	-70	19	31.43	+0.420	+0.001
456	4660	δ Ursae Maj.	3.31	151	23	50.86	51.48	+0.119	+51	39	30.34	+0.490	+0.074
364	3849	κ Hydrae	5.06	153	00	12.86	49.85	-0.020	-26	35	54.76	+0.360	-0.028
1243	3718	θ Pyxidis	4.72	153	23	06.65	49.59	-0.008	-39	02	00.15	+0.380	-0.012
441	4518	χ Ursae Maj.	3.71	153	59	23.33	50.88	-0.177	+41	32	40.93	+0.330	-0.048
396	4133	ρ Leonis	3.85	156	43	01.94	50.29	-0.005	+0	09	02.37	+0.320	-0.005
425	4377	ν Ursae Maj.	3.48	156	58	59.26	50.68	-0.040	+26	09	48.59	+0.340	+0.014
521	5291	α Draconis	3.65	157	47	25.73	52.20	-0.111	+66	21	45.95	+0.280	-0.037
1261	3970	ν^2 Hydrae	4.6	158	39	05.98	49.88	-0.045	-23	10	37.15	+0.310	+0.003
483	4905	ε Ursae Maj.	1.77	159	16	00.64	51.69	+0.150	+54	19	12.40	+0.360	+0.070
381	3994	λ Hydrae	3.61	159	41	34.88	49.77	-0.165	-22	00	51.08	+0.130	-0.159
1270	4116	δ Sextantis	5.21	160	26	02.73	50.08	-0.040	-11	20	42.57	+0.240	-0.031
345	3634	λ Velorum	2.21	161	30	40.90	48.92	-0.040	-55	52	12.30	+0.260	+0.001
422	4357	δ Leonis*	2.56	161	38	48.74	50.72	+0.188	+14	20	01.93	+0.190	-0.062
423	4359	θ Leonis	3.34	163	45	06.03	50.43	-0.025	+9	40	27.33	+0.120	-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, 2023.5

MEAN PLACES FOR JULY 2^{d}.875 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	03	18.48	48.14	-0.073	-66	16	33.11	+0.200	+0.001
389	4094	μ Hydrae	3.81	165	21	46.10	49.78	-0.093	-24	40	18.46	+0.070	-0.125
497	5054	ζ Ursae Maj. pr	2.27	166	02	03.09	51.86	+0.188	+56	22	47.51	+0.260	+0.067
1304	4527	93 Leonis*	4.53v	169	18	09.54	50.44	-0.140	+17	18	33.21	+0.070	-0.065
410	4232	ν Hydrae	3.11	170	41	35.40	49.92	+0.004	-21	47	46.97	+0.330	+0.221
444	4534	β Leonis	2.14	171	56	37.67	50.09	-0.417	+12	15	54.13	-0.220	-0.306
392	4104	α Antliae	4.25	172	45	58.27	49.49	-0.089	-37	25	39.27	+0.050	-0.025
315	3307	ε Carinae	1.86	173	26	50.14	47.20	-0.093	-72	40	47.82	+0.060	-0.012
1283	4287	α Crateris	4.08	174	00	47.28	49.39	-0.512	-22	43	00.34	-0.020	-0.074
485	4915	α CVn sq	2.9	174	53	44.29	50.78	-0.302	+40	07	14.19	-0.020	-0.069
426	4382	δ Crateris	3.56	177	00	46.70	49.80	-0.206	-17	34	18.09	+0.140	+0.139
509	5191	η Ursae Maj.	1.86	177	15	52.90	51.45	-0.156	+54	23	14.50	-0.080	-0.083
445	4540	β Virginis	3.61	177	29	51.65	51.10	+0.789	+0	41	39.86	+0.050	+0.047
353	3734	κ Velorum	2.5	179	12	50.60	48.37	-0.027	-63	43	18.99	-0.030	0.000
531	5404	θ Bootis	4.05	182	56	41.74	52.07	+0.148	+60	06	19.59	-0.550	-0.456
639	6396	ζ Draconis	3.17	183	44	24.36	60.17	-0.288	+84	45	39.58	-0.120	-0.013
361	3803	N Velorum	3.13	184	32	07.51	48.31	-0.056	-64	14	20.76	-0.130	-0.020
460	4689	η Virginis	3.89	184	37	51.98	50.29	-0.051	+2	35	19.64	-0.150	-0.042
492	4983	β Com	4.26	184	41	13.69	49.57	-1.319	+32	30	51.75	+0.310	+0.429
571	5744	ι Draconis	3.29	185	17	11.19	52.95	-0.059	+71	05	34.84	-0.120	+0.004
351	3699	ι Carinae	2.25	185	38	49.99	48.05	-0.048	-67	07	01.26	-0.140	-0.011
1326	4828	ρ Virginis	4.88	185	50	35.17	50.63	+0.116	+13	32	31.43	-0.180	-0.049
375	3940	φVelorum	3.54	186	16	10.67	48.67	-0.019	-59	57	04.01	-0.150	-0.005
434	4450	ξ Hydrae	3.54	188	18	47.91	49.53	-0.193	-31	36	00.39	-0.310	-0.131
488	4932	ε Virginis	2.83	190	16	03.68	50.30	-0.269	+16	12	12.84	-0.290	-0.090
457	4662	γ Corvi	2.59	191	03	07.57	49.90	-0.161	-14	30	07.38	-0.260	-0.045
484	4910	δ Virginis	3.38	191	47	13.06	50.02	-0.415	+8	36	39.63	-0.460	-0.232
453	4630	ε Corvi	3	191	59	31.74	49.90	-0.074	-19	40	28.37	-0.260	-0.018
475	4813	χ Virginis	4.66	192	28	54.65	50.18	-0.060	-3	28	09.90	-0.290	-0.052
465	4757	δ Corvi*	2.95	193	46	42.59	49.96	-0.140	-12	11	55.18	-0.480	-0.211
319	3347	β Volantis	3.77	195	29	34.17	47.37	+0.547	-75	35	12.56	-0.370	-0.082
471	4786	β Corvi	2.65	197	41	43.73	50.03	+0.026	-18	02	45.97	-0.370	-0.048
535	5435	γ Bootis	3.03	197	59	35.92	51.06	-0.268	+49	33	03.24	-0.250	+0.079
513	5235	η Bootis	2.68	199	40	01.22	50.85	+0.095	+28	04	24.62	-0.710	-0.354
281	2803	δ Volantis	3.98	199	43	51.86	43.68	-0.039	-82	28	42.54	-0.360	-0.006
501	5107	ζ Virginis	3.37	202	00	55.98	50.16	-0.284	+9	44	32.56	-0.460	-0.066
534	5429	ρ Bootis	3.58	203	06	55.76	50.88	-0.191	+42	27	02.71	-0.340	+0.066
498	5056	α Virginis*	0.98	204	10	09.88	50.24	-0.028	-2	03	22.43	-0.460	-0.041
526	5340	α Bootis*	-0.04	204	33	42.11	50.51	-0.286	+30	43	11.83	-2.690	-2.265
555	5602	β Bootis	3.5	204	34	56.39	51.42	-0.039	+54	08	57.14	-0.470	-0.044
495	5020	γ Hydrae	3	207	20	47.35	50.18	+0.079	-13	44	39.91	-0.480	-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, 2023.5

MEAN PLACES FOR JULY $2^d.875$ 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	48	28.67	49.47	-0.033	-44	30	41.41	-0.500	-0.026
406	4199	θ Carinae	2.76	209	30	45.19	48.74	-0.046	-62	08	27.22	-0.510	-0.012
348	3685	β Carinae	1.68	212	17	11.20	47.42	-0.463	-72	14	19.53	-0.670	-0.133
496	5028	ι Centauri	2.75	213	27	14.38	49.62	-0.305	-26	01	10.47	-0.760	-0.219
563	5681	δ Bootis	3.47	213	29	23.39	51.35	+0.189	+48	57	47.52	-0.610	-0.069
525	5338	ι Virginis	4.08	214	07	36.85	50.54	+0.140	+7	11	41.77	-0.970	-0.409
523	5315	κ Virginis	4.19	214	49	18.94	50.29	-0.039	+2	54	42.79	-0.430	+0.135
436	4467	λ Centauri	3.13	214	52	06.42	49.11	-0.045	-56	47	29.27	-0.600	-0.033
455	4656	δ Crucis	2.8	215	59	23.67	49.37	-0.042	-50	25	18.33	-0.620	-0.032
468	4763	γ Crucis	1.63v	217	04	01.19	49.76	+0.257	-47	50	04.48	-0.790	-0.199
1371	5359	λ Virginis	4.52	217	16	49.23	50.28	-0.024	+0	29	19.49	-0.580	+0.023
385	4037	ω Carinae	3.32	217	45	43.71	48.52	-0.054	-67	23	04.92	-0.640	-0.033
519	5287	π Hydrae	3.27	218	57	08.31	50.23	+0.092	-13	03	08.71	-0.740	-0.115
572	5747	β Cr. Borealis	3.68	219	26	43.85	50.73	-0.286	+46	03	07.40	-0.600	+0.018
1189	2736	γ^2 Volantis	3.78	220	09	55.30	44.14	-0.682	-82	37	09.13	-0.660	+0.065
545	5487	μ Virginis	3.88	220	27	40.34	50.61	+0.203	+9	40	05.26	-0.900	-0.268
442	4520	λ Muscae	3.64	221	18	55.50	49.00	-0.181	-58	30	34.27	-0.700	-0.053
508	5193	μ Centauri	3.04v	221	51	47.74	49.91	-0.015	-28	58	54.02	-0.690	-0.028
481	4853	β Crucis	1.25	221	58	17.54	49.49	-0.046	-48	38	28.65	-0.700	-0.039
462	4730	α Crucis A	1.33	222	11	42.50	49.38	-0.031	-52	52	52.77	-0.690	-0.032
578	5793	α Cr.Borealis	2.23	222	37	38.89	51.14	+0.201	+44	19	15.61	-0.710	-0.044
520	5288	θ Centauri	2.06	222	38	02.23	49.71	-0.317	-22	05	11.79	-1.340	-0.672
608	6092	τ Herculis	3.89	224	43	00.36	51.65	-0.065	+65	49	40.02	-0.660	+0.032
512	5231	ζ Centauri	2.55	225	16	38.55	49.85	-0.040	-32	56	46.00	-0.750	-0.062
548	5531	α^2 Librae*	2.75	225	24	37.62	50.22	-0.082	+0	19	48.29	-0.790	-0.095
504	5132	ε Centauri	2.3	225	52	52.72	49.75	-0.023	-39	35	18.84	-0.730	-0.028
297	3024	ζ Volantis	3.95	226	04	37.98	46.83	-0.031	-79	23	23.08	-0.680	+0.034
391	4102	I Carinae	4	228	24	29.99	48.89	+0.052	-67	53	08.56	-0.760	-0.027
564	5685	β Librae	2.61	229	41	58.96	50.29	-0.089	+8	29	35.31	-0.780	-0.043
583	5867	β Serpentis	3.67	230	16	42.98	50.77	+0.093	+34	19	26.35	-0.770	-0.026
537	5440	η Centauri	2.31	230	34	34.45	50.01	-0.023	-25	30	57.10	-0.790	-0.044
474	4798	α Muscae	2.69	230	41	57.81	49.40	-0.044	-56	33	35.41	-0.800	-0.043
556	5603	σ Librae	3.29	231	00	53.81	50.17	-0.059	-7	38	50.73	-0.810	-0.062
559	5652	ι Librae	4.54	231	19	58.07	50.25	-0.024	-1	51	08.70	-0.800	-0.047
582	5854	α Serpentis	2.65	232	24	18.64	50.69	+0.134	+25	30	21.46	-0.690	+0.079
591	5933	γ Serpentis	3.85	233	06	56.63	51.43	+0.758	+35	11	07.93	-1.930	-1.164
541	5469	α Lupi	2.3	233	49	51.92	49.98	-0.016	-30	01	43.10	-0.810	-0.024
518	5267	β Centauri	0.61	234	07	07.77	49.77	-0.026	-44	08	25.70	-0.820	-0.032
469	4773	γ Muscae	3.87	234	20	36.28	49.38	-0.069	-58	52	24.87	-0.830	-0.045
588	5892	ε Serpentis	3.71	234	39	38.89	50.64	+0.121	+24	00	16.80	-0.700	+0.091
553	5576	κ Centauri	3.13	235	07	20.29	50.06	-0.011	-24	02	03.45	-0.820	-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, 2023.5

MEAN PLACES FOR JULY $2^{d}.875$ 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	21	10.79	50.04	-0.023	-25	02	56.94	-0.840	-0.048
577	5787	γ Librae	3.91	235	28	00.68	50.39	+0.061	+4	23	00.20	-0.770	+0.024
585	5881	μ Serpentis	3.54	236	16	02.40	50.35	-0.082	+16	14	06.82	-0.840	-0.042
487	4923	δ Muscae	3.62	236	31	06.13	49.92	+0.360	-56	46	37.97	-0.640	+0.163
566	5705	φ' Lupi	3.56	237	49	17.79	50.08	-0.067	-17	10	54.15	-0.920	-0.105
1413	5838	κ Librae	4.74	238	05	08.07	50.28	-0.013	-0	01	21.98	-0.920	-0.109
579	5794	ν Librae	3.58	238	56	14.90	50.22	-0.010	-8	30	36.75	-0.820	+0.001
1402	5695	δ Lupi	3.22	238	59	04.57	50.11	-0.008	-21	25	44.07	-0.860	-0.029
626	6220	η Herculis	3.53	239	07	08.93	51.20	+0.116	+60	17	11.90	-0.900	-0.070
609	6095	γ Herculis	3.75	239	32	36.28	50.59	-0.072	+40	00	18.68	-0.800	+0.032
538	5460	α Centauri cg	var.	239	46	25.37	45.00	-4.887	-42	36	16.60	-1.700	-0.859
401	4174	γ Chamaeleontis	4.11	240	44	46.04	49.19	-0.049	-68	05	14.11	-0.870	-0.040
558	5649	ζ Lupi	3.41	241	05	04.07	49.93	-0.099	-32	50	06.09	-0.940	-0.104
618	6148	β Herculis	2.77	241	25	11.69	50.55	-0.126	+42	41	57.65	-0.880	-0.034
613	6117	ω Herculis	4.57	241	54	17.92	50.65	+0.067	+35	09	54.77	-0.900	-0.050
603	6056	δ Ophiuchi	2.74	242	37	50.52	50.40	-0.018	+17	14	14.61	-1.000	-0.149
539	5463	α Circini	3.19	242	41	20.53	49.78	-0.104	-46	12	26.36	-1.140	-0.292
594	5953	δ Scorpii*	2.32	242	53	58.17	50.28	-0.001	-1	59	20.95	-0.890	-0.038
592	5944	π Scorpii	2.89	243	16	05.01	50.26	-0.006	-5	28	42.21	-0.880	-0.027
597	5984	β Scorpii pr	2.62	243	31	06.00	50.30	-0.002	+1	00	17.32	-0.880	-0.020
605	6075	ε Ophiuchi	3.24	243	50	21.15	50.48	+0.079	16	26	13.89	-0.800	+0.055
459	4674	β Chamaeleontis	4.26	245	45	48.68	49.52	-0.083	-63	35	50.58	-0.900	-0.034
411	4234	δ^2 Chamaeleontis	4.45	245	58	54.37	49.42	-0.030	-67	47	38.09	-0.920	-0.048
607	6084	σ Scorpii	2.89	248	07	40.10	50.27	-0.007	-4	02	25.75	-0.910	-0.022
634	6324	ε Herculis	3.92	248	39	21.44	50.62	-0.085	+53	14	43.89	-0.870	+0.019
622	6175	ζ Ophiuchi	2.56	249	33	27.87	50.36	+0.010	+11	23	18.74	-0.860	+0.028
560	5671	γ Tr. Austrini	2.89	249	43	12.92	49.90	-0.082	-48	06	22.43	-0.950	-0.056
616	6134	α Scorpii cg*	var.	250	05	25.49	50.27	-0.006	-4	34	23.00	-0.920	-0.022
620	6165	τ Scorpii	2.82	251	47	06.47	50.26	-0.005	-6	07	24.83	-0.920	-0.023
633	6299	κ Ophiuchi	3.2	252	08	52.86	50.11	-0.339	+31	49	58.32	-0.960	-0.046
589	5897	β Tr.Australis	2.85	252	10	05.57	49.97	-0.101	-41	57	06.27	-1.340	-0.435
653	6536	β Draconis	2.79	252	17	48.32	51.16	-0.072	+75	16	29.66	-0.890	+0.011
643	6418	π Herculis	3.16	252	23	47.76	50.66	-0.051	+59	32	52.09	-0.900	0.000
542	5470	α Apodis	3.83	254	45	25.84	49.96	-0.002	-58	14	16.99	-0.930	-0.019
641	6410	δ Herculis	3.14	255	05	32.61	50.51	-0.004	+47	40	53.62	-1.070	-0.158
628	6241	ε Scorpii	2.29	255	39	34.28	49.67	-0.588	-11	44	37.38	-1.240	-0.326
1439	6247	μ^1 Scorpii	3.08v	256	29	01.53	50.24	-0.008	-15	25	35.00	-0.950	-0.026
1435	6229	η Arae	3.76	259	13	57.58	50.25	+0.051	-36	16	46.68	-0.950	-0.023
631	6285	ζ Arae	3.13	260	09	06.99	50.20	-0.018	-33	05	41.85	-0.970	-0.038
663	6588	ι Herculis	3.8	260	13	05.25	50.59	-0.015	+69	15	44.99	-0.930	+0.005
638	6380	η Scorpii	3.33	261	04	17.29	50.31	+0.052	-20	11	18.33	-1.210	-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, 2023.5

MEAN PLACES FOR JULY $2^{d}.875$ 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	13	26.73	50.22	+0.028	-46	09	16.75	-0.960	-0.031
644	6453	θ Ophiuchi	3.27	261	43	23.37	50.29	-0.002	-1	50	48.08	-0.950	-0.020
656	6556	α Ophiuchi	2.08	262	46	41.21	50.51	+0.163	+35	49	50.53	-1.150	-0.220
611	6102	γ Apodis	3.89	263	01	49.40	50.00	-0.191	-56	00	39.10	-1.040	-0.106
649	6508	ν Scorpii	2.69	264	20	27.60	50.29	0.000	-14	00	41.83	-0.970	-0.031
645	6461	β Arae	2.85	264	32	02.76	50.26	-0.008	-32	16	05.52	-0.970	-0.026
658	6561	ξ Serpentis	3.54	264	52	26.79	50.27	-0.040	+7	55	52.50	-0.990	-0.060
652	6527	λ Scorpii*	1.63	264	54	50.62	50.28	+0.000	-13	47	30.16	-0.960	-0.029
671	6688	ξ Draconis	3.75	265	05	13.38	51.06	+0.525	+80	16	47.88	-0.850	+0.085
651	6510	α Arae	2.95	265	15	44.69	50.24	-0.031	-26	33	50.99	-1.010	-0.072
667	6623	μ Herculis	3.42	265	32	59.82	49.89	-0.453	+51	05	44.82	-1.700	-0.762
665	6603	β Ophiuchi	2.77	265	39	52.98	50.26	-0.051	+27	56	15.64	-0.780	+0.158
648	6500	δ Arae	3.62	265	53	04.31	50.21	-0.067	-37	21	34.71	-1.030	-0.099
654	6553	θ Scorpii	1.87	265	55	40.46	50.31	+0.016	-19	38	53.56	-0.940	-0.001
660	6580	κ Scorpii	2.41	266	47	51.90	50.29	-0.005	-15	38	51.46	-0.960	-0.027
668	6629	γ Ophiuchi	3.75	266	57	38.38	50.27	-0.023	+26	06	27.46	-1.010	-0.074
666	6615	ι^1 Scorpii	3.03	267	51	03.13	50.30	0.000	-16	43	03.26	-0.940	-0.008
669	6630	*G* Scorpii	3.21	268	14	47.70	50.35	+0.049	-13	37	30.65	-0.910	+0.034
676	6705	γ Draconis	2.23	268	17	46.27	50.22	-0.028	+74	55	08.59	-0.950	-0.020
661	6582	η Pavonis	3.62	268	18	06.25	50.29	-0.017	-41	18	47.01	-1.000	-0.055
672	6695	θ Herculis	3.86	268	48	17.99	50.26	+0.009	+60	40	54.60	-0.930	+0.006
674	6703	ξ Herculis	3.7	269	31	28.65	50.39	+0.139	+52	40	56.85	-0.950	-0.017
673	6698	ν Ophiuchi	3.34	270	04	53.05	50.28	-0.007	+13	39	41.83	-1.050	-0.116
1471	6743	θ Arae	3.66	271	31	06.23	50.32	-0.012	-26	39	44.12	-0.940	-0.014
679	6746	γ Sagittarii	2.99	271	35	21.95	50.25	-0.056	-6	59	43.49	-1.120	-0.185
680	6771	72 Ophiuchi	3.73	272	29	16.55	50.18	-0.070	+32	59	12.62	-0.850	+0.081
681	6779	*o* Herculis	3.83	273	01	27.50	50.19	+0.002	+52	10	52.16	-0.920	+0.009
682	6812	μ Sagittarii	3.86	273	32	30.51	50.29	+0.002	+2	20	20.57	-0.930	+0.001
683	6832	η Sagittarii	3.11	273	57	19.07	50.19	-0.137	-13	22	55.21	-1.090	-0.162
687	6859	δ Sagittarii*	2.7	274	54	34.23	50.35	+0.034	-6	28	31.82	-0.960	-0.029
691	6897	α Telescopii	3.51	275	24	07.12	50.33	-0.021	-22	39	04.43	-0.980	-0.053
689	6879	ε Sagittarii	1.85	275	24	24.09	50.28	-0.045	-11	03	20.37	-1.050	-0.122
688	6869	η Serpentis	3.26	276	00	11.65	49.63	-0.614	+20	25	41.00	-1.610	-0.677
692	6913	λ Sagittarii	2.81	276	38	42.34	50.25	-0.053	-2	08	23.43	-1.110	-0.183
697	6951	θ Coronae Aust.	4.64	276	52	21.88	50.38	+0.031	-19	03	59.36	-0.950	-0.024
1482	6973	α Scuti	3.85	279	20	39.89	50.21	-0.037	+14	54	54.52	-1.230	-0.310
214	1953	γ Mensae	5.19	279	53	47.87	51.27	+1.083	-79	59	21.51	-1.220	+0.238
1487	7039	φ Sagittarii	3.17	280	30	36.23	50.37	+0.053	-3	57	25.22	-0.920	-0.004
1489	7063	β Scuti	4.22	282	42	28.99	50.21	-0.006	+18	10	58.64	-0.930	-0.016
706	7121	σ Sagittarii*	2.02	282	42	49.44	50.32	+0.008	-3	27	10.16	-0.960	-0.055
710	7150	ξ^2 Sagittarii	3.51	283	46	46.58	50.32	+0.032	+1	39	29.59	-0.920	-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, 2023.5

MEAN PLACES FOR JULY 2^{d}.875 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	09	43.74	50.23	-0.083	-5	05	36.06	-1.140	-0.243
699	7001	α Lyrae	0.03	285	38	45.38	50.26	+0.505	+61	43	53.84	-0.640	+0.256
720	7264	π Sagittarii	2.89	286	34	48.24	50.28	-0.004	+1	26	02.26	-0.930	-0.035
717	7236	λ Aquilae	3.44	287	39	36.34	50.16	-0.029	+17	33	44.43	-0.970	-0.087
754	7665	δ Pavonis	3.56	287	57	00.58	51.76	+1.141	-44	42	41.95	-2.310	-1.445
712	7176	ε Aquilae	4.02	288	35	20.25	49.96	-0.075	+37	33	50.65	-0.940	-0.066
705	7106	β Lyrae	var.	289	12	36.78	49.79	+0.005	+55	58	52.77	-0.870	-0.003
810	8254	ν Octantis	3.76	290	01	03.73	50.65	-0.212	-57	47	00.88	-1.080	-0.217
716	7235	ζ Aquilae	2.99	290	07	23.61	50.01	-0.023	+36	10	56.22	-0.960	-0.094
713	7178	γ Lyrae	3.24	292	14	55.08	49.74	-0.003	+55	00	36.87	-0.850	+0.003
775	7913	β Pavonis	3.42	292	49	24.85	50.66	-0.055	-45	57	25.74	-0.820	+0.028
730	7377	δ Aquilae	3.36	293	58	02.19	50.40	+0.294	+24	48	52.63	-0.800	+0.040
764	7790	α Pavonis	1.94	294	08	48.09	50.58	-0.025	-36	16	15.24	-0.920	-0.087
751	7623	θ^1 Sagittarii	4.37	295	11	55.43	50.41	+0.001	-14	23	18.79	-0.860	-0.027
785	7986	β Indi	3.65	298	06	55.17	50.70	+0.008	-39	09	35.42	-0.840	-0.030
769	7869	α Indi	3.11	299	26	02.20	50.63	+0.078	-27	45	21.20	-0.750	+0.048
1508	7405	α Vulpeculae	4.44	299	49	57.85	49.58	-0.209	+45	51	19.08	-0.860	-0.076
746	7570	η Aquilae	var.	300	45	41.08	50.11	+0.010	+21	31	14.55	-0.790	-0.009
741	7525	γ Aquilae	2.72	301	15	58.69	50.00	+0.020	+31	14	27.81	-0.780	-0.005
11	98	β Hydri	2.8	301	19	14.77	54.05	+2.667	-64	47	59.69	-2.710	-1.954
1513	7488	β Sagittae	4.37	301	31	58.40	49.88	+0.003	+38	12	55.57	-0.810	-0.033
732	7417	β Cygni *p*	3.08	301	34	40.69	49.70	+0.002	+48	57	54.70	-0.780	-0.002
745	7557	α Aquilae*	0.77	302	06	29.70	50.69	+0.697	+29	18	09.85	-0.510	+0.262
749	7602	β Aquilae	3.71	302	45	02.22	49.96	-0.064	+26	39	12.81	-1.240	-0.481
743	7536	δ Sagittae	3.82	303	42	50.60	49.87	+0.011	+38	54	37.64	-0.750	+0.006
761	7754	α^2 Capricorni	3.57	304	11	13.54	50.29	+0.063	+6	55	39.77	-0.760	-0.011
762	7776	β Capricorni	3.08	304	22	32.95	50.30	+0.042	+4	35	10.38	-0.760	-0.008
756	7710	θ Aquilae	3.23	305	38	24.76	50.12	+0.041	+20	19	29.00	-0.740	-0.005
752	7635	γ Sagittae	3.47	307	22	15.03	49.90	+0.090	+39	11	16.77	-0.710	+0.006
1550	8039	γ Microscopii	4.67	308	45	37.18	50.45	0.000	-14	40	03.00	-0.700	+0.006
841	8502	α Tucanae	2.86	310	00	03.91	50.82	-0.120	-45	24	21.47	-0.690	0.000
146	1208	γ Hydri	3.24	310	48	46.39	53.44	+0.537	-76	45	34.51	-0.760	-0.010
781	7950	ε Aquarii	3.77	312	03	04.93	50.23	+0.024	+8	04	41.41	-0.710	-0.042
1547	7990	μ Aquarii	4.73	313	23	10.69	50.24	+0.035	+8	14	15.60	-0.700	-0.041
768	7852	ε Delphini	4.03	314	23	17.25	49.93	+0.007	+29	04	15.56	-0.670	-0.024
726	7328	κ Cygni	3.77	315	14	27.71	48.31	+0.396	+73	48	02.93	-0.550	+0.080
829	8425	α Gruis	1.74	316	14	14.24	50.81	+0.064	-32	54	59.29	-0.810	-0.191
(771)	7882	β Delphini m*	3.64	316	40	06.97	49.92	+0.070	+31	54	56.11	-0.680	-0.069
806	8204	ζ Capricorni	3.74	317	15	56.08	50.40	+0.008	-6	59	33.71	-0.580	+0.022
774	7906	α Delphini	3.77	317	42	28.03	49.90	+0.074	+33	01	12.94	-0.620	-0.022
822	8353	γ Gruis	3.01	317	44	57.40	50.70	+0.095	-23	03	09.17	-0.650	-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, 2023.5

MEAN PLACES FOR JULY $2^d.875$ 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	17	28.19	48.38	+0.252	+71	26	59.65	-0.490	+0.104
778	7928	δ Delphini	4.43	318	26	34.08	49.81	-0.037	+31	56	29.58	-0.620	-0.035
1541	7948	γ Delphini sq	4.27	319	41	40.27	49.72	-0.110	+32	41	57.70	-0.760	-0.177
860	8675	ε Gruis	3.49	321	03	39.18	51.00	+0.077	-39	47	25.01	-0.670	-0.115
846	8556	δ^1 Gruis	3.97	321	55	57.14	50.78	+0.027	-31	20	57.24	-0.560	-0.017
812	8278	γ Capricorni	3.68	322	07	13.17	50.50	+0.172	-2	33	34.33	-0.620	-0.084
856	8636	β Gruis	2.11v	322	39	30.29	50.99	+0.145	-35	26	03.26	-0.600	-0.071
800	8131	α Equulei	3.92	323	26	41.24	50.04	+0.029	+20	07	10.42	-0.620	-0.102
808	8232	β Aquarii	2.91	323	43	23.20	50.19	+0.017	+8	36	47.88	-0.540	-0.015
819	8322	δ Capricorni	2.87	323	52	19.08	50.48	+0.149	-2	36	20.46	-0.880	-0.368
1569	8264	ξ Aquarii	4.69	324	26	50.01	50.32	+0.103	+5	57	20.52	-0.570	-0.062
765	7796	γ Cygni	2.2	325	09	56.75	49.08	+0.007	+57	07	22.37	-0.500	-0.001
780	7949	ε Cygni	2.46	328	04	31.18	50.05	+0.705	+49	25	18.71	-0.310	+0.155
815	8308	ε Pegasi	var.	332	12	44.22	49.98	+0.031	+22	05	54.89	-0.410	-0.011
849	8592	ν Aquarii	5.2	332	52	20.18	50.61	+0.154	-10	54	12.74	-0.610	-0.218
797	8115	ζ Cygni	3.2	333	22	00.51	49.45	-0.031	+43	41	35.71	-0.430	-0.051
827	8414	α Aquarii	2.96	333	54	43.93	50.14	+0.015	+11	15	29.42	-0.390	-0.016
867	8728	α PsA	1.16	334	11	28.85	50.88	+0.253	-21	08	19.01	-0.650	-0.287
777	7924	α Cygni	1.25	335	39	09.36	48.80	+0.007	+59	54	18.51	-0.350	+0.001
842	8518	γ Aquarii	3.84	337	02	33.90	50.30	+0.126	+8	14	02.12	-0.370	-0.042
834	8450	θ Pegasi	3.53	337	09	44.47	50.32	+0.278	+16	20	20.96	-0.410	-0.077
861	8679	τ Aquarii	4.01	338	55	27.06	50.36	-0.026	-5	39	56.09	-0.330	-0.030
866	8709	δ Aquarii	3.27	339	12	06.86	50.38	-0.047	-8	11	32.08	-0.300	-0.008
3	25	ε Phoenicis	3.88	339	58	44.86	51.11	+0.011	-41	57	29.91	-0.500	-0.220
850	8597	η Aquarii	4.02	340	49	13.52	50.22	+0.064	+8	21	48.26	-0.360	-0.087
792	8079	ξ Cygni	3.72	341	07	24.22	48.94	+0.014	+56	34	52.54	-0.270	-0.003
864	8698	λ Aquarii*	3.74	341	54	16.46	50.33	+0.025	-0	23	13.69	-0.220	+0.030
72	591	α Hydri	2.86	342	27	19.20	52.58	+0.420	-64	14	38.74	-0.430	-0.194
831	8430	ι Pegasi	3.76	344	44	13.80	50.01	+0.339	+34	15	15.22	-0.310	-0.104
54	472	α Eridani	0.46	345	38	43.18	51.93	+0.084	-59	22	45.26	-0.280	-0.092
12	99	α Phoenicis	2.39	345	49	27.56	51.04	-0.042	-40	38	11.39	-0.640	-0.444
855	8634	ζ Pegasi	3.4	346	28	46.04	50.07	+0.072	+17	40	43.28	-0.220	-0.043
141	1175	β Reticuli	3.85	351	44	26.50	54.85	+0.796	-76	05	23.82	-0.360	-0.260
878	8852	γ Piscium	3.69	351	47	08.87	50.90	+0.713	+7	15	18.18	-0.380	-0.285
871	8781	α Pegasi	2.49	353	48	47.21	50.01	+0.043	+19	24	19.84	-0.130	-0.065
1044	440	δ Phoenicis	3.95	353	57	23.70	51.86	+0.337	-52	34	56.97	-0.020	+0.035
862	8684	μ Pegasi	3.48	354	42	48.11	49.90	+0.130	+29	23	10.26	-0.140	-0.102
857	8650	η Pegasi	2.94	356	02	21.91	49.64	+0.002	+35	06	28.92	-0.050	-0.029
68	566	χ Eridani	3.7	356	35	20.06	53.05	+1.308	-57	01	07.39	-0.230	-0.210
49	429	γ Phoenicis	3.41	358	28	26.28	51.14	-0.186	-35	09	00.15	-0.150	-0.167
870	8775	β Pegasi*	2.42v	359	42	08.74	50.00	+0.270	+8	28	00.07	+0.070	+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 2023.5

FOR JULY 2^{d}.875 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	36.5	3.117	+104	+29	13	12.37	+19.86	-163
2	21	β Cassiopeiae*	2.27	F2 III	0	10	26.8	3.246	+685	+59	16	45.48	19.84	-181
3	25	ε Phoenicis	3.88	K0 III	0	10	35.8	3.024	+118	-45	37	04.51	19.84	-181
7	39	γ Pegasi*	2.83	B2 IV	0	14	26.9	3.099	+2	+15	18	50.65	19.99	-12
9	74	ι Ceti	3.56	K1 IIIb	0	20	37.5	3.056	-9	-8	41	37.80	19.92	-36
11	98	β Hydri	2.80	G1 IV	0	26	57.1	3.052	+6624	-77	07	19.92	20.23	+324
12	99	α Phoenicis	2.39	K0 III b	0	27	26.4	2.949	+183	-42	10	43.35	+19.50	-396
17	153	ζ Cassiopeiae	3.66	B2 IV	0	38	17.7	3.384	+22	+54	01	33.36	19.75	-9
20	165	δ Andromedae	3.27	K3 III	0	40	35.5	3.227	+106	+30	59	21.13	19.64	-92
21	168	α Cassiopeiae*	2.23	K0^{-} IIIa	0	41	51.4	3.451	+64	+56	39	57.12	19.68	-32
22	188	β Ceti*	2.04	G9 III CH-1 CN 0.5 Ca 1	0	44	46.1	3.008	+164	-17	51	28.79	19.69	+32
33	269	μ Andromedae	3.87	A5 IV-V	0	58	04.0	3.356	+130	+38	37	34.66	19.43	+33
32	264	γ Cassiopeiae*	2.47	B0 IVnpe(shell)	0	58	08.8	3.680	+36	+60	50	36.35	+19.39	-5
35	280	α Sculptoris	4.31	B4 Vp	0	59	44.2	2.884	+17	-29	13	51.42	19.37	+4
40	334	η Ceti	3.45	K2^{-}III CN0.5	1	09	46.3	3.019	+147	-10	03	29.73	18.98	-138
42	337	β Andromedae*	2.06	M0^{-}IIIa	1	11	03.4	3.383	+146	+35	44	40.23	18.97	-114
1033	361	ζ Piscium*	5.24	F0Vn	1	14	57.7	3.143	+97	+7	41	56.28	18.92	-56
47	402	θ Ceti	3.60	K0 IIIb	1	25	11.9	3.001	-53	-8	03	46.17	18.45	-218
48	403	δ Cassiopeiae	2.68	A5 IV	1	27	22.5	3.989	+401	+60	21	23.52	+18.55	-52
49	429	γ Phoenicis	3.41	M0^{-} IIIa	1	29	23.0	2.597	-13	-43	11	54.54	18.33	-208
1044	440	δ Phoenicis	3.95	G9 III	1	32	13.6	2.489	+144	-48	57	04.46	18.59	+151
50	437	η Piscium	3.62	G7 IIIa	1	32	44.7	3.223	+19	+15	27	58.14	18.42	-6
54	472	α Eridani*	0.46	B3Vnp(shell)	1	38	35.2	2.225	+117	-57	07	04.54	18.18	-35
52	464	51 Andromedae	3.57	K3^{-} III	1	39	26.9	3.722	+65	+48	44	46.85	18.07	-113
59	509	τ Ceti	3.50	G8 V	1	45	09.6	2.789	-1190	-15	48	51.98	+18.83	+858
62	539	ζ Ceti	3.73	K0 III	1	52	37.3	2.964	+28	-10	13	11.30	17.63	-39
64	544	α Trianguli	3.41	F6 IV	1	54	25.7	3.441	+8	+29	41	32.45	17.36	-235
66	553	β Arietis*	2.64	A4 V	1	55	56.6	3.330	+68	+20	55	18.85	17.42	-111
63	542	ε Cassiopeiae	3.38	B3 IV:p(shell)	1	56	06.7	4.397	+48	+63	47	04.47	17.50	-21
68	566	χ Eridani	3.70	G8 III-IVCN-0.5Hδ0.5	1	56	52.2	2.329	+730	-51	29	33.61	17.78	+291
72	591	α Hydri	2.86	F0n III-IV	1	59	30.6	1.889	+368	-61	27	22.04	+17.40	+26
71	585	ν Ceti	4.00	M0 IIIb	2	01	06.7	2.827	+97	-20	57	53.45	17.28	-24
73	603	γ Andromed.* p	2.26	K3^{-} Iib	2	05	21.2	3.715	+40	+42	26	28.83	17.07	-52
70	580	50 Cassiopeiae	3.98	A1 Va	2	05	29.5	5.276	-99	+72	32	00.44	17.13	+22
74	617	α Arietis*	2.00	K2 IIIab	2	08	30.2	3.399	+138	+23	34	20.77	16.82	-149
75	622	β Trianguli	3.00	A5 IV	2	10	57.0	3.595	+122	+35	05	50.25	16.82	-41
82	674	φ Eridani	3.56	B8 V	2	17	20.9	2.141	+102	-51	24	15.28	+16.52	-27
79	664	γ Trianguli	4.01	A0 IV-Vn	2	18	43.2	3.591	+38	+33	57	16.93	16.43	-51
91	779	δ Ceti	4.07	B2 IV	2	40	41.4	3.083	+9	+0	25	43.17	+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 2023.5

FOR JULY 2^d.875 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)
1075	794	ι Eridani	4.11	K0.5 IIIb Fe-0.5	2	41	35.7	2.367	+119	-39	45	20.99	+15.23	-32
94	801	35 Arietis	4.66	B3 V	2	44	50.2	3.540	+6	+27	48	20.67	15.07	-12
101	841	β Fornacis	4.46	G8.5 III Fe-0.5	2	50	04.5	2.512	+71	-32	18	29.92	14.93	155
100	838	41 Arietis*	3.63	B8 Vn	2	51	22.4	3.550	+50	+27	21	21.35	14.58	-118
99	834	η Persei	3.76	K3$^-$Ib-IIa	2	52	25.7	4.431	+20	+55	59	28.54	14.62	-14
103	854	τ Persei	3.95	G5 III + A4 V	2	55	56.4	4.300	0	+52	51	24.91	14.41	-5
104	874	η Eridani	3.89	K1 IIIb	2	57	34.6	2.936	+53	-8	48	21.19	+14.10	-220
106	897	θ Eridani* p	3.25	A5 IV	2	59	09.2	2.276	-39	-40	12	41.60	14.24	+19
907	424	α Ursae Mins.*	2.02	F5-8 Ib	3	02	10.5	88.903	+2158	+89	21	42.41	14.02	-20
1085	919	τ^3 Eridani	4.09	A4 V	3	03	25.7	2.647	-105	-23	32	00.46	13.90	-53
107	911	α Ceti*	2.53	M1.5 IIIa	3	03	30.7	3.145	-6	+4	10	49.90	13.87	-78
108	915	γ Persei	2.93	G5 III + A2 V	3	06	30.9	4.393	0	+53	35	47.90	13.76	-5
109	921	ρ Persei*	3.39	M4 II	3	06	41.5	3.872	+111	+38	55	46.83	+13.65	-106
111	936	β Persei*	2.12	B8 V + F:	3	09	42.4	3.932	+3	+41	02	40.21	13.56	-1
120	1017	α Persei*	1.79	F5 Ib	3	26	00.8	4.322	+25	+49	56	34.30	12.45	-25
121	1030	ο Tauri	3.60	G6 IIIa Fe-1	3	26	04.9	3.239	-45	+9	06	36.12	12.39	-78
123	1038	ξ Tauri	3.74	B9 Vn	3	28	26.8	3.262	+40	+9	48	47.10	12.27	-39
127	1084	ε Eridani	3.73	K2 V	3	34	02.4	2.832	-658	-9	22	48.20	11.94	+23
135	1136	δ Eridani	3.54	K0$^+$ IV	3	44	22.6	2.880	-61	-9	41	07.05	+11.92	+745
131	1122	δ Persei	3.01	B5 III	3	44	36.5	4.305	+28	+47	51	38.27	11.13	-34
141	1175	β Reticuli	3.85	K2 III	3	44	30.1	0.774	+489	-64	44	00.53	11.24	+75
136	1142	17 Tauri	3.70	B6 III	3	46	16.6	3.578	+14	+24	11	07.61	11.00	-46
134	1135	ν Persei	3.77	F5 II	3	46	48.0	4.103	-13	+42	39	02.63	11.00	-2
146	1208	γ Hydri	3.24	M2 III	3	46	54.0	-0.852	+116	-74	09	59.47	11.11	+114
139	1165	η Tauri*	2.87	B7 IIIn	3	48	53.2	3.581	+14	+24	10	33.50	+10.80	-46
142	1178	27 Tauri	3.63	B8 III	3	50	33.9	3.582	+13	+24	07	24.44	10.68	-47
144	1203	ζ Persei	2.85	B1 Ib	3	55	36.9	3.789	+4	+31	57	05.33	10.34	-10
149	1231	γ Eridani	2.95	M0.5 IIIb Ca-1	3	59	07.6	2.804	+42	-13	26	35.31	9.98	-112
147	1220	ε Persei	2.89	B 0.5 IV	3	59	26.3	4.049	+16	+40	04	34.01	10.04	-26
148	1228	ξ Persei	4.04	O 7.5 IIIf	4	00	29.8	3.913	+2	+35	51	23.57	9.98	0
150	1239	λ Tauri	3.47v	B3 V	4	01	59.1	3.334	-4	+12	33	18.07	+9.86	-12
151	1251	ν Tauri	3.91	A1 Va	4	04	24.5	3.200	+3	+6	03	10.14	9.68	-3
152	1273	48 Persei	4.04	B3 Ve	4	10	22.6	4.384	+20	+47	46	22.73	9.19	-31
155	1326	α Horologii	3.86	K2 III	4	14	46.9	1.992	+41	-42	14	15.47	8.67	-209
156	1336	α Reticuli	3.35	G8II-III	4	14	44.0	0.790	+65	-62	24	55.71	8.93	+45
159	1346	γ Tauri	3.65	G9.5 IIIab CN 0.5	4	21	08.0	3.424	+80	+15	40	57.00	8.35	-25
162	1373	δ Tauri	3.76	G9.5 III CN 0.5	4	24	17.6	3.470	+75	+17	35	44.57	+8.10	-30
1121	1393	43 Eridani	3.96	K3.5$^-$IIIb	4	24	55.3	2.257	+56	-33	57	48.90	8.13	50
164	1409	ε Tauri	3.54	G9.5 III CN 0.5	4	29	59.5	3.514	+76	+19	13	50.13	7.63	-38
171	1465	α Doradus	3.27	A0p Si	4	34	30.4	1.305	+60	-54	59	50.16	7.30	-4
170	1464	υ^2 Eridani	3.82	G8.5 IIIa	4	36	27.9	2.336	-35	-30	30	55.94	+7.13	-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 2023.5

FOR JULY 2^{d}.875 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	16.3	3.451	+44	+16	33	16.57	+6.89	-190
172	1481	53 Eridani	3.87	K1.5IIIb	4	39	15.5	2.751	-52	-14	15	34.23	6.76	-155
1129	1502	α Caeli	4.45	F1 V	4	41	19.2	1.937	-126	-41	49	12.27	6.67	-77
1134	1543	π Orionis	3.19	F6 V	4	51	07.1	3.263	+313	+7	00	01.49	5.94	+10
179	1552	π Orionis	3.69	B2 III	4	52	27.6	3.202	-1	+5	38	36.36	5.82	+1
180	1567	π Orionis	3.72	B2 III	4	55	28.7	3.131	0	+2	28	38.40	5.57	0
178	1542	α Camelopardi	4.29	O9.5 Ia	4	56	24.2	6.014	-1	+66	22	45.12	+5.50	+6
181	1577	ι Aurigae	2.69	K3 II	4	58	31.7	3.919	+3	+33	12	03.85	5.29	-18
183	1605	ε Aurigae*	2.99V	A9 Ia	5	03	39.6	4.320	-1	+43	51	20.05	4.87	-4
1137	1612	ζ Aurigae	3.75	K5II + B5 V	5	04	07.5	4.208	+8	+41	06	27.78	4.82	-22
182	1603	β Camelopardi	4.03	G1 Ib-Iia	5	05	31.1	5.367	-9	+60	28	24.67	4.70	-16
186	1654	ε Leporis	3.19	K4 III	5	06	27.4	2.543	+18	-22	20	27.50	4.57	-74
185	1641	η Aurigae	3.17	B3 V	5	08	10.0	4.220	+26	+41	15	49.82	+4.43	-68
188	1666	β Eridani*	2.79	A3 IVn	5	09	00.4	2.954	-63	-5	03	28.03	4.34	-81
1144	1702	μ Leporis	3.31	B9p Hg Mn	5	13	59.3	2.698	+30	-16	10	45.59	3.97	-26
194	1713	β Orionis*	0.12	B8 Ia	5	15	40.1	2.887	0	-8	10	34.33	3.85	-1
193	1708	α Aurigae*	0.08	G6 III + G2 II	5	18	25.8	4.444	+72	+46	01	09.64	3.19	-425
195	1735	τ Orionis	3.60	B5 III	5	18	44.9	2.917	-10	-6	49	14.58	3.58	-8
1147	1765	22 Orionis	4.73	B2 IV-V	5	22	57.8	3.067	0	-0	21	40.09	+3.22	-1
201	1790	γ Orionis*	1.64	B2 III	5	26	23.6	3.222	-6	+6	22	08.51	2.91	-14
202	1791	β Tauri*	1.65	B7 III	5	27	46.8	3.799	+17	+28	37	30.07	2.63	-175
204	1829	β Leporis	2.84	G5 II	5	29	15.2	2.574	-3	-20	44	32.15	2.59	-89
214	1953	γ Mensae	5.19	K2 III	5	30	57.8	-2.339	+321	-76	19	22.44	2.81	282
206	1852	δ Orionis*	2.23	O9.5 II	5	33	12.5	3.069	+1	-0	17	00.77	2.34	-2
207	1865	α Leporis*	2.58	F0 Ib	5	33	46.0	2.649	+1	-17	48	25.36	+2.29	+2
212	1922	β Doradus	3.76v	F7-G2 Ib	5	33	49.9	0.529	+3	-62	28	29.40	2.29	+9
(GC)	1879	λ Orionis*	3.54	O8 IIIf	5	36	26.0	3.308	-1	+9	56	52.60	2.06	-2
209	1899	ι Orionis	2.77	O9 III	5	36	35.0	2.938	0	-5	53	46.37	2.05	+1
210	1903	ε Orionis*	1.70	B0 Ia	5	37	24.4	3.048	+1	-1	11	19.50	1.97	-2
211	1910	ζ Tauri	3.00	B2 IIIpe (shell)	5	39	03.0	3.590	0	+21	09	17.00	1.81	-21
215	1956	α Columbae*	2.64	B7 IV	5	40	30.1	2.176	+5	-34	03	46.73	+1.68	-26
1154	2015	δ Doradus	4.35	A7 V n	5	44	49.0	0.114	-49	-65	43	36.54	1.33	+8
217	1983	γ Leporis	3.60	F7 V	5	45	26.6	2.503	-212	-22	26	32.09	0.90	-369
219	1998	ζ Leporis	3.55	A2 Van	5	48	01.3	2.721	-11	-14	48	53.43	1.05	-1
220	2004	κ Orionis*	2.06	B0.5 Ia	5	48	52.3	2.848	+1	-9	39	46.80	0.97	-2
223	2040	β Columbae	3.12	K1.5 III	5	51	47.4	2.119	+49	-35	45	39.04	1.12	+401
222	2035	δ Leporis	3.81	K0 III Fe 1.5 CH 0.5	5	52	20.0	2.582	+161	-20	52	43.35	+0.02	-649
224	2061	α Orionis*	0.5	M1 M2 Ia Iab	5	56	26.7	3.251	+17	+7	24	34.17	+0.32	+9

No. 168 : *Aldebaran,* Rohini
* **No. 183 : Mag. 2.9 to 3.8.**
No. 188 : *Cursa* .
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 2023.5

FOR JULY 2^{d}.875 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	28.6	2.735	-28	-14	09	54.31	+0.36	+139
229	2120	η Columbae	3.96	G8/K1 II	5	59	52.0	1.840	+20	-42	48	54.16	+0.00	-14
227	2088	β Aurigae*	1.90	A1 IV	6	01	15.2	4.404	-54	+44	56	49.99	-0.11	0
225	2077	δ Aurigae*	3.72	K0^{-} III	6	01	27.8	4.943	+92	+54	17	00.98	0.25	-126
1163	2134	1 Geminorum	4.16	G5 III-IV	6	05	33.0	3.649	-6	+23	15	35.87	0.59	-100
1168	2219	κ Aurigae	4.35	G9 IIIb	6	16	52.5	3.823	-57	+29	29	13.68	1.74	-262
240	2282	ζ Canis Maj.	3.02	B2.5 V	6	21	13.0	2.306	+7	-30	04	30.81	-1.85	+3
243	2294	β Canis Maj.*	1.98	B1 II-III	6	23	44.1	2.644	-4	-17	58	08.99	2.07	0
241	2286	μ Geminorum	2.88	M3 IIIab	6	24	22.9	3.630	+39	22	29	57.62	2.24	-111
245	2326	α Carinae*	-0.7	A9 II	6	24	28.5	1.333	+25	-52	42	33.68	2.12	+21
244	2298	8ε Monocerotis	4.44	A6 IV	6	25	00.8	3.181	-12	+4	34	44.47	2.17	+11
1173	2343	ν Geminorum	4.15	B6 III	6	30	21.5	3.562	-5	+20	11	42.45	2.66	-14
252	2451	ν Puppis	3.17	B8 IIIn	6	38	28.9	1.838	+2	-43	13	03.63	-3.36	-6
251	2421	γ Geminorum*	1.93	A1 IVs	6	39	04.2	3.465	+29	+16	22	37.92	3.44	-42
254	2473	ε Geminorum	2.98	G8 Ib	6	45	22.6	3.689	-4	+25	06	20.41	3.96	-13
257	2491	α Canis Maj* cg	-1.5	A0m A1 Va	6	46	11.0	2.643	-387	-16	44	59.53	5.22	-1204
256	2484	ξGeminorum	3.36	F5 IV	6	46	36.5	3.366	-79	+12	52	05.73	4.24	-191
262	2550	α Pictoris	3.27	A6 Vn	6	48	25.8	0.612	-96	-61	58	01.18	3.93	+269
263	2553	τ Puppis	2.93	K1 III	6	50	31.2	1.490	+38	-50	38	36.77	-4.45	-70
1180	2538	κ Canis Maj.	3.96	B1.5 Ive	6	50	43.2	2.243	-5	-32	32	13.01	4.39	+4
261	2540	θ Geminorum	3.60	A3 III-IV	6	54	20.2	3.949	-2	+33	55	50.23	4.76	-48
268	2618	ε Canis Maj.*	1.50	B2 II	6	59	33.0	2.360	+3	-29	00	19.52	5.15	+3
1183	2646	σ Canis Maj.	3.47	K7 IB	7	02	39.4	2.392	-4	-27	58	11.57	5.41	+5
270	2653	*o*^{2} Canis Maj.	3.02	B3 Ia	7	04	00.4	2.507	-3	-23	52	08.75	5.52	+3
269	2650	ζ Geminorum*	3.79v	F9 Ib (var)	7	05	30.1	3.555	-6	+20	32	01.58	-5.65	0
1189	2736	γ^{2} Volantis	3.78	G9 III	7	08	32.4	-0.533	+48	-70	32	12.81	5.80	+106
273	2693	δ Canis Maj.	1.86	F8 Ia	7	09	20.8	2.441	-2	-26	25	54.86	5.97	+4
1187	2714	22δ Monocerotis	4.15	A1 III'	7	13	03.9	3.064	-1	-0	32	00.31	6.28	+5
281	2803	δ Volantis	3.98	F9 Ib	7	16	48.7	-0.049	-12	-68	00	00.85	6.59	+5
278	2773	π Puppis	2.70	K3 Ib	7	17	58.4	2.121	-8	-37	08	27.34	6.68	+4
277	2763	λ Geminorum	3.58	A4 IV	7	19	26.5	3.444	-33	+16	29	45.75	-6.85	-36
279	2777	δ Geminorum	3.53	F0 V'	7	21	31.5	3.578	-19	+21	56	13.32	6.99	-12
283	2827	η Canis Maj.	2.45	B5 Ia	7	25	01.5	2.375	-3	-29	21	00.97	7.26	+5
282	2821	ι Geminorum	3.79	G9 IIIb	7	27	11.0	3.719	-93	+27	44	57.47	7.53	-86
285	2845	β Canis Min.*	2.90	B8 V	7	28	25.5	3.251	-35	+8	14	24.57	7.58	-38
1194	2878	ρ Puppis	3.25	K5 III	7	29	58.6	1.905	-50	-43	21	00.38	7.48	+187
287	2891	α Gemino.* *cg*	1.95	Alm A2 Va	7	36	05.8	3.820	-135	+31	50	05.87	-8.26	-98
291	2943	α C. Min.* *cg*	0.38	F5 IV-V	7	40	31.8	3.137	-477	+5	09	47.15	9.53	-1021
297	3024	ζ Volantis	3.95	G9 III	7	41	31.0	-0.785	+67	-72	39	43.56	-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 2023.5

FOR JULY 2^{d}.875 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	22.2	2.866	-49	-9	36	27.05	-8.68	-19
294	2985	κ Geminorum	3.57	G8 III	7	45	51.8	3.614	-24	+24	20	22.89	8.98	-52
295	2990	β Geminorum*	1.14	K0 IIIb	7	46	45.0	3.662	-474	+27	58	02.98	9.05	-44
1204	3045	ξ Puppis	3.34	G6 Iab-Ib	7	50	17.0	2.525	-2	-24	55	12.45	9.28	-2
301	3080	213 G. Puppis	3.73	K1/2 II + A	7	53	01.6	2.065	-8	-40	38	15.27	9.48	+3
303	3117	χ Carinae	3.47	B3p Si	7	57	22.5	1.524	-32	-53	02	46.21	9.80	+21
306	3165	ζ Puppis	2.25	O5 Iafn	8	04	24.6	2.111	-24	-40	04	13.93	-10.34	+12
308	3185	ρ Puppis	2.81	F5 (Ib-II)p	8	08	32.7	2.557	-61	-24	22	23.96	10.61	+49
309	3207	γ^{2} Velorum	1.78	WC8 + O9I:	8	10	15.4	1.850	-4	-47	24	24.64	10.78	+6
312	3249	β Cancri	3.52	K 4 III Ba 0.5	8	17	47.3	3.249	-30	+9	06	41.42	11.38	-49
315	3307	ε Carinae	1.86	K3: III + B2: V	8	22	59.6	1.225	-35	-59	35	08.94	11.69	+14
319	3347	β Volantis	3.77	K2 III	8	25	59.1	0.632	-60	-66	12	56.58	12.07	-155
316	3314	Br 1197 Hydrae	3.90	A0 Va	8	26	50.1	2.996	-44	-3	59	04.25	-12.00	-23
317	3323	*o* Ursae Maj.	3.36	G5 III	8	32	11.9	4.927	-182	+60	38	14.20	12.46	-107
321	3366	η Cancri	5.33	K3 III	8	34	03.8	3.460	-34	+20	21	34.92	12.52	-43
1223	3410	δ Hydrae	4.16	A1 Ivnn	8	38	53.9	3.172	-44	+5	37	13.25	12.82	-7
1224	3418	σ Hydrae	4.44	K1 III	8	39	59.1	3.132	-12	+3	15	26.79	12.90	-18
1227	3447	*o* Velorum	3.62	B3 IV	8	40	58.0	1.719	-24	-53	00	22.38	12.93	+20
1226	3445	53 G. Velorum	3.84	F0 Ia	8	41	24.4	1.994	0	-46	43	59.84	-12.97	+3
327	3468	α Pyxidis	3.68	B1.5 III	8	44	32.3	2.414	-9	-33	16	19.86	13.17	+11
1228	3449	γ Cancri	4.66	A1 Va	8	44	38.5	3.462	-76	+21	22	56.66	13.23	-39
326	3461	δ Cancri*	3.94	K0 IIIb	8	46	01.0	3.401	-13	+18	03	59.00	13.51	-228
(329)	3482	ε Hydrae* m	3.38	G5: III ' A:	8	48	01.0	3.170	-155	+6	19	52.54	13.45	-40
328	3475	ι Cancri	4.02	G8 II-III	8	48	06.8	3.616	-19	+28	40	20.44	13.46	-42
336	3571	108 G. Carinae	3.84	B7 II-III	8	55	34.7	1.354	-28	-60	44	06.00	-13.86	+38
334	3547	ζ Hydrae	3.11	G9 IIIa	8	56	38.1	3.167	-66	+5	51	17.02	13.95	+15
337	3572	α Cancri*	4.25	A5m	8	59	46.2	3.275	+23	+11	45	55.29	14.19	-31
335	3569	ι Ursae Maj.	3.14	A7 Ivn	9	00	48.3	4.075	-443	+47	56	51.73	14.45	-225
342	3614	97 G. Velorum	3.75	K2 III	9	04	58.0	2.073	-44	-47	11	31.90	14.49	-13
341	3594	κ Ursae Maj.	3.60	A0 IIIn	9	05	13.2	4.064	-32	+47	03	42.89	14.54	-54
345	3634	λ Velorum	2.21	K4.5 Ib	9	08	51.7	2.212	-17	-43	31	42.14	-14.70	+13
1239	3627	ξ Cancri	5.14	G9 IIIa Fe-0.5 CH-I	9	10	42.4	3.438	+1	+21	56	56.38	14.81	+5
348	3685	β Carinae	1.68	A1 III	9	13	26.9	0.630	-311	-69	48	51.24	14.87	+109
347	3665	θ Hydrae	3.88	B9.5 IV (C II)	9	15	35.2	3.118	+86	+2	12	49.87	15.41	-310
351	3699	ι Carinae	2.25	A7 Ib	9	17	43.1	1.605	-26	-59	22	28.20	15.22	+8
352	3705	α Lyncis	3.13	K7 IIIab	9	22	28.8	3.636	-179	+34	17	30.51	15.47	+19
1243	3718	θ Pyxidis	4.72	M0.5 III	9	22	32.1	2.660	-8	-26	03	59.31	-15.50	-8
353	3734	κ Velorum*	2.50	B2 IV-V	9	22	50.6	1.861	-10	-55	06	42.44	15.50	+9
354	3748	α Hydrae*	1.98	K3 II-III	9	28	44.5	2.948	-9	-8	45	41.73	15.80	+33
361	3803	N Velorum	3.13	K5 III	9	31	56.2	1.826	-39	-57	08	19.39	16.00	+4
355	3757	23 Ursae Maj.	3.67	F0 IV	9	33	21.4	4.654	+160	+62	57	26.65	16.05	+27
358	3775	θ Ursae Maj.	3.17	F6 IV	9	34	24.9	3.972	-1024	+51	34	07.75	-16.66	-529

* **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 2023.5

FOR JULY $2^{d}.875$ 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)
1250	3845	ι Hydrae	3.91	K2.5 III	9	41	03.3	3.062	+32	-1	15	02.23	-16.53	-64
364	3849	κ Hydrae	5.06	B5 V	9	41	26.0	2.878	-19	-14	26	23.69	16.51	-20
365	3852	*o* Leonis	3.52	F5 II + A5?	9	42	24.2	3.196	-96	+9	47	03.54	16.57	-37
367	3873	ε Leonis	2.98	G1 II	9	47	10.8	3.393	-34	+23	39	53.62	16.78	-11
368	3888	*v* Ursae Maj.	3.80	F0 IV	9	52	38.5	4.207	-379	+58	55	36.68	17.18	-151
371	3905	μ Leonis	3.88	K2 III CN I Ca I	9	54	05.7	3.398	-160	+25	53	42.64	17.15	-56
375	3940	φVelorum	3.54	B5 Ib	9	57	41.4	2.115	-12	-54	40	49.15	-17.25	+3
1261	3970	ν^{2} Hydrae	4.60	B8 V	10	06	16.2	2.924	-25	-13	10	46.05	17.61	+18
379	3975	η Leonis	3.52	A0 Ib	10	08	36.6	3.262	-1	+16	38	49.70	17.72	0
380	3982	α Leonis*	1.35	B7 Vn	10	09	37.3	3.188	-169	+11	51	05.23	17.75	+7
381	3994	λ Hydrae	3.61	K0 III CN 0.5	10	11	44.1	2.927	-138	-12	28	15.67	17.93	-88
385	4037	ω Carinae	3.32	B8 IIIn	10	14	17.6	1.420	-76	-70	09	17.92	17.94	+7
382	4023	191 G.Velorum	3.85	A2 Va	10	15	43.6	2.529	-131	-42	14	20.90	-17.96	+45
1264	4050	187 G. Carinae	3.40	K2.5 II	10	17	52.3	2.014	-34	-61	27	00.91	18.08	+5
384	4031	ζ Leonis	3.44	F0 III	10	17	59.6	3.324	+13	+23	17	57.57	18.10	-7
383	4033	λ Ursae Maj.	3.45	A1 IV	10	18	30.3	3.591	-149	+42	47	45.99	18.15	-38
1268	4080	204 G.Velorum	4.83	K1 III	10	23	20.3	2.585	-20	-41	46	08.19	18.23	+56
386	4069	μ Ursae Maj.	3.05	M0 III	10	23	43.2	3.548	-72	+41	22	49.62	18.26	+35
391	4102	I Carinae	4.00	F2 V	10	24	51.3	1.172	-52	-74	09	05.21	-18.36	-26
389	4094	μ Hydrae	3.81	K4' III	10	27	13.7	2.906	-89	-16	57	25.19	18.50	-80
392	4104	α Antliae	4.25	K4.5 III	10	28	13.8	2.754	-58	-31	11	17.16	18.45	+11
393	4114	196 G. Carinae	3.82	F0 Ib	10	28	44.8	2.216	-17	-58	51	35.90	18.47	0
1270	4116	δ Sextantis	5.21	B9.5 V	10	30	40.3	3.047	-32	-2	51	36.36	18.55	-14
397	4140	203 G. Carinae	3.32	B4 Vne	10	32	51.9	2.148	-27	-61	48	24.15	18.60	+9
396	4133	ρ Leonis	3.85	B1 Iab	10	34	02.8	3.154	-4	+9	11	05.81	-18.65	-3
401	4174	γ Chamaeleontis	4.11	M0 III	10	35	43.6	0.651	-144	-78	43	47.05	18.69	+14
406	4199	θ Carinae	2.76	B0.5 Vp	10	43	48.0	2.157	-35	-64	31	04.76	18.93	+10
411	4234	δ^{2} Chamaeleontis	4.45	B2.5 IV	10	45	58.3	0.476	-201	-80	39	51.04	19.00	+8
410	4232	ν Hydrae	3.11	K1.5 IIIb Hδ-0.5	10	50	47.2	2.966	+66	-16	19	01.87	18.93	+200
412	4247	46 Leonis Min.	3.83	K0' III-IV	10	54	37.2	3.337	+70	+34	05	15.42	19.51	-279
1283	4287	α Crateris	4.08	K0' III	11	00	55.3	2.930	-323	-18	25	27.71	-19.25	+130
416	4295	β Ursae Maj.*	2.37	A1 IV-V	11	03	14.7	3.575	+99	+56	15	21.18	19.40	+34
417	4301	α Ursae Maj.*	1.80	$K0^{-}$ IIIa	11	05	09.5	3.645	-167	+61	37	24.44	19.54	-66
1289	4337	260 G. Carinae	3.91	G4 0-Ia	11	09	36.1	2.587	-9	-59	06	09.66	19.56	0
420	4335	ψ Ursae Maj.	3.01	K1 III	11	10	58.5	3.347	-60	+44	22	13.98	19.61	-28
422	4357	δ Leonis*	2.56	A4 IV	11	15	21.3	3.182	+101	+20	23	40.42	19.79	-130
423	4359	θ Leonis*	3.34	A2 IV (Kvar)	11	15	28.3	3.142	-42	+15	18	02.63	-19.74	-79
425	4377	ν Ursae Maj.	3.48	$K3^{-}$ III	11	19	44.6	3.225	-20	+32	57	56.59	19.70	+28
426	4382	δ Crateris	3.56	G9 IIIb CH 0.2	11	20	31.1	3.006	-84	-14	54	21.76	19.54	+208
433	4434	λ Draconis	3.84	M0 III Ca-1	11	32	46.4	3.485	-73	+69	12	03.97	19.92	-17
434	4450	ξ Hydrae	3.54	G7 III	11	34	09.8	2.965	-162	-31	59	16.30	19.95	-39
436	4467	λ Centauri	3.13	B9.5 Iin	11	36	52.6	2.803	-61	-63	08	59.91	-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.

MEAN PLACES OF STARS, J 2023.5

FOR JULY $2^d.875$ 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)
442	4520	λ Muscae	3.64	A7 IV	11	46	43.8	2.877	-174	-66	51	32.73	-19.97	+37
441	4518	χ Ursae Maj.	3.71	K0.5 IIIb	11	47	17.0	3.143	-136	+47	38	56.40	19.98	+30
1304	4527	93 Leonis*	4.53v	G4 III-IV + A7 V	11	49	11.7	3.088	-106	+20	05	17.64	20.02	-3
444	4534	β Leonis*	2.14	A3 Va	11	50	15.4	3.056	-342	+14	26	26.16	20.14	-114
445	4540	β Virginis	3.61	F9 V	11	51	55.2	3.126	+495	+1	37	55.84	20.30	-271
447	4554	γ Ursae Maj.*	2.44	A0 Van	11	55	03.4	3.125	+107	+53	33	50.55	20.02	+12
452	4621	δ Centauri	2.60	B2 IVne	12	09	35.2	3.140	-36	-50	51	11.57	-20.03	-8
453	4630	ε Corvi	3.00	K2.5 IIIa	12	11	20.2	3.098	-51	-22	45	01.31	20.00	+13
455	4656	δ Crucis	2.80	B2 IV	12	16	24.4	3.228	-53	-58	52	46.16	20.00	-9
456	4660	δ Ursae Maj.*	3.31	A2 Van	12	16	34.8	2.940	+127	+56	54	07.80	19.98	9
457	4662	γ Corvi*	2.59	B8p Hg Mn	12	17	01.1	3.096	-112	-17	40	20.20	19.96	+23
459	4674	β Chamaeleontis	4.26	B5 Vn	12	19	46.5	3.676	-175	-79	26	32.88	19.95	+17
460	4689	η Virginis	3.89	AI IV'	12	21	06.6	3.073	-42	-0	47	50.04	-19.97	-18
462	4730	α Crucis*A	1.33	B0.5 IV	12	27	55.4	3.392	-53	-63	13	44.53	19.90	-12
465	4757	δ Corvi*	2.95	B9.5 IV⁻n	12	31	05.0	3.115	-146	-16	38	45.65	20.00	-138
468	4763	γ Crucis	1.63v	M3.5 III	12	32	29.0	3.372	+29	-57	14	40.12	20.10	-262
469	4773	γ Muscae	3.87	B5 V	12	33	54.0	3.678	-126	-72	15	44.75	19.82	-2
472	4787	κ Draconis	3.87v	B6 IIIpe	12	34	28.4	2.524	-112	+69	39	32.08	19.80	+12
471	4786	β Corvi	2.65	G5 IIb	12	35	37.6	3.166	+2	-23	31	35.08	-19.85	-54
474	4798	α Muscae	2.69	B2 IV-V	12	38	36.6	3.658	-90	-69	15	52.82	19.77	-13
475	4813	χ Virginis	4.66	K2 III CN 1.5	12	40	27.7	3.104	-51	-8	07	28.70	19.75	-25
1326	4828	ρ Virginis	4.88	A0 Va(λ Boo)	12	43	04.4	3.037	+57	+10	06	23.09	19.78	-90
481	4853	β Crucis	1.25	B0.5 III	12	49	06.6	3.558	-63	-59	49	00.30	19.60	-14
483	4905	ε Ursae Maj.*	1.77	A0p Cr	12	55	03.4	2.620	+132	+55	49	57.62	19.47	-6
484	4910	δ Virginis*	3.38	M3' III	12	56	47.3	3.025	-313	+3	16	12.58	-19.48	-54
485	4915	α CVn sq*	2.90	A0p Si Eu	12	57	07.4	2.796	-198	+38	11	30.82	19.37	+56
488	4932	ε Virginis*	2.83	G8 IIIab	13	03	20.8	2.987	-185	+10	49	59.91	19.26	+20
487	4923	δ Muscae	3.62	K2 III	13	03	55.4	4.240	+544	-71	40	29.62	19.29	-20
492	4983	β Com	4.26	F9.5 V	13	12	58.1	2.795	-604	+27	45	34.44	18.15	+881
495	5020	γ Hydrae	3.00	G8 IIIa	13	20	12.3	3.277	+47	-23	17	41.60	18.87	-45
496	5028	ι Centauri	2.75	A2 Va	13	21	55.6	3.397	-284	-36	50	08.02	-18.86	-86
497	5054	ζ Ursae Maj.*pr	2.27	A1 Va' (Si)	13	24	52.1	2.404	+141	+54	48	11.50	18.70	-20
498	5056	α Virginis*	0.98	B1 V	13	26	26.1	3.171	-28	-11	16	59.73	18.66	-28
501	5107	ζ Virginis	3.37	A2 IV⁻	13	35	53.6	3.063	-190	-0	42	55.26	18.27	+42
504	5132	ε Centauri	2.30	B1 III	13	41	23.5	3.848	-32	-53	35	05.68	18.13	-17
509	5191	η Ursae Maj.*	1.86	B3 V	13	48	27.9	2.358	-125	+49	11	48.04	17.85	-11
508	5193	μ Centauri	3.04	B2 IV-Vpne(shell)	13	51	02.5	3.645	-21	-42	35	23.46	-17.75	-20
513	5235	η Bootis	2.68	G0 IV	13	55	48.2	2.857	-44	+18	16	50.61	17.90	-358
512	5231	ζ Centauri	2.55	B2.5 IV	13	57	01.1	3.780	-56	-47	24	10.78	-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.

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FOR JULY 2^{d}.875 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	05	01.6	1.629	-84	+64	15	50.51	-17.11	+18
518	5267	β Centauri*	0.61	B1 III	14	05	30.2	4.300	-43	-60	29	06.26	17.13	-19
519	5287	π Hydrae	3.27	K2⁻ III Fe-0.5	14	07	43.0	3.436	+33	-26	47	40.24	17.15	-139
520	5288	θ Centauri	2.06	K0⁻ IIIb	14	08	04.4	3.556	-429	-36	29	04.33	17.51	-520
523	5315	κ Virginis	4.19	K2.5 III Fe-0.5	14	14	09.2	3.211	+5	-10	22	55.43	16.56	+140
526	5340	α Bootis*	-0.04	K1.5 III Fe-0.	14	16	44.0	2.739	-769	+19	03	39.49	18.58	-2000
525	5338	ι Virginis	4.08	F7 III-IV	14	17	15.0	3.156	-2	-6	06	41.93	-16.99	-432
1371	5359	λ Virginis	4.52	A5m:	14	20	23.1	3.258	-11	-13	28	41.39	16.37	+30
531	5404	θ Bootis	4.05	F7 V	14	25	59.8	2.042	-253	+51	44	34.33	16.51	-398
534	5429	ρ Bootis	3.58	K3 III	14	32	50.6	2.585	-77	+30	16	09.21	15.63	+119
535	5435	γ Bootis	3.03	A7 IV'	14	33	01.4	2.415	-97	+38	12	22.89	15.58	+153
537	5440	η Centauri	2.31	B1.5 IVpne(shell)	14	37	00.6	3.840	-31	-42	15	34.90	15.55	-35
538	5460	α Centauri* cg	0.00	K1 V	14	41	12.7	4.130	-5000	-60	55	51.37	-14.59	+691
541	5469	α Lupi	2.30	B1.5 III	14	43	30.3	4.027	-21	-47	29	15.12	15.17	-18
545	5487	μ Virginis	3.88	F2 V	14	44	18.1	3.171	73	-5	45	32.87	15.42	-316
539	5463	α Circini	3.19	A 7p Sr Eu	14	44	26.1	4.936	-302	-65	04	32.14	15.33	-232
544	5485	371 G.Cen	4.05	K3 IIIb	14	45	06.2	3.694	-52	-35	16	24.55	15.24	-180
547	5511	109 Virginis	3.72	A0 Ivnn	14	47	26.4	3.040	-76	+1	47	41.94	14.95	-27
542	5470	α Apodis	3.83	K3 III CN 0.5	14	50	53.6	7.797	-41	-79	08	29.63	-14.74	-16
550	5563	β Ursae Min.*	2.08	K4⁻ III	14	50	39.7	-0.102	-76	74	03	33.76	14.72	+12
548	5531	α²Librae*	2.75	A3 III-IV	14	52	11.0	3.332	-73	-16	08	17.11	14.71	-67
552	5571	β Lupi	2.68	B2 IV	15	00	04.9	3.961	-32	-43	13	37.37	14.21	-39
553	5576	κ Centauri	3.13	B2 V	15	00	42.0	3.933	-17	-42	11	49.08	14.15	-24
555	5602	β Bootis	3.50	G8 IIIa Fe-0.5	15	02	49.9	2.261	-35	+40	17	55.90	14.02	-28
556	5603	σ Librae	3.29	M2.5 III	15	05	27.1	3.529	-54	-25	22	22.18	-13.87	-43
559	5652	ι Librae*	4.54	B9p Si	15	13	33.9	3.434	-25	-19	52	44.96	13.35	-39
558	5649	ζ Lupi	3.41	G8 III	15	13	59.2	4.353	-122	-52	11	12.51	13.35	-73
563	5681	δ Bootis	3.47	G8 III Fe-I	15	16	27.1	2.421	+69	+33	13	41.64	13.23	-112
564	5685	β Librae*	2.61	B8 IIIn	15	18	16.5	3.239	-65	-9	28	05.43	13.02	-19
560	5671	γ Tr. Austrini	2.89	A1 III	15	21	08.3	5.707	-132	-68	45	49.82	12.84	-31
569	5735	γ Ursae Min.	3.05	A 3 III	15	20	42.6	-0.041	-40	+71	45	01.35	-12.81	20
1402	5695	δ Lupi	3.22	B1.5 IVn	15	22	55.4	3.965	-13	-40	43	51.36	12.71	-26
566	5705	φ' Lupi	3.56	K4 III	15	23	18.3	3.830	-74	-36	20	41.72	12.74	-84
571	5744	ι Draconis	3.29	K2 III	15	25	27.3	1.345	-12	+58	53	03.74	12.50	+17
572	5747	β Cr. Borealis	3.68	F0p Cr Eu	15	28	47.9	2.476	-137	+29	01	33.15	12.20	+86
578	5793	α Cr.Borealis*	2.23	A0 IV	15	35	41.0	2.543	+91	+26	38	12.67	11.89	-88
577	5787	γ Librae	3.91	G8.5 III	15	36	50.7	3.368	+45	-14	51	58.72	-11.71	+9
579	5794	ν Librae	3.58	K3.5 III	15	38	27.4	3.659	-7	-28	12	40.03	11.60	+3
1413	5838	κ Librae	4.74	M0⁻ IIIb	15	43	18.3	3.470	-26	-19	45	12.01	11.36	-103
582	5854	α Serpentis*	2.65	K2 IIIb CN I	15	45	25.6	2.961	+92	+6	21	11.49	-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.***

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(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)
583	5867	β Serpentis	3.67	A2 IV	15	47	16.4	2.773	+46	+15	20	58.80	-11.01	-45
585	5881	μ Serpentis	3.54	A0 III	15	50	51.0	3.139	-57	-3	30	02.03	10.73	-24
588	5892	ε Serpentis	3.71	A5m	15	51	59.4	2.997	+86	+4	24	30.69	10.56	+63
589	5897	β Tr.Australis	2.85	F0 1V	15	57	14.1	5.352	-283	-63	30	01.97	10.63	-398
591	5933	γ Serpentis	3.85	F6 V	15	57	32.4	2.776	+218	+15	35	10.96	11.49	-1281
592	5944	π Scorpii	2.89	B1 V + B2 V	16	00	16.7	3.644	-8	-26	10	47.62	10.02	-26
594	5953	δ Scorpii*	2.32	B0.3 IV	16	01	43.6	3.560	-8	-22	41	12.22	-9.91	-22
597	5984	β Scorpii*pr	2.62	B0.5 V	16	06	48.4	3.500	-4	-19	52	04.46	9.52	-19
603	6056	δ Ophiuchi	2.74	M0.5 III	16	15	34.8	3.151	-29	-3	45	11.29	8.96	-143
605	6075	ε Ophiuchi	3.24	G9.5 IIIb Fe-0.5	16	19	34.0	3.182	+57	-4	44	53.04	8.46	+41
608	6092	τ Herculis	3.89	B5 IV	16	20	26.9	1.808	-11	+46	15	30.28	8.39	+40
607	6084	σ Scorpii	2.89	B1 III	16	22	37.3	3.659	-8	-25	38	50.15	8.28	-21
609	6095	γ Herculis	3.75	A9 IIIbn	16	22	57.5	2.650	-33	+19	05	57.72	-8.19	+43
613	6117	ω Herculis	4.57	B9 p Cr	16	26	30.1	2.773	+30	+13	58	50.47	8.01	-59
616	6134	α Scorpii* cg	0.96	M1.5 Iab-Ib	16	30	51.1	3.691	-7	-26	28	55.62	7.62	-20
618	6148	β Herculis	2.77	G7 III a Fe-0.5	16	31	13.9	2.583	-70	+21	26	23.35	7.58	-15
611	6102	γ Apodis	3.89	G8/K0 III	16	37	07.8	9.426	-452	-78	56	41.60	7.17	-77
620	6165	τ Scorpii	2.82	B0 V	16	37	21.0	3.747	-6	-28	15	45.84	7.09	-22
622	6175	ζ Ophiuchi	2.56	O9.5 Vn	16	38	27.3	3.311	+9	-10	36	46.26	-6.95	+26
626	6220	η Herculis	3.53	G7 III Fe-1	16	43	42.2	2.060	+32	38	52	43.66	6.63	-82
625	6217	α Tr. Austr.*	1.92	K2 IIb-IIIa	16	51	10.4	6.415	+26	-69	04	02.41	5.96	-34
1438	6243	20 Ophiuchi	4.65	F7 III	16	51	08.2	3.326	+65	-10	49	21.76	6.02	-92
628	6241	ε Scorpii	2.29	K2 III	16	51	41.4	3.898	-493	-34	20	01.55	6.14	-257
1435	6229	η Arae	3.76	K5 III	16	51	49.5	5.213	+49	-59	04	49.85	5.90	-28
1439	6247	μ^1 Scorpii	3.08v	B1.5 IVn	16	53	28.0	4.078	-9	-38	05	07.71	-5.76	-25
633	6299	κ Ophiuchi	3.20	K2 III	16	58	46.9	2.844	-197	+9	20	24.42	5.30	-11
631	6285	ζ Arae	3.13	K4 III	17	00	34.4	4.989	-23	-56	01	28.06	5.17	-36
634	6324	ε Herculis	3.92	A0 IV	17	01	11.4	2.299	-36	+30	53	35.32	5.06	+27
635	6355	60 Herculis	4.91	A4 IV	17	06	28.1	2.786	+35	+12	42	36.69	4.65	-10
639	6396	ζ Draconis	3.17	B6 III	17	08	51.6	0.188	-33	+65	41	09.00	4.41	+22
638	6380	η Scorpii	3.33	F2 V:p(Cr)	17	13	50.5	4.310	+23	-43	16	03.65	-4.30	-287
643	6418	π Herculis	3.16	K3 II	17	15	52.0	2.093	-22	+36	47	02.13	3.83	+4
641	6410	δ Herculis	3.14	A1 Vann	17	15	59.9	2.468	-15	+24	48	46.64	3.98	-157
644	6453	θ Ophiuchi	3.27	B2 IV	17	23	27.3	3.691	-3	-25	01	14.97	3.20	-20
645	6461	β Arae	2.85	K3 Ib-IIa	17	27	15.5	5.002	-9	-55	32	57.25	2.88	-25
1457	6486	44 Ophiuchi	4.17	A9m:	17	27	48.4	3.670	0	-24	11	41.27	2.92	-116
653	6536	β Draconis	2.79	G2 Ib-IIa	17	30	57.9	1.360	-17	+52	17	05.41	-2.52	+15
649	6508	ν Scorpii	2.69	B2 IV	17	32	21.8	4.086	-1	-37	18	44.05	2.44	-31
648	6500	δ Arae	3.62	B8 Vn	17	33	13.5	5.432	-79	-60	42	01.02	2.43	-96
651	6510	α Arae	2.95	B2 Vne	17	33	39.7	4.648	-32	-49	53	31.81	2.37	-70
652	6527	λ Scorpii*	1.63	B1.5 IV	17	35	12.4	4.081	-1	-37	07	06.89	2.19	-29
656	6556	α Ophiuchi*	2.08	A5 Vnn	17	36	01.6	2.788	+83	+12	32	40.53	-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*.

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FOR JULY 2^{d}.875 TERRESTRIAL TIME
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					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
658	6561	ξ Serpentis	3.54	F0 IIIb	17	38	56.0	3.439	-29	-15	24	40.76	-1.90	-58
654	6553	θ Scorpii	1.87	F1 III	17	39	00.6	4.318	+14	-43	00	37.06	1.83	-2
663	6588	ι Herculis	3.80	B3 IV	17	40	07.8	1.697	-5	45	59	41.56	1.73	+5
660	6580	κ Scorpii	2.41	B1.5 III	17	44	06.9	4.156	-5	-39	02	23.00	1.41	-27
665	6603	β Ophiuchi	2.77	K2 III CN 0.5	17	44	38.1	2.966	-27	+4	33	33.26	1.18	159
667	6623	μ Herculis	3.42	G5IV	17	47	22.8	2.352	-232	+27	42	29.82	1.86	-752
661	6582	η Pavonis	3.62	K1 IIIa CN I	17	48	02.6	5.900	-21	-64	43	53.98	-1.10	-54
668	6629	γ Ophiuchi	3.75	A0 Van	17	49	04.3	3.011	-14	+2	42	00.79	1.03	-74
666	6615	ι^{1} Scorpii	3.03	F2 Ia	17	49	13.8	4.201	0	-40	08	01.36	0.95	-8
669	6630	*G* Scorpii	3.21	K2 III	17	51	27.5	4.087	+41	-37	02	54.27	0.71	+33
671	6688	ξ Draconis	3.75	K2 III	17	53	56.2	1.040	+114	+56	52	10.56	0.45	+80
672	6695	θ Herculis	3.86	K1 IIa CN2	17	57	03.6	2.060	+4	+37	14	55.18	0.25	+6
676	6705	γ Draconis*	2.23	K5 III	17	57	09.2	1.396	-8	+51	29	13.34	-0.27	-19
674	6703	ξ Herculis	3.70	G8.5 III	17	58	40.7	2.334	+64	+29	14	48.41	0.13	-17
673	6698	ν Ophiuchi	3.34	G 9 IIIa	18	00	19.3	3.305	-4	-9	46	28.49	-0.09	-116
677	6714	67 Ophiuchi	3.97	B5 Ib	18	01	49.4	3.007	+1	+2	55	55.94	+0.15	-8
679	6746	γ Sagittarii	2.99	K0^{-} III	18	07	19.1	3.855	-41	-30	25	17.56	0.45	-185
1471	6743	θ Arae	3.66	B2 Ib	18	08	27.6	4.670	-10	-50	05	14.40	0.73	-14
680	6771	72 Ophiuchi	3.73	A5 IV-V	18	08	27.9	2.846	-41	+9	34	07.99	+0.82	+80
681	6779	*o* Herculis	3.83	A0 II-III	18	08	27.6	2.342	+1	+28	46	01.67	0.75	+10
682	6812	μ Sagittarii	3.86	B9 Ia	18	15	10.1	3.589	+1	-21	03	02.05	1.33	+1
683	6832	η Sagittarii	3.11	M3.5 IIIab	18	19	13.0	4.059	-106	-36	45	08.26	1.51	-167
695	6927	χ Draconis	3.57	F7 V	18	20	37.8	-1.088	+1201	+72	44	32.94	1.46	-346
687	6859	δ Sagittarii*	2.70	K2.5 IIIa CN 0.5	18	22	29.9	3.840	+27	-29	48	57.36	1.94	-28
688	6869	η Serpentis	3.26	K0 III-IV	18	22	31.6	3.106	-364	-2	53	27.24	+1.27	-702
690	6895	109 Herculis	3.84	K2 IIIab	18	24	42.0	2.559	+141	+21	46	55.03	1.91	-242
689	6879	ε Sagittarii*	1.85	A0 II^{-}n(shell)	18	25	43.9	3.980	-31	-34	22	16.47	2.12	-124
691	6897	α Telescopii	3.51	B3 IV	18	28	42.9	4.444	-15	-45	57	10.61	2.45	-54
692	6913	λ Sagittarii	2.81	K1 IIIb	18	29	25.2	3.702	-32	-25	24	23.69	2.38	-185
697	6951	θ Coronae Aust.	4.64	G8 III	18	35	10.8	4.279	+28	-42	17	35.30	3.04	-22
1482	6973	α Scuti	3.85	K3 III	18	36	29.2	3.265	-10	-8	13	32.60	+2.86	-312
699	7001	α Lyrae*	0.03	A0 Va	18	37	44.1	2.033	+172	38	48	24.29	3.57	+287
1487	7039	φ Sagittarii	3.17	B8 III	18	47	07.4	3.745	+40	-26	57	52.12	4.09	+1
1489	7063	β Scuti	4.22	G4 IIa	18	48	25.3	3.183	-3	-4	43	15.23	4.19	-16
705	7106	β Lyrae*	3.45	B7 Vpe(shell)	18	50	56.9	2.217	+3	+33	23	28.55	4.42	-3
706	7121	σ Sagittarii*	2.02	B3 IV	18	56	43.3	3.716	+10	-26	15	55.57	4.86	-54
710	7150	ξ^{2} Sagittarii	3.51	K1 III	18	59	07.8	3.576	+24	-21	04	25.46	+5.10	-12
713	7178	γ Lyrae	3.24	B9 II	18	59	49.4	2.246	-2	+32	43	23.15	5.17	+2
712	7176	ε Aquilae	4.02	K1^{-}III CN 0.5	19	00	41.4	2.724	-35	+15	06	06.28	5.17	-74
716	7235	ζ Aquilae	2.99	A0 Vann	19	06	29.4	2.758	-3	+13	53	59.84	5.64	-96
717	7236	λ Aquilae	3.44	A0 IVp(wk 4481)	19	07	29.7	3.183	-11	-4	50	43.77	5.73	-90
1496	7234	τ Sagittarii	3.32	K1.5 IIIb	19	08	24.3	3.740	-40	-27	38	02.40	+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 2023.5

FOR JULY $2^d.875$ 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)
720	7264	π Sagittarii	2.89	F2 II-III	19	11	09.6	3.563	0	-20	59	03.36	+6.09	-35
723	7310	δ Draconis	3.07	G9 III	19	12	33.2	-0.004	+164	+67	42	10.38	6.33	+93
726	7328	κ Cygni	3.77	G9 III	19	17	38.7	1.384	+65	+53	24	45.48	6.79	+125
730	7377	δ Aquilae	3.36	F2 IV-V	19	26	41.0	3.024	+171	+3	09	47.90	7.48	+83
1508	7405	α Vulpeculae	4.44	M0.5 IIIb	19	29	41.0	2.498	-92	+24	42	49.88	7.54	-106
733	7420	ι Cygni	3.79	A4 V	19	30	17.9	1.511	+21	+51	46	50.55	7.82	+130
732	7417	β Cygni*_p_	3.08	K3 II + B9.5 V	19	31	40.2	2.421	+2	+28	00	37.30	+7.80	-2
1513	7488	β Sagittae	4.37	G8 IIIa CN 0.5	19	42	06.3	2.695	+7	+17	31	54.98	8.60	-32
741	7525	γ Aquilae	2.72	K3 II	19	47	22.6	2.852	+12	+10	40	19.39	9.05	-2
743	7536	δ Sagittae	3.82	M2 II + A0 V	19	48	26.2	2.676	+5	+18	35	37.20	9.14	+8
745	7557	α Aquilae*	0.77	A7 Vnn	19	51	55.8	2.926	+362	+8	55	55.07	9.79	+387
746	7570	η Aquilae	3.90V	F6-GI Ib	19	53	40.2	3.054	+7	+1	04	03.26	9.53	-7
749	7602	β Aquilae*	3.71	G8 IV	19	56	28.0	2.946	+33	+6	28	01.11	+9.27	-482
752	7635	γ Sagittae	3.47	M0$^-$ III	19	59	48.1	2.669	+46	+19	33	26.56	10.03	+24
751	7623	θ^1 Sagittarii	4.37	B2.5 IV	20	01	15.6	3.890	+5	-35	12	38.97	10.09	-26
754	7665	δ Pavonis	3.56	G6/8 IV	20	11	00.5	5.813	+1998	-66	07	09.13	9.72	-1125
756	7710	θ Aquilae	3.23	B9.5 III$'$	20	12	31.0	3.093	+26	-0	45	00.83	10.96	+4
757	7735	31 o^2 Cygni	3.79	K2 II+ B4 V	20	14	22.3	1.890	+4	+46	48	48.89	11.09	+3
761	7754	α^2 Capricorni*	3.57	G9III	20	19	21.4	3.322	+44	-12	28	13.38	+11.45	+4
762	7776	β Capricorni	3.08	K0 II: + A5n: V:	20	22	19.7	3.363	+29	-14	42	20.00	11.66	+2
765	7796	γ Cygni	2.20	F8 Ib	20	23	04.3	2.155	+4	+40	19	58.74	11.71	0
764	7790	α Pavonis	1.94	B2.5 V	20	27	29.5	4.701	+9	-56	39	27.38	11.94	-89
768	7852	ε Delphini	4.03	B6 III	20	34	20.1	2.866	+9	+11	23	04.13	12.48	-22
(771)	7882	β Delphini*m	3.64	F5 IV	20	38	39.1	2.814	+81	+14	40	40.94	12.74	-47
769	7869	α Indi	3.11	K0 III CN-1	20	39	12.6	4.189	+52	-47	12	27.66	+12.89	+66
774	7906	α Delphini*	3.77	B9 IV	20	40	43.8	2.787	+46	+15	59	46.27	12.93	-2
777	7924	α Cygni*	1.25	A2 Ia	20	42	14.0	2.048	+3	+45	21	54.99	13.03	+2
778	7928	δ Delphini	4.43	F0m	20	44	33.4	2.801	-13	+15	09	36.41	13.14	-43
783	7957	η Cephei	3.43	K0 IV	20	45	45.8	1.209	+119	+61	55	50.25	14.08	+819
775	7913	β Pavonis	3.42	A6 IV$^-$	20	47	02.8	5.319	-76	-66	06	59.08	13.36	+11
780	7949	ε Cygni	2.46	K0 III	20	47	09.8	2.431	+286	+34	03	33.78	+13.68	+329
1541	7948	γ Delphini sq	4.27	K1 IV	20	47	44.9	2.784	-22	+16	12	36.73	13.20	-197
781	7950	ε Aquarii	3.77	A1 III$^-$	20	48	56.8	3.242	+24	-9	24	29.92	13.44	-34
1547	7990	μ Aquarii	4.73	F2m	20	53	55.2	3.230	+30	-8	53	37.50	13.76	-30
785	7986	β Indi	3.65	K1 II	20	56	37.7	4.633	+21	-58	21	48.85	13.94	-26
1550	8039	γ Microscopii	4.67	G8 III	21	02	43.6	3.662	-2	-32	09	51.86	14.34	+5
792	8079	ξ Cygni	3.72	K4.5 Ib-II	21	05	47.2	2.186	+8	+44	01	21.04	+14.53	+1
797	8115	ζ Cygni	3.20	G8$^+$ III-IIIa Ba 0.5	21	13	56.3	2.557	+1	+30	19	27.73	14.95	-56
800	8131	α Equulei	3.92	G2 II-III + A4 V	21	16	59.9	2.998	+39	+5	20	46.21	15.09	-88
803	8162	α Cephei*	2.44	A7 V$'$ n	21	19	08.3	1.427	+219	+62	41	08.53	15.35	+50
806	8204	ζ Capricorni	3.74	G4 Ib: Ba 2	21	28	00.3	3.413	+1	-22	18	29.96	+15.82	+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 2023.5

FOR JULY $2^d.875$ 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)
809	8238	β Cephei	3.23	B1 III	21	28	57.2	0.746	+21	+70	39	50.94	+15.85	+7
808	8232	β Aquarii*	2.91	G0 Ib	21	32	47.7	3.153	+14	-5	28	00.08	16.04	-8
1569	8264	ξ Aquarii	4.69	A5 Vn	21	39	00.1	3.188	+78	-7	44	51.91	16.34	-25
812	8278	γ Capricorni	3.68	A7 m:	21	41	23.4	3.314	+132	-16	33	18.27	16.46	-23
810	8254	ν Octantis	3.76	K0 III	21	43	59.9	6.400	+140	-77	17	00.81	16.37	-240
815	8308	ε Pegasi*	2.34	K2 Ib-II	21	45	20.4	2.947	+21	+9	59	01.25	16.68	-1
819	8322	δ Capricorni	2.87	F2m	21	48	20.1	3.302	+183	-16	01	10.58	+16.53	-296
822	8353	γ Gruis	3.01	B8 IV-Vs	21	55	20.6	3.610	+86	-37	15	11.83	17.13	-21
827	8414	α Aquarii*	2.96	G2 Ib	22	06	59.4	3.079	+13	-0	12	17.40	17.64	-10
831	8430	ι Pegasi	3.76	F5 V	22	08	06.4	2.799	+220	25	27	38.33	17.72	+25
829	8425	α Gruis*	1.74	B7 Vn	22	09	42.2	3.748	+126	-46	50	46.35	17.61	-151
834	8450	θ Pegasi	3.53	A2m AI IV-V	22	11	23.1	3.026	+185	+6	18	51.42	17.86	+27
836	8465	ζ Cephei	3.35	K1.5 Ib	22	11	40.4	2.092	+19	+58	19	03.56	+17.85	+4
841	8502	α Tucanae	2.86	K3 III	22	20	05.5	4.049	-96	-60	08	29.36	18.12	-43
842	8518	γ Aquarii	3.84	B9.5 III-IV	22	22	52.2	3.096	+88	-1	16	05.47	18.28	+7
846	8556	δ' Gruis	3.97	G6/8 III	22	30	39.9	3.558	+26	-43	22	29.14	18.53	-5
848	8585	α Lacertae	3.77	A1 Va	22	32	15.9	2.486	+144	+50	24	14.01	18.61	+19
849	8592	v Aquarii	5.20	F5 V	22	35	58.6	3.271	+158	-20	35	13.73	18.56	-144
850	8597	η Aquarii	4.02	B9 IV-V:n	22	36	33.8	3.081	+61	+0	00	15.35	+18.67	-56
855	8634	ζ Pegasi	3.40	B8.5 III	22	42	38.1	2.995	+55	+10	57	16.56	18.90	-12
856	8636	β Gruis	2.10	M4.5 III	22	44	03.6	3.551	+133	-46	45	39.98	18.94	-8
857	8650	η Pegasi	2.94	G8 II + F0V	22	44	06.4	2.822	+11	+30	20	40.95	18.93	-25
860	8675	ε Gruis	3.49	A2 Va	22	49	57.7	3.587	+115	-51	11	33.68	19.04	-71
863	8694	ι Cephei	3.52	$K0^-$ III	22	50	31.4	2.155	-108	+66	19	27.82	19.00	-125
861	8679	τ Aquarii	4.01	M0 III	22	50	50.0	3.170	-8	-13	28	05.01	+19.10	-38
862	8684	μ Pegasi	3.48	G8' III	22	51	08.4	2.904	+108	+24	43	34.26	19.10	-42
864	8698	λ Aquarii*	3.74	M2.5 III Fe-0.5	22	53	50.3	3.126	+8	-7	27	14.59	19.25	+37
866	8709	δ Aquarii	3.27	A3 IV-V	22	55	53.7	3.176	-28	-15	41	43.22	19.24	-25
867	8728	α PsA*	1.16	A3 Va	22	58	56.7	3.300	+255	-29	29	49.95	19.17	-164
869	8762	*o* Andromedae	3.62	B6 pe (shell)	23	03	00.5	2.777	+20	+42	27	09.58	19.42	-6
870	8775	β Pegasi*	2.42	M2.5 II-III	23	04	55.0	2.919	+143	+28	12	38.50	+19.60	+138
871	8781	α Pegasi*	2.49	A0 III-IV	23	05	56.0	2.994	+44	+15	19	55.56	19.44	-42
873	8812	88 Aquarii	3.66	K1.5 III	23	10	41.8	3.189	+40	-21	02	40.04	19.61	+31
878	8852	γ Piscium	3.69	G9 III: Fe-2	23	18	23.1	3.112	+509	+3	24	39.60	19.73	+17
890	8961	λ Andromedae	3.82v	G8 III-IV	23	38	43.3	2.960	+157	+46	35	08.38	19.53	-421
893	8974	γ Cephei	3.21	K1 III-IV CN I	23	40	19.9	2.526	-213	+77	45	49.51	20.12	+151
902	9072	ω Piscium	4.01	F4V	0	00	31.2	3.086	+103	+6	59	36.10	+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, 2023

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	24	+15	18	41	0	27	25	-42	11	10	0	44	44	-17	51	49	1	11	01	+35	44	40
	11	0	14	24	15	18	40	0	27	25	42	11	10	0	44	44	17	51	50	1	11	01	35	44	39
	21	0	14	24	15	18	40	0	27	24	42	11	10	0	44	44	17	51	50	1	11	01	35	44	39
	31	0	14	24	15	18	38	0	27	24	42	11	09	0	44	44	17	51	50	1	11	00	35	44	38
Feb.	10	0	14	24	15	18	37	0	27	24	42	11	07	0	44	44	17	51	50	1	11	00	35	44	36
	20	0	14	24	15	18	37	0	27	24	42	11	05	0	44	44	17	51	49	1	11	00	35	44	35
Mar.	2	0	14	24	+15	18	36	0	27	24	-42	11	03	0	44	44	-17	51	48	1	11	00	+35	44	34
	12	0	14	24	15	18	35	0	27	24	42	11	01	0	44	43	17	51	47	1	10	60	35	44	32
	22	0	14	24	15	18	34	0	27	24	42	10	58	0	44	44	17	51	45	1	10	60	35	44	30
Apr.	1	0	14	24	15	18	34	0	27	24	42	10	55	0	44	44	17	51	44	1	10	60	35	44	29
	11	0	14	24	15	18	34	0	27	24	42	10	52	0	44	44	17	51	42	1	10	60	35	44	27
	21	0	14	24	15	18	34	0	27	24	42	10	49	0	44	44	17	51	40	1	11	00	35	44	26
May	1	0	14	25	+15	18	35	0	27	24	-42	10	46	0	44	44	-17	51	38	1	11	00	+35	44	26
	11	0	14	25	15	18	35	0	27	25	42	10	43	0	44	44	17	51	35	1	11	00	35	44	25
	21	0	14	25	15	18	36	0	27	25	42	10	40	0	44	44	17	51	33	1	11	01	35	44	25
	31	0	14	25	15	18	38	0	27	25	42	10	37	0	44	45	17	51	31	1	11	01	35	44	25
June	10	0	14	26	15	18	40	0	27	26	42	10	34	0	44	45	17	51	28	1	11	01	35	44	26
	20	0	14	26	15	18	42	0	27	26	42	10	32	0	44	45	17	51	26	1	11	02	35	44	27
	30	0	14	26	+15	18	43	0	27	26	-42	10	30	0	44	46	-17	51	24	1	11	02	+35	44	28
July	10	0	14	27	15	18	46	0	27	27	42	10	29	0	44	46	17	51	22	1	11	02	35	44	30
	20	0	14	27	15	18	48	0	27	27	42	10	28	0	44	46	17	51	20	1	11	03	35	44	32
	30	0	14	27	15	18	50	0	27	28	42	10	27	0	44	47	17	51	19	1	11	03	35	44	34
Aug.	9	0	14	28	15	18	52	0	27	28	42	10	27	0	44	47	17	51	17	1	11	04	35	44	37
	19	0	14	28	15	18	55	0	27	28	42	10	28	0	44	47	17	51	17	1	11	04	35	44	39
	29	0	14	28	+15	18	57	0	27	28	-42	10	28	0	44	47	-17	51	16	1	11	04	+35	44	42
Sept.	8	0	14	28	15	18	58	0	27	29	42	10	30	0	44	48	17	51	16	1	11	04	35	44	44
	18	0	14	28	15	18	60	0	27	29	42	10	32	0	44	48	17	51	17	1	11	05	35	44	46
	28	0	14	28	15	19	01	0	27	29	42	10	33	0	44	48	17	51	17	1	11	05	35	44	49
Oct.	8	0	14	28	15	19	02	0	27	29	42	10	35	0	44	48	17	51	18	1	11	05	35	44	51
	18	0	14	28	15	19	03	0	27	29	42	10	38	0	44	48	17	51	19	1	11	05	35	44	53
	28	0	14	28	+15	19	04	0	27	29	-42	10	40	0	44	48	-17	51	20	1	11	05	+35	44	55
Nov.	7	0	14	28	15	19	04	0	27	29	42	10	42	0	44	48	17	51	22	1	11	05	35	44	57
	17	0	14	28	15	19	05	0	27	29	42	10	44	0	44	48	17	51	23	1	11	05	35	44	58
	27	0	14	28	15	19	04	0	27	29	42	10	46	0	44	48	17	51	24	1	11	05	35	44	59
Dec.	7	0	14	28	15	19	04	0	27	28	42	10	47	0	44	48	17	51	25	1	11	05	35	45	00
	17	0	14	28	15	19	04	0	27	28	42	10	48	0	44	48	17	51	26	1	11	05	35	45	01
	27	0	14	28	+15	19	04	0	27	28	-42	10	49	0	44	48	-17	51	27	1	11	05	+35	45	01
	37	0	14	28	+15	19	03	0	27	28	-42	10	49	0	44	47	-17	51	28	1	11	04	+35	45	01

APPARENT PLACES OF STARS, 2023

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	36	-10	13	26	2	01	05	-20	58	11	2	08	28	+23	34	19	3	03	29	+4	10	45
	11	1	52	36	10	13	26	2	01	05	20	58	12	2	08	28	23	34	19	3	03	29	4	10	44
	21	1	52	35	10	13	27	2	01	05	20	58	12	2	08	28	23	34	18	3	03	29	4	10	43
	31	1	52	35	10	13	27	2	01	05	20	58	13	2	08	28	23	34	17	3	03	29	4	10	43
Feb.	10	1	52	35	10	13	27	2	01	05	20	58	12	2	08	28	23	34	17	3	03	29	4	10	42
	20	1	52	35	10	13	27	2	01	05	20	58	12	2	08	28	23	34	16	3	03	29	4	10	42
Mar.	2	1	52	35	-10	13	27	2	01	05	-20	58	11	2	08	27	+23	34	15	3	03	28	+4	10	42
	12	1	52	35	10	13	26	2	01	04	20	58	10	2	08	27	23	34	14	3	03	28	4	10	42
	22	1	52	35	10	13	25	2	01	04	20	58	09	2	08	27	23	34	14	3	03	28	4	10	42
Apr.	1	1	52	35	10	13	24	2	01	04	20	58	07	2	08	27	23	34	13	3	03	28	4	10	42
	11	1	52	35	10	13	23	2	01	04	20	58	05	2	08	27	23	34	12	3	03	28	4	10	42
	21	1	52	35	10	13	22	2	01	04	20	58	03	2	08	27	23	34	12	3	03	28	4	10	43
May	1	1	52	35	-10	13	20	2	01	04	-20	58	01	2	08	27	+23	34	12	3	03	28	+4	10	44
	11	1	52	35	10	13	18	2	01	05	20	57	58	2	08	28	23	34	12	3	03	28	4	10	45
	21	1	52	35	10	13	16	2	01	05	20	57	56	2	08	28	23	34	12	3	03	28	4	10	46
	31	1	52	36	10	13	13	2	01	05	20	57	53	2	08	28	23	34	12	3	03	28	4	10	48
June	10	1	52	36	10	13	11	2	01	05	20	57	50	2	08	28	23	34	13	3	03	29	4	10	49
	20	1	52	36	10	13	09	2	01	06	20	57	48	2	08	29	23	34	14	3	03	29	4	10	51
	30	1	52	36	-10	13	07	2	01	06	-20	57	45	2	08	29	+23	34	15	3	03	29	+4	10	53
July	10	1	52	37	10	13	04	2	01	06	20	57	43	2	08	29	23	34	17	3	03	30	4	10	55
	20	1	52	37	10	13	02	2	01	07	20	57	41	2	08	30	23	34	19	3	03	30	4	10	56
	30	1	52	37	10	13	01	2	01	07	20	57	39	2	08	30	23	34	20	3	03	30	4	10	58
Aug.	9	1	52	38	10	12	59	2	01	07	20	57	38	2	08	30	23	34	22	3	03	30	4	10	60
	19	1	52	38	10	12	58	2	01	07	20	57	37	2	08	31	23	34	24	3	03	31	4	11	01
	29	1	52	38	-10	12	57	2	01	08	-20	57	36	2	08	31	+23	34	26	3	03	31	+4	11	02
Sept.	8	1	52	38	10	12	56	2	01	08	20	57	36	2	08	31	23	34	28	3	03	31	4	11	03
	18	1	52	39	10	12	56	2	01	08	20	57	37	2	08	31	23	34	29	3	03	32	4	11	04
	28	1	52	39	10	12	56	2	01	08	20	57	37	2	08	32	23	34	31	3	03	32	4	11	05
Oct.	8	1	52	39	10	12	57	2	01	09	20	57	38	2	08	32	23	34	33	3	03	32	4	11	05
	18	1	52	39	10	12	58	2	01	09	20	57	40	2	08	32	23	34	34	3	03	32	4	11	05
	28	1	52	39	-10	12	58	2	01	09	-20	57	41	2	08	32	+23	34	35	3	03	32	+4	11	05
Nov.	7	1	52	39	10	12	59	2	01	09	20	57	43	2	08	32	23	34	36	3	03	33	4	11	04
	17	1	52	39	10	13	01	2	01	09	20	57	45	2	08	32	23	34	37	3	03	33	4	11	04
	27	1	52	39	10	13	02	2	01	09	20	57	46	2	08	32	23	34	37	3	03	33	4	11	03
Dec.	7	1	52	39	10	13	03	2	01	09	20	57	48	2	08	32	23	34	38	3	03	33	4	11	03
	17	1	52	39	10	13	04	2	01	09	20	57	49	2	08	32	23	34	38	3	03	33	4	11	02
	27	1	52	39	-10	13	05	2	01	09	-20	57	51	2	08	32	+23	34	38	3	03	33	+4	11	01
	37	1	52	39	-10	13	06	2	01	08	-20	57	52	2	08	32	+23	34	38	3	03	33	+4	11	00

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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	52	+24	10	36	4	37	15	+16	33	19	5	08	60	-5	03	27	5	26	23	+6	22	12
	11	3	48	52	24	10	36	4	37	15	16	33	19	5	08	60	5	03	28	5	26	23	6	22	12
	21	3	48	52	24	10	36	4	37	15	16	33	19	5	08	60	5	03	29	5	26	23	6	22	11
	31	3	48	51	24	10	36	4	37	15	16	33	19	5	08	59	5	03	30	5	26	23	6	22	10
Feb.	10	3	48	51	24	10	36	4	37	15	16	33	19	5	08	59	5	03	31	5	26	22	6	22	10
	20	3	48	51	24	10	36	4	37	15	16	33	19	5	08	59	5	03	32	5	26	22	6	22	10
Mar.	2	3	48	51	+24	10	35	4	37	14	+16	33	18	5	08	59	-5	03	32	5	26	22	+6	22	09
	12	3	48	51	24	10	35	4	37	14	16	33	18	5	08	59	5	03	32	5	26	22	6	22	09
	22	3	48	51	24	10	34	4	37	14	16	33	18	5	08	59	5	03	32	5	26	22	6	22	09
Apr.	1	3	48	50	24	10	34	4	37	14	16	33	18	5	08	59	5	03	32	5	26	22	6	22	09
	11	3	48	50	24	10	33	4	37	14	16	33	18	5	08	58	5	03	31	5	26	22	6	22	09
	21	3	48	50	24	10	33	4	37	14	16	33	18	5	08	58	5	03	30	5	26	21	6	22	10
May	1	3	48	50	+24	10	32	4	37	14	+16	33	18	5	08	58	-5	03	29	5	26	21	+6	22	10
	11	3	48	50	24	10	32	4	37	14	16	33	18	5	08	58	5	03	28	5	26	21	6	22	11
	21	3	48	50	24	10	32	4	37	14	16	33	18	5	08	58	5	03	27	5	26	21	6	22	12
	31	3	48	51	24	10	32	4	37	14	16	33	19	5	08	58	5	03	25	5	26	21	6	22	13
June	10	3	48	51	24	10	33	4	37	14	16	33	19	5	08	58	5	03	23	5	26	21	6	22	14
	20	3	48	51	24	10	33	4	37	14	16	33	20	5	08	58	5	03	22	5	26	22	6	22	15
	30	3	48	51	+24	10	34	4	37	14	+16	33	21	5	08	59	-5	03	20	5	26	22	+6	22	16
July	10	3	48	52	24	10	35	4	37	15	16	33	22	5	08	59	5	03	18	5	26	22	6	22	17
	20	3	48	52	24	10	36	4	37	15	16	33	23	5	08	59	5	03	16	5	26	22	6	22	18
	30	3	48	52	24	10	36	4	37	15	16	33	23	5	08	59	5	03	15	5	26	22	6	22	19
Aug.	9	3	48	53	24	10	38	4	37	16	16	33	25	5	08	60	5	03	13	5	26	23	6	22	21
	19	3	48	53	24	10	39	4	37	16	16	33	26	5	08	60	5	03	12	5	26	23	6	22	22
	29	3	48	53	+24	10	40	4	37	16	+16	33	26	5	09	00	-5	03	11	5	26	23	+6	22	22
Sept.	8	3	48	54	24	10	41	4	37	17	16	33	27	5	09	00	5	03	10	5	26	24	6	22	23
	18	3	48	54	24	10	42	4	37	17	16	33	28	5	09	01	5	03	09	5	26	24	6	22	24
	28	3	48	54	24	10	43	4	37	17	16	33	29	5	09	01	5	03	09	5	26	24	6	22	24
Oct.	8	3	48	54	24	10	44	4	37	17	16	33	29	5	09	01	5	03	10	5	26	24	6	22	24
	18	3	48	55	24	10	45	4	37	18	16	33	29	5	09	02	5	03	10	5	26	25	6	22	23
	28	3	48	55	+24	10	46	4	37	18	+16	33	29	5	09	02	-5	03	11	5	26	25	+6	22	23
Nov.	7	3	48	55	24	10	47	4	37	18	16	33	29	5	09	02	5	03	12	5	26	25	6	22	22
	17	3	48	55	24	10	47	4	37	18	16	33	29	5	09	02	5	03	14	5	26	25	6	22	21
	27	3	48	55	24	10	48	4	37	19	16	33	29	5	09	02	5	03	15	5	26	26	6	22	20
Dec.	7	3	48	56	24	10	48	4	37	19	16	33	29	5	09	03	5	03	17	5	26	26	6	22	19
	17	3	48	56	24	10	49	4	37	19	16	33	29	5	09	03	5	03	18	5	26	26	6	22	18
	27	3	48	56	+24	10	49	4	37	19	+16	33	28	5	09	03	-5	03	20	5	26	26	+6	22	17
	37	3	48	56	+24	10	49	4	37	19	+16	33	28	5	09	03	-5	03	21	5	26	26	+6	22	17

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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	15	-20	44	31	5	36	34	-5	53	43	5	40	30	-34	03	45	5	48	52	-9	39	43
	11	5	29	15	20	44	33	5	36	34	5	53	45	5	40	30	34	03	48	5	48	52	9	39	45
	21	5	29	15	20	44	35	5	36	34	5	53	46	5	40	30	34	03	51	5	48	52	9	39	46
	31	5	29	15	20	44	37	5	36	34	5	53	47	5	40	30	34	03	53	5	48	52	9	39	48
Feb.	10	5	29	15	20	44	38	5	36	34	5	53	48	5	40	30	34	03	54	5	48	52	9	39	49
	20	5	29	14	20	44	39	5	36	34	5	53	49	5	40	30	34	03	55	5	48	51	9	39	49
Mar.	2	5	29	14	-20	44	40	5	36	34	-5	53	49	5	40	29	-34	03	56	5	48	51	-9	39	50
	12	5	29	14	20	44	40	5	36	34	5	53	50	5	40	29	34	03	57	5	48	51	9	39	50
	22	5	29	14	20	44	39	5	36	33	5	53	49	5	40	29	34	03	57	5	48	51	9	39	50
Apr.	1	5	29	14	20	44	39	5	36	33	5	53	49	5	40	29	34	03	56	5	48	51	9	39	50
	11	5	29	13	20	44	38	5	36	33	5	53	49	5	40	28	34	03	55	5	48	51	9	39	50
	21	5	29	13	20	44	37	5	36	33	5	53	48	5	40	28	34	03	54	5	48	50	9	39	49
May	1	5	29	13	-20	44	36	5	36	33	-5	53	47	5	40	28	-34	03	52	5	48	50	-9	39	48
	11	5	29	13	20	44	34	5	36	33	5	53	46	5	40	28	34	03	50	5	48	50	9	39	47
	21	5	29	13	20	44	32	5	36	33	5	53	45	5	40	28	34	03	48	5	48	50	9	39	45
	31	5	29	13	20	44	30	5	36	33	5	53	43	5	40	28	34	03	45	5	48	50	9	39	43
June	10	5	29	13	20	44	27	5	36	33	5	53	41	5	40	28	34	03	42	5	48	50	9	39	42
	20	5	29	13	20	44	25	5	36	33	5	53	40	5	40	28	34	03	39	5	48	50	9	39	40
	30	5	29	13	-20	44	22	5	36	33	-5	53	38	5	40	28	-34	03	36	5	48	50	-9	39	38
July	10	5	29	14	20	44	20	5	36	33	5	53	36	5	40	28	34	03	33	5	48	51	9	39	36
	20	5	29	14	20	44	17	5	36	34	5	53	34	5	40	28	34	03	30	5	48	51	9	39	34
	30	5	29	14	20	44	15	5	36	34	5	53	33	5	40	29	34	03	28	5	48	51	9	39	32
Aug.	9	5	29	14	20	44	13	5	36	34	5	53	31	5	40	29	34	03	25	5	48	51	9	39	30
	19	5	29	15	20	44	11	5	36	34	5	53	30	5	40	29	34	03	23	5	48	52	9	39	29
	29	5	29	15	-20	44	10	5	36	35	-5	53	29	5	40	30	-34	03	22	5	48	52	-9	39	28
Sept.	8	5	29	15	20	44	10	5	36	35	5	53	28	5	40	30	34	03	21	5	48	52	9	39	27
	18	5	29	15	20	44	09	5	36	35	5	53	28	5	40	30	34	03	20	5	48	52	9	39	27
	28	5	29	16	20	44	09	5	36	36	5	53	28	5	40	31	34	03	20	5	48	53	9	39	27
Oct.	8	5	29	16	20	44	10	5	36	36	5	53	28	5	40	31	34	03	21	5	48	53	9	39	27
	18	5	29	16	20	44	11	5	36	36	5	53	29	5	40	31	34	03	22	5	48	53	9	39	28
	28	5	29	17	-20	44	12	5	36	36	-5	53	29	5	40	31	-34	03	24	5	48	54	-9	39	29
Nov.	7	5	29	17	20	44	14	5	36	37	5	53	31	5	40	32	34	03	26	5	48	54	9	39	30
	17	5	29	17	20	44	16	5	36	37	5	53	32	5	40	32	34	03	29	5	48	54	9	39	32
	27	5	29	17	20	44	18	5	36	37	5	53	34	5	40	32	34	03	32	5	48	54	9	39	34
Dec.	7	5	29	17	20	44	21	5	36	37	5	53	35	5	40	32	34	03	34	5	48	55	9	39	36
	17	5	29	18	20	44	23	5	36	37	5	53	37	5	40	32	34	03	38	5	48	55	9	39	38
	27	5	29	18	-20	44	26	5	36	37	-5	53	39	5	40	33	-34	03	41	5	48	55	-9	39	40
	37	5	29	18	-20	44	28	5	36	38	-5	53	40	5	40	33	-34	03	43	5	48	55	-9	39	41

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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	26	+7	24	40	6	21	13	-30	04	25	6	24	30	-52	42	27	6	39	03	+16	22	45
	11	5	56	26	7	24	39	6	21	13	30	04	28	6	24	30	52	42	31	6	39	03	16	22	44
	21	5	56	26	7	24	38	6	21	13	30	04	30	6	24	30	52	42	34	6	39	03	16	22	44
	31	5	56	26	7	24	37	6	21	13	30	04	33	6	24	29	52	42	37	6	39	03	16	22	44
Feb.	10	5	56	26	7	24	37	6	21	13	30	04	34	6	24	29	52	42	39	6	39	03	16	22	44
	20	5	56	26	7	24	37	6	21	13	30	04	36	6	24	29	52	42	41	6	39	03	16	22	44
Mar.	2	5	56	25	+7	24	36	6	21	12	-30	04	37	6	24	29	-52	42	43	6	39	03	+16	22	44
	12	5	56	25	7	24	36	6	21	12	30	04	38	6	24	28	52	42	44	6	39	03	16	22	44
	22	5	56	25	7	24	37	6	21	12	30	04	38	6	24	28	52	42	44	6	39	03	16	22	44
Apr.	1	5	56	25	7	24	37	6	21	12	30	04	38	6	24	28	52	42	44	6	39	03	16	22	44
	11	5	56	25	7	24	37	6	21	12	30	04	38	6	24	27	52	42	44	6	39	02	16	22	44
	21	5	56	25	7	24	37	6	21	11	30	04	37	6	24	27	52	42	43	6	39	02	16	22	45
May	1	5	56	25	+7	24	38	6	21	11	-30	04	35	6	24	27	-52	42	41	6	39	02	+16	22	45
	11	5	56	25	7	24	38	6	21	11	30	04	34	6	24	26	52	42	39	6	39	02	16	22	45
	21	5	56	24	7	24	39	6	21	11	30	04	32	6	24	26	52	42	37	6	39	02	16	22	45
	31	5	56	24	7	24	40	6	21	11	30	04	29	6	24	26	52	42	34	6	39	02	16	22	45
June	10	5	56	25	7	24	40	6	21	11	30	04	27	6	24	26	52	42	31	6	39	02	16	22	46
	20	5	56	25	7	24	41	6	21	11	30	04	25	6	24	26	52	42	28	6	39	02	16	22	46
	30	5	56	25	+7	24	42	6	21	11	-30	04	22	6	24	26	-52	42	25	6	39	02	+16	22	46
July	10	5	56	25	7	24	43	6	21	11	30	04	19	6	24	26	52	42	21	6	39	02	16	22	47
	20	5	56	25	7	24	44	6	21	11	30	04	16	6	24	26	52	42	18	6	39	02	16	22	47
	30	5	56	25	7	24	45	6	21	11	30	04	14	6	24	26	52	42	15	6	39	03	16	22	47
Aug.	9	5	56	26	7	24	46	6	21	12	30	04	11	6	24	27	52	42	12	6	39	03	16	22	48
	19	5	56	26	7	24	47	6	21	12	30	04	09	6	24	27	52	42	10	6	39	03	16	22	48
	29	5	56	26	+7	24	48	6	21	12	-30	04	08	6	24	27	-52	42	08	6	39	03	+16	22	48
Sept.	8	5	56	27	7	24	48	6	21	13	30	04	07	6	24	28	52	42	06	6	39	04	16	22	48
	18	5	56	27	7	24	49	6	21	13	30	04	06	6	24	28	52	42	05	6	39	04	16	22	48
	28	5	56	27	7	24	49	6	21	13	30	04	06	6	24	28	52	42	05	6	39	04	16	22	48
Oct.	8	5	56	27	7	24	48	6	21	13	30	04	06	6	24	29	52	42	06	6	39	05	16	22	48
	18	5	56	28	7	24	48	6	21	14	30	04	07	6	24	29	52	42	06	6	39	05	16	22	47
	28	5	56	28	+7	24	48	6	21	14	-30	04	08	6	24	30	-52	42	08	6	39	05	+16	22	47
Nov.	7	5	56	28	7	24	47	6	21	14	30	04	10	6	24	30	52	42	10	6	39	06	16	22	46
	17	5	56	29	7	24	46	6	21	15	30	04	13	6	24	30	52	42	13	6	39	06	16	22	45
	27	5	56	29	7	24	45	6	21	15	30	04	15	6	24	31	52	42	16	6	39	06	16	22	44
Dec.	7	5	56	29	7	24	44	6	21	15	30	04	18	6	24	31	52	42	19	6	39	06	16	22	44
	17	5	56	29	7	24	43	6	21	15	30	04	21	6	24	31	52	42	23	6	39	07	16	22	43
	27	5	56	29	+7	24	42	6	21	15	-30	04	24	6	24	31	-52	42	27	6	39	07	+16	22	42
	37	5	56	29	+7	24	41	6	21	15	-30	04	27	6	24	31	-52	42	30	6	39	07	+16	22	42

APPARENT PLACES OF STARS, 2023

FOR 0^h TERRESTRIAL TIME

Name		α Canis Majoris A						o^2 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	11	-16	44	52	7	04	00	-23	51	59	7	28	25	+8	14	34	7	40	31	+5	09	57
	11	6	46	11	16	44	54	7	04	00	23	52	02	7	28	25	8	14	33	7	40	31	5	09	56
	21	6	46	11	16	44	56	7	04	00	23	52	04	7	28	25	8	14	32	7	40	31	5	09	55
	31	6	46	11	16	44	58	7	04	00	23	52	06	7	28	25	8	14	31	7	40	31	5	09	54
Feb.	10	6	46	11	16	44	60	7	04	00	23	52	08	7	28	25	8	14	31	7	40	31	5	09	53
	20	6	46	10	16	45	01	7	04	00	23	52	10	7	28	25	8	14	30	7	40	31	5	09	52
Mar.	2	6	46	10	-16	45	02	7	03	60	-23	52	12	7	28	25	+8	14	30	7	40	31	+5	09	52
	12	6	46	10	16	45	03	7	03	60	23	52	12	7	28	25	8	14	30	7	40	31	5	09	52
	22	6	46	10	16	45	03	7	03	59	23	52	13	7	28	24	8	14	30	7	40	31	5	09	52
Apr.	1	6	46	10	16	45	03	7	03	59	23	52	13	7	28	24	8	14	30	7	40	31	5	09	52
	11	6	46	10	16	45	03	7	03	59	23	52	13	7	28	24	8	14	30	7	40	31	5	09	52
	21	6	46	09	16	45	02	7	03	59	23	52	13	7	28	24	8	14	31	7	40	30	5	09	52
May	1	6	46	09	-16	45	01	7	03	59	-23	52	12	7	28	24	+8	14	31	7	40	30	+5	09	53
	11	6	46	09	16	45	00	7	03	59	23	52	11	7	28	24	8	14	31	7	40	30	5	09	53
	21	6	46	09	16	44	59	7	03	58	23	52	09	7	28	24	8	14	32	7	40	30	5	09	54
	31	6	46	09	16	44	57	7	03	58	23	52	07	7	28	24	8	14	33	7	40	30	5	09	55
June	10	6	46	09	16	44	55	7	03	58	23	52	05	7	28	24	8	14	33	7	40	30	5	09	55
	20	6	46	09	16	44	53	7	03	58	23	52	03	7	28	24	8	14	34	7	40	30	5	09	56
	30	6	46	09	-16	44	51	7	03	58	-23	52	01	7	28	24	+8	14	35	7	40	30	+5	09	57
July	10	6	46	09	16	44	49	7	03	59	23	51	58	7	28	24	8	14	35	7	40	30	5	09	58
	20	6	46	09	16	44	47	7	03	59	23	51	56	7	28	24	8	14	36	7	40	30	5	09	58
	30	6	46	10	16	44	45	7	03	59	23	51	54	7	28	24	8	14	36	7	40	30	5	09	59
Aug.	9	6	46	10	16	44	43	7	03	59	23	51	52	7	28	24	8	14	37	7	40	31	5	09	60
	19	6	46	10	16	44	42	7	03	59	23	51	50	7	28	24	8	14	38	7	40	31	5	10	00
	29	6	46	10	-16	44	40	7	03	59	-23	51	48	7	28	25	+8	14	38	7	40	31	+5	10	00
Sept.	8	6	46	11	16	44	40	7	03	60	23	51	47	7	28	25	8	14	38	7	40	31	5	10	01
	18	6	46	11	16	44	39	7	03	60	23	51	46	7	28	25	8	14	38	7	40	31	5	10	01
	28	6	46	11	16	44	39	7	04	00	23	51	46	7	28	25	8	14	38	7	40	32	5	10	00
Oct.	8	6	46	11	16	44	39	7	04	01	23	51	46	7	28	26	8	14	37	7	40	32	5	09	60
	18	6	46	12	16	44	40	7	04	01	23	51	47	7	28	26	8	14	36	7	40	32	5	09	59
	28	6	46	12	-16	44	41	7	04	01	-23	51	48	7	28	26	+8	14	35	7	40	33	+5	09	58
Nov.	7	6	46	12	16	44	43	7	04	02	23	51	49	7	28	27	8	14	34	7	40	33	5	09	57
	17	6	46	13	16	44	45	7	04	02	23	51	52	7	28	27	8	14	33	7	40	33	5	09	55
	27	6	46	13	16	44	47	7	04	02	23	51	54	7	28	27	8	14	32	7	40	34	5	09	54
Dec.	7	6	46	13	16	44	49	7	04	02	23	51	56	7	28	28	8	14	30	7	40	34	5	09	52
	17	6	46	13	16	44	52	7	04	03	23	51	59	7	28	28	8	14	29	7	40	34	5	09	50
	27	6	46	13	-16	44	55	7	04	03	-23	52	02	7	28	28	+8	14	27	7	40	34	+5	09	49
	37	6	46	13	-16	44	57	7	04	03	-23	52	05	7	28	28	+8	14	26	7	40	34	+5	09	48

APPARENT PLACES OF STARS, 2023

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	44	+27	58	11	7	50	17	-24	54	59	8	08	32	-24	22	09	8	56	37	+5	51	29
	11	7	46	44	27	58	11	7	50	17	24	55	02	8	08	32	24	22	12	8	56	37	5	51	28
	21	7	46	44	27	58	11	7	50	17	24	55	04	8	08	32	24	22	15	8	56	37	5	51	26
	31	7	46	44	27	58	12	7	50	17	24	55	07	8	08	33	24	22	18	8	56	38	5	51	25
Feb.	10	7	46	44	27	58	13	7	50	17	24	55	09	8	08	33	24	22	20	8	56	38	5	51	24
	20	7	46	44	27	58	13	7	50	17	24	55	11	8	08	33	24	22	22	8	56	38	5	51	24
Mar.	2	7	46	44	+27	58	14	7	50	17	-24	55	13	8	08	32	-24	22	24	8	56	38	+5	51	23
	12	7	46	44	27	58	15	7	50	16	24	55	14	8	08	32	24	22	25	8	56	38	5	51	23
	22	7	46	44	27	58	15	7	50	16	24	55	15	8	08	32	24	22	26	8	56	37	5	51	23
Apr.	1	7	46	44	27	58	16	7	50	16	24	55	16	8	08	32	24	22	27	8	56	37	5	51	23
	11	7	46	44	27	58	16	7	50	16	24	55	16	8	08	32	24	22	28	8	56	37	5	51	23
	21	7	46	44	27	58	17	7	50	16	24	55	16	8	08	32	24	22	27	8	56	37	5	51	24
May	1	7	46	43	+27	58	17	7	50	16	-24	55	15	8	08	31	-24	22	27	8	56	37	+5	51	24
	11	7	46	43	27	58	17	7	50	15	24	55	15	8	08	31	24	22	27	8	56	37	5	51	24
	21	7	46	43	27	58	17	7	50	15	24	55	14	8	08	31	24	22	25	8	56	37	5	51	25
	31	7	46	43	27	58	16	7	50	15	24	55	12	8	08	31	24	22	24	8	56	37	5	51	25
June	10	7	46	43	27	58	16	7	50	15	24	55	10	8	08	31	24	22	22	8	56	37	5	51	26
	20	7	46	43	27	58	16	7	50	15	24	55	08	8	08	31	24	22	21	8	56	37	5	51	26
	30	7	46	43	+27	58	15	7	50	15	-24	55	06	8	08	31	-24	22	19	8	56	36	+5	51	27
July	10	7	46	43	27	58	15	7	50	15	24	55	04	8	08	31	24	22	16	8	56	36	5	51	28
	20	7	46	43	27	58	14	7	50	15	24	55	02	8	08	31	24	22	14	8	56	37	5	51	28
	30	7	46	43	27	58	14	7	50	15	24	54	59	8	08	31	24	22	12	8	56	37	5	51	29
Aug.	9	7	46	44	27	58	13	7	50	15	24	54	57	8	08	31	24	22	10	8	56	37	5	51	29
	19	7	46	44	27	58	12	7	50	16	24	54	55	8	08	31	24	22	08	8	56	37	5	51	30
	29	7	46	44	+27	58	11	7	50	16	-24	54	54	8	08	31	-24	22	06	8	56	37	+5	51	30
Sept.	8	7	46	44	27	58	11	7	50	16	24	54	52	8	08	32	24	22	05	8	56	37	5	51	30
	18	7	46	45	27	58	10	7	50	16	24	54	51	8	08	32	24	22	04	8	56	37	5	51	29
	28	7	46	45	27	58	09	7	50	17	24	54	51	8	08	32	24	22	03	8	56	38	5	51	29
Oct.	8	7	46	45	27	58	08	7	50	17	24	54	51	8	08	33	24	22	03	8	56	38	5	51	28
	18	7	46	46	27	58	07	7	50	17	24	54	51	8	08	33	24	22	04	8	56	38	5	51	27
	28	7	46	46	+27	58	06	7	50	17	-24	54	52	8	08	33	-24	22	04	8	56	38	+5	51	26
Nov.	7	7	46	46	27	58	05	7	50	18	24	54	54	8	08	33	24	22	06	8	56	39	5	51	24
	17	7	46	47	27	58	04	7	50	18	24	54	56	8	08	34	24	22	08	8	56	39	5	51	23
	27	7	46	47	27	58	04	7	50	18	24	54	58	8	08	34	24	22	10	8	56	39	5	51	21
Dec.	7	7	46	47	27	58	03	7	50	19	24	55	00	8	08	34	24	22	12	8	56	40	5	51	19
	17	7	46	48	27	58	03	7	50	19	24	55	03	8	08	35	24	22	15	8	56	40	5	51	17
	27	7	46	48	+27	58	02	7	50	19	-24	55	06	8	08	35	-24	22	18	8	56	40	+5	51	16
	37	7	46	48	+27	58	03	7	50	19	-24	55	09	8	08	35	-24	22	21	8	56	41	+5	51	14

APPARENT PLACES OF STARS, 2023

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	51	-43	31	19	9	28	43	-8	45	26	10	09	36	+11	51	16	10	28	12	-31	10	54
	11	9	08	52	43	31	23	9	28	44	8	45	28	10	09	36	11	51	14	10	28	13	31	10	57
	21	9	08	52	43	31	27	9	28	44	8	45	30	10	09	36	11	51	13	10	28	13	31	10	60
	31	9	08	52	43	31	30	9	28	44	8	45	32	10	09	37	11	51	12	10	28	13	31	11	03
Feb.	10	9	08	52	43	31	33	9	28	44	8	45	34	10	09	37	11	51	12	10	28	13	31	11	06
	20	9	08	52	43	31	37	9	28	44	8	45	36	10	09	37	11	51	11	10	28	14	31	11	09
Mar.	2	9	08	52	-43	31	40	9	28	44	-8	45	37	10	09	37	+11	51	11	10	28	14	-31	11	11
	12	9	08	52	43	31	42	9	28	44	8	45	38	10	09	37	11	51	11	10	28	14	31	11	14
	22	9	08	52	43	31	44	9	28	44	8	45	39	10	09	37	11	51	11	10	28	14	31	11	16
Apr.	1	9	08	51	43	31	46	9	28	44	8	45	40	10	09	37	11	51	12	10	28	13	31	11	18
	11	9	08	51	43	31	48	9	28	44	8	45	40	10	09	37	11	51	12	10	28	13	31	11	19
	21	9	08	51	43	31	48	9	28	44	8	45	40	10	09	37	11	51	13	10	28	13	31	11	21
May	1	9	08	51	-43	31	49	9	28	44	-8	45	40	10	09	37	+11	51	13	10	28	13	-31	11	21
	11	9	08	50	43	31	49	9	28	43	8	45	40	10	09	36	11	51	14	10	28	13	31	11	22
	21	9	08	50	43	31	49	9	28	43	8	45	39	10	09	36	11	51	14	10	28	13	31	11	22
	31	9	08	50	43	31	48	9	28	43	8	45	38	10	09	36	11	51	15	10	28	13	31	11	22
June	10	9	08	50	43	31	46	9	28	43	8	45	37	10	09	36	11	51	15	10	28	13	31	11	21
	20	9	08	50	43	31	45	9	28	43	8	45	37	10	09	36	11	51	16	10	28	12	31	11	20
	30	9	08	50	-43	31	43	9	28	43	-8	45	35	10	09	36	+11	51	16	10	28	12	-31	11	19
July	10	9	08	49	43	31	40	9	28	43	8	45	34	10	09	36	11	51	17	10	28	12	31	11	18
	20	9	08	49	43	31	38	9	28	43	8	45	33	10	09	36	11	51	17	10	28	12	31	11	16
	30	9	08	49	43	31	35	9	28	43	8	45	32	10	09	36	11	51	17	10	28	12	31	11	14
Aug.	9	9	08	49	43	31	32	9	28	43	8	45	31	10	09	36	11	51	17	10	28	12	31	11	12
	19	9	08	50	43	31	30	9	28	43	8	45	30	10	09	36	11	51	16	10	28	12	31	11	10
	29	9	08	50	-43	31	27	9	28	43	-8	45	29	10	09	36	+11	51	16	10	28	12	-31	11	08
Sept.	8	9	08	50	43	31	25	9	28	43	8	45	28	10	09	36	11	51	15	10	28	12	31	11	07
	18	9	08	50	43	31	23	9	28	44	8	45	27	10	09	36	11	51	15	10	28	12	31	11	05
	28	9	08	50	43	31	22	9	28	44	8	45	27	10	09	37	11	51	14	10	28	12	31	11	04
Oct.	8	9	08	51	43	31	21	9	28	44	8	45	28	10	09	37	11	51	12	10	28	13	31	11	03
	18	9	08	51	43	31	20	9	28	44	8	45	28	10	09	37	11	51	11	10	28	13	31	11	02
	28	9	08	51	-43	31	20	9	28	45	-8	45	29	10	09	37	+11	51	09	10	28	13	-31	11	02
Nov.	7	9	08	52	43	31	21	9	28	45	8	45	31	10	09	38	11	51	08	10	28	13	31	11	03
	17	9	08	52	43	31	23	9	28	45	8	45	32	10	09	38	11	51	06	10	28	14	31	11	04
	27	9	08	53	43	31	24	9	28	46	8	45	34	10	09	38	11	51	04	10	28	14	31	11	05
Dec.	7	9	08	53	43	31	27	9	28	46	8	45	36	10	09	39	11	51	02	10	28	15	31	11	07
	17	9	08	53	43	31	30	9	28	46	8	45	39	10	09	39	11	50	60	10	28	15	31	11	09
	27	9	08	54	-43	31	33	9	28	47	-8	45	41	10	09	39	+11	50	58	10	28	15	-31	11	12
	37	9	08	54	-43	31	36	9	28	47	-8	45	43	10	09	40	+11	50	57	10	28	16	-31	11	15

APPARENT PLACES OF STARS, 2023

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	46	-16	18	43	11	34	08	-31	58	52	11	50	14	+14	26	34	12	16	59	-17	40	02
	11	10	50	46	16	18	45	11	34	08	31	58	55	11	50	14	14	26	32	12	16	59	17	40	04
	21	10	50	46	16	18	48	11	34	09	31	58	58	11	50	14	14	26	31	12	16	60	17	40	06
	31	10	50	46	16	18	50	11	34	09	31	59	00	11	50	15	14	26	30	12	16	60	17	40	09
Feb.	10	10	50	47	16	18	52	11	34	09	31	59	03	11	50	15	14	26	29	12	17	00	17	40	11
	20	10	50	47	16	18	55	11	34	09	31	59	06	11	50	15	14	26	28	12	17	00	17	40	13
Mar.	2	10	50	47	-16	18	57	11	34	09	-31	59	09	11	50	15	+14	26	28	12	17	01	-17	40	15
	12	10	50	47	16	18	58	11	34	09	31	59	11	11	50	15	14	26	28	12	17	01	17	40	17
	22	10	50	47	16	18	60	11	34	09	31	59	14	11	50	15	14	26	28	12	17	01	17	40	19
Apr.	1	10	50	47	16	19	01	11	34	09	31	59	16	11	50	15	14	26	29	12	17	01	17	40	20
	11	10	50	47	16	19	02	11	34	09	31	59	18	11	50	15	14	26	30	12	17	01	17	40	21
	21	10	50	47	16	19	02	11	34	09	31	59	19	11	50	15	14	26	31	12	17	01	17	40	22
May	1	10	50	47	-16	19	03	11	34	09	-31	59	21	11	50	15	+14	26	32	12	17	01	-17	40	23
	11	10	50	46	16	19	03	11	34	09	31	59	22	11	50	15	14	26	32	12	17	01	17	40	23
	21	10	50	46	16	19	03	11	34	09	31	59	22	11	50	15	14	26	33	12	17	01	17	40	23
	31	10	50	46	16	19	02	11	34	09	31	59	22	11	50	15	14	26	34	12	17	01	17	40	23
June	10	10	50	46	16	19	02	11	34	09	31	59	23	11	50	15	14	26	35	12	17	01	17	40	23
	20	10	50	46	16	19	01	11	34	09	31	59	22	11	50	15	14	26	36	12	17	00	17	40	23
	30	10	50	46	-16	19	00	11	34	09	-31	59	21	11	50	15	+14	26	36	12	17	00	-17	40	22
July	10	10	50	46	16	18	59	11	34	08	31	59	20	11	50	15	14	26	36	12	17	00	17	40	22
	20	10	50	46	16	18	58	11	34	08	31	59	19	11	50	15	14	26	36	12	17	00	17	40	21
	30	10	50	46	16	18	57	11	34	08	31	59	18	11	50	15	14	26	37	12	17	00	17	40	20
Aug.	9	10	50	46	16	18	56	11	34	08	31	59	16	11	50	14	14	26	36	12	16	60	17	40	19
	19	10	50	46	16	18	54	11	34	08	31	59	14	11	50	14	14	26	36	12	16	60	17	40	18
	29	10	50	46	-16	18	53	11	34	08	-31	59	13	11	50	14	+14	26	35	12	16	60	-17	40	17
Sept.	8	10	50	46	16	18	52	11	34	08	31	59	11	11	50	14	14	26	34	12	16	60	17	40	16
	18	10	50	46	16	18	51	11	34	08	31	59	09	11	50	14	14	26	33	12	16	60	17	40	15
	28	10	50	46	16	18	51	11	34	08	31	59	08	11	50	15	14	26	32	12	16	60	17	40	15
Oct.	8	10	50	46	16	18	51	11	34	08	31	59	07	11	50	15	14	26	30	12	16	60	17	40	14
	18	10	50	46	16	18	51	11	34	08	31	59	06	11	50	15	14	26	29	12	17	00	17	40	14
	28	10	50	47	-16	18	51	11	34	09	-31	59	05	11	50	15	+14	26	27	12	17	00	-17	40	14
Nov.	7	10	50	47	16	18	52	11	34	09	31	59	06	11	50	15	14	26	25	12	17	00	17	40	15
	17	10	50	47	16	18	53	11	34	09	31	59	06	11	50	16	14	26	22	12	17	01	17	40	16
	27	10	50	48	16	18	55	11	34	10	31	59	07	11	50	16	14	26	20	12	17	01	17	40	17
Dec.	7	10	50	48	16	18	57	11	34	10	31	59	08	11	50	16	14	26	18	12	17	01	17	40	19
	17	10	50	48	16	18	59	11	34	10	31	59	10	11	50	17	14	26	15	12	17	02	17	40	21
	27	10	50	49	-16	19	02	11	34	11	-31	59	13	11	50	17	+14	26	13	12	17	02	-17	40	23
	37	10	50	49	-16	19	04	11	34	11	-31	59	15	11	50	17	+14	26	11	12	17	02	-17	40	25

APPARENT PLACES OF STARS, 2023

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	35	-23	31	15	12	56	45	+3	16	22	13	03	19	+10	50	07	13	21	53	-36	49	46
	11	12	35	36	23	31	17	12	56	45	3	16	20	13	03	19	10	50	04	13	21	53	36	49	48
	21	12	35	36	23	31	20	12	56	46	3	16	18	13	03	19	10	50	02	13	21	53	36	49	50
	31	12	35	36	23	31	22	12	56	46	3	16	16	13	03	20	10	50	01	13	21	54	36	49	52
Feb.	10	12	35	36	23	31	25	12	56	46	3	16	15	13	03	20	10	49	60	13	21	54	36	49	54
	20	12	35	37	23	31	27	12	56	47	3	16	13	13	03	20	10	49	59	13	21	54	36	49	57
Mar.	2	12	35	37	-23	31	29	12	56	47	+3	16	13	13	03	20	+10	49	58	13	21	55	-36	49	60
	12	12	35	37	23	31	31	12	56	47	3	16	12	13	03	21	10	49	58	13	21	55	36	50	02
	22	12	35	37	23	31	33	12	56	47	3	16	12	13	03	21	10	49	58	13	21	55	36	50	05
Apr.	1	12	35	37	23	31	35	12	56	47	3	16	12	13	03	21	10	49	58	13	21	55	36	50	07
	11	12	35	37	23	31	36	12	56	47	3	16	12	13	03	21	10	49	59	13	21	55	36	50	09
	21	12	35	37	23	31	38	12	56	47	3	16	12	13	03	21	10	49	60	13	21	55	36	50	11
May	1	12	35	37	-23	31	39	12	56	47	+3	16	13	13	03	21	+10	50	01	13	21	55	-36	50	13
	11	12	35	37	23	31	40	12	56	47	3	16	13	13	03	21	10	50	02	13	21	55	36	50	14
	21	12	35	37	23	31	40	12	56	47	3	16	14	13	03	21	10	50	03	13	21	55	36	50	16
	31	12	35	37	23	31	40	12	56	47	3	16	15	13	03	21	10	50	04	13	21	55	36	50	17
June	10	12	35	37	23	31	40	12	56	47	3	16	15	13	03	21	10	50	05	13	21	55	36	50	18
	20	12	35	37	23	31	40	12	56	47	3	16	16	13	03	21	10	50	05	13	21	55	36	50	18
	30	12	35	37	-23	31	40	12	56	47	+3	16	17	13	03	21	+10	50	06	13	21	55	-36	50	18
July	10	12	35	37	23	31	39	12	56	47	3	16	17	13	03	20	10	50	07	13	21	55	36	50	18
	20	12	35	37	23	31	39	12	56	47	3	16	18	13	03	20	10	50	07	13	21	55	36	50	18
	30	12	35	37	23	31	38	12	56	47	3	16	18	13	03	20	10	50	07	13	21	55	36	50	17
Aug.	9	12	35	36	23	31	37	12	56	47	3	16	18	13	03	20	10	50	07	13	21	54	36	50	16
	19	12	35	36	23	31	36	12	56	46	3	16	18	13	03	20	10	50	07	13	21	54	36	50	15
	29	12	35	36	-23	31	34	12	56	46	+3	16	18	13	03	20	+10	50	07	13	21	54	-36	50	14
Sept.	8	12	35	36	23	31	33	12	56	46	3	16	18	13	03	20	10	50	06	13	21	54	36	50	12
	18	12	35	36	23	31	32	12	56	46	3	16	18	13	03	20	10	50	06	13	21	54	36	50	10
	28	12	35	36	23	31	31	12	56	46	3	16	17	13	03	20	10	50	04	13	21	54	36	50	09
Oct.	8	12	35	36	23	31	30	12	56	46	3	16	16	13	03	20	10	50	03	13	21	54	36	50	08
	18	12	35	36	23	31	30	12	56	46	3	16	15	13	03	20	10	50	02	13	21	54	36	50	06
	28	12	35	37	-23	31	30	12	56	47	+3	16	14	13	03	20	+10	49	60	13	21	54	-36	50	05
Nov.	7	12	35	37	23	31	30	12	56	47	3	16	12	13	03	20	10	49	58	13	21	54	36	50	04
	17	12	35	37	23	31	30	12	56	47	3	16	10	13	03	21	10	49	56	13	21	55	36	50	04
	27	12	35	37	23	31	31	12	56	47	3	16	09	13	03	21	10	49	53	13	21	55	36	50	04
Dec.	7	12	35	38	23	31	33	12	56	48	3	16	06	13	03	21	10	49	51	13	21	55	36	50	04
	17	12	35	38	23	31	34	12	56	48	3	16	04	13	03	21	10	49	48	13	21	56	36	50	05
	27	12	35	38	-23	31	36	12	56	48	+3	16	02	13	03	22	+10	49	46	13	21	56	-36	50	06
	37	12	35	39	-23	31	38	12	56	49	+3	15	60	13	03	22	+10	49	44	13	21	56	-36	50	08

APPARENT PLACES OF STARS, 2023

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	23	-11	16	46	14	08	01	-36	28	45	14	52	08	-16	08	08	15	00	01	-43	13	21
	11	13	26	24	11	16	49	14	08	01	36	28	46	14	52	08	16	08	09	15	00	01	43	13	22
	21	13	26	24	11	16	51	14	08	02	36	28	48	14	52	08	16	08	11	15	00	02	43	13	23
	31	13	26	24	11	16	53	14	08	02	36	28	50	14	52	09	16	08	13	15	00	02	43	13	24
Feb.	10	13	26	25	11	16	55	14	08	03	36	28	52	14	52	09	16	08	14	15	00	02	43	13	25
	20	13	26	25	11	16	57	14	08	03	36	28	54	14	52	09	16	08	16	15	00	03	43	13	27
Mar.	2	13	26	25	-11	16	58	14	08	03	-36	28	56	14	52	10	-16	08	17	15	00	03	-43	13	29
	12	13	26	25	11	16	59	14	08	03	36	28	58	14	52	10	16	08	19	15	00	04	43	13	31
	22	13	26	26	11	17	01	14	08	04	36	29	01	14	52	10	16	08	20	15	00	04	43	13	33
Apr.	1	13	26	26	11	17	02	14	08	04	36	29	03	14	52	10	16	08	21	15	00	04	43	13	35
	11	13	26	26	11	17	02	14	08	04	36	29	05	14	52	11	16	08	21	15	00	04	43	13	37
	21	13	26	26	11	17	03	14	08	04	36	29	07	14	52	11	16	08	22	15	00	05	43	13	39
May	1	13	26	26	-11	17	03	14	08	04	-36	29	09	14	52	11	-16	08	23	15	00	05	-43	13	41
	11	13	26	26	11	17	03	14	08	04	36	29	10	14	52	11	16	08	23	15	00	05	43	13	43
	21	13	26	26	11	17	03	14	08	04	36	29	12	14	52	11	16	08	23	15	00	05	43	13	45
	31	13	26	26	11	17	03	14	08	04	36	29	13	14	52	11	16	08	23	15	00	05	43	13	46
June	10	13	26	26	11	17	03	14	08	04	36	29	14	14	52	11	16	08	23	15	00	05	43	13	48
	20	13	26	26	11	17	02	14	08	04	36	29	15	14	52	11	16	08	23	15	00	05	43	13	49
	30	13	26	26	-11	17	02	14	08	04	-36	29	15	14	52	11	-16	08	23	15	00	05	-43	13	50
July	10	13	26	26	11	17	02	14	08	04	36	29	15	14	52	11	16	08	23	15	00	05	43	13	51
	20	13	26	26	11	17	01	14	08	04	36	29	15	14	52	11	16	08	23	15	00	05	43	13	51
	30	13	26	25	11	17	00	14	08	04	36	29	15	14	52	11	16	08	22	15	00	05	43	13	51
Aug.	9	13	26	25	11	16	60	14	08	04	36	29	14	14	52	11	16	08	22	15	00	04	43	13	51
	19	13	26	25	11	16	59	14	08	03	36	29	14	14	52	11	16	08	22	15	00	04	43	13	51
	29	13	26	25	-11	16	59	14	08	03	-36	29	13	14	52	10	-16	08	21	15	00	04	-43	13	50
Sept.	8	13	26	25	11	16	58	14	08	03	36	29	11	14	52	10	16	08	20	15	00	04	43	13	49
	18	13	26	25	11	16	58	14	08	03	36	29	10	14	52	10	16	08	20	15	00	04	43	13	48
	28	13	26	25	11	16	58	14	08	03	36	29	09	14	52	10	16	08	20	15	00	04	43	13	47
Oct.	8	13	26	25	11	16	58	14	08	03	36	29	07	14	52	10	16	08	19	15	00	03	43	13	45
	18	13	26	25	11	16	58	14	08	03	36	29	06	14	52	10	16	08	19	15	00	03	43	13	44
	28	13	26	25	-11	16	58	14	08	03	-36	29	05	14	52	10	-16	08	19	15	00	03	-43	13	42
Nov.	7	13	26	25	11	16	59	14	08	03	36	29	04	14	52	10	16	08	20	15	00	03	43	13	41
	17	13	26	26	11	16	60	14	08	03	36	29	03	14	52	10	16	08	20	15	00	04	43	13	40
	27	13	26	26	11	17	01	14	08	04	36	29	03	14	52	10	16	08	21	15	00	04	43	13	39
Dec.	7	13	26	26	11	17	03	14	08	04	36	29	03	14	52	11	16	08	22	15	00	04	43	13	38
	17	13	26	26	11	17	05	14	08	04	36	29	04	14	52	11	16	08	23	15	00	04	43	13	38
	27	13	26	27	-11	17	06	14	08	05	-36	29	04	14	52	11	-16	08	24	15	00	05	-43	13	38
	37	13	26	27	-11	17	08	14	08	05	-36	29	05	14	52	11	-16	08	26	15	00	05	-43	13	38

APPARENT PLACES OF STARS, 2023

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	13	-9	28	00	15	45	23	+6	21	11	16	01	40	-22	41	08	16	15	31	-3	45	12
	11	15	18	14	9	28	02	15	45	23	6	21	09	16	01	40	22	41	09	16	15	32	3	45	13
	21	15	18	14	9	28	03	15	45	23	6	21	07	16	01	41	22	41	09	16	15	32	3	45	15
	31	15	18	14	9	28	05	15	45	23	6	21	05	16	01	41	22	41	11	16	15	32	3	45	16
Feb.	10	15	18	15	9	28	07	15	45	24	6	21	03	16	01	41	22	41	12	16	15	33	3	45	18
	20	15	18	15	9	28	08	15	45	24	6	21	02	16	01	42	22	41	13	16	15	33	3	45	19
Mar.	2	15	18	15	-9	28	09	15	45	24	+6	21	01	16	01	42	-22	41	14	16	15	33	-3	45	20
	12	15	18	15	9	28	10	15	45	25	6	21	00	16	01	42	22	41	15	16	15	33	3	45	21
	22	15	18	16	9	28	11	15	45	25	6	21	00	16	01	43	22	41	16	16	15	34	3	45	21
Apr.	1	15	18	16	9	28	12	15	45	25	6	21	00	16	01	43	22	41	17	16	15	34	3	45	21
	11	15	18	16	9	28	12	15	45	25	6	21	01	16	01	43	22	41	18	16	15	34	3	45	21
	21	15	18	16	9	28	12	15	45	26	6	21	02	16	01	43	22	41	18	16	15	35	3	45	21
May	1	15	18	16	-9	28	12	15	45	26	+6	21	02	16	01	44	-22	41	19	16	15	35	-3	45	21
	11	15	18	17	9	28	12	15	45	26	6	21	04	16	01	44	22	41	19	16	15	35	3	45	20
	21	15	18	17	9	28	12	15	45	26	6	21	05	16	01	44	22	41	20	16	15	35	3	45	19
	31	15	18	17	9	28	11	15	45	26	6	21	06	16	01	44	22	41	20	16	15	35	3	45	18
June	10	15	18	17	9	28	11	15	45	26	6	21	07	16	01	44	22	41	21	16	15	35	3	45	18
	20	15	18	17	9	28	11	15	45	26	6	21	09	16	01	44	22	41	21	16	15	35	3	45	17
	30	15	18	17	-9	28	10	15	45	26	+6	21	10	16	01	44	-22	41	21	16	15	35	-3	45	16
July	10	15	18	17	9	28	10	15	45	26	6	21	11	16	01	44	22	41	21	16	15	35	3	45	15
	20	15	18	17	9	28	09	15	45	26	6	21	12	16	01	44	22	41	21	16	15	35	3	45	15
	30	15	18	17	9	28	09	15	45	26	6	21	13	16	01	44	22	41	21	16	15	35	3	45	14
Aug.	9	15	18	16	9	28	08	15	45	26	6	21	13	16	01	44	22	41	21	16	15	35	3	45	14
	19	15	18	16	9	28	08	15	45	26	6	21	13	16	01	44	22	41	21	16	15	35	3	45	13
	29	15	18	16	-9	28	08	15	45	26	+6	21	14	16	01	44	-22	41	21	16	15	35	-3	45	13
Sept.	8	15	18	16	9	28	08	15	45	25	6	21	14	16	01	43	22	41	20	16	15	35	3	45	13
	18	15	18	16	9	28	07	15	45	25	6	21	13	16	01	43	22	41	20	16	15	34	3	45	13
	28	15	18	16	9	28	07	15	45	25	6	21	13	16	01	43	22	41	20	16	15	34	3	45	13
Oct.	8	15	18	16	9	28	07	15	45	25	6	21	12	16	01	43	22	41	19	16	15	34	3	45	13
	18	15	18	16	9	28	07	15	45	25	6	21	11	16	01	43	22	41	19	16	15	34	3	45	14
	28	15	18	16	-9	28	08	15	45	25	+6	21	10	16	01	43	-22	41	18	16	15	34	-3	45	14
Nov.	7	15	18	16	9	28	09	15	45	25	6	21	08	16	01	43	22	41	18	16	15	34	3	45	15
	17	15	18	16	9	28	09	15	45	25	6	21	07	16	01	43	22	41	18	16	15	34	3	45	16
	27	15	18	16	9	28	10	15	45	25	6	21	05	16	01	43	22	41	18	16	15	34	3	45	17
Dec.	7	15	18	16	9	28	12	15	45	25	6	21	03	16	01	43	22	41	18	16	15	34	3	45	19
	17	15	18	16	9	28	13	15	45	25	6	21	01	16	01	43	22	41	19	16	15	35	3	45	20
	27	15	18	17	-9	28	15	15	45	26	+6	20	59	16	01	44	-22	41	19	16	15	35	-3	45	22
	37	15	18	17	-9	28	16	15	45	26	+6	20	56	16	01	44	-22	41	20	16	15	35	-3	45	23

APPARENT PLACES OF STARS, 2023

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	47	-26	28	53	16	38	24	-10	36	47	16	51	37	-34	19	59	17	23	23	-25	01	18
	11	16	30	47	26	28	53	16	38	24	10	36	48	16	51	37	34	19	59	17	23	23	25	01	18
	21	16	30	48	26	28	54	16	38	24	10	36	49	16	51	38	34	19	59	17	23	24	25	01	18
	31	16	30	48	26	28	55	16	38	25	10	36	51	16	51	38	34	19	60	17	23	24	25	01	19
Feb.	10	16	30	48	26	28	56	16	38	25	10	36	52	16	51	38	34	20	00	17	23	24	25	01	19
	20	16	30	49	26	28	57	16	38	25	10	36	53	16	51	39	34	20	01	17	23	25	25	01	20
Mar.	2	16	30	49	-26	28	57	16	38	26	-10	36	54	16	51	39	-34	20	01	17	23	25	-25	01	20
	12	16	30	49	26	28	58	16	38	26	10	36	55	16	51	39	34	20	02	17	23	25	25	01	21
	22	16	30	50	26	28	59	16	38	26	10	36	55	16	51	40	34	20	03	17	23	26	25	01	21
Apr.	1	16	30	50	26	28	60	16	38	26	10	36	55	16	51	40	34	20	04	17	23	26	25	01	21
	11	16	30	50	26	29	00	16	38	27	10	36	55	16	51	41	34	20	04	17	23	26	25	01	22
	21	16	30	51	26	29	01	16	38	27	10	36	55	16	51	41	34	20	05	17	23	27	25	01	22
May	1	16	30	51	-26	29	02	16	38	27	-10	36	55	16	51	41	-34	20	06	17	23	27	-25	01	22
	11	16	30	51	26	29	02	16	38	27	10	36	55	16	51	41	34	20	07	17	23	27	25	01	22
	21	16	30	51	26	29	03	16	38	28	10	36	54	16	51	42	34	20	08	17	23	27	25	01	22
	31	16	30	51	26	29	03	16	38	28	10	36	54	16	51	42	34	20	09	17	23	28	25	01	23
June	10	16	30	52	26	29	04	16	38	28	10	36	54	16	51	42	34	20	10	17	23	28	25	01	23
	20	16	30	52	26	29	04	16	38	28	10	36	53	16	51	42	34	20	10	17	23	28	25	01	23
	30	16	30	52	-26	29	05	16	38	28	-10	36	52	16	51	42	-34	20	11	17	23	28	-25	01	23
July	10	16	30	52	26	29	05	16	38	28	10	36	52	16	51	42	34	20	12	17	23	28	25	01	24
	20	16	30	52	26	29	05	16	38	28	10	36	52	16	51	42	34	20	13	17	23	28	25	01	24
	30	16	30	52	26	29	05	16	38	28	10	36	51	16	51	42	34	20	13	17	23	28	25	01	24
Aug.	9	16	30	51	26	29	06	16	38	28	10	36	51	16	51	42	34	20	14	17	23	28	25	01	24
	19	16	30	51	26	29	06	16	38	28	10	36	51	16	51	42	34	20	14	17	23	28	25	01	25
	29	16	30	51	-26	29	06	16	38	27	-10	36	50	16	51	42	-34	20	14	17	23	28	-25	01	25
Sept.	8	16	30	51	26	29	05	16	38	27	10	36	50	16	51	41	34	20	14	17	23	28	25	01	25
	18	16	30	51	26	29	05	16	38	27	10	36	50	16	51	41	34	20	14	17	23	27	25	01	25
	28	16	30	51	26	29	05	16	38	27	10	36	50	16	51	41	34	20	14	17	23	27	25	01	25
Oct.	8	16	30	51	26	29	04	16	38	27	10	36	50	16	51	41	34	20	13	17	23	27	25	01	24
	18	16	30	50	26	29	04	16	38	27	10	36	50	16	51	41	34	20	12	17	23	27	25	01	24
	28	16	30	50	-26	29	03	16	38	27	-10	36	51	16	51	41	-34	20	12	17	23	27	-25	01	24
Nov.	7	16	30	50	26	29	03	16	38	27	10	36	51	16	51	41	34	20	11	17	23	27	25	01	23
	17	16	30	50	26	29	02	16	38	27	10	36	51	16	51	41	34	20	10	17	23	27	25	01	23
	27	16	30	50	26	29	02	16	38	27	10	36	52	16	51	41	34	20	09	17	23	27	25	01	23
Dec.	7	16	30	51	26	29	02	16	38	27	10	36	53	16	51	41	34	20	09	17	23	27	25	01	23
	17	16	30	51	26	29	02	16	38	27	10	36	54	16	51	41	34	20	08	17	23	27	25	01	23
	27	16	30	51	-26	29	02	16	38	27	-10	36	55	16	51	41	-34	20	08	17	23	27	-25	01	23
	37	16	30	51	-26	29	03	16	38	27	-10	36	57	16	51	41	-34	20	07	17	23	27	-25	01	23

APPARENT PLACES OF STARS, 2023

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	08	-37	07	10	17	35	58	+12	32	33	17	44	35	+4	33	26	18	22	26	-29	49	06
	11	17	35	08	37	07	09	17	35	58	12	32	31	17	44	35	4	33	24	18	22	26	29	49	05
	21	17	35	08	37	07	09	17	35	59	12	32	29	17	44	35	4	33	22	18	22	26	29	49	05
	31	17	35	09	37	07	08	17	35	59	12	32	27	17	44	35	4	33	21	18	22	26	29	49	05
Feb.	10	17	35	09	37	07	09	17	35	59	12	32	25	17	44	36	4	33	19	18	22	27	29	49	05
	20	17	35	09	37	07	08	17	35	60	12	32	23	17	44	36	4	33	18	18	22	27	29	49	04
Mar.	2	17	35	10	-37	07	08	17	35	60	+12	32	23	17	44	36	+4	33	17	18	22	27	-29	49	04
	12	17	35	10	37	07	09	17	36	00	12	32	22	17	44	36	4	33	16	18	22	28	29	49	04
	22	17	35	11	37	07	09	17	36	00	12	32	22	17	44	37	4	33	16	18	22	28	29	49	04
Apr.	1	17	35	11	37	07	09	17	36	01	12	32	22	17	44	37	4	33	16	18	22	28	29	49	04
	11	17	35	11	37	07	10	17	36	01	12	32	23	17	44	37	4	33	17	18	22	29	29	49	03
	21	17	35	12	37	07	10	17	36	01	12	32	24	17	44	38	4	33	18	18	22	29	29	49	03
May	1	17	35	12	-37	07	11	17	36	02	+12	32	25	17	44	38	+4	33	19	18	22	29	-29	49	03
	11	17	35	12	37	07	12	17	36	02	12	32	27	17	44	38	4	33	20	18	22	30	29	49	03
	21	17	35	13	37	07	12	17	36	02	12	32	28	17	44	38	4	33	22	18	22	30	29	49	03
	31	17	35	13	37	07	13	17	36	02	12	32	30	17	44	38	4	33	23	18	22	30	29	49	03
June	10	17	35	13	37	07	14	17	36	02	12	32	32	17	44	39	4	33	25	18	22	30	29	49	04
	20	17	35	13	37	07	15	17	36	02	12	32	34	17	44	39	4	33	26	18	22	31	29	49	04
	30	17	35	13	-37	07	16	17	36	02	+12	32	36	17	44	39	+4	33	28	18	22	31	-29	49	04
July	10	17	35	13	37	07	17	17	36	02	12	32	37	17	44	39	4	33	29	18	22	31	29	49	05
	20	17	35	13	37	07	18	17	36	02	12	32	39	17	44	39	4	33	30	18	22	31	29	49	05
	30	17	35	13	37	07	18	17	36	02	12	32	41	17	44	39	4	33	31	18	22	31	29	49	06
Aug.	9	17	35	13	37	07	19	17	36	02	12	32	42	17	44	39	4	33	32	18	22	31	29	49	06
	19	17	35	13	37	07	20	17	36	02	12	32	42	17	44	39	4	33	33	18	22	31	29	49	07
	29	17	35	13	-37	07	20	17	36	02	+12	32	43	17	44	39	+4	33	34	18	22	31	-29	49	07
Sept.	8	17	35	13	37	07	20	17	36	02	12	32	44	17	44	38	4	33	34	18	22	31	29	49	07
	18	17	35	13	37	07	21	17	36	02	12	32	44	17	44	38	4	33	34	18	22	30	29	49	08
	28	17	35	12	37	07	21	17	36	02	12	32	43	17	44	38	4	33	34	18	22	30	29	49	08
Oct.	8	17	35	12	37	07	20	17	36	01	12	32	43	17	44	38	4	33	34	18	22	30	29	49	08
	18	17	35	12	37	07	20	17	36	01	12	32	42	17	44	38	4	33	33	18	22	30	29	49	08
	28	17	35	12	-37	07	19	17	36	01	+12	32	41	17	44	38	+4	33	32	18	22	30	-29	49	08
Nov.	7	17	35	12	37	07	18	17	36	01	12	32	40	17	44	38	4	33	31	18	22	30	29	49	07
	17	17	35	12	37	07	17	17	36	01	12	32	39	17	44	38	4	33	30	18	22	30	29	49	07
	27	17	35	12	37	07	16	17	36	01	12	32	37	17	44	37	4	33	29	18	22	29	29	49	07
Dec.	7	17	35	12	37	07	16	17	36	01	12	32	35	17	44	38	4	33	27	18	22	30	29	49	06
	17	17	35	12	37	07	15	17	36	01	12	32	32	17	44	38	4	33	26	18	22	30	29	49	06
	27	17	35	12	-37	07	14	17	36	01	+12	32	30	17	44	38	+4	33	24	18	22	30	-29	49	05
	37	17	35	12	-37	07	13	17	36	01	+12	32	28	17	44	38	+4	33	22	18	22	30	-29	49	05

APPARENT PLACES OF STARS, 2023

FOR 0^h TERRESTRIAL TIME

Name		ε Sagittarii						σ Sagittarii						ζ Aquilae						γ Aquilae					
Mag. Spect.		1.85			A0 IIn(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	39	-34	22	25	18	56	39	-26	16	07	19	06	26	+13	53	49	19	47	19	+10	40	07
	11	18	25	40	34	22	24	18	56	39	26	16	07	19	06	26	13	53	47	19	47	19	10	40	05
	21	18	25	40	34	22	24	18	56	39	26	16	07	19	06	26	13	53	45	19	47	19	10	40	03
	31	18	25	40	34	22	23	18	56	40	26	16	06	19	06	26	13	53	43	19	47	20	10	40	02
Feb.	10	18	25	40	34	22	23	18	56	40	26	16	06	19	06	27	13	53	41	19	47	20	10	39	60
	20	18	25	41	34	22	22	18	56	40	26	16	06	19	06	27	13	53	40	19	47	20	10	39	59
Mar.	2	18	25	41	-34	22	22	18	56	41	-26	16	06	19	06	27	+13	53	38	19	47	20	+10	39	58
	12	18	25	41	34	22	22	18	56	41	26	16	05	19	06	27	13	53	38	19	47	20	10	39	57
	22	18	25	42	34	22	22	18	56	41	26	16	05	19	06	28	13	53	37	19	47	21	10	39	57
Apr.	1	18	25	42	34	22	21	18	56	42	26	16	04	19	06	28	13	53	37	19	47	21	10	39	57
	11	18	25	43	34	22	21	18	56	42	26	16	04	19	06	28	13	53	38	19	47	21	10	39	57
	21	18	25	43	34	22	21	18	56	42	26	16	03	19	06	29	13	53	39	19	47	21	10	39	58
May	1	18	25	43	-34	22	21	18	56	43	-26	16	03	19	06	29	+13	53	40	19	47	22	+10	39	59
	11	18	25	44	34	22	21	18	56	43	26	16	02	19	06	29	13	53	42	19	47	22	10	40	01
	21	18	25	44	34	22	21	18	56	43	26	16	02	19	06	29	13	53	44	19	47	22	10	40	03
	31	18	25	44	34	22	22	18	56	43	26	16	02	19	06	30	13	53	46	19	47	23	10	40	05
June	10	18	25	44	34	22	22	18	56	44	26	16	02	19	06	30	13	53	48	19	47	23	10	40	07
	20	18	25	45	34	22	23	18	56	44	26	16	01	19	06	30	13	53	50	19	47	23	10	40	09
	30	18	25	45	-34	22	23	18	56	44	-26	16	01	19	06	30	+13	53	52	19	47	23	+10	40	11
July	10	18	25	45	34	22	24	18	56	44	26	16	02	19	06	30	13	53	54	19	47	24	10	40	13
	20	18	25	45	34	22	25	18	56	44	26	16	02	19	06	30	13	53	56	19	47	24	10	40	15
	30	18	25	45	34	22	25	18	56	44	26	16	02	19	06	30	13	53	58	19	47	24	10	40	17
Aug.	9	18	25	45	34	22	26	18	56	44	26	16	03	19	06	30	13	53	60	19	47	24	10	40	19
	19	18	25	45	34	22	27	18	56	44	26	16	03	19	06	30	13	54	01	19	47	24	10	40	20
	29	18	25	45	-34	22	28	18	56	44	-26	16	03	19	06	30	+13	54	03	19	47	24	+10	40	21
Sept.	8	18	25	45	34	22	28	18	56	44	26	16	04	19	06	30	13	54	03	19	47	24	10	40	22
	18	18	25	44	34	22	29	18	56	44	26	16	04	19	06	30	13	54	04	19	47	23	10	40	23
	28	18	25	44	34	22	29	18	56	44	26	16	05	19	06	30	13	54	04	19	47	23	10	40	23
Oct.	8	18	25	44	34	22	29	18	56	44	26	16	05	19	06	30	13	54	04	19	47	23	10	40	24
	18	18	25	44	34	22	29	18	56	43	26	16	05	19	06	29	13	54	04	19	47	23	10	40	24
	28	18	25	44	-34	22	29	18	56	43	-26	16	05	19	06	29	+13	54	03	19	47	23	+10	40	23
Nov.	7	18	25	44	34	22	28	18	56	43	26	16	05	19	06	29	13	54	03	19	47	23	10	40	23
	17	18	25	43	34	22	27	18	56	43	26	16	05	19	06	29	13	54	02	19	47	22	10	40	22
	27	18	25	43	34	22	27	18	56	43	26	16	04	19	06	29	13	54	00	19	47	22	10	40	21
Dec.	7	18	25	43	34	22	26	18	56	43	26	16	04	19	06	29	13	53	58	19	47	22	10	40	19
	17	18	25	44	34	22	25	18	56	43	26	16	04	19	06	29	13	53	57	19	47	22	10	40	18
	27	18	25	44	-34	22	24	18	56	43	-26	16	04	19	06	29	+13	53	55	19	47	22	+10	40	16
	37	18	25	44	-34	22	24	18	56	43	-26	16	03	19	06	29	+13	53	53	19	47	22	+10	40	14

APPARENT PLACES OF STARS, 2023

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	52	+8	55	42	20	23	01	+40	19	50	20	42	11	+45	21	47	21	32	44	-5	28	18
	11	19	51	52	8	55	40	20	23	01	40	19	47	20	42	11	45	21	44	21	32	44	5	28	19
	21	19	51	53	8	55	39	20	23	01	40	19	44	20	42	11	45	21	42	21	32	44	5	28	19
	31	19	51	53	8	55	37	20	23	01	40	19	41	20	42	11	45	21	39	21	32	44	5	28	20
Feb.	10	19	51	53	8	55	35	20	23	01	40	19	38	20	42	11	45	21	35	21	32	45	5	28	20
	20	19	51	53	8	55	34	20	23	01	40	19	36	20	42	11	45	21	33	21	32	45	5	28	20
Mar.	2	19	51	53	+8	55	34	20	23	02	+40	19	34	20	42	11	+45	21	30	21	32	45	-5	28	20
	12	19	51	53	8	55	33	20	23	02	40	19	32	20	42	11	45	21	28	21	32	45	5	28	20
	22	19	51	54	8	55	33	20	23	02	40	19	30	20	42	12	45	21	26	21	32	45	5	28	20
Apr.	1	19	51	54	8	55	33	20	23	02	40	19	30	20	42	12	45	21	26	21	32	45	5	28	19
	11	19	51	54	8	55	33	20	23	03	40	19	29	20	42	12	45	21	25	21	32	46	5	28	18
	21	19	51	55	8	55	34	20	23	03	40	19	30	20	42	13	45	21	25	21	32	46	5	28	17
May	1	19	51	55	+8	55	35	20	23	03	+40	19	31	20	42	13	+45	21	26	21	32	46	-5	28	15
	11	19	51	55	8	55	37	20	23	04	40	19	32	20	42	13	45	21	27	21	32	47	5	28	13
	21	19	51	56	8	55	39	20	23	04	40	19	34	20	42	14	45	21	29	21	32	47	5	28	12
	31	19	51	56	8	55	41	20	23	04	40	19	36	20	42	14	45	21	31	21	32	47	5	28	10
June	10	19	51	56	8	55	43	20	23	05	40	19	39	20	42	14	45	21	34	21	32	48	5	28	08
	20	19	51	56	8	55	45	20	23	05	40	19	42	20	42	15	45	21	37	21	32	48	5	28	06
	30	19	51	56	+8	55	47	20	23	05	+40	19	45	20	42	15	+45	21	40	21	32	48	-5	28	05
July	10	19	51	57	8	55	49	20	23	05	40	19	48	20	42	15	45	21	43	21	32	48	5	28	03
	20	19	51	57	8	55	51	20	23	06	40	19	52	20	42	15	45	21	47	21	32	49	5	28	02
	30	19	51	57	8	55	53	20	23	06	40	19	55	20	42	15	45	21	50	21	32	49	5	28	00
Aug.	9	19	51	57	8	55	54	20	23	06	40	19	58	20	42	15	45	21	53	21	32	49	5	27	59
	19	19	51	57	8	55	56	20	23	06	40	20	01	20	42	15	45	21	56	21	32	49	5	27	59
	29	19	51	57	+8	55	57	20	23	06	+40	20	03	20	42	15	+45	21	59	21	32	49	-5	27	58
Sept.	8	19	51	57	8	55	58	20	23	05	40	20	06	20	42	15	45	22	02	21	32	49	5	27	57
	18	19	51	57	8	55	58	20	23	05	40	20	08	20	42	15	45	22	04	21	32	49	5	27	57
	28	19	51	56	8	55	59	20	23	05	40	20	09	20	42	15	45	22	06	21	32	49	5	27	57
Oct.	8	19	51	56	8	55	59	20	23	05	40	20	10	20	42	15	45	22	08	21	32	49	5	27	57
	18	19	51	56	8	55	59	20	23	05	40	20	11	20	42	14	45	22	08	21	32	49	5	27	57
	28	19	51	56	+8	55	58	20	23	04	+40	20	11	20	42	14	+45	22	09	21	32	49	-5	27	58
Nov.	7	19	51	56	8	55	58	20	23	04	40	20	11	20	42	14	45	22	09	21	32	48	5	27	58
	17	19	51	56	8	55	57	20	23	04	40	20	10	20	42	14	45	22	09	21	32	48	5	27	59
	27	19	51	56	8	55	56	20	23	04	40	20	09	20	42	13	45	22	07	21	32	48	5	27	59
Dec.	7	19	51	56	8	55	55	20	23	04	40	20	07	20	42	13	45	22	06	21	32	48	5	27	60
	17	19	51	56	8	55	54	20	23	03	40	20	05	20	42	13	45	22	04	21	32	48	5	28	00
	27	19	51	56	+8	55	52	20	23	03	+40	20	03	20	42	13	+45	22	02	21	32	48	-5	28	01
	37	19	51	56	+8	55	50	20	23	03	+40	20	00	20	42	13	+45	21	59	21	32	48	-5	28	02

APPARENT PLACES OF STARS, 2023

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	17	+9	58	47	22	06	56	-0	12	35	22	55	51	-15	42	05	23	05	53	+15	19	44
	11	21	45	17	9	58	46	22	06	56	0	12	35	22	55	51	15	42	05	23	05	53	15	19	43
	21	21	45	17	9	58	45	22	06	56	0	12	36	22	55	51	15	42	05	23	05	53	15	19	42
	31	21	45	17	9	58	43	22	06	56	0	12	37	22	55	51	15	42	05	23	05	53	15	19	40
Feb.	10	21	45	17	9	58	42	22	06	56	0	12	37	22	55	51	15	42	05	23	05	53	15	19	39
	20	21	45	17	9	58	41	22	06	56	0	12	38	22	55	51	15	42	04	23	05	53	15	19	38
Mar.	2	21	45	18	+9	58	40	22	06	57	-0	12	38	22	55	51	-15	42	03	23	05	53	+15	19	37
	12	21	45	18	9	58	39	22	06	57	0	12	38	22	55	51	15	42	02	23	05	53	15	19	36
	22	21	45	18	9	58	39	22	06	57	0	12	38	22	55	51	15	42	01	23	05	53	15	19	35
Apr.	1	21	45	18	9	58	39	22	06	57	0	12	37	22	55	51	15	41	60	23	05	53	15	19	35
	11	21	45	18	9	58	40	22	06	57	0	12	36	22	55	51	15	41	58	23	05	53	15	19	35
	21	21	45	19	9	58	40	22	06	57	0	12	35	22	55	52	15	41	56	23	05	54	15	19	35
May	1	21	45	19	+9	58	41	22	06	58	-0	12	34	22	55	52	-15	41	54	23	05	54	+15	19	36
	11	21	45	19	9	58	43	22	06	58	0	12	32	22	55	52	15	41	52	23	05	54	15	19	37
	21	21	45	20	9	58	44	22	06	58	0	12	31	22	55	52	15	41	50	23	05	55	15	19	39
	31	21	45	20	9	58	46	22	06	59	0	12	29	22	55	53	15	41	48	23	05	55	15	19	40
June	10	21	45	20	9	58	48	22	06	59	0	12	27	22	55	53	15	41	46	23	05	55	15	19	42
	20	21	45	20	9	58	51	22	06	59	0	12	25	22	55	53	15	41	44	23	05	56	15	19	44
	30	21	45	21	+9	58	53	22	06	60	-0	12	23	22	55	54	-15	41	43	23	05	56	+15	19	46
July	10	21	45	21	9	58	55	22	06	60	0	12	21	22	55	54	15	41	41	23	05	56	15	19	49
	20	21	45	21	9	58	57	22	07	00	0	12	19	22	55	54	15	41	40	23	05	56	15	19	51
	30	21	45	21	9	58	59	22	07	00	0	12	17	22	55	55	15	41	39	23	05	57	15	19	54
Aug.	9	21	45	22	9	59	01	22	07	01	0	12	16	22	55	55	15	41	38	23	05	57	15	19	56
	19	21	45	22	9	59	03	22	07	01	0	12	15	22	55	55	15	41	37	23	05	57	15	19	58
	29	21	45	22	+9	59	05	22	07	01	-0	12	14	22	55	55	-15	41	37	23	05	57	+15	20	00
Sept.	8	21	45	22	9	59	06	22	07	01	0	12	13	22	55	55	15	41	37	23	05	57	15	20	02
	18	21	45	22	9	59	07	22	07	01	0	12	13	22	55	55	15	41	38	23	05	57	15	20	03
	28	21	45	22	9	59	08	22	07	01	0	12	12	22	55	55	15	41	38	23	05	57	15	20	05
Oct.	8	21	45	21	9	59	09	22	07	01	0	12	12	22	55	55	15	41	39	23	05	57	15	20	06
	18	21	45	21	9	59	09	22	07	01	0	12	12	22	55	55	15	41	40	23	05	57	15	20	06
	28	21	45	21	+9	59	09	22	07	00	-0	12	12	22	55	55	-15	41	40	23	05	57	+15	20	07
Nov.	7	21	45	21	9	59	09	22	07	00	0	12	12	22	55	55	15	41	41	23	05	57	15	20	07
	17	21	45	21	9	59	09	22	07	00	0	12	13	22	55	55	15	41	42	23	05	57	15	20	07
	27	21	45	21	9	59	08	22	07	00	0	12	13	22	55	55	15	41	43	23	05	57	15	20	07
Dec.	7	21	45	21	9	59	07	22	06	60	0	12	14	22	55	55	15	41	43	23	05	57	15	20	07
	17	21	45	21	9	59	06	22	06	60	0	12	15	22	55	55	15	41	44	23	05	57	15	20	06
	27	21	45	21	+9	59	05	22	06	60	-0	12	15	22	55	54	-15	41	44	23	05	57	+15	20	05
	37	21	45	20	+9	59	04	22	06	60	-0	12	16	22	55	54	-15	41	45	23	05	56	+15	20	04

BESSELIAN DAY NUMBERS, 2023.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Jan.	0	-0.5034	-14.286	-6.567	-3.122	+20.556	-13	-0.051	+0.101
	1	0.5007	14.239	6.542	3.451	20.492	13	0.129	0.063
	2	0.4979	14.175	6.508	3.778	20.422	13	0.165	+0.016
	3	0.4952	14.093	6.474	4.104	20.346	13	0.156	-0.032
	4	0.4925	13.997	6.449	4.429	20.265	13	0.109	0.071
	5	0.4897	13.890	6.439	4.752	20.177	13	-0.036	0.096
	6	-0.4870	-13.779	-6.447	-5.074	+20.083	-13	+0.049	0.104
	7	0.4842	13.671	6.475	5.394	19.983	13	0.128	0.093
	8	0.4815	13.572	6.518	5.712	19.878	13	0.186	0.066
	9	0.4788	13.486	6.574	6.029	19.767	12	0.211	-0.028
	10	0.4760	13.416	6.635	6.345	19.650	12	0.197	+0.015
	11	0.4733	13.362	6.694	6.658	19.527	12	0.143	0.056
	12	-0.4706	-13.322	-6.745	-6.970	+19.398	-12	+0.055	+0.087
	13	0.4678	13.292	6.781	7.280	19.263	13	-0.056	0.104
	14	0.4651	13.265	6.798	7.588	19.122	13	0.174	0.101
	15	0.4623	13.233	6.796	7.893	18.975	13	0.278	0.078
	16	0.4596	13.188	6.775	8.197	18.823	13	0.347	+0.036
	17	0.4569	13.122	6.743	8.499	18.664	13	0.361	-0.017
	18	-0.4541	-13.029	-6.710	-8.798	+18.499	-13	-0.310	-0.072
	19	0.4514	12.912	6.691	9.094	18.328	12	0.194	0.114
	20	0.4487	12.778	6.698	9.388	18.151	12	-0.034	0.129
	21	0.4459	12.642	6.739	9.679	17.968	12	+0.132	0.111
	22	0.4432	12.521	6.811	9.966	17.778	12	0.260	-0.063
	23	0.4404	12.429	6.899	10.250	17.583	11	0.319	+0.001
	24	-0.4377	-12.370	-6.986	-10.531	+17.381	-11	+0.297	+0.064
	25	0.4350	12.336	7.054	10.807	17.175	12	0.213	0.108
	26	0.4322	12.316	7.095	11.080	16.963	12	+0.095	0.124
	27	0.4295	12.295	7.106	11.348	16.746	12	-0.020	0.111
	28	0.4267	12.264	7.096	11.613	16.523	12	0.107	0.076
	29	0.4240	12.217	7.074	11.874	16.297	12	-0.151	+0.029
	30	-0.4213	-12.152	-7.050	-12.130	+16.065	-12	-0.150	-0.020
	31	0.4185	12.072	7.033	12.383	15.829	12	0.109	0.063
Feb.	1	0.4158	11.981	7.030	12.631	15.589	12	-0.039	0.092
	2	0.4131	11.885	7.044	12.876	15.344	11	+0.045	0.103
	3	0.4103	11.791	7.076	13.117	15.095	11	0.127	0.096
	4	0.4076	11.705	7.125	13.353	14.841	11	0.191	0.073
	5	-0.4048	-11.631	-7.187	-13.585	+14.584	-11	+0.225	-0.037
	6	0.4021	11.573	7.254	13.814	14.322	11	0.221	+0.006
	7	0.3994	11.531	7.322	14.038	14.057	11	0.176	0.048
	8	0.3966	11.505	7.382	14.258	13.787	11	+0.095	0.082
	9	0.3939	11.490	7.427	14.474	13.514	11	-0.013	0.103
	10	0.3912	11.480	7.454	14.685	13.236	12	-0.131	0.105
	11	-0.3884	-11.467	-7.460	-14.893	+12.955	-12	-0.240	+0.086
	12	0.3857	11.444	7.448	15.095	12.669	12	0.321	0.049
	13	0.3829	11.402	7.423	15.294	12.380	12	0.355	+0.000
	14	0.3802	11.338	7.394	15.488	12.087	12	0.331	-0.054
	15	-0.3775	-11.250	-7.372	-15.677	+11.790	-12	-0.246	-0.099

BESSELIAN DAY NUMBERS, 2023.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Feb.	15	-0.3775	-11.250	-7.372	-15.677	+11.790	-12	-0.246	-0.099
	16	0.3747	11.144	7.370	15.862	11.488	12	-0.111	0.125
	17	0.3720	11.029	7.397	16.042	11.183	11	+0.046	0.121
	18	0.3693	10.920	7.454	16.217	10.875	11	0.188	0.087
	19	0.3665	10.833	7.535	16.386	10.562	11	0.278	-0.028
	20	0.3638	10.776	7.623	16.550	10.246	11	0.293	+0.038
	21	-0.3610	-10.749	-7.700	-16.708	+9.927	-11	+0.235	+0.093
	22	0.3583	10.742	7.752	16.861	9.605	11	0.127	0.123
	23	0.3556	10.741	7.771	17.007	9.280	12	+0.006	0.121
	24	0.3528	10.732	7.763	17.148	8.953	12	-0.094	0.092
	25	0.3501	10.707	7.736	17.284	8.623	12	0.152	+0.046
	26	0.3474	10.662	7.704	17.413	8.292	12	0.160	-0.006
	27	-0.3446	-10.600	-7.676	-17.538	+7.958	-12	-0.124	-0.053
	28	0.3419	10.526	7.661	17.656	7.623	12	-0.055	0.086
Mar.	1	0.3391	10.446	7.662	17.769	7.285	12	+0.031	0.103
	2	0.3364	10.365	7.682	17.877	6.947	12	0.117	0.101
	3	0.3337	10.291	7.718	17.979	6.607	11	0.188	0.081
	4	0.3309	10.229	7.768	18.076	6.265	11	0.232	0.047
	5	-0.3282	-10.181	-7.826	-18.167	+5.922	-11	+0.239	-0.005
	6	0.3254	10.150	7.885	18.253	5.578	12	0.206	+0.039
	7	0.3227	10.134	7.936	18.334	5.232	12	0.133	0.076
	8	0.3200	10.131	7.975	18.410	4.886	12	+0.031	0.101
	9	0.3172	10.134	7.995	18.480	4.538	12	-0.087	0.108
	10	0.3145	10.136	7.993	18.545	4.189	12	-0.200	0.094
	11	-0.3118	-10.128	-7.972	-18.604	+3.839	-12	-0.289	+0.061
	12	0.3090	10.104	7.935	18.659	3.488	12	0.336	+0.014
	13	0.3063	10.058	7.893	18.708	3.136	13	0.327	-0.039
	14	0.3035	9.989	7.855	18.751	2.783	12	0.261	0.087
	15	0.3008	9.900	7.833	18.789	2.429	12	0.146	0.118
	16	0.2981	9.802	7.836	18.822	2.074	12	-0.004	0.123
	17	-0.2953	-9.704	-7.867	-18.848	+1.718	-12	-0.135	-0.100
	18	0.2926	9.622	7.923	18.869	1.361	12	0.237	-0.051
	19	0.2899	9.564	7.992	18.884	1.004	12	0.277	+0.012
	20	0.2871	9.534	8.057	18.893	0.647	12	0.245	0.072
	21	0.2844	9.528	8.103	18.895	+0.289	12	0.155	0.113
	22	0.2816	9.534	8.120	18.892	-0.068	12	-0.035	0.126
	23	-0.2789	-9.537	-8.106	-18.882	-0.425	-13	-0.078	+0.108
	24	0.2762	9.525	8.067	18.867	0.782	13	0.156	0.066
	25	0.2734	9.494	8.016	18.845	1.137	13	0.182	+0.013
	26	0.2707	9.441	7.966	18.818	1.492	13	0.157	-0.038
	27	0.2680	9.373	7.926	18.785	1.845	13	0.092	0.079
	28	0.2652	9.295	7.903	18.746	2.198	13	-0.003	0.102
	29	-0.2625	-9.216	-7.899	-18.701	-2.548	-13	+0.090	-0.105
	30	0.2597	9.141	7.913	18.652	2.898	13	0.171	0.090
	31	0.2570	9.076	7.942	18.596	3.246	13	0.226	0.059
Apr.	1	0.2543	9.025	7.981	18.536	3.592	13	0.246	-0.018
	2	-0.2515	-8.989	-8.022	-18.470	-3.937	-13	+0.225	+0.026

BESSELIAN DAY NUMBERS, 2023.5

FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Apr.	1	-0.2543	-9.025	-7.981	-18.536	-3.592	-13	+0.246	-0.018
	2	0.2515	8.989	8.022	18.470	3.937	13	0.225	+0.026
	3	0.2488	8.970	8.059	18.400	4.280	13	0.164	0.067
	4	0.2461	8.963	8.084	18.324	4.621	13	+0.070	0.097
	5	0.2433	8.965	8.092	18.243	4.961	13	-0.045	0.110
	6	0.2406	8.967	8.079	18.157	5.298	13	0.163	0.102
	7	-0.2378	-8.961	-8.044	-18.066	-5.634	-13	-0.261	+0.073
	8	0.2351	8.939	7.992	17.970	5.969	14	0.319	+0.028
	9	0.2324	8.895	7.931	17.870	6.301	14	0.323	-0.026
	10	0.2296	8.827	7.873	17.764	6.631	14	0.267	0.076
	11	0.2269	8.738	7.829	17.654	6.960	13	0.161	0.112
	12	0.2241	8.637	7.809	17.538	7.287	13	-0.025	0.123
	13	-0.2214	-8.536	-7.816	-17.418	-7.612	-13	+0.112	-0.107
	14	0.2187	8.445	7.848	17.292	7.935	13	0.219	0.065
	15	0.2159	8.377	7.896	17.161	8.256	13	0.271	-0.007
	16	0.2132	8.333	7.946	17.025	8.574	13	0.257	+0.053
	17	0.2105	8.314	7.982	16.884	8.890	13	0.183	0.100
	18	0.2077	8.309	7.994	16.737	9.204	13	+0.070	0.123
	19	-0.2050	-8.307	-7.976	-16.585	-9.514	-13	-0.050	+0.116
	20	0.2022	8.294	7.931	16.428	9.821	14	0.145	0.084
	21	0.1995	8.263	7.869	16.266	10.125	14	0.194	+0.034
	22	0.1968	8.209	7.802	16.099	10.425	14	0.188	-0.020
	23	0.1940	8.136	7.743	15.927	10.721	14	0.135	0.066
	24	0.1913	8.049	7.699	15.751	11.014	14	-0.049	0.097
	25	-0.1886	-7.957	-7.675	-15.570	-11.303	-13	+0.048	-0.108
	26	0.1858	7.867	7.671	15.385	11.588	13	0.139	0.099
	27	0.1831	7.786	7.683	15.196	11.869	13	0.206	0.072
	28	0.1803	7.718	7.708	15.002	12.146	13	0.240	-0.033
	29	0.1776	7.666	7.739	14.805	12.419	13	0.233	+0.011
	30	0.1749	7.629	7.768	14.603	12.688	13	0.184	0.054
May	1	-0.1721	-7.606	-7.788	-14.398	-12.953	-13	+0.100	+0.089
	2	0.1694	7.592	7.792	14.190	13.214	13	-0.009	0.108
	3	0.1667	7.582	7.777	13.977	13.470	14	0.128	0.107
	4	0.1639	7.566	7.740	13.761	13.723	14	0.235	0.085
	5	0.1612	7.536	7.684	13.542	13.972	14	0.308	+0.044
	6	0.1584	7.485	7.617	13.319	14.217	14	0.329	-0.009
	7	-0.1557	-7.408	-7.548	-13.093	-14.457	-14	-0.287	-0.063
	8	0.1530	7.308	7.492	12.864	14.694	14	0.187	0.105
	9	0.1502	7.192	7.459	12.631	14.927	13	-0.050	0.124
	10	0.1475	7.073	7.454	12.394	15.156	13	+0.095	0.114
	11	0.1448	6.963	7.477	12.155	15.381	13	0.213	0.077
	12	0.1420	6.874	7.518	11.911	15.602	13	0.279	-0.021
	13	-0.1393	-6.811	-7.564	-11.664	-15.818	-13	+0.278	+0.039
	14	0.1365	6.772	7.601	11.413	16.030	13	0.216	0.089
	15	0.1338	6.750	7.616	11.159	16.238	13	+0.110	0.118
	16	0.1311	6.733	7.604	10.902	16.441	13	-0.011	0.120
	17	-0.1283	-6.709	-7.566	-10.641	-16.639	-13	-0.117	+0.095

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
May	17	-0.1283	-6.709	-7.566	-10.641	-16.639	-13	-0.117	+0.095
	18	0.1256	6.669	7.509	10.377	16.832	13	0.183	+0.050
	19	0.1228	6.609	7.443	10.109	17.019	13	0.199	-0.003
	20	0.1201	6.528	7.381	9.839	17.201	13	0.163	0.052
	21	0.1174	6.430	7.332	9.566	17.378	13	-0.089	0.089
	22	0.1146	6.324	7.302	9.290	17.549	13	+0.007	0.107
	23	-0.1119	-6.217	-7.293	-9.012	-17.715	-13	+0.103	-0.104
	24	0.1092	6.117	7.303	8.732	17.875	13	0.181	0.083
	25	0.1064	6.029	7.328	8.449	18.030	12	0.227	0.048
	26	0.1037	5.956	7.361	8.164	18.179	12	0.234	-0.004
	27	0.1009	5.900	7.395	7.878	18.323	12	0.198	+0.040
	28	0.0982	5.858	7.423	7.589	18.461	12	0.125	0.077
	29	-0.0955	-5.828	-7.439	-7.299	-18.594	-13	+0.022	+0.102
	30	0.0927	5.803	7.437	7.007	18.722	13	-0.096	0.109
	31	0.0900	5.776	7.414	6.714	18.843	13	0.209	0.094
June	1	0.0873	5.739	7.372	6.419	18.960	13	0.298	0.060
	2	0.0845	5.683	7.315	6.123	19.071	13	0.340	+0.010
	3	0.0818	5.602	7.252	5.826	19.178	13	-0.320	-0.046
	4	-0.0790	-5.495	-7.197	-5.528	-19.279	-12	-0.236	-0.095
	5	0.0763	5.368	7.163	5.228	19.375	12	-0.101	0.123
	6	0.0736	5.232	7.159	4.927	19.466	12	+0.054	0.122
	7	0.0708	5.102	7.185	4.625	19.552	12	0.193	0.091
	8	0.0681	4.992	7.235	4.321	19.633	12	0.281	-0.038
	9	0.0654	4.910	7.293	4.016	19.709	11	0.301	+0.025
	10	-0.0626	-4.854	-7.345	-3.709	-19.779	-11	+0.252	+0.079
	11	0.0599	4.818	7.377	3.401	19.844	12	0.153	0.114
	12	0.0571	4.790	7.383	3.092	19.904	12	+0.033	0.122
	13	0.0544	4.759	7.363	2.781	19.958	12	-0.079	0.102
	14	0.0517	4.715	7.322	2.470	20.006	12	0.157	0.062
	15	0.0489	4.651	7.272	2.157	20.047	12	0.188	+0.012
	16	-0.0462	-4.567	-7.222	-1.844	-20.083	-12	-0.168	-0.039
	17	0.0434	4.467	7.182	1.530	20.113	11	0.107	0.079
	18	0.0407	4.355	7.161	1.216	20.137	11	-0.019	0.103
	19	0.0380	4.241	7.160	0.901	20.155	11	+0.077	0.106
	20	0.0352	4.131	7.178	0.587	20.166	11	0.160	0.091
	21	0.0325	4.033	7.214	-0.272	20.172	11	0.217	-0.059
	22	-0.0298	-3.949	-7.259	+0.042	-20.172	-11	+0.235	-0.018
	23	0.0270	3.882	7.308	0.357	20.165	11	0.212	+0.026
	24	0.0243	3.831	7.353	0.670	20.153	11	0.148	0.066
	25	0.0215	3.793	7.388	0.983	20.135	11	+0.053	0.095
	26	0.0188	3.762	7.407	1.296	20.111	11	-0.063	0.107
	27	0.0161	3.733	7.408	1.608	20.082	11	-0.180	0.100
	28	-0.0133	-3.697	-7.389	+1.919	-20.046	-11	-0.280	+0.073
	29	0.0106	3.646	7.353	2.229	20.006	12	0.342	+0.029
	30	0.0079	3.573	7.308	2.538	19.960	12	0.349	-0.025
July	1	0.0051	3.474	7.265	2.846	19.908	12	0.292	0.078
	2	-0.0024	-3.352	-7.237	+3.153	-19.852	-11	-0.175	-0.116

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
July	1	-0.0051	-3.474	-7.265	+2.846	-19.908	-12	-0.292	-0.078
	2	-0.0024	3.352	7.237	3.153	19.852	11	0.175	0.116
	3	+0.0004	3.215	7.236	3.458	19.790	11	-0.020	0.128
	4	0.0031	3.078	7.268	3.763	19.724	11	+0.137	0.108
	5	0.0058	2.956	7.328	4.067	19.652	10	0.256	-0.059
	6	0.0086	2.861	7.405	4.370	19.576	10	0.306	+0.005
	7	+0.0113	-2.797	-7.479	+4.673	-19.494	-10	+0.280	+0.066
	8	0.0140	2.758	7.536	4.974	19.407	10	0.194	0.109
	9	0.0168	2.731	7.565	5.275	19.314	10	+0.075	0.124
	10	0.0195	2.704	7.566	5.574	19.216	10	-0.041	0.110
	11	0.0223	2.665	7.544	5.873	19.113	10	0.128	0.074
	12	0.0250	2.609	7.510	6.170	19.004	10	0.169	+0.024
	13	+0.0277	-2.533	-7.475	+6.465	-18.889	-10	-0.161	-0.027
	14	0.0305	2.441	7.448	6.759	18.768	10	0.109	0.071
	15	0.0332	2.337	7.438	7.051	18.642	9	-0.028	0.098
	16	0.0359	2.228	7.447	7.342	18.510	9	+0.065	0.107
	17	0.0387	2.123	7.476	7.630	18.372	9	0.151	0.095
	18	0.0414	2.028	7.522	7.916	18.229	9	0.214	0.067
	19	+0.0442	-1.947	-7.580	+8.199	-18.080	-9	+0.242	-0.028
	20	0.0469	1.882	7.643	8.480	17.926	9	0.229	+0.015
	21	0.0496	1.835	7.703	8.759	17.767	9	0.175	0.056
	22	0.0524	1.801	7.755	9.035	17.603	9	+0.086	0.088
	23	0.0551	1.778	7.792	9.308	17.433	9	-0.025	0.105
	24	0.0579	1.757	7.810	9.578	17.258	9	0.144	0.103
	25	+0.0606	-1.733	-7.810	+9.845	-17.079	-9	-0.252	+0.083
	26	0.0633	1.697	7.793	10.109	16.894	9	0.330	+0.044
	27	0.0661	1.643	7.764	10.370	16.705	9	0.360	-0.005
	28	0.0688	1.566	7.733	10.628	16.512	9	0.332	0.059
	29	0.0715	1.465	7.710	10.883	16.314	9	0.243	0.103
	30	0.0743	1.346	7.708	11.134	16.112	9	-0.105	0.127
	31	+0.0770	-1.218	-7.736	+11.383	-15.906	-9	+0.054	-0.121
Aug.	1	0.0798	1.099	7.796	11.628	15.696	8	0.195	0.083
	2	0.0825	1.002	7.879	11.870	15.482	8	0.280	-0.022
	3	0.0852	0.936	7.968	12.110	15.264	8	0.289	+0.045
	4	0.0880	0.900	8.045	12.346	15.042	8	0.224	0.099
	5	0.0907	0.883	8.094	12.580	14.815	8	+0.113	0.125
	6	+0.0934	-0.870	-8.111	+12.811	-14.584	-9	-0.008	+0.120
	7	0.0962	0.848	8.101	13.038	14.349	9	0.105	0.087
	8	0.0989	0.809	8.075	13.262	14.110	9	0.157	+0.038
	9	0.1017	0.750	8.044	13.483	13.866	9	0.157	-0.015
	10	0.1044	0.673	8.021	13.701	13.617	9	0.111	0.062
	11	0.1071	0.584	8.011	13.915	13.364	9	-0.033	0.094
	12	+0.1099	-0.490	-8.021	+14.124	-13.107	-8	+0.060	-0.106
	13	0.1126	0.398	8.051	14.330	12.846	8	0.149	0.099
	14	0.1153	0.314	8.097	14.532	12.580	8	0.218	0.075
	15	0.1181	0.244	8.157	14.730	12.311	8	0.254	-0.038
	16	+0.1208	-0.190	-8.222	+14.923	-12.037	-8	+0.250	+0.006

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Aug.	16	+0.1208	-0.190	-8.222	+14.923	-12.037	-8	+0.250	+0.006
	17	0.1236	0.153	8.286	15.112	11.760	8	0.205	0.048
	18	0.1263	0.132	8.343	15.297	11.479	8	0.124	0.082
	19	0.1290	0.121	8.385	15.477	11.194	8	+0.016	0.103
	20	0.1318	0.115	8.409	15.652	10.906	9	-0.103	0.106
	21	0.1345	0.108	8.414	15.822	10.615	9	0.216	0.090
	22	+0.1372	-0.091	-8.401	+15.988	-10.321	-9	-0.304	+0.057
	23	0.1400	0.058	8.376	16.149	10.024	9	0.351	+0.010
	24	0.1427	-0.004	8.344	16.306	9.723	9	0.345	-0.041
	25	0.1455	+0.071	8.317	16.457	9.421	9	0.281	0.088
	26	0.1482	0.167	8.306	16.604	9.115	9	0.168	0.119
	27	0.1509	0.274	8.319	16.745	8.808	9	-0.024	0.125
	28	+0.1537	+0.380	-8.362	+16.883	-8.498	-8	+0.121	-0.101
	29	0.1564	0.472	8.431	17.015	8.186	8	0.229	-0.050
	30	0.1592	0.537	8.515	17.143	7.872	8	0.272	+0.016
	31	0.1619	0.572	8.595	17.267	7.556	8	0.238	0.079
Sept.	1	0.1646	0.581	8.653	17.386	7.238	9	0.143	0.119
	2	0.1674	0.580	8.678	17.501	6.918	9	+0.021	0.128
	3	+0.1701	+0.582	-8.670	+17.611	-6.595	-9	-0.089	+0.104
	4	0.1728	0.602	8.639	17.717	6.270	9	0.157	0.057
	5	0.1756	0.643	8.598	17.818	5.942	9	0.169	+0.001
	6	0.1783	0.704	8.561	17.914	5.612	9	0.129	-0.051
	7	0.1811	0.780	8.537	18.005	5.280	9	-0.051	0.088
	8	0.1838	0.864	8.532	18.091	4.946	9	+0.045	0.106
	9	+0.1865	+0.946	-8.548	+18.172	-4.610	-9	+0.140	-0.104
	10	0.1893	1.021	8.581	18.248	4.271	9	0.217	0.083
	11	0.1920	1.084	8.628	18.318	3.931	9	0.263	0.048
	12	0.1947	1.130	8.682	18.383	3.589	9	0.270	-0.005
	13	0.1975	1.160	8.736	18.442	3.246	9	0.235	+0.039
	14	0.2002	1.175	8.784	18.495	2.901	9	0.162	0.076
	15	+0.2030	+1.177	-8.818	+18.543	-2.555	-9	+0.059	+0.101
	16	0.2057	1.173	8.834	18.586	2.208	9	-0.059	0.109
	17	0.2084	1.170	8.831	18.622	1.859	9	0.175	0.097
	18	0.2112	1.175	8.808	18.653	1.511	10	0.271	0.067
	19	0.2139	1.194	8.771	18.679	1.161	10	0.329	+0.023
	20	0.2166	1.233	8.726	18.698	0.811	10	0.338	-0.027
	21	+0.2194	+1.294	-8.684	+18.712	-0.461	-10	-0.292	-0.075
	22	0.2221	1.374	8.654	18.720	-0.111	10	0.198	0.110
	23	0.2249	1.468	8.644	18.722	+0.239	10	-0.070	0.124
	24	0.2276	1.565	8.662	18.719	0.588	9	+0.067	0.110
	25	0.2303	1.653	8.705	18.711	0.938	9	0.181	0.069
	26	0.2331	1.720	8.767	18.697	1.286	9	0.244	-0.010
	27	+0.2358	+1.761	-8.832	+18.678	+1.635	-9	+0.238	+0.054
	28	0.2385	1.775	8.884	18.654	1.983	9	0.166	0.105
	29	0.2413	1.772	8.907	18.626	2.330	10	+0.051	0.128
	30	0.2440	1.767	8.896	18.592	2.677	10	-0.070	0.118
Oct.	1	+0.2468	+1.775	-8.856	+18.553	+3.024	-10	-0.159	+0.079

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Oct.	1	+0.2468	+1.775	-8.856	+18.553	+3.024	-10	-0.159	+0.079
	2	0.2495	1.805	8.798	18.509	3.370	10	0.192	+0.023
	3	0.2522	1.858	8.739	18.459	3.716	10	0.166	-0.034
	4	0.2550	1.931	8.690	18.405	4.062	10	-0.093	0.079
	5	0.2577	2.015	8.661	18.345	4.407	10	+0.008	0.105
	6	0.2605	2.101	8.653	18.279	4.752	10	0.112	0.109
	7	+0.2632	+2.181	-8.664	+18.208	+5.096	-10	+0.201	-0.093
	8	0.2659	2.249	8.691	18.131	5.439	10	0.261	0.060
	9	0.2687	2.302	8.727	18.049	5.781	10	0.281	-0.018
	10	0.2714	2.338	8.765	17.961	6.122	10	0.258	+0.027
	11	0.2741	2.359	8.798	17.868	6.462	10	0.196	0.068
	12	0.2769	2.367	8.819	17.768	6.800	10	+0.100	0.097
	13	+0.2796	+2.367	-8.824	+17.663	+7.137	-10	-0.016	+0.110
	14	0.2824	2.367	8.808	17.552	7.471	10	0.134	0.103
	15	0.2851	2.373	8.773	17.436	7.804	11	0.237	0.078
	16	0.2878	2.393	8.721	17.314	8.134	11	0.305	+0.036
	17	0.2906	2.433	8.660	17.186	8.463	11	0.326	-0.014
	18	0.2933	2.495	8.599	17.053	8.788	11	-0.292	-0.064
	19	+0.2960	+2.578	-8.549	+16.915	+9.111	-11	-0.208	-0.103
	20	0.2988	2.675	8.518	16.771	9.431	11	-0.089	0.122
	21	0.3015	2.777	8.513	16.622	9.748	10	+0.043	0.115
	22	0.3043	2.873	8.533	16.468	10.062	10	0.158	0.081
	23	0.3070	2.953	8.573	16.309	10.372	10	0.229	-0.028
	24	0.3097	3.009	8.621	16.145	10.680	10	0.240	+0.033
	25	+0.3125	+3.040	-8.661	+15.977	+10.984	-10	+0.186	+0.088
	26	0.3152	3.051	8.680	15.804	11.284	10	+0.083	0.121
	27	0.3179	3.056	8.668	15.627	11.582	11	-0.040	0.124
	28	0.3207	3.068	8.626	15.445	11.876	11	0.146	0.096
	29	0.3234	3.099	8.560	15.259	12.168	11	0.205	+0.046
	30	0.3262	3.154	8.487	15.069	12.456	11	0.204	-0.012
	31	+0.3289	+3.233	-8.419	+14.874	+12.741	-11	-0.146	-0.064
Nov.	1	0.3316	3.328	8.368	14.675	13.023	11	-0.049	0.100
	2	0.3344	3.430	8.339	14.471	13.302	10	+0.063	0.112
	3	0.3371	3.528	8.333	14.262	13.577	10	0.166	0.102
	4	0.3398	3.616	8.345	14.049	13.849	10	0.241	0.074
	5	0.3426	3.690	8.369	13.831	14.117	10	0.277	-0.033
	6	+0.3453	+3.746	-8.398	+13.609	+14.381	-10	+0.270	+0.012
	7	0.3481	3.787	8.424	13.382	14.641	10	0.220	0.055
	8	0.3508	3.814	8.441	13.150	14.897	10	0.134	0.089
	9	0.3535	3.831	8.443	12.914	15.149	10	+0.023	0.108
	10	0.3563	3.846	8.426	12.674	15.397	10	-0.096	0.108
	11	0.3590	3.865	8.390	12.429	15.640	11	0.206	0.088
	12	+0.3618	+3.897	-8.335	+12.180	+15.879	-11	-0.286	+0.050
	13	0.3645	3.947	8.270	11.927	16.112	11	0.321	+0.001
	14	0.3672	4.021	8.201	11.669	16.340	11	0.300	-0.051
	15	0.3700	4.116	8.141	11.408	16.564	10	0.224	0.095
	16	+0.3727	+4.229	-8.101	+11.143	+16.782	-10	-0.107	-0.120

BESSELIAN DAY NUMBERS, 2023.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Nov.	16	+0.3727	+4.229	-8.101	+11.143	+16.782	-10	-0.107	-0.120
	17	0.3754	4.350	8.086	10.874	16.994	10	+0.028	0.119
	18	0.3782	4.466	8.098	10.602	17.201	10	0.150	0.091
	19	0.3809	4.567	8.132	10.326	17.402	10	0.232	-0.042
	20	0.3837	4.644	8.176	10.047	17.598	10	0.255	+0.018
	21	0.3864	4.697	8.217	9.766	17.788	10	0.214	0.074
	22	+0.3891	+4.730	-8.241	+9.482	+17.972	-10	+0.121	+0.112
	23	0.3919	4.753	8.238	9.195	18.151	10	+0.001	0.124
	24	0.3946	4.779	8.206	8.905	18.325	10	-0.114	0.106
	25	0.3973	4.819	8.151	8.613	18.493	10	0.193	0.064
	26	0.4001	4.881	8.082	8.319	18.656	10	0.218	+0.008
	27	0.4028	4.968	8.014	8.022	18.814	10	0.183	-0.047
	28	+0.4056	+5.074	-7.960	+7.723	+18.966	-10	-0.101	-0.089
	29	0.4083	5.191	7.926	7.421	19.113	9	+0.008	0.111
	30	0.4110	5.309	7.916	7.117	19.255	9	0.119	0.109
Dec.	1	0.4138	5.420	7.928	6.810	19.391	9	0.209	0.087
	2	0.4165	5.516	7.955	6.501	19.521	9	0.262	0.049
	3	0.4192	5.596	7.991	6.189	19.646	9	0.271	-0.004
	4	+0.4220	+5.658	-8.026	+5.876	+19.766	-9	+0.235	+0.041
	5	0.4247	5.704	8.055	5.559	19.879	9	0.160	0.079
	6	0.4275	5.740	8.071	5.241	19.986	9	+0.056	0.103
	7	0.4302	5.771	8.070	4.921	20.088	9	-0.062	0.109
	8	0.4329	5.803	8.050	4.599	20.183	9	0.177	0.096
	9	0.4357	5.844	8.012	4.274	20.272	9	-0.269	0.064
	10	+0.4384	+5.901	-7.960	+3.949	+20.354	-9	-0.322	+0.018
	11	0.4411	5.980	7.903	3.621	20.430	9	0.321	-0.034
	12	0.4439	6.083	7.850	3.292	20.499	9	0.261	0.083
	13	0.4466	6.206	7.813	2.961	20.562	9	0.151	0.116
	14	0.4494	6.341	7.802	2.630	20.618	8	-0.010	0.124
	15	0.4521	6.476	7.821	2.297	20.666	8	+0.128	0.103
	16	+0.4548	+6.597	-7.865	+1.964	+20.708	-8	+0.230	-0.057
	17	0.4576	6.693	7.924	1.631	20.743	8	0.273	+0.003
	18	0.4603	6.763	7.983	1.297	20.771	8	0.247	0.062
	19	0.4631	6.810	8.027	0.963	20.793	8	0.164	0.106
	20	0.4658	6.844	8.046	0.629	20.808	8	+0.047	0.123
	21	0.4685	6.877	8.036	+0.295	20.816	8	-0.071	0.112
	22	+0.4713	+6.922	-8.003	-0.038	+20.819	-8	-0.162	+0.075
	23	0.4740	6.986	7.954	0.371	20.815	8	0.204	+0.024
	24	0.4767	7.072	7.903	0.704	20.805	8	0.190	-0.031
	25	0.4795	7.177	7.862	1.037	20.788	8	0.126	0.078
	26	0.4822	7.297	7.839	1.369	20.766	7	-0.028	0.106
	27	0.4850	7.420	7.839	1.701	20.738	7	+0.081	-0.112
	28	+0.4877	+7.539	-7.862	-2.032	+20.704	-7	+0.178	-0.096
	29	0.4904	7.645	7.903	2.363	20.663	7	0.245	0.063
	30	0.4932	7.735	7.955	2.693	20.617	7	0.269	-0.019
	31	0.4959	7.806	8.010	3.023	20.564	7	0.248	+0.027
	32	+0.4986	+7.860	-8.060	-3.352	+20.505	-7	+0.184	+0.067

SECOND-ORDER DAY NUMBERS, 2023
J FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2023.5

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	-2	-2	-1	0	1	1	1	1	0	-1	-2	-2
	7	-3	-3	-3	-2	-1	1	2	2	2	1	0	-2	-3
	17	-3	-4	-5	-4	-2	0	2	3	4	3	1	-1	-3
	27	-3	-5	-6	-6	-4	-1	2	4	5	5	3	0	-3
Feb.	6	-2	-6	-8	-8	-6	-2	1	5	7	7	5	1	-2
	16	-1	-5	-8	-9	-8	-5	0	4	7	8	7	4	-1
	26	1	-4	-8	-11	-10	-7	-2	3	7	10	9	6	1
Mar.	8	4	-2	-8	-11	-12	-10	-5	1	7	10	11	9	4
	18	7	0	-6	-11	-13	-12	-8	-1	5	10	12	11	7
	28	9	3	-4	-10	-14	-14	-10	-4	3	9	13	13	9
Apr.	7	12	6	-1	-8	-13	-15	-13	-7	0	7	12	14	12
	17	13	9	2	-6	-12	-15	-14	-10	-3	5	11	14	13
	27	14	11	5	-3	-10	-14	-15	-12	-6	2	9	13	14
May	7	14	13	8	0	-7	-13	-15	-14	-9	-1	6	12	14
	17	13	13	9	3	-4	-11	-14	-14	-10	-4	3	10	13
	27	11	13	10	5	-2	-8	-12	-14	-11	-6	1	7	11
June	6	9	12	11	7	1	-5	-10	-13	-12	-8	-2	4	9
	16	7	10	10	8	3	-3	-8	-11	-11	-9	-4	2	7
	26	4	8	9	8	5	0	-5	-9	-10	-9	-6	-1	4
July	6	2	5	8	7	5	2	-3	-6	-9	-8	-6	-3	2
	16	0	3	6	6	5	3	-1	-4	-7	-7	-6	-4	0
	26	-2	1	4	5	5	3	1	-2	-5	-6	-6	-4	-2
Aug.	5	-3	-1	2	3	4	3	2	0	-3	-4	-5	-4	-3
	15	-3	-2	0	1	2	3	2	1	-1	-2	-3	-4	-3
	25	-3	-2	-1	0	1	2	2	1	0	-1	-2	-3	-3
Sept.	4	-2	-2	-2	-1	0	1	1	1	1	0	-1	-2	-2
	14	-1	-2	-2	-2	-2	-1	0	1	1	1	1	0	-1
	24	0	-1	-2	-2	-2	-2	-1	0	1	1	1	1	0
Oct.	4	1	1	0	-1	-2	-3	-2	-2	-1	0	1	2	1
	14	2	2	1	0	-2	-3	-3	-3	-2	-1	1	2	2
	24	3	3	3	2	0	-2	-4	-4	-4	-3	-1	1	3
Nov.	3	3	4	5	4	1	-1	-4	-5	-6	-5	-2	0	3
	13	2	5	6	6	4	1	-3	-6	-7	-7	-5	-2	2
	23	0	4	7	8	6	3	-1	-5	-8	-9	-7	-4	0
Dec.	3	-2	3	8	10	9	6	1	-4	-9	-11	-10	-7	-2
	13	-5	1	7	11	11	9	4	-2	-8	-12	-12	-10	-5
	23	-8	-1	6	11	13	12	7	0	-7	-12	-14	-13	-8
	33	-11	-4	3	10	14	14	10	3	-4	-11	-15	-15	-11

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 2023.5

SECOND-ORDER DAY NUMBERS, 2023
J' FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2023.5

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

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 2023.5

SECOND-ORDER DAY NUMBERS, 2023

J FOR SOUTHERN DECLINATIONS

FOR 0^h TT AND EQUINOX J 2023.5

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	4	14	19	19	14	5	-5	-15	-20	-20	-15	-6	4
	7	1	10	16	18	15	8	-2	-11	-17	-19	-16	-9	1
	17	-2	6	13	16	14	9	1	-7	-14	-17	-15	-10	-2
	27	-4	3	9	13	13	10	3	-4	-10	-14	-14	-11	-4
Feb.	6	-6	0	6	10	11	9	5	-1	-7	-11	-12	-10	-6
	16	-7	-2	3	7	9	8	6	1	-4	-8	-10	-9	-7
	26	-6	-4	0	4	6	7	5	3	-1	-5	-7	-8	-6
Mar.	8	-6	-4	-1	1	4	5	5	3	0	-2	-5	-6	-6
	18	-4	-4	-2	0	1	3	3	3	1	-1	-2	-4	-4
	28	-3	-3	-3	-2	0	1	2	2	2	1	-1	-2	-3
Apr.	7	-2	-2	-2	-2	-1	0	1	1	1	1	0	-1	-2
	17	0	-1	-2	-2	-2	-1	-1	0	1	1	1	0	0
	27	0	0	-1	-1	-2	-2	-1	-1	0	0	1	1	0
May	7	1	1	0	0	-1	-1	-2	-2	-1	-1	0	0	1
	17	0	1	1	1	0	-1	-1	-2	-2	-2	-1	0	0
	27	0	1	2	2	2	1	-1	-2	-3	-3	-3	-2	0
June	6	-2	0	2	3	3	2	1	-1	-3	-4	-4	-3	-2
	16	-3	-1	1	3	4	4	2	0	-2	-4	-5	-5	-3
	26	-5	-3	0	3	4	5	4	2	-1	-4	-5	-6	-5
July	6	-7	-5	-2	2	5	6	6	4	1	-3	-6	-7	-7
	16	-8	-7	-4	0	4	7	7	6	3	-1	-5	-8	-8
	26	-9	-9	-6	-2	3	6	8	8	5	1	-4	-7	-9
Aug.	5	-10	-10	-8	-4	1	6	9	9	7	3	-2	-7	-10
	15	-9	-11	-10	-7	-1	4	8	10	9	6	0	-5	-9
	25	-8	-11	-12	-9	-4	2	7	10	11	8	3	-3	-8
Sept.	4	-6	-11	-12	-11	-7	-1	5	10	11	10	6	0	-6
	14	-4	-9	-12	-12	-9	-3	3	8	11	11	8	2	-4
	24	-1	-7	-11	-13	-11	-6	0	6	10	12	10	5	-1
Oct.	4	1	-5	-10	-12	-12	-8	-2	4	9	11	11	7	1
	14	4	-2	-8	-11	-12	-10	-5	1	7	10	11	9	4
	24	6	0	-5	-9	-11	-10	-7	-1	4	8	10	9	6
Nov.	3	7	3	-3	-7	-10	-10	-8	-4	2	6	9	9	7
	13	7	4	0	-5	-8	-9	-8	-5	-1	4	7	8	7
	23	7	5	2	-3	-6	-8	-8	-6	-3	2	5	7	7
Dec.	3	6	5	3	-1	-4	-6	-7	-6	-4	0	3	5	6
	13	4	5	3	1	-2	-4	-5	-6	-4	-2	1	3	4
	23	3	4	3	2	0	-2	-4	-5	-4	-3	-1	1	3
	33	1	2	2	2	1	-1	-2	-3	-3	-3	-2	0	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 2023.5

SECOND-ORDER DAY NUMBERS, 2023

J' FOR SOUTHERN DECLINATIONS

FOR 0^h TT AND EQUINOX J 2023.5

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	-5	-12	-19	-26	-30	-30	-27	-20	-12	-5	-1	-1
	7	-1	-3	-8	-15	-22	-27	-28	-26	-20	-13	-7	-2	-1
	17	-1	-2	-6	-11	-18	-23	-25	-24	-20	-14	-8	-3	-1
	27	-1	-1	-3	-8	-13	-18	-21	-21	-19	-14	-9	-4	-1
Feb.	6	-2	-1	-2	-5	-9	-14	-17	-18	-17	-13	-9	-5	-2
	16	-2	-1	-1	-3	-6	-10	-13	-15	-14	-12	-9	-5	-2
	26	-3	-1	-1	-2	-4	-7	-9	-11	-11	-10	-8	-5	-3
Mar.	8	-3	-1	-1	-1	-2	-4	-6	-8	-9	-8	-7	-5	-3
	18	-3	-2	-1	-1	-1	-2	-3	-5	-6	-6	-6	-5	-3
	28	-3	-2	-1	-1	-1	-1	-2	-3	-4	-4	-5	-4	-3
Apr.	7	-3	-2	-2	-1	-1	-1	-1	-1	-2	-3	-3	-3	-3
	17	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-2	-2	-2
	27	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1	-2
May	7	-1	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1
	17	-1	-1	-2	-3	-3	-3	-3	-2	-2	-1	-1	-1	-1
	27	-1	-1	-2	-3	-3	-4	-4	-4	-3	-2	-1	-1	-1
June	6	-1	-1	-1	-2	-4	-5	-5	-5	-5	-4	-2	-1	-1
	16	-1	-1	-1	-2	-3	-5	-6	-7	-7	-6	-4	-3	-1
	26	-2	-1	-1	-1	-3	-5	-7	-8	-9	-8	-6	-4	-2
July	6	-4	-2	-1	-1	-2	-5	-7	-9	-11	-10	-9	-6	-4
	16	-6	-3	-1	-1	-2	-4	-7	-10	-12	-12	-11	-9	-6
	26	-8	-5	-2	-1	-1	-3	-6	-10	-12	-14	-13	-11	-8
Aug.	5	-11	-7	-3	-1	-1	-2	-5	-9	-13	-15	-15	-14	-11
	15	-13	-9	-5	-2	-1	-1	-4	-8	-12	-15	-17	-16	-13
	25	-15	-12	-7	-3	-1	-1	-3	-6	-11	-15	-17	-17	-15
Sept.	4	-17	-14	-10	-5	-2	-1	-2	-5	-9	-14	-17	-18	-17
	14	-19	-16	-12	-7	-3	-1	-1	-3	-8	-12	-16	-19	-19
	24	-19	-17	-14	-9	-4	-1	-1	-2	-6	-10	-15	-18	-19
Oct.	4	-18	-18	-15	-11	-6	-2	-1	-1	-4	-8	-13	-16	-18
	14	-17	-18	-16	-12	-8	-4	-1	-1	-2	-6	-10	-15	-17
	24	-15	-17	-16	-13	-9	-5	-2	-1	-1	-4	-8	-12	-15
Nov.	3	-13	-15	-15	-13	-10	-6	-3	-1	-1	-2	-6	-9	-13
	13	-10	-13	-14	-13	-11	-7	-4	-2	-1	-1	-4	-7	-10
	23	-8	-10	-12	-12	-11	-8	-5	-2	-1	-1	-2	-5	-8
Dec.	3	-5	-8	-10	-10	-9	-8	-5	-3	-1	-1	-1	-3	-5
	13	-3	-5	-7	-8	-8	-7	-5	-3	-2	-1	-1	-2	-3
	23	-2	-3	-5	-6	-7	-6	-5	-4	-2	-1	-1	-1	-2
	33	-1	-2	-3	-4	-5	-5	-4	-3	-2	-1	-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 2023.5

POSITION AND VELOCITY OF THE EARTH, 2023
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	-0.162 064 60	+0.891 259 42	+0.386 584 29	-1727 1268	-252 9870	-109 7155
	1	0.179 310 42	0.888 591 33	0.385 427 20	1721 9501	280 6130	121 6952
	2	0.196 501 89	0.885 647 52	0.384 150 56	1716 2599	308 1294	133 6240
	3	0.213 633 92	0.882 429 12	0.382 754 89	1710 0621	335 5332	145 5004
	4	0.230 701 46	0.878 937 25	0.381 240 73	1703 3613	362 8207	157 3236
	5	0.247 699 48	0.875 173 10	0.379 608 60	1696 1612	389 9888	169 0923
	6	-0.264 623 03	+0.871 137 88	+0.377 859 07	-1688 4647	-417 0342	-180 8056
	7	0.281 467 13	0.866 832 84	0.375 992 68	1680 2737	443 9533	192 4627
	8	0.298 226 85	0.862 259 25	0.374 010 01	1671 5892	470 7423	204 0620
	9	0.314 897 27	0.857 418 44	0.371 911 63	1662 4119	497 3971	215 6025
	10	0.331 473 45	0.852 311 77	0.369 698 16	1652 7416	523 9130	227 0829
	11	0.347 950 46	0.846 940 66	0.367 370 18	1642 5776	550 2850	238 5014
	12	-0.364 323 35	+0.841 306 57	+0.364 928 34	-1631 9189	-576 5074	-249 8561
	13	0.380 587 18	0.835 411 03	0.362 373 28	1620 7639	602 5744	261 1451
	14	0.396 736 97	0.829 255 62	0.359 705 67	1609 1108	628 4796	272 3661
	15	0.412 767 73	0.822 842 00	0.356 926 19	1596 9570	654 2156	283 5165
	16	0.428 674 43	0.816 171 90	0.354 035 58	1584 2990	679 7749	294 5936
	17	0.444 452 01	0.809 247 12	0.351 034 58	1571 1327	705 1479	305 5936
	18	-0.460 095 37	+0.802 069 60	+0.347 923 98	-1557 4532	-730 3233	-316 5118
	19	0.475 599 35	0.794 641 36	0.344 704 63	1543 2561	755 2873	327 3426
	20	0.490 958 76	0.786 964 61	0.341 377 45	1528 5384	780 0227	338 0781
	21	0.506 168 39	0.779 041 74	0.337 943 42	1513 3007	804 5098	348 7089
	22	0.521 223 06	0.770 875 32	0.334 403 65	1497 5485	828 7275	359 2250
	23	0.536 117 68	0.762 468 15	0.330 759 34	1481 2932	852 6557	369 6161
	24	-0.550 847 30	+0.753 823 22	+0.327 011 77	-1464 5513	-876 2773	-379 8732
	25	0.565 407 14	0.744 943 67	0.323 162 34	1447 3416	899 5800	389 9898
	26	0.579 792 64	0.735 832 71	0.319 212 46	1429 6839	922 5559	399 9615
	27	0.593 999 39	0.726 493 65	0.315 163 60	1411 5958	945 2006	409 7861
	28	0.608 023 17	0.716 929 81	0.311 017 23	1393 0926	967 5124	419 4626
	29	0.621 859 90	0.707 144 52	0.306 774 84	1374 1873	989 4908	428 9908
	30	-0.635 505 61	+0.697 141 11	+0.302 437 91	-1354 8904	-1011 1351	-438 3707
	31	0.648 956 43	0.686 922 93	0.298 007 92	1335 2111	1032 4447	447 6025
Feb.	1	0.662 208 58	0.676 493 33	0.293 486 35	1315 1573	1053 4190	456 6864
	2	0.675 258 35	0.665 855 67	0.288 874 69	1294 7361	1074 0567	465 6222
	3	0.688 102 10	0.655 013 32	0.284 174 40	1273 9541	1094 3566	474 4100
	4	0.700 736 25	0.643 969 67	0.279 386 98	1252 8166	1114 3174	483 0496
	5	-0.713 157 27	+0.632 728 11	+0.274 513 91	-1231 3291	-1133 9377	-491 5409
	6	0.725 361 68	0.621 292 06	0.269 556 66	1209 4959	1153 2155	499 8837
	7	0.737 346 05	0.609 664 95	0.264 516 73	1187 3206	1172 1490	508 0779
	8	0.749 106 96	0.597 850 23	0.259 395 60	1164 8063	1190 7358	516 1229
	9	0.760 641 05	0.585 851 40	0.254 194 77	1141 9554	1208 9728	524 0178
	10	0.771 944 95	0.573 671 96	0.248 915 75	1118 7697	1226 8564	531 7617
	11	-0.783 015 33	+0.561 315 46	+0.243 560 04	-1095 2504	-1244 3825	-539 3534
	12	0.793 848 85	0.548 785 51	0.238 129 19	1071 3987	1261 5457	546 7910
	13	0.804 442 20	0.536 085 78	0.232 624 75	1047 2148	1278 3399	554 0718
	14	0.814 792 04	0.523 219 97	0.227 048 29	1022 6990	1294 7573	561 1932
	15	-0.824 895 07	+0.510 191 92	+0.221 401 43	-997 8518	-1310 7887	-568 1511

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1543	-509 560	-221 394	+509 552	-1298	-3745	+221 410	+2617	-245
	1	1544	509 612	221 417	509 605	1299	3733	221 433	2605	245
	2	1544	509 684	221 448	509 677	1299	3717	221 464	2588	245
	3	1545	509 775	221 487	509 768	1299	3701	221 503	2572	245
	4	1545	509 883	221 534	509 876	1300	3689	221 550	2559	245
	5	1546	510 002	221 586	509 995	1301	3684	221 602	2554	246
	6	-1547	-510 125	-221 640	+510 119	-1301	-3688	+221 656	+2558	-246
	7	1548	510 246	221 692	510 239	1302	3702	221 708	2570	246
	8	1548	510 357	221 740	510 350	1302	3723	221 756	2591	246
	9	1549	510 454	221 782	510 447	1303	3750	221 798	2618	246
	10	1549	510 532	221 816	510 525	1303	3780	221 832	2648	246
	11	1550	510 592	221 842	510 585	1304	3809	221 859	2676	246
	12	-1550	-510 636	-221 861	+510 629	-1304	-3834	+221 878	+2701	-246
	13	1550	510 670	221 876	510 663	1304	3851	221 893	2718	246
	14	1550	510 700	221 889	510 693	1304	3860	221 906	2727	246
	15	1550	510 735	221 905	510 728	1304	3859	221 921	2725	246
	16	1551	510 786	221 926	510 779	1305	3849	221 943	2715	246
	17	1551	510 860	221 959	510 852	1305	3833	221 975	2699	246
	18	-1552	-510 962	-222 003	+510 955	-1305	-3818	+222 020	+2683	-247
	19	1553	511 093	222 060	511 086	1306	3809	222 076	2674	247
	20	1554	511 243	222 125	511 236	1307	3812	222 141	2677	247
	21	1554	511 395	222 191	511 388	1308	3832	222 208	2696	247
	22	1555	511 530	222 249	511 523	1308	3867	222 266	2730	247
	23	1556	511 633	222 294	511 626	1309	3911	222 311	2773	247
	24	-1556	-511 700	-222 323	+511 692	-1309	-3953	+222 340	+2815	-247
	25	1557	511 738	222 340	511 730	1309	3986	222 357	2848	247
	26	1557	511 760	222 349	511 752	1310	4006	222 367	2868	247
	27	1557	511 783	222 359	511 775	1310	4012	222 377	2873	247
	28	1557	511 817	222 374	511 810	1310	4007	222 392	2868	247
	29	1557	511 870	222 397	511 862	1310	3996	222 415	2858	247
	30	-1558	-511 942	-222 429	+511 935	-1310	-3985	+222 446	+2846	-247
	31	1558	512 032	222 467	512 024	1311	3976	222 485	2837	248
Feb.	1	1559	512 133	222 512	512 126	1311	3975	222 529	2835	248
	2	1560	512 240	222 558	512 233	1312	3982	222 575	2842	248
	3	1560	512 346	222 604	512 338	1313	3998	222 621	2857	248
	4	1561	512 442	222 646	512 435	1313	4022	222 663	2881	248
	5	-1561	-512 525	-222 681	+512 517	-1313	-4052	+222 699	+2910	-248
	6	1562	512 590	222 710	512 582	1314	4085	222 728	2943	248
	7	1562	512 636	222 730	512 628	1314	4118	222 748	2976	248
	8	1562	512 665	222 742	512 657	1314	4147	222 761	3005	248
	9	1562	512 681	222 750	512 673	1314	4169	222 768	3027	248
	10	1562	512 693	222 755	512 685	1314	4182	222 773	3040	248
	11	-1562	-512 707	-222 761	+512 699	-1314	-4185	+222 779	+3043	-248
	12	1563	512 733	222 772	512 725	1315	4179	222 791	3037	248
	13	1563	512 779	222 792	512 771	1315	4167	222 811	3024	248
	14	1563	512 851	222 823	512 843	1315	4153	222 842	3010	248
	15	-1564	-512 949	-222 866	+512 941	-1316	-4142	+222 884	+2999	-248

POSITION AND VELOCITY OF THE EARTH, 2023
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	-0.824 895 07	+0.510 191 92	+0.221 401 43	-997 8518	-1310 7887	-568 1511
	16	0.834 747 98	0.497 005 52	0.215 685 83	972 6739	1326 4228	574 9401
	17	0.844 347 46	0.483 664 83	0.209 903 21	947 1684	1341 6456	581 5541
	18	0.853 690 27	0.470 174 03	0.204 055 35	921 3412	1356 4417	587 9855
	19	0.862 773 24	0.456 537 47	0.198 144 13	895 2027	1370 7947	594 2257
	20	0.871 593 34	0.442 759 67	0.192 171 50	868 7687	1384 6895	600 2669
	21	-0.880 147 70	+0.428 845 25	+0.186 139 48	-842 0589	-1398 1136	-606 1024
	22	0.888 433 68	0.414 798 99	0.180 050 16	815 0962	1411 0595	611 7276
	23	0.896 448 85	0.400 625 67	0.173 905 64	787 9030	1423 5241	617 1403
	24	0.904 191 04	0.386 330 11	0.167 708 06	760 5002	1435 5087	622 3409
	25	0.911 658 22	0.371 917 09	0.161 459 52	732 9057	1447 0162	627 3306
	26	0.918 848 56	0.357 391 36	0.155 162 14	705 1340	1458 0513	632 1119
	27	-0.925 760 35	+0.342 757 62	+0.148 817 97	-677 1975	-1468 6184	-636 6869
	28	0.932 391 99	0.328 020 53	0.142 429 08	649 1064	1478 7216	641 0581
Mar.	1	0.938 741 99	0.313 184 72	0.135 997 49	620 8696	1488 3641	645 2274
	2	0.944 808 93	0.298 254 78	0.129 525 20	592 4954	1497 5490	649 1966
	3	0.950 591 47	0.283 235 26	0.123 014 21	563 9916	1506 2789	652 9675
	4	0.956 088 35	0.268 130 71	0.116 466 51	535 3651	1514 5563	656 5415
	5	-0.961 298 38	+0.252 945 63	+0.109 884 04	-506 6227	-1522 3835	-659 9203
	6	0.966 220 44	0.237 684 53	0.103 268 75	477 7702	1529 7627	663 1054
	7	0.970 853 44	0.222 351 87	0.096 622 57	448 8124	1536 6961	666 0983
	8	0.975 196 35	0.206 952 09	0.089 947 42	419 7537	1543 1851	668 9003
	9	0.979 248 19	0.191 489 64	0.083 245 19	390 5973	1549 2308	671 5122
	10	0.983 007 98	0.175 968 95	0.076 517 80	361 3456	1554 8333	673 9349
	11	-0.986 474 79	+0.160 394 45	+0.069 767 13	-332 0007	-1559 9917	-676 1682
	12	0.989 647 69	0.144 770 60	0.062 995 07	302 5642	1564 7037	678 2114
	13	0.992 525 77	0.129 101 88	0.056 203 54	273 0376	1568 9658	680 0634
	14	0.995 108 15	0.113 392 81	0.049 394 45	243 4232	1572 7726	681 7217
	15	0.997 393 95	0.097 647 97	0.042 569 76	213 7239	1576 1178	683 1832
	16	0.999 382 36	0.081 872 02	0.035 731 45	183 9440	1578 9931	684 4441
	17	-1.001 072 58	+0.066 069 70	+0.028 881 56	-154 0900	-1581 3889	-685 4995
	18	1.002 463 94	0.050 245 87	0.022 022 17	124 1715	1583 2950	686 3439
	19	1.003 555 84	0.034 405 47	0.015 155 41	94 2019	1584 7011	686 9715
	20	1.004 347 86	0.018 553 55	0.008 283 47	64 1981	1585 5986	687 3777
	21	1.004 839 76	+0.002 695 21	+0.001 408 61	34 1805	1585 9816	687 5582
	22	1.005 031 50	-0.013 164 37	-0.005 466 93	-4 1715	1585 8481	687 5114
	23	-1.004 923 29	-0.029 020 04	-0.012 340 87	+25 8070	-1585 2007	-687 2378
	24	1.004 515 53	0.044 866 69	0.019 210 94	55 7348	1584 0452	686 7395
	25	1.003 808 82	0.060 699 27	0.026 074 92	85 5947	1582 3898	686 0205
	26	1.002 803 91	0.076 512 85	0.032 930 63	115 3727	1580 2436	685 0850
	27	1.001 501 68	0.092 302 54	0.039 775 92	145 0577	1577 6159	683 9376
	28	0.999 903 10	0.108 063 59	0.046 608 69	174 6406	1574 5152	682 5828
	29	-0.998 009 23	-0.123 791 29	-0.053 426 89	+204 1136	-1570 9492	-681 0245
	30	0.995 821 21	0.139 481 04	0.060 228 51	233 4698	1566 9250	679 2661
	31	0.993 340 25	0.155 128 29	0.067 011 56	262 7029	1562 4492	677 3114
Apr.	1	0.990 567 59	0.170 728 54	0.073 774 10	291 8073	1557 5281	675 1634
	2	-0.987 504 55	-0.186 277 39	-0.080 514 20	+320 7772	-1552 1677	-672 8254

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1564	-512 949	-222 866	+512 941	-1316	-4142	+222 884	+2999	-248
	16	1565	513 068	222 917	513 060	1316	4142	222 936	2998	249
	17	1565	513 196	222 973	513 188	1317	4155	222 992	3010	249
	18	1566	513 317	223 026	513 309	1318	4183	223 044	3038	249
	19	1567	513 415	223 068	513 407	1318	4222	223 087	3077	249
	20	1567	513 479	223 096	513 471	1318	4265	223 115	3120	249
	21	-1567	-513 509	-223 109	+513 501	-1319	-4303	+223 128	+3157	-249
	22	1567	513 517	223 113	513 509	1319	4328	223 132	3182	249
	23	1567	513 518	223 113	513 510	1319	4337	223 132	3191	249
	24	1567	513 528	223 117	513 519	1319	4333	223 137	3187	249
	25	1568	513 556	223 130	513 547	1319	4320	223 149	3174	249
	26	1568	513 605	223 151	513 597	1319	4305	223 170	3158	249
	27	-1568	-513 674	-223 181	+513 666	-1319	-4291	+223 200	+3145	-249
	28	1569	513 757	223 217	513 749	1320	4284	223 236	3137	249
Mar.	1	1569	513 847	223 256	513 839	1320	4285	223 275	3137	249
	2	1570	513 937	223 295	513 929	1321	4294	223 314	3147	249
	3	1570	514 020	223 331	514 011	1321	4312	223 350	3164	249
	4	1571	514 090	223 361	514 081	1322	4337	223 381	3188	250
	5	-1571	-514 143	-223 385	+514 135	-1322	-4365	+223 404	+3216	-250
	6	1571	514 178	223 400	514 169	1322	4393	223 419	3245	250
	7	1572	514 195	223 407	514 186	1322	4419	223 427	3270	250
	8	1572	514 199	223 409	514 190	1322	4437	223 429	3288	250
	9	1572	514 195	223 407	514 186	1322	4447	223 427	3298	250
	10	1572	514 193	223 406	514 184	1322	4446	223 426	3297	250
	11	-1572	-514 201	-223 410	+514 193	-1322	-4436	+223 430	+3287	-250
	12	1572	514 228	223 422	514 220	1322	4418	223 442	3269	250
	13	1572	514 280	223 444	514 271	1322	4397	223 464	3248	250
	14	1573	514 357	223 478	514 348	1323	4379	223 497	3230	250
	15	1573	514 455	223 521	514 447	1323	4369	223 540	3219	250
	16	1574	514 566	223 568	514 557	1324	4370	223 588	3220	250
	17	-1574	-514 675	-223 616	+514 666	-1325	-4385	+223 635	+3235	-250
	18	1575	514 767	223 656	514 758	1325	4413	223 676	3261	250
	19	1575	514 832	223 684	514 823	1325	4446	223 704	3294	250
	20	1576	514 865	223 698	514 856	1325	4478	223 718	3326	250
	21	1576	514 872	223 701	514 863	1326	4501	223 722	3349	250
	22	1576	514 865	223 699	514 856	1325	4509	223 719	3357	250
	23	-1576	-514 862	-223 697	+514 853	-1325	-4502	+223 717	+3350	-250
	24	1576	514 874	223 703	514 865	1326	4483	223 723	3331	250
	25	1576	514 909	223 718	514 900	1326	4458	223 738	3306	250
	26	1576	514 967	223 743	514 959	1326	4434	223 763	3282	250
	27	1577	515 044	223 776	515 035	1326	4415	223 796	3262	250
	28	1577	515 130	223 814	515 122	1327	4404	223 834	3251	251
	29	-1578	-515 220	-223 853	+515 211	-1327	-4402	+223 872	+3249	-251
	30	1578	515 304	223 889	515 295	1328	4409	223 909	3255	251
	31	1579	515 376	223 921	515 368	1328	4423	223 941	3269	251
Apr.	1	1579	515 433	223 946	515 425	1328	4442	223 965	3288	251
	2	-1579	-515 473	-223 963	+515 464	-1329	-4462	+223 983	+3308	-251

POSITION AND VELOCITY OF THE EARTH, 2023
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	-0.990 567 59	-0.170 728 54	-0.073 774 10	+291 8073	-1557 5281	-675 1634
	2	0.987 504 55	0.186 277 39	0.080 514 20	320 7772	1552 1677	672 8254
	3	0.984 152 51	0.201 770 45	0.087 229 98	349 6081	1546 3740	670 3006
	4	0.980 512 86	0.217 203 44	0.093 919 60	378 2964	1540 1529	667 5921
	5	0.976 587 06	0.232 572 11	0.100 581 22	406 8392	1533 5099	664 7027
	6	0.972 376 57	0.247 872 25	0.107 213 06	435 2348	1526 4495	661 6352
	7	-0.967 882 86	-0.263 099 72	-0.113 813 34	+463 4825	-1518 9753	-658 3915
	8	0.963 107 41	0.278 250 38	0.120 380 30	491 5826	1511 0893	654 9729
	9	0.958 051 70	0.293 320 13	0.126 912 21	519 5349	1502 7919	651 3798
	10	0.952 717 21	0.308 304 84	0.133 407 32	547 3390	1494 0815	647 6114
	11	0.947 105 42	0.323 200 37	0.139 863 85	574 9937	1484 9549	643 6662
	12	0.941 217 84	0.338 002 54	0.146 280 04	602 4954	1475 4075	639 5416
	13	-0.935 056 04	-0.352 707 10	-0.152 654 08	+629 8385	-1465 4337	-635 2345
	14	0.928 621 63	0.367 309 77	0.158 984 11	657 0148	1455 0276	630 7414
	15	0.921 916 34	0.381 806 19	0.165 268 27	684 0133	1444 1838	626 0588
	16	0.914 942 00	0.396 191 97	0.171 504 65	710 8198	1432 8977	621 1837
	17	0.907 700 63	0.410 462 67	0.177 691 30	737 4179	1421 1669	616 1138
	18	0.900 194 40	0.424 613 83	0.183 826 27	763 7890	1408 9919	610 8482
	19	-0.892 425 67	-0.438 641 03	-0.189 907 61	+789 9141	-1396 3761	-605 3879
	20	0.884 397 00	0.452 539 91	0.195 933 39	815 7747	1383 3268	599 7356
	21	0.876 111 12	0.466 306 16	0.201 901 70	841 3541	1369 8535	593 8951
	22	0.867 570 90	0.479 935 60	0.207 810 68	866 6385	1355 9679	587 8719
	23	0.858 779 37	0.493 424 18	0.213 658 54	891 6168	1341 6823	581 6719
	24	0.849 739 62	0.506 767 95	0.219 443 55	916 2808	1327 0090	575 3010
	25	-0.840 454 82	-0.519 963 11	-0.225 164 01	+940 6243	-1311 9600	-568 7651
	26	0.830 928 21	0.533 005 94	0.230 818 32	964 6424	1296 5458	562 0693
	27	0.821 163 07	0.545 892 84	0.236 404 89	988 3313	1280 7765	555 2189
	28	0.811 162 70	0.558 620 31	0.241 922 19	1011 6877	1264 6618	548 2182
	29	0.800 930 43	0.571 184 95	0.247 368 76	1034 7087	1248 2102	541 0720
	30	0.790 469 65	0.583 583 42	0.252 743 16	1057 3921	1231 4305	533 7843
May	1	-0.779 783 72	-0.595 812 50	-0.258 043 99	+1079 7360	-1214 3313	-526 3595
	2	0.768 876 06	0.607 869 01	0.263 269 91	1101 7395	1196 9208	518 8016
	3	0.757 750 07	0.619 749 90	0.268 419 60	1123 4027	1179 2071	511 1148
	4	0.746 409 14	0.631 452 17	0.273 491 79	1144 7273	1161 1970	503 3027
	5	0.734 856 64	0.642 972 87	0.278 485 24	1165 7158	1142 8960	495 3680
	6	0.723 095 93	0.654 309 13	0.283 398 75	1186 3713	1124 3085	487 3128
	7	-0.711 130 31	-0.665 458 09	-0.288 231 10	+1206 6976	-1105 4357	-479 1380
	8	0.698 963 07	0.676 416 89	0.292 981 11	1226 6966	1086 2770	470 8432
	9	0.686 597 47	0.687 182 67	0.297 647 56	1246 3689	1066 8299	462 4267
	10	0.674 036 79	0.697 752 52	0.302 229 23	1265 7121	1047 0903	453 8858
	11	0.661 284 34	0.708 123 49	0.306 724 85	1284 7207	1027 0543	445 2180
	12	0.648 343 52	0.718 292 60	0.311 133 15	1303 3858	1006 7181	436 4206
	13	-0.635 217 81	-0.728 256 84	-0.315 452 82	+1321 6959	-986 0800	-427 4914
	14	0.621 910 83	0.738 013 20	0.319 682 54	1339 6377	965 1401	418 4297
	15	0.608 426 33	0.747 558 65	0.323 820 98	1357 1966	943 9011	409 2355
	16	0.594 768 23	0.756 890 24	0.327 866 81	1374 3570	922 3683	399 9106
	17	-0.580 940 57	-0.766 005 06	-0.331 818 76	+1391 1043	-900 5497	-390 4578

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1579	-515 433	-223 946	+515 425	-1328	-4442	+223 965	+3288	-251
	2	1579	515 473	223 963	515 464	1329	4462	223 983	3308	251
	3	1580	515 494	223 972	515 486	1329	4480	223 992	3325	251
	4	1580	515 501	223 975	515 493	1329	4492	223 995	3338	251
	5	1580	515 500	223 974	515 491	1329	4496	223 995	3342	251
	6	1580	515 497	223 973	515 488	1329	4490	223 994	3335	251
	7	-1580	-515 504	-223 976	+515 495	-1329	-4473	+223 996	+3318	-251
	8	1580	515 528	223 987	515 519	1329	4448	224 007	3293	251
	9	1580	515 577	224 008	515 569	1329	4418	224 028	3263	251
	10	1580	515 653	224 041	515 645	1330	4390	224 061	3235	251
	11	1581	515 752	224 084	515 744	1330	4369	224 104	3213	251
	12	1582	515 865	224 133	515 856	1331	4359	224 153	3203	251
	13	-1582	-515 979	-224 183	+515 970	-1331	-4363	+224 202	+3206	-251
	14	1583	516 080	224 226	516 071	1332	4379	224 246	3222	251
	15	1584	516 157	224 260	516 148	1332	4402	224 280	3245	252
	16	1584	516 205	224 281	516 196	1332	4427	224 301	3269	252
	17	1584	516 226	224 290	516 218	1333	4444	224 310	3286	252
	18	1584	516 231	224 292	516 223	1333	4450	224 312	3292	252
	19	-1584	-516 234	-224 293	+516 225	-1333	-4441	+224 313	+3283	-252
	20	1584	516 248	224 300	516 239	1333	4420	224 319	3262	252
	21	1584	516 283	224 315	516 274	1333	4390	224 335	3231	252
	22	1585	516 343	224 341	516 334	1333	4357	224 360	3199	252
	23	1585	516 425	224 376	516 416	1334	4329	224 396	3170	252
	24	1586	516 521	224 418	516 513	1334	4308	224 438	3148	252
	25	-1586	-516 624	-224 463	+516 616	-1335	-4296	+224 482	+3136	-252
	26	1587	516 724	224 507	516 716	1335	4294	224 526	3134	252
	27	1588	516 815	224 546	516 807	1336	4301	224 565	3140	252
	28	1588	516 891	224 579	516 883	1336	4313	224 598	3152	252
	29	1588	516 950	224 605	516 942	1336	4327	224 624	3166	252
	30	1589	516 991	224 622	516 983	1336	4342	224 642	3180	252
May	1	-1589	-517 017	-224 634	+517 008	-1337	-4351	+224 653	+3190	-252
	2	1589	517 032	224 640	517 023	1337	4354	224 660	3192	252
	3	1589	517 043	224 645	517 035	1337	4347	224 665	3185	252
	4	1589	517 060	224 653	517 052	1337	4329	224 672	3167	252
	5	1589	517 093	224 667	517 085	1337	4302	224 686	3140	252
	6	1590	517 151	224 692	517 142	1337	4269	224 711	3107	253
	7	-1590	-517 236	-224 729	+517 228	-1338	-4236	+224 748	+3074	-253
	8	1591	517 348	224 778	517 340	1338	4209	224 796	3046	253
	9	1592	517 477	224 834	517 469	1339	4193	224 852	3029	253
	10	1592	517 611	224 892	517 603	1340	4191	224 910	3027	253
	11	1593	517 733	224 945	517 725	1340	4202	224 964	3038	253
	12	1594	517 833	224 988	517 825	1341	4223	225 007	3057	253
	13	-1594	-517 904	-225 019	+517 895	-1341	-4245	+225 038	+3080	-253
	14	1595	517 947	225 038	517 939	1341	4263	225 057	3097	253
	15	1595	517 972	225 049	517 964	1342	4270	225 068	3105	253
	16	1595	517 991	225 057	517 983	1342	4265	225 076	3099	253
	17	-1595	-518 017	-225 068	+518 009	-1342	-4246	+225 087	+3081	-253

POSITION AND VELOCITY OF THE EARTH, 2023
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	-0.580 940 57	-0.766 005 06	-0.331 818 76	+1391 1043	-900 5497	-390 4578
	18	0.566 947 56	0.774 900 31	0.335 675 56	1407 4252	878 4557	380 8817
	19	0.552 793 53	0.783 573 30	0.339 436 00	1423 3082	856 0985	371 1875
	20	0.538 482 89	0.792 021 45	0.343 098 94	1438 7438	833 4912	361 3814
	21	0.524 020 16	0.800 242 34	0.346 663 28	1453 7256	810 6480	351 4698
	22	0.509 409 91	0.808 233 67	0.350 128 00	1468 2490	787 5824	341 4595
	23	-0.494 656 72	-0.815 993 29	-0.353 492 16	+1482 3115	-764 3075	-331 3568
	24	0.479 765 22	0.823 519 16	0.356 754 85	1495 9119	740 8357	321 1676
	25	0.464 740 02	0.830 809 38	0.359 915 24	1509 0501	717 1782	310 8975
	26	0.449 585 76	0.837 862 14	0.362 972 55	1521 7262	693 3459	300 5518
	27	0.434 307 04	0.844 675 75	0.365 926 04	1533 9413	669 3490	290 1353
	28	0.418 908 46	0.851 248 61	0.368 775 04	1545 6966	645 1971	279 6530
	29	-0.403 394 63	-0.857 579 21	-0.371 518 90	+1556 9940	-620 8999	-269 1092
	30	0.387 770 10	0.863 666 15	0.374 157 03	1567 8361	596 4663	258 5087
	31	0.372 039 41	0.869 508 11	0.376 688 90	1578 2266	571 9051	247 8558
June	1	0.356 207 06	0.875 103 86	0.379 113 98	1588 1703	547 2243	237 1541
	2	0.340 277 48	0.880 452 22	0.381 431 83	1597 6735	522 4303	226 4070
	3	0.324 255 04	0.885 552 10	0.383 641 98	1606 7431	497 5272	215 6168
	4	-0.308 144 04	-0.890 402 41	-0.385 744 02	+1615 3858	-472 5168	-204 7839
	5	0.291 948 72	0.895 002 07	0.387 737 52	1623 6071	447 3984	193 9078
	6	0.275 673 29	0.899 350 00	0.389 622 03	1631 4100	422 1685	182 9863
	7	0.259 321 92	0.903 445 06	0.391 397 08	1638 7934	396 8228	172 0166
	8	0.242 898 84	0.907 286 06	0.393 062 19	1645 7523	371 3574	160 9956
	9	0.226 408 32	0.910 871 80	0.394 616 81	1652 2778	345 7701	149 9210
	10	-0.209 854 76	-0.914 201 06	-0.396 060 43	+1658 3590	-320 0613	-138 7923
	11	0.193 242 66	0.917 272 63	0.397 392 48	1663 9835	294 2344	127 6096
	12	0.176 576 66	0.920 085 37	0.398 612 45	1669 1389	268 2962	116 3751
	13	0.159 861 49	0.922 638 21	0.399 719 82	1673 8140	242 2553	105 0925
	14	0.143 102 01	0.924 930 17	0.400 714 15	1677 9988	216 1227	93 7663
	15	0.126 303 17	0.926 960 40	0.401 595 02	1681 6851	189 9107	82 4018
	16	-0.109 469 99	-0.928 728 17	-0.402 362 08	+1684 8670	-163 6326	-71 0052
	17	0.092 607 53	0.930 232 88	0.403 015 04	1687 5404	137 3023	59 5829
	18	0.075 720 88	0.931 474 09	0.403 553 67	1689 7031	110 9336	48 1415
	19	0.058 815 17	0.932 451 47	0.403 977 83	1691 3548	84 5401	36 6875
	20	0.041 895 49	0.933 164 85	0.404 287 40	1692 4970	58 1348	25 2272
	21	0.024 966 92	0.933 614 17	0.404 482 37	1693 1321	31 7299	13 7665
	22	-0.008 034 52	-0.933 799 49	-0.404 562 75	+1693 2634	-5 3370	-2 3111
	23	+0.008 896 68	0.933 720 98	0.404 528 63	1692 8952	+21 0332	+9 1340
	24	0.025 821 73	0.933 378 93	0.404 380 12	1692 0318	47 3706	20 5637
	25	0.042 735 69	0.932 773 71	0.404 117 42	1690 6784	73 6657	31 9734
	26	0.059 633 68	0.931 905 79	0.403 740 73	1688 8406	99 9092	43 3587
	27	0.076 510 91	0.930 775 73	0.403 250 34	1686 5244	126 0927	54 7154
	28	+0.093 362 60	-0.929 384 16	-0.402 646 54	+1683 7370	+152 2076	+66 0395
	29	0.110 184 10	0.927 731 83	0.401 929 67	1680 4865	178 2471	77 3275
	30	0.126 970 82	0.925 819 49	0.401 100 12	1676 7821	204 2053	88 5764
July	1	0.143 718 27	0.923 648 00	0.400 158 28	1672 6341	230 0786	99 7846
	2	+0.160 422 05	-0.921 218 21	-0.399 104 56	+1668 0521	+255 8659	+110 9521

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1595	-518 017	-225 068	+518 009	-1342	-4246	+225 087	+3081	-253
	18	1595	518 061	225 087	518 053	1342	4219	225 106	3053	253
	19	1596	518 129	225 117	518 120	1342	4187	225 135	3021	253
	20	1596	518 219	225 156	518 211	1343	4157	225 175	2990	254
	21	1597	518 328	225 203	518 320	1343	4134	225 222	2966	254
	22	1598	518 447	225 255	518 439	1344	4119	225 273	2951	254
	23	-1598	-518 566	-225 306	+518 558	-1345	-4115	+225 325	+2947	-254
	24	1599	518 678	225 355	518 670	1345	4120	225 373	2951	254
	25	1600	518 776	225 398	518 768	1346	4133	225 416	2963	254
	26	1600	518 857	225 433	518 849	1346	4149	225 451	2979	254
	27	1601	518 920	225 460	518 912	1346	4165	225 479	2995	254
	28	1601	518 967	225 481	518 959	1347	4179	225 499	3009	254
	29	-1601	-519 001	-225 495	+518 993	-1347	-4187	+225 514	+3016	-254
	30	1601	519 028	225 507	519 020	1347	4186	225 526	3015	254
	31	1601	519 058	225 520	519 050	1347	4175	225 539	3005	254
June	1	1602	519 099	225 538	519 091	1347	4155	225 557	2984	254
	2	1602	519 162	225 565	519 154	1348	4127	225 584	2956	254
	3	1603	519 252	225 604	519 244	1348	4097	225 623	2926	255
	4	-1603	-519 371	-225 656	+519 363	-1349	-4071	+225 674	+2899	-255
	5	1604	519 513	225 718	519 506	1350	4054	225 736	2882	255
	6	1605	519 665	225 784	519 658	1350	4053	225 802	2879	255
	7	1606	519 810	225 847	519 802	1351	4066	225 865	2892	255
	8	1607	519 933	225 900	519 925	1352	4090	225 918	2915	255
	9	1607	520 025	225 940	520 017	1352	4119	225 958	2944	255
	10	-1608	-520 087	-225 967	+520 079	-1353	-4144	+225 986	+2969	-255
	11	1608	520 127	225 984	520 119	1353	4160	226 003	2984	255
	12	1608	520 158	225 998	520 150	1353	4163	226 016	2987	255
	13	1608	520 193	226 013	520 185	1353	4153	226 031	2977	255
	14	1609	520 242	226 034	520 234	1353	4134	226 053	2958	256
	15	1609	520 313	226 065	520 305	1354	4109	226 084	2933	256
	16	-1610	-520 407	-226 106	+520 399	-1354	-4085	+226 124	+2908	-256
	17	1610	520 519	226 155	520 511	1355	4066	226 173	2889	256
	18	1611	520 643	226 209	520 635	1355	4056	226 227	2878	256
	19	1612	520 771	226 264	520 763	1356	4055	226 282	2877	256
	20	1613	520 893	226 317	520 885	1357	4065	226 335	2886	256
	21	1613	521 003	226 365	520 996	1357	4082	226 383	2903	256
	22	-1614	-521 097	-226 405	+521 089	-1358	-4104	+226 424	+2925	-256
	23	1614	521 172	226 438	521 164	1358	4128	226 456	2948	256
	24	1615	521 229	226 463	521 221	1358	4151	226 481	2970	257
	25	1615	521 271	226 481	521 263	1359	4168	226 500	2987	257
	26	1615	521 305	226 496	521 297	1359	4177	226 515	2996	257
	27	1616	521 338	226 510	521 330	1359	4177	226 529	2996	257
	28	-1616	-521 378	-226 528	+521 370	-1359	-4168	+226 546	+2987	-257
	29	1616	521 435	226 552	521 427	1360	4151	226 571	2970	257
	30	1617	521 516	226 587	521 508	1360	4129	226 606	2948	257
July	1	1617	521 625	226 635	521 617	1361	4109	226 653	2926	257
	2	-1618	-521 762	-226 694	+521 754	-1361	-4095	+226 712	+2912	-257

POSITION AND VELOCITY OF THE EARTH, 2023
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	+0.143 718 27	-0.923 648 00	-0.400 158 28	+1672 6341	+230 0786	+99 7846
	2	0.160 422 05	0.921 218 21	0.399 104 56	1668 0521	255 8659	110 9521
	3	0.177 077 89	0.918 530 96	0.397 939 37	1663 0443	281 5694	122 0799
	4	0.193 681 54	0.915 587 09	0.396 663 09	1657 6159	307 1933	133 1707
	5	0.210 228 81	0.912 387 35	0.395 276 07	1651 7675	332 7431	144 2284
	6	0.226 715 48	0.908 932 45	0.393 778 62	1645 4950	358 2237	155 2563
	7	+0.243 137 26	-0.905 223 10	-0.392 171 03	+1638 7899	+383 6367	+166 2564
	8	0.259 489 80	0.901 259 95	0.390 453 58	1631 6419	408 9803	177 2293
	9	0.275 768 59	0.897 043 74	0.388 626 54	1624 0402	434 2490	188 1730
	10	0.291 969 06	0.892 575 25	0.386 690 23	1615 9751	459 4339	199 0844
	11	0.308 086 52	0.887 855 38	0.384 644 98	1607 4393	484 5238	209 9586
	12	0.324 116 26	0.882 885 13	0.382 491 20	1598 4275	509 5062	220 7898
	13	+0.340 053 48	-0.877 665 65	-0.380 229 35	+1588 9368	+534 3682	+231 5723
	14	0.355 893 39	0.872 198 22	0.377 859 94	1578 9665	559 0962	242 2998
	15	0.371 631 21	0.866 484 22	0.375 383 55	1568 5173	583 6774	252 9659
	16	0.387 262 15	0.860 525 20	0.372 800 84	1557 5918	608 0987	263 5647
	17	0.402 781 47	0.854 322 82	0.370 112 51	1546 1937	632 3478	274 0900
	18	0.418 184 47	0.847 878 86	0.367 319 31	1534 3280	656 4129	284 5361
	19	+0.433 466 49	-0.841 195 21	-0.364 422 06	+1522 0009	+680 2827	+294 8978
	20	0.448 622 97	0.834 273 89	0.361 421 65	1509 2190	703 9470	305 1696
	21	0.463 649 38	0.827 116 99	0.358 318 99	1495 9900	727 3961	315 3471
	22	0.478 541 30	0.819 726 71	0.355 115 04	1482 3219	750 6209	325 4257
	23	0.493 294 38	0.812 105 35	0.351 810 81	1468 2232	773 6132	335 4016
	24	0.507 904 36	0.804 255 25	0.348 407 36	1453 7030	796 3652	345 2708
	25	+0.522 367 07	-0.796 178 87	-0.344 905 77	+1438 7707	+818 8698	+355 0299
	26	0.536 678 44	0.787 878 70	0.341 307 14	1423 4368	841 1208	364 6759
	27	0.550 834 50	0.779 357 31	0.337 612 63	1407 7121	863 1128	374 2063
	28	0.564 831 42	0.770 617 32	0.333 823 41	1391 6084	884 8419	383 6190
	29	0.578 665 45	0.761 661 36	0.329 940 65	1375 1382	906 3062	392 9135
	30	0.592 333 00	0.752 492 08	0.325 965 53	1358 3131	927 5067	402 0902
	31	+0.605 830 56	-0.743 112 09	-0.321 899 23	+1341 1434	+948 4466	+411 1513
Aug.	1	0.619 154 74	0.733 523 99	0.317 742 88	1323 6362	969 1320	420 1005
	2	0.632 302 17	0.723 730 28	0.313 497 58	1305 7933	989 5694	428 9418
	3	0.645 269 48	0.713 733 41	0.309 164 39	1287 6119	1009 7645	437 6793
	4	0.658 053 25	0.703 535 79	0.304 744 33	1269 0847	1029 7199	446 3153
	5	0.670 649 99	0.693 139 82	0.300 238 42	1250 2024	1049 4335	454 8500
	6	+0.683 056 09	-0.682 547 95	-0.295 647 67	+1230 9559	+1068 8987	+463 2812
	7	0.695 267 87	0.671 762 70	0.290 973 15	1211 3385	1088 1058	471 6047
	8	0.707 281 61	0.660 786 73	0.286 215 96	1191 3467	1107 0427	479 8152
	9	0.719 093 55	0.649 622 79	0.281 377 25	1170 9792	1125 6968	487 9067
	10	0.730 699 95	0.638 273 78	0.276 458 24	1150 2382	1144 0555	495 8731
	11	0.742 097 08	0.626 742 71	0.271 460 22	1129 1278	1162 1064	503 7086
	12	+0.753 281 29	-0.615 032 72	-0.266 384 52	+1107 6530	+1179 8380	+511 4075
	13	0.764 248 95	0.603 147 05	0.261 232 54	1085 8206	1197 2397	518 9646
	14	0.774 996 54	0.591 089 06	0.256 005 72	1063 6383	1214 3010	526 3748
	15	0.785 520 58	0.578 862 19	0.250 705 55	1041 1143	1231 0124	533 6332
	16	+0.795 817 71	-0.566 470 00	-0.245 333 58	+1018 2577	+1247 3648	+540 7356

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1617	-521 625	-226 635	+521 617	-1361	-4109	+226 653	+2926	-257
	2	1618	521 762	226 694	521 754	1361	4095	226 712	2912	257
	3	1619	521 915	226 761	521 907	1362	4095	226 779	2912	257
	4	1620	522 069	226 827	522 061	1363	4111	226 846	2927	257
	5	1621	522 205	226 886	522 197	1364	4141	226 905	2956	257
	6	1622	522 310	226 932	522 302	1364	4178	226 951	2993	258
	7	-1622	-522 382	-226 963	+522 374	-1364	-4214	+226 982	+3029	-258
	8	1622	522 426	226 982	522 417	1365	4242	227 001	3056	258
	9	1622	522 455	226 995	522 447	1365	4256	227 014	3070	258
	10	1623	522 486	227 008	522 477	1365	4257	227 028	3070	258
	11	1623	522 528	227 027	522 520	1365	4246	227 046	3060	258
	12	1623	522 591	227 054	522 583	1366	4230	227 073	3043	258
	13	-1624	-522 676	-227 091	+522 667	-1366	-4213	+227 110	+3026	-258
	14	1624	522 779	227 136	522 771	1367	4200	227 155	3013	258
	15	1625	522 895	227 186	522 887	1367	4195	227 205	3007	258
	16	1626	523 016	227 239	523 008	1368	4200	227 257	3011	258
	17	1627	523 133	227 290	523 125	1368	4214	227 308	3025	258
	18	1627	523 240	227 336	523 232	1369	4237	227 355	3047	258
	19	-1628	-523 330	-227 375	+523 322	-1369	-4265	+227 394	+3075	-259
	20	1628	523 402	227 406	523 394	1370	4296	227 426	3105	259
	21	1629	523 455	227 429	523 447	1370	4325	227 449	3135	259
	22	1629	523 493	227 446	523 484	1370	4350	227 465	3160	259
	23	1629	523 519	227 457	523 511	1370	4369	227 477	3178	259
	24	1629	523 542	227 467	523 533	1371	4378	227 487	3187	259
	25	-1629	-523 569	-227 479	+523 560	-1371	-4378	+227 499	+3187	-259
	26	1630	523 608	227 496	523 600	1371	4369	227 516	3178	259
	27	1630	523 668	227 522	523 660	1371	4355	227 542	3164	259
	28	1631	523 754	227 559	523 746	1372	4340	227 579	3148	259
	29	1631	523 866	227 608	523 858	1372	4329	227 628	3137	259
	30	1632	524 000	227 666	523 991	1373	4329	227 686	3136	259
	31	-1633	-524 142	-227 728	+524 134	-1374	-4343	+227 747	+3149	-259
Aug.	1	1634	524 276	227 786	524 268	1374	4372	227 806	3178	260
	2	1634	524 385	227 833	524 376	1375	4413	227 853	3218	260
	3	1635	524 458	227 865	524 449	1375	4456	227 885	3261	260
	4	1635	524 498	227 882	524 489	1376	4493	227 903	3298	260
	5	1635	524 517	227 890	524 508	1376	4517	227 911	3322	-260
	6	-1635	-524 531	-227 897	+524 522	-1376	-4526	+227 917	+3330	-260
	7	1636	524 555	227 907	524 546	1376	4521	227 928	3325	260
	8	1636	524 598	227 926	524 590	1376	4508	227 946	3312	260
	9	1636	524 664	227 955	524 655	1376	4494	227 975	3297	260
	10	1637	524 750	227 992	524 741	1377	4482	228 012	3286	260
	11	1637	524 849	228 035	524 840	1377	4478	228 055	3281	260
	12	-1638	-524 955	-228 081	+524 946	-1378	-4483	+228 101	+3285	-260
	13	1639	525 058	228 125	525 049	1378	4497	228 146	3299	260
	14	1639	525 151	228 166	525 142	1379	4520	228 187	3322	260
	15	1640	525 230	228 200	525 221	1379	4549	228 221	3350	260
	16	-1640	-525 290	-228 226	+525 281	-1380	-4581	+228 247	+3382	-261

POSITION AND VELOCITY OF THE EARTH, 2023
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	+0.795 817 71	-0.566 470 00	-0.245 333 58	+1018 2577	+1247 3648	+540 7356
	17	0.805 884 66	0.553 916 12	0.239 891 37	995 0789	1263 3498	547 6776
	18	0.815 718 25	0.541 204 26	0.234 380 57	971 5882	1278 9600	554 4554
	19	0.825 315 42	0.528 338 20	0.228 802 82	947 7968	1294 1883	561 0657
	20	0.834 673 22	0.515 321 78	0.223 159 83	923 7166	1309 0288	567 5054
	21	0.843 788 83	0.502 158 93	0.217 453 29	899 3595	1323 4761	573 7719
	22	+0.852 659 53	-0.488 853 59	-0.211 684 97	+874 7383	+1337 5261	+579 8630
	23	0.861 282 76	0.475 409 74	0.205 856 62	849 8658	1351 1753	585 7771
	24	0.869 656 06	0.461 831 42	0.199 970 02	824 7555	1364 4216	591 5130
	25	0.877 777 12	0.448 122 66	0.194 026 96	799 4212	1377 2640	597 0706
	26	0.885 643 78	0.434 287 49	0.188 029 20	773 8761	1389 7040	602 4505
	27	0.893 253 98	0.420 329 91	0.181 978 53	748 1331	1401 7449	607 6548
	28	+0.900 605 82	-0.406 253 90	-0.175 876 68	+722 2033	+1413 3922	+612 6864
	29	0.907 697 45	0.392 063 35	0.169 725 36	696 0944	1424 6535	617 5500
	30	0.914 527 12	0.377 762 09	0.163 526 23	669 8094	1435 5369	622 2502
	31	0.921 093 05	0.363 353 85	0.157 280 89	643 3468	1446 0493	626 7915
Sept.	1	0.927 393 44	0.348 842 33	0.150 990 92	616 7009	1456 1941	631 1768
	2	0.933 426 43	0.334 231 20	0.144 657 87	589 8642	1465 9705	635 4066
	3	+0.939 190 07	-0.319 524 16	-0.138 283 31	+562 8296	+1475 3728	+639 4787
	4	0.944 682 35	0.304 725 02	0.131 868 84	535 5929	1484 3916	643 3890
	5	0.949 901 25	0.289 837 65	0.125 416 09	508 1537	1493 0158	647 1324
	6	0.954 844 76	0.274 866 06	0.118 926 77	480 5147	1501 2341	650 7032
	7	0.959 510 90	0.259 814 36	0.112 402 62	452 6818	1509 0354	654 0959
	8	0.963 897 77	0.244 686 77	0.105 845 46	424 6628	1516 4097	657 3056
	9	+0.968 003 56	-0.229 487 62	-0.099 257 13	+396 4669	+1523 3484	+660 3276
	10	0.971 826 55	0.214 221 28	0.092 639 54	368 1040	1529 8435	663 1580
	11	0.975 365 12	0.198 892 25	0.085 994 63	339 5847	1535 8878	665 7930
	12	0.978 617 76	0.183 505 05	0.079 324 35	310 9204	1541 4751	668 2293
	13	0.981 583 09	0.168 064 29	0.072 630 71	282 1227	1546 5994	670 4640
	14	0.984 259 81	0.152 574 62	0.065 915 75	253 2039	1551 2557	672 4941
	15	+0.986 646 80	-0.137 040 75	-0.059 181 52	+224 1773	+1555 4393	+674 3172
	16	0.988 743 04	0.121 467 42	0.052 430 10	195 0561	1559 1465	675 9314
	17	0.990 547 66	0.105 859 42	0.045 663 59	165 8548	1562 3748	677 3351
	18	0.992 059 92	0.090 221 53	0.038 884 10	136 5879	1565 1223	678 5272
	19	0.993 279 25	0.074 558 58	0.032 093 75	107 2703	1567 3886	679 5075
	20	0.994 205 21	0.058 875 36	0.025 294 66	77 9170	1569 1748	680 2761
	21	+0.994 837 52	-0.043 176 67	-0.018 488 93	+48 5425	+1570 4827	+680 8342
	22	0.995 176 04	0.027 467 29	0.011 678 67	+19 1614	1571 3165	681 1836
	23	0.995 220 77	-0.011 751 91	-0.004 865 95	-10 2127	1571 6812	681 3271
	24	0.994 971 85	+0.003 964 80	+0.001 947 20	39 5675	1571 5840	681 2683
	25	0.994 429 52	0.019 678 26	0.008 758 76	68 8930	1571 0336	681 0118
	26	0.993 594 11	0.035 383 99	0.015 566 79	98 1823	1570 0395	680 5632
	27	+0.992 466 00	+0.051 077 61	+0.022 369 40	-127 4320	+1568 6115	+679 9278
	28	0.991 045 60	0.066 754 80	0.029 164 74	156 6432	1566 7579	679 1105
	29	0.989 333 25	0.082 411 36	0.035 951 02	185 8201	1564 4838	678 1146
	30	0.987 329 29	0.098 043 08	0.042 726 44	214 9684	1561 7900	676 9414
Oct.	1	+0.985 033 96	+0.113 645 75	+0.049 489 25	-244 0930	+1558 6731	+675 5894

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1640	-525 290	-228 226	+525 281	-1380	-4581	+228 247	+3382	-261
17	1640	525 331	228 244	525 322	1380	4612	228 265	3413	261
18	1641	525 355	228 254	525 346	1380	4640	228 276	3441	261
19	1641	525 367	228 260	525 357	1380	4661	228 281	3461	261
20	1641	525 373	228 262	525 364	1380	4672	228 284	3473	261
21	1641	525 382	228 266	525 372	1380	4675	228 288	3475	-261
22	-1641	-525 400	-228 274	+525 391	-1380	-4668	+228 296	+3469	-261
23	1641	525 437	228 290	525 428	1380	4656	228 312	3456	261
24	1641	525 496	228 316	525 487	1381	4641	228 337	3441	261
25	1642	525 580	228 353	525 571	1381	4628	228 374	3427	261
26	1643	525 687	228 399	525 678	1382	4622	228 420	3422	261
27	1643	525 806	228 451	525 797	1382	4629	228 472	3428	261
28	-1644	-525 926	-228 503	+525 917	-1383	-4650	+228 524	+3448	-261
29	1645	526 029	228 547	526 019	1384	4684	228 569	3482	261
30	1645	526 101	228 579	526 092	1384	4725	228 600	3523	261
31	1645	526 140	228 595	526 130	1384	4764	228 617	3561	261
Sept. 1	1645	526 150	228 600	526 140	1384	4792	228 622	3589	261
2	1645	526 148	228 599	526 138	1384	4804	228 621	3601	261
3	-1645	-526 151	-228 600	+526 141	-1384	-4800	+228 623	+3597	-261
4	1646	526 172	228 610	526 163	1384	4785	228 632	3582	261
5	1646	526 218	228 630	526 209	1385	4765	228 652	3562	261
6	1646	526 287	228 659	526 277	1385	4748	228 681	3544	262
7	1647	526 371	228 696	526 362	1385	4736	228 718	3532	262
8	1647	526 464	228 737	526 455	1386	4734	228 758	3530	262
9	-1648	-526 557	-228 777	+526 547	-1386	-4742	+228 798	+3537	-262
10	1649	526 641	228 813	526 631	1387	4758	228 835	3553	262
11	1649	526 711	228 844	526 701	1387	4781	228 866	3576	262
12	1649	526 763	228 866	526 753	1387	4807	228 888	3602	262
13	1650	526 796	228 881	526 786	1388	4834	228 903	3628	262
14	1650	526 812	228 888	526 802	1388	4857	228 910	3651	262
15	-1650	-526 815	-228 889	+526 805	-1388	-4874	+228 911	+3668	-262
16	1650	526 810	228 887	526 800	1388	4882	228 910	3676	262
17	1650	526 806	228 885	526 797	1388	4880	228 908	3674	262
18	1650	526 812	228 888	526 802	1388	4869	228 910	3663	262
19	1650	526 833	228 897	526 824	1388	4851	228 920	3645	262
20	1650	526 877	228 916	526 867	1388	4829	228 939	3623	262
21	-1650	-526 945	-228 946	+526 935	-1388	-4809	+228 968	+3602	-262
22	1651	527 034	228 984	527 025	1389	4794	229 007	3587	262
23	1652	527 139	229 030	527 129	1389	4790	229 052	3583	262
24	1652	527 247	229 077	527 237	1390	4799	229 099	3591	262
25	1653	527 346	229 120	527 336	1391	4820	229 142	3612	263
26	1653	527 421	229 152	527 412	1391	4850	229 175	3642	263
27	-1654	-527 466	-229 172	+527 456	-1391	-4882	+229 195	+3673	-263
28	1654	527 482	229 179	527 472	1391	4907	229 201	3698	263
29	1654	527 478	229 177	527 468	1391	4919	229 200	3710	263
30	1654	527 472	229 175	527 462	1391	4913	229 198	3704	263
Oct. 1	-1654	-527 481	-229 179	+527 471	-1391	-4894	+229 201	+3685	-263

POSITION AND VELOCITY OF THE EARTH, 2023
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	+0.985 033 96	+0.113 645 75	+0.049 489 25	-244 0930	+1558 6731	+675 5894
	2	0.982 447 50	0.129 215 11	0.056 237 63	273 1962	1555 1267	674 0558
	3	0.979 570 12	0.144 746 83	0.062 969 74	302 2767	1551 1420	672 3361
	4	0.976 402 06	0.160 236 46	0.069 683 71	331 3290	1546 7103	670 4259
	5	0.972 943 66	0.175 679 52	0.076 377 61	360 3449	1541 8241	668 3209
	6	0.969 195 32	0.191 071 41	0.083 049 47	389 3147	1536 4764	666 0172
	7	+0.965 157 56	+0.206 407 49	+0.089 697 29	-418 2266	+1530 6623	+663 5122
	8	0.960 831 02	0.221 683 09	0.096 319 03	447 0688	1524 3779	660 8035
	9	0.956 216 45	0.236 893 47	0.102 912 67	475 8288	1517 6202	657 8891
	10	0.951 314 75	0.252 033 90	0.109 476 13	504 4941	1510 3870	654 7675
	11	0.946 126 93	0.267 099 62	0.116 007 32	533 0518	1502 6765	651 4375
	12	0.940 654 12	0.282 085 84	0.122 504 18	561 4884	1494 4878	647 8983
	13	+0.934 897 61	+0.296 987 78	+0.128 964 59	-589 7899	+1485 8204	+644 1491
	14	0.928 858 82	0.311 800 65	0.135 386 46	617 9417	1476 6748	640 1898
	15	0.922 539 33	0.326 519 69	0.141 767 69	645 9289	1467 0524	636 0205
	16	0.915 940 85	0.341 140 12	0.148 106 18	673 7356	1456 9561	631 6426
	17	0.909 065 27	0.355 657 24	0.154 399 85	701 3463	1446 3902	627 0575
	18	0.901 914 63	0.370 066 38	0.160 646 64	728 7456	1435 3608	622 2680
	19	+0.894 491 11	+0.384 362 94	+0.166 844 54	-755 9188	+1423 8755	+617 2778
	20	0.886 797 05	0.398 542 40	0.172 991 55	782 8525	1411 9433	612 0912
	21	0.878 834 90	0.412 600 35	0.179 085 73	809 5353	1399 5752	606 7136
	22	0.870 607 21	0.426 532 49	0.185 125 20	835 9573	1386 7823	601 1507
	23	0.862 116 64	0.440 334 62	0.191 108 14	862 1114	1373 5770	595 4088
	24	0.853 365 89	0.454 002 70	0.197 032 80	887 9936	1359 9716	589 4945
	25	+0.844 357 68	+0.467 532 76	+0.202 897 48	-913 6028	+1345 9775	+583 4137
	26	0.835 094 74	0.480 920 98	0.208 700 54	938 9408	1331 6042	577 1718
	27	0.825 579 75	0.494 163 60	0.214 440 39	964 0117	1316 8586	570 7724
	28	0.815 815 38	0.507 256 92	0.220 115 47	988 8204	1301 7438	564 2175
	29	0.805 804 21	0.520 197 25	0.225 724 22	1013 3706	1286 2596	557 5071
	30	0.795 548 82	0.532 980 88	0.231 265 09	1037 6638	1270 4032	550 6395
	31	+0.785 051 80	+0.545 604 06	+0.236 736 48	-1061 6981	+1254 1698	+543 6122
Nov.	1	0.774 315 74	0.558 063 00	0.242 136 79	1085 4682	1237 5549	536 4223
	2	0.763 343 34	0.570 353 87	0.247 464 38	1108 9662	1220 5547	529 0673
	3	0.752 137 36	0.582 472 80	0.252 717 58	1132 1817	1203 1667	521 5450
	4	0.740 700 68	0.594 415 91	0.257 894 72	1155 1037	1185 3898	513 8547
	5	0.729 036 30	0.606 179 30	0.262 994 11	1177 7204	1167 2247	505 9957
	6	+0.717 147 33	+0.617 759 11	+0.268 014 07	-1200 0200	+1148 6729	+497 9680
	7	0.705 037 00	0.629 151 48	0.272 952 91	1221 9907	1129 7367	489 7723
	8	0.692 708 66	0.640 352 57	0.277 808 96	1243 6203	1110 4188	481 4094
	9	0.680 165 77	0.651 358 59	0.282 580 54	1264 8970	1090 7227	472 8801
	10	0.667 411 94	0.662 165 78	0.287 266 01	1285 8078	1070 6527	464 1861
	11	0.654 450 88	0.672 770 42	0.291 863 72	1306 3396	1050 2133	455 3289
	12	+0.641 286 45	+0.683 168 84	+0.296 372 05	-1326 4786	+1029 4103	+446 3107
	13	0.627 922 66	0.693 357 44	0.300 789 41	1346 2106	1008 2513	437 1346
	14	0.614 363 65	0.703 332 71	0.305 114 23	1365 5214	986 7455	427 8047
	15	0.600 613 68	0.713 091 23	0.309 345 00	1384 3973	964 9039	418 3259
	16	+0.586 677 19	+0.722 629 71	+0.313 480 27	-1402 8265	+942 7397	+408 7044

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1654	-527 481	-229 179	+527 471	-1391	-4894	+229 201	+3685	-263
	2	1654	527 514	229 193	527 505	1391	4866	229 216	3657	263
	3	1654	527 574	229 219	527 565	1392	4837	229 242	3628	263
	4	1655	527 656	229 255	527 646	1392	4814	229 277	3604	263
	5	1655	527 749	229 295	527 739	1393	4800	229 317	3590	263
	6	1656	527 845	229 337	527 835	1393	4796	229 359	3585	263
	7	-1657	-527 934	-229 375	+527 925	-1394	-4802	+229 398	+3591	-263
	8	1657	528 011	229 409	528 001	1394	4815	229 431	3603	263
	9	1658	528 070	229 434	528 060	1394	4832	229 457	3621	263
	10	1658	528 111	229 452	528 101	1395	4851	229 475	3639	263
	11	1658	528 134	229 462	528 124	1395	4867	229 485	3655	263
	12	1658	528 142	229 466	528 133	1395	4878	229 489	3666	263
	13	-1658	-528 143	-229 466	+528 133	-1395	-4880	+229 489	+3668	-263
	14	1658	528 142	229 466	528 132	1395	4873	229 489	3661	263
	15	1658	528 149	229 469	528 139	1395	4855	229 492	3643	263
	16	1658	528 172	229 479	528 162	1395	4830	229 501	3618	263
	17	1658	528 216	229 498	528 207	1395	4801	229 521	3588	263
	18	1659	528 286	229 528	528 276	1396	4771	229 550	3559	264
	19	-1659	-528 378	-229 568	+528 368	-1396	-4747	+229 590	+3534	-264
	20	1660	528 486	229 615	528 477	1397	4732	229 637	3519	264
	21	1661	528 600	229 665	528 591	1397	4730	229 687	3516	264
	22	1662	528 708	229 712	528 699	1398	4740	229 734	3526	264
	23	1662	528 797	229 751	528 788	1398	4760	229 773	3545	264
	24	1662	528 860	229 778	528 850	1399	4783	229 800	3568	264
	25	-1663	-528 894	-229 793	+528 884	-1399	-4803	+229 815	+3588	-264
	26	1663	528 907	229 798	528 897	1399	4812	229 820	3597	264
	27	1663	528 912	229 800	528 902	1399	4807	229 823	3591	264
	28	1663	528 925	229 806	528 915	1399	4786	229 828	3570	264
	29	1663	528 959	229 821	528 950	1399	4754	229 843	3539	264
	30	1663	529 021	229 848	529 012	1399	4719	229 870	3503	264
	31	-1664	-529 109	-229 886	+529 100	-1400	-4686	+229 908	+3470	-264
Nov.	1	1665	529 216	229 932	529 206	1400	4661	229 954	3445	264
	2	1665	529 329	229 982	529 320	1401	4648	230 003	3430	265
	3	1666	529 439	230 029	529 430	1402	4645	230 051	3427	265
	4	1667	529 538	230 072	529 528	1402	4651	230 094	3433	265
	5	1667	529 620	230 108	529 611	1403	4663	230 129	3444	265
	6	-1668	-529 683	-230 135	+529 674	-1403	-4677	+230 157	+3458	-265
	7	1668	529 728	230 155	529 719	1403	4690	230 177	3471	265
	8	1668	529 758	230 168	529 749	1403	4699	230 190	3479	265
	9	1668	529 778	230 177	529 768	1403	4700	230 198	3480	265
	10	1668	529 794	230 184	529 785	1403	4692	230 205	3472	265
	11	1668	529 816	230 193	529 806	1404	4674	230 215	3454	265
	12	-1669	-529 851	-230 208	+529 841	-1404	-4648	+230 230	+3428	-265
	13	1669	529 907	230 233	529 898	1404	4616	230 254	3396	265
	14	1670	529 989	230 268	529 980	1405	4583	230 289	3363	265
	15	1670	530 095	230 315	530 086	1405	4554	230 336	3333	265
	16	-1671	-530 222	-230 369	+530 213	-1406	-4535	+230 390	+3313	-265

POSITION AND VELOCITY OF THE EARTH, 2023
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	+0.586 677 19	+0.722 629 71	+0.313 480 27	-1402 8265	+942 7397	+408 7044
	17	0.572 558 68	0.731 945 00	0.317 518 64	1420 7986	920 2676	398 9472
	18	0.558 262 76	0.741 034 09	0.321 458 79	1438 3064	897 5034	389 0621
	19	0.543 794 11	0.749 894 14	0.325 299 48	1455 3456	874 4629	379 0571
	20	0.529 157 42	0.758 522 48	0.329 039 56	1471 9145	851 1615	368 9398
	21	0.514 357 38	0.766 916 55	0.332 677 93	1488 0148	827 6139	358 7176
	22	+0.499 398 68	+0.775 073 97	+0.336 213 58	-1503 6497	+803 8324	+348 3969
	23	0.484 285 92	0.782 992 45	0.339 645 55	1518 8245	779 8271	337 9827
	24	0.469 023 70	0.790 669 80	0.342 972 94	1533 5453	755 6060	327 4791
	25	0.453 616 51	0.798 103 87	0.346 194 85	1547 8176	731 1737	316 8882
	26	0.438 068 83	0.805 292 58	0.349 310 41	1561 6461	706 5327	306 2110
	27	0.422 385 06	0.812 233 83	0.352 318 78	1575 0334	681 6836	295 4473
	28	+0.406 569 63	+0.818 925 55	+0.355 219 07	-1587 9792	+656 6255	+284 5962
	29	0.390 626 96	0.825 365 64	0.358 010 41	1600 4803	631 3578	273 6564
	30	0.374 561 52	0.831 552 01	0.360 691 90	1612 5314	605 8806	262 6270
Dec.	1	0.358 377 85	0.837 482 56	0.363 262 65	1624 1253	580 1952	251 5081
	2	0.342 080 57	0.843 155 23	0.365 721 76	1635 2536	554 3041	240 2998
	3	0.325 674 36	0.848 567 97	0.368 068 35	1645 9079	528 2114	229 0033
	4	+0.309 164 02	+0.853 718 80	+0.370 301 54	-1656 0794	+501 9221	+217 6202
	5	0.292 554 41	0.858 605 78	0.372 420 47	1665 7594	475 4422	206 1528
	6	0.275 850 50	0.863 227 03	0.374 424 32	1674 9394	448 7782	194 6034
	7	0.259 057 32	0.867 580 75	0.376 312 28	1683 6109	421 9370	182 9745
	8	0.242 180 01	0.871 665 20	0.378 083 56	1691 7651	394 9260	171 2694
	9	0.225 223 77	0.875 478 73	0.379 737 42	1699 3927	367 7535	159 4908
	10	+0.208 193 94	+0.879 019 77	+0.381 273 14	-1706 4838	+340 4285	+147 6428
	11	0.191 095 92	0.882 286 83	0.382 690 06	1713 0284	312 9615	135 7299
	12	0.173 935 23	0.885 278 57	0.383 987 54	1719 0160	285 3651	123 7574
	13	0.156 717 49	0.887 993 75	0.385 165 03	1724 4375	257 6540	111 7320
	14	0.139 448 39	0.890 431 32	0.386 222 03	1729 2850	229 8453	99 6620
	15	0.122 133 71	0.892 590 39	0.387 158 15	1733 5544	201 9575	87 5562
	16	+0.104 779 24	+0.894 470 27	+0.387 973 07	-1737 2445	+174 0098	+75 4238
	17	0.087 390 74	0.896 070 45	0.388 666 57	1740 3585	146 0212	63 2746
	18	0.069 973 97	0.897 390 62	0.389 238 53	1742 9029	118 0087	51 1168
	19	0.052 534 56	0.898 430 60	0.389 688 90	1744 8862	89 9868	38 9577
	20	0.035 078 08	0.899 190 36	0.390 017 70	1746 3188	61 9674	26 8033
	21	0.017 609 98	0.899 669 98	0.390 225 00	1747 2111	33 9593	14 6576
	22	+0.000 135 62	+0.899 869 61	+0.390 310 90	-1747 5727	+5 9693	+2 5240
	23	-0.017 339 73	0.899 789 44	0.390 275 52	1747 4125	-21 9982	-9 5959
	24	0.034 810 91	0.899 429 73	0.390 119 03	1746 7373	49 9401	-21 7012
	25	0.052 272 78	0.898 790 73	0.389 841 55	1745 5522	77 8547	33 7917
	26	0.069 720 26	0.897 872 73	0.389 443 24	1743 8600	105 7405	45 8673
	27	0.087 148 29	0.896 676 02	0.388 924 25	1741 6615	133 5959	57 9283
	28	-0.104 551 80	+0.895 200 92	+0.388 284 73	-1738 9558	-161 4190	-69 9744
	29	0.121 925 71	0.893 447 76	0.387 524 82	1735 7403	189 2065	82 0051
	30	0.139 264 90	0.891 416 92	0.386 644 68	1732 0119	216 9543	94 0194
	31	0.156 564 23	0.889 108 83	0.385 644 49	1727 7669	244 6571	106 0152
	32	-0.173 818 50	+0.886 523 95	+0.384 524 44	-1723 0013	-272 3085	-117 9906

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

FRAME BIAS, PRECESSION AND NUTATION, 2023
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	-1671	-530 222	-230 369	+530 213	-1406	-4535	+230 390	+3313	-265
	17	1672	530 356	230 428	530 347	1406	4528	230 449	3305	266
	18	1673	530 486	230 484	530 477	1407	4534	230 505	3311	266
	19	1673	530 599	230 533	530 590	1408	4551	230 554	3327	266
	20	1674	530 686	230 571	530 677	1408	4572	230 592	3349	266
	21	1674	530 745	230 597	530 736	1409	4592	230 618	3368	266
	22	-1675	-530 782	-230 613	+530 773	-1409	-4604	+230 634	+3380	-266
	23	1675	530 807	230 624	530 798	1409	4603	230 645	3379	266
	24	1675	530 836	230 636	530 827	1409	4588	230 657	3363	266
	25	1675	530 881	230 656	530 871	1409	4561	230 676	3336	266
	26	1676	530 950	230 686	530 941	1410	4528	230 707	3303	266
	27	1676	531 047	230 728	531 038	1410	4495	230 748	3270	266
	28	-1677	-531 165	-230 779	+531 156	-1411	-4469	+230 800	+3243	-266
	29	1678	531 296	230 836	531 287	1411	4453	230 856	3226	267
	30	1679	531 428	230 893	531 420	1412	4448	230 914	3221	267
Dec.	1	1679	531 552	230 947	531 543	1413	4454	230 967	3226	267
	2	1680	531 660	230 994	531 651	1413	4468	231 014	3240	267
	3	1681	531 749	231 032	531 740	1414	4485	231 053	3256	267
	4	-1681	-531 818	-231 062	+531 809	-1414	-4503	+231 083	+3274	-267
	5	1681	531 870	231 085	531 861	1414	4517	231 106	3288	267
	6	1682	531 910	231 102	531 901	1415	4525	231 123	3295	267
	7	1682	531 944	231 117	531 935	1415	4524	231 138	3295	267
	8	1682	531 979	231 133	531 970	1415	4515	231 153	3285	267
	9	1682	532 025	231 153	532 016	1415	4497	231 173	3267	267
	10	-1683	-532 089	-231 180	+532 080	-1416	-4472	+231 201	+3241	-267
	11	1683	532 177	231 219	532 168	1416	4444	231 239	3213	267
	12	1684	532 292	231 268	532 283	1417	4418	231 289	3187	268
	13	1685	532 430	231 328	532 421	1417	4401	231 348	3169	268
	14	1686	532 581	231 394	532 572	1418	4396	231 414	3163	268
	15	1687	532 731	231 459	532 723	1419	4405	231 479	3172	268
	16	-1688	-532 866	-231 518	+532 858	-1420	-4427	+231 538	+3193	-268
	17	1688	532 975	231 565	532 966	1420	4456	231 585	3222	268
	18	1689	533 053	231 598	533 044	1421	4485	231 619	3250	268
	19	1689	533 105	231 621	533 096	1421	4506	231 642	3271	268
	20	1690	533 143	231 638	533 134	1421	4515	231 658	3280	268
	21	1690	533 180	231 654	533 171	1421	4511	231 675	3276	268
	22	-1690	-533 229	-231 675	+533 220	-1422	-4495	+231 696	+3259	-268
	23	1690	533 300	231 706	533 291	1422	4471	231 727	3236	269
	24	1691	533 396	231 748	533 387	1423	4447	231 768	3211	269
	25	1692	533 515	231 799	533 506	1423	4427	231 819	3190	269
	26	1693	533 648	231 857	533 639	1424	4416	231 877	3179	269
	27	1694	533 786	231 917	533 777	1425	4417	231 937	3179	269
	28	-1694	-533 919	-231 974	+533 910	-1425	-4428	+231 995	+3189	-269
	29	1695	534 038	232 026	534 029	1426	4448	232 046	3209	269
	30	1696	534 138	232 070	534 129	1427	4474	232 090	3234	269
	31	1696	534 217	232 104	534 208	1427	4500	232 125	3260	269
	32	-1697	-534 278	-232 130	+534 269	-1427	-4525	+232 151	+3285	-270

APPARENT PLACES OF POLARIS, 2023

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	01	54	+89	21	54	3	01	02	+89	21	59	3	00	09	+89	21	58	2	59	24	+89	21	52
2	3	01	53	+89	21	54	3	01	01	+89	21	59	3	00	07	+89	21	58	2	59	23	+89	21	52
3	3	01	52	+89	21	54	3	00	59	+89	21	59	3	00	06	+89	21	58	2	59	22	+89	21	52
4	3	01	50	+89	21	55	3	00	57	+89	21	59	3	00	04	+89	21	58	2	59	21	+89	21	52
5	3	01	49	+89	21	55	3	00	55	+89	21	59	3	00	02	+89	21	58	2	59	20	+89	21	51
6	3	01	48	+89	21	55	3	00	53	+89	21	59	3	00	00	+89	21	58	2	59	19	+89	21	51
7	3	01	47	+89	21	55	3	00	50	+89	21	59	2	59	58	+89	21	58	2	59	18	+89	21	51
8	3	01	45	+89	21	56	3	00	48	+89	21	59	2	59	56	+89	21	57	2	59	17	+89	21	50
9	3	01	43	+89	21	56	3	00	46	+89	21	59	2	59	54	+89	21	57	2	59	17	+89	21	50
10	3	01	42	+89	21	56	3	00	44	+89	21	59	2	59	53	+89	21	57	2	59	16	+89	21	50
11	3	01	40	+89	21	56	3	00	42	+89	21	59	2	59	51	+89	21	57	2	59	16	+89	21	49
12	3	01	38	+89	21	57	3	00	40	+89	21	59	2	59	49	+89	21	57	2	59	16	+89	21	49
13	3	01	36	+89	21	57	3	00	38	+89	21	59	2	59	48	+89	21	56	2	59	15	+89	21	49
14	3	01	34	+89	21	57	3	00	36	+89	21	59	2	59	47	+89	21	56	2	59	14	+89	21	49
15	3	01	32	+89	21	57	3	00	35	+89	21	59	2	59	46	+89	21	56	2	59	14	+89	21	48
16	3	01	31	+89	21	57	3	00	33	+89	21	59	2	59	44	+89	21	56	2	59	13	+89	21	48
17	3	01	29	+89	21	57	3	00	32	+89	21	59	2	59	43	+89	21	56	2	59	12	+89	21	48
18	3	01	28	+89	21	57	3	00	30	+89	21	59	2	59	42	+89	21	56	2	59	11	+89	21	48
19	3	01	26	+89	21	58	3	00	28	+89	21	59	2	59	40	+89	21	55	2	59	11	+89	21	47
20	3	01	25	+89	21	58	3	00	26	+89	21	59	2	59	38	+89	21	55	2	59	11	+89	21	47
21	3	01	23	+89	21	58	3	00	23	+89	21	59	2	59	37	+89	21	55	2	59	10	+89	21	47
22	3	01	21	+89	21	58	3	00	21	+89	21	59	2	59	35	+89	21	55	2	59	10	+89	21	46
23	3	01	19	+89	21	58	3	00	19	+89	21	59	2	59	34	+89	21	55	2	59	10	+89	21	46
24	3	01	17	+89	21	58	3	00	17	+89	21	59	2	59	32	+89	21	54	2	59	10	+89	21	46
25	3	01	15	+89	21	59	3	00	15	+89	21	59	2	59	31	+89	21	54	2	59	10	+89	21	45
26	3	01	13	+89	21	59	3	00	14	+89	21	59	2	59	30	+89	21	54	2	59	10	+89	21	45
27	3	01	11	+89	21	59	3	00	12	+89	21	58	2	59	30	+89	21	53	2	59	10	+89	21	45
28	3	01	09	+89	21	59	3	00	11	+89	21	58	2	59	29	+89	21	53	2	59	10	+89	21	45
29	3	01	07	+89	21	59							2	59	28	+89	21	53	2	59	10	+89	21	44
30	3	01	06	+89	21	59							2	59	27	+89	21	53	2	59	10	+89	21	44
31	3	01	04	+89	21	59							2	59	26	+89	21	53						

APPARENT PLACES OF POLARIS, 2023

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	59	10	+89	21	44	2	59	28	+89	21	35	3	00	13	+89	21	29	3	01	16	+89	21	28
2	2	59	09	+89	21	43	2	59	29	+89	21	35	3	00	16	+89	21	29	3	01	18	+89	21	28
3	2	59	09	+89	21	43	2	59	31	+89	21	34	3	00	18	+89	21	29	3	01	20	+89	21	28
4	2	59	09	+89	21	43	2	59	32	+89	21	34	3	00	20	+89	21	29	3	01	22	+89	21	28
5	2	59	10	+89	21	42	2	59	34	+89	21	34	3	00	22	+89	21	29	3	01	24	+89	21	28
6	2	59	10	+89	21	42	2	59	35	+89	21	34	3	00	23	+89	21	29	3	01	26	+89	21	28
7	2	59	11	+89	21	42	2	59	37	+89	21	34	3	00	25	+89	21	29	3	01	28	+89	21	28
8	2	59	11	+89	21	41	2	59	38	+89	21	33	3	00	26	+89	21	29	3	01	30	+89	21	28
9	2	59	12	+89	21	41	2	59	39	+89	21	33	3	00	28	+89	21	29	3	01	32	+89	21	28
10	2	59	13	+89	21	41	2	59	40	+89	21	33	3	00	30	+89	21	29	3	01	35	+89	21	28
11	2	59	13	+89	21	41	2	59	41	+89	21	33	3	00	32	+89	21	28	3	01	37	+89	21	29
12	2	59	13	+89	21	40	2	59	42	+89	21	33	3	00	34	+89	21	28	3	01	39	+89	21	29
13	2	59	14	+89	21	40	2	59	43	+89	21	32	3	00	36	+89	21	28	3	01	42	+89	21	29
14	2	59	14	+89	21	40	2	59	45	+89	21	32	3	00	38	+89	21	28	3	01	44	+89	21	29
15	2	59	14	+89	21	40	2	59	47	+89	21	32	3	00	41	+89	21	28	3	01	46	+89	21	29
16	2	59	14	+89	21	39	2	59	48	+89	21	32	3	00	43	+89	21	28	3	01	48	+89	21	29
17	2	59	15	+89	21	39	2	59	50	+89	21	31	3	00	45	+89	21	28	3	01	50	+89	21	29
18	2	59	16	+89	21	39	2	59	52	+89	21	31	3	00	47	+89	21	28	3	01	51	+89	21	29
19	2	59	16	+89	21	38	2	59	54	+89	21	31	3	00	49	+89	21	28	3	01	53	+89	21	30
20	2	59	17	+89	21	38	2	59	55	+89	21	31	3	00	51	+89	21	28	3	01	55	+89	21	30
21	2	59	18	+89	21	38	2	59	57	+89	21	31	3	00	53	+89	21	28	3	01	57	+89	21	30
22	2	59	20	+89	21	37	2	59	58	+89	21	31	3	00	54	+89	21	28	3	01	59	+89	21	30
23	2	59	21	+89	21	37	2	59	60	+89	21	31	3	00	56	+89	21	28	3	02	01	+89	21	30
24	2	59	21	+89	21	37	3	00	01	+89	21	30	3	00	58	+89	21	28	3	02	04	+89	21	30
25	2	59	22	+89	21	37	3	00	03	+89	21	30	3	01	00	+89	21	28	3	02	06	+89	21	30
26	2	59	23	+89	21	36	3	00	04	+89	21	30	3	01	02	+89	21	28	3	02	08	+89	21	30
27	2	59	24	+89	21	36	3	00	06	+89	21	30	3	01	04	+89	21	28	3	02	11	+89	21	31
28	2	59	24	+89	21	36	3	00	07	+89	21	30	3	01	07	+89	21	28	3	02	13	+89	21	31
29	2	59	25	+89	21	36	3	00	09	+89	21	30	3	01	09	+89	21	28	3	02	15	+89	21	31
30	2	59	26	+89	21	35	3	00	11	+89	21	29	3	01	12	+89	21	28	3	02	17	+89	21	31
31	2	59	27	+89	21	35							3	01	14	+89	21	28	3	02	18	+89	21	32

APPARENT PLACES OF POLARIS, 2023

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	02	20	+89	21	32	3	03	13	+89	21	39	3	03	49	+89	21	49	3	03	55	+89	22	01
2	3	02	22	+89	21	32	3	03	15	+89	21	39	3	03	50	+89	21	50	3	03	54	+89	22	01
3	3	02	24	+89	21	32	3	03	17	+89	21	40	3	03	51	+89	21	50	3	03	54	+89	22	01
4	3	02	26	+89	21	32	3	03	18	+89	21	40	3	03	51	+89	21	51	3	03	53	+89	22	02
5	3	02	28	+89	21	32	3	03	20	+89	21	40	3	03	52	+89	21	51	3	03	52	+89	22	02
6	3	02	30	+89	21	32	3	03	22	+89	21	40	3	03	52	+89	21	51	3	03	52	+89	22	03
7	3	02	32	+89	21	33	3	03	23	+89	21	41	3	03	52	+89	21	52	3	03	51	+89	22	03
8	3	02	34	+89	21	33	3	03	24	+89	21	41	3	03	52	+89	21	52	3	03	50	+89	22	03
9	3	02	36	+89	21	33	3	03	26	+89	21	42	3	03	53	+89	21	53	3	03	49	+89	22	03
10	3	02	38	+89	21	33	3	03	27	+89	21	42	3	03	53	+89	21	53	3	03	49	+89	22	04
11	3	02	40	+89	21	34	3	03	28	+89	21	42	3	03	53	+89	21	53	3	03	48	+89	22	04
12	3	02	42	+89	21	34	3	03	29	+89	21	43	3	03	53	+89	21	54	3	03	48	+89	22	04
13	3	02	44	+89	21	34	3	03	30	+89	21	43	3	03	54	+89	21	54	3	03	48	+89	22	05
14	3	02	45	+89	21	34	3	03	31	+89	21	43	3	03	54	+89	21	54	3	03	47	+89	22	05
15	3	02	47	+89	21	35	3	03	32	+89	21	43	3	03	55	+89	21	55	3	03	47	+89	22	05
16	3	02	48	+89	21	35	3	03	33	+89	21	44	3	03	55	+89	21	55	3	03	46	+89	22	06
17	3	02	50	+89	21	35	3	03	34	+89	21	44	3	03	56	+89	21	55	3	03	45	+89	22	06
18	3	02	52	+89	21	35	3	03	36	+89	21	44	3	03	56	+89	21	56	3	03	43	+89	22	07
19	3	02	53	+89	21	36	3	03	37	+89	21	45	3	03	56	+89	21	56	3	03	42	+89	22	07
20	3	02	55	+89	21	36	3	03	39	+89	21	45	3	03	56	+89	21	57	3	03	41	+89	22	07
21	3	02	57	+89	21	36	3	03	40	+89	21	46	3	03	56	+89	21	57	3	03	40	+89	22	07
22	3	02	59	+89	21	36	3	03	41	+89	21	46	3	03	55	+89	21	58	3	03	39	+89	22	08
23	3	03	01	+89	21	37	3	03	42	+89	21	46	3	03	55	+89	21	58	3	03	38	+89	22	08
24	3	03	03	+89	21	37	3	03	42	+89	21	47	3	03	55	+89	21	58	3	03	37	+89	22	08
25	3	03	05	+89	21	37	3	03	43	+89	21	47	3	03	55	+89	21	58	3	03	36	+89	22	08
26	3	03	06	+89	21	38	3	03	44	+89	21	47	3	03	55	+89	21	59	3	03	35	+89	22	09
27	3	03	08	+89	21	38	3	03	44	+89	21	48	3	03	55	+89	21	59	3	03	34	+89	22	09
28	3	03	09	+89	21	38	3	03	45	+89	21	48	3	03	55	+89	21	59	3	03	33	+89	22	09
29	3	03	10	+89	21	39	3	03	46	+89	21	48	3	03	55	+89	21	60	3	03	32	+89	22	10
30	3	03	12	+89	21	39	3	03	47	+89	21	49	3	03	55	+89	22	00	3	03	30	+89	22	10
31							3	03	48	+89	21	49							3	03	29	+89	22	10
32																			3	03	27	+89	22	10

POLARIS TABLE, 2023

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	-26.7	+27.5	-32.9	+19.5	-36.9	+10.3	-38.2	+0.2	-37.0	-9.8	-33.2	-19.1
3	27.1	27.1	33.2	19.1	37.0	9.8	38.2	-0.3	36.8	10.3	32.9	19.6
6	27.5	26.7	33.4	18.7	37.1	9.3	38.2	0.8	36.7	10.8	32.7	20.0
9	27.8	26.4	33.7	18.2	37.2	8.8	38.2	1.3	36.6	11.3	32.4	20.4
12	28.1	26.0	33.9	17.8	37.3	8.3	38.2	1.8	36.4	11.7	32.1	20.9
15	-28.5	+25.6	-34.1	+17.3	-37.4	+7.8	-38.2	-2.3	-36.3	-12.2	-31.8	-21.3
18	28.8	25.3	34.4	16.9	37.5	7.3	38.1	2.8	36.1	12.7	31.6	21.7
21	29.1	24.9	34.6	16.4	37.6	6.8	38.1	3.3	35.9	13.2	31.3	22.1
24	29.5	24.5	34.8	16.0	37.7	6.3	38.1	3.8	35.8	13.7	31.0	22.5
27	29.8	24.1	35.0	15.5	37.8	5.8	38.0	4.3	35.6	14.1	30.7	22.9
30	-30.1	+23.7	-35.2	+15.0	-37.9	+5.3	-37.9	-4.8	-35.4	-14.6	-30.4	-23.3
33	30.4	23.3	35.4	14.6	37.9	4.8	37.9	5.3	35.2	15.1	30.1	23.7
36	30.7	22.9	35.6	14.1	38.0	4.3	37.8	5.8	35.0	15.5	29.8	24.1
39	31.0	22.5	35.8	13.6	38.1	3.8	37.7	6.3	34.8	16.0	29.4	24.5
42	31.3	22.1	35.9	13.1	38.1	3.3	37.6	6.8	34.6	16.4	29.1	24.9
45	-31.6	+21.7	-36.1	+12.7	-38.1	+2.8	-37.5	-7.3	-34.4	-16.9	-28.8	-25.3
48	31.9	21.3	36.3	12.2	38.2	2.3	37.4	7.8	34.1	17.4	28.5	25.7
51	32.1	20.8	36.4	11.7	38.2	1.8	37.3	8.3	33.9	17.8	28.1	26.0
54	32.4	20.4	36.6	11.2	38.2	1.2	37.2	8.8	33.7	18.3	27.8	26.4
57	32.7	20.0	36.7	10.7	38.2	0.7	37.1	9.3	33.4	18.7	27.4	26.8
60	-32.9	+19.5	-36.9	+10.3	-38.2	+0.2	-37.0	-9.8	-33.2	-19.1	-27.1	-27.1
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.	.1	-.1	.2	-.1	.2	.0	.2	.0	.2	.1	.2	.1
Feb.	.1	-.3	.1	-.2	.2	-.2	.2	-.1	.3	-.1	.3	.0
Mar.	-.1	-.3	.0	-.3	.1	-.3	.2	-.3	.2	-.2	.3	-.2
Apr.	-.2	-.3	-.1	-.3	-.1	-.4	.0	-.3	.1	-.3	.2	-.3
May	-.3	-.2	-.3	-.3	-.2	-.3	-.1	-.3	.0	-.4	.1	-.4
June	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.3	-.2	-.3	-.1	-.3
July	-.3	.1	-.3	.0	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2
Aug.	-.1	.2	-.2	.2	-.2	.1	-.3	.1	-.3	.0	-.3	-.1
Sept.	.0	.3	.0	.3	-.1	.3	-.2	.2	-.2	.2	-.3	.1
Oct.	.2	.3	.2	.3	.1	.4	.0	.3	-.1	.3	-.2	.3
Nov.	.4	.2	.3	.3	.3	.4	.2	.4	.0	.4	-.1	.4
Dec.	.5	.0	.5	.2	.4	.3	.3	.4	.2	.5	.1	.5

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, 2023

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	-27.1	-19.1	-33.2	-9.9	-37.0	+0.0	-38.2	+9.9	-36.9	+19.1	-33.0
3	26.7	27.5	18.7	33.5	9.4	37.1	0.5	38.2	10.4	36.7	19.5	32.8
6	26.4	27.8	18.3	33.7	8.9	37.2	1.0	38.2	10.9	36.6	20.0	32.5
9	26.0	28.2	17.8	33.9	8.4	37.4	1.5	38.2	11.3	36.4	20.4	32.2
12	25.6	28.5	17.4	34.2	7.9	37.5	2.0	38.2	11.8	36.3	20.8	32.0
15	-25.2	-28.8	-16.9	-34.4	-7.4	-37.6	+2.5	-38.1	+12.3	-36.1	+21.2	-31.7
18	24.9	29.2	16.5	34.6	7.0	37.7	3.0	38.1	12.8	36.0	21.6	31.4
21	24.5	29.5	16.0	34.8	6.5	37.7	3.5	38.1	13.2	35.8	22.1	31.1
24	24.1	29.8	15.6	35.0	6.0	37.8	4.0	38.0	13.7	35.6	22.5	30.8
27	23.7	30.1	15.1	35.2	5.5	37.9	4.5	37.9	14.2	35.4	22.9	30.5
30	-23.3	-30.4	-14.6	-35.4	-5.0	-38.0	+5.0	-37.9	+14.6	-35.2	+23.3	-30.2
33	22.9	30.7	14.2	35.6	4.5	38.0	5.5	37.8	15.1	35.0	23.6	29.9
36	22.5	31.0	13.7	35.8	4.0	38.1	6.0	37.7	15.6	34.8	24.0	29.6
39	22.1	31.3	13.2	36.0	3.5	38.1	6.5	37.6	16.0	34.6	24.4	29.3
42	21.7	31.6	12.8	36.1	3.0	38.1	7.0	37.6	16.5	34.4	24.8	29.0
45	-21.3	-31.9	-12.3	-36.3	-2.5	-38.2	+7.5	-37.5	+16.9	-34.2	+25.2	-28.7
48	20.8	32.2	11.8	36.4	2.0	38.2	8.0	37.4	17.4	34.0	25.6	28.3
51	20.4	32.4	11.3	36.6	1.5	38.2	8.5	37.2	17.8	33.7	25.9	28.0
54	20.0	32.7	10.9	36.7	1.0	38.2	8.9	37.1	18.2	33.5	26.3	27.6
57	19.6	33.0	10.4	36.9	-0.5	38.2	9.4	37.0	18.7	33.3	26.6	27.3
60	-19.1	-33.2	-9.9	-37.0	0.0	-38.2	9.9	-36.9	+19.1	-33.0	+27.0	-26.9
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.	.1	.1	.1	.1	.0	.2	.0	.2	-.1	.2	-.1	.2
Feb.	.3	.1	.2	.1	.2	.2	.1	.2	.1	.3	.0	.3
Mar.	.3	-.1	.3	-.1	.3	.1	.3	.2	.2	.2	.2	.3
Apr.	.3	-.2	.3	-.2	.4	-.1	.4	.0	.3	.1	.3	.2
May	.2	-.3	.3	-.3	.3	-.2	.4	-.1	.4	.0	.4	.1
June	.0	-.3	.1	-.3	.2	-.3	.3	-.2	.3	-.2	.3	-.1
July	-.1	-.3	.0	-.3	.0	-.3	.1	-.3	.2	-.3	.2	-.2
Aug.	-.2	-.1	-.2	-.1	-.1	-.2	-.1	-.3	.0	-.3	.1	-.3
Sept.	-.3	.0	-.3	.0	-.3	-.1	-.2	-.2	-.2	-.2	-.1	-.3
Oct.	-.3	.2	-.3	.2	-.4	.1	-.4	.0	-.3	-.1	-.3	-.2
Nov.	-.2	.4	-.3	.4	-.4	.3	-.4	.2	-.4	.0	-.4	-.1
Dec.	.0	.5	-.2	.5	-.3	.4	-.4	.3	-.5	.2	-.5	.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, 2023

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	+27.0	-26.9	+33.1	-19.1	+36.9	-10.0	+38.2	-0.2	+37.0	+9.5	+33.3	+18.7
3	27.4	26.6	33.3	18.7	37.0	9.5	38.2	+0.3	36.9	10.0	33.0	19.1
6	27.7	26.2	33.6	18.2	37.1	9.0	38.2	0.8	36.8	10.5	32.8	19.6
9	28.0	25.9	33.8	17.8	37.3	8.6	38.2	1.3	36.6	11.0	32.5	20.0
12	28.4	25.5	34.0	17.4	37.4	8.1	38.2	1.7	36.5	11.4	32.3	20.4
15	+28.7	-25.1	+34.2	-16.9	+37.5	-7.6	+38.2	+2.2	+36.3	+11.9	+32.0	+20.8
18	29.0	24.8	34.5	16.5	37.6	7.1	38.1	2.7	36.2	12.4	31.7	21.2
21	29.4	24.4	34.7	16.0	37.7	6.6	38.1	3.2	36.0	12.9	31.4	21.6
24	29.7	24.0	34.9	15.6	37.7	6.1	38.1	3.7	35.8	13.3	31.2	22.0
27	30.0	23.6	35.1	15.1	37.8	5.6	38.0	4.2	35.6	13.8	30.9	22.5
30	+30.3	-23.2	+35.3	-14.7	+37.9	-5.2	+37.9	+4.7	+35.5	+14.2	+30.6	+22.9
33	30.6	22.8	35.5	14.2	38.0	4.7	37.9	5.2	35.3	14.7	30.3	23.2
36	30.9	22.4	35.6	13.7	38.0	4.2	37.8	5.7	35.1	15.2	30.0	23.6
39	31.2	22.0	35.8	13.3	38.1	3.7	37.7	6.2	34.9	15.6	29.7	24.0
42	31.5	21.6	36.0	12.8	38.1	3.2	37.6	6.7	34.7	16.1	29.3	24.4
45	+31.7	-21.2	+36.2	-12.4	+38.1	-2.7	+37.6	+7.1	+34.4	+16.5	+29.0	+24.8
48	32.0	20.8	36.3	11.9	38.2	2.2	37.5	7.6	34.2	17.0	28.7	25.2
51	32.3	20.4	36.5	11.4	38.2	1.7	37.4	8.1	34.0	17.4	28.4	25.5
54	32.6	20.0	36.6	10.9	38.2	1.2	37.2	8.6	33.8	17.8	28.0	25.9
57	32.8	19.5	36.8	10.5	38.2	0.7	37.1	9.1	33.5	18.3	27.7	26.3
60	+33.1	-19.1	+36.9	-10.0	+38.2	-0.2	+37.0	+9.5	+33.3	+18.7	+27.3	+26.6
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.	-.1	.1	-.2	.1	-.2	.0	-.2	.0	-.2	-.1	-.2	-.1
Feb.	-.1	.3	-.1	.2	-.2	.2	-.2	.1	-.3	.1	-.3	.0
Mar.	.1	.3	.0	.3	-.1	.3	-.2	.3	-.2	.2	-.3	.2
Apr.	.2	.3	.1	.3	.1	.4	.0	.4	-.1	.3	-.2	.3
May	.3	.2	.3	.3	.2	.3	.1	.4	.0	.4	-.1	.4
June	.3	.0	.3	.1	.3	.2	.2	.3	.2	.3	.1	.3
July	.3	-.1	.3	.0	.3	.0	.3	.1	.3	.2	.2	.2
Aug.	.1	-.2	.2	-.2	.2	-.1	.3	-.1	.3	.0	.3	.1
Sept.	.0	-.3	.0	-.3	.1	-.3	.2	-.2	.2	-.2	.3	-.1
Oct.	-.2	-.3	-.2	-.3	-.1	-.4	.0	-.4	.1	-.3	.2	-.3
Nov.	-.4	-.2	-.3	-.3	-.3	-.4	-.2	-.4	.0	-.4	.1	-.4
Dec.	-.5	.0	-.5	-.2	-.4	-.3	-.3	-.4	-.2	-.5	-.1	-.5

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, 2023

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	+27.3	+26.6	+19.5	+32.8	+10.4	+36.7	+0.5	+38.2	-9.4	+37.1	-18.7	+33.5
3	27.0	27.0	19.1	33.0	9.9	36.9	0.0	38.2	9.9	37.0	19.2	33.2
6	26.6	27.3	18.6	33.3	9.4	37.0	-0.5	38.2	10.4	36.9	19.6	33.0
9	26.3	27.7	18.2	33.5	8.9	37.1	1.0	38.2	10.9	36.7	20.0	32.7
12	25.9	28.0	17.8	33.8	8.4	37.2	1.5	38.2	11.4	36.6	20.5	32.4
15	+25.5	+28.3	+17.3	+34.0	+7.9	+37.4	-2.0	+38.2	-11.8	+36.4	-20.9	+32.2
18	25.2	28.7	16.9	34.2	7.4	37.5	2.5	38.2	12.3	36.3	21.3	31.9
21	24.8	29.0	16.4	34.4	7.0	37.6	3.0	38.1	12.8	36.1	21.7	31.6
24	24.4	29.3	16.0	34.6	6.5	37.7	3.5	38.1	13.3	35.9	22.1	31.3
27	24.0	29.6	15.5	34.9	6.0	37.7	4.0	38.1	13.7	35.8	22.5	31.0
30	+23.6	+30.0	+15.1	+35.1	+5.5	+37.8	-4.5	+38.0	-14.2	+35.6	-22.9	+30.7
33	23.2	30.3	14.6	35.3	5.0	37.9	5.0	37.9	14.7	35.4	23.3	30.4
36	22.8	30.6	14.1	35.4	4.5	37.9	5.5	37.9	15.1	35.2	23.7	30.1
39	22.4	30.9	13.7	35.6	4.0	38.0	6.0	37.8	15.6	35.0	24.1	29.8
42	22.0	31.1	13.2	35.8	3.5	38.1	6.5	37.7	16.0	34.8	24.5	29.5
45	+21.6	+31.4	+12.7	+36.0	+3.0	+38.1	-7.0	+37.6	-16.5	+34.6	-24.9	+29.2
48	21.2	31.7	12.3	36.1	2.5	38.1	7.5	37.6	17.0	34.4	25.3	28.8
51	20.8	32.0	11.8	36.3	2.0	38.2	8.0	37.5	17.4	34.2	25.6	28.5
54	20.4	32.3	11.3	36.5	1.5	38.2	8.5	37.3	17.8	33.9	26.0	28.2
57	19.9	32.5	10.8	36.6	1.0	38.2	8.9	37.2	18.3	33.7	26.4	27.8
60	+19.5	+32.8	+10.4	+36.7	+0.5	+38.2	-9.4	+37.1	-18.7	+33.5	-26.7	+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.	-.1	-.1	-.1	-.2	.0	-.2	.0	-.2	.1	-.2	.1	-.2
Feb.	-.3	-.1	-.2	-.1	-.2	-.2	-.1	-.2	-.1	-.3	.0	-.3
Mar.	-.3	.1	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2	-.2	-.3
Apr.	-.3	.2	-.3	.1	-.4	.1	-.4	.0	-.3	-.1	-.3	-.2
May	-.2	.3	-.3	.3	-.3	.2	-.4	.1	-.4	.0	-.4	-.1
June	.0	.3	-.1	.3	-.2	.3	-.3	.2	-.3	.2	-.3	.1
July	.1	.3	.0	.3	.0	.3	-.1	.3	-.2	.3	-.2	.2
Aug.	.2	.1	.2	.2	.1	.2	.1	.3	.0	.3	-.1	.3
Sept.	.3	.0	.3	.0	.3	.1	.2	.2	.2	.2	.1	.3
Oct.	.3	-.2	.3	-.2	.4	-.1	.4	.0	.3	.1	.3	.2
Nov.	.2	-.4	.3	-.3	.4	-.3	.4	-.2	.4	.0	.4	.1
Dec.	.0	-.5	.2	-.5	.3	-.4	.4	-.3	.5	-.2	.5	-.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, 2023

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 (82°.5 - λ) mins. or deduct 4 x (λ - 82°.5) mins. as the station is west or east of 82°.5 E. Longitude.

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

BEGINNING OF MORNING TWILIGHT

Date	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
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 04	5 19	5 32	5 39	5 45	5 52	5 59	6 02	6 06	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 02	6 04	6 07	6 10
24	4 55	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 29	5 33	5 36	5 40	5 43	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 33	5 33	5 33	5 33	5 32
17	5 00	5 08	5 14	5 18	5 20	5 20	5 20	5 20	5 19	5 18	5 17	5 16	5 14
25	5 00	5 06	5 10	5 11	5 11	5 10	5 08	5 05	5 03	5 01	4 59	4 56	4 53
Mar. 5	4 59	5 03	5 04	5 03	5 01	4 58	4 55	4 49	4 46	4 43	4 39	4 35	4 29
13	4 58	4 59	4 58	4 54	4 50	4 46	4 40	4 31	4 27	4 22	4 17	4 11	4 03
21	4 55	4 54	4 51	4 44	4 39	4 32	4 24	4 12	4 07	4 00	3 53	3 45	3 35
29	4 53	4 49	4 43	4 33	4 27	4 18	4 07	3 52	3 45	3 37	3 27	3 16	3 03
Apr. 6	4 50	4 44	4 36	4 23	4 14	4 03	3 49	3 31	3 22	3 12	2 59	2 44	2 26

SUNSET, 2023

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 (82°.5 - λ) mins. or deduct 4 x (λ - 82°.5) mins. as the station is west or east of 82°.5 E. Longitude.

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

END OF EVENING TWILIGHT

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

SUNRISE, 2023

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.

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

BEGINNING OF MORNING TWILIGHT

Date \ Lat.	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
Apr. 6	4 50	4 44	4 36	4 23	4 14	4 03	3 49	3 31	3 22	3 12	2 59	2 44	2 26
14	4 48	4 39	4 28	4 12	4 02	3 49	3 32	3 09	2 58	2 44	2 28	2 08	1 41
22	4 45	4 35	4 21	4 02	3 49	3 34	3 14	2 46	2 32	2 14	1 52	1 21	0 11
30	4 43	4 30	4 14	3 52	3 38	3 20	2 56	2 22	2 04	1 40	1 05		
May 8	4 41	4 27	4 08	3 43	3 27	3 06	2 38	1 57	1 32	0 55			
16	4 40	4 24	4 03	3 36	3 17	2 54	2 22	1 30	0 53				
24	4 40	4 22	4 00	3 30	3 09	2 43	2 07	1 00					
June 1	4 40	4 21	3 57	3 25	3 03	2 35	1 54	0 09					
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 47	4 28	4 05	3 32	3 10	2 41	1 59						

SUNSET, 2023

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

END OF EVENING TWILIGHT

Date \ Lat.	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
Apr. 6	19 15	19 21	19 30	19 43	19 52	20 03	20 17	20 36	20 45	20 56	21 08	21 24	21 43
14	19 13	19 22	19 33	19 49	20 00	20 13	20 31	20 54	21 05	21 19	21 36	21 57	22 26
22	19 12	19 23	19 37	19 56	20 09	20 25	20 45	21 13	21 28	21 46	22 09	22 42	
30	19 12	19 24	19 41	20 03	20 18	20 36	21 00	21 35	21 54	22 18	22 56		
May 8	19 12	19 26	19 45	20 10	20 27	20 48	21 16	21 59	22 24	23 05			
16	19 13	19 29	19 50	20 18	20 36	21 00	21 33	22 26	23 06				
24	19 14	19 32	19 54	20 25	20 45	21 11	21 49	22 58					
June 1	19 16	19 35	19 58	20 31	20 53	21 21	22 03						
9	19 18	19 37	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 20						
11	19 23	19 42	20 06	20 39	21 00	21 29	22 11						

SUNRISE, 2023

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

BEGINNING OF MORNING TWILIGHT

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

SUNSET, 2023

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

END OF EVENING TWILIGHT

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

SUNRISE, 2023

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

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

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

BEGINNING OF MORNING TWILIGHT

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

SUNSET, 2023

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 (82°.5 - λ) mins. or deduct 4 x (λ - 82°.5) mins. as the station is west or east of 82°.5 E. Longitude.

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

END OF EVENING TWILIGHT

Date \ Lat.	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
Oct. 7	19 00	18 57	18 57	18 58	19 00	19 03	19 08	19 14	19 17	19 21	19 25	19 30	19 36
15	18 59	18 53	18 50	18 49	18 50	18 51	18 54	18 57	18 59	19 02	19 04	19 08	19 11
23	18 58	18 50	18 45	18 42	18 41	18 40	18 41	18 42	18 43	18 44	18 46	18 47	18 50
31	18 58	18 48	18 41	18 35	18 33	18 31	18 30	18 29	18 29	18 29	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 16	18 15	18 14	18 13
16	19 01	18 48	18 36	18 26	18 22	18 17	18 13	18 08	18 07	18 05	18 03	18 01	18 00
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 46	17 42
10	19 11	18 54	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 28	18 21	18 14	18 06	17 58	17 55	17 51	17 48	17 43	17 39
26	19 19	19 02	18 47	18 32	18 25	18 18	18 11	18 02	17 59	17 55	17 52	17 48	17 43
34	19 23	19 06	18 51	18 37	18 31	18 24	18 16	18 09	18 06	18 02	17 59	17 55	17 51
42	19 26	19 10	18 56	18 43	18 37	18 30	18 24	18 17	18 14	18 11	18 08	18 05	18 01

DURATION OF TWILIGHT, 2023
MORNING AND EVENING TWILIGHT: CIVIL (6°), NAUTICAL (12°)
AND ASTRONOMICAL (18°)

Date \ Lat.		0° Civ.	0° Nt.	0° Ast.	10° Civ.	10° Nt.	10° Ast.	20° Civ.	20° Nt.	20° Ast.	30° Civ.	30° Nt.	30° Ast.	40° Civ.	40° Nt.	40° 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, 2023
MORNING AND EVENING TWILIGHT: CIVIL (6º), NAUTICAL (12º)
AND ASTRONOMICAL (18º)

Date \ Lat.		45º Civ.	45º Nt.	45º Ast.	50º Civ.	50º Nt.	50º Ast.	55º Civ.	55º Nt.	55º Ast.	60º Civ.	60º Nt.	60º 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, 2023
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, SUNSET AND TWILIGHT, 2023
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 AND SUNSET, 2023
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 16.3	17 02.7	6 43.3	17 18.4	6 30.8	17 53.0	7 14.0	17 34.5	7 11.7	18 11.5
	2	6 16.9	17 04.0	6 43.9	17 19.8	6 31.6	17 54.1	7 14.6	17 35.9	7 12.4	18 12.7
	4	6 17.5	17 05.3	6 44.4	17 21.1	6 32.3	17 55.2	7 15.0	17 37.3	7 13.0	18 13.9
	6	6 17.9	17 06.6	6 44.8	17 22.5	6 33.0	17 56.3	7 15.3	17 38.8	7 13.6	18 15.1
	8	6 18.3	17 08.0	6 45.1	17 24.0	6 33.6	17 57.4	7 15.6	17 40.3	7 14.1	18 16.4
	10	6 18.6	17 09.4	6 45.4	17 25.5	6 34.1	17 58.5	7 15.7	17 41.9	7 14.5	18 17.7
	12	6 18.8	17 10.8	6 45.5	17 26.9	6 34.6	17 59.6	7 15.7	17 43.5	7 14.8	18 18.9
	14	6 19.0	17 12.2	6 45.5	17 28.4	6 35.0	18 00.7	7 15.6	17 45.1	7 15.0	18 20.2
	16	6 19.0	17 13.7	6 45.4	17 30.0	6 35.3	18 01.8	7 15.4	17 46.7	7 15.1	18 21.5
	18	6 18.9	17 15.1	6 45.3	17 31.5	6 35.6	18 02.8	7 15.1	17 48.3	7 15.2	18 22.8
	20	6 18.8	17 16.5	6 45.0	17 33.0	6 35.8	18 03.8	7 14.7	17 50.0	7 15.2	18 24.0
	22	6 18.5	17 17.9	6 44.6	17 34.5	6 35.9	18 04.8	7 14.1	17 51.6	7 15.1	18 25.3
	24	6 18.2	17 19.3	6 44.1	17 36.0	6 36.0	18 05.8	7 13.5	17 53.3	7 14.9	18 26.5
	26	6 17.7	17 20.7	6 43.6	17 37.5	6 35.9	18 06.8	7 12.8	17 54.9	7 14.6	18 27.7
	28	6 17.2	17 22.0	6 42.9	17 39.0	6 35.8	18 07.7	7 11.9	17 56.6	7 14.2	18 28.9
	30	6 16.6	17 23.4	6 42.1	17 40.5	6 35.7	18 08.6	7 11.0	17 58.2	7 13.8	18 30.1
Feb.	1	6 15.9	17 24.7	6 41.3	17 41.9	6 35.4	18 09.4	7 09.9	17 59.8	7 13.3	18 31.2
	3	6 15.1	17 26.0	6 40.4	17 43.4	6 35.1	18 10.2	7 08.8	18 01.4	7 12.7	18 32.3
	5	6 14.3	17 27.3	6 39.3	17 44.8	6 34.7	18 11.0	7 07.6	18 03.0	7 12.0	18 33.4
	7	6 13.4	17 28.5	6 38.2	17 46.2	6 34.2	18 11.7	7 06.3	18 04.5	7 11.2	18 34.4
	9	6 12.3	17 29.7	6 37.0	17 47.5	6 33.7	18 12.4	7 04.9	18 06.1	7 10.4	18 35.5
	11	6 11.3	17 30.9	6 35.8	17 48.8	6 33.1	18 13.1	7 03.4	18 07.6	7 09.5	18 36.4
	13	6 10.1	17 32.0	6 34.4	17 50.1	6 32.5	18 13.7	7 01.8	18 09.1	7 08.5	18 37.4
	15	6 08.9	17 33.2	6 33.0	17 51.4	6 31.7	18 14.3	7 00.2	18 10.6	7 07.4	18 38.3
	17	6 07.6	17 34.2	6 31.5	17 52.6	6 31.0	18 14.8	6 58.5	18 12.0	7 06.3	18 39.2
	19	6 06.2	17 35.3	6 30.0	17 53.8	6 30.1	18 15.3	6 56.7	18 13.5	7 05.2	18 40.0
	21	6 04.8	17 36.3	6 28.4	17 55.0	6 29.2	18 15.8	6 54.8	18 14.9	7 03.9	18 40.8
	23	6 03.4	17 37.3	6 26.7	17 56.2	6 28.3	18 16.2	6 52.9	18 16.2	7 02.6	18 41.6
	25	6 01.9	17 38.3	6 25.0	17 57.3	6 27.3	18 16.6	6 51.0	18 17.6	7 01.3	18 42.4
	27	6 00.3	17 39.2	6 23.2	17 58.4	6 26.3	18 17.0	6 49.0	18 18.9	6 59.9	18 43.1
Mar.	1	5 58.7	17 40.1	6 21.4	17 59.4	6 25.2	18 17.3	6 46.9	18 20.2	6 58.5	18 43.8
	3	5 57.1	17 41.0	6 19.6	18 00.5	6 24.1	18 17.7	6 44.8	18 21.5	6 57.0	18 44.4
	5	5 55.4	17 41.8	6 17.7	18 01.5	6 23.0	18 17.9	6 42.7	18 22.8	6 55.5	18 45.1
	7	5 53.7	17 42.6	6 15.8	18 02.5	6 21.8	18 18.2	6 40.5	18 24.0	6 54.0	18 45.7
	9	5 51.9	17 43.5	6 13.8	18 03.5	6 20.6	18 18.4	6 38.3	18 25.3	6 52.4	18 46.3
	11	5 50.1	17 44.2	6 11.9	18 04.4	6 19.4	18 18.7	6 36.0	18 26.5	6 50.8	18 46.9
	13	5 48.3	17 45.0	6 09.9	18 05.4	6 18.1	18 18.8	6 33.8	18 27.7	6 49.2	18 47.4
	15	5 46.5	17 45.8	6 07.8	18 06.3	6 16.8	18 19.0	6 31.5	18 28.8	6 47.5	18 48.0
	17	5 44.6	17 46.5	6 05.8	18 07.2	6 15.6	18 19.2	6 29.2	18 30.0	6 45.9	18 48.5
	19	5 42.7	17 47.2	6 03.8	18 08.1	6 14.3	18 19.3	6 26.9	18 31.2	6 44.2	18 49.0
	21	5 40.9	17 47.9	6 01.7	18 09.0	6 13.0	18 19.5	6 24.6	18 32.3	6 42.5	18 49.5
	23	5 39.0	17 48.7	5 59.7	18 09.9	6 11.6	18 19.6	6 22.3	18 33.4	6 40.8	18 50.0
	25	5 37.1	17 49.4	5 57.6	18 10.8	6 10.3	18 19.8	6 19.9	18 34.6	6 39.1	18 50.5
	27	5 35.1	17 50.0	5 55.6	18 11.6	6 09.0	18 19.9	6 17.6	18 35.7	6 37.4	18 51.0
	29	5 33.2	17 50.7	5 53.5	18 12.5	6 07.7	18 20.0	6 15.3	18 36.8	6 35.7	18 51.4
	31	5 31.3	17 51.4	5 51.5	18 13.4	6 06.4	18 20.1	6 13.0	18 37.9	6 34.0	18 51.9
Apr.	2	5 29.4	17 52.1	5 49.4	18 14.3	6 05.1	18 20.3	6 10.8	18 39.0	6 32.3	18 52.4

SUNRISE AND SUNSET, 2023

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 29.4	17 52.1	5 49.4	18 14.3	6 05.1	18 20.3	6 10.8	18 39.0	6 32.3	18 52.4
4	5 27.6	17 52.8	5 47.4	18 15.1	6 03.8	18 20.4	6 08.5	18 40.2	6 30.7	18 52.9
6	5 25.7	17 53.5	5 45.4	18 16.0	6 02.5	18 20.5	6 06.3	18 41.3	6 29.0	18 53.4
8	5 23.8	17 54.2	5 43.4	18 16.9	6 01.3	18 20.7	6 04.1	18 42.4	6 27.4	18 53.9
10	5 22.0	17 54.9	5 41.4	18 17.8	6 00.0	18 20.9	6 01.9	18 43.5	6 25.8	18 54.4
12	5 20.2	17 55.6	5 39.4	18 18.7	5 58.8	18 21.0	5 59.7	18 44.7	6 24.2	18 54.9
14	5 18.4	17 56.4	5 37.5	18 19.6	5 57.6	18 21.2	5 57.6	18 45.8	6 22.7	18 55.5
16	5 16.7	17 57.1	5 35.6	18 20.5	5 56.5	18 21.4	5 55.6	18 47.0	6 21.2	18 56.0
18	5 15.0	17 57.8	5 33.7	18 21.5	5 55.3	18 21.7	5 53.5	18 48.1	6 19.7	18 56.6
20	5 13.3	17 58.6	5 31.9	18 22.4	5 54.2	18 21.9	5 51.5	18 49.3	6 18.3	18 57.1
22	5 11.7	17 59.4	5 30.1	18 23.4	5 53.2	18 22.2	5 49.5	18 50.5	6 16.9	18 57.7
24	5 10.1	18 00.2	5 28.4	18 24.3	5 52.1	18 22.5	5 47.6	18 51.7	6 15.5	18 58.3
26	5 08.6	18 01.0	5 26.7	18 25.3	5 51.2	18 22.8	5 45.8	18 52.9	6 14.2	18 58.9
28	5 07.1	18 01.8	5 25.1	18 26.3	5 50.2	18 23.1	5 43.9	18 54.1	6 13.0	18 59.6
30	5 05.7	18 02.6	5 23.5	18 27.3	5 49.3	18 23.4	5 42.2	18 55.3	6 11.8	19 00.2
May 2	5 04.3	18 03.4	5 22.0	18 28.3	5 48.5	18 23.8	5 40.5	18 56.5	6 10.6	19 00.9
4	5 03.0	18 04.3	5 20.6	18 29.3	5 47.6	18 24.2	5 38.9	18 57.8	6 09.5	19 01.6
6	5 01.8	18 05.2	5 19.2	18 30.4	5 46.9	18 24.6	5 37.3	18 59.0	6 08.5	19 02.3
8	5 00.6	18 06.0	5 17.8	18 31.4	5 46.2	18 25.1	5 35.8	19 00.2	6 07.5	19 03.0
10	4 59.5	18 06.9	5 16.6	18 32.4	5 45.5	18 25.5	5 34.4	19 01.5	6 06.6	19 03.8
12	4 58.4	18 07.8	5 15.4	18 33.5	5 44.9	18 26.0	5 33.0	19 02.7	6 05.8	19 04.5
14	4 57.5	18 08.7	5 14.3	18 34.5	5 44.4	18 26.5	5 31.8	19 03.9	6 05.0	19 05.3
16	4 56.6	18 09.6	5 13.3	18 35.6	5 43.9	18 27.0	5 30.6	19 05.1	6 04.3	19 06.1
18	4 55.7	18 10.5	5 12.3	18 36.6	5 43.5	18 27.6	5 29.5	19 06.4	6 03.6	19 06.8
20	4 55.0	18 11.4	5 11.4	18 37.7	5 43.1	18 28.1	5 28.4	19 07.6	6 03.0	19 07.6
22	4 54.3	18 12.3	5 10.7	18 38.7	5 42.8	18 28.7	5 27.5	19 08.7	6 02.5	19 08.4
24	4 53.7	18 13.2	5 09.9	18 39.7	5 42.5	18 29.3	5 26.7	19 09.9	6 02.0	19 09.2
26	4 53.2	18 14.1	5 09.3	18 40.8	5 42.3	18 29.9	5 25.9	19 11.0	6 01.7	19 10.0
28	4 52.7	18 15.0	5 08.8	18 41.7	5 42.1	18 30.5	5 25.2	19 12.2	6 01.3	19 10.8
30	4 52.3	18 15.9	5 08.3	18 42.7	5 42.1	18 31.1	5 24.7	19 13.2	6 01.1	19 11.6
June 1	4 52.1	18 16.7	5 07.9	18 43.7	5 42.0	18 31.7	5 24.2	19 14.3	6 00.9	19 12.3
3	4 51.8	18 17.6	5 07.6	18 44.6	5 42.0	18 32.3	5 23.8	19 15.3	6 00.8	19 13.1
5	4 51.7	18 18.4	5 07.4	18 45.5	5 42.1	18 32.9	5 23.5	19 16.3	6 00.7	19 13.8
7	4 51.6	18 19.1	5 07.3	18 46.3	5 42.2	18 33.5	5 23.3	19 17.2	6 00.7	19 14.5
9	4 51.6	18 19.9	5 07.2	18 47.1	5 42.4	18 34.1	5 23.2	19 18.1	6 00.8	19 15.2
11	4 51.7	18 20.6	5 07.3	18 47.9	5 42.6	18 34.7	5 23.1	19 18.9	6 00.9	19 15.9
13	4 51.8	18 21.3	5 07.4	18 48.6	5 42.9	18 35.2	5 23.2	19 19.6	6 01.1	19 16.5
15	4 52.0	18 21.9	5 07.5	18 49.2	5 43.2	18 35.8	5 23.3	19 20.3	6 01.3	19 17.1
17	4 52.3	18 22.4	5 07.8	18 49.8	5 43.5	18 36.3	5 23.5	19 21.0	6 01.6	19 17.6
19	4 52.7	18 23.0	5 08.1	18 50.4	5 43.9	18 36.8	5 23.8	19 21.5	6 02.0	19 18.1
21	4 53.1	18 23.4	5 08.5	18 50.8	5 44.3	18 37.2	5 24.2	19 22.0	6 02.4	19 18.6
23	4 53.5	18 23.8	5 09.0	18 51.3	5 44.7	18 37.6	5 24.7	19 22.4	6 02.8	19 19.0
25	4 54.0	18 24.2	5 09.5	18 51.6	5 45.2	18 38.0	5 25.2	19 22.7	6 03.3	19 19.4
27	4 54.6	18 24.5	5 10.0	18 51.9	5 45.7	18 38.4	5 25.8	19 22.9	6 03.8	19 19.7
29	4 55.2	18 24.7	5 10.7	18 52.0	5 46.2	18 38.7	5 26.4	19 23.1	6 04.4	19 19.9
July 1	4 55.8	18 24.8	5 11.3	18 52.2	5 46.7	18 38.9	5 27.1	19 23.2	6 04.9	19 20.1
3	4 56.5	18 24.9	5 12.0	18 52.2	5 47.3	18 39.2	5 27.9	19 23.1	6 05.5	19 20.3

SUNRISE AND SUNSET, 2023

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
July	1	4 55.8	18 24.8	5 11.3	18 52.2	5 46.7	18 38.9	5 27.1	19 23.2	6 04.9	19 20.1
	3	4 56.5	18 24.9	5 12.0	18 52.2	5 47.3	18 39.2	5 27.9	19 23.1	6 05.5	19 20.3
	5	4 57.2	18 24.9	5 12.8	18 52.1	5 47.8	18 39.3	5 28.7	19 23.0	6 06.2	19 20.3
	7	4 57.9	18 24.8	5 13.6	18 52.0	5 48.4	18 39.4	5 29.6	19 22.8	6 06.8	19 20.3
	9	4 58.7	18 24.7	5 14.4	18 51.8	5 48.9	18 39.5	5 30.5	19 22.5	6 07.5	19 20.3
	11	4 59.5	18 24.5	5 15.3	18 51.5	5 49.5	18 39.5	5 31.5	19 22.1	6 08.2	19 20.1
	13	5 00.3	18 24.2	5 16.2	18 51.1	5 50.0	18 39.4	5 32.4	19 21.6	6 08.9	19 19.9
	15	5 01.1	18 23.8	5 17.1	18 50.6	5 50.6	18 39.3	5 33.5	19 21.0	6 09.6	19 19.6
	17	5 02.0	18 23.3	5 18.0	18 50.1	5 51.1	18 39.1	5 34.5	19 20.3	6 10.3	19 19.3
	19	5 02.8	18 22.8	5 19.0	18 49.4	5 51.7	18 38.9	5 35.6	19 19.6	6 11.0	19 18.8
	21	5 03.7	18 22.2	5 19.9	18 48.7	5 52.2	18 38.6	5 36.6	19 18.7	6 11.7	19 18.3
	23	5 04.5	18 21.5	5 20.9	18 47.9	5 52.7	18 38.2	5 37.7	19 17.8	6 12.4	19 17.8
	25	5 05.4	18 20.7	5 21.9	18 47.0	5 53.2	18 37.8	5 38.8	19 16.7	6 13.1	19 17.1
	27	5 06.2	18 19.9	5 22.8	18 46.0	5 53.6	18 37.3	5 40.0	19 15.6	6 13.8	19 16.4
	29	5 07.1	18 18.9	5 23.8	18 44.9	5 54.1	18 36.8	5 41.1	19 14.3	6 14.5	19 15.7
	31	5 07.9	18 17.9	5 24.8	18 43.8	5 54.5	18 36.2	5 42.2	19 13.0	6 15.2	19 14.8
Aug.	2	5 08.8	18 16.9	5 25.7	18 42.6	5 54.9	18 35.5	5 43.3	19 11.7	6 15.9	19 13.9
	4	5 09.6	18 15.8	5 26.7	18 41.3	5 55.3	18 34.8	5 44.4	19 10.2	6 16.5	19 12.9
	6	5 10.4	18 14.6	5 27.6	18 39.9	5 55.7	18 34.1	5 45.6	19 08.6	6 17.1	19 11.9
	8	5 11.2	18 13.3	5 28.6	18 38.5	5 56.0	18 33.2	5 46.7	19 07.0	6 17.7	19 10.8
	10	5 12.0	18 12.0	5 29.5	18 37.0	5 56.3	18 32.4	5 47.8	19 05.3	6 18.3	19 09.6
	12	5 12.8	18 10.6	5 30.4	18 35.5	5 56.6	18 31.4	5 48.9	19 03.6	6 18.9	19 08.4
	14	5 13.5	18 09.2	5 31.3	18 33.8	5 56.8	18 30.5	5 49.9	19 01.7	6 19.5	19 07.1
	16	5 14.2	18 07.7	5 32.2	18 32.2	5 57.1	18 29.4	5 51.0	18 59.8	6 20.0	19 05.7
	18	5 15.0	18 06.1	5 33.1	18 30.4	5 57.3	18 28.4	5 52.1	18 57.9	6 20.5	19 04.4
	20	5 15.7	18 04.5	5 34.0	18 28.6	5 57.5	18 27.3	5 53.1	18 55.9	6 21.0	19 02.9
	22	5 16.4	18 02.9	5 34.8	18 26.8	5 57.6	18 26.1	5 54.2	18 53.8	6 21.5	19 01.4
	24	5 17.0	18 01.2	5 35.6	18 24.9	5 57.8	18 24.9	5 55.2	18 51.7	6 21.9	18 59.9
	26	5 17.7	17 59.5	5 36.4	18 23.0	5 57.9	18 23.7	5 56.2	18 49.5	6 22.4	18 58.4
	28	5 18.3	17 57.8	5 37.3	18 21.1	5 58.0	18 22.4	5 57.2	18 47.3	6 22.8	18 56.8
	30	5 19.0	17 56.0	5 38.1	18 19.1	5 58.1	18 21.1	5 58.2	18 45.1	6 23.2	18 55.1
Sept.	1	5 19.6	17 54.1	5 38.8	18 17.1	5 58.2	18 19.8	5 59.2	18 42.8	6 23.6	18 53.5
	3	5 20.2	17 52.3	5 39.6	18 15.0	5 58.2	18 18.5	6 00.2	18 40.5	6 24.0	18 51.8
	5	5 20.8	17 50.4	5 40.4	18 12.9	5 58.3	18 17.1	6 01.1	18 38.2	6 24.4	18 50.1
	7	5 21.4	17 48.5	5 41.1	18 10.8	5 58.3	18 15.8	6 02.1	18 35.9	6 24.8	18 48.3
	9	5 21.9	17 46.5	5 41.9	18 08.7	5 58.3	18 14.4	6 03.1	18 33.5	6 25.1	18 46.6
	11	5 22.5	17 44.6	5 42.6	18 06.6	5 58.3	18 13.0	6 04.0	18 31.1	6 25.5	18 44.8
	13	5 23.1	17 42.6	5 43.4	18 04.5	5 58.3	18 11.6	6 05.0	18 28.7	6 25.8	18 43.0
	15	5 23.7	17 40.6	5 44.1	18 02.4	5 58.3	18 10.2	6 05.9	18 26.3	6 26.2	18 41.2
	17	5 24.2	17 38.6	5 44.9	18 00.2	5 58.4	18 08.7	6 06.9	18 23.9	6 26.5	18 39.4
	19	5 24.8	17 36.6	5 45.6	17 58.1	5 58.4	18 07.3	6 07.9	18 21.5	6 26.9	18 37.6
	21	5 25.4	17 34.7	5 46.4	17 56.0	5 58.4	18 05.9	6 08.8	18 19.1	6 27.2	18 35.8
	23	5 26.0	17 32.7	5 47.1	17 53.8	5 58.4	18 04.5	6 09.8	18 16.7	6 27.6	18 34.1
	25	5 26.6	17 30.7	5 47.9	17 51.7	5 58.4	18 03.1	6 10.8	18 14.3	6 28.0	18 32.3
	27	5 27.2	17 28.7	5 48.7	17 49.5	5 58.4	18 01.7	6 11.8	18 12.0	6 28.4	18 30.5
	29	5 27.8	17 26.7	5 49.5	17 47.4	5 58.5	18 00.4	6 12.8	18 09.6	6 28.8	18 28.8
Oct.	1	5 28.4	17 24.8	5 50.3	17 45.3	5 58.5	17 59.0	6 13.9	18 07.3	6 29.2	18 27.1

SUNRISE AND SUNSET, 2023
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
Oct.	1	5 28.4	17 24.8	5 50.3	17 45.3	5 58.5	17 59.0	6 13.9	18 07.3	6 29.2	18 27.1
	3	5 29.1	17 22.8	5 51.1	17 43.2	5 58.6	17 57.7	6 14.9	18 05.0	6 29.6	18 25.3
	5	5 29.8	17 20.9	5 51.9	17 41.2	5 58.7	17 56.4	6 16.0	18 02.7	6 30.0	18 23.7
	7	5 30.4	17 19.0	5 52.8	17 39.1	5 58.8	17 55.1	6 17.1	18 00.5	6 30.5	18 22.0
	9	5 31.1	17 17.2	5 53.6	17 37.1	5 59.0	17 53.9	6 18.2	17 58.3	6 31.0	18 20.4
	11	5 31.9	17 15.3	5 54.5	17 35.1	5 59.1	17 52.6	6 19.3	17 56.2	6 31.5	18 18.8
	13	5 32.6	17 13.6	5 55.4	17 33.2	5 59.3	17 51.5	6 20.4	17 54.0	6 32.0	18 17.3
	15	5 33.4	17 11.8	5 56.4	17 31.3	5 59.5	17 50.3	6 21.6	17 51.9	6 32.6	18 15.8
	17	5 34.2	17 10.1	5 57.3	17 29.4	5 59.8	17 49.2	6 22.8	17 49.9	6 33.2	18 14.4
	19	5 35.1	17 08.5	5 58.3	17 27.6	6 00.1	17 48.1	6 24.1	17 47.9	6 33.8	18 13.0
	21	5 35.9	17 06.9	5 59.4	17 25.9	6 00.4	17 47.1	6 25.3	17 46.0	6 34.5	18 11.6
	23	5 36.8	17 05.4	6 00.4	17 24.2	6 00.7	17 46.1	6 26.6	17 44.1	6 35.2	18 10.3
	25	5 37.8	17 03.9	6 01.5	17 22.5	6 01.1	17 45.2	6 27.9	17 42.2	6 35.9	18 09.1
	27	5 38.7	17 02.5	6 02.6	17 21.0	6 01.6	17 44.4	6 29.3	17 40.5	6 36.7	18 07.9
	29	5 39.7	17 01.2	6 03.7	17 19.5	6 02.0	17 43.6	6 30.7	17 38.8	6 37.5	18 06.8
	31	5 40.7	16 59.9	6 04.9	17 18.0	6 02.5	17 42.8	6 32.1	17 37.2	6 38.3	18 05.8
Nov.	2	5 41.8	16 58.7	6 06.1	17 16.7	6 03.1	17 42.1	6 33.5	17 35.6	6 39.2	18 04.8
	4	5 42.9	16 57.6	6 07.4	17 15.4	6 03.7	17 41.5	6 35.0	17 34.1	6 40.1	18 03.9
	6	5 44.0	16 56.5	6 08.6	17 14.2	6 04.3	17 41.0	6 36.5	17 32.8	6 41.0	18 03.1
	8	5 45.2	16 55.6	6 09.9	17 13.1	6 05.0	17 40.5	6 38.0	17 31.5	6 42.0	18 02.3
	10	5 46.3	16 54.7	6 11.3	17 12.1	6 05.7	17 40.1	6 39.5	17 30.3	6 43.0	18 01.7
	12	5 47.5	16 53.9	6 12.6	17 11.1	6 06.4	17 39.8	6 41.1	17 29.1	6 44.1	18 01.1
	14	5 48.8	16 53.2	6 14.0	17 10.3	6 07.2	17 39.5	6 42.7	17 28.1	6 45.2	18 00.6
	16	5 50.0	16 52.6	6 15.4	17 09.5	6 08.1	17 39.3	6 44.3	17 27.2	6 46.3	18 00.1
	18	5 51.3	16 52.1	6 16.8	17 08.9	6 08.9	17 39.2	6 45.9	17 26.4	6 47.4	17 59.8
	20	5 52.6	16 51.6	6 18.2	17 08.3	6 09.8	17 39.2	6 47.5	17 25.7	6 48.6	17 59.5
	22	5 53.9	16 51.3	6 19.6	17 07.9	6 10.8	17 39.2	6 49.1	17 25.1	6 49.8	17 59.4
	24	5 55.2	16 51.1	6 21.1	17 07.5	6 11.7	17 39.4	6 50.7	17 24.6	6 51.0	17 59.3
	26	5 56.5	16 50.9	6 22.5	17 07.3	6 12.7	17 39.6	6 52.3	17 24.2	6 52.2	17 59.3
	28	5 57.8	16 50.9	6 24.0	17 07.1	6 13.8	17 39.8	6 53.9	17 23.9	6 53.4	17 59.3
	30	5 59.2	16 50.9	6 25.4	17 07.1	6 14.8	17 40.2	6 55.5	17 23.8	6 54.7	17 59.5
Dec.	2	6 00.5	16 51.1	6 26.9	17 07.2	6 15.9	17 40.6	6 57.0	17 23.7	6 55.9	17 59.8
	4	6 01.8	16 51.3	6 28.3	17 07.3	6 16.9	17 41.1	6 58.6	17 23.8	6 57.2	18 00.1
	6	6 03.1	16 51.7	6 29.7	17 07.6	6 18.0	17 41.6	7 00.1	17 24.0	6 58.4	18 00.5
	8	6 04.4	16 52.1	6 31.0	17 07.9	6 19.1	17 42.2	7 01.6	17 24.2	6 59.7	18 01.0
	10	6 05.6	16 52.6	6 32.4	17 08.4	6 20.2	17 42.9	7 03.0	17 24.6	7 00.9	18 01.5
	12	6 06.8	16 53.2	6 33.7	17 09.0	6 21.3	17 43.7	7 04.4	17 25.1	7 02.1	18 02.2
	14	6 08.0	16 53.9	6 34.9	17 09.6	6 22.4	17 44.4	7 05.7	17 25.7	7 03.3	18 02.9
	16	6 09.2	16 54.6	6 36.2	17 10.3	6 23.5	17 45.3	7 06.9	17 26.4	7 04.4	18 03.7
	18	6 10.3	16 55.5	6 37.3	17 11.2	6 24.5	17 46.2	7 08.1	17 27.2	7 05.5	18 04.5
	20	6 11.4	16 56.4	6 38.4	17 12.1	6 25.6	17 47.1	7 09.3	17 28.1	7 06.6	18 05.4
	22	6 12.4	16 57.4	6 39.5	17 13.0	6 26.6	17 48.1	7 10.3	17 29.0	7 07.6	18 06.4
	24	6 13.4	16 58.4	6 40.4	17 14.1	6 27.6	17 49.1	7 11.3	17 30.1	7 08.6	18 07.4
	26	6 14.3	16 59.5	6 41.3	17 15.2	6 28.5	17 50.1	7 12.2	17 31.2	7 09.5	18 08.5
	28	6 15.1	17 00.7	6 42.1	17 16.4	6 29.4	17 51.2	7 12.9	17 32.4	7 10.4	18 09.6
	30	6 15.8	17 01.9	6 42.9	17 17.6	6 30.3	17 52.3	7 13.6	17 33.7	7 11.2	18 10.7
	32	6 16.5	17 03.2	6 43.5	17 18.9	6 31.1	17 53.4	7 14.2	17 35.0	7 12.0	18 11.9

MOONRISE, 2023

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

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

MOONSET, 2023
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
Jan.	0	0	32	0	36	0	40	0	45	0	51	0	58	0	17	0	47	1	06	1	20
	1	1	17	1	25	1	34	1	44	1	57	2	13	1	12	1	37	2	04	2	13
	2	2	02	2	14	2	27	2	43	3	02	3	28	2	07	2	27	3	03	3	06
	3	2	49	3	05	3	22	3	42	4	06	4	42	3	02	3	19	4	01	4	00
	4	3	38	3	56	4	16	4	40	5	10	5	54	3	58	4	12	4	59	4	55
	5	4	28	4	49	5	11	5	38	6	11	6	60	4	53	5	05	5	56	5	49
	6	5	20	5	41	6	04	6	31	7	06	7	57	5	47	5	57	6	49	6	42
	7	6	11	6	32	6	55	7	21	7	55	8	43	6	37	6	48	7	39	7	33
	8	7	01	7	21	7	41	8	05	8	35	9	19	7	23	7	36	8	23	8	19
	9	7	49	8	05	8	23	8	44	9	10	9	46	8	04	8	20	9	03	9	01
	10	8	34	8	47	9	02	9	19	9	39	10	06	8	42	9	01	9	38	9	40
	11	9	17	9	27	9	37	9	49	10	04	10	23	9	16	9	39	10	09	10	15
	12	9	58	10	04	10	10	10	17	10	26	10	37	9	48	10	15	10	38	10	49
	13	10	39	10	41	10	42	10	45	10	47	10	50	10	19	10	50	11	06	11	22
	14	11	20	11	18	11	15	11	12	11	09	11	04	10	50	11	26	11	34	11	55
	15	12	03	11	57	11	49	11	41	11	31	11	18	11	24	12	04	12	04	12	29
	16	12	50	12	38	12	27	12	13	11	57	11	34	12	00	12	44	12	37	13	08
	17	13	41	13	26	13	09	12	50	12	27	11	55	12	41	13	30	13	15	13	51
	18	14	38	14	19	13	59	13	36	13	06	12	24	13	29	14	22	14	01	14	41
	19	15	41	15	19	14	56	14	29	13	56	13	06	14	25	15	22	14	55	15	39
	20	16	47	16	25	16	01	15	34	14	58	14	06	15	30	16	27	16	00	16	44
	21	17	54	17	33	17	11	16	45	16	13	15	25	16	40	17	36	17	12	17	54
	22	18	57	18	40	18	22	18	01	17	34	16	55	17	52	18	44	18	26	19	04
	23	19	56	19	44	19	30	19	15	18	55	18	27	19	02	19	49	19	39	20	12
	24	20	50	20	42	20	34	20	24	20	13	19	57	20	07	20	49	20	48	21	16
	25	21	40	21	38	21	35	21	31	21	27	21	22	21	09	21	46	21	54	22	15
	26	22	27	22	29	22	32	22	34	22	38	22	42	22	08	22	39	22	56	23	12
	27	23	13	23	20	23	28	23	36	23	46	**	**	23	05	23	32	23	57	**	**
	28	23	59	**	**	**	**	**	**	**	**	0	00	**	**	**	**	**	**	0	07
	29	**	**	0	10	0	22	0	36	0	53	1	17	0	01	0	23	0	56	1	01
	30	0	46	1	01	1	17	1	36	1	59	2	32	0	57	1	15	1	55	1	56
	31	1	35	1	53	2	12	2	35	3	04	3	45	1	53	2	08	2	53	2	50
Feb.	1	2	24	2	45	3	07	3	33	4	05	4	53	2	49	3	01	3	51	3	45
	2	3	16	3	37	4	00	4	27	5	02	5	53	3	43	3	53	4	45	4	38
	3	4	07	4	28	4	51	5	18	5	53	6	42	4	33	4	44	5	36	5	29
	4	4	57	5	18	5	39	6	04	6	35	7	21	5	21	5	33	6	22	6	16
	5	5	46	6	03	6	22	6	44	7	12	7	50	6	04	6	18	7	03	7	00
	6	6	32	6	46	7	02	7	20	7	42	8	12	6	42	7	00	7	39	7	40
	7	7	16	7	27	7	38	7	52	8	08	8	30	7	18	7	39	8	11	8	16
	8	7	58	8	04	8	12	8	20	8	31	8	44	7	50	8	16	8	41	8	51
	9	8	38	8	41	8	44	8	48	8	52	8	58	8	21	8	51	9	09	9	24
	10	9	19	9	18	9	17	9	15	9	13	9	11	8	52	9	27	9	37	9	56
	11	10	01	9	55	9	50	9	43	9	35	9	24	9	24	10	03	10	05	10	29
	12	10	45	10	35	10	24	10	13	9	58	9	39	9	58	10	41	10	36	11	06
	13	11	33	11	19	11	04	10	47	10	26	9	57	10	36	11	24	11	11	11	45
	14	12	25	12	07	11	49	11	27	10	60	10	21	11	19	12	11	11	52	12	30
	15	13	23	13	03	12	40	12	15	11	43	10	55	12	10	13	05	12	40	13	23

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

MOONRISE, 2023
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
Feb. 15	0	55	1	14	1	35	1	60	2	30	3	16	1	17	1	30	2	18	2	13
16	1	55	2	17	2	40	3	07	3	42	4	34	2	22	2	33	3	26	3	18
17	2	60	3	22	3	45	4	13	4	48	5	40	3	28	3	38	4	31	4	23
18	4	04	4	25	4	47	5	12	5	45	6	30	4	28	4	41	5	31	5	25
19	5	08	5	25	5	43	6	04	6	30	7	07	5	24	5	40	6	22	6	21
20	6	06	6	19	6	32	6	48	7	07	7	33	6	12	6	32	7	07	7	11
21	7	01	7	09	7	17	7	26	7	38	7	53	6	55	7	21	7	47	7	56
22	7	52	7	55	7	57	8	01	8	04	8	09	7	34	8	05	8	21	8	37
23	8	41	8	38	8	36	8	33	8	29	8	25	8	11	8	47	8	55	9	16
24	9	29	9	21	9	14	9	05	8	54	8	40	8	47	9	28	9	28	9	54
25	10	16	10	04	9	52	9	38	9	21	8	57	9	25	10	10	10	02	10	33
26	11	05	10	49	10	32	10	13	9	50	9	18	10	04	10	53	10	38	11	14
27	11	55	11	36	11	16	10	53	10	23	9	43	10	46	11	39	11	18	11	58
28	12	45	12	24	12	02	11	36	11	03	10	15	11	32	12	27	12	02	12	44
Mar. 1	13	37	13	15	12	52	12	24	11	50	10	58	12	21	13	18	12	50	13	34
2	14	28	14	07	13	44	13	17	12	42	11	51	13	13	14	09	13	43	14	26
3	15	19	14	59	14	37	14	12	13	40	12	53	14	07	15	02	14	37	15	20
4	16	07	15	49	15	31	15	09	14	41	14	01	15	01	15	53	15	34	16	12
5	16	52	16	38	16	23	16	05	15	43	15	12	15	55	16	43	16	30	17	05
6	17	36	17	26	17	14	17	01	16	45	16	23	16	47	17	32	17	25	17	56
7	18	18	18	11	18	05	17	57	17	47	17	34	17	39	18	18	18	20	18	45
8	18	59	18	57	18	54	18	52	18	49	18	44	18	29	19	05	19	14	19	35
9	19	41	19	43	19	45	19	48	19	51	19	56	19	21	19	53	20	09	20	24
10	20	23	20	29	20	36	20	44	20	55	21	09	20	14	20	41	21	05	21	16
11	21	08	21	19	21	31	21	44	22	01	22	24	21	09	21	32	22	04	22	09
12	21	56	22	11	22	27	22	46	23	10	23	43	22	07	22	25	23	05	23	06
13	22	49	23	07	23	28	23	51	**	**	**	**	23	09	23	23	**	**	**	**
14	23	46	**	**	**	**	**	**	0	20	1	03	**	**	**	**	0	09	0	05
15	**	**	0	07	0	30	0	57	1	31	2	21	0	12	0	23	1	15	1	08
16	0	47	1	09	1	33	2	01	2	37	3	31	1	16	1	26	2	19	2	11
17	1	50	2	11	2	34	3	01	3	35	4	25	2	16	2	27	3	19	3	12
18	2	51	3	10	3	31	3	54	4	23	5	05	3	12	3	26	4	12	4	08
19	3	50	4	05	4	21	4	39	5	02	5	34	4	01	4	19	4	59	4	59
20	4	45	4	56	5	07	5	19	5	35	5	55	4	46	5	08	5	39	5	46
21	5	38	5	43	5	49	5	55	6	02	6	13	5	26	5	54	6	15	6	27
22	6	27	6	27	6	27	6	27	6	28	6	28	6	04	6	36	6	49	7	07
23	7	16	7	11	7	06	6	60	6	53	6	43	6	40	7	19	7	23	7	46
24	8	04	7	55	7	45	7	33	7	19	6	60	7	18	8	01	7	56	8	25
25	8	53	8	39	8	25	8	08	7	47	7	19	7	57	8	44	8	32	9	06
26	9	44	9	27	9	08	8	46	8	19	7	42	8	38	9	30	9	11	9	50
27	10	36	10	16	9	54	9	29	8	57	8	11	9	24	10	18	9	54	10	36
28	11	29	11	07	10	43	10	16	9	42	8	50	10	13	11	09	10	42	11	26
29	12	21	11	59	11	36	11	08	10	32	9	40	11	05	12	01	11	34	12	18
30	13	13	12	51	12	29	12	03	11	29	10	40	11	58	12	54	12	28	13	12
31	14	01	13	43	13	23	12	59	12	29	11	47	12	53	13	46	13	25	14	05
Apr. 1	14	48	14	32	14	15	13	56	13	32	12	57	13	47	14	36	14	21	14	57
2	15	32	15	20	15	07	14	52	14	34	14	08	14	39	15	26	15	17	15	49

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

MOONSET, 2023
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
Feb.	15	13	23	13	03	12	40	12	15	11	43	10	55	12	10	13	05	12	40	13	23
	16	14	26	14	04	13	40	13	13	12	37	11	45	13	09	14	06	13	39	14	23
	17	15	31	15	09	14	46	14	19	13	45	12	53	14	15	15	12	14	45	15	29
	18	16	35	16	16	15	56	15	32	15	01	14	16	15	26	16	19	15	57	16	38
	19	17	37	17	21	17	05	16	46	16	22	15	49	16	36	17	26	17	11	17	47
	20	18	33	18	23	18	11	17	59	17	43	17	21	17	44	18	29	18	23	18	53
	21	19	26	19	21	19	15	19	09	19	01	18	49	18	49	19	28	19	32	19	56
	22	20	15	20	15	20	15	20	15	20	15	20	15	19	51	20	24	20	37	20	56
	23	21	04	21	09	21	14	21	20	21	27	21	37	20	51	21	19	21	41	21	53
	24	21	51	22	01	22	11	22	22	22	37	22	57	21	50	22	13	22	43	22	50
	25	22	39	22	53	23	08	23	25	23	46	**	**	22	47	23	07	23	44	23	46
	26	23	28	23	46	**	**	**	**	**	**	0	16	23	45	**	**	**	**	**	**
	27	**	**	**	**	0	04	0	26	0	53	1	33	**	**	0	00	0	44	0	42
	28	0	18	0	39	1	00	1	26	1	57	2	44	0	42	0	54	1	44	1	38
Mar.	1	1	10	1	32	1	55	2	22	2	57	3	48	1	37	1	48	2	40	2	32
	2	2	02	2	23	2	47	3	15	3	50	4	41	2	29	2	40	3	33	3	25
	3	2	53	3	14	3	36	4	02	4	35	5	23	3	18	3	30	4	20	4	13
	4	3	42	4	01	4	21	4	44	5	13	5	54	4	02	4	16	5	02	4	58
	5	4	28	4	44	5	01	5	21	5	45	6	18	4	42	4	59	5	40	5	40
	6	5	13	5	26	5	39	5	54	6	12	6	37	5	18	5	39	6	13	6	17
	7	5	56	6	04	6	13	6	23	6	35	6	52	5	52	6	16	6	43	6	52
	8	6	37	6	41	6	46	6	51	6	57	7	06	6	23	6	52	7	12	7	25
	9	7	19	7	19	7	19	7	19	7	19	7	18	6	55	7	28	7	40	7	58
	10	8	00	7	56	7	51	7	46	7	40	7	31	7	26	8	04	8	08	8	31
	11	8	44	8	35	8	26	8	15	8	02	7	45	7	59	8	41	8	38	9	06
	12	9	30	9	17	9	04	8	48	8	28	8	02	8	36	9	23	9	12	9	45
	13	10	20	10	04	9	46	9	26	8	60	8	23	9	17	10	08	9	50	10	27
	14	11	16	10	56	10	34	10	09	9	39	8	53	10	04	10	59	10	35	11	17
	15	12	15	11	53	11	30	11	02	10	27	9	36	10	59	11	55	11	28	12	12
	16	13	17	12	55	12	31	12	03	11	28	10	34	12	00	12	57	12	29	13	14
	17	14	19	13	59	13	37	13	11	12	38	11	50	13	06	14	02	13	37	14	20
	18	15	20	15	03	14	44	14	23	13	56	13	16	14	15	15	07	14	48	15	27
	19	16	17	16	04	15	51	15	35	15	15	14	46	15	23	16	10	15	59	16	32
	20	17	11	17	03	16	54	16	45	16	32	16	16	16	28	17	10	17	08	17	36
	21	18	01	17	59	17	56	17	53	17	48	17	43	17	31	18	07	18	15	18	36
	22	18	50	18	53	18	55	18	58	19	02	19	07	18	32	19	03	19	20	19	36
	23	19	39	19	46	19	54	20	03	20	14	20	29	19	32	19	58	20	23	20	33
	24	20	27	20	39	20	52	21	07	21	26	21	51	20	31	20	53	21	27	21	31
	25	21	18	21	34	21	51	22	10	22	35	23	11	21	31	21	48	22	29	22	29
	26	22	09	22	28	22	49	23	13	23	43	**	**	22	30	22	43	23	31	23	27
	27	23	01	23	23	23	46	**	**	**	**	0	27	23	28	23	39	**	**	**	**
	28	23	54	**	**	**	**	0	12	0	46	1	37	**	**	**	**	0	30	0	23
	29	**	**	0	16	0	40	1	08	1	43	2	35	0	22	0	32	1	26	1	18
	30	0	46	1	08	1	31	1	58	2	31	3	22	1	13	1	24	2	15	2	08
	31	1	36	1	56	2	17	2	41	3	13	3	57	1	59	2	11	3	00	2	55
Apr.	1	2	24	2	41	2	59	3	20	3	47	4	23	2	40	2	56	3	39	3	37
	2	3	09	3	23	3	38	3	54	4	15	4	43	3	18	3	37	4	13	4	15

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

MOONRISE, 2023
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
Apr. 1	14	48	14	32	14	15	13	56	13	32	12	57	13	47	14	36	14	21	14	57
2	15	32	15	20	15	07	14	52	14	34	14	08	14	39	15	26	15	17	15	49
3	16	14	16	06	15	58	15	48	15	36	15	19	15	32	16	13	16	11	16	39
4	16	56	16	52	16	48	16	43	16	38	16	30	16	23	17	00	17	06	17	29
5	17	38	17	38	17	39	17	40	17	41	17	42	17	15	17	48	18	01	18	18
6	18	20	18	25	18	30	18	36	18	44	18	55	18	08	18	36	18	58	19	10
7	19	05	19	14	19	25	19	36	19	51	20	11	19	03	19	27	19	56	20	03
8	19	53	20	06	20	21	20	38	21	00	21	31	20	01	20	20	20	58	21	00
9	20	45	21	02	21	22	21	44	22	12	22	52	21	02	21	18	22	02	22	00
10	21	41	22	02	22	24	22	50	23	24	**	**	22	06	22	18	23	08	23	02
11	22	41	23	03	23	28	23	55	**	**	0	12	23	10	23	20	**	**	**	**
12	23	43	**	**	**	**	**	**	0	31	1	25	**	**	**	**	0	13	0	05
13	**	**	0	05	0	28	0	56	1	31	2	23	0	10	0	21	1	14	1	06
14	0	43	1	04	1	25	1	50	2	21	3	06	1	07	1	19	2	08	2	03
15	1	42	1	58	2	16	2	36	3	02	3	37	1	57	2	13	2	55	2	54
16	2	36	2	49	3	02	3	17	3	35	3	60	2	41	3	02	3	36	3	40
17	3	28	3	36	3	43	3	52	4	03	4	18	3	22	3	47	4	12	4	22
18	4	17	4	19	4	22	4	25	4	28	4	33	3	59	4	29	4	46	5	01
19	5	05	5	02	4	60	4	57	4	53	4	48	4	35	5	11	5	19	5	40
20	5	53	5	46	5	38	5	29	5	18	5	04	5	12	5	52	5	52	6	18
21	6	41	6	29	6	17	6	02	5	45	5	21	5	50	6	35	6	26	6	58
22	7	32	7	16	6	59	6	39	6	15	5	42	6	30	7	20	7	04	7	41
23	8	24	8	05	7	44	7	21	6	51	6	08	7	15	8	08	7	46	8	26
24	9	18	8	56	8	33	8	06	7	33	6	43	8	03	8	58	8	32	9	16
25	10	11	9	49	9	25	8	57	8	21	7	29	8	54	9	51	9	23	10	07
26	11	04	10	42	10	18	9	52	9	17	8	26	9	48	10	44	10	17	11	01
27	11	54	11	34	11	13	10	48	10	17	9	31	10	43	11	37	11	14	11	55
28	12	42	12	24	12	06	11	46	11	19	10	40	11	37	12	28	12	10	12	48
29	13	27	13	13	12	59	12	42	12	21	11	52	12	30	13	18	13	06	13	40
30	14	09	13	60	13	50	13	38	13	23	13	02	13	23	14	06	14	01	14	30
May 1	14	51	14	45	14	39	14	32	14	24	14	13	14	13	14	53	14	55	15	20
2	15	32	15	31	15	30	15	28	15	26	15	24	15	05	15	40	15	50	16	09
3	16	14	16	17	16	20	16	24	16	29	16	36	15	57	16	27	16	46	17	00
4	16	58	17	06	17	14	17	24	17	36	17	52	16	52	17	18	17	44	17	53
5	17	46	17	57	18	10	18	25	18	44	19	11	17	50	18	10	18	45	18	49
6	18	37	18	53	19	11	19	31	19	57	20	33	18	51	19	08	19	50	19	49
7	19	33	19	53	20	14	20	39	21	11	21	57	19	56	20	08	20	57	20	52
8	20	33	20	55	21	19	21	47	22	22	23	15	21	01	21	12	22	04	21	57
9	21	36	21	58	22	22	22	50	23	26	**	**	22	05	22	15	23	08	23	00
10	22	38	22	59	23	21	23	47	**	**	0	19	23	03	23	15	**	**	23	59
11	23	38	23	55	**	**	**	**	0	20	1	07	23	55	**	**	0	05	**	**
12	**	**	**	**	0	14	0	36	1	03	1	42	**	**	0	10	0	54	0	52
13	0	32	0	46	1	01	1	18	1	38	2	06	0	40	1	00	1	37	1	39
14	1	24	1	33	1	43	1	54	2	07	2	25	1	21	1	45	2	13	2	21
15	2	12	2	17	2	21	2	26	2	32	2	41	1	58	2	27	2	47	3	00
16	2	59	2	59	2	58	2	57	2	56	2	55	2	34	3	08	3	19	3	38
17	3	46	3	41	3	35	3	28	3	20	3	10	3	09	3	48	3	51	4	15

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

MOONSET, 2023
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.							
Lat. / Date	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
Apr. 1	2	24	2	41	2	59	3	20	3	47	4	23	2	40	2	56	3	39	3	37
2	3	09	3	23	3	38	3	54	4	15	4	43	3	18	3	37	4	13	4	15
3	3	53	4	02	4	13	4	25	4	39	4	60	3	52	4	15	4	45	4	51
4	4	34	4	40	4	46	4	53	5	02	5	13	4	24	4	51	5	14	5	25
5	5	16	5	17	5	19	5	21	5	23	5	26	4	55	5	27	5	42	5	58
6	5	57	5	55	5	52	5	48	5	44	5	39	5	27	6	03	6	10	6	31
7	6	41	6	33	6	26	6	17	6	06	5	52	6	00	6	40	6	40	7	06
8	7	27	7	16	7	03	6	49	6	31	6	08	6	36	7	21	7	13	7	44
9	8	17	8	01	7	45	7	25	7	01	6	28	7	16	8	05	7	50	8	26
10	9	11	8	52	8	31	8	08	7	38	6	55	8	02	8	55	8	33	9	14
11	10	09	9	48	9	25	8	58	8	23	7	33	8	54	9	50	9	24	10	07
12	11	11	10	48	10	24	9	56	9	20	8	26	9	53	10	50	10	22	11	07
13	12	12	11	51	11	28	11	01	10	26	9	36	10	57	11	53	11	27	12	10
14	13	12	12	53	12	33	12	10	11	41	10	57	12	03	12	57	12	35	13	16
15	14	08	13	54	13	38	13	20	12	57	12	24	13	09	13	58	13	45	14	20
16	15	01	14	51	14	40	14	28	14	13	13	51	14	13	14	57	14	52	15	22
17	15	52	15	47	15	41	15	35	15	27	15	17	15	15	15	54	15	58	16	22
18	16	40	16	40	16	40	16	40	16	40	16	40	16	15	16	49	17	02	17	20
19	17	28	17	33	17	38	17	44	17	52	18	02	17	15	17	44	18	05	18	17
20	18	16	18	25	18	36	18	48	19	03	19	24	18	14	18	38	19	08	19	15
21	19	05	19	20	19	35	19	52	20	14	20	45	19	15	19	34	20	12	20	13
22	19	57	20	14	20	34	20	56	21	24	22	05	20	14	20	29	21	15	21	12
23	20	49	21	10	21	33	21	58	22	31	23	19	21	14	21	26	22	16	22	10
24	21	43	22	05	22	29	22	56	23	32	**	**	22	11	22	21	23	14	23	06
25	22	36	22	58	23	22	23	50	**	**	0	24	23	04	23	15	**	**	24	00
26	23	28	23	49	**	**	**	**	0	25	1	17	23	53	**	**	0	07	**	**
27	**	**	**	**	0	11	0	36	1	09	1	57	**	**	0	05	0	55	0	48
28	0	17	0	35	0	55	1	18	1	46	2	26	0	36	0	50	1	36	1	33
29	1	03	1	19	1	35	1	54	2	16	2	48	1	15	1	33	2	12	2	13
30	1	47	1	59	2	11	2	25	2	42	3	06	1	51	2	12	2	44	2	49
May 1	2	29	2	37	2	45	2	54	3	05	3	20	2	23	2	48	3	14	3	24
2	3	11	3	14	3	18	3	22	3	27	3	33	2	55	3	24	3	43	3	57
3	3	52	3	51	3	50	3	49	3	48	3	46	3	26	4	00	4	10	4	29
4	4	34	4	29	4	23	4	17	4	09	3	59	3	58	4	37	4	39	5	04
5	5	20	5	10	4	60	4	48	4	33	4	13	4	33	5	17	5	11	5	41
6	6	09	5	55	5	40	5	23	5	01	4	32	5	12	6	00	5	47	6	21
7	7	03	6	45	6	26	6	04	5	36	4	57	5	56	6	49	6	28	7	08
8	8	02	7	41	7	18	6	52	6	19	5	31	6	48	7	43	7	18	8	01
9	9	03	8	41	8	17	7	49	7	13	6	20	7	46	8	43	8	15	9	00
10	10	06	9	44	9	21	8	53	8	18	7	26	8	50	9	47	9	20	10	04
11	11	07	10	47	10	26	10	02	9	31	8	45	9	56	10	51	10	27	11	09
12	12	04	11	49	11	32	11	12	10	46	10	11	11	02	11	53	11	37	12	13
13	12	58	12	46	12	34	12	19	12	02	11	37	12	06	12	52	12	44	13	16
14	13	48	13	41	13	34	13	26	13	15	13	01	13	07	13	48	13	49	14	14
15	14	35	14	33	14	31	14	29	14	26	14	22	14	06	14	42	14	51	15	12
16	15	22	15	25	15	28	15	32	15	37	15	43	15	05	15	35	15	53	16	08
17	16	08	16	16	16	24	16	34	16	46	17	03	16	03	16	28	16	55	17	04

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

MOONRISE, 2023
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
May 17	3 46	3 41	3 35	3 28	3 20	3 10	3 09	3 48	3 51	4 15
18	4 33	4 23	4 12	4 00	3 46	3 26	3 46	4 29	4 23	4 53
19	5 22	5 08	4 53	4 35	4 14	3 44	4 24	5 13	4 59	5 34
20	6 13	5 55	5 36	5 14	4 47	4 08	5 07	5 59	5 39	6 18
21	7 06	6 46	6 23	5 58	5 26	4 39	5 54	6 48	6 23	7 06
22	8 00	7 39	7 15	6 47	6 12	5 21	6 44	7 41	7 13	7 57
23	8 54	8 32	8 08	7 41	7 06	6 13	7 38	8 34	8 07	8 51
24	9 46	9 25	9 03	8 37	8 04	7 16	8 32	9 28	9 03	9 46
25	10 34	10 16	9 57	9 35	9 06	8 24	9 28	10 20	10 00	10 39
26	11 21	11 06	10 50	10 31	10 08	9 35	10 21	11 10	10 56	11 32
27	12 04	11 53	11 41	11 27	11 10	10 46	11 13	11 59	11 51	12 22
28	12 46	12 38	12 30	12 21	12 11	11 56	12 04	12 45	12 45	13 12
29	13 27	13 23	13 20	13 16	13 12	13 05	12 55	13 32	13 39	14 00
30	14 07	14 08	14 10	14 11	14 13	14 16	13 46	14 18	14 33	14 50
31	14 50	14 55	15 02	15 09	15 17	15 29	14 39	15 07	15 30	15 41
June 1	15 35	15 45	15 56	16 09	16 24	16 46	15 35	15 58	16 29	16 35
2	16 24	16 39	16 55	17 13	17 36	18 07	16 34	16 53	17 32	17 34
3	17 20	17 38	17 58	18 20	18 50	19 32	17 39	17 53	18 39	18 36
4	18 19	18 40	19 03	19 30	20 04	20 55	18 45	18 57	19 48	19 42
5	19 23	19 46	20 09	20 37	21 14	22 07	19 52	20 02	20 55	20 47
6	20 27	20 49	21 12	21 39	22 13	23 03	20 54	21 05	21 57	21 50
7	21 30	21 49	22 09	22 32	23 01	23 43	21 50	22 04	22 50	22 47
8	22 28	22 43	22 59	23 17	23 40	** **	22 39	22 57	23 36	23 37
9	23 21	23 32	23 43	23 55	** **	0 10	23 22	23 44	** **	** **
10	** **	** **	** **	** **	0 10	0 31	24 00	** **	0 15	0 21
11	0 11	0 16	0 22	0 29	0 37	0 48	** **	0 27	0 49	1 01
12	0 58	0 59	0 59	1 00	1 01	1 03	0 35	1 08	1 22	1 39
13	1 44	1 40	1 36	1 31	1 25	1 17	1 10	1 48	1 53	2 15
14	2 30	2 21	2 12	2 02	1 49	1 32	1 46	2 28	2 25	2 53
15	3 18	3 04	2 51	2 35	2 16	1 50	2 23	3 10	2 59	3 32
16	4 07	3 50	3 33	3 12	2 46	2 11	3 03	3 54	3 37	4 14
17	4 59	4 39	4 18	3 54	3 23	2 39	3 48	4 42	4 19	5 00
18	5 52	5 31	5 07	4 40	4 06	3 16	4 36	5 33	5 06	5 50
19	6 45	6 23	5 60	5 32	4 57	4 04	5 29	6 25	5 58	6 42
20	7 38	7 17	6 54	6 27	5 54	5 04	6 23	7 20	6 53	7 37
21	8 28	8 09	7 49	7 25	6 54	6 10	7 19	8 12	7 50	8 31
22	9 16	8 59	8 42	8 22	7 57	7 21	8 13	9 03	8 47	9 24
23	9 60	9 47	9 34	9 18	8 59	8 31	9 06	9 52	9 42	10 15
24	10 41	10 33	10 23	10 13	9 59	9 41	9 57	10 39	10 36	11 04
25	11 22	11 17	11 12	11 07	10 60	10 50	10 47	11 25	11 30	11 53
26	12 02	12 02	12 01	12 00	11 60	11 59	11 37	12 10	12 22	12 41
27	12 43	12 47	12 51	12 55	13 01	13 10	12 27	12 57	13 17	13 31
28	13 26	13 34	13 43	13 53	14 06	14 23	13 21	13 46	14 13	14 22
29	14 12	14 25	14 38	14 54	15 14	15 41	14 18	14 38	15 14	15 17
30	15 04	15 21	15 39	15 59	16 25	17 03	15 19	15 36	16 18	16 17
July 1	16 01	16 21	16 43	17 08	17 40	18 27	16 24	16 37	17 27	17 21
2	17 04	17 26	17 50	18 17	18 53	19 46	17 32	17 42	18 35	18 27

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

MOONSET, 2023
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
May	17	16	08	16	16	16	24	16	34	16	46	17	03	16	03	16	28	16	55	17	04
	18	16	56	17	09	17	22	17	38	17	56	18	23	17	01	17	22	17	57	18	01
	19	17	47	18	03	18	20	18	40	19	06	19	43	18	01	18	17	19	00	18	59
	20	18	38	18	58	19	19	19	44	20	14	20	60	19	01	19	14	20	02	19	57
	21	19	32	19	54	20	17	20	44	21	19	22	09	19	59	20	10	21	02	20	54
	22	20	26	20	48	21	12	21	40	22	15	23	08	20	54	21	05	21	58	21	50
	23	21	19	21	41	22	03	22	30	23	04	23	53	21	46	21	56	22	48	22	40
	24	22	09	22	29	22	49	23	14	23	44	**	**	22	31	22	44	23	32	23	27
	25	22	57	23	14	23	31	23	51	**	**	0	26	23	12	23	28	**	**	**	**
	26	23	42	23	55	**	**	**	**	0	16	0	51	23	49	**	**	0	10	0	09
	27	**	**	**	**	0	08	0	24	0	44	1	11	**	**	0	08	0	44	0	47
	28	0	24	0	33	0	43	0	54	1	08	1	26	0	22	0	45	1	14	1	22
	29	1	05	1	10	1	16	1	22	1	30	1	40	0	53	1	21	1	43	1	55
	30	1	46	1	47	1	48	1	49	1	50	1	52	1	24	1	56	2	10	2	27
	31	2	27	2	24	2	20	2	16	2	11	2	04	1	55	2	32	2	38	3	00
June	1	3	11	3	03	2	55	2	45	2	33	2	18	2	28	3	10	3	08	3	35
	2	3	58	3	46	3	33	3	18	2	60	2	35	3	05	3	51	3	42	4	14
	3	4	50	4	34	4	16	3	56	3	32	2	56	3	48	4	38	4	21	4	58
	4	5	48	5	28	5	07	4	42	4	11	3	27	4	36	5	31	5	08	5	49
	5	6	50	6	27	6	04	5	37	5	02	4	10	5	33	6	30	6	03	6	47
	6	7	54	7	32	7	08	6	40	6	04	5	11	6	37	7	34	7	06	7	51
	7	8	58	8	37	8	15	7	50	7	17	6	28	7	45	8	40	8	15	8	58
	8	9	58	9	41	9	23	9	01	8	34	7	55	8	53	9	45	9	27	10	05
	9	10	54	10	41	10	27	10	11	9	52	9	24	9	59	10	46	10	36	11	09
	10	11	46	11	38	11	29	11	19	11	06	10	49	11	02	11	44	11	42	12	10
	11	12	33	12	30	12	27	12	23	12	18	12	11	12	02	12	38	12	45	13	08
	12	13	20	13	22	13	24	13	26	13	28	13	32	12	59	13	32	13	47	14	03
	13	14	06	14	12	14	19	14	27	14	36	14	50	13	57	14	23	14	48	14	58
	14	14	52	15	03	15	15	15	29	15	45	16	08	14	54	15	16	15	49	15	54
	15	15	41	15	56	16	12	16	30	16	54	17	27	15	52	16	10	16	50	16	50
	16	16	31	16	50	17	10	17	33	18	02	18	44	16	51	17	05	17	51	17	48
	17	17	24	17	45	18	07	18	33	19	07	19	56	17	49	18	01	18	52	18	45
	18	18	17	18	40	19	03	19	31	20	06	20	59	18	46	18	56	19	49	19	41
	19	19	11	19	33	19	56	20	23	20	58	21	49	19	39	19	49	20	41	20	33
	20	20	02	20	22	20	44	21	09	21	41	22	26	20	26	20	38	21	27	21	22
	21	20	51	21	09	21	28	21	49	22	16	22	54	21	09	21	24	22	07	22	05
	22	21	37	21	51	22	06	22	24	22	45	23	15	21	47	22	05	22	43	22	44
	23	22	20	22	30	22	42	22	54	23	10	23	32	22	21	22	43	23	14	23	20
	24	23	01	23	08	23	15	23	23	23	33	23	46	22	53	23	19	23	43	23	53
	25	23	41	23	44	23	46	23	49	23	53	23	58	23	23	23	54	**	**	**	**
	26	**	**	**	**	**	**	**	**	**	**	**	**	23	53	**	**	0	10	0	25
	27	0	21	0	19	0	17	0	15	0	13	0	10	**	**	0	28	0	37	0	57
	28	1	03	0	57	0	50	0	43	0	34	0	23	0	25	1	04	1	06	1	31
	29	1	48	1	37	1	26	1	14	0	58	0	37	0	59	1	43	1	37	2	07
	30	2	36	2	22	2	06	1	49	1	27	0	56	1	38	2	26	2	13	2	48
July	1	3	31	3	12	2	53	2	30	2	02	1	22	2	23	3	16	2	55	3	35
	2	4	30	4	09	3	47	3	21	2	47	1	59	3	16	4	12	3	47	4	29

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

MOONRISE, 2023
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
July	1	16	01	16	21	16	43	17	08	17	40	18	27	16	24	16	37	17	27	17	21
	2	17	04	17	26	17	50	18	17	18	53	19	46	17	32	17	42	18	35	18	27
	3	18	09	18	31	18	55	19	23	19	58	20	50	18	37	18	48	19	41	19	33
	4	19	15	19	35	19	56	20	21	20	52	21	38	19	38	19	51	20	39	20	34
	5	20	16	20	33	20	50	21	11	21	36	22	11	20	31	20	47	21	30	21	29
	6	21	13	21	26	21	38	21	53	22	11	22	35	21	18	21	39	22	12	22	16
	7	22	06	22	13	22	20	22	29	22	39	22	54	21	59	22	24	22	49	22	59
	8	22	55	22	57	22	59	23	02	23	05	23	09	22	36	23	07	23	23	23	39
	9	23	42	23	39	23	37	23	33	23	29	23	24	23	12	23	48	23	55	**	**
	10	**	**	**	**	**	**	**	**	23	53	23	39	23	47	**	**	**	**	0	16
	11	0	28	0	21	0	13	0	04	**	**	23	55	**	**	0	28	0	27	0	53
	12	1	16	1	04	0	51	0	36	0	19	**	**	0	23	1	09	1	00	1	32
	13	2	04	1	48	1	32	1	12	0	48	0	15	1	03	1	53	1	37	2	13
	14	2	55	2	35	2	15	1	52	1	23	0	41	1	46	2	39	2	17	2	57
	15	3	47	3	26	3	03	2	36	2	03	1	15	2	32	3	28	3	02	3	46
	16	4	40	4	18	3	54	3	27	2	51	1	59	3	24	4	20	3	53	4	37
	17	5	33	5	11	4	48	4	21	3	46	2	55	4	17	5	14	4	47	5	31
	18	6	23	6	04	5	42	5	18	4	46	3	60	5	12	6	06	5	43	6	24
	19	7	12	6	54	6	36	6	14	5	48	5	09	6	07	6	58	6	40	7	18
	20	7	57	7	43	7	28	7	11	6	50	6	20	7	00	7	48	7	36	8	10
	21	8	39	8	29	8	18	8	06	7	51	7	30	7	52	8	35	8	30	9	00
	22	9	20	9	14	9	07	9	00	8	51	8	38	8	41	9	21	9	23	9	48
	23	9	59	9	58	9	56	9	53	9	51	9	47	9	31	10	06	10	15	10	35
	24	10	39	10	41	10	44	10	47	10	51	10	56	10	20	10	51	11	08	11	24
	25	11	20	11	27	11	34	11	42	11	53	12	06	11	12	11	39	12	03	12	13
	26	12	04	12	15	12	26	12	40	12	57	13	21	12	06	12	28	13	00	13	06
	27	12	52	13	07	13	23	13	42	14	05	14	39	13	03	13	21	14	01	14	02
	28	13	45	14	04	14	24	14	47	15	17	16	01	14	05	14	19	15	06	15	02
	29	14	44	15	06	15	29	15	55	16	30	17	21	15	11	15	22	16	13	16	06
	30	15	48	16	10	16	34	17	02	17	39	18	32	16	16	16	26	17	20	17	12
	31	16	53	17	15	17	38	18	04	18	38	19	28	17	20	17	31	18	22	18	15
Aug.	1	17	57	18	16	18	36	18	58	19	27	20	07	18	17	18	31	19	17	19	14
	2	18	58	19	12	19	28	19	45	20	06	20	35	19	07	19	26	20	04	20	06
	3	19	54	20	03	20	13	20	24	20	38	20	57	19	52	20	15	20	44	20	52
	4	20	46	20	50	20	55	20	60	21	06	21	14	20	32	21	01	21	21	21	34
	5	21	36	21	35	21	34	21	33	21	31	21	29	21	09	21	44	21	54	22	13
	6	22	23	22	17	22	11	22	04	21	56	21	44	21	46	22	25	22	27	22	52
	7	23	12	23	01	22	50	22	37	22	21	22	00	22	23	23	07	23	01	23	31
	8	**	**	23	46	23	30	23	12	22	50	22	19	23	02	23	51	23	37	**	**
	9	0	01	**	**	**	**	23	51	23	23	22	43	23	44	**	**	**	**	0	11
	10	0	51	0	33	0	13	**	**	**	**	23	14	**	**	0	36	0	16	0	55
	11	1	44	1	23	1	00	0	34	0	02	23	56	0	30	1	25	1	00	1	43
	12	2	36	2	14	1	50	1	23	0	47	**	**	1	20	2	16	1	49	2	33
	13	3	29	3	07	2	43	2	15	1	41	0	48	2	12	3	09	2	41	3	26
	14	4	20	3	60	3	38	3	12	2	38	1	50	3	07	4	02	3	38	4	20
	15	5	09	4	51	4	31	4	09	3	40	2	59	4	02	4	54	4	34	5	14
	16	5	55	5	40	5	24	5	06	4	42	4	09	4	55	5	45	5	30	6	06

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

MOONSET, 2023
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

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

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

MOONRISE, 2023

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

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

MOONSET, 2023
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
Aug.	16	18	15	18	28	18	42	18	58	19	18	19	44	18	22	18	42	19	18	19	21
	17	18	58	19	07	19	17	19	28	19	41	19	59	18	55	19	19	19	48	19	55
	18	19	38	19	43	19	49	19	55	20	02	20	12	19	26	19	54	20	15	20	27
	19	20	17	20	18	20	19	20	20	20	22	20	24	19	56	20	28	20	42	20	59
	20	20	57	20	54	20	50	20	47	20	42	20	35	20	25	21	02	21	09	21	31
	21	21	38	21	31	21	23	21	14	21	03	20	48	20	57	21	38	21	37	22	03
	22	22	21	22	10	21	58	21	44	21	27	21	03	21	31	22	15	22	07	22	38
	23	23	09	22	53	22	37	22	18	21	54	21	22	22	08	22	58	22	42	23	19
	24	**	**	23	42	23	22	22	58	22	28	21	47	22	52	23	45	23	24	**	**
	25	0	01	**	**	**	**	23	47	23	13	22	22	23	43	**	**	**	**	0	04
	26	0	58	0	37	0	13	**	**	**	**	23	15	**	**	0	39	0	12	0	56
	27	2	00	1	38	1	13	0	45	0	08	**	**	0	42	1	40	1	11	1	56
	28	3	04	2	42	2	19	1	52	1	17	0	25	1	48	2	45	2	18	3	02
	29	4	07	3	48	3	28	3	05	2	34	1	51	2	58	3	52	3	30	4	11
	30	5	07	4	53	4	37	4	19	3	56	3	24	4	08	4	57	4	44	5	19
	31	6	03	5	54	5	44	5	32	5	18	4	57	5	17	6	00	5	56	6	25
Sept.	1	6	56	6	52	6	48	6	43	6	36	6	27	6	22	7	00	7	06	7	29
	2	7	47	7	48	7	50	7	51	7	53	7	55	7	26	7	58	8	13	8	29
	3	8	37	8	43	8	50	8	58	9	08	9	21	8	27	8	54	9	19	9	30
	4	9	27	9	38	9	50	10	04	10	21	10	45	9	29	9	51	10	24	10	29
	5	10	17	10	33	10	50	11	09	11	33	12	08	10	30	10	47	11	28	11	28
	6	11	10	11	29	11	49	12	13	12	43	13	27	11	31	11	44	12	31	12	27
	7	12	03	12	24	12	47	13	14	13	49	14	39	12	29	12	40	13	32	13	25
	8	12	57	13	19	13	43	14	11	14	47	15	41	13	26	13	36	14	29	14	20
	9	13	50	14	11	14	35	15	02	15	38	16	29	14	17	14	28	15	20	15	13
	10	14	40	15	01	15	23	15	48	16	19	17	05	15	04	15	17	16	05	16	00
	11	15	29	15	46	16	05	16	26	16	53	17	32	15	46	16	01	16	45	16	43
	12	16	14	16	28	16	43	17	01	17	22	17	52	16	23	16	42	17	20	17	22
	13	16	57	17	07	17	19	17	31	17	47	18	07	16	57	17	20	17	51	17	57
	14	17	38	17	44	17	51	17	59	18	08	18	20	17	29	17	55	18	19	18	29
	15	18	17	18	19	18	22	18	25	18	28	18	32	17	59	18	29	18	46	19	01
	16	18	57	18	55	18	53	18	51	18	48	18	44	18	28	19	04	19	13	19	33
	17	19	38	19	32	19	25	19	18	19	08	18	56	18	59	19	39	19	40	20	05
	18	20	20	20	10	19	59	19	46	19	31	19	10	19	32	20	16	20	09	20	39
	19	21	06	20	52	20	36	20	18	19	57	19	27	20	08	20	56	20	43	21	18
	20	21	56	21	38	21	19	20	56	20	28	19	49	20	49	21	42	21	21	22	00
	21	22	50	22	29	22	07	21	41	21	08	20	19	21	37	22	32	22	06	22	49
	22	23	49	23	26	23	02	22	34	21	58	21	04	22	31	23	29	23	00	23	45
	23	**	**	**	**	**	**	23	36	22	59	22	05	23	33	**	**	**	**	**	**
	24	0	50	0	27	0	03	**	**	**	**	23	23	**	**	0	30	0	02	0	46
	25	1	51	1	31	1	09	0	43	0	11	**	**	0	38	1	34	1	10	1	52
	26	2	51	2	34	2	16	1	55	1	29	0	51	1	47	2	38	2	20	2	58
	27	3	48	3	36	3	23	3	07	2	48	2	22	2	54	3	41	3	32	4	04
	28	4	41	4	34	4	26	4	18	4	07	3	53	4	00	4	41	4	41	5	08
	29	5	33	5	31	5	29	5	27	5	25	5	21	5	04	5	40	5	50	6	09
	30	6	22	6	26	6	30	6	35	6	41	6	48	6	07	6	37	6	56	7	10
Oct.	1	7	13	7	22	7	32	7	43	7	56	8	15	7	10	7	34	8	03	8	11

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

MOONRISE, 2023
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
Oct. 1	19	40	19	29	19	17	19	03	18	46	18	24	18	49	19	35	19	27	19	58
2	20	32	20	16	19	60	19	41	19	17	18	44	19	31	20	21	20	05	20	41
3	21	26	21	07	20	46	20	23	19	53	19	11	20	16	21	10	20	48	21	29
4	22	21	21	60	21	37	21	10	20	35	19	46	21	06	22	02	21	36	22	19
5	23	17	22	54	22	29	22	01	21	25	20	31	21	59	22	56	22	27	23	12
6	**	**	23	48	23	24	22	57	22	21	21	29	22	53	23	50	23	23	**	**
7	0	10	**	**	**	**	23	54	23	22	22	35	23	49	**	**	**	**	0	07
8	1	01	0	41	0	19	**	**	**	**	23	45	**	**	0	44	0	19	1	02
9	1	49	1	32	1	13	0	51	0	24	**	**	0	44	1	36	1	17	1	55
10	2	34	2	20	2	05	1	48	1	27	0	56	1	37	2	25	2	12	2	47
11	3	17	3	06	2	56	2	43	2	28	2	07	2	28	3	13	3	07	3	37
12	3	57	3	51	3	45	3	38	3	29	3	17	3	19	3	59	4	01	4	25
13	4	37	4	35	4	33	4	31	4	29	4	25	4	09	4	44	4	53	5	14
14	5	17	5	20	5	23	5	26	5	30	5	35	4	59	5	30	5	47	6	02
15	5	58	6	05	6	13	6	21	6	32	6	47	5	51	6	16	6	42	6	52
16	6	42	6	53	7	05	7	19	7	37	8	01	6	44	7	06	7	39	7	44
17	7	29	7	45	8	01	8	20	8	44	9	19	7	41	7	59	8	39	8	39
18	8	20	8	39	8	60	9	23	9	54	10	37	8	41	8	54	9	42	9	38
19	9	16	9	37	10	00	10	27	11	02	11	54	9	43	9	54	10	45	10	38
20	10	14	10	37	11	02	11	30	12	07	13	02	10	44	10	54	11	48	11	39
21	11	15	11	37	12	00	12	28	13	03	13	55	11	43	11	53	12	46	12	38
22	12	14	12	34	12	55	13	20	13	50	14	34	12	36	12	49	13	38	13	33
23	13	11	13	28	13	45	14	04	14	28	15	03	13	25	13	42	14	23	14	22
24	14	05	14	17	14	29	14	43	15	00	15	24	14	08	14	30	15	03	15	08
25	14	57	15	03	15	10	15	18	15	28	15	41	14	48	15	15	15	39	15	49
26	15	47	15	48	15	50	15	51	15	53	15	56	15	26	15	58	16	12	16	29
27	16	35	16	32	16	28	16	23	16	18	16	11	16	03	16	40	16	46	17	08
28	17	26	17	17	17	08	16	57	16	44	16	27	16	41	17	23	17	20	17	48
29	18	17	18	04	17	50	17	33	17	13	16	45	17	22	18	09	17	57	18	31
30	19	11	18	53	18	35	18	13	17	47	17	09	18	05	18	57	18	38	19	17
31	20	07	19	46	19	24	18	59	18	26	17	40	18	54	19	49	19	24	20	06
Nov. 1	21	04	20	41	20	17	19	49	19	14	18	21	19	47	20	43	20	15	21	00
2	21	59	21	37	21	13	20	44	20	08	19	15	20	42	21	39	21	11	21	55
3	22	52	22	31	22	09	21	43	21	09	20	19	21	38	22	34	22	08	22	51
4	23	43	23	24	23	04	22	41	22	11	21	29	22	34	23	27	23	06	23	46
5	**	**	**	**	23	57	23	39	23	15	22	41	23	29	**	**	**	**	**	**
6	0	29	0	13	**	**	**	**	**	**	23	52	**	**	0	18	0	03	0	39
7	1	12	1	01	0	48	0	34	0	16	**	**	0	21	1	06	0	58	1	30
8	1	54	1	46	1	38	1	29	1	17	1	02	1	12	1	53	1	52	2	18
9	2	33	2	30	2	26	2	22	2	17	2	10	2	01	2	38	2	45	3	07
10	3	13	3	14	3	15	3	16	3	18	3	20	2	51	3	24	3	38	3	55
11	3	54	3	59	4	05	4	11	4	19	4	30	3	42	4	10	4	32	4	44
12	4	37	4	46	4	57	5	09	5	24	5	44	4	35	4	59	5	29	5	36
13	5	23	5	37	5	52	6	09	6	31	7	01	5	32	5	51	6	28	6	30
14	6	14	6	31	6	50	7	13	7	41	8	21	6	31	6	46	7	32	7	29
15	7	09	7	30	7	52	8	18	8	52	9	41	7	34	7	46	8	36	8	30
16	8	08	8	30	8	55	9	23	9	59	10	53	8	37	8	47	9	41	9	33

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

MOONSET, 2023

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

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

MOONRISE, 2023

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

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

MOONSET, 2023

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

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

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. 2023

(Time in I.S.T.)

		d	h	m			d	h	m
Full Moon	Dec, 22	08	09	38	Full Moon	Jul	03	17	09
Last Quarter	Dec, 22	16	14	26	Last Quarter	Jul	10	07	18
New Moon	Dec, 22	23	15	47	New Moon	Jul	18	00	02
First Quarter	Dec, 22	30	06	51	First Quarter	Jul	26	03	37
Full Moon	Jan,23	07	04	38	Full Moon	Aug	02	00	02
Last Quarter	Jan	15	07	40	Last Quarter	Aug	08	15	58
New Moon	Jan	22	02	23	New Moon	Aug	16	15	08
First Quarter	Jan	28	20	49	First Quarter	Aug	24	15	27
Full Moon	Feb	05	23	59	Full Moon	Aug	31	07	06
Last Quarter	Feb	13	21	31	Last Quarter	Sep	07	03	51
New Moon	Feb	20	12	36	New Moon	Sep	15	07	10
First Quarter	Feb	27	13	36	First Quarter	Sep	23	01	02
Full Moon	Mar	07	18	10	Full Moon	Sep	29	15	27
Last Quarter	Mar	15	07	38	Last Quarter	Oct	06	19	18
New Moon	Mar	21	22	53	New Moon	Oct	14	23	25
First Quarter	Mar	29	08	02	First Quarter	Oct	22	08	59
Full Moon	Apr	06	10	04	Full Moon	Oct	29	01	54
Last Quarter	Apr	13	14	41	Last Quarter	Nov	05	14	07
New Moon	Apr	20	09	42	New Moon	Nov	13	14	57
First Quarter	Apr	28	02	50	First Quarter	Nov	20	16	20
Full Moon	May	05	23	04	Full Moon	Nov	27	14	46
Last Quarter	May	12	19	58	Last Quarter	Dec	05	11	19
New Moon	May	19	21	23	New Moon	Dec	13	05	02
First Quarter	May	27	20	52	First Quarter	Dec	20	00	09
Full Moon	Jun	04	09	12	Full Moon	Dec,23	27	06	03
Last Quarter	Jun	11	01	01	Last Quarter	Jan, 24	04	09	00
New Moon	Jun	18	10	07	New Moon	Jan, 24	11	17	27
First Quarter	Jun	26	13	20	First Quarter	Jan, 24	18	09	23

PART - IV

ECLIPSES AND OCCULTATIONS

ECLIPSES, 2023

In the year 2023, there are twoeclipses of the Sun andone eclipse of the Moon.

I	April	20	Annular–Total eclipse of the Sun	320–323
II	October	14	Annular eclipse of the Sun	324–327
III	October	28	Partial eclipse of the Moon	328

In addition, there isone Penumbral eclipse of the Moon	May 5	329

I-Annular–Total eclipse of the Sun, 20 April, 2023, Thursday.

Not visible in India.

Area of Visibility

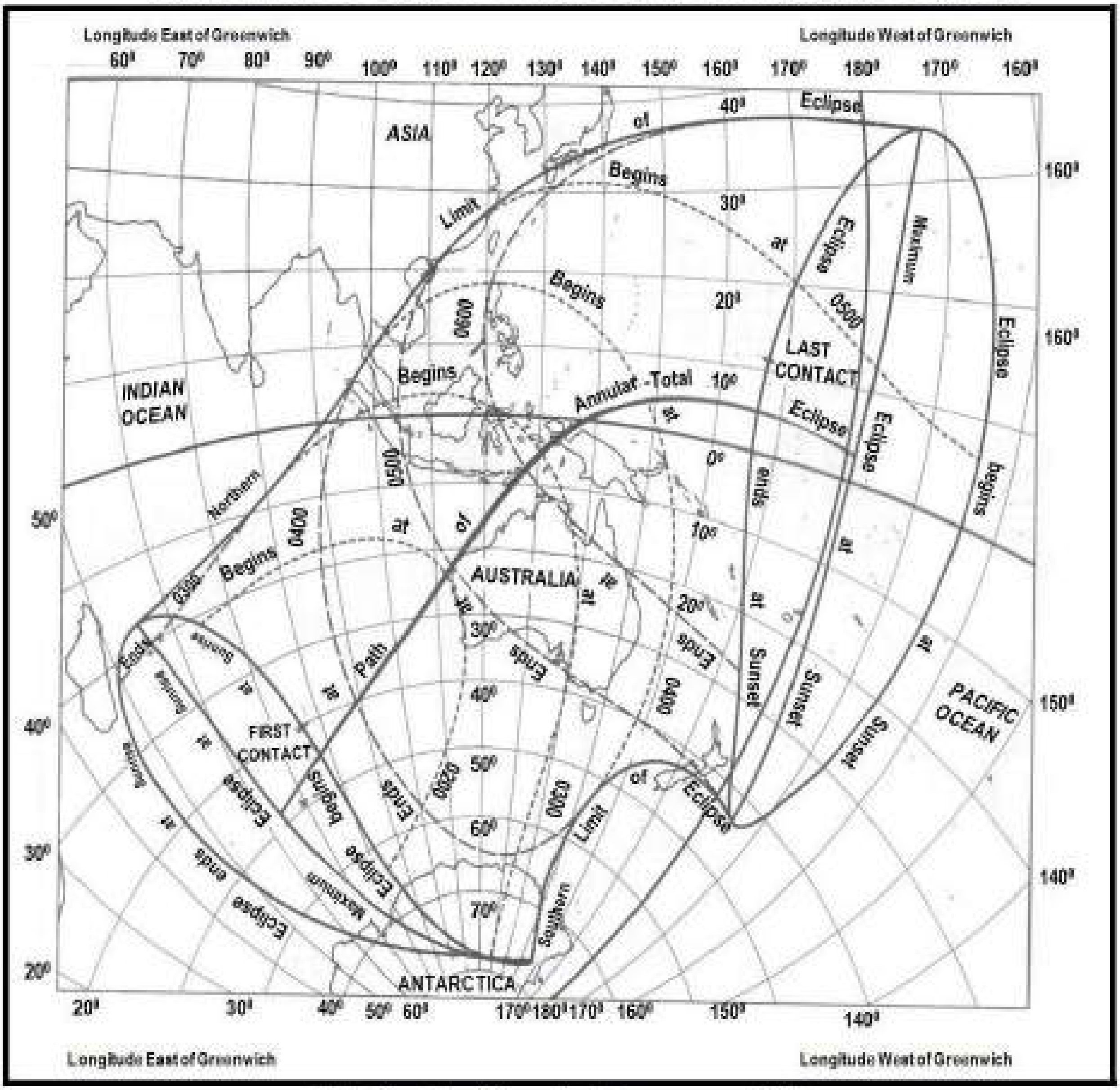
The eclipse is visible in the region covering Antarctica, Australia, the South Indian Ocean, Indonesia, Philippines and the South Pacific Ocean.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension :April$20^d3^h55^m34^s.56$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	1	50	58.43	1	50	58.43
Hourly Motion			126.65			9.33
	°	'	"	°	'	"
Declination	10	58	57.29	11	24	35.84
Hourly Motion		15	06.71			51.61
Equatorial Horizontal Parallax		58	20.38			08.76
True Semi-diameter		15	53.46		15	55.38

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	20	01	34.5	20	07	04.5	–40	17.9	+75	57.9
Central eclipse begins	20	02	37.1	20	08	07.1	–48	27.0	+63	37.2
Greatest eclipse*	20	04	16.8	20	09	46.8	–9	35.6	+125	46.7
Central eclipse ends	20	05	56.6	20	11	26.6	+2	55.9	–178	48.6
Eclipse ends	20	06	59.2	20	12	29.2	+11	16.3	+167	15.1

*Magnitude of the eclipse = 1.013, Duration of eclipse = 5h25 m.
Duration of Central eclipse = 3h20 m, Maximum duration of Annular phase = 1 m 12s.

ANNULAR–TOTAL SOLAR ECLIPSE OF APRIL 20, 2023



The timings of beginning and ending are expressed in UT

ECLIPSES, 2023

BESSELIAN ELEMENTS OF THE ANNULAR–TOTAL ECLIPSE OF THE SUN
APRIL 20

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	l_2
1	20	-1.292972	-1.078853	+0.197232	+0.980357	200	14	01.5	+0.545494	+0.000473
	30	-1.210505	-1.038123	+0.197271	+0.980349	202	44	03.6	+0.545524	+0.000503
	40	-1.128035	-0.997394	+0.197310	+0.980341	205	14	05.6	+0.545554	+0.000533
	50	-1.045561	-0.956667	+0.197349	+0.980333	207	44	07.7	+0.545583	+0.000561
2	00	-0.963084	-0.915941	+0.197388	+0.980325	210	14	09.7	+0.545611	+0.000590
	10	-0.880603	-0.875216	+0.197428	+0.980317	212	44	11.8	+0.545638	+0.000617
	20	-0.798119	-0.834493	+0.197467	+0.980310	215	14	13.8	+0.545665	+0.000644
	30	-0.715633	-0.793772	+0.197506	+0.980302	217	44	15.9	+0.545691	+0.000670
	40	-0.633143	-0.753052	+0.197545	+0.980294	220	14	17.9	+0.545717	+0.000696
	50	-0.550651	-0.712334	+0.197584	+0.980286	222	44	20.0	+0.545742	+0.000720
3	00	-0.468157	-0.671617	+0.197624	+0.980278	225	14	22.0	+0.545766	+0.000745
	10	-0.385661	-0.630903	+0.197663	+0.980270	227	44	24.1	+0.545789	+0.000768
	20	-0.303162	-0.590191	+0.197702	+0.980262	230	14	26.1	+0.545812	+0.000791
	30	-0.220662	-0.549481	+0.197741	+0.980254	232	44	28.2	+0.545834	+0.000813
	40	-0.138160	-0.508773	+0.197780	+0.980246	235	14	30.2	+0.545855	+0.000834
	50	-0.055657	-0.468067	+0.197820	+0.980238	237	44	32.3	+0.545876	+0.000855
4	00	+0.026848	-0.427364	+0.197859	+0.980231	240	14	34.3	+0.545896	+0.000875
	10	+0.109354	-0.386663	+0.197898	+0.980223	242	44	36.4	+0.545915	+0.000894
	20	+0.191861	-0.345965	+0.197937	+0.980215	245	14	38.4	+0.545934	+0.000912
	30	+0.274368	-0.305270	+0.197976	+0.980207	247	44	40.5	+0.545951	+0.000930
	40	+0.356876	-0.264577	+0.198015	+0.980199	250	14	42.5	+0.545968	+0.000947
	50	+0.439385	-0.223888	+0.198055	+0.980191	252	44	44.6	+0.545985	+0.000964
5	00	+0.521893	-0.183201	+0.198094	+0.980183	255	14	46.6	+0.546000	+0.000979
	10	+0.604402	-0.142517	+0.198133	+0.980175	257	44	48.7	+0.546015	+0.000994
	20	+0.686911	-0.101837	+0.198172	+0.980167	260	14	50.7	+0.546029	+0.001008
	30	+0.769419	-0.061160	+0.198211	+0.980159	262	44	52.8	+0.546043	+0.001022
	40	+0.851926	-0.020486	+0.198250	+0.980151	265	14	54.8	+0.546055	+0.001034
	50	+0.934433	+0.020185	+0.198289	+0.980143	267	44	56.9	+0.546067	+0.001046
6	00	+1.016939	+0.060851	+0.198329	+0.980136	270	14	58.9	+0.546078	+0.001057
	10	+1.099445	+0.101515	+0.198368	+0.980128	272	45	01.0	+0.546089	+0.001068
	20	+1.181948	+0.142174	+0.198407	+0.980120	275	15	03.0	+0.546098	+0.001077
	30	+1.264451	+0.182830	+0.198446	+0.980112	277	45	05.1	+0.546107	+0.001086
	40	+1.346952	+0.223482	+0.198485	+0.980104	280	15	07.1	+0.546115	+0.001094
	50	+1.429451	+0.264130	+0.198524	+0.980096	282	45	09.2	+0.546123	+0.001102
7	00	+1.511948	+0.304773	+0.198563	+0.980088	285	15	11.3	+0.546129	+0.001108
	10	+1.594443	+0.345413	+0.198602	+0.980080	287	45	13.3	+0.546135	+0.001114

tanf1= 0.00466252 tanf2= 0.00463933

TT hr	d °	'	"	Variations per minute x'	y'	μ' '	"
1	11	22	31	+0.008247	+0.004073	15	00
2	11	23	03	+0.008248	+0.004073	15	00
3	11	23	53	+0.008250	+0.004071	15	00
4	11	24	42	+0.008251	+0.004070	15	00
5	11	25	32	+0.008251	+0.004068	15	00
6	11	26	21	+0.008251	+0.004066	15	00
7	11	27	11	+0.008250	+0.004064	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 hourangle

ECLIPSES, 2023

PATH OF CENTRAL PHASE DURING THE ANNULAR–TOTAL ECLIPSE OF THE SUN
APRIL 20

Terrestrial Time (TT)	Northern Limit		Central Line		Southern Limit		Central Line
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration of Annularity
	° ′	° ′	° ′	° ′	° ′	° ′	m s
Limit	-48 26.2	+63 36.9	-48 27.1	+63 37.2	-48 28.0	+63 37.5	- -
h m							
2 40	-43 54.2	+79 58.0	-43 55.8	+79 57.0	-43 57.4	+79 56.1	0 04.7
50	-37 20.2	+94 21.8	-37 25.3	+94 23.2	-37 30.4	+94 24.6	0 22.6
3 00	-32 38.8	+101 41.9	-32 45.3	+101 45.4	-32 51.9	+101 49.0	0 34.6
10	28 41.0	106 47.0	28 48.4	106 52.1	28 55.8	106 57.2	0 44.1
20	25 09.6	110 43.4	25 17.5	110 49.6	25 25.5	110 55.9	0 52.0
30	21 56.6	113 59.0	22 04.9	114 06.1	22 13.2	114 13.2	0 58.4
40	18 57.7	116 48.9	19 06.3	116 56.6	19 14.9	117 04.3	1 03.5
50	-16 10.2	+119 22.4	-16 19.0	+119 30.6	-16 27.9	+119 38.7	1 07.4
4 00	-13 32.3	+121 46.1	-13 41.4	+121 54.5	-13 50.4	+122 02.9	1 10.0
10	11 03.0	124 04.8	11 12.2	124 13.4	11 21.3	124 21.9	1 11.4
20	8 41.5	126 22.7	8 50.7	126 31.3	8 59.9	126 39.8	1 11.6
30	6 27.2	128 43.6	6 36.5	128 52.1	6 45.8	129 00.5	1 10.5
40	4 20.2	131 11.3	4 29.5	131 19.5	4 38.7	131 27.6	1 08.0
50	-2 20.6	+133 50.0	-2 29.7	+133 57.7	-2 38.7	+134 05.5	1 04.2
5 00	-0 28.9	+136 44.6	-0 37.7	+136 51.9	-0 46.4	+136 59.1	0 59.1
10	+1 13.8	140 02.0	+1 05.6	140 08.6	+0 57.4	140 15.2	0 52.5
20	2 45.8	143 51.9	2 38.3	143 57.7	2 30.8	144 03.5	0 44.4
30	4 03.6	148 30.9	3 57.2	148 35.7	3 50.8	148 40.5	0 34.6
40	4 59.8	154 32.5	4 55.1	154 36.1	4 50.4	154 39.8	0 22.9
50	+5 12.5	+163 38.8	+5 10.6	+163 40.5	+5 08.8	+163 42.2	0 07.5
Limit	+2 58.1	-178 48.5	+2 55.8	-178 48.7	+2 53.5	-178 48.8	- -

ECLIPSES, 2023

II-Annular eclipse of the Sun, 14 October, 2023, Saturday.

Not Visible in India

Area of Visibility

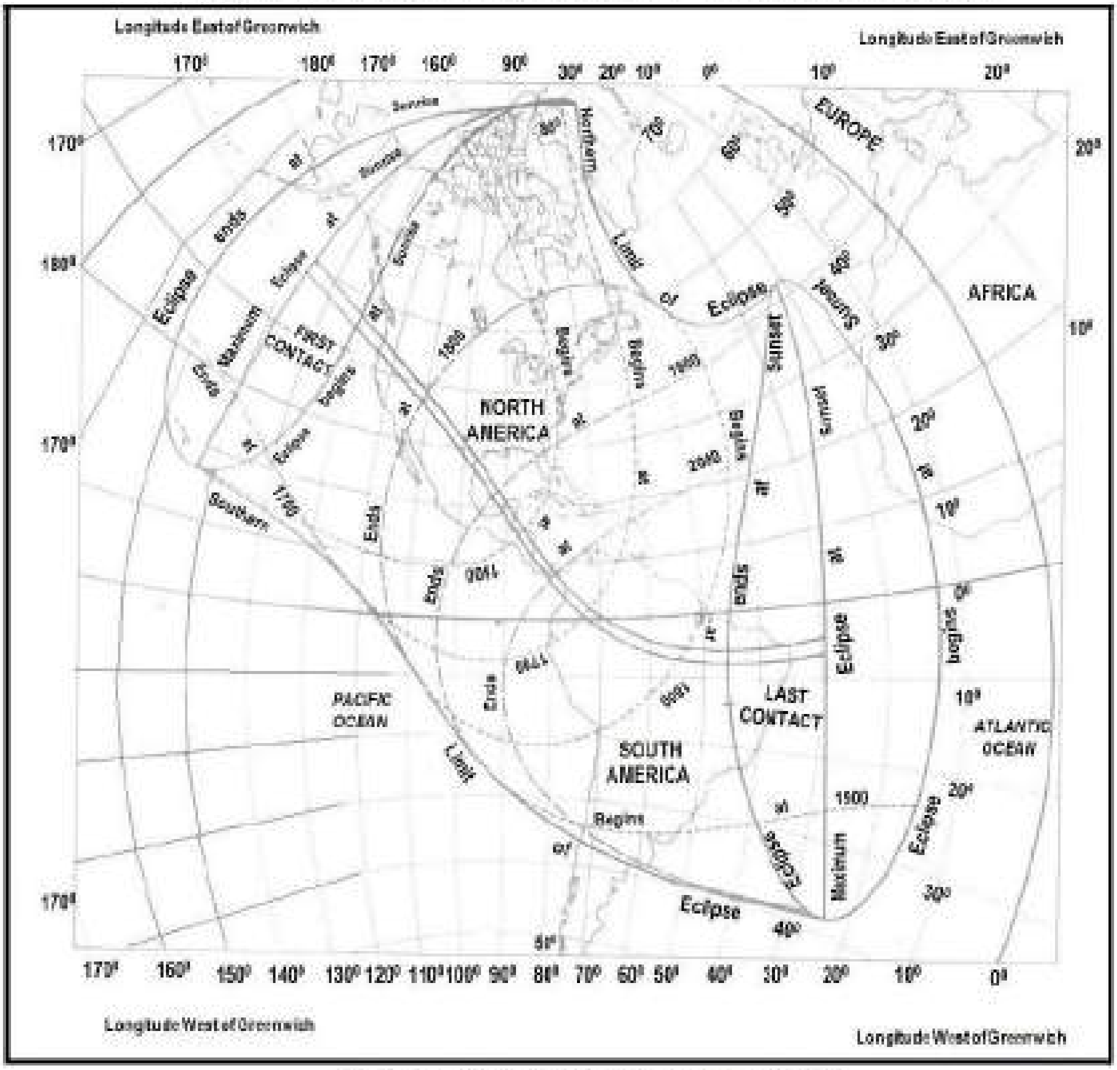
The eclipse will be visible in the region covering Hawaii, North America, Central America, South America (except southern tip), Azores, western edge of North Africa, the Atlantic Ocean and the Pacific Ocean.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension :October14^{d}17^{h}36^{m}36^{s}.42						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	13	18	01.91	13	18	01.91
Hourly Motion			111.22			09.28
	°	'	"	°	'	"
Declination	–7	50	53.27	–8	14	15.43
Hourly Motion		–14	13.11			–55.73
Equatorial Horizontal Parallax		55	13.40			08.82
True Semi-diameter		15	02.53		16	02.04

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	14	15	03.9	14	20	33.9	+41	20.4	–132	11.2
Central eclipse begins	14	16	12.4	14	21	42.4	+49	20.8	–146	55.2
Greatest eclipse*	14	17	59.5	14	23	29.5	+11	22.1	–83	06.4
Central eclipse ends	14	19	46.8	15	01	16.8	–5	41.1	–29	22.9
Eclipse ends	14	20	55.2	15	02	25.2	–13	47.5	–45	15.0

*Magnitude of the eclipse = 0.951, Duration of eclipse = 5h51 m.
Duration of Central eclipse = 3h34 m, Maximum duration of Annular phase =5 m 23s.

ANNULAR SOLAR ECLIPSE OF OCTOBER 14, 2023



The timings of beginning and ending are expressed in UT

ECLIPSES, 2023

BESSELIAN ELEMENTS OF THE ANNULAR ECLIPSE OF THE SUN
OCTOBER 14

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	l_2
15	00	-1.205608	+1.059099	-0.142620	+0.989777	48	29	28.0	+0.563522	+0.018501
	10	-1.129233	+1.018861	-0.142663	+0.989771	50	59	30.1	+0.563517	+0.018496
	20	-1.052855	+0.978623	-0.142706	+0.989765	53	29	32.2	+0.563512	+0.018491
	30	-0.976472	+0.938385	-0.142749	+0.989759	55	59	34.3	+0.563506	+0.018485
	40	-0.900085	+0.898147	-0.142792	+0.989753	58	29	36.4	+0.563499	+0.018478
	50	-0.823695	+0.857909	-0.142835	+0.989747	60	59	38.6	+0.563492	+0.018471
16	00	-0.747301	+0.817671	-0.142878	+0.989740	63	29	40.7	+0.563484	+0.018463
	10	-0.670904	+0.777433	-0.142920	+0.989734	65	59	42.8	+0.563476	+0.018455
	20	-0.594503	+0.737196	-0.142963	+0.989728	68	29	44.9	+0.563467	+0.018446
	30	-0.518099	+0.696959	-0.143006	+0.989722	70	59	47.0	+0.563458	+0.018436
	40	-0.441692	+0.656722	-0.143049	+0.989716	73	29	49.2	+0.563448	+0.018426
	50	-0.365282	+0.616486	-0.143092	+0.989709	75	59	51.3	+0.563437	+0.018416
17	00	-0.288870	+0.576251	-0.143135	+0.989703	78	29	53.4	+0.563426	+0.018405
	10	-0.212454	+0.536016	-0.143178	+0.989697	80	59	55.5	+0.563414	+0.018393
	20	-0.136036	+0.495783	-0.143220	+0.989691	83	29	57.6	+0.563401	+0.018380
	30	-0.059616	+0.455550	-0.143263	+0.989685	85	59	59.8	+0.563388	+0.018367
	40	+0.016806	+0.415318	-0.143306	+0.989678	88	30	01.9	+0.563375	+0.018354
	50	+0.093230	+0.375087	-0.143349	+0.989672	91	00	04.0	+0.563361	+0.018340
18	00	+0.169656	+0.334858	-0.143392	+0.989666	93	30	06.1	+0.563346	+0.018325
	10	+0.246084	+0.294629	-0.143435	+0.989660	96	00	08.2	+0.563331	+0.018309
	20	+0.322514	+0.254402	-0.143478	+0.989654	98	30	10.3	+0.563315	+0.018293
	30	+0.398945	+0.214177	-0.143520	+0.989647	101	00	12.5	+0.563298	+0.018277
	40	+0.475377	+0.173953	-0.143563	+0.989641	103	30	14.6	+0.563281	+0.018260
	50	+0.551811	+0.133730	-0.143606	+0.989635	106	00	16.7	+0.563263	+0.018242
19	00	+0.628245	+0.093510	-0.143649	+0.989629	108	30	18.8	+0.563245	+0.018224
	10	+0.704681	+0.053291	-0.143692	+0.989622	111	00	20.9	+0.563226	+0.018205
	20	+0.781117	+0.013073	-0.143735	+0.989616	113	30	23.0	+0.563207	+0.018186
	30	+0.857554	-0.027142	-0.143778	+0.989610	116	00	25.1	+0.563187	+0.018166
	40	+0.933991	-0.067355	-0.143820	+0.989604	118	30	27.3	+0.563166	+0.018145
	50	+1.010429	-0.107566	-0.143863	+0.989598	121	00	29.4	+0.563145	+0.018124
20	00	+1.086866	-0.147775	-0.143906	+0.989591	123	30	31.5	+0.563123	+0.018102
	10	+1.163304	-0.187982	-0.143949	+0.989585	126	00	33.6	+0.563101	+0.018080
	20	+1.239742	-0.228186	-0.143992	+0.989579	128	30	35.7	+0.563078	+0.018057
	30	+1.316179	-0.268388	-0.144034	+0.989573	131	00	37.8	+0.563054	+0.018033
	40	+1.392616	-0.308587	-0.144077	+0.989566	133	30	40.0	+0.563030	+0.018009
	50	+1.469053	-0.348784	-0.144120	+0.989560	136	00	42.1	+0.563005	+0.017984
21	00	+1.545488	-0.388978	-0.144163	+0.989554	138	30	44.2	+0.562980	+0.017959

tanf1= 0.00469570 tanf2= 0.00467234

TT hr	d °	'	"	Variations per minute x'	y'	μ' '	"
15	-8	11	58	+0.007638	-0.004024	15	00
16	-8	12	52	+0.007640	-0.004024	15	00
17	-8	13	45	+0.007642	-0.004024	15	00
18	-8	14	39	+0.007643	-0.004023	15	00
19	-8	15	33	+0.007644	-0.004022	15	00
20	-8	16	26	+0.007644	-0.004021	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, 2023

PATH OF CENTRAL PHASE DURING THE ANNULAR ECLIPSE OF THE SUN
OCTOBER 14

Terrestrial Time (TT)	Northern Limit		Central Line		Southern Limit		Central Line
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration of Annularity
	° '	° '	° '	° '	° '	° '	m s
Limit	+52 18.7	-146 43.0	+50 26.1	-146 55.2	+48 15.9	-147 06.8	- -
h m							
16 20	+43 56.8	-121 21.6	+42 48.2	-121 19.9	+41 42.5	-121 23.6	4 40.8
30	38 55.3	110 45.5	38 00.2	111 11.4	37 06.6	111 38.6	4 50.6
40	34 49.8	104 22.6	34 02.0	104 56.5	33 15.1	105 30.8	4 57.6
50	+31 13.2	-99 47.2	+30 30.2	-100 24.4	+29 47.8	-101 01.6	5 03.2
17 00	+27 55.8	-96 11.9	+27 16.0	-96 50.5	+26 37.0	-97 29.1	5 07.8
10	24 52.3	93 14.2	24 15.0	93 53.4	23 38.3	94 32.5	5 11.6
20	21 59.9	90 41.0	21 24.3	91 20.6	20 49.2	92 00.0	5 14.9
30	19 16.5	88 24.3	18 42.0	89 04.0	18 08.1	89 43.5	5 17.5
40	16 40.8	86 18.2	16 07.0	86 58.0	15 33.7	87 37.5	5 19.7
50	+14 11.9	-84 18.2	+13 38.3	-84 58.1	+13 05.2	-85 37.7	5 21.3
18 00	+11 48.9	-82 20.7	+11 15.2	-83 00.7	+10 42.0	-83 40.5	5 22.5
10	9 31.6	80 22.2	8 57.3	81 02.6	8 23.6	81 42.6	5 23.0
20	7 19.5	78 19.8	6 44.4	79 00.4	6 09.9	79 40.8	5 22.8
30	5 12.7	76 09.8	4 36.4	76 51.0	4 00.7	77 31.8	5 21.9
40	3 11.1	73 48.5	2 33.3	74 30.3	+1 56.1	75 11.7	5 20.1
50	+1 15.2	-71 11.1	+0 35.5	-71 53.7	-0 03.6	-72 35.9	5 17.3
19 00	-0 34.4	-68 10.9	-1 16.4	-68 54.7	-1 57.7	-69 37.9	5 13.2
10	2 16.4	64 38.2	3 01.2	65 23.8	3 45.2	66 08.5	5 07.8
20	3 48.3	60 16.1	4 36.5	61 04.7	5 23.9	61 52.0	5 00.8
30	5 04.7	54 30.1	5 57.5	55 24.8	6 49.3	56 17.5	4 51.5
40	-5 48.5	-45 30.9	-6 49.5	-46 46.6	-7 48.6	-47 56.3	4 38.6
Limit	-4 35.8	-29 22.0	-5 41.1	-29 23.0	-6 45.9	-29 23.4	- -

ECLIPSES, 2023

III- Partial eclipse of the Moon, 28 October, 2023, Saturday

Visible in India

Eclipse will be visible in the region covering Western Pacific Ocean, Australia, Asia, Europe, Africa, eastern South America, north–eastern North America, the Atlantic Ocean, the Indian Ocean and the South Pacific Ocean.

The places from where the beginning of the umbral phase is visible at the time of moonset are Australia, the North Pacific Ocean and eastern parts of Russia.

The places from where the ending of the umbral phase is visible at the time of moonrise are the South Atlantic Ocean, the North Atlantic Ocean, eastern parts of Brazil and Canada.

Visibility in India: The eclipse is visible from beginning to end from all places of India.

ELEMENTS OF THE ECLIPSE

Universal Time of Opposition in Right Ascension : October28^{d} 21^{h} 01^{m} 38^{s}.29

	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	2	11	33.53	14	11	33.53
Hourly Motion			133.90			09.66
	°	'	"	°	'	"
Declination	14	16	51.83	-13	14	49.17
Hourly Motion		14	52.29			-49.98
Equatorial Horizontal Parallax		59	17.79			08.85
True Semi-diameter		16	09.09		16	05.90

CIRCUMSTANCES OF THE ECLIPSE

	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	28	17	59.9	28	23	29.9	102	+13	31	+84	41
Moon enters umbra	28	19	34.8	29	01	04.8	134	+13	55	+61	47
Middle of the eclipse*	28	20	14.1	29	01	44.1	–	+14	05	+52	17
Moon leaves umbra	28	20	53.5	29	02	23.5	176	+14	15	+42	47
Moon leaves penumbra	28	22	28.3	29	03	58.3	208	+14	38	+19	54

*Magnitude of the eclipse =0.126 (Moon's diam =1.0). Distance between the centers at middle 3371".1

Radius of shadow cone at Moon's distance: Penumbra 4616".8, Umbra 2646".4

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (19h 34.8m U.T.)						Western Limit Moonrise at ending (20h 53.5m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
°	°	'	°	°	'	°	°	'	°	°	'
-50	+134	37	+10	+154	18	-50	-29	36	+10	-49	47
40	139	47	20	156	58	40	34	54	20	52	31
30	143	34	30	160	01	30	38	47	30	55	38
20	146	37	40	163	48	20	41	54	40	59	31
-10	149	17	50	168	58	-10	44	39	50	64	49
0	+151	47	+60	+177	13	0	-47	13	+60	-73	18

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, 2023

PENUMBRAL ECLIPSE OF THE MOON, May 5, 2023, Friday

CIRCUMSTANCES OF THE ECLIPSE											
	Universal Time			Indian Standard Time			Position Angle 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	5	15	12.3	5	20	42.3	71	-16	46	129	54
Middle of the eclipse*	5	17	23.0	5	22	53.0	-	-17	15	98	19
Moon leaves penumbra	5	19	33.7	6	01	03.7	334	-17	42	66	45

* Penumbral magnitude of eclipse: 0.989

** N.E.S.W stands for North, East, South and West

Note : - A penumbral eclipse of the Moon is not to be taken as an eclipse of the Moon in the ordinary sense,as the Moon is not covered by the real shadow of the Earth during such an eclipse.

OCCULTATIONS, 2023

PLANETS BY THE MOON

Sl. No.	Date and Ingress - Egress Times (U.T.)			Planet	Magnitude of Planet	Area of Visibility
		h --	h			
1.	Jan–01	19.9	23.7	Uranus	5.7	Most of Central America, most of Caribbean, most of North America, Greenland, Iceland, most of Northern Europe (including most of British Isles), most of W. and N. Russia.
2.	Jan–03	17.9	21.9	Mars	–1.1	Most of southern and eastern Africa, Madagascar, Maldives.
3.	Jan–29	02.0	05.0	Uranus	5.7	Northernmost Micronesia, Japan, north easternmost China, E. Russia, Alaska, northernmost Canada, Svalbard, Greenland.
4.	Jan–31	02.2	06.8	Mars	–0.3	Most of Polynesia (except New Zealand), southern U.S.A., Mexico, Central America, Caribbean, northern South America.
5.	Feb–22	21.8	24.1	Jupiter	–2.1	Parts of Western Antarctica, Falkland Islands, S. South America.
6.	Feb–25	11.8	12.7	Uranus	5.8	Southern half of Greenland, parts of northern Canada.
7.	Feb–28	03.2	05.2	Mars	0.4	N. Mongolia, central and N.W. Russia, Svalbard, N. Scandinavia, N.W. Greenland, Iceland, Faroe Islands.
8.	Mar–22	18.4	22.4	Jupiter	–2.1	Easternmost Polynesia, Galapagos Islands, northern half of South America, S. Central America, S.E. Caribbean.
9.	Mar–24	08.2	12.9	Venus	–4.0	Southern and eastern Africa, Madagascar, south and eastern Arabian Peninsula, Pakistan, southern half of Asia, Philippines.
10.	May–17	10.9	14.5	Jupiter	–2.1	N. Central America, N. Caribbean, most of North America, Greenland, Iceland, Svalbard, N. British Isles, Scandinavia, N.W. Russia.
11.	Sept–01	07.7	09.1	Neptune	7.8	Parts of Western Antarctica, South Georgia and the South Sandwich Islands.
12.	Sept–16	17.9	22.1	Mars	1.7	Alaska, Canada, most of North America (except W. Mexico), Caribbean, Central America, N. South America.
13.	Sept–28	17.7	18.5	Neptune	7.8	Oates Land (Antarctica), extreme south of New Zealand.
14.	Nov–09	09.0	12.2	Venus	–4.4	Extreme N. Canada, most of Greenland, Iceland, Svalbard, W. Russia, Europe except Iberian Peninsula, parts of N. Africa, most of Middle East.
15.	Dec–19	13.3	15.3	Neptune	7.9	Parts of Eastern Antarctica, southern edge of Australia.

OCCULTATIONS, 2023

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.	Jan–01	22	16.1	26	11.4	0.7606	0.5220	0.2117	2	51	06.0	16	01	57.4
2.	Jan–03	19	37.3	22	05.3	-0.5912	0.5475	0.1324	4	25	50.7	24	32	32.4
3.	Jan–29	4	08.5	9	52.0	1.0143	0.5234	0.2123	2	50	23.7	15	59	35.5
4.	Jan–31	4	24.9	8	34.5	-0.1154	0.5318	0.1224	4	32	09.6	24	39	13.5
5.	Feb–22	22	00.3	31	31.2	-1.2012	0.5238	0.2742	0	40	27.5	3	08	04.5
6.	Feb–25	13	05.5	20	34.9	1.3385	0.5302	0.2142	2	52	15.1	16	08	29.4
7.	Feb–28	4	31.8	9	53.6	1.1705	0.5297	0.0824	5	10	20.2	25	22	29.0
8.	Mar–22	19	55.8	30	53.2	-0.5410	0.5240	0.2727	1	04	03.8	5	39	15.7
9.	Mar–24	10	26.7	20	08.7	-0.1134	0.4889	0.2186	2	25	44.9	15	00	06.8
10.	May–17	13	17.5	27	04.7	0.8280	0.5192	0.2511	1	53	53.8	10	32	07.5
11.	Sept–01	7	20.7	6	12.6	-1.3592	0.5464	0.2887	23	50	08.4	-2	27	14.0
12.	Sept–16	19	20.2	30	14.3	0.7277	0.4640	-0.2491	12	49	03.3	-4	43	40.3
13.	Sept–28	16	59.3	-6	18.1	-1.4102	0.5458	0.2898	23	47	24.6	-2	45	16.9
14.	Nov–09	9	29.9	0	38.3	1.1160	0.4414	-0.2455	12	05	56.9	0	41	22.6
15.	Dec–19	13	16.1	-4	34.5	-1.2784	0.5267	0.2782	23	43	23.4	-3	09	13.4

ELEMENTS OF OCCULTATIONS OF PLANETS

Sl. No.	*l*	*a*
1.	0.2725	1.0028
2.	0.2736	1.0031
3.	0.2725	1.0027
4.	0.2733	1.0021
5.	0.2726	1.0022
6.	0.2725	1.0027
7.	0.2731	1.0015
8.	0.2726	1.0021
9.	0.2731	0.9995
10.	0.2726	1.0021
11.	0.2725	1.0028
12.	0.2728	1.0011
13.	0.2725	1.0028
14.	0.2734	0.9999
15.	0.2725	1.0027

OCCULTATIONS, 2023

BRIGHT STARS BY THE MOON

Sl. No.	Date and Ingress - Egress Times (U.T.)			Star	Area of Visibility
		h --	h		
1.	Aug–25	01.4	03.7	Antares	Southern half of Canada, most of U.S.A. (except Alaska), northernmost Mexico.
2.	Sept–21	07.3	10.4	Antares	Easternmost Kazakhstan, south eastern Russia, Mongolia, most of China, Japan, north Philippines, north east Micronesia.
3.	Oct–18	12.6	15.9	Antares	Azores, eastern Canary Islands, most of Europe (except north Scandinavia), most of northern Africa, most of Middle East.
4.	Nov–14	19.1	22.2	Antares	North America (except Alaska and northern Canada), northern Central America, northern Caribbean, Bermuda.

ELEMENTS OF OCCULTATIONS OF STARS

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.	Aug–25	02	05.5	7	48.2	1.0995	0.5676	-0.1256	16	30	51.2	-26	29	05.4
2.	Sept–21	08	26.8	15	56.9	0.9286	0.5619	-0.1241	16	30	50.8	-26	29	04.8
3.	Oct–18	13	53.1	0	49.4	0.8776	0.5636	-0.1245	16	30	50.4	-26	29	03.5
4.	Nov–14	20	17.9	7	22.9	0.9153	0.5703	-0.1254	16	30	50.3	-26	29	02.3

$l = 0.2725^{*}$ and $a = 1.0027^{*}$

*Elements l and a have identical values correct upto last significant digit (as reported) in each 04 occultations of the bright stars.

PART - V

ASTRONOMICAL PHENOMENA
AND
MISCELLANEOUS TABLES

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PHENOMENA, 2023

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.	19	-0.1	E.	16	-3.9	June	30	W.	2	-2.2	E.	42	-4.7
	1		13	+1.1		17	-3.9	July	5	E.	5	-1.8		40	-4.7
	6	E.	4	+4.7		18	-3.9		10		10	-1.2		38	-4.7
	11	W.	9	+3.0		19	-3.9		15		15	-0.8		35	-4.7
	16		17	+0.8		21	-3.9		20		19	-0.4		31	-4.7
	21	W.	22	+0.2	E.	22	-3.9		25	E.	22	-0.1	E.	27	-4.6
	26		24	0.0		23	-3.9		30		25	+0.1		22	-4.4
	31		25	-0.1		24	-3.9	Aug	4		27	+0.2		16	-4.2
Feb.	5		24	-0.1		25	-3.9		9		27	+0.4	E.	10	-4.1
	10		23	-0.2		26	-3.9		14		27	+0.5	W.	8	-4.1
	15	W.	21	-0.2	E.	27	-3.9		19	E.	25	+0.7	W.	12	-4.0
	20		19	-0.3		29	-3.9		24		22	+1.1		18	-4.3
	25		16	-0.5		30	-3.9		29		16	+2.1		24	-4.5
Mar	2		13	-0.7		31	-3.9	Sept	3	E.	8	+4.1		29	-4.7
	7		9	-0.9		32	-4.0		8	W.	4	+5.2		33	-4.7
	12	W.	5	-1.3	E.	33	-4.0		13	W.	11	+2.2	W.	37	-4.8
	17	W.	2	-1.9		34	-4.0		18		16	+0.4		39	-4.8
	22	E.	5	-1.7		35	-4.0		23		18	-0.4		42	-4.8
	27		10	-1.5		36	-4.0		28		16	-0.9		43	-4.7
Apr.	1		14	-1.1		37	-4.0	Oct.	3		13	-1.1		45	-4.7
	6	E.	18	-0.6	E.	38	-4.0		8	W.	9	-1.2	W.	45	-4.6
	11		19	-0.1		39	-4.0		13		5	-1.3		46	-4.6
	16		19	+0.7		40	-4.1		18	W.	2	-1.5		46	-4.5
	21		15	+1.9		41	-4.1		23	E.	2	-1.4		46	-4.5
	26		9	+3.8		42	-4.1		28		5	-1.0		46	-4.4
May	1	E.	2	----	E.	42	-4.1	Nov	2	E.	8	-0.8	W.	46	-4.4
	6	W.	6	+5.0		43	-4.2		7		11	-0.6		46	-4.4
	11		14	+3.0		44	-4.2		12		13	-0.5		45	-4.3
	16		19	+1.8		44	-4.2		17		16	-0.5		45	-4.3
	21		23	+1.1		45	-4.3		22		18	-0.5		44	-4.2
	26	W.	25	+0.7	E.	45	-4.3		27	E.	20	-0.5	W.	44	-4.2
	31		25	+0.4		45	-4.4	Dec.	2		21	-0.4		43	-4.2
June	5		24	+0.1		45	-4.4		7		21	-0.3		42	-4.2
	10		21	-0.2		45	-4.5		12		19	+0.1		41	-4.1
	15		18	-0.6		45	-4.5		17		12	+1.5		40	-4.1
	20	W.	13	-1.1	E.	44	-4.6		22	E.	3	----	W.	39	-4.1
	25		8	-1.6		43	-4.6		27	W.	10	+2.4		38	-4.1
	30	W.	2	-2.2	E.	42	-4.7		32	W.	18	+0.5	W.	37	-4.0

Conjunction-	Mercury	Venus	Mercury	Venus
	d h / d h	d h	d h / d h	d h
Inferior:	Jan. 7 13 / May 1 23	…	Sept. 6 11 / Dec. 22 19	Aug. 13 11
Superior:	Mar. 17 11 / July 1 05	…	Oct. 20 06 / ….	…

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, 2023

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.	-4	E.	155	-1.4	E.	85	-2.4	E.	47	+0.8	E.	130	E.	78	E.	22
	6		143	-1.1		76	-2.3		38	+0.8		120		68		13
	16		133	-0.7		68	-2.3		28	+0.8		109		58	E.	3
	26		123	-0.4		59	-2.2		19	+0.8		99		48	W.	8
Feb.	5		115	-0.2		51	-2.2		11	+0.8		89		38		17
	15	E.	108	+0.1	E.	43	-2.1	E.	2	+0.7	E.	79	E.	28	W.	27
	25		101	+0.3		35	-2.1	W.	7	+0.8		69		18		37
Mar	7		95	+0.5		27	-2.1		16	+0.8		60	E.	9		47
	17		90	+0.7		19	-2.1		25	+0.9		50	W.	2		56
	27		85	+0.9		12	-2.1		34	+0.9		40		11		66
Apr.	6	E.	80	+1.0	E.	5	-2.0	W.	43	+0.9	E.	31	W.	20	W.	76
	16		75	+1.2	W.	3	-2.0		52	+0.9		22		30		85
	26		71	+1.3		10	-2.0		61	+0.9		13		39		95
May	6		67	+1.4		18	-2.1		69	+0.9	E.	3		48		105
	16		62	+1.5		25	-2.1		79	+0.8	W.	6		58		115
	26	E.	59	+1.5	W.	32	-2.1	W.	88	+0.8	W.	15	W.	67	W.	124
June	5		55	+1.6		40	-2.1		97	+0.8		24		77		134
	15		51	+1.7		47	-2.1		106	+0.7		33		86		144
	25		47	+1.7		55	-2.2		116	+0.7		42		96		153
July	5		44	+1.7		63	-2.2		126	+0.6		51		105		163
	15	E.	40	+1.8	W.	71	-2.3	W.	136	+0.6	W.	60	W.	115	W.	173
	25		37	+1.8		79	-2.3		146	+0.5		69		124	E.	176
Aug	4		34	+1.8		87	-2.4		156	+0.5		79		134		167
	14		30	+1.8		96	-2.5		166	+0.4		88		144		157
	24		27	+1.8		105	-2.5	W.	176	+0.4		98		154		148
Sept	3	E.	24	+1.7	W.	115	-2.6	E.	173	+0.4	W.	107	W.	163	E.	138
	13		21	+1.7		124	-2.7		163	+0.4		117	W.	173		128
	23		17	+1.7		135	-2.8		152	+0.5		127	E.	176		118
Oct.	3		14	+1.6		145	-2.8		142	+0.5		137		166		108
	13		11	+1.6		156	-2.9		132	+0.6		147		156		98
	23	E.	8	+1.5	W.	167	-2.9	E.	121	+0.6	W.	157	E.	146	E.	89
Nov	2		5	+1.5	W.	178	-2.9		111	+0.7		168		136		79
	12	E.	2	+1.4	E.	170	-2.9		101	+0.7	W.	178		126		69
	22	W.	1	+1.3		159	-2.9		91	+0.8	E.	171		116		59
Dec.	2		4	+1.4		147	-2.8		82	+0.8		161		105		49
	12	W.	7	+1.4	E.	137	-2.7	E.	72	+0.8	E.	150	E.	95	E.	39
	22		10	+1.4		126	-2.7		63	+0.9		140		85		29
	32		13	+1.4		116	-2.6		53	+0.9		129		75		20
	42	W.	15	+1.4	E.	106	-2.5	E.	44	+0.9	E.	119	E.	65	E.	10
		d h			d h			d h			d h		d h		d h	
Conjunction:		Nov. 18 06			Apr. 11 22			Feb. 16 17			May 9 20		Mar. 16 00		Jan. 18 15	
Opposition:		…			Nov. 3 05			Aug. 27 08			Nov. 13 17		Sept. 19 11		July 22 04	

Magnitudes at opposition: Uranus +5.7; Neptune +7.9; 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, 2023

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

UNIVERSAL TIME

MERCURY

		d	h	m			d	h	m	
Heliacal setting W.	Jan.	3	00	13		Aug.	26	01	31	
Inferior conjunction	Jan.	7	12	56		Sept.	6	11	11	
Heliacal rising E.	Jan.	11	18	57		Sept.	12	02	55	
Direct	Jan.	18	13	19		Sept.	15	20	18	
Greatest elongation W.	Jan.	30	05	54	(25°.0)	Sept.	22	13	16	(17°.9)
Heliacal setting E.	Feb.	25	13	13		Oct.	6	22	16	
Superior conjuction	Mar.	17	10	42		Oct.	20	05	40	
Heliacal rising W.	Mar.	27	09	02		Nov.	12	19	01	
Greatest elongation E.	Apr.	11	22	10	(19°.5)	Dec.	4	14	28	(21°.3)
Retrograde	Apr.	21	08	40		Dec.	13	06	57	
Heliacal setting W.	Apr.	25	11	59		Dec.	18	00	48	
Inferior conjunction	May	1	23	28		Dec.	22	18	53	
Heliacal rising E.	May	12	18	43		Dec.	27	00	02	
Direct	May	15	03	16			…	…	…	
Greatest elongation W.	May	29	05	34	(24°.9)		…	…	…	
Heliacal setting E.	June	21	04	32			…	…	…	
Superior conjuction	July	1	05	06			…	…	…	
Heliacal rising W.	July	11	00	41			…	…	…	
Greatest elongation E.	Aug.	10	01	47	(27°.4)		…	…	…	
Retrograde	Aug.	23	19	52			…	…	…	

VENUS

		d	h	m			d	h	m	
Heliacal setting W.		…	…	…		Aug.	4	09	29	
Inferior conjunction		…	…	…		Aug.	13	11	16	
Heliacal rising E.		…	…	…		Aug.	17	20	33	
Direct		…	…	…		Sept.	4	01	24	
Greatest elongation W.		…	…	…		Oct.	23	23	14	(46°.4)
Heliacal setting E.		…	…	…			…	…	…	
Superior conjuction		…	…	…			…	…	…	
Heliacal rising W.		…	…	…			…	…	…	
Greatest elongation E.	June	4	11	01	(45°.4)		…	…	…	
Retrograde	July	23	01	29			…	…	…	

EARTH

		d	h	m			d	h	m		d	h	m
Perihelion	Jan.	4	16	14	Equinoxes	Mar.	20	21	24	Sept.	23	06	50
Aphelion	July	6	19	46	Solstices	June	21	14	58	Dec.	22	03	27

SUPERIOR PLANETS

	MARS				JUPITER				SATURN			
		d	h	m		d	h	m		d	h	m
Heliacal setting W.	Sept.	15	07	09	Mar.	31	10	56	Feb.	3	02	40
Conjunction	Nov.	18	05	43	Apr.	11	22	07	Feb.	16	16	49
Heliacal rising E.		…	…	…	Apr.	29	15	28	Mar.	9	06	21
Retrograde		…	…	…	Sept.	4	14	10	June	17	17	27
Opposition		…	…	…	Nov.	3	05	03	Aug.	27	08	28
Direct	Jan.	12	20	59	Dec.	31	02	40	Nov.	4	07	02

PHENOMENA, 2023

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	9 19 55	Mar.	15 23 40	Jan.	18 14 41
Retrograde	Aug.	29 02 37	June	30 21 06	May	1 17 08
Opposition	Nov.	13 17 20	Sept.	19 11 18	July	22 03 49
Direct	Jan.	22 22 58	Dec.	6 13 21	Oct.	11 01 08

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, 2023

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

UNIVERSAL TIME

	d h m			d h m	
Jan.	3 19 47	Moon conj. Mars	May	13 15 12	Moon conj. Saturn
	20 08 29	Moon conj. Mercury		17 12 47	Moon conj. Jupiter
	22 22 13	*Venus conj. Saturn*		17 23 27	Moon conj. Mercury
	23 09 24	Moon conj. Saturn		23 12 45	Moon conj. Venus
	23 10 18	Moon conj. Venus		24 19 21	Moon conj. Mars
	26 03 18	Moon conj. Jupiter	June	9 22 16	Moon conj. Saturn
	31 04 27	Moon conj. Mars		14 05 40	Moon conj. Jupiter
Feb.	18 22 35	Moon conj. Mercury		16 19 12	Moon conj. Mercury
	20 02 00	Moon conj. Saturn		22 03 08	Moon conj. Venus
	22 09 25	Moon conj. Venus		22 12 42	Moon conj. Mars
	22 22 48	Moon conj. Jupiter	July	7 04 47	Moon conj. Saturn
	28 04 21	Moon conj. Mars		11 20 04	Moon conj. Jupiter
Mar.	2 05 36	*Venus conj. Jupiter*		19 11 23	Moon conj. Mercury
	2 14 34	*Mercury conj. Saturn*		20 14 09	Moon conj. Venus
	19 17 27	Moon conj. Saturn		21 06 36	Moon conj. Mars
	22 01 34	Moon conj. Mercury		27 15 16	*Mercury conj. Venus*
	22 20 17	Moon conj. Jupiter	Aug.	3 11 52	Moon conj. Saturn
	24 10 31	Moon conj. Venus		8 08 11	Moon conj. Jupiter
	28 06 50	*Mercury conj. Jupiter*		16 00 44	Moon conj. Venus
	28 13 20	Moon conj. Mars		18 17 09	Moon conj. Mercury
Apr.	16 05 57	Moon conj. Saturn		19 00 57	Moon conj. Mars
	19 17 26	Moon conj. Jupiter		30 19 32	Moon conj. Saturn
	21 08 05	Moon conj. Mercury	Sept.	4 18 06	Moon conj. Jupiter
	23 12 44	Moon conj. Venus		11 19 32	Moon conj. Venus
	26 03 08	Moon conj. Mars		13 22 04	Moon conj. Mercury

PHENOMENA, 2023 --- contd.

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

UNIVERSAL TIME

d h m		d h m	
Sept. 16 19 53	Moon conj. Mars	Nov. 13 12 18	Moon conj. Mars
27 03 00	Moon conj. Saturn	14 14 04	Moon conj. Mercury
Oct. 2 01 37	Moon conj. Jupiter	20 15 45	Moon conj. Saturn
10 14 46	Moon conj. Venus	25 09 42	Moon conj. Jupiter
14 08 58	Moon conj. Mercury	Dec. 9 14 24	Moon conj. Venus
15 15 35	Moon conj. Mars	12 10 05	Moon conj. Mars
24 09 34	Moon conj. Saturn	14 05 46	Moon conj. Mercury
29 06 36	Moon conj. Jupiter	17 23 32	Moon conj. Saturn
29 14 22	*Mercury conj. Mars*	22 12 53	Moon conj. Jupiter
Nov. 9 10 23	Moon conj. Venus	28 00 31	*Mercury conj. Mars*

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

d h m		d h m	
Feb. 5 06 50	Mars 8°.22 N. of Aldebaran	July 29 00 45	Mercury 0°.11 S. of Regulus
Apr. 20 20 32	Venus 7°.54 N. of Aldebaran	Oct. 2 01 19	Mars 2°.59 N. of Spica
May 10 19 50	Mars 5°.10 S. of Pollux	Oct. 10 04 31	Venus 2°.34 S. of Regulus
May 30 16 06	Venus 4°.06 S. of Pollux	Oct. 18 02 15	Mercury 3°.30 N. of Spica
June 17 14 18	Mercury 4°.47 N. of Aldebaran	Nov. 16 18 24	Mercury 2°.58 N. of Antares
July 8 09 32	Mercury 4°.96 S. of Pollux	Dec. 28 09 02	Venus 4°.46 N. of Spica
July 10 07 55	Mars 0°.70 N. of Regulus	Dec. 7 14 08	Mars 4°.31 N. of Antares

ASTRONOMICAL DIARY, 2023

UNIVERSAL TIME

	d	h	m			d	h	m	
Jan.	1	08	50	*Venus 0° 53′ N. of Pluto*	Feb.	16	16	49	Saturn in conjunction with Sun
	1	15	25	Moon in ascending node		18	07	55	Moon greatest lat. S 4° 57'
	1	22	16	Uranus 0°.70 S of Moon		18	20	52	Mercury 3°.60 N of Moon
				Occultation		19	09	05	Moon at perigee
	2	20	17	*Mercury at perihelion*		19	23	58	Saturn 3°.70 N of Moon
	3	19	37	Mars 0°.50 N of Moon		20	07	06	NEW MOON
				Occultation		21	18	16	Neptune 2°.50 N of Moon
	4	16	14	*Earth at perihelion*		22	07	55	Venus 2°.10 N. of Moon
	6	23	08	FULL MOON		22	22	00	Jupiter 1°.20 N of Moon
	7	12	56	Mercury in inferior conjunction					*Occultation*
				2° 47' N of Sun		24	18	58	Moon in ascending node
	8	09	18	Moon at apogee		25	13	05	Uranus 1°.30 S of Moon
	8	12	11	Moon greatest lat. N 5° 01'					*Occultation*
	12	20	15	Mars stationary in RA		27	08	06	FIRST QUARTER
	13	01	37	Mercury greatest helio. lat N.		28	04	32	Mars 1°.10 S of Moon
	15	02	10	LAST QUARTER					*Occultation*
	16	06	31	Moon in descending node	Mar.	2	09	35	*Mercury 0° 56′ S of Saturn*
	17	10	41	Venus greatest helio. lat S.		2	10	41	*Venus 0° 32′ N. of Jupiter*
	18	11	53	Mercury stationary in RA		3	13	10	Moon greatest lat. N 5° 04'
	18	14	41	Pluto in conjunction with Sun		3	18	00	Moon at apogee
	20	07	50	Mercury 6°.90 N of Moon		7	12	40	FULL MOON
	20	11	59	*Jupiter at perihelion*		8	01	44	Mercury greatest helio. lat S.
	21	16	35	Moon greatest lat. S 4° 55'		11	08	53	Moon in descending node
	21	20	53	NEW MOON		14	17	34	Venus in ascending node
	21	20	57	Moon at perigee		15	02	08	LAST QUARTER
	22	19	36	*Venus 0° 22′ S. of Saturn*		15	23	40	Neptune in conjunction with Sun
	23	02	49	Uranus stationary in RA		16	15	07	*Mercury 0° 25′ S of Neptune*
	23	07	21	Saturn 3°.80 N of Moon		16	18	10	Mars in square with Sun
	23	08	18	Venus 3°.50 N. of Moon		17	10	42	Mercury in superior conjunction
	25	05	55	Neptune 2°.70 N of Moon					1° 28' S of Sun
	26	02	03	Jupiter 1°.80 N of Moon		17	10	56	Moon greatest lat. S 5° 09'
	28	15	19	FIRST QUARTER		19	15	13	Moon at perigee
	28	16	04	Moon in ascending node		19	15	22	Saturn 3°.60 N of Moon
	29	04	09	Uranus 0°.90 S of Moon		20	21	24	*Vernal Equinox*
				Occultation		21	06	47	Neptune 2°.40 N of Moon
	30	05	54	Mercury greatest elong. W. (25°.0)		21	17	23	NEW MOON
	31	04	25	Mars 0°.10 N of Moon		22	00	10	Mercury 1°.80 N of Moon
				Occultation		22	19	56	Jupiter 0°.50 N of Moon
Feb.	4	02	50	Uranus in square with Sun					*Occultation*
	4	08	57	Moon at apogee		24	02	07	Moon in ascending node
	4	12	23	Moon greatest lat. N 4° 59'		24	10	27	Venus 0°.10 N. of Moon
									Occultation
	5	06	50	*Mars 8°.22 N. of Aldebaran*		25	00	39	Uranus 1°.50 S of Moon
	5	11	05	Mercury in descending node		27	03	32	Mercury in ascending node
	5	18	28	FULL MOON		28	13	16	Mars 2°.30 S of Moon
	10	23	15	*Mercury 1° 36′ N of Pluto*		28	14	34	*Mercury 1° 27′ N of Jupiter*
	12	07	31	Moon in descending node		29	02	32	FIRST QUARTER
	13	16	01	LAST QUARTER		30	15	36	Moon greatest lat. N 5° 11'
	15	12	20	*Venus 0° 01′ S. of Neptune*		31	06	10	*Venus 1° 18′ N. of Uranus*
	15	19	55	*Mercury at aphelion*		31	11	18	Moon at apogee

ASTRONOMICAL DIARY, 2023

UNIVERSAL TIME

	d	h	m			d	h	m	
Mar.	31	19	32	*Mercury at perihelion*	May	23	12	08	Venus 2°.20 S. of Moon
Apr.	6	04	34	FULL MOON		24	10	58	Moon greatest lat. N 5° 11'
	7	13	52	Moon in descending node		24	17	32	Mars 3°.80 S of Moon
	11	00	53	Mercury greatest helio. lat N.		26	01	38	Moon at apogee
	11	22	07	Jupiter in conjunction with Sun		27	15	22	FIRST QUARTER
	11	22	10	Mercury greatest elong. E. (19°.5)		28	10	46	Saturn in square with Sun
	13	09	11	LAST QUARTER		29	05	34	Mercury greatest elong. W. (24°.9)
	13	13	43	Moon greatest lat. S 5° 14'		30	16	06	*Venus 4°.06 S. of Pollux*
	16	02	23	Moon at perigee		30	20	37	*Mars at aphelion*
	16	03	49	Saturn 3°.50 N of Moon	June	1	06	22	Moon in descending node
	17	13	47	*Venus at perihelion*		4	01	00	Mercury greatest helio. lat S.
	17	17	24	Neptune 2°.30 N of Moon		4	03	42	FULL MOON
	19	17	31	Jupiter 0°.10 S of Moon		4	04	41	*Mercury 2° 54' S. of Uranus*
	20	04	12	NEW MOON; *Solar Eclipse*		4	11	01	Venus greatest elong. E. (45°.4)
	20	11	31	Moon in ascending node		6	23	06	Moon at perigee
	20	16	23	Pluto in square with Sun		7	06	58	Moon greatest lat. S 5° 04'
	20	20	32	*Venus 7°.54 N. of Aldebaran*		9	20	23	Saturn 3° N of Moon
	21	07	04	Mercury 1°.90 N of Moon		10	19	31	LAST QUARTER
	21	13	00	Uranus 1°.70 S of Moon		11	07	46	Neptune 2° N of Moon
	21	16	08	Mercury stationary in RA		14	00	04	Moon in ascending node
	22	16	47	Mars greatest helio. lat N.		14	06	35	Jupiter 1°.50 S of Moon
	23	13	03	Venus 1°.30 S. of Moon		15	09	54	Uranus 2° S of Moon
	26	02	18	Mars 3°.20 S. of Moon		16	20	39	Mercury 4°.30 S of Moon
	27	07	18	Moon greatest lat. N 5° 14'		17	14	18	*Mercury 4°.47 N. of Aldebaran*
	27	21	20	FIRST QUARTER		18	04	37	NEW MOON
	28	06	43	Moon at apogee		18	15	14	Saturn stationary in RA
May	1	23	28	Mercury in inferior conjunction		19	03	54	Neptune in square with Sun
				0° 42' N of Sun		20	13	21	Moon greatest lat. N 5° 03'
	2	23	17	Pluto stationary in RA		21	14	58	*Summer Solstice*
	4	10	17	Mercury in descending node		22	00	48	Venus 3°.70 S. of Moon
	4	21	57	Moon in descending node		22	10	09	Mars 3°.80 S of Moon
	5	17	34	FULL MOON; *Penumbral Eclipse*		22	18	30	Moon at apogee
	9	05	26	Venus greatest helio. lat N.		23	02	48	Mercury in ascending node
	9	19	55	Uranus in conjunction with Sun		26	07	50	FIRST QUARTER
	10	16	20	Moon greatest lat. S 5° 11'		27	18	48	*Mercury at perihelion*
	10	19	50	*Mars 5°.10 S. of Pollux*		28	12	23	Moon in descending node
	11	05	07	Moon at perigee	July	1	05	06	Mercury in superior conjunction
	12	14	28	LAST QUARTER					1° 16' N of Sun
	13	13	07	Saturn 3°.30 N of Moon		1	13	25	Neptune stationary in RA
	14	06	43	Mercury stationary in RA		3	11	39	FULL MOON
	14	19	10	*Mercury at aphelion*		4	06	51	Venus in descending node
	15	01	25	Neptune 2°.20 N of Moon		4	09	44	Moon greatest lat. S 4° 58'
	17	13	18	Jupiter 0°.80 S of Moon		4	22	26	Moon at perigee
				Occultation		6	19	46	*Earth at aphelion*
	17	19	36	Moon in ascending node		7	03	10	Saturn 2°.70 N of Moon
	18	01	35	Mercury 3°.60 S of Moon		8	00	08	Mercury greatest helio. lat N.
	19	00	22	Uranus 1°.80 S of Moon		8	09	32	*Mercury 4°.96 S. of Pollux*
	19	15	53	NEW MOON		8	14	12	Neptune 1°.70 N of Moon

ASTRONOMICAL DIARY, 2023

UNIVERSAL TIME

	d	h	m			d	h	m	
July	10	01	48	LAST QUARTER	Aug.	30	18	08	Saturn 2°.50 N of Moon
	10	07	55	*Mars 0°.70 N. of Regulus*		31	01	36	FULL MOON
	11	01	22	Moon in ascending node		31	00	15	Mercury greatest helio. lat S.
	11	21	21	Jupiter 2°.20 S of Moon	Sept.	1	07	21	Neptune 1°.40 N of Moon
	12	17	48	Uranus 2°.30 S of Moon					*Occultation*
	17	14	16	Moon greatest lat. N 4° 57'		3	03	37	Venus stationary in RA
	17	18	32	NEW MOON		3	07	43	Moon in ascending node
	19	08	55	Mercury 3°.50 S of Moon		4	19	47	Jupiter 3°.30 S of Moon
	20	06	55	Moon at apogee		4	21	01	Jupiter stationary in RA
	20	08	37	Venus 7°.90 S. of Moon		5	08	45	Uranus 2°.80 S of Moon
	20	23	26	Venus stationary in RA		6	11	11	Mercury in inferior conjunction
	21	04	00	Mars 3°.30 S of Moon					3° 46' S of Sun
	22	03	49	Pluto in opposition with Sun		6	22	21	LAST QUARTER
	25	15	06	Moon in descending node		9	15	55	Moon greatest lat. N 5° 07'
	25	22	07	FIRST QUARTER		11	13	00	Venus 11°.40 S. of Moon
	26	12	40	*Mercury 5° 17' N. of Venus*		12	15	42	Moon at apogee
	29	00	45	*Mercury 0°.11 S. of Regulus*		13	17	42	Mercury 6° S of Moon
	31	09	31	Mercury in descending node		15	00	15	Mercury stationary in RA
	31	12	43	Moon greatest lat. S 4° 59'		15	01	40	NEW MOON
Aug.	1	18	32	FULL MOON		16	19	20	Mars 0°.70 S of Moon
									Occultation
	2	05	52	Moon at perigee		17	19	18	Moon in descending node
	3	10	26	Saturn 2°.50 N of Moon		19	02	06	Mercury in ascending node
	4	22	02	Neptune 1°.50 N of Moon		19	11	18	Neptune in opposition with Sun
	7	00	03	Jupiter in square with Sun		22	13	16	Mercury greatest elong. W. (17°.9)
	7	02	45	Moon in ascending node		22	19	32	FIRST QUARTER
	7	23	59	*Venus at aphelion*		23	06	50	*Autumnal Equinox*
	8	09	44	Jupiter 2°.90 S of Moon		23	18	03	*Mercury at perihelion*
	8	10	28	LAST QUARTER		24	07	35	Moon greatest lat. S 5° 10'
	9	01	03	Uranus 2°.60 S of Moon		27	01	29	Saturn 2°.60 N of Moon
	10	01	47	Mercury greatest elong. E. (27°.4)		28	00	59	Moon at perigee
	10	18	25	*Mercury at aphelion*		28	16	59	Neptune 1°.40 N of Moon
	13	11	16	Venus in inferior conjunction					*Occultation*
				7° 41' S of Sun		29	09	57	FULL MOON
	13	14	40	Moon greatest lat. N 5°		30	16	49	Moon in ascending node
	15	17	00	Venus 13°.30 S. of Moon	Oct.	2	01	19	*Mars 2°.59 N. of Spica*
	16	02	34	Uranus in square with Sun		2	03	20	Jupiter 3°.40 S of Moon
	16	09	38	NEW MOON		2	17	15	Uranus 2°.90 S of Moon
	16	11	54	Moon at apogee		3	23	24	Mercury greatest helio. lat N.
	18	11	25	Mercury 6°.90 S of Moon		6	13	48	LAST QUARTER
	18	23	07	Mars 2°.20 S. of Moon		7	06	42	Moon greatest lat. N 5° 13'
	21	16	23	Moon in descending node		10	03	42	Moon at apogee
	23	04	42	Mercury stationary in RA		10	04	31	*Venus 2°.34 S. of Regulus*
	24	09	57	FIRST QUARTER		10	09	45	Venus 6°.50 S. of Moon
	27	08	28	Saturn in opposition with Sun		10	23	53	Pluto stationary in RA
	27	16	06	Moon greatest lat. S 5° 02'		14	09	33	Mercury 0°.70 N of Moon
	29	03	27	Uranus stationary in RA		14	17	55	NEW MOON; *Solar Eclipse*
	30	03	12	Venus greatest helio. lat S.		15	01	11	Moon in descending node
	30	15	55	Moon at perigee		15	16	17	Mars 1° N of Moon

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	d	h	m			d	h	m	
Oct.	18	02	15	*Mercury 3°.30 N. of Spica*	Nov.	25	11	14	Jupiter 2°.80 S of Moon
	20	05	40	Mercury in superior conjunction		26	09	19	Uranus 2°.80 S of Moon
				0° 47' N of Sun		26	23	31	Mercury greatest helio. lat S.
	21	14	06	Pluto in square with Sun		27	09	16	FULL MOON
	21	10	34	Moon greatest lat. S 5° 15'		28	09	02	*Venus 4°.46 N. of Spica*
	22	03	29	FIRST QUARTER		28	12	36	*Venus at perihelion*
	23	23	14	Venus greatest elong. W. (46°.4)		30	14	10	Moon greatest lat. N 5° 06'
	24	07	56	Saturn 2°.80 N of Moon	Dec.	4	14	28	Mercury greatest elong. E. (21°.3)
	25	10	23	Venus in ascending node		4	18	42	Moon at apogee
	26	01	23	Neptune 1°.50 N of Moon		5	05	49	LAST QUARTER
	26	03	03	Moon at perigee		6	23	48	Neptune stationary in RA
	27	08	52	Mercury in descending node		7	14	08	*Mars 4°.31 N. of Antares*
	28	03	13	Moon in ascending node		8	15	25	Moon in descending node
	28	20	24	FULL MOON; *Lunar Eclipse*		9	16	53	Venus 3°.60 N. of Moon
	29	08	14	Jupiter 3°.10 S of Moon		12	10	55	Mars 3°.60 N of Moon
	29	17	18	*Mercury 0° 22' S. of Mars*		12	23	32	NEW MOON
	30	01	53	Uranus 2°.90 S of Moon		13	04	41	Mercury stationary in RA
Nov.	3	05	03	Jupiter in opposition with Sun		14	05	17	Mercury 4°.40 N of Moon
	3	10	37	Moon greatest lat. N 5° 14'		14	15	02	Moon greatest lat. S 5°
	4	16	59	Saturn stationary in RA		16	01	19	Mercury in ascending node
	5	08	37	LAST QUARTER		16	18	51	Moon at perigee
	6	15	25	Mars in descending node		17	03	44	Neptune in square with Sun
	6	17	41	*Mercury at aphelion*		17	22	01	Saturn 2°.50 N of Moon
	6	21	49	Moon at apogee		19	13	16	Neptune 1°.30 N of Moon
	9	09	30	Venus 1°S. of Moon					*Occultation*
				Occultation		19	18	39	FIRST QUARTER
	11	08	48	Moon in descending node		19	22	24	Venus greatest helio. lat N.
	13	09	27	NEW MOON		20	17	19	*Mercury at perihelion*
	13	13	32	Mars 2°.50 N of Moon		21	13	54	Moon in ascending node
	13	17	20	Uranus in opposition with Sun		22	03	27	*Winter Solstice*
	14	14	39	Mercury 1°.70 N of Moon		22	14	24	Jupiter 2°.60 S of Moon
	16	18	24	*Mercury 2°.58 N. of Antares*		22	18	53	Mercury in inferior conjunction
	17	12	57	Moon greatest lat. S 5° 11'					2° 09' N of Sun
	18	05	43	Mars in conjunction with Sun		23	14	54	Uranus 2°.80 S of Moon
	20	10	50	FIRST QUARTER		27	00	33	FULL MOON
	20	14	06	Saturn 2°.70 N of Moon		27	16	14	Moon greatest lat. N 4° 57'
	21	20	58	Moon at perigee		28	02	46	*Mercury 3° 35' N. of Mars*
	22	07	46	Neptune 1°.50 N of Moon		30	22	40	Mercury greatest helio. lat N.
	23	09	47	Saturn in square with Sun		31	15	09	Jupiter stationary in RA
	24	11	02	Moon in ascending node					

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	0	0.0
1	0028	1694	3361	5028		8361	6	0.1
2	0056	1722	3389	5056	6722	8389	12	0.2
3	0083	1750	3417	5083	6750	8417	18	0.3
4	0111	1778	3444	5111	6778	8444	24	0.4
5	0139	1806	3472	5139	6806	8472	30	0.5
6	0167	1833	3500	5167	6833	8500	36	0.6
7	0194	1861	3528	5194	6861	8528	42	0.7
8	0222	1889	3556	5222	6889	8556	48	0.8
9	0250	1917	3583	5250	6917	8583	54	0.9
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		

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″*	E_0''	E_1''	n	*B″*	E_0''	E_1''
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 Latitude	ONE DEGREE OF Longitude	φ	φ′ - φ	ρ	ONE DEGREE OF Latitude	ONE DEGREE OF 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)

Decli. \ Lat.	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)

Decli. \ Lat.	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, 2023 and materials up to April 20, 2024 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 2024 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, 2024
(JANUARY TO APRIL)

Planet	National Date		Nirayana Date		Gregorian Date		Time (I.S.T) h	m
Mercury sets in the East	Magha	26, 1945 Saka	Magha	26, 5124 Kali	Feb.	08, 2024	11	04
Mercury rises in the West	Phalguna	20, 1945 Saka	Phalguna	10, 5124 Kali	Mar.	10, 2024	11	26
Mercury sets in the West	Chaitra	16, 1946 Saka	Chaitra	22, 5124 Kali	Apr.	24, 2024	24	58
Mars rises in the East	Pausha	24, 1945 Saka	Magha	01, 5124 Kali	Jan.	14,2024	14	05
Saturn sets in the West	Magha	26, 1945 Saka	Phalguna	03, 5124 Kali	Feb	15, 2024	12	27
Saturn rises in the East	Chaitra	01, 1946 Saka	Chaitra	07, 5124 Kali	Mar.	21, 2024	21	14

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, 2024
(JANUARY TO APRIL)

Planet		National Date		Nirayana Date		Gregorian Date	Time (I.S.T) h	m
Mercury	Direct	Pausha	12, 1945 Saka	Pausha	19, 5124 Kali	Jan. 02, 2024	08	54
Mercury	Retrograde	Chaitra	12, 1946 Saka	Chaitra	18, 5124 Kali	April 01, 2024	27	52
Uranus	Direct	Magha	07, 1945 Saka	Magha	14, 5124 Kali	Jan. 27, 2024	13	05

MEAN RAHU, 2024

Date		Longitude ° ′ ″	Date		Longitude ° ′ ″	Date		Longitude ° ′ ″
Jan.	-2	356 47 32	Feb.	7	354 43 31	Mar.	19	352 33 10
	8	356 18 55		17	354 11 44		29	352 01 22
	18	355 47 07		27	353 39 56	Apr.	8	351 29 34
Jan.	28	355 15 19	Mar.	9	353 04 58		18	350 57 47
							28	350 25 59

ECLIPSES, 2024
(JANUARY TO APRIL)

Total Solar eclipse **Not visible in India**

19, Chaitra 1946 SE , 25 Chaitra, 5124 KE, 8 April, 2024

–

SAKA ERA 1944

Makara : Tapas
Winter (Sisira), 1st Month

Month of PAUSHA (30 days)

(*Nirayana*) 8 Pausha, 5123 Kali Era to (*Nirayana*) 7 Magha, 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	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

Uttarayana
Dakshina Gola

SAKA ERA 1944

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), MakaraSamkranti (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

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
	2023A.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, $9^h 44^m.9$.

INDIAN CALENDAR

SAKA ERA 1944

Mina : Madhu
Spring (Vasanta), 1st Month

Month of PHALGUNA (30 days)

(*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

SAKA ERA 1944

Uttarayana
Dakshina Gola

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
	2023A.D.		CHANDRA MAGHA			
1	Feb. 20	SAURA PHALGUNA			1- New Moon ($12^h 35^m.9$)	
2	21		CHANDRA PHALGUNA			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 22h 04m), 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, $6^h 34^m.5$.

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 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	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

INDIAN CALENDAR

SAKA ERA 1945

Month of CHAITRA (30 days)

Uttarayana
Uttara Gola

Ayanamsa on 1st : $24^0 10' 43''$

(*Nirayana*) 8 Chaitra, 5123 Kali Era to (*Nirayana)* 7 Vaisakha, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023 A.D					
1	Mar. 22	SAURA CHAITRA	CHANDRA CHAITRA			1- Indian New Year's Day, Chaitra Sukladi(Gudi Padava, Ugadi) Cheti Chand (Sindhi New Year,s Day), Telugu New Year,s Day, Vasanta Navaratrarambha (or Sthapana Navaratrarambha).
2	23					
3	24					3- Gauri Tritiya (Gangaur), Andolana Tritiya, Sarhul (Bihar).
4	25					
5	26					5- Sri (Lakshmi) Panchami.
6	27					6- Skanda Shashthi.
7	28					7- Vasanti Pujarambha.
8	29					8- Oli Begins (Jain), Annapurna Puja, Ashokashtami (Punarvasu after 20h07m), Mela Bahu Fort(Jammu).
9	30					9- Rama Navami.
10	31			10- Sun Enters Revati nak. ($25^h 36^m.5$)	10- Jupiter sets in the West ($16^h 26^m.0$).	
11	Apr. 1					11- Kamada Ekadasi.
12	2					
13	3				13- Sayana Vyatipata ($24^h 33^m.6$)	13- Ananga Trayodasi.
14	4					14- Mahavira Jayanti Jain), Damanaka Chardasi, Panguni Uttiram.
15	5					15- Birthday Anniversary of Swami Leela Shah(Sindhi), Trivandrum Arat (Kerala).
16	6				16- Full Moon ($10^h 04^m.5$)	16- Chaitri Purnima, Hanumat Jayanti (S.India), Oli Ends(Jain).
17	7					
18	8					
19	9					
20	10					
21	11					
22	12					
23	13			23- Saura Vaisakhad ($16^h 13^m.5$)		
24	14			24- Sun Enters Asvini Nak. ($14^h 59^m.0$)		24- Vaisakhi (Panjab, Haryana, H.P.,Delhi & Odisha), Mesha Samkranti, Chaitra Samkranti,Chadak Puja (Bengal), Cheiraoba (Manipur), Meshadi (Tamil Nadu), Tamil New Year,s Day, Visu (Kerala), Dr. B.R. Ambedkar Jayanti, Beginning of Nirayana5124 K.E.
25	15	SAURA VAISAKHA				25- Vaisakhadi (Bengal) Bahag Bihu (Assam), Shilhenba (Manipur).
26	16				26- Sayana Vaidhriti ($11^h 09^m.4$)	26- Varuthini Ekadasi, Sri Vallabhacharya Jayanti.
27	17					
28	18					
29	19					
30	Apr. 20		CHANDRA VAISAKHA	30- Sun enters Trop. Taurus ($13^h 43^m.6$m)	30- New Moon ($9^h 42^m.5$)	30- Tithi of Deva Damodara(Assam).

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, $14^h 08^m.5$; Vrisha 4, $19^h 25^m.1$; Mithuna 6, $28^h 25^m.4$; Karkata 9, $16^h 15^m.2$;Simha 11, $28^h 48^m.4$; Kanya 14, $16^h 05^m.5$; Tula 16, $25^h 10^m.7$; Vrischika 19, $08^h 02^m.0$; Dhanus 21, $12^h 58^m.3$; Makara 23, $16^h 22^m.1$; Kumbha 25, $18^h 43^m.9$; Mina 27, $20^h 51^m.8$; Mesha 29, $23^h 53^m.1$

Sun enters :- Nirayana Mesha 24, $14^h 59^m.0$m.

SAKA ERA 1945

Vrisha : Sukra

Month of VAISAKHA (31 days)

Summer (Grishma), 1st Month

(*Nirayana*) 8 Vaisakha, 5124 Kali Era to (*Nirayana*) 7 Jyaishtha, 5124 Kali Era

Date	Week Day	Gregorian Date	Sunrise h	m	Apparent Noon h	m	Sunset h	m	Tithi No.	Tithi Ending Moment h	m	Nakshatra No.	Nakshatra Ending Moment h	m	Yoga No.	Yoga Ending Moment h	m
		2023A.D.															
1	Fri	Apr. 21	5	34.8	11	58.8	18	23.0	S 1	8	29.2	2	22	59.5	2	10	58.8
2	Sat	22	5	34.0	11	58.6	18	23.4	2	7	49.7	3	23	24.2	3	9	24.9
3	Sun	23	5	33.2	11	58.4	18	23.8	3	7	47.9	4	24	27.0	4	8	21.0
4	Mon	24	5	32.4	11	58.2	18	24.3	4	8	25.4	5	26	07.3	5	7	48.0
5	Tue	25	5	31.6	11	58.1	18	24.7	S 5	9	40.6	6	28	20.8	6	7	44.3
6	Wed	26	5	30.9	11	57.9	18	25.1	6	11	28.2	7	---	---	7	8	06.0
7	Thu	27	5	30.1	11	57.7	18	25.6	7	13	39.2	7	6	59.6	8	8	46.7
8	Fri	28	5	29.4	11	57.6	18	26.0	8	16	01.9	8	9	52.7	9	9	38.2
9	Sat	29	5	28.7	11	57.4	18	26.4	9	18	22.8	9	12	47.3	10	10	31.0
10	Sun	30	5	27.9	11	57.3	18	26.9	S 10	20	29.2	10	15	30.4	11	11	15.6
11	Mon	May 1	5	27.2	11	57.2	18	27.3	S 11	22	10.2	11	17	51.1	12	11	43.8
12	Tue	2	5	26.6	11	57.0	18	27.8	12	23	18.4	12	19	41.3	13	11	48.9
13	Wed	3	5	25.9	11	56.9	18	28.2	13	23	50.0	13	20	56.3	14	11	26.9
14	Thu	4	5	25.2	11	56.8	18	28.7	14	23	44.5	14	21	35.1	15	10	35.8
15	Fri	5	5	24.6	11	56.7	18	29.1	15	23	04.0	15	21	39.4	16	9	16.2
16	Sat	6	5	24.0	11	56.7	18	29.6	K 1	21	52.7	16	21	13.2	17	7	30.0
															(18	29	20.5)
17	Sun	7	5	23.4	11	56.6	18	30.0	2	20	15.9	17	20	21.4	19	26	52.0
18	Mon	8	5	22.8	11	56.5	18	30.5	3	18	19.3	18	19	10.1	20	24	08.8
19	Tue	9	5	22.2	11	56.5	18	31.0	4	16	08.8	19	17	45.2	21	21	15.6
20	Wed	10	5	21.7	11	56.4	18	31.4	K 5	13	50.0	20	16	12.4	22	18	16.7
21	Thu	11	5	21.1	11	56.4	18	31.9	S 6	11	27.9	21	14	36.9	23	15	16.0
22	Fri	12	5	20.6	11	56.4	18	32.4	7	9	07.1	22	13	03.2	24	12	16.8
23	Sat	13	5	20.1	11	56.3	18	32.8	8	6	51.2	23	11	35.1	25	9	22.2
									(9	28	43.4)						
24	Sun	14	5	19.6	11	56.3	18	33.3	K 10	26	46.7	24	10	15.9	26	6	34.7
															(27	27	56.3)
25	Mon	15	5	19.2	11	56.3	18	33.8	11	25	03.6	25	9	08.3	1	25	29.2
26	Tue	16	5	18.7	11	56.4	18	34.3	12	23	36.8	26	8	15.0	2	23	15.4
27	Wed	17	5	18.3	11	56.4	18	34.7	13	22	29.0	27	7	38.8	3	21	17.1
28	Thu	18	5	17.9	11	56.4	18	35.2	14	21	43.5	1	7	22.6	4	19	36.5
29	Fri	19	5	17.5	11	56.5	18	35.7	K 30	21	23.3	2	7	29.5	5	18	16.0
30	Sat	20	5	17.1	11	56.5	18	36.2	S 1	21	31.4	3	8	02.7	6	17	17.7
31	Sun	21	5	16.8	11	56.6	18	36.6	S 2	22	10.0	4	9	04.6	7	16	43.2

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

Uttarayana
Uttara Gola

SAKA ERA 1945

Month of VAISAKHA (31 days)

Ayanamsa on 1st : $24^{0} 10' 47''$

(*Nirayana*) 8 Vaisakha, 5124 Kali Era to (*Nirayana)* 7 Jyaishtha, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	Apr. 21	SAURA VAISAKHA	CHANDRA VAISAKHA		1- Jupiter enters in Mesha ($29^h 14^m.4$)	
2	22					2- Parasurama jayanti, Akshaya Tritiya, Kedar Badri Yatra
3	23					3- Akshaya Tritiya(Bengal), Varsitapa Samapana(Jain), Babu Kuer Singh Day(Bihar).
4	24					
5	25					5- Sri Sankaracharya Jayanti, Sri Ramanujacharya Jayanti South India).
6	26					6- Sri Ramanujacharya Jayanti, Gangotpatti..
7	27			7- Sun Enters Bharani nak. ($6^h 40^m.7$)		
8	28					
9	29				9- Sayana Vyatipata ($7^h 21^m.3$)	9- Sita Navami..
10	30					10- Trichur Pooram (Kerala).
11	May 1				9- Jupiter rises in ($20^h 58^m.0$) East	11- May Day, Mohini Ekadasi.
12	2					12- Minakshi Kalyanam.
13	3					13- Birth Anniversary of Dada Chellaram (Sindhi).
14	4					14- Nrisimha Chaturdasi.
15	5				15-Full Moon ($23^h 04^m.0$)	15- Vaisakhi Purnima, Bhuddha Purnima.
16	6					
17	7					
18	8					
19	9					19- Birthday of Rabindra nath Tagore.
20	10					
21	11			21- Sun Enters Krittika nak. ($24^h 53^m.4$)	21-Sayana Vaidhriti ($23^h 06^m.3$)	
22	12					
23	13					
24	14			24- Saura Jyaishthadi ($12^h 36^m.3$)		
25	15					25- Apara Ekadasi, Bhadrakali Ekadasi (Punjab).
26	16	SAURA JYAISHTHA				
27	17					
28	18					28- Savitri Chaturdasi, Phalaharini Kalika Puja.
29	19				29-New moon ($21^h 23^m.3$)	29- Vata Savitri Vrata (Amavasya Paksha).
30	20		CHANDRA JYAISHTHA			
31	May 21			31- Sun Enters Trop.Gemini ($12^h 39^m.1$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :-Vrisha1, $29^h 02^m.1$; Mithuna 4, $13^h 12^m.6$;Karkata 6, $24^h 18^m.1$;Simha 9, $12^h 47^m.3$;Kanya 11, $24^h 21^m.8$; Tula 14, $9^h 20^m.2$;Vrischika 16,$15^h 22^m.3$;Dhanus 18, $19^h 10^m.1$; Makara 20, $21^h 48^m.6$; Kumbha22, $24^h 18^m.2$;Mina 24, $27^h 23^m.9$; Mesha 27, $7^h 38^m.8$;Vrisha 29, $13^h 35^m.2$; Mithuna 31, $21^h 47^m.0$; Sun enters :-Nirayana Vrisha 25, $11^h 44^m.9$

SAKA ERA 1945

Month of JYAISHTHA (31 days)

Mithuna :Suchi
Summer (Grishma), 2nd Month

(*Nirayana*) 8 Jyaishtha, 5124 Kali Era to (*Nirayana)* 7 Ashadha, 5124 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
		2023 A.D.															
1	Mon	May 22	5	16.4	11	56.6	18	37.1	S 3	23	19.6	5	10	36.8	8	16	33.0
2	Tue	23	5	16.1	11	56.7	18	37.6	4	24	58.4	6	12	38.5	9	16	46.0
3	Wed	24	5	15.8	11	56.8	18	38.0	S 5	27	01.3	7	15	06.3	10	17	19.3
4	Thu	25	5	15.5	11	56.9	18	38.5	6	---	---	8	17	53.5	11	18	07.3
5	Fri	26	5	15.3	11	57.0	18	39.0	6	5	20.1	9	20	49.9	12	19	02.8
6	Sat	27	5	15.0	11	57.1	18	39.4	7	7	43.2	10	23	43.2	13	19	56.5
7	Sun	28	5	14.8	11	57.2	18	39.9	8	9	57.4	11	26	20.2	14	20	38.8
8	Mon	29	5	14.6	11	57.4	18	40.3	9	11	49.6	12	28	28.9	15	21	00.5
9	Tue	30	5	14.5	11	57.5	18	40.8	S 10	13	08.5	13	----	----	16	20	54.0
10	Wed	31	5	14.3	11	57.6	18	41.2	11	13	46.4	13	6	00.0	17	20	14.3
11	Thu	June 1	5	14.1	11	57.8	18	41.6	12	13	39.7	14	6	48.4	18	18	59.2
12	Fri	2	5	14.0	11	57.9	18	42.1	13	12	48.8	15	6	52.8	19	17	09.2
13	Sat	3	5	13.9	11	58.1	18	42.5	14	11	17.4	16	6	16.0	20	14	47.3
												(17	29	03.5)			
14	Sun	4	5	13.8	11	58.3	18	42.9	S 15	9	11.7	18	27	23.0	21	11	58.3
15	Mon	5	5	13.8	11	58.4	18	43.3	K 1	6	39.5	19	25	23.2	22	8	48.4
									(2	27	49.5)						
16	Thu	6	5	13.7	11	58.6	18	43.7	3	24	50.6	20	23	13.4	23	5	24.5
															(24	25	53.8)
17	Wed	7	5	13.7	11	58.8	18	44.1	4	21	51.2	21	21	02.6	25	22	23.0
18	Thu	8	5	13.7	11	59.0	18	44.5	K 5	18	59.3	22	18	58.9	26	18	58.6
19	Fri	9	5	13.7	11	59.2	18	44.8	6	16	21.3	23	17	09.3	27	15	45.8
20	Sat	10	5	13.7	11	59.4	18	45.2	7	14	02.4	24	15	39.1	1	12	48.8
21	Sun	11	5	13.8	11	59.6	18	45.6	8	12	06.4	25	14	31.9	2	10	10.4
22	Mon	12	5	13.8	11	59.8	18	45.9	9	10	35.2	26	13	49.5	3	7	52.3
23	Tue	13	5	13.9	12	00.0	18	46.2	K 10	9	29.4	27	13	32.5	4	5	54.8
															(5	28	17.7)
24	Wed	14	5	14.0	12	00.2	18	46.5	11	8	48.8	1	13	40.2	6	27	00.3
25	Thu	15	5	14.1	12	00.4	18	46.8	12	8	32.8	2	14	11.9	7	26	01.9
26	Fri	16	5	14.2	12	00.6	18	47.1	13	8	40.6	3	15	07.0	8	25	22.3
27	Sat	17	5	14.4	12	00.8	18	47.4	14	9	12.0	4	16	25.2	9	25	01.3
28	Sun	18	5	14.5	12	01.1	18	47.7	K 30	10	07.1	5	18	06.5	10	24	58.9
29	Mon	19	5	14.7	12	01.3	18	47.9	S 1	11	26.0	6	20	10.7	11	25	14.6
30	Tue	20	5	14.9	12	01.5	18	48.2	2	13	07.8	7	22	36.5	12	25	47.2
31	Wed	21	5	15.1	12	01.7	18	48.4	S 3	15	10.2	8	25	20.9	13	26	34.2

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

Uttarayana — SAKA ERA 1945

Uttara Gola — Month of JYAISHTHA (31 days) — Ayanamsa on 1st : $24^0 10' 52''$

(Nirayana) 8 Jyaishtha, 5124 Kali Era to *(Nirayana)* 7 Ashadha, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	May 22	JYAISHTHA	JYAISHTHA			1- Rambha Tritiya, Pratap Jayanti (Rajasthan).
2	23					2- Guru Arjan Dev's Martyrdom Day (Sikh).
3	24				3- Sayana Vyatipata ($14^h 12^m.1$)	
4	25			4- Sun enters Rohini nak. ($20^h 59^m.1$)		4- Vindhyavasini Puja, Aranya Shashthi (Bengal), Jamatri Shashthi.
5	26					
6	27					
7	28					7- Mela Kshir Bhawani (Kashmir).
8	29					
9	30					9- Ganga Dasahara (Hasta nak. Ahoratra)
	31					
10						10-Nirjala Ekadasi.
11	June 1					11-Champka Dvadasi.
12	2					
13	3					13-Vata Savitri Vrata (Purnima Paksha).
14	4				14- Full Moon ($9^h 11^m.7$)	14-Deva Snana Purnima.
15	5	SAURA	CHANDRA			15-Guru Hargobind's Bithday.
16	6				16- Sayana Vaidhriti ($13^h 03^m.3$)	
17	7					
18	8			18-Sun enters Mrigasiras nak. ($18^h 54^m.1$)		
19	9					
20	10					
21	11					
22	12					
23	13					
24	14			24-Saura Ashadhadi ($18^h 51^m.7$)		24-Yogini Ekadasi.
25	15					25-Rajas Samkranti (Odisha).
26	16	SAURA ASHADHA				
27	17					
28	18				28-New moon ($10^h 07^m.1$)	
29	19		CHANDRA ASHADHA			29-Manoratha Dvitiya, Vrata.
30	20				28-Sayana Vyatipata ($21^h 56^m.9$)	30-Rathayatra.
31	June 21			31-Sun enters Trop.Cancer ($20^h 27^m.8$)		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:- Karkata 3, $8^h 27^m.2$; Simha 5, $20^h 49^m.9$; Kanya 8, $8^h 55^m.4$; Tula 10, $18^h 29^m.7$; Vrischika 12, $24^h 28^m.8$;Dhanus 14, $27^h 22^m.9$;Makara 16, $28^h 40^m.4$; Kumbha 19, $6^h 01^m.9$;Mina 21, $8^h 46^m.4$; Mesha 23, $13^h 32^m.5$;Vrisha 25, $20^h 23^m.5$;Mithuna 27, $29^h 12^m.9$; Karkata 30, $15^h 58^m.2$; Sun enters :-Nirayana Mithuna 25, $18^h 16^m.3$

INDIAN CALENDAR

SAKA ERA 1945

Karkata : Nabhas

Month of ASHADHA (31 days)

Rains (Varsa), 1st Month

(*Nirayana* 8 Ashadha, 5124 Kali Era to (*Nirayana)* 7 Sravana, 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	Thu	June 22	5	15.3	12	01.9	18	48.6	S 4	17	28.4	9	28	17.8	14	27	30.9
2	Fri	23	5	15.6	12	02.2	18	48.8	S 5	19	54.5	10	----	----	15	28	30.9
3	Sat	24	5	15.8	12	02.4	18	49.0	6	22	17.8	10	7	18.4	16	---	----
4	Sun	25	5	16.1	12	02.6	18	49.1	7	24	25.6	11	10	11.3	16	5	25.8
5	Mon	26	5	16.4	12	02.8	18	49.3	8	26	05.2	12	12	43.7	17	6	06.2
6	Tue	27	5	16.6	12	03.0	18	49.4	9	27	05.6	13	14	43.4	18	6	22.8
7	Wed	28	5	16.9	12	03.2	18	49.5	S 10	27	19.2	14	16	00.7	19	6	07.8
															(20	29	15.4)
8	Thu	29	5	17.2	12	03.4	18	49.6	11	26	42.7	15	16	30.0	21	27	43.2
9	Fri	30	5	17.6	12	03.6	18	49.7	12	25	17.3	16	16	10.1	22	25	31.5
10	Sat	Jul. 1	5	17.9	12	03.8	18	49.7	13	23	07.8	17	15	03.9	23	22	43.8
11	Sun	2	5	18.2	12	04.0	18	49.8	14	20	21.8	18	13	18.2	24	19	25.8
12	Mon	3	5	18.6	12	04.2	18	49.8	S 15	17	08.6	19	11	01.7	25	15	44.7
13	Tue	4	5	18.9	12	04.4	18	49.8	K 1	13	38.7	20	8	25.1	26	11	49.0
14	Wed	5	5	19.3	12	04.6	18	49.8	2	10	02.6	21	5	39.5	27	7	47.2
												(22	26	56.1)	(1	27	48.2)
15	Thu	6	5	19.6	12	04.7	18	49.7	3	6	30.8	23	24	25.3	2	23	59.9
									(4	27	13.1)						
16	Fri	7	5	20.0	12	04.9	18	49.7	K 5	24	18.0	24	22	16.2	3	20	29.6
17	Sat	8	5	20.4	12	05.0	18	49.6	6	21	52.2	25	20	36.0	4	17	22.7
18	Sun	9	5	20.8	12	05.2	18	49.5	7	20	00.3	26	19	29.6	5	14	43.2
19	Mon	10	5	21.2	12	05.3	18	49.4	8	18	44.7	27	18	59.2	6	12	33.1
20	Tue	11	5	21.6	12	05.5	18	49.3	9	18	05.3	1	19	04.7	7	10	52.4
21	Wed	12	5	22.0	12	05.6	18	49.1	K 10	18	00.0	2	19	43.6	8	9	39.6
22	Thu	13	5	22.4	12	05.7	18	48.9	11	18	25.4	3	20	52.2	9	8	52.2
23	Fri	14	5	22.8	12	05.9	18	48.7	12	19	17.6	4	22	26.7	10	8	27.1
24	Sat	15	5	23.3	12	06.0	18	48.5	13	20	33.0	5	24	23.2	11	8	21.2
25	Sun	16	5	23.7	12	06.1	18	48.3	14	22	08.5	6	26	38.9	12	8	32.0
26	Mon	17	5	24.1	12	06.2	18	48.0	K 30	24	01.8	7	29	11.3	13	8	57.4
27	Tue	18	5	24.6	12	06.2	18	47.8	S 1	26	10.4	8	----	----	14	9	35.6
28	Wed	19	5	25.0	12	06.3	18	47.5	2	28	31.0	8	7	57.8	15	10	24.7
29	Thu	20	5	25.4	12	06.4	18	47.1	3	----	----	9	10	55.1	16	11	22.0
30	Fri	21	5	25.9	12	06.4	18	46.8	3	6	58.9	10	13	57.9	17	12	23.6
31	Sat	22	5	26.3	12	06.5	18	46.5	S 4	9	26.8	11	16	58.5	18	13	23.9

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

SAKA ERA 1945

Dakshinayana | Month of ASHADHA (31 days)

Uttara Gola | Ayanamsa on 1st : $24^{0}\,10^{\prime}\,58^{\prime\prime}$

Nirayana) 8 Ashadha, 5124 Kali Era to (*Nirayana*) 7 Sravana, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	June 22	SAURA ASHADHA	CHANDRA ASHADHA	1- Sun Enters Ardra nak. ($17^h49^m.1$)		
2	23					
3	24					3- Kumara Shashthi (Vrata).
4	25					4- Vivasvat Saptami.
5	26					5- Kharchi Puja (Tripura).
6	27					6- Mela Sharik Bhagwati (Kashmir).
7	28					7- Punaryatra, Ultaratha (Odisha), Bahudha Yatra.
8	29					8- Harisayani Ekadasi.
9	30					
10	July 1					
11	2				11- Sayana Vaidhriti ($6^h29^m.4$)	11- Mela Jwalamukhi (Kashmir).
12	3				12- Full Moon ($17^h08^m.6$)	12- Guru Purnima, Vyasa Puja, Asadhi Purnima.
13	4					
14	5					
15	6			15- Sun enters Punarvasu nak. ($17^h26^m.9$)		
16	7					16- Naga Panchami (Bengal).
17	8					
18	9					
19	10					
20	11					20- Ker Puja (Tripura)
21	12					
22	13					22- Kamika Ekadasi, Martyr's Day (Kashmir).
23	14				23- Sayana Vyatipata ($5^h25^m.5$)	
24	15					
25	16			25- Saura Sravanadi ($5^h37^m.8$)		
26	17	SAURA SRAVANA			26- New Moon ($24^h01^m.8$)	26- Chitalagi Amavasya (Odisha), Adi Amavasya (Tamilnadu), Karkataka Vavu (Kerala), Manasa puja Begins (Bengal).
27	18		CHANDRA SRAVANA MALA			
28	19					
29	20			29- Sun enters Pushya nak. ($16^h56^m.2$)		
30	21					30- Adi Puram (S. India).
31	July 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:-Simha 1, $28^h\,17^m.8$; Kanya 4,$16^h\,51^m.9$;Tula 6,$27^h\,27^m.8$;Vrischika 9, $10^h\,19^m.6$; Dhanus 11,$13^h\,18^m.2$; Makara 13, $13^h\,44^m.1$;Kumbha 15, $13^h\,38^m.5$;Mina 17, $14^h\,58^m.0$;Mesha 19,$18^h\,59^m.2$;Vrisha 21,$25^h\,58^m.1$; Mithuna 24,$11^h\,22^m.4$; Karkata 26,$22^h\,31^m.8$; Simha 29, $10^h\,55^m.1$; Kanya 31,$23^h\,42^m.1$; Sun enters:-Nirayana Karkata 25, $29^h\,07^m.1$

SAKA ERA 1945

Simha : Nabhasya

Month of SRAVANA (31 days)

Rains (Varsa), 2nd Month

(*Nirayana*) 8 Sravana, 5124 Kali Era to (*Nirayana)* 7 Bhadra, 5124 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
		2023 A.D.															
1	Sun	July 23	5	26.7	12	06.5	18	46.1	S 5	11	45.3	12	19	47.0	19	14	15.8
2	Mon	24	5	27.2	12	06.5	18	45.7	6	13	43.2	13	22	12.3	20	14	51.1
3	Tue	25	5	27.6	12	06.6	18	45.3	7	15	09.1	14	24	03.1	21	15	01.2
4	Wed	26	5	28.0	12	06.6	18	44.8	8	15	52.9	15	25	10.2	22	14	38.7
5	Thu	27	5	28.5	12	06.6	18	44.4	9	15	48.1	16	25	28.1	23	13	37.9
6	Fri	28	5	28.9	12	06.6	18	43.9	S 10	14	51.8	17	24	55.3	24	11	56.1
7	Sat	29	5	29.3	12	06.5	18	43.4	11	13	05.6	18	23	34.6	25	9	33.6
8	Sun	30	5	29.8	12	06.5	18	42.9	12	10	34.8	19	21	32.6	26	6	33.5
															(27	27	01.3)
9	Mon	31	5	30.2	12	06.4	18	42.4	13	7	27.1	20	18	58.4	1	23	04.6
									(14	27	52.4)						
10	Tue	Aug. 1	5	30.6	12	06.4	18	41.8	S 15	24	01.6	21	16	03.1	2	18	52.2
11	Wed	2	5	31.1	12	06.3	18	41.3	K 1	20	06.2	22	12	58.3	3	14	33.3
12	Thu	3	5	31.5	12	06.3	18	40.7	2	16	17.3	23	9	56.1	4	10	17.2
13	Fri	4	5	31.9	12	06.2	18	40.1	3	12	45.6	24	7	08.0	5	6	13.0
												(25	28	44.5)	(6	26	29.0)
14	Sat	5	5	32.3	12	06.1	18	39.5	4	9	40.6	26	26	54.4	7	23	11.8
15	Sun	6	5	32.7	12	06.0	18	38.9	K 5	7	10.4	27	25	43.9	8	20	26.5
									(6	29	20.8)						
16	Mon	7	5	33.1	12	05.9	18	38.2	7	28	14.9	1	25	16.4	9	18	16.1
17	Tue	8	5	33.6	12	05.7	18	37.5	8	27	52.8	2	25	32.3	10	16	41.1
18	Wed	9	5	34.0	12	05.6	18	36.9	9	28	11.8	3	26	28.9	11	15	40.2
19	Thu	10	5	34.4	12	05.4	18	36.2	K 10	29	06.9	4	28	01.1	12	15	09.8
20	Fri	11	5	34.8	12	05.3	18	35.5	11	----	----	5	----	----	13	15	05.5
21	Sat	12	5	35.2	12	05.1	18	34.7	11	6	32.0	5	6	02.5	14	15	22.2
22	Sun	13	5	35.5	12	05.0	18	34.0	12	8	20.3	6	8	26.5	15	15	55.0
23	Mon	14	5	35.9	12	04.8	18	33.2	13	10	25.9	7	11	06.9	16	16	39.6
24	Tue	15	5	36.3	12	04.6	18	32.5	14	12	43.3	8	13	58.7	17	17	32.3
25	Wed	16	5	36.7	12	04.4	18	31.7	K 30	15	08.2	9	16	57.3	18	18	30.0
26	Thu	17	5	37.1	12	04.2	18	30.9	S 1	17	36.1	10	19	58.4	19	19	29.4
27	Fri	18	5	37.5	12	04.0	18	30.1	2	20	02.1	11	22	57.2	20	20	27.1
28	Sat	19	5	37.8	12	03.8	18	29.2	3	22	20.1	12	25	47.5	21	21	18.5
29	Sun	20	5	38.2	12	03.5	18	28.4	4	24	22.5	13	28	21.8	22	21	58.2
30	Mon	21	5	38.5	12	03.3	18	27.6	S 5	26	00.9	14	---	---	23	22	20.1
31	Tue	22	5	38.9	12	03.0	18	26.7	S 6	27	06.5	14	6	31.6	24	22	17.6

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

Dakshinayana
Uttara Gola

SAKA ERA 1945
Month of SRAVANA (31 days)

Ayanamsa on 1st : $24^0 11^{/} 02^{//}$

(Nirayana) 8 Sravana, 5124 Kali Era to *(Nirayana)* 7 Bhadra, 5124 Kali Era

Date	Gergorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	July 23	SAURA SRAVANA	CHANDRA SRAVANA MALA	1- Sun enters trop. Leo ($7^h20^m.4$).	1- Sayana Vaidhriti ($21^h55^m.1$)	
2	24					
3	25					
4	26					
5	27					
6	28					
7	29					7- Padmini Ekadasi (Purusottami)
8	30					
9	31					
10	Aug. 1				10- Full moon ($24^h01^m.6$)	10- Tilak Commemoration Day.
11	2					
12	3			12- Sun enters Aslesha nak. ($15^h52^m.5$)		
13	4				13- Venus sets in ($14^h 59^m.0$) West	
14	5					
15	6					
16	7					
17	8				17- Sayana Vyatipata ($13^h 50^m.9$)	
18	9					
19	10					
20	11					
21	12					21- Kamala Ekadasi (Purusottami).
22	13					
23	14					
24	15					24- Independence Day.
25	16		CHANDRA SRAVANA SUDDHA	25- Saura Bhadrapadadi ($14^h11^m.7$)	25- New moon ($15^h 08^m.2$)	
26	17	SAURA BHADRAPADA		26- Sun enters Magha nak. ($13^h32^m.5$)	26- Venus rises in ($26^h03^m.0$) East	26- Manasha Puja Ends (Bengal).
27	18					27- Beginning of Kollam Era, Simhadi (Kerala), Tithi of Sri Sankara Deva.
28	19					28- Madhusrava Tritiya (Teej).
29	20					29- Vinayaka Chaturthi (Tamil Nadu), Haritalika Chaturthi.
30	21					30- Naga Panchami.
31	Aug. 22				31- Sayana Vaidhriti ($7^h 17^m.5$)	

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Tula 3, $11^h 12^m.6$; Vrischika 5, $19^h 28^m.4$; Dhanus 7, $23^h 34^m.6$; Makara 9, $24^h 16^m.1$;Kumbha 11, $23^h 26^m.1$; Mina 13, $23^h 17^m.7$;Mesha 15, $25^h 43^m.9$;Vrisha 18, $7^h 42^m.7$; Mithuna 20,$16^h 58^m.5$; Karkata 22, $28^h 25^m.6$; Simha 25, $16^h 57^m.3$; Kanya 28, $5^h 40^m.8$; Tula 30, $17^h 30^m.3$; Sun enters: Nirayana Simha 26, $13^h 32^m.5$.

SAKA ERA 1945

Kanya: Isha

Month of BHADRA (31 days) Autumn (Sarat), 1st Month

(*Nirayana*) 8 Bhadra, 5124 Kali Era to (*Nirayana)* 7 Asvina, 5124 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
		2023 A.D.									
1	Wed	Aug. 23	5 39.3	12 02.8	18 25.8	S 7	27 31.6	15	8 08.1	25	21 44.5
2	Thu	24	5 39.6	12 02.5	18 25.0	8	27 11.0	16	9 03.9	26	20 36.2
3	Fri	25	5 40.0	12 02.2	18 24.1	9	26 02.9	17	9 14.2	27	18 50.0
4	Sat	26	5 40.3	12 02.0	18 23.2	S 10	24 08.6	18	8 37.5	1	16 25.8
5	Sun	27	5 40.6	12 01.7	18 22.2	11	21 32.9	19	7 16.0	2	13 26.2
								(20	29 15.2)		
6	Mon	28	5 41.0	12 01.4	18 21.3	12	18 23.1	21	26 43.2	3	9 55.8
7	Tue	29	5 41.3	12 01.1	18 20.4	13	14 48.4	22	23 49.9	4	6 01.3
										(5	25 50.5)
8	Wed	30	5 41.6	12 00.8	18 19.5	14	10 59.0	23	20 46.7	6	21 32.2
9	Thu	31	5 42.0	12 00.5	18 18.5	S 15	7 05.6	24	17 45.0	7	17 15.5
						(K 1	27 19.4)				
10	Fri	Sept. 1	5 42.3	12 00.2	18 17.6	2	23 50.9	25	14 56.1	8	21 09.3
11	Sat	2	5 42.6	11 59.8	18 16.6	3	20 50.0	26	12 30.8	9	9 21.9
12	Sun	3	5 42.9	11 59.5	18 15.6	4	18 25.0	27	10 38.5	10	6 00.6
										(11	27 11.6)
13	Mon	4	5 43.2	11 59.2	18 14.6	K 5	16 42.5	1	9 26.6	12	24 58.6
14	Tue	5	5 43.5	11 58.9	18 13.7	6	15 46.6	2	8 59.9	13	23 23.4
15	Wed	6	5 43.9	11 58.5	18 12.7	7	15 38.1	3	9 19.9	14	22 25.4
16	Thu	7	5 44.2	11 58.2	18 11.7	8	16 14.7	4	10 24.8	15	22 01.5
17	Fri	8	5 44.5	11 57.8	18 10.7	9	17 30.8	5	12 09.5	16	22 06.7
18	Sat	9	5 44.8	11 57.5	18 09.7	K 10	19 18.6	6	14 26.4	17	22 34.9
19	Sun	10	5 45.1	11 57.1	18 08.7	11	21 28.9	7	17 06.5	18	23 19.2
20	Mon	11	5 45.4	11 56.8	18 07.7	12	23 52.8	8	20 00.9	19	24 13.1
21	Tue	12	5 45.7	11 56.4	18 06.7	13	26 21.9	9	23 01.4	20	25 10.8
22	Wed	13	5 46.0	11 56.1	18 05.7	14	28 49.5	10	26 01.0	21	26 07.4
23	Thu	14	5 46.3	11 55.7	18 04.6	K 30	--- ----	11	28 54.1	22	26 58.8
24	Fri	15	5 46.6	11 55.4	18 03.6	K 30	7 09.8	12	---- ----	23	27 41.5
25	Sat	16	5 46.9	11 55.0	18 02.6	S 1	9 18.0	12	7 35.9	24	28 12.1
26	Sun	17	5 47.2	11 54.7	18 01.6	2	11 09.5	13	10 02.0	25	28 27.3
27	Mon	18	5 47.5	11 54.3	18 00.6	3	12 39.6	14	12 07.6	26	28 23.6
28	Tue	19	5 47.9	11 54.0	17 59.5	4	13 43.6	15	13 48.1	27	27 57.3
29	Wed	20	5 48.2	11 53.6	17 58.5	S 5	14 16.7	16	14 58.6	1	27 04.9
30	Thu	21	5 48.5	11 53.2	17 57.5	6	14 15.0	17	15 35.0	2	25 43.8
31	Fri	22	5 48.8	11 52.9	17 56.5	S 7	13 35.8	18	15 34.5	3	23 52.3

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

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Dakshinayana — SAKA ERA 1945

Uttara Gola — Month of BHADRA (31 days) — Ayanamsa on 1st : $24^0 11^/ 07^{//}$

(*Nirayana*) 8 Bhadra, 5124 Kali Era to (*Nirayana)* 7 Asvina, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023 A.D.					
1	Aug. 23	SAURA BHADRAPADA	CHANDRA SRAVANA SUDDHA	1- Sun enters Trop.Virgo ($14^h 31^m.3$)		1- Goswami Tulasidas Jayanti.
2	24					2- Durvashtami.
3	25					3- Vara Maha Lakshmi Vrata (S. India)
4	26					
5	27					5- Jhulana Yatrarambha, Pavitra Ekadasi.
6	28					6- First Onam Day.
7	29					7- Onam or Thiru Onam Day (Kerala), Rik Upakarma.
8	30					8- Third Onam Day, Raksha Bandhana, Jhulana Yatra Samapana (Prodosa), Balabhadra Puja (Odisha), Naroli Purnima, Avani Avittam(S. India), Yaju Upakarma, Sravani Purnima.
9	31			9- Sun enters Purva Phalguni nak. ($9^h 32^m.3$)	9- Full Moon ($7^h 05^m.6$)	9- Fourth Onam Day, Sri Narayan Guru Deva's Birthdav (Kelala), Jhulana vatra Samapana, Amarnath Yatra, Solono (Rakhi Bandhan), Gayatri Japam.
10	Sept. 1					
11	2				11- Sayana Vyatipata ($27^h 22^m.7$)	11- Teejri (Sindhi)
12	3					12- Bahula Chaturthi (Sankashta Chaturthi), Raksha Panchami (Odisha), Keil Muhurth (Coorg).
13	4					13- Tithi of Sri Madhava Deva (Assam).
14	5					
15	6					15- Janmashtami (Smarta), Janmashtami (Jayanti Yoga), Sri Krishna Jayanti (Tamil Nadu, Kerala, Assam), Vadi Thadri (Sindhi).
16	7					16- Sri Jayanti (Ramanuja), Janmashtami (Vaishnava), Gokulashtami (Nandotsava)
17	8					
18	9					
19	10					19- Aja Ekadasi
20	11					
21	12					21- Paryusana Parvarambha (Chaturthi Paksha-jain), Puryusana Parvarambha (panchami Paksha-jain), Kailas Yatra - 2 days.
22	13			22- Sun enters Uttara Phalguni nak. ($27^h 26^m.1$)		22- Aghora Chaturdasi.
23	14					23- Saptapuri Amavasya (Odisha) Kusotpatini, Pithori.
24	15		CHANDRA BHADRAPADA		24- New Moon ($7^h 09^m.8$) 24- Mars sets in West ($12^h 39^m$)	24- Jain festival.
25	16			25- Saura Asvinadi ($14^h 28^m.6$)	25- Sayana vaidhriti ($12^h 48^m.8$)	25- Samaveda Upakarma.
26	17	SAURA ASVINA				26- Samaveda Upakarma, Visvakarma Puja.
27	18					27- Haritalika Gauri Tritiya.
28	19					28- Ganesha Chaturthi, Samvatsari (chaturthi Paksha -jain),Samvatsari (Panchami Paksha -Jain)
29	20					29- Rishi Panchami, Melapat - 3 days (Jammu & Kashmir)
30	21					30- Surya Shashthi, Samadhi day of Narayana Guru (Kelala)
31	Sept. 22					31- Maha Lakashmi Vratarambha.

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, $26^h 54^m.1$;Dhanus 4, $8^h 37^m.5$;Makara 6,$10^h 39^m.7$;Kumbha 8, $10^h 18^m.9$; Mina 10, $9^h 36^m.5$; Mesha 12, $10^h 38^m.5$; Vrisha 14, $15^h 00^m.6$; Mithuna 16, $23^h 12^m.7$; Karkata 19, $10^h 24^m.8$;Simha 21, $23^h 01^m.4$; Kanya 24, $11^h 35^m.8$;Tula 26, $23^h 07^m.7$;Vrischika 29, $8^h 44^m.0$;Dhanus 31, $15^h 34^m.5$; Sun enters :- Nirayana Kanya 26, $13^h 30^m.9$.

SAKA ERA 1945

Tula : Urja

Month of ASVINA (30 days) Autumn (Sarat), 2nd Month

(*Nirayana*) 8 Asvina, 5124 Kali Era to (*Nirayana*) 7 Kartika, 5124 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	Sep.	23	5	49.1	11	52.5	17	55.5	S	8	12	18.2	19	14	56.2	4	21	30.2
2	Sun		24	5	49.4	11	52.2	17	54.4		9	10	23.8	20	13	41.7	5	18	39.2
3	Mon		25	5	49.7	11	51.8	17	53.4	S	10	7	56.2	21	11	54.8	6	15	22.7
											(11	29	01.2)						
4	Tue		26	5	50.1	11	51.5	17	52.4		12	25	46.0	22	9	41.7	7	11	45.4
5	Wed		27	5	50.4	11	51.1	17	51.4		13	22	19.1	23	7	10.2	8	7	53.5
														(24	28	29.1)	(9	27	54.0)
6	Thu		28	5	50.7	11	50.8	17	50.4		14	18	49.8	25	25	48.5	10	23	54.5
7	Fri		29	5	51.0	11	50.5	17	49.4	S	15	15	27.6	26	23	18.2	11	20	03.0
8	Sat		30	5	51.4	11	50.1	17	48.4	K	1	12	22.0	27	21	08.3	12	16	26.9
9	Sun	Oct.	1	5	51.7	11	49.8	17	47.4		2	9	42.3	1	19	27.7	13	13	13.3
10	Mon		2	5	52.0	11	49.5	17	46.4		3	7	36.8	2	18	24.3	14	10	28.5
11	Tue		3	5	52.4	11	49.2	17	45.5		4	6	12.3	3	18	03.8	15	8	17.3
										(K	5	29	33.4)						
12	Wed		4	5	52.7	11	48.9	17	44.5		6	29	41.8	4	18	29.1	16	6	42.6
																	(17	29	44.9)
13	Thu		5	5	53.1	11	48.5	17	43.5	S	7	----	----	5	19	39.8	18	29	22.2
14	Fri		6	5	53.5	11	48.2	17	42.6		7	6	35.5	6	21	31.6	19	29	30.2
15	Sat		7	5	53.8	11	48.0	17	41.6		8	8	08.9	7	23	56.7	20	----	----
16	Sun		8	5	54.2	11	47.7	17	40.7		9	10	13.2	8	26	45.0	20	6	02.2
17	Mon		9	5	54.6	11	47.4	17	39.7	K	10	12	37.2	9	29	44.8	21	6	50.3
18	Tue		10	5	55.0	11	47.1	17	38.8		11	15	09.1	10	----	----	22	7	46.1
19	Wed		11	5	55.4	11	46.9	17	37.9		12	17	37.8	10	8	45.0	23	8	41.5
20	Thu		12	5	55.7	11	46.6	17	37.0		13	19	54.1	11	11	36.1	24	9	29.6
21	Fri		13	5	56.2	11	46.3	17	36.1		14	21	51.4	12	14	10.7	25	10	05.1
22	Sat		14	5	56.6	11	46.1	17	35.2	K	30	23	25.1	13	16	23.8	26	10	23.9
23	Sun		15	5	57.0	11	45.9	17	34.4	S	1	24	32.9	14	18	12.4	27	10	23.7
24	Mon		16	5	57.4	11	45.7	17	33.5		2	25	13.6	15	19	35.1	1	10	03.1
25	Tue		17	5	57.8	11	45.4	17	32.6		3	25	26.9	16	20	31.1	2	9	21.3
26	Wed		18	5	58.3	11	45.2	17	31.8		4	25	12.9	17	21	00.5	3	8	18.1
27	Thu		19	5	58.7	11	45.1	17	31.0	S	5	24	32.1	18	21	03.6	4	6	53.6
																	(5	29	08.1)
28	Fri		20	5	59.2	11	44.9	17	30.2		6	23	25.3	19	20	41.1	6	27	02.0
29	Sat		21	5	59.6	11	44.7	17	29.4		7	21	53.8	20	19	54.0	7	24	36.2
30	Sun		22	6	00.1	11	44.5	17	28.6	S	8	19	59.5	21	18	44.1	8	21	52.3

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

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INDIAN CALENDAR

Dakshinayana
Dakshina Gola

SAKA ERA 1945

Month of ASVINA (30 days)

Ayanamsa on 1st : $24^{0} 11^{\prime} 11^{\prime\prime}$

(*Nirayana*) 8 Asvina, 5124 Kali Era to (*Nirayana*) 7 Kartika, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	Sept. 23	SAURA ASVINA	CHANDRA BHADRAPADA	1- Sun enters Trop. Libra ($12^h 19^m.9$)		1- Radhashtami, Durvashtami (Bengal), Jalavisuva Day.
2	24					
3	25					3- Dolgyaras(Madhya Pradesh), Parvaparivartani Ekadasi (Smarta)
4	26					4- Parvaparivartani Ekadasi(Vaishnava and Vidhava), Heikra Hitamba(Manipur), Sravana Dvadasi, Vamana Jayanti, Sakrotthana.
5	27			5- Sun enters Hasta nak. ($18^h 55^m.6$)		
6	28				6- Sayana Vyatipata ($21^h 22^m.4$)	6- Ananta Chaturdasi, Indra Purnima
7	29				7- Full Moon ($15^h 27^m.6$)	7- Pitri Paksha Tarpana Begins or Mahalaya Paksha Begins (S.India)
8	30					
9	Oct. 1					
10	2					10- Mahatma Gandhi's Birthday.
11	3					
12	4					
13	5					
14	6					14- Maha Lakshmi Vrata Sampana.
15	7					15- Matri Navami.
16	8					
17	9					
18	10					18- Indira Ekadasi.
19	11			19- Sun enters Chitra nak. ($7^h 59^m.3$)	19- Sayana Vaidhriti ($17^h 54^m.7$)	
20	12					
21	13					
22	14				22- New Moon ($23^h 25^m.1$) 22- Annualar Solar Eclipse (Not visible in India)	22- Mahalaya Amavasya, Sarvapitri Amavasya, Tarpana Layba(Manipur).
23	15		CHANDRA ASVINA			23- Saradiya Navaratrambha, Maharaja Agrasen's Jayanti.
24	16			24- Saura Kartikadi ($26^h 49^m.9$)		
25	17					
26	18	SAURA KARTIKA				26- Kaveri Samkramana Snana.
27	19					27- Upanga Lalita Vrata(Lalita Panchami)
28	20					28- Oli Begins(Jain), Saraswati Avahana.
29	21					29- Durga Puja Begins (Saptami)
30	22					30- Mahastami, Saraswati Visarjana (after $18^h 44^m.1$)

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, $19^h 17^m.8$; Kumbha 4, $20^h 27^m.7$; Mina 6, $20^h 28^m.0$; Mesha 8, $21^h 08^m.3$; Vrisha 10, $24^h 15^m.0$; Mithuna 13, $06^h 59^m.0$; Karkata 15, $17^h 17^m.8$; Simha 17, $29^h 44^m.8$; Kanya 20, $18^h 16^m.5$; Tula 22, $29^h 21^m.3$; Vrischika 25, $14^h 19^m.6$; Dhanus 27, $21^h 03^m.6$; Makara 29, $25^h 38^m.5$; Sun enters :- Nirayana Tula 25, $25^h 29^m.8$.

INDIAN CALENDAR

SAKA ERA 1945

Vrischika : Sahas
Hemanta, 1st Month

Month of KARTIKA (30 days)

(*Nirayana*) 8 Kartika, 5124 Kali Era to (*Nirayana)* 7 Agrahayana, 5124 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	Oct.	23	6 00.6	11 44.4	17 27.8	S 9	17 45.2	22	17 14.1	9	18 52.4
2	Tue		24	6 01.1	11 44.3	17 27.1	S 10	15 14.7	23	15 27.9	10	15 39.3
3	Wed		25	6 01.6	11 44.1	17 26.4	11	12 32.6	24	13 30.1	11	12 16.9
4	Thu		26	6 02.0	11 44.0	17 25.6	12	9 44.6	25	11 26.8	12	8 49.5
											(13	29 22.4)
5	Fri		27	6 02.6	11 43.9	17 24.9	13	6 57.3	26	9 24.7	14	26 01.2
							(14	28 17.9)				
6	Sat		28	6 03.1	11 43.8	17 24.2	S 15	25 54.1	27	7 31.2	15	22 51.9
									(1	29 54.3)		
7	Sun		29	6 03.6	11 43.7	17 23.6	K 1	23 53.5	2	28 41.8	16	20 00.5
8	Mon		30	6 04.1	11 43.7	17 22.9	2	22 23.5	3	28 01.0	17	17 32.7
9	Tue		31	6 04.7	11 43.6	17 22.3	3	21 30.8	4	27 57.9	18	15 33.4
10	Wed	Nov.	1	6 05.2	11 43.6	17 21.7	4	21 19.8	5	28 36.3	19	14 06.1
11	Thu		2	6 05.8	11 43.6	17 21.1	K 5	21 52.8	6	29 57.1	20	13 12.8
12	Fri		3	6 06.3	11 43.5	17 20.5	6	23 08.1	7	--- ----	21	12 52.6
13	Sat		4	6 06.9	11 43.5	17 19.9	7	25 00.0	7	7 57.1	22	13 02.3
14	Sun		5	6 07.5	11 43.6	17 19.4	8	27 18.8	8	10 29.2	23	13 35.8
15	Mon		6	6 08.1	11 43.6	17 18.9	9	29 51.4	9	13 22.5	24	14 24.7
16	Tue		7	6 08.7	11 43.6	17 18.4	K 10	--- ----	10	16 23.8	25	15 19.5
17	Wed		8	6 09.3	11 43.7	17 17.9	K 10	8 23.7	11	19 19.3	26	16 10.1
18	Thu		9	6 09.9	11 43.8	17 17.4	11	10 42.1	12	21 57.2	27	16 47.7
19	Fri		10	6 10.5	11 43.9	17 17.0	12	12 36.0	13	24 08.1	1	17 05.2
20	Sat		11	6 11.1	11 44.0	17 16.6	13	13 58.2	14	25 46.8	2	16 57.9
21	Sun		12	6 11.7	11 44.1	17 16.2	14	14 45.3	15	26 51.3	3	16 23.8
22	Mon		13	6 12.4	11 44.2	17 15.8	K 30	14 57.3	16	27 22.7	4	15 22.6
23	Tue		14	6 13.0	11 44.3	17 15.5	S 1	14 36.8	17	27 24.4	5	13 56.1
24	Wed		15	6 13.7	11 44.5	17 15.2	2	13 47.8	18	27 00.8	6	12 07.1
25	Thu		16	6 14.3	11 44.7	17 14.9	3	12 35.2	19	26 16.8	7	9 59.1
26	Fri		17	6 15.0	11 44.9	17 14.6	4	11 04.0	20	25 17.3	8	7 35.8
											(9	29 00.8)
27	Sat		18	6 15.6	11 45.1	17 14.3	S 5	9 18.8	21	24 06.7	10	26 17.3
28	Sun		19	6 16.3	11 45.3	17 14.1	6	7 23.8	22	22 48.6	11	23 27.9
							(7	29 22.2)				
29	Mon		20	6 17.0	11 45.5	17 13.9	8	27 16.9	23	21 26.0	12	20 34.9
30	Tue		21	6 17.7	11 45.7	17 13.7	S 9	25 10.3	24	20 01.4	13	17 40.2

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

Dakshinayana — SAKA ERA 1945

Dakshina Gola — Month of KARTIKA (30 days) — Ayanamsa on 1st : $24^0 11^{/} 15^{//}$

(*Nirayana*) 8 Kartika, 5124 Kali Era to (*Nirayana)* 7 Agrahayana, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	Oct. 23	SAURA KARTIKA	CHANDRA ASVINA	1- Sun enters Trop. Scorpio ($21^h50^m.8$)		1- Maha Navami, Ayudha Puja, Trivandrum Arat (Kerala).
2	24			2- Sun enters Svati nak. ($18^h26^m.3$)	2- Sayana Vyatipata ($12^h59^m.4$)	2- Vijaya Dasami (Dusehara or Dasahara), Vijaya Dasami (Bengal & Kerala), Madhavacharya Jayanti.
3	25					3- Bharat Milap, Papankusa Ekadasi (Pasankusa).
4	26					
5	27					
6	28				6- Full Moon ($25^h54^m.10$) 6- Partial Lunar Eclipse (Visible in India)	6- Kojagari Lakshmi Puja (Bengal), Kumara Purnima (Odisha), Sarat Purnima,Kojagar (Lakshmindra Puja), Maharshi Valmiki's Birth day, Oli Ends (Jain).
7	29					
8	30					
9	31					
10	Nov. 1					10- Karaka Chaturthi, Dasaratha Chaturthi, Martyrdom Day of Bhagat Kanwar Ram (Sandhi).
11	2					
12	3					
13	4					
14	5				14- Sayana Vaidhriti ($22^h49^m.1$)	14- Ahoyi Astami, Karashtami, Ahoyi Ashtami (Punjab).
15	6			15- Sun enters Visakha nak. ($26^h 40^m.2$)		
16	7					
17	8					
18	9					18- Rama Ekadasi, Govatsa Dvadasi.
19	10					19- Dhana Trayodasi.
20	11					20- Kali Chaturdasi.
21	12					21- Naraka Chaturthi (Purvarunodaya), Hanumajjanma (N. India) (Purvarunodaya), Dipavali (S.India), Dipavali, Kali Puja, Lakshmi Puja, Lakshmi Dipam, Mahavira Nirvana (Jain).
22	13		CHANDRA KARTIKA		22- New Moon ($14^h57^m.3$)	22- Kaumudi Dipam, Kedar Gauri Vrata, Govardhana Puja, Bali Puja, Annakuta.
23	14					23- Kartika Sukladi, Children's Day (Nehru's Birthday).
24	15			24- Saura Margasirshadi ($26^h 58^m.1$)		24- Yama Dvitiya, Visvakarma day, Bhratri Dvitiya,Dwat Puja (Bihar).
25	16					
26	17	SAURA MARGASIRSHA				26- Kartika Puja, Death Anniversary of Lala Lajpat Rai.
27	18				27- Sayana Vyatipata ($23^h33^m.2$)	27- Jnana Panchami (Jain).
28	19			28- Sun enters Anuradha nak. ($8^h38^m.1$)		28- Pratihara Shashthi or Surya Shashthi (Chhat-Bihar).
29	20					29- Gopashtami or Gothastami, Birthday celebration of Sri Prof Ram Panjwani (Sindhi).
30	Nov. 21					30- Jagaddhatri Puja, Akshaya Navami.

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, $28^h 22^m.8$; Mina 3, $29^h 57^m.8$; Mesha 6, $7^h 31.2^m.0$; Vrisha 8, $10^h 28^m.4$; Mithuna 10, $16^h 11^m.8$ Karkata 12, $25^h 23^m.8$; Simha 15, $13^h 22^m.5$; Kanya 17, $26^h 00^m.9$; Tula 20, $13^h 01^m.7$; Vrischika 22, $21^h 17.8^m.0$; Dhanus 24, $27^h 00^m.8$; Makara 27, $7^h 00^m.6$; Kumbha 29, $10^h 07^m.7$; Sun enters :- Nirayana Vrischika 25, $25^h 18^m.9$.

INDIAN CALENDAR

SAKA ERA 1945

Dhanus : Sahasya

Month of AGRAHAYANA (30 days)

Hemanta, 2nd Month

(*Nirayana*) 8 Agrahayana, 5124 Kali Era to (*Nirayana)* 7 Pausha, 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
		2023A.D.															
1	Wed	Nov. 22	6	18.3	11	46.0	17	13.6	S 10	23	04.6	25	18	37.2	14	14	45.6
2	Thu	23	6	19.0	11	46.2	17	13.4	11	21	02.5	26	17	16.0	15	11	53.0
3	Fri	24	6	19.7	11	46.5	17	13.3	12	19	07.2	27	16	00.8	16	9	04.6
4	Sat	25	6	20.4	11	46.8	17	13.2	13	17	22.7	1	14	55.7	17	6	23.3
															(18	27	52.5)
5	Sun	26	6	21.1	11	47.1	17	13.1	14	15	53.9	2	14	05.4	19	25	36.0
6	Mon	27	6	21.7	11	47.4	17	13.1	S 15	14	46.3	3	13	35.5	20	23	38.2
7	Tue	28	6	22.4	11	47.8	17	13.1	K 1	14	05.7	4	13	31.5	21	22	03.2
8	Wed	29	6	23.1	11	48.1	17	13.1	2	13	57.4	5	13	58.8	22	20	54.4
9	Thu	30	6	23.8	11	48.5	17	13.1	3	14	25.6	6	15	01.4	23	20	14.2
10	Fri	Dec. 1	6	24.5	11	48.8	17	13.2	4	15	31.9	7	16	40.6	24	20	03.0
11	Sat	2	6	25.2	11	49.2	17	13.3	K 5	17	14.7	8	18	54.2	25	20	18.5
12	Sun	3	6	25.8	11	49.6	17	13.4	6	19	27.7	9	21	36.0	26	20	55.6
13	Mon	4	6	26.5	11	50.0	17	13.5	7	22	00.1	10	24	35.1	27	21	46.7
14	Tue	5	6	27.2	11	50.4	17	13.6	8	24	37.8	11	27	37.7	1	22	41.5
15	Wed	6	6	27.8	11	50.8	17	13.8	9	27	04.9	12	---	----	2	23	29.4
16	Thu	7	6	28.5	11	51.2	17	14.0	K 10	29	06.7	12	6	28.6	3	23	59.8
17	Fri	8	6	29.2	11	51.6	17	14.2	11	----	----	13	8	53.9	4	24	04.1
18	Sat	9	6	29.8	11	52.1	17	14.5	11	6	31.9	14	10	43.0	5	23	36.5
19	Sun	10	6	30.4	11	52.5	17	14.7	12	7	13.8	15	11	49.9	6	22	34.4
20	Mon	11	6	31.1	11	53.0	17	15.0	13	7	10.6	16	12	13.5	7	20	58.2
									(14	30	24.8)						
21	Tue	12	6	31.7	11	53.5	17	15.3	K 30	29	02.0	17	11	56.6	8	18	51.0
22	Wed	13	6	32.3	11	53.9	17	15.7	S 1	27	09.7	18	11	05.2	9	16	17.6
23	Thu	14	6	32.9	11	54.4	17	16.0	2	24	56.5	19	9	46.9	10	13	24.0
24	Fri	15	6	33.5	11	54.9	17	16.4	3	22	30.9	20	8	10.5	11	10	16.8
												(21	30	24.6)			
25	Sat	16	6	34.1	11	55.4	17	16.8	4	20	01.0	22	28	37.1	12	7	02.5
															(13	27	47.0)
26	Sun	17	6	34.7	11	55.8	17	17.2	S 5	17	33.7	23	26	54.5	14	24	35.4
27	Mon	18	6	35.2	11	56.3	17	17.6	6	15	14.5	24	25	21.8	15	21	31.5
28	Tue	19	6	35.8	11	56.8	17	18.1	7	13	07.4	25	24	02.4	16	18	38.0
29	Wed	20	6	36.3	11	57.3	17	18.5	8	11	14.9	26	22	57.9	17	15	56.4
30	Thu	21	6	36.8	11	57.8	17	19.0	S 9	9	38.0	27	22	09.0	18	13	27.3

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 1945

Dakshina Gola — Month of AGRAHAYANA (30 days) — Ayanamsa on 1st : $24^0 11' 19''$

(*Nirayana*) 8 Agrahayana, 5124 Kali Era to (*Nirayana)* 7 Pausha, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023 A.D.					
1	Nov. 22	SAURA MARGASIRSHA	CHANDRA KARTIK	1- Sun enters Trop. Saggitarius ($19^h 32^m.7$)		
2	23					2- Utthana or Deva Probodhani Ekadasi.
3	24					3- Tulsi Vivaha, Guru Tegh Bahadur's Martyrdom Day.
4	25					4- Vaikuntha Chaturdasi, Vaikuntha Chaturdasi(Prodosa), Bharani Dipam.
5	26					5- Rasayatra, Tripurotsava, Krittika Dipam.
6	27				6- Full Moon ($14^h 46^m.3$)	6- Rasayatra (Vaishnava), Kartiki Purnima, Ratha yatra (Jain), Guru Nanak's Birthday, Pushkar fair, Huthri - 3 Days(Coorg).
7	28					
8	29					
9	30				9- Sayana Vaidhriti ($29^h 02^m.2$)	
10	Dec. 1					
11	2					
12	3			12- Sun enters Jyeshtha nak. ($13^h 01^m.7$)		
13	4					
14	5					14- Kalashtami, Prathamastami (Odisha), Vaikkatashtami(Kerala).
15	6					
16	7					
17	8					
18	9					18- Utpanna Ekadasi.
19	10					
20	11					
21	12				21- New Moon ($29^h 02^m.0$)	
22	13		CHANDRA MARGASIRSHA			
23	14				23- Sayana Vyatipata ($10^h 41^m.4$)	
24	15			24- Saura Paushadi ($17^h 48^m.4$)		
25	16	SAURA PAUSHA		25- Sun enters Mula nak.($15^h 58^m.5$)		
26	17					
27	18					27- Guha Shashthi , Subrahmanya Shashshi (S. India), Champa Shashthi (Maharastra), Mulakarupani Shashthi (Bengal).
28	19					28- Mitra Saptami.
29	20					
30	Dec. 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 :- Mina 1, $12^h 58^m.1$; Mesha 3, $16^h 00^m.8$; Vrisha 5, $19^h 55^m.8$; Mithuna 7, $25^h 41^m.0$;Karkata 10, $10^h 12^m.4$ Simha 12, $21^h 36^m.0$; Kanya 15, $10^h 22^m.1$; Tula 17, $21^h 53^m.4$; Vrischika 20, $6^h 11^m.7$, Dhanus 22, $11^h 05^m.2$; Makara 24, $13^h 44^m.6$; Kumbha 26, $15^h 44^m.8$;Mina 28, $18^h 20^m.9$;Mesha 30, $22^h 09^m.0$;

Sun enters :- Nirayana Dhanus 25, $15^h 58^m.5$.

SAKA ERA 1945

Makara : Tapas

Month of PAUSHA (30 days)

Winter (Sisira), 1st Month

(*Nirayana*) 8 Pausha, 5124 Kali Era to (*Nirayana*) 7 Magha, 5124 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
		2023 A.D.									
1	Fri	Dec. 22	6 37.3	11 58.3	17 19.5	S 10	8 17.1	1	21 35.9	19	11 10.9
2	Sat	23	6 37.8	11 58.8	17 20.0	11	7 12.4	2	21 19.0	20	9 07.4
						(12	30 24.7)				
3	Sun	24	6 38.3	11 59.3	17 20.6	13	29 55.5	3	21 19.3	21	7 17.2
										(22	29 41.5)
4	Mon	25	6 38.7	11 59.8	17 21.1	14	29 47.2	4	21 39.1	23	28 22.0
5	Tue	26	6 39.2	12 00.3	17 21.7	S 15	30 03.2	5	22 21.2	24	27 20.9
6	Wed	27	6 39.6	12 00.8	17 22.2	K 1	---- ----	6	23 28.8	25	26 40.7
7	Thu	28	6 40.0	12 01.3	17 22.8	K 1	6 46.7	7	25 04.7	26	26 23.1
8	Fri	29	6 40.4	12 01.8	17 23.4	2	8 00.2	8	27 09.8	27	26 28.5
9	Sat	30	6 40.7	12 02.2	17 24.0	3	9 44.3	9	29 42.2	1	26 55.5
10	Sun	31	6 41.1	12 02.7	17 24.6	4	11 56.1	10	---- ----	2	27 40.0
		2024A.D.									
11	Mon	Jan. 1	6 41.4	12 03.2	17 25.3	K 5	14 28.8	10	8 36.3	3	28 35.4
12	Tue	2	6 41.7	12 03.7	17 25.9	6	17 11.2	11	11 42.1	4	29 32.5
13	Wed	3	6 42.0	12 04.1	17 26.6	7	19 48.6	12	14 46.2	5	30 20.5
14	Thu	4	6 42.3	12 04.6	17 27.2	8	22 05.2	13	17 33.5	6	---- ----
15	Fri	5	6 42.5	12 05.1	17 27.9	9	23 46.6	14	19 49.6	6	6 48.6
16	Sat	6	6 42.7	12 05.5	17 28.6	K 10	24 42.2	15	21 23.3	7	6 47.3
										(8	30 9.8)
17	Sun	7	6 42.9	12 05.9	17 29.3	11	24 46.5	16	22 08.2	9	28 52.5
18	Mon	8	6 43.1	12 06.4	17 30.0	12	23 59.1	17	22 03.0	10	26 55.5
19	Tue	9	6 43.3	12 06.8	17 30.7	13	22 25.1	18	21 11.3	11	24 22.0
20	Wed	10	6 43.4	12 07.2	17 31.4	14	20 11.2	19	19 40.1	12	21 17.3
21	Thu	11	6 43.5	12 07.6	17 32.1	K 30	17 27.3	20	17 38.9	13	17 48.9
22	Fri	12	6 43.6	12 08.0	17 32.8	S 1	14 23.9	21	15 18.4	14	14 04.8
23	Sat	13	6 43.6	12 08.4	17 33.5	2	11 11.5	22	12 49.5	15	10 13.3
										(16	30 22.5)
24	Sun	14	6 43.7	12 08.8	17 34.2	3	8 00.4	23	10 22.6	17	26 39.6
						(4	28 59.7)				
25	Mon	15	6 43.7	12 09.1	17 34.9	S 5	26 17.1	24	8 07.0	18	23 10.9
								(25	30 10.3)		
26	Tue	16	6 43.7	12 09.5	17 35.6	6	23 58.4	26	28 38.2	19	20 01.0
27	Wed	17	6 43.7	12 09.8	17 36.3	7	22 07.3	27	27 33.8	20	17 12.8
28	Thu	18	6 43.6	12 10.2	17 37.1	8	20 45.3	1	26 58.1	21	14 47.7
29	Fri	19	6 43.5	12 10.5	17 37.8	9	19 52.4	2	26 50.5	22	12 45.7
30	Sat	20	6 43.4	12 10.8	17 38.5	S 10	19 27.1	3	27 09.3	23	11 05.8

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 — SAKA ERA 1945

Dakshina Gola — Month of PAUSHA (30 days) — Ayanamsa on 1st : 24° 11′ 25″

(*Nirayana*) 8 Pausha, 5124 Kali Era to (*Nirayana*) 7 Magha, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	Dec. 22	S A U R A P A U S H A	C H A N D R A M A R G A S I R S H A	1- Sun enters trop. Capricorn ($8^h57^m.3$)		1- Uttarayana day,Mokshada Ekadasi(Smarta), Gita Jayanti.
2	23					2- Mokshada Ekadasi(Vaishnava & Vidhava), Trisprisha Maha Dvadasi, Mauna Ekadasi(Jain), Akhanda Dvadasi, Vaikuntha Ekadasi(S.India).
3	24					
4	25					4- Birthday of Sadhu T.L.Vaswani(Sindhi).
5	26				5- Full Moon ($30^h03^m.2$) 5- Sayana Vaidhriti ($12^h53^m.9$)	5- Margi Purnima, Shri Datta Jayanti (Maharahstra), Datta Treya Jayanti, Jor Mela - 3 days(Punjab).
6	27					6- Arudra Darsanam (Purvarunodaya) (S.India).
7	28					
8	29			8- Sun enters Purvashadha nak.($18^h15^m.6$)		
9	30					
10	31					
	2024A.D.					
11	Jan. 1					
12	2					
13	3					
14	4					14- Ashtaka (Pupashtaka).
15	5					
16	6					16- Birthday of Parsvanath(Jain).
17	7					17- Saphala Ekadasi.
18	8				18- Sayana Vyatipata ($24^h02^m.8$)	
19	9					
20	10					
21	11			21- Sun enters Uttarashadha nak.($20^h13^m.9$)	21- New Moon ($17^h27^m.3$)	21- Vakula Amavasya (Odisha).
22	12		C H A N D R A P A U S H A			
23	13			23- Saura Maghadi ($28^h33^m.1$)		23- Lohri (Punjab, Jammu & Kashmir).
24	14				24- Mars rises in East (14^h05^m)	24- Makara Samkranti(N. India), Bhogi (S. India), Birthday of Sant Parmanand (Sindhi).
25	15	S A U R A M A G H A				25- Makara Samkranti (Bengal), Magha Bihu(Assam), Pongal(S. India), Makara Snana, Tila Samkranti ,Tai Pongal (Kerala).
26	16					26- Mattu Pongal or Kanumu (s. India).
27	17					27- Guru Gobind Singh's Birthday.
28	18					
29	19					
30	Jan. 20			30- Sun Enters Trop. Aquarius ($19^h37^m.3$)	30- Sayana Vaidhriti ($19^h31^m.3$)	30- Samba Dasami(Odisha).

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Vrisha 2, $27^h17^m.4$; Mithuna 5, $9^h57^m.2$; Karkata 7, $18^h38^m.0$; Simha 9, $29^h42^m.2$; Kanya 12, $18^h28^m.8$; Tula 15, $6^h46^m.3$; Vrischika 17, $16^h01^m.7$; Dhanus 19, $21^h11^m.3$; Makara 21, $23^h05^m.1$; Kumbha 23, $23^h35^m.1$; Mina 25, $24^h37^m.4$; Mesha 27, 33^h8^m; Vrisha 30, $8^h52^m.8$; Sun enters :- Nirayana Makara 24, $26^h43^m.7$

INDIAN CALENDAR

SAKA ERA 1945

Kumbha : Tapasya

Month of MAGHA (30 days)

Winter (Sisira), 2nd Month

(*Nirayana*) 8 Magha, 5124 Kali Era to (*Nirayana*) 7 Phalguna, 5124 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
		2024A.D.															
1	Sun	Jan. 21	6	43.3	12	11.1	17	39.2	S 11	19	27.6	4	27	52.4	24	9	46.5
2	Mon	22	6	43.1	12	11.4	17	39.9	12	19	52.2	5	28	58.5	25	8	46.2
3	Tue	23	6	43.0	12	11.6	17	40.6	13	20	39.9	6	30	26.5	26	8	04.0
4	Wed	24	6	42.8	12	11.9	17	41.3	14	21	50.5	7	---	----	27	7	39.3
5	Thu	25	6	42.5	12	12.1	17	42.0	S 15	23	24.0	7	8	16.5	1	7	31.9
6	Fri	26	6	42.3	12	12.4	17	42.7	K 1	25	20.2	8	10	28.4	2	7	41.8
7	Sat	27	6	42.0	12	12.6	17	43.4	2	27	37.3	9	13	01.4	3	8	08.4
8	Sun	28	6	41.7	12	12.8	17	44.1	3	30	11.3	10	15	52.8	4	8	50.1
9	Mon	2	6	41.4	12	13.0	17	44.8	4	----	----	11	18	57.3	5	9	43.3
10	Tue	30	6	41.1	12	13.1	17	45.5	4	8	54.6	12	22	06.2	6	10	42.7
11	Wed	31	6	40.7	12	13.3	17	46.1	K 5	11	36.6	13	25	07.9	7	11	40.5
12	Thu	Feb. 1	6	40.4	12	13.4	17	46.8	6	14	04.1	14	27	49.1	8	12	27.7
13	Fri	2	6	40.0	12	13.6	17	47.5	7	16	03.1	15	29	56.9	9	12	54.3
14	Sat	3	6	39.5	12	13.7	17	48.1	8	17	21.3	16	---	---	10	12	51.4
15	Sun	4	6	39.1	12	13.8	17	48.8	9	17	50.0	16	7	20.6	11	12	12.0
16	Mon	5	6	38.6	12	13.9	17	49.4	K 10	17	25.1	17	7	53.9	12	10	51.7
17	Tue	6	6	38.2	12	14.0	17	50.1	11	16	07.6	18	7	35.2	13	8	49.8
												(19	30	27.4)	(14	30	08.5)
18	Wed	7	6	37.7	12	14.0	17	50.7	12	14	02.4	20	28	37.3	15	26	52.7
19	THu	8	6	37.2	12	14.1	17	51.3	13	11	17.5	21	26	14.3	16	23	09.3
20	Fri	9	6	36.6	12	14.1	17	51.9	14	8	02.8	22	23	29.3	17	19	06.5
									(K 30	28	29.2)						
21	Sat	10	6	36.1	12	14.2	17	52.6	S 1	24	47.8	23	20	33.9	18	14	53.3
22	Sun	11	6	35.5	12	14.2	17	53.2	2	21	09.6	24	17	39.5	19	10	38.3
															(20	30	30.2)
23	Mon	12	6	34.9	12	14.2	17	53.8	3	17	44.9	25	14	56.8	21	26	36.8
24	Tue	13	6	34.3	12	14.2	17	54.3	4	14	42.6	26	12	35.5	22	23	04.6
25	Wed	14	6	33.6	12	14.2	17	54.9	S 5	12	10.2	27	10	43.3	23	19	58.7
26	Thu	15	6	33.0	12	14.1	17	55.5	6	10	13.3	1	9	26.0	24	17	22.4
27	Fri	16	6	32.3	12	14.1	17	56.1	7	8	55.1	2	8	46.8	25	15	17.4
28	Sat	17	6	31.7	12	14.0	17	56.6	8	8	16.5	3	8	46.2	26	13	43.4
29	Sun	18	6	31.0	12	13.9	17	57.2	9	8	16.0	4	9	22.8	27	12	38.7
30	Mon	19	6	30.3	12	13.9	17	57.7	S 10	8	50.6	5	10	33.1	1	12	00.6

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 1945

Dakshina Gola — Month of MAGHA (30 days) — Ayanamsa on 1st : 24° 11′ 31″

(*Nirayana*) 8 Magha, 5124 Kali Era to (*Nirayana)* 7 Phalguna, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun Date	Phenomena	Festivals
	2024A.D.					
1	Jan. 21	SAURA MAGHA	CHANDRA PAUSHA			1- Putrada Ekadasi, Martyrdom day of Hemu Kalani (Sindhi).
2	22					
3	23					3- Netaji's Birthday.
4	24			4- Sun enters Sravana nak. ($22^h 31^m.9$)		
5	25				5- Full Moon ($23^h 24^m.0$)	5- Paushi Purnima, Pushyabhisheka yatra.
6	26					6- Floating Festval/ Tai Poosam, Republic Day.
7	27					
8	28					8- Birthday of Lala Lajpat Rai.
9	29					9- Ganesha Sankastha Chaturthi.
10	30					10- Martyr's day (Mahatma Gandhi Commemoration Day)
11	31					
12	Feb. 1					
13	2					13- Birthday of Swami Vivekanda (According to tithi)
14	3				14- Sayana Vyatipata ($9^h 45^m.7$)	14- Astaka (Mamsastaka).
15	4					
16	5					
17	6			17- Sun enters Dhanishtha Nak.($25^h 43^m.7$)		17- Sattila Ekadasi.
18	7					
19	8					19- Meru Trayadasi(Jain), Ratanti Kalika Puja.
20	9				20- New Moon ($28^h 29^m.2$)	20- Mauni Amavasya, Mahodaya Yoga (Amavasya after $8^h 02^m.8$), Tai Amavasya, Makara Vavu (Kerala).
21	10		CHANDRA MAGHA			21- Magha Sukladi.
22	11					
23	12			23- Saura Phalgunadi ($17^h 21^m.6$)		23- Tila Chaturthi, Kunda Chaturthi.
24	13					24- Varada Chaturthi, Ganesha Puja(Bengal).
25	14	SAURA PHALGUNA			25- Sayana Vaidhriti ($27^h 52^m.9$)	25- Sri Panchami, Saraswati Puja, Vasanta Panchami.
26	15					
27	16					27- Ratha Saptami(Purvarunodaya), Vidhana Saptami, Arogya Saptami, Bhismashtami.
28	17					
29	18					
30	Feb. 19			30- Sun enters Trop. Pisces ($9^h 43^m.1$) 30- Sun enters Satabhisaj nak. ($30^h 11^m.0$)		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 :-Mithuna 2,16 ^{h} $22^m.6$; Karkata 4, 25^h $47^m.0$; Simha 7, 13^h $01^m.4$; Kanya 9, 25^h $44^m.5$; Tula 12, 14^h $31^m.9$; Vrischika 14, 25^h $04^m.3$; Dhanus 17, 7^h $35^m.2$;Makara 19, 10^h $04^m.2$; Kumbha 21, 10^h $02^m.2$; Mina 23, 9^h $35^m.8$; Mesha 25, 10^h $43^m.3$;Vrisha 27, 14^h $43^m.0$; Mithuna 29,21 ^{h} $54^m.0$;

Sun enters :- Nirayana Kumbha 24, 15^h $43^m.8$.

SAKA ERA 1945

Mina : Madhu

Month of PHALGUNA (30 days)

Spring (Vasanta), 1st Month

(*Nirayana*) 8 Phalguna, 5124 Kali Era to (*Nirayana*) 6 Chaitra, 5124 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
		2024A.D.															
1	Tue	Feb. 20	6	29.5	12	13.8	17	58.2	S 11	9	56.1	6	12	13.0	2	11	45.7
2	Wed	21	6	28.8	12	13.7	17	58.8	12	11	28.0	7	14	17.7	3	11	50.6
3	Thu	22	6	28.0	12	13.5	17	59.3	13	13	22.1	8	16	43.2	4	12	12.2
4	Fri	23	6	27.3	12	13.4	17	59.8	14	15	34.2	9	19	25.5	5	12	47.6
5	Sat	24	6	26.5	12	13.3	18	00.3	S 15	18	00.4	10	22	20.6	6	13	34.0
6	Sun	25	6	25.7	12	13.1	18	00.8	K 1	20	36.4	11	25	24.3	7	14	28.2
7	Mon	26	6	24.9	12	13.0	18	01.3	2	23	16.5	12	28	30.8	8	15	26.7
8	Tue	27	6	24.0	12	12.8	18	01.8	3	25	53.7	13	---	---	9	16	24.8
9	Wed	28	6	23.2	12	12.6	18	02.2	4	28	19.0	13	7	33.1	10	17	16.8
10	Thu	29	6	22.4	12	12.4	18	02.7	K 5	---	---	14	10	22.3	11	17	55.8
11	Fri	Mar. 1	6	21.5	12	12.2	18	03.2	K 5	6	22.6	15	12	48.6	12	18	14.5
12	Sat	2	6	20.7	12	12.0	18	03.6	6	7	54.2	16	14	42.3	13	18	06.0
13	Sun	3	6	19.8	12	11.8	18	04.1	7	8	45.2	17	15	55.0	14	17	24.3
14	Mon	4	6	18.9	12	11.6	18	04.5	8	8	49.5	18	16	21.4	15	16	05.5
15	Tue	5	6	18.0	12	11.4	18	05.0	9	8	04.4	19	15	59.7	16	14	07.9
16	Wed	6	6	17.1	12	11.2	18	05.4	K 10	6	31.2	20	14	51.8	17	11	32.8
									(11	28	14.1)						
17	Thu	7	6	16.2	12	10.9	18	05.8	12	25	20.2	21	13	02.9	18	8	23.5
															(19	28	45.5)
18	Fri	8	6	15.3	12	10.7	18	06.3	13	21	58.2	22	10	40.9	20	24	45.7
19	Sat	9	6	14.4	12	10.4	18	06.7	14	18	18.2	23	7	55.1	21	20	32.2
												(24	28	56.2)			
20	Sun	10	6	13.4	12	10.2	18	07.1	K 30	14	30.4	25	25	55.1	22	16	13.3
21	Mon	11	6	12.5	12	09.9	18	07.5	S 1	10	45.5	26	23	02.9	23	11	57.6
22	Tue	12	6	11.6	12	09.6	18	07.9	2	7	13.6	27	20	29.7	24	7	53.2
									(3	28	04.4)				(25	28	07.8)
23	Wed	13	6	10.6	12	09.4	18	08.3	4	25	26.4	1	18	24.7	26	24	48.2
24	Thu	14	6	09.7	12	09.1	18	08.7	S 5	23	26.6	2	16	55.8	27	21	59.5
25	Fri	15	6	08.7	12	08.8	18	09.1	6	22	10.0	3	16	08.4	1	19	45.4
26	Sat	16	6	07.8	12	08.5	18	09.5	7	21	39.1	4	16	05.6	2	18	07.5
27	Sun	17	6	06.8	12	08.3	18	09.9	8	21	53.5	5	16	47.4	3	17	05.3
28	Mon	18	6	05.8	12	08.0	18	10.3	9	22	49.8	6	18	10.7	4	16	36.4
29	Tue	19	6	04.9	12	07.7	18	10.7	S 10	24	22.3	7	20	10.1	5	16	36.6
30	Wed	20	6	03.9	12	07.4	18	11.1	S 11	26	23.4	8	22	38.3	6	17	00.3

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 1945

Month of PHALGUNA (30 days)

Ayanamsa on 1st : 24^{0} 11$'$ 36$''$

(*Nirayana*) 8 Phalguna, 5124 Kali Era to (*Nirayana*) 6 Chaitra, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2024 A.D.					
1	Feb. 20	SAURA PHALGUNA	CHANDRA MAGHA			1- Jaya Ekadasi, Bhaimi Ekadasi (Bengal), Bhisma Dvadasim.
2	21					
3	22					3- Desert Festival - 3 days (Jaisalmer).
4	23					
5	24				5- Full Moon (18^{h} 00^{m}.4)	5- Guru Rabi Day's Birthday,Maghi Purnima, Masi Masi Magham.
6	25					
7	26					
8	27					
9	28				9- Sayana Vyatipata (14^{h} 03^{m}.2)	
10	29					
11	Mar. 1					
12	2					
13	3					13- Astaka(Sakashtaka), Janaki Janaki Janma, Vaikkatashtami (Kerala)
14	4			14-Sun enters Purva Bhadrapada nak. (12^{h} 33^{m}.9)		
15	5					
16	6					16- Vijaya Ekadasi (Smarta), Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj).
17	7					17- Vijaya Ekadasi (Vaishnava & Vidhava), Maha Shivaratri (Kashmir).
18	8					18- Maha Shivaratri, Shivaratri (S. India).
19	9					
20	10				20- New Moon (14^{h} 30^{m}.4)	
21	11		CHANDRA PHALGUNA		21- Sayana Vaidhriti (19^{h} 21^{m}.8)	
22	12					22- Birthday of Sri Ramakrishna Paramahamsa Deva.
23	13			23-Saura Chaitradi (13^{h} 53^{m}.6)		
24	14	SAURA CHAITRA				
25	15					
26	16					
27	17			27-Sun enters Uttara Bhadrapada nak. (20^{h} 55^{m}.3)		27- Holastaka.
28	18					
29	19					
30	Mar. 20			30-Sun enters Trop. Aries (8^{h} 36^{m}.4)		30- Mahavisuva Day, Indian Year Ending Day, Amalak Ekadasi.

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 :- Karkata 2, 7^{h} 44^{m}.4; Simha 4, 19^{h} 25^{m}.5; Kanya 7, 8^{h} 10^{m}.9; Tula 9, 21^{h} 00^{m}.0; Vrischika 12, 08^{h} 17^{m}.4; Dhanus 14, 16^{h} 21^{m}.4; Makara 16, 20^{h} 28^{m}.2; Kumbha 18, 21^{h} 20^{m}.2; Mina 20, 20^{h} 40^{m}.0; Mesha 22, 20^{h} 29^{m}.7; Vrisha 24, 22^{h} 39^{m}.9; Mithuna 26, 28^{h} 21^{m}.0; Karkata 29, 13^{h} 37^{m}.3;

Sun enters: Nirayana Mina 24, 12^{h} 36^{m}.3.

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS (2023-24 A.D.)

	Festivals	Criterion	Date
			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 S5	Magha 6 / Magha 13 / Jan. 26
	Republic Day.	Fixed	Magha 6 / Magha 13 / Jan 26
70.	Guru Ravi Das's Birthday.	Magha S15	Magha 16 / Magha 23 / Feb 5
71.	Birth Day of Swami Dayananda Saraswati (Founder of "Arya Samaj")	Phalguna K 10 (Purnimanta)	Magha 26/ Phalguna 3/ Feb 15
72.	Maha Shivratri.	Magha K 14	Magha 29/ Phalguna 6 / Feb 18
73.	Shivaji Jayanti.	Fixed	Magha 30/Phalguna 7/Feb 19
74.	Holikadahana.	Phalguna S 15(Night)	Phalguna 16/Phalguna 23/Mar 7
	Dolyatra	Phalguna S 15	Phalguna 16/Phalguna 23/Mar 7
75	Holi	Day after Holikadahan	Phalguna 17/Phalguna 24/Mar 8
	Hola,Vasantotsava	Phalguna K 1	Phalguna 17/Phalguna 24/Mar 8
76.	MahaVishuva day	Day of Sun's entry into Trop. Aries (Midnight rule)	Phalguna 30/ Chaitra 7 /March 21
			1945 S.E./5123 K.E./2023 A.D.
1.	Indian New Year's Day	Fixed	Chaitra 1 / Chaitra 8/ March 22
	Chaitra Sukladi(GudiPadava, Ugadi),	Chaitra S 1	Chaitra 1 / Chaitra 8/ March 22
	Cheti Chand (Sindhi New Year'sDay),	Chaitra S 1	Chaitra 1 / Chaitra 8/ March 22
	Telugu New Year's Day, Vasanta Navaratrarambha.	Chaitra S 1	Chaitra 1 / Chaitra 8/ March 22
2.	Sarhul(Bihar).	Chaitra S 3	Chaitra 3/ Chaitra 10 /March 24
3.	Vasanti Pujarambha	Chaitra S 7	Chaitra 7 / Chaitra 14/ March 28
4.	Oli Begins (Jain).	Eight Days before Oli Ends	Chaitra 8/ Chaitra 15 / March 29
5.	Rama Navami.	Chaitra S 9	Chaitra 9/ Chaitra 16/ March 30
6.	Mahavira Jayanti	Chaitra S13	Chaitra 14/ Vaisakha 21/ Apr 4
7.	Oli Ends (Jain)	Chaitra S15 (Udayavyapini)	Chaitra 16/ Vaisakha 23/ Apr 6
			1945 S.E./ 5124 K.E. /2023 A.D.
8.	Vaisakhi (Punjab, Haryana, H.P., Delhi & Odisha),	Saura Vaisakhadi(Sunrise Rule)	Chaitra 24/ Vaisakha 1/Apr. 14
	Visu(Kerala),	SauraVaisakhadi (Sunrise Rule)	Chaitra 24 / Vaisakha 1/ Apr. 14
	Chaitra Samkranti, Chadak Puja (Begal),	Saura Vaisakhadi(Midnight Rule)	Chaitra 24/ Vaisakha 1 / Apr. 14
	Cheiraoba (Manipur),		Chaitra 24/ Vaisakha 1 / Apr. 14
	Meshadi (T.N),Tamil New Year's Day,	Saura Vaisakhadi(Sunset Rule)	Chaitra 24/ Vaisakha 1 / Apr. 14
	Dr. B.R.Ambedkar Jayanti,		Chaitra 24/ Vaisakha 1 / Apr. 14
	Beginning of 5124 K.E.	Fixed	Chaitra 24/ Vaisakha 1 / Apr. 14
9.	Vaisakhadi (Bengal) , Bahag Bihu (Assam),	Day following SauraVaisakhadi (Midnight Rule)	Chaitra 25/ Vaisakha 2 / Apr. 15
	Shilhenba (Manipur)		Chaitra 25/ Vaisakha 2 / Apr. 15
10.	Tithi of Deva Damodara (Assam),	S1 of Saura Vaisakha	Chaitra 30/ Vaisakha 7 / Apr. 20
11.	Akshaya Tritiya	Vaisakha S3	Vaisakha 2 / Vaisakha 9 /Apr. 22
12.	Akshaya Tritiya (Bengal)	Vaisakha S3(Tithi more than one muhurta)	Vaisakha 3 / Vaisakha 10/ Apr 23
	Babu Kuer Singh Day(Bihar)	Fixed	Vaisakha 3 / Vaisakha 10/ Apr 23
13.	May Day	Fixed	Vaisakha 11 / Vaisakha 18 / May 1
14.	Buddha Purnima	Vaisakha S15	Vaisakha 15/ Vaisakha 22 / May 5
15.	Birthday of Rabindranath Tagore	25 Vaisakha of Beng. Calendar	Vaisakha 19/ Vaisakha 26 / May 9
16.	Pratap Jayanti (Rajasthan)	Jyaishtha S3	Jyaishtha 1/ Jyaishtha 8/May 22
17.	Guru Arjan Dev's Martyrdom Day	Jyaishtha S4	Jyaishtha 2/ Jyaishtha 9/May 23
18.	Rajas Samkranti (Odisha)	Saura Ashadhadi (Sunrise rule)	Jyaishtha 25/ Ashadha 1/June 15
18.	Rathayatra	Ashadha S2	Jyaishtha 30/Ashadha 6/ June 20
20.	Kharchi Puja (Tripura)	Ashadha S8	Ashadha 5/Ashadha 12/June 26
21.	Punaryatra,	Ashadha S10	Ashadha 7/Ashadha 14/June 28
	Ultaratha (Odisha), Bahudha Yatra	9th day from Rathayatra	Ashadha 7/Ashadha 14/June 28

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS

Festivals	Criterion	Date
		1945 S.E./ 5124 K.E./ 2023 A.D
22. Ker Puja (Tripura)	First Tuesday or Saturday after 14 days from Kharchi Puja not falling on K10	Ashadha 20/Ashadha 27/July 11
23. KarkatakaVavu (Kerala)	K30 of Saura Sravana	Ashadha 26/Sravana 2/July 17
24. Tilak Commemoration Day	Fixed	Sravana 10 / Sravana 17/ Aug 1
25. Independence Day	Fixed	Sravana 24 / Srabana 31 / Aug. 15
26. Tithi of Sri Sankara Deva	S2 of Saura Bhadra	Sravana 27 / Bhadra 3 / Aug. 18
27. Vinayak Chaturthi (Tamilnadu)	S4 of Saura Bhadra	Sravana 29/Bhadra 5/Aug 20
28. Jhulana Yatrarambha	Sravana S 11	Bhadra 5 / Bhadra 12 / Aug. 27
29. First Onam Day	Day before Thiru Onam Day	Bhadra 6 / Bhadra 13/ Aug. 28
30. Onam or Thiru Onam Day	Srabana Nak. of Saura Bhadra	Bhadra 7 / Bhadra 14 / Aug. 29
Rik Upakarma	Srabana Nak. of Chandra Sravana	Bhadra 7 / Bhadra 14/ Aug. 29
31. Third Onam Day	Day after Thiru Onam Day	Bhadra 8 / Bhadra 15/ Aug. 30
Avani Avittam (S. India),	Sravana S15	Bhadra 8/ Bhadra 15/ Aug 30
Naroli Purnima,	Sravana S15(Aparahna & Sayahna)	Bhadra 8 / Bhadra 15/ Aug. 30
Raksha Bandhan	Sravana S15(Pradosa)	Bhadra 8/ Bhadra 15/ Aug 30
32. Fourth Onam Day	Two Days after Thiru Onam Day	Bhadra 9/ Bhadra 16/ Aug 31
Solono (Rakhi Bandhan),	Sravana S15 (Udayavyapini)	Bhadra 9/ Bhadra 16/ Aug 31
Jhulana Yatra Samapanna	Sravana S15(Purvahna)	Bhadra 9/ Bhadra 16/ Sept 31
33. Tithi of Sri Madhava Deva (Assam)	K5 of Saura Bhadra	Bhadra 13/ Bhadra 20/ Sept 4
34. Janmashtami (Smarta)	Sravana K8 (Nishitha)	Bhadra 15/ Bhadra 22/ Sept 6
35. Janmashtami (Vaishnava),	Sravana K8	Bhadra 16/ Bhadra 23/ Sept 7
Gokulashtami |(Nandotsava)	Day after Janmashtami	Bhadra 16 /Bhadra 23 /Sept 7
Sri Jayanti (Ramanuja)	Rohini Nakshatra of Saura Bhadra	Bhadra 16/Bhadra 23/ Sept 7
36. Paryusana Parvarambha (Chaturthi Paksha-Jain),	7 Days before Samvatsari (Chaturthi Paksha)	Bhadra 21 / Bhadra 28 /Sept 12
Paryusana Parvarambha (Panchami Paksha-Jain)		Bhadra 21/ Bhadra 28/ Sept 12
37. Jain Festival	Sravana K30 (Udayavyapini)	Bhadra 24/ Bhadra 31/ Sept 15
38. Ganesha Chaturthi,	Bhadra S4	Bhadra 28/ Asvina 4/ Sept 19
Samvatsari (Chaturthi Paksha-Jain),	Bhadra S4 (Udayavtapini)	Bhadra 28/ Asvina 4/ Sept 19
Samvatsari (Panchami Paksha-Jain)	Bhadra S5 (Current at Sunset)	Bhadra 28 /Asvina 4 /Sept 19
39. Samadhi Day of Narayan Guru(Kerala)	Fixed	Bhadra 30 / Asvina 6 /Sept 21
40. Radhashtami	Bhadra S8	Asvina 1/Asvina 8/Sept 23
41. Ananta Chaturdasi	Bhadra S14	Asvina 6/Asvina 13/Sept 28
42. Mahatma Gandhi's Birthday	Fixed	Asvina 10/Asvina 17/Oct 2
43. Mahalaya Amavasya, Sarvapitri	Bhadra K30	Asvina 22/Asvina 29/Oct 14
Amavasya,Tarpana Layba (Manipur)	Bhadra K30	Asvina 22/Asvina 29 /Oct 14
44. Saradiya Navaratrarambha	Asvina S1	Asvina 23/Asvina 30/Oct 15
45. Kaveri Samkramana Snana	Saura Kartikadi (Midnight Rule)	Asvina 26/Kartika 3/Oct 18
46. Oli Begins (Jain)	Eight Days before Oli Ends	Asvina 28/Kartika 5/Oct 20
47. Durga Puja Begins (Saptami)	Asvina S7	Asvina 29/Kartika 6/Oct 21
48. Durga Puja (Mahanavami),	Asvina S8	Asvina 30/Kartika 7 /Oct 22
49. Durga Puja (Mahanavami)	Asvina S9	Kartika 1/ Kartika 8 /Oct 23
Ayudha Puja.	Day before Dussehara	Kartika 1/ Kartika 8 /Oct 23
50. Vijaya Dasami (Dussehara or	Asvina S10 (Aparahna)	Kartika 2/ Kartika 9/ Oct24
Dasahara), Vijaya Dasami(Bengal & Kerala)	Asvina S10 (Purvahna)	Kartika 2/Kartika 9/ Oct24
51. Kumara Purnima (Odisha)	Asvina S15 (Pradosa)	Kartika 6/Kartika 13/Oct 28
Maharshi Valmiki's Birthday,	Asvina S15(Udayavyapini)	Kartika 6/Kartika 13/Oct 28
Oli Engs (Jain),	Asvina S15(Udayavyapin)	Kartika 6/Kartika 13/Oct 28
Kojagori Lakshmi Puja (Bengal)	Asvina S15 (Pradosa)	Kartika 6/Kartika 13/Oct 28
52. Naraka Chaturdasi(Purvarunodaya),	Asvina K14(Purvarunodaya)	Kartika 21/Kartika 28/ Nov12
Hanumajjanma,	Asvina K14(Udayavyapini)	Kartika 21/ Kartika 28/Nov 12
Dipavali(S. India)	Asvina K14	Kartika 21/Kartika 28/Nov12
Dipavali, Kali Puja	Asvina K30	Kartika 21/Kartika 28/Nov 12
53. Govardhana Puja	Kartika S1	Kartika 22/Kartika 29/Nov 13
Bali Puja	Kartika S1	Kartika 22/Kartika 29/ Nov 13

Festivals	Criterion	National / Nirayana/ Gregorian
		1945 S.E./ 5124 K.E./ 2023 A.D.
54. Kartika Sukladi	Kartika S 1	Kartika 23/ Kartika 30 /Nov 14
55. Bhratri Dvitiya, Tikka Ceremony, Bhai Duj	Kartika S2 (Aparahna)	Kartika 24/ Agrahayana1/Nov 15
Dwat Puja (Bihar)	Kartika S 2 (Purvahna)	Kartika 24/ Agrahayana1 /Nov 15
56. PratiharaShashthi or Surya Shashthi (Chhat-Bihar)	Kartika S6	Kartika 28/ Agrahayana 5 /Nov 19
57. Guru Teg Bahadur's Martyrdom Day	Fixed	Agrahayana 3/Agrahayana 10/Nov 24
58. Rasayatra (Smarta)	Kartika S 15 (Nisithavyapini)	Agrahayan 5/Agrahayana12/Nov26
58. Rasayatra (Vaishnava),	Kartika S 15 (Udayavyapini)	Agrahayana 6/Agrahayana13/Nov 27
Kartiki Purnima,	Kartika S15	Agrahayana 6/Agrahayana13/Nov 27
Rathayatra (Jain), Guru Nanak's	Kartika S 15 (Udayavyapini)	Agrahayana 6/Agrahayana13/Nov 27
Birthday, Puskar Fair	Kartika S15	Agrahayana 6/Agrahayana13/Nov 27
Huthri-3 Days (Coorg)	S15 to K2 of Saura Margasirsha	Agrahayana 6/Agrahayana13/Nov 27
60. Prathamashtami (Odisha)	Kartika K8	Agrahayana 14/Agrahayana 21/Dec 5
61. Vaikuntha Ekadasi (S. India)	S11 Saura Pausha	Pausha 2 / Pausha 9 /Dec 23
62. Jor Mela-3 Days (Punjab)	Fixed	Pausha 5 / Pausha 12 /Dec 26
		1945 S.E/ 5124 K.E./2024 A.D.
63. Bhogi (S.India)	Day before Pongal	Pausha 24 / Magha 1 / Jan.14
Makara Samkranti (N.India)	The Day after Lohri	Pausha 24 / Magha 1 / Jan 14
64. Makara Samkranti (Bengal),	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Magha Bihu (Assam),	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
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
65. Mattu Pongal or Kanumu	The Day after Pongal	Pausha 26 / Magha 3 / Jan. 16
66. Guru Gobind Singh,s Birthday	Pausha S7	Pausha 27 / Magha 4 / Jan. 17
67. Netaji's Birthday	Fixed	Magha 3 / Magha 10 / Jan. 23
68. Republic Day	Fixed	Magha 6 / Magha 13 / Jan 26
69. Sri Panchami, Vasanta Panchami	Magha S 5	Magha 25 / Phalguna 2 / Feb 14
70. Shivaji Jayanti	Fixed	Magha 30 / Phalguna 7 / Feb 19
71. Guru Ravi Das's Birthday	Magha S 15	Phalguna 5/Phalguna 12/Feb 24
72. Maha Shivratri	Magha K 14	Phalguna 18/Phalguna 25/Mar 8
73. Mahavishuva Day	Day of Sun's entry into Trop. Aries (Midnight rule)	Phalguna 30/Chaitra 6 /Mar 20

Special Festivals for Jammu and Kashmir

Festivals	Criterion	National / Nirayana / Gregorian Saka 1944 / Kali 5123 / 2023A.D
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausha 23/Pausha 30/ Jan 13
		Saka 1945 / Kali 5123 / 2023 A.D
1. Mela Bahu Fort	Chaitra S 8	Chaitra 8 / Chaitra 15 /Mar 29
		Saka 1945 / Kali 5124 / 2023 A.D
2. Mela Kshir Bhawani	Jyaishtha S 8	Jyaishtha 7 / Jyaishtha 14/ May 28
3. Guru Hargobind's Birthday	Jyaishtha K 1	Jyaishtha 15/ Jyaishtha 22/ June 5
4. Martyr's Day	Fixed	Ashadha 22/ Ashadha 29/ July 13
5. Kailas Yatra-2 Days	Sravana K 13 & K 14	Bhadra 21 /Bhadra 28 / Sept 12
6. Mela Pat - 3 Days	Bhadra S 5 to S 7	Bhadra 29 /Asvina 5 / Sep 20
		Saka 1945 / Kali 5124 / 2024 A.D
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausha 23/ Pausha 30 /Jan 13

Moslem Festival (2023-24 A.D.)

Festivals	Criterion	National/Nirayana/Gregorian
		Saka 1945/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/Apr 13
		Saka1945/Kali 5124/2023 A.D
3. Sab-e-Qadr*	27 Ramadan	Chaitra 29/Vaisakha 06/Apr 19
4. Jumatul Vida	Last Friday of Ramadan	Vaisakha 1/Vaisakha 08/Apr 21
5. Id-ul-Fitr	1 Shawwal	Vaisakha 2/Vaisakha 09/April 22
6. Id-uz-Zuha(Bakrid)	10 Zulhijja	Ashadha 08/Ashadha 15/June 29
7. Muharram	10 Muharram	Sravana 7/Sravana 14/July 29
8. Chelhum	Fortieth Day from (39 days after) 10 Muharram	Bhadra 15/ Bhadra 22/Sep 06
9. Akheri Chahar Shumba	Last Wednesday of Safar	Bhadra 22/Bhadra 29/ Sep 13
10. Shahadat-e-Iman Hasan	28 Safar	Bhadra 23/Bhadra 30/ Sep 14
11. Miland-un-Nabi or Id-e-Milad (Birthday of Prophet), Fateha Dwaz Daham or Bara Wafat	12 Rabiu'lawwal	Asvina 06/Asvina 13/Sept 28
12. Id-e-Maulad	17 Rabiu'lawwal	Asvina 11/Asvina 18/Oct 03
13. FatehaYazdaham (Giarhween Sharif)	11 Rabiu'ssani	Kartika 05/Kartika 12/Oct 27
		Saka1945/Kali 5124/2024A.D
14. Hazrat Ali's Birthday	13 Rajab	Magha 05 / Magha 12/ Jan 25
15. Sab-e-Miraj*	27 Rajab	Magha 19/Megha 26/ Feb 08
16. Sab-e-Barat*	15 Shaban	Phalguna 07/Phalguna 14/Feb 26
17. First Day of Ramadan	1 Ramadan	Phalguna22/Phalguna29/March12
		Saka1946/Kali 5124/2024A.D
1. Shahadat-e-Hazrat Ali	21 Ramadan	Chaitra 12 /Chaitra 18 /April 1
2. Jumatul Vida	Last Friday of Ramadan	Chaitra 16 /Chaitra 22 / April 5
3. Sab-e-Qadr*	27 Ramadan	Chaitra 18/ Chaitra 24 /Apr 7
4. Id-ul-Fitr	1 Shawwal	Chaitra 22/ Chaitra 28/April 11

*The festival is observed in the preceeding night

The Islamic Calendar (2023-24 A.D.)(Hejira: 1444-1445A.H.)

The beginning dates of the different months of the Islamic Calendar for the year 2023-24 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:-

1444A.H.					1445 A.H.				
Rajab	"	Jan.24	2023A.D	(29)	Rabiu'l awwal	"	Sept 1	2023A.D.	(30)
Shaban	"	Feb. 22	"	(30)	Rabiu's sani	"	Oct 17	"	(30)
Ramadan	"	March 24*	"	(29)	Jumadu'l awwal	"	Nov 16	"	(29)
Shawwal	"	April22	"	(29)	Jumadu's sani	"	Dec 15	"	(29)
Zu'lqada	"	May21	"	(30)	Rajab	"	Jan 13	2024	(30)
Zulhijja	"	June 20	"	(30)	Shaban	"	Feb 12	"	(29)
MUHARRAM1445A.H.		July 20	"	(29)	Ramadan	"	March 12	"	(30)
Safar	"	Aug 18	"	(30)	Shawwal	"	April 11	"	(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 22.03.2023 in western part of India.

Fixed Calendar

According to the Fixed Calendar the beginning dates of different months are as follows : Jan. 23(2023 A.D.), Feb. 22, Mar. 23, Apr. 22, May 21, June 20, July 19, Aug. 18, Sept. 16, Oct. 16, Nov. 14, Dec. 14 , Jan. 12(2024 A.D.) Feb. 11, Mar. 11, April 10.

THE PARSI (SHAHENSHAHI) CALENDAR, 2023 - 2024 A.D.

(As used by the Indian Parsis)

Yazdejardi Era : 1392 - 1393

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	1392	Jan. 13	2023	(30)	Ardibehesht	1393	Sept. 15	2023	(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	2024	(30)
Bahman	"	June 12	"	(30)	Meher	"	Feb. 12	"	(30)
Aspandad	"	July 12	"	(30)	Avan	"	Mar. 13	"	(30)
Gathas(I-V)	"	Aug. 11	"	(5)	Adar	"	Apr. 12	"	(30)
FARVARDIN	1393	Aug. 16	"	(30)	Dei	"	May 12	"	(30)

PARSI FESTIVALS

Festivals	Criterion	Shahenshahi	Kadmi
		National / Nirayana / Gregorian Saka 1945/ Kali 5124/ 2023 A.D.	**National / Nirayana / Gregorian Saka 1945/ Kali 5124/ 2023 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, 2023 - 2024 A.D.

Jewish Era : 5783 - 84 A.M.

To beginning dates of different months of the Jewish Calendar are as follows:

5783 A.M.					5784 A.M.				
Shebat	"	Jan. 23	2023A.D.	(30)	TISHRI	"	Sept. 16	2023A.D.	(30)
Adar	"	Feb 22	"	(29)	Heshvan	"	Oct. 16	"	(29)
Nisan	"	March23	"	(30)	Kislev	"	Nov. 14	"	(29)
Iyar	"	April 22	"	(29)	Tebeth	"	Dec. 13	"	(29)
Sivan	"	May 21	"	(30)	Shebat	"	Jan. 11	2024	(30)
Tammuz	"	June 20	"	(29)	Vedar	"	Feb. 10	"	(30)
Ab	"	July 19	"	(30)	Adar	"	Mar. 11	"	(29)
Ellul	"	Aug. 18	,,	(29)	Nisan	"	April 09	"	(30)

JEWISH FESTIVALS 2023-2024 A.D.

Festivals	Criterion	Date
		Saka 1945 / Kali 5123 / 2023 A.D.
First day of Passover (Pesach)	15 Nisan	Chaitra 16 / Chaitra 23/ April 06
		Saka 1945 / Kali 5124 / 2023 A.D.
Feast of Weeks (Shebuoth)	6 Sivan	Jyaishtha 05 / Jyaishtha 12 / May 26
Tishabeab	9 Ab	Sravana 05 / Sravana 12 / July 27
Jewish New Year (Rosh Hashanah)	1 Tishri	Bhadra 25/ Asvina 01 / September 16
Day of Atonement (Yom Kippur)	10 Tishri	Asvina 03 / Asvina 10 / September 25
First day of Tabernacles (Succoth)	15 Tishri	Asvina 08/Asvina 15/ September 30
Last day of Succoth (SimhathTorah)	23 Tishri	Asvina 16 / Asvina 23 / October 08
Hanukah	25 Kislev	Agrahayana17/Agrahayana24/Dec 08
		Saka 1946/Kali 5124 / 2024 A.D.
Purim	14 Adar	Chaitra 04 / Chaitra 10 /March 24

CHRISTIAN FESTIVALS, 2023-2024 A.D.

Festivals	Criterion	Date
		National/Nirayana/Gregorian
		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
11. Rogation Sunday	35 days after Easter Sunday	Vaisakha 24/ Vaisakha 31 /May 14
12. Ascension Day-Holy Thursday	39 days after Easter Sunday	Vaisaka 28 / Jyaishtha 4 /May 18
13. Ascension Sunday	3 days after Ascension day	Vaisakha 31 / Jyaishtha 7/May 21
14. Whit Sunday-Pentecost	49 days after Easter Sunday	Jyaishtha 7 / Jyaishtha 14 /May 28
15. Trinity Sunday	56 days after Easter Sunday	Jyaishtha 14/Jyaishtha 21/June 4
16. Corpus Christi (Thursday)	60 days after Easter Sunday	Jyaishtha 18/Jyaishtha 25/June 8
17. First Sunday in Advent	Fourth Sunday before Christmas, i.e.,Sunday nearest to Nov.,30.	Agrahayana12/Agrahayana19/Dec3
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 1945/ Kali 5124 / 2024 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 8 / Magha 15/ Jan 28
4. Quinquagesima (Shrove) Sunday	49 days before Easter Sunday	Magha 22 / Magha 29/ Feb 11
5. Ash Wednesday	46 days before Easter Sunday	Magha 25/Phalguna 2 /Feb 14
		Saka 1946 / Kali 5124/ 2024 A.D.
6. Palm Sunday	7 days before Easter Sunday	Chaitra 4/Chaitra 10 / March 24
7. Good Friday	2 days before Easter Sunday	Chaitra 9/ Chaitra 15/ March 29
8. Easter (Holy) Saturday	Day before Easter Sunday	Chaitra 10/ Chaitra 16 / March 30
9. Easter Sunday	First Sunday after the 14th day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Chaitra 11/Chaitra 17/March 31
10. Low Sunday	7 days after Easter Sunday	Chaitra 18/Chaitra 24/April 7

THE INDIAN LUNAR CALENDAR

TIME OF NEW MOON(IN I.S.T.) MARKING THE
COMMENCEMENT OF LUNAR MONTHS

	2005 (1926-27 S.E.)	d	h	m	2008 (1929-30 S.E.)	d	h	m	2011 (1932-33 S.E.)	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.)	d	h	m	2009 (1930-31 S.E.)	d	h	m	2012 (1933-34 S.E.)	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			---	

	2007 (1928-29 S.E.)	d	h	m	2010 (1931-32 S.E.)	d	h	m	2013 (1934-35 S.E.)	d	h	m
Pausha			---				---		Jan.	11	25	14
Magha	Jan.	19	09	31	Jan.	15	12	41	Feb.	10	12	50
Phalguna	Feb.	17	21	44	Feb.	14	08	21	Mar.	11	25	21
Chaitra	Mar.	19	08	13	Mar.	15	26	31	Apr.	10	15	05
Vaisakha	Apr.	17	17	06	*Apr.*	*14*	*17*	*59*	May	10	05	58
					May	14	06	34				
Jyaishtha	*May*	*16*	*24*	*57*	June	12	16	45	June	08	21	26
	June	15	08	43								
Ashadha	July	14	17	34	July	11	25	10	July	08	12	44
Sravana	Aug.	12	28	33	Aug.	10	08	38	Aug.	06	27	21
Bhadra	Sept.	11	18	14	Sept.	8	16	00	Sept.	05	17	06
Asvina	Oct.	11	10	31	Oct.	7	24	15	Oct.	05	06	05
Kartika	Nov.	9	28	33	Nov.	6	10	22	Nov.	03	18	20
Margasirsha	Dec.	9	23	10	Dec.	5	23	06	Dec.	02	29	52
Pausha			---				---				---	

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

	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*
													Aug.	16	15	08
Bhadra	Aug.	25	19	43	Aug.	21	24	00	Aug.	19	08	12	Sept.	15	07	10
Asvina	Sept.	24	11	44	Sept	20	11	00	*Sept.*	*17*	*16*	*30*	Oct.	14	23	25
									Oct.	16	25	01				
Kartika	Oct.	23	27	27	Oct.	19	24	42	Nov.	15	10	37	Nov.	13	14	57
Margasirsha	Nov.	22	18	02	Nov.	18	17	12	Dec.	14	21	47	Dec.	12	29	02
Pausha	Dec.	22	07	06	Dec.	18	12	00			---				---	

	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.	13	10	30	Jan.	11	17	27
Magha	Jan.	20	18	44	Jan.	17	07	47	Feb.	11	24	36	Feb.	09	28	29
Phalguna	Feb.	18	29	17	Feb.	15	26	35	Mar.	13	15	51	Mar.	10	14	30
Chaitra	Mar.	20	15	06	Mar.	17	18	42	Apr.	12	08	01	Apr.	08	23	51
Vaisakha	Apr.	18	24	27	Apr.	16	07	27	May	11	24	30	May	08	08	52
Jyaishtha	May	18	09	43	*May*	*15*	*17*	*18*	June	10	16	23	June	06	18	08
					June	13	25	13								
Ashadha	*June*	*16*	*19*	*35*	July	13	08	18	July	10	06	47	July	05	28	27
	July	16	06	54												
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

	2016 (1937-38 S.E.)				2019 (1940-41 S.E.)				2022 (1943-44 S.E.)				2025 (1946-47 S.E.)			
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha	Jan.	10	07	01	Jan.	06	06	58	Jan.	02	24	04			---	
Magha	Feb.	08	20	09	Feb.	04	26	34	Feb.	01	11	16	Jan.	29	18	06
Phalguna	Mar.	09	07	25	Mar.	06	21	34	Mar.	02	23	05	Feb	27	30	15
Chaitra	Apr.	07	16	54	Apr.	05	14	21	Apr.	01	11	54	Mar.	29	16	28
Vaisakha	May	06	25	00	May	04	28	16	Apr.	30	25	58	Apr.	27	25	01
Jyaishtha	June	05	08	30	June	03	15	32	May	30	17	00	May	27	8	32
Ashadha	July	04	16	31	July	02	24	46	June	29	08	22	June	25	16	02
Sravana	Aug.	02	26	15	Aug.	01	08	42	July	28	23	25	July	24	24	41
Bhadra	Sept.	01	14	33	Aug.	30	16	07	Aug.	27	13	47	Aug.	23	11	37
Asvina	Sept.	30	29	41	Sept.	28	23	56	Sept.	25	27	25	Sept.	21	25	24
Kartika	Oct.	30	23	08	Oct.	28	09	09	Oct.	25	16	19	Oct.	21	17	55
Margasirsha	Nov.	29	17	48	Nov.	26	20	36	Nov.	23	28	27	Nov.	20	12	17
Pausha	Dec.	29	12	23	Dec.	26	10	43	Dec.	23	15	47	Dec.	20	07	13

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 1946 — Mesha : Madhava

Month of CHAITRA(31 days) — Spring (Vasanta), 2nd Month

(*Nirayana*) 7 Chaitra, 5124 Kali Era to (*Nirayana)* 7 Vaisakha, 5125 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
		2024 A.D.															
1	Thu	Mar 21	6	02.9	12	07.1	18	11.4	S 12	28	44.8	9	25	26.9	7	17	41.8
2	Fri	22	6	01.9	12	06.8	18	11.8	13	---	----	10	28	27.9	8	18	34.9
3	Sat	23	6	01.0	12	06.5	18	12.2	13	7	18.1	11	---	----	9	19	33.9
4	Sun	24	6	00.0	12	06.2	18	12.6	14	9	55.6	11	7	33.8	10	20	33.7
5	Mon	25	5	59.0	12	05.9	18	12.9	S 15	12	30.3	12	10	37.7	11	21	29.7
6	Tue	26	5	58.0	12	05.6	18	13.3	K 1	14	56.1	13	13	33.6	12	22	17.6
7	Wed	27	5	57.1	12	05.3	18	13.7	2	17	06.9	14	16	15.6	13	22	53.2
8	Thu	28	5	56.1	12	05.0	18	14.0	3	18	57.2	15	18	38.3	14	23	12.5
9	Fri	29	5	55.1	12	04.7	18	14.4	4	20	21.4	16	20	36.0	15	23	11.4
10	Sat	30	5	54.1	12	04.4	18	14.8	K 5	21	14.3	17	22	03.7	16	22	45.9
11	Sun	31	5	53.2	12	04.1	18	15.1	6	21	31.5	18	22	56.7	17	21	52.8
12	Mon	Apr. 1	5	52.2	12	03.8	18	15.5	7	21	10.2	19	23	12.2	18	20	29.5
13	Tue	2	5	51.2	12	03.5	18	15.9	8	20	09.2	20	22	48.8	19	18	35.0
14	Wed	3	5	50.3	12	03.2	18	16.3	9	18	29.6	21	21	47.6	20	16	09.5
15	Thu	4	5	49.3	12	02.9	18	16.6	K 10	16	14.6	22	20	11.8	21	13	15.0
16	Fri	5	5	48.4	12	02.6	18	17.0	11	13	29.0	23	18	06.7	22	9	55.1
17	Sat	6	5	47.4	12	02.3	18	17.4	12	10	19.7	24	15	39.5	23	6	14.6
															(24	26	19.5)
18	Sun	7	5	46.5	12	02.0	18	17.8	13	6	54.3	25	12	58.4	25	22	16.7
									(14	27	21.6)						
19	Mon	8	5	45.6	12	01.8	18	18.2	K 30	23	50.9	26	10	12.7	26	18	13.7
20	Tue	9	5	44.7	12	01.5	18	18.5	S 1	20	31.5	27	7	32.1	27	14	18.0
												(1	29	06.7)			
21	Wed	10	5	43.7	12	01.2	18	18.9	2	17	32.8	2	27	05.6	1	10	37.3
22	Thu	11	5	42.8	12	01.0	18	19.3	3	15	03.8	3	25	38.0	2	7	18.8
															(3	28	28.9)
23	Fri	12	5	41.9	12	00.7	18	19.7	4	13	12.3	4	24	51.0	4	26	12.8
24	Sat	13	5	41.0	12	00.5	18	20.1	S 5	12	04.6	5	24	49.3	5	24	33.7
25	Sun	14	5	40.1	12	00.2	18	20.5	6	11	44.4	6	25	34.8	6	23	32.7
26	Mon	15	5	39.3	12	00.0	18	20.9	7	12	12.1	7	27	05.6	7	23	08.3
27	Tue	16	5	38.4	11	59.7	18	21.3	8	13	24.5	8	29	15.9	8	23	16.4
28	Wed	17	5	37.5	11	59.5	18	21.7	9	15	14.6	9	---	---	9	23	50.6
29	Thu	18	5	37.3	11	59.3	18	21.8	S 10	17	32.1	9	7	56.7	10	24	42.8
30	Fri	19	5	36.5	11	59.1	18	22.2	11	20	05.3	10	10	56.8	11	25	44.5
31	Sat	20	5	35.6	11	58.9	18	22.6	S 12	22	42.1	11	14	04.2	12	26	47.3

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, 2023

TRUE AYANAMSA FOR 5h 29^{m}

Date 2023	Ayanamsa			Date 2023	Ayanamsa			Date 2023	Ayanamsa			Date 2023-24	Ayanamsa		
	°	'	"		°	'	"		°	'	"		°	'	"
Jan. 1	24	10	31.6	May 1	24	10	48.3	Aug. 29	24	11	08.5	Dec. 27	24	11	26.0
4	24	10	32.2	4	24	10	48.4	Sept. 1	24	11	08.8	30	24	11	26.8
7	24	10	33.0	7	24	10	48.8	4	24	11	08.9	Jan. 2	24	11	27.2
10	24	10	33.7	10	24	10	49.6	7	24	11	09.3	5	24	11	27.4
13	24	10	34.0	13	24	10	50.3	10	24	11	09.9	8	24	11	28.0
16	24	10	34.2	16	24	10	50.5	13	24	11	10.3	11	24	11	28.9
19	24	10	34.9	19	24	10	50.8	16	24	11	10.3	14	24	11	29.7
22	24	10	35.9	22	24	10	51.5	19	24	11	10.3	17	24	11	29.9
25	24	10	36.4	25	24	10	52.2	22	24	11	10.8	20	24	11	30.3
28	24	10	36.6	28	24	10	52.6	25	24	11	11.5	23	24	11	31.1
31	24	10	37.1	31	24	10	52.9	28	24	11	11.8	26	24	11	31.8
Feb. 3	24	10	37.8	June 3	24	10	53.3	Oct. 1	24	11	11.8	29	24	11	32.2
6	24	10	38.3	6	24	10	54.2	4	24	11	12.2	Feb. 1	24	11	32.3
9	24	10	38.5	9	24	10	55.0	7	24	11	12.8	4	24	11	32.7
12	24	10	38.6	12	24	10	55.3	10	24	11	13.2	7	24	11	33.5
15	24	10	39.1	15	24	10	55.7	13	24	11	13.3	10	24	11	34.2
18	24	10	39.9	18	24	10	56.4	16	24	11	13.3	13	24	11	34.4
21	24	10	40.4	21	24	10	57.2	19	24	11	13.8	16	24	11	34.6
24	24	10	40.4	24	24	10	57.7	22	24	11	14.6	19	24	11	35.2
27	24	10	40.7	27	24	10	58.0	25	24	11	15.0	22	24	11	35.8
Mar. 2	24	10	41.3	30	24	10	58.4	28	24	11	15.0	25	24	11	36.1
5	24	10	41.8	July 3	24	10	59.3	31	24	11	15.5	28	24	11	36.1
8	24	10	41.9	6	24	11	00.2	Nov. 3	24	11	16.2	Mar. 2	24	11	36.3
11	24	10	41.9	9	24	11	00.5	6	24	11	16.7	5	24	11	36.9
14	24	10	42.3	12	24	11	00.8	9	24	11	17.0	8	24	11	37.6
17	24	10	43.0	15	24	11	01.5	12	24	11	17.1	11	24	11	37.7
20	24	10	43.4	18	24	11	02.3	15	24	11	17.7	14	24	11	37.8
23	24	10	43.4	21	24	11	02.7	18	24	11	18.6	17	24	11	38.4
26	24	10	43.7	24	24	11	02.9	21	24	11	19.1	20	24	11	38.9
29	24	10	44.2	27	24	11	03.2	24	24	11	19.3	23	24	11	39.2
Apr. 1	24	10	44.7	30	24	11	04.0	27	24	11	19.8	26	24	11	39.2
4	24	10	44.9	Aug. 2	24	11	04.8	30	24	11	20.7	29	24	11	39.3
7	24	10	44.9	5	24	11	05.1	Dec. 3	24	11	21.4	Apr. 1	24	11	39.8
10	24	10	45.2	8	24	11	05.3	6	24	11	21.8	4	24	11	40.5
13	24	10	45.9	11	24	11	05.9	9	24	11	22.0	7	24	11	40.7
16	24	10	46.4	14	24	11	06.6	12	24	11	22.6	10	24	11	40.8
19	24	10	46.5	17	24	11	07.0	15	24	11	23.6	13	24	11	41.3
22	24	10	46.7	20	24	11	07.1	18	24	11	24.3	16	24	11	42.0
25	24	10	47.4	23	24	11	07.2	21	24	11	24.6	19	24	11	42.3
28	24	10	48.0	26	24	11	07.8	24	24	11	25.1	22	24	11	42.4
May 1	24	10	48.3	Aug. 29	24	11	08.5	Dec. 27	24	11	26.0	Apr. 25	24	11	42.6

Mean Ayanamsa= 23°51′25″.53 for J2000.0
Mean Ayanamsa= 24°10′42″.04+ precession from 2023.0 to date
Mean Ayanamsa= 24°11′32″.30+ precession from 2024.0 to date
True Ayanamsa= Mean Ayanamsa+ nutation in longitude

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Jan. 0	279	1	9	144	4	48	262	32	46	241	23	45	266	34	0	35	34	52	333	9	20
1	280	2	17	155	58	58	262	16	55	242	36	41	267	18	28	35	34	57	333	14	37
2	281	3	26	167	47	59	262	10	57	243	49	40	268	2	58	35	35	14	333	19	57
3	282	4	35	179	36	22	262	14	16	245	2	43	268	47	32	35	35	44	333	25	22
4	283	5	44	191	29	15	262	26	11	246	15	49	269	32	8	35	36	26	333	30	50
5	284	6	53	203	32	11	262	45	58	247	28	59	270	16	46	35	37	21	333	36	23
6	285	8	3	215	50	44	263	12	55	248	42	12	271	1	28	35	38	28	333	41	59
7	286	9	13	228	30	2	263	46	18	249	55	27	271	46	12	35	39	47	333	47	39
8	287	10	23	241	34	11	264	25	29	251	8	46	272	30	59	35	41	19	333	53	23
9	288	11	33	255	5	34	265	9	52	252	22	7	273	15	48	35	43	3	333	59	10
10	289	12	43	269	4	5	265	58	54	253	35	31	274	0	40	35	45	0	334	5	2
11	290	13	54	283	26	42	266	52	5	254	48	58	274	45	35	35	47	9	334	10	56
12	291	15	4	298	7	29	267	48	58	256	2	27	275	30	32	35	49	30	334	16	55
13	292	16	13	312	58	19	268	49	10	257	15	58	276	15	31	35	52	3	334	22	56
14	293	17	22	327	50	14	269	52	20	258	29	30	277	0	33	35	54	48	334	29	1
15	294	18	30	342	35	4	270	58	10	259	43	5	277	45	37	35	57	45	334	35	9
16	295	19	38	357	6	38	272	6	23	260	56	42	278	30	43	36	0	54	334	41	20
17	296	20	45	11	21	16	273	16	45	262	10	20	279	15	52	36	4	15	334	47	34
18	297	21	51	25	17	41	274	29	5	263	24	0	280	1	3	36	7	47	334	53	51
19	298	22	57	38	56	26	275	43	10	264	37	42	280	46	16	36	11	31	335	0	11
20	299	24	1	52	19	2	276	58	53	265	51	25	281	31	31	36	15	27	335	6	34
21	300	25	5	65	27	20	278	16	5	267	5	10	282	16	48	36	19	34	335	12	59
22	301	26	8	78	23	4	279	34	38	268	18	57	283	2	8	36	23	52	335	19	28
23	302	27	10	91	7	32	280	54	27	269	32	45	283	47	30	36	28	22	335	25	59
24	303	28	11	103	41	31	282	15	26	270	46	35	284	32	54	36	33	2	335	32	32
25	304	29	11	116	5	31	283	37	32	272	0	27	285	18	20	36	37	54	335	39	8
26	305	30	11	128	19	55	285	0	39	273	14	20	286	3	49	36	42	56	335	45	47
27	306	31	10	140	25	17	286	24	45	274	28	14	286	49	19	36	48	9	335	52	28
28	307	32	7	152	22	43	287	49	47	275	42	10	287	34	52	36	53	32	335	59	11
29	308	33	5	164	13	59	289	15	42	276	56	7	288	20	27	36	59	6	336	5	56
30	309	34	1	176	1	41	290	42	29	278	10	5	289	6	4	37	4	51	336	12	43
31	310	34	56	187	49	17	292	10	6	279	24	5	289	51	43	37	10	45	336	19	33

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″
Feb. 1	311	35	51	199	41	2	293	38	32	280	38	6	290	37	25	37	16	50	336	26	24
2	312	36	45	211	41	51	295	7	45	281	52	8	291	23	8	37	23	5	336	33	18
3	313	37	38	223	57	1	296	37	46	283	6	12	292	8	54	37	29	30	336	40	13
4	314	38	31	236	31	57	298	8	33	284	20	16	292	54	42	37	36	5	336	47	10
5	315	39	23	249	31	28	299	40	7	285	34	22	293	40	31	37	42	50	336	54	10
6	316	40	14	262	59	14	301	12	27	286	48	29	294	26	23	37	49	45	337	1	11
7	317	41	4	276	56	51	302	45	32	288	2	37	295	12	17	37	56	49	337	8	13
8	318	41	53	291	22	59	304	19	25	289	16	45	295	58	13	38	4	3	337	15	17
9	319	42	41	306	12	54	305	54	3	290	30	55	296	44	10	38	11	26	337	22	23
10	320	43	28	321	18	40	307	29	29	291	45	4	297	30	10	38	18	58	337	29	30
11	321	44	13	336	30	15	309	5	42	292	59	15	298	16	10	38	26	40	337	36	38
12	322	44	57	351	37	13	310	42	43	294	13	25	299	2	13	38	34	30	337	43	47
13	323	45	39	6	30	34	312	20	33	295	27	37	299	48	17	38	42	29	337	50	58
14	324	46	20	21	3	55	313	59	12	296	41	48	300	34	22	38	50	37	337	58	9
15	325	46	59	35	13	54	315	38	41	297	55	60	301	20	29	38	58	54	338	5	22
16	326	47	37	48	59	52	317	19	2	299	10	12	302	6	38	39	7	19	338	12	36
17	327	48	12	62	23	6	319	0	14	300	24	25	302	52	48	39	15	53	338	19	50
18	328	48	46	75	26	4	320	42	20	301	38	37	303	38	59	39	24	34	338	27	6
19	329	49	19	88	11	43	322	25	19	302	52	50	304	25	12	39	33	24	338	34	22
20	330	49	49	100	42	58	324	9	13	304	7	4	305	11	26	39	42	22	338	41	39
21	331	50	18	113	2	28	325	54	2	305	21	17	305	57	42	39	51	28	338	48	56
22	332	50	45	125	12	27	327	39	47	306	35	31	306	43	58	40	0	41	338	56	14
23	333	51	10	137	14	48	329	26	28	307	49	45	307	30	17	40	10	2	339	3	32
24	334	51	33	149	11	5	331	14	6	309	3	60	308	16	36	40	19	30	339	10	51
25	335	51	55	161	2	54	333	2	41	310	18	14	309	2	57	40	29	6	339	18	10
26	336	52	15	172	51	54	334	52	12	311	32	29	309	49	19	40	38	49	339	25	29
27	337	52	33	184	40	9	336	42	39	312	46	44	310	35	42	40	48	39	339	32	48
28	338	52	50	196	30	9	338	34	1	314	0	60	311	22	7	40	58	36	339	40	8
29	339	53	6	208	24	59	340	26	16	315	15	15	312	8	32	41	8	40	339	47	27

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Mar. 1	340	53	19	220	28	21	342	19	23	316	29	31	312	54	60	41	18	51	339	54	47
2	341	53	32	232	44	24	344	13	17	317	43	48	313	41	28	41	29	8	340	2	7
3	342	53	42	245	17	36	346	7	54	318	58	4	314	27	57	41	39	32	340	9	27
4	343	53	52	258	12	20	348	3	11	320	12	21	315	14	28	41	50	3	340	16	46
5	344	53	60	271	32	22	349	58	59	321	26	38	316	1	0	42	0	41	340	24	5
6	345	54	6	285	20	11	351	55	12	322	40	55	316	47	33	42	11	24	340	31	25
7	346	54	11	299	36	7	353	51	39	323	55	13	317	34	7	42	22	14	340	38	43
8	347	54	14	314	17	41	355	48	10	325	9	30	318	20	41	42	33	10	340	46	1
9	348	54	15	329	19	15	357	44	30	326	23	47	319	7	17	42	44	12	340	53	19
10	349	54	14	344	32	24	359	40	25	327	38	4	319	53	53	42	55	19	341	0	36
11	350	54	12	359	47	4	1	35	37	328	52	21	320	40	29	43	6	33	341	7	52
12	351	54	7	14	53	9	3	29	45	330	6	37	321	27	7	43	17	52	341	15	7
13	352	54	1	29	42	4	5	22	28	331	20	54	322	13	44	43	29	16	341	22	22
14	353	53	52	44	7	49	7	13	22	332	35	10	323	0	23	43	40	46	341	29	36
15	354	53	41	58	7	22	9	2	1	333	49	25	323	47	1	43	52	22	341	36	49
16	355	53	29	71	40	17	10	47	57	335	3	41	324	33	41	44	4	2	341	44	0
17	356	53	13	84	48	13	12	30	42	336	17	55	325	20	20	44	15	48	341	51	11
18	357	52	56	97	34	6	14	9	48	337	32	10	326	6	60	44	27	39	341	58	21
19	358	52	36	110	1	35	15	44	45	338	46	24	326	53	40	44	39	34	342	5	29
20	359	52	14	122	14	32	17	15	5	340	0	38	327	40	20	44	51	34	342	12	36
21	0	51	50	134	16	38	18	40	21	341	14	51	328	27	1	45	3	39	342	19	42
22	1	51	23	146	11	20	20	0	8	342	29	4	329	13	42	45	15	49	342	26	46
23	2	50	55	158	1	38	21	14	1	343	43	17	330	0	23	45	28	2	342	33	49
24	3	50	24	169	50	10	22	21	41	344	57	29	330	47	4	45	40	20	342	40	50
25	4	49	51	181	39	16	23	22	46	346	11	41	331	33	45	45	52	43	342	47	49
26	5	49	16	193	31	5	24	17	2	347	25	52	332	20	26	46	5	9	342	54	47
27	6	48	39	205	27	40	25	4	15	348	40	3	333	7	8	46	17	40	343	1	43
28	7	47	60	217	31	13	25	44	13	349	54	14	333	53	49	46	30	14	343	8	38
29	8	47	19	229	44	3	26	16	49	351	8	25	334	40	31	46	42	53	343	15	30
30	9	46	36	242	8	46	26	41	59	352	22	36	335	27	13	46	55	35	343	22	21
31	10	45	52	254	48	10	26	59	43	353	36	46	336	13	55	47	8	21	343	29	10

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR 5^h $29^m.0$ I.S.T.

Date		Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
		°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Apr.	1	11	45	6	267	45	6	27	10	2	354	50	56	337	0	37	47	21	11	343	35	57
	2	12	44	18	281	2	14	27	13	6	356	5	6	337	47	18	47	34	5	343	42	41
	3	13	43	28	294	41	34	27	9	6	357	19	16	338	34	0	47	47	2	343	49	24
	4	14	42	37	308	43	59	26	58	18	358	33	25	339	20	41	48	0	2	343	56	4
	5	15	41	44	323	8	35	26	41	6	359	47	34	340	7	23	48	13	6	344	2	42
	6	16	40	49	337	52	20	26	17	58	1	1	43	340	54	3	48	26	13	344	9	18
	7	17	39	52	352	49	47	25	49	25	2	15	51	341	40	43	48	39	23	344	15	51
	8	18	38	53	7	53	32	25	16	7	3	29	59	342	27	23	48	52	36	344	22	22
	9	19	37	52	22	54	55	24	38	47	4	44	6	343	14	2	49	5	52	344	28	50
	10	20	36	49	37	45	21	23	58	12	5	58	13	344	0	41	49	19	11	344	35	15
	11	21	35	45	52	17	27	23	15	10	7	12	19	344	47	18	49	32	33	344	41	38
	12	22	34	38	66	26	0	22	30	36	8	26	25	345	33	55	49	45	57	344	47	58
	13	23	33	29	80	8	20	21	45	19	9	40	30	346	20	31	49	59	25	344	54	16
	14	24	32	17	93	24	13	21	0	13	10	54	34	347	7	7	50	12	54	345	0	30
	15	25	31	4	106	15	30	20	16	7	12	8	38	347	53	41	50	26	26	345	6	41
	16	26	29	48	118	45	27	19	33	47	13	22	41	348	40	14	50	40	1	345	12	50
	17	27	28	30	130	58	12	18	53	55	14	36	43	349	26	46	50	53	37	345	18	55
	18	28	27	10	142	58	16	18	17	8	15	50	45	350	13	17	51	7	16	345	24	57
	19	29	25	47	154	50	14	17	43	58	17	4	46	350	59	47	51	20	57	345	30	56
	20	30	24	22	166	38	24	17	14	52	18	18	46	351	46	16	51	34	39	345	36	52

SUN AND MOON, 2024

DECLINATION OF SUN, LATITUDE AND DECLINATION OF MOON FOR $5^h\ 29^m.0$ I.S.T.

Date		Declination		Latitude		Declination		Date		Declination		Latitude		Declination	
		°	'	°	'	°	'			°	'	°	'	°	'
Jan.	0	-23	07.9	+4	13.3	+17	28.4	Feb.	1	-17	18.3	-0	09.8	-7	51.0
	1	23	03.5	3	34.1	12	37.9		2	17	01.3	1	13.2	13	12.5
	2	22	58.7	2	45.9	7	22.0		3	16	44.0	2	14.6	18	09.9
	3	22	53.4	1	50.5	+1	50.8		4	16	26.4	3	11.2	22	28.6
	4	22	47.6	0	49.9	-3	46.6		5	16	08.5	3	59.8	25	49.7
	5	22	41.4	-0	13.7	9	21.1		6	15	50.4	4	37.1	27	51.8
	6	22	34.8	1	18.0	14	41.7		7	15	31.9	4	59.5	28	14.4
	7	22	27.7	2	20.2	19	34.6		8	15	13.2	5	03.9	26	44.4
	8	22	20.1	3	17.0	23	41.3		9	14	54.3	4	48.4	23	22.3
	9	22	12.1	4	04.7	26	39.5		10	14	35.1	4	12.8	18	23.0
	10	22	03.7	4	39.5	28	05.6		11	14	15.6	3	19.0	12	12.2
	11	21	54.9	4	57.8	27	41.8		12	13	55.9	2	11.4	-5	20.1
	12	21	45.6	4	57.1	25	23.0		13	13	36.0	-0	55.5	+1	44.1
	13	21	35.9	4	36.4	21	20.0		14	13	15.9	+0	22.5	8	34.0
	14	21	25.8	3	57.0	15	55.7		15	12	55.5	1	37.1	14	47.4
	15	21	15.2	3	01.9	9	38.2		16	12	34.9	2	44.0	20	05.8
	16	21	04.3	1	55.7	-2	55.1		17	12	14.2	3	40.1	24	13.9
	17	20	52.9	-0	43.3	+3	49.6		18	11	53.2	4	23.1	27	00.1
	18	20	41.2	+0	30.2	10	15.3		19	11	32.0	4	52.0	28	17.6
	19	20	29.1	1	40.5	16	03.9		20	11	10.7	5	06.3	28	05.6
	20	20	16.5	2	43.8	20	59.2		21	10	49.2	5	06.1	26	29.9
	21	20	03.6	3	37.2	24	46.4		22	10	27.5	4	51.9	23	40.9
	22	19	50.3	4	18.4	27	13.2		23	10	05.7	4	24.9	19	52.0
	23	19	36.7	4	46.0	28	12.0		24	9	43.7	3	46.4	15	17.4
	24	19	22.7	4	59.2	27	41.7		25	9	21.6	2	58.2	10	10.1
	25	19	08.3	4	58.0	25	48.4		26	8	59.3	2	02.4	+4	42.3
	26	18	53.6	4	43.1	22	43.9		27	8	36.9	+1	01.2	-0	55.2
	27	18	38.6	4	15.4	18	42.8		28	8	14.4	-0	02.9	6	32.0
	28	18	23.2	3	36.6	13	59.6		29	-7	51.8	-1	07.5	-11	57.7
	29	18	07.4	2	48.6	8	47.8								
	30	17	51.4	1	53.4	3	18.8								
	31	-17	35.0	+0	53.2	-2	17.3								

SUN AND MOON, 2024

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	29.0	-2	09.9	-17	01.0	Apr. 1	+4	38.8	-5	02.4	-28	27.6
2	7	06.1	3	07.5	21	28.7	2	5	01.9	5	16.7	28	14.3
3	6	43.1	3	57.6	25	04.7	3	5	24.9	5	13.7	26	19.7
4	6	20.0	4	37.2	27	31.0	4	5	47.8	4	52.3	22	46.4
5	5	56.9	5	03.4	28	29.1	5	6	10.6	4	12.2	17	46.2
6	5	33.6	5	13.3	27	44.5	6	6	33.3	3	14.8	11	37.7
7	5	10.3	5	04.5	25	11.5	7	6	55.9	2	03.4	-4	44.1
8	4	46.9	4	35.8	20	56.2	8	7	18.4	-0	42.9	+2	28.5
9	4	23.4	3	47.8	15	15.8	9	7	40.8	+0	40.4	9	32.1
10	3	59.9	2	43.1	8	35.6	10	8	03.0	1	59.9	15	59.1
11	3	36.3	1	26.5	-1	24.5	11	8	25.1	3	09.9	21	24.0
12	3	12.7	-0	04.5	+5	47.7	12	8	47.1	4	06.3	25	25.5
13	2	49.1	+1	16.4	12	33.5	13	9	08.9	4	46.6	27	50.1
14	2	25.4	2	30.4	18	28.3	14	9	30.5	5	10.1	28	33.7
15	2	01.7	3	33.1	23	12.1	15	9	52.0	5	17.2	27	41.7
16	1	38.0	4	21.8	26	30.4	16	10	13.3	5	08.9	25	26.6
17	1	14.3	4	55.1	28	15.0	17	10	34.5	4	46.7	22	04.1
18	0	50.5	5	12.7	28	25.5	18	10	55.5	4	12.3	17	49.7
19	0	26.8	5	15.0	27	08.2	19	11	16.2	3	27.4	12	57.1
20	-0	03.1	5	03.0	24	34.5	20	+11	36.9	+2	33.9	+7	38.1
21	+0	20.6	4	37.7	20	58.2							
22	0	44.3	4	00.6	16	33.3							
23	1	08.0	3	13.3	11	32.8							
24	1	31.6	2	17.9	6	08.3							
25	1	55.2	1	16.4	0	30.7							
26	2	18.7	+0	11.4	-5	09.6							
27	2	42.2	-0	54.6	-10	41.6							
28	3	05.7	1	58.9	-15	53.5							
29	3	29.0	2	58.5	-20	32.0							
30	3	52.4	3	50.9	-24	21.5							
31	+4	15.6	-4	33.0	-27	05.6							

PLANETS, 2024

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	+3 06.4	-20 07.6	+1 58.7	-18 30.1	-0 32.4	-23 56.1	-1 11.4	+12 15.5	-1 38.1	-11 52.3
2	2 60.0	20 12.8	1 55.2	19 01.7	0 33.6	23 59.1	1 10.8	12 16.2	1 38.0	11 48.3
4	2 48.8	20 24.9	1 51.4	19 31.5	0 34.8	24 01.0	1 10.2	12 17.2	1 37.8	11 44.3
6	2 34.3	20 41.8	1 47.3	19 59.2	0 35.9	24 02.0	1 09.6	12 18.4	1 37.7	11 40.1
8	2 17.7	21 01.6	1 42.9	20 24.8	0 37.1	24 01.9	1 09.0	12 20.0	1 37.6	11 35.8
10	1 59.9	21 22.8	1 38.4	20 48.2	0 38.2	24 00.9	1 08.4	12 21.8	1 37.5	11 31.5
12	1 41.5	21 43.7	1 33.6	21 09.3	0 39.4	23 58.8	1 07.8	12 23.8	1 37.4	11 27.0
14	1 22.8	22 03.5	1 28.7	21 28.0	0 40.5	23 55.6	1 07.2	12 26.1	1 37.3	11 22.5
16	1 04.3	22 21.0	1 23.6	21 44.4	0 41.6	23 51.5	1 06.6	12 28.7	1 37.2	11 17.9
18	0 46.0	22 35.7	1 18.3	21 58.3	0 42.7	23 46.2	1 06.0	12 31.6	1 37.1	11 13.2
20	0 28.3	22 47.0	1 12.9	22 09.6	0 43.9	23 40.0	1 05.4	12 34.6	1 37.0	11 08.5
22	+0 11.1	22 54.5	1 07.3	22 18.4	0 44.9	23 32.7	1 04.8	12 37.9	1 36.9	11 03.7
24	-0 05.3	22 57.7	1 01.6	22 24.5	0 46.0	23 24.4	1 04.2	12 41.5	1 36.9	10 58.8
26	0 21.0	22 56.5	0 55.9	22 28.1	0 47.1	23 15.1	1 03.6	12 45.3	1 36.8	10 53.9
28	0 35.9	22 50.6	0 50.1	22 28.9	0 48.2	23 04.8	1 03.1	12 49.3	1 36.8	10 48.9
30	0 49.8	22 39.8	0 44.2	22 27.1	0 49.2	22 53.4	1 02.5	12 53.5	1 36.7	10 43.8
Feb. 1	1 02.8	22 24.0	0 38.3	22 22.6	0 50.3	22 41.1	1 02.0	12 57.9	1 36.7	10 38.7
3	1 14.8	22 03.1	0 32.3	22 15.4	0 51.3	22 27.7	1 01.4	13 02.5	1 36.7	10 33.6
5	1 25.6	21 36.9	0 26.4	22 05.6	0 52.3	22 13.4	1 00.9	13 07.3	1 36.7	10 28.4
7	1 35.4	21 05.4	0 20.4	21 53.1	0 53.4	21 58.1	1 00.4	13 12.4	1 36.7	10 23.2
9	1 44.0	20 28.5	0 14.5	21 38.0	0 54.4	21 41.8	0 59.8	13 17.6	1 36.7	10 17.9
11	1 51.3	19 46.2	0 08.7	21 20.3	0 55.3	21 24.6	0 59.3	13 22.9	1 36.7	10 12.6
13	1 57.3	18 58.4	+0 02.9	21 00.0	0 56.3	21 06.5	0 58.8	13 28.5	1 36.7	10 07.3
15	2 01.8	18 05.1	-0 02.9	20 37.3	0 57.2	20 47.4	0 58.3	13 34.2	1 36.8	10 01.9
17	2 04.9	17 06.2	0 08.5	20 12.1	0 58.2	20 27.5	0 57.8	13 40.0	1 36.8	9 56.5
19	2 06.5	16 01.8	0 14.1	19 44.6	0 59.1	20 06.7	0 57.4	13 46.0	1 36.8	9 51.1
21	2 06.3	14 51.9	0 19.5	19 14.7	0 60.0	19 45.0	0 56.9	13 52.2	1 36.9	9 45.7
23	2 04.4	13 36.5	0 24.8	18 42.7	1 00.9	19 22.5	0 56.4	13 58.4	1 37.0	9 40.2
25	2 00.6	12 15.7	0 30.0	18 08.4	1 01.7	18 59.1	0 56.0	14 04.8	1 37.1	9 34.8
27	-1 54.8	-10 49.5	-0 35.0	-17 32.1	-1 02.6	-18 35.0	-0 55.5	+14 11.3	-1 37.1	-9 29.4

PLANETS, 2024

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	-1 54.8	-10 49.5	-0 35.0	-17 32.1	-1 02.6	-18 35.0	-0 55.5	+14 11.3	-1 37.1	-9 29.4
29	1 46.9	9 18.1	0 39.9	16 53.8	1 03.4	18 10.1	0 55.1	14 17.9	1 37.2	9 23.9
Mar. 2	1 36.8	7 41.8	0 44.6	16 13.5	1 04.2	17 44.4	0 54.7	14 24.6	1 37.3	9 18.5
4	1 24.4	6 01.1	0 49.1	15 31.5	1 05.0	17 18.0	0 54.2	14 31.5	1 37.5	9 13.0
6	1 09.6	4 16.3	0 53.4	14 47.7	1 05.7	16 50.8	0 53.8	14 38.4	1 37.6	9 07.6
8	0 52.6	2 28.3	0 57.4	14 02.2	1 06.5	16 23.0	0 53.4	14 45.4	1 37.7	9 02.1
10	0 33.2	-0 38.3	1 01.3	13 15.2	1 07.2	15 54.5	0 53.0	14 52.4	1 37.9	8 56.7
12	-0 11.8	+1 12.6	1 05.0	12 26.8	1 07.9	15 25.4	0 52.6	14 59.6	1 38.0	8 51.3
14	+0 11.5	3 02.6	1 08.4	11 37.0	1 08.5	14 55.6	0 52.3	15 06.8	1 38.2	8 46.0
16	0 36.1	4 49.7	1 11.6	10 45.9	1 09.2	14 25.3	0 51.9	15 14.1	1 38.3	8 40.6
18	1 01.5	6 31.8	1 14.5	9 53.7	1 09.8	13 54.4	0 51.5	15 21.4	1 38.5	8 35.3
20	1 27.0	8 06.8	1 17.2	9 00.4	1 10.4	13 22.9	0 51.2	15 28.7	1 38.7	8 30.0
22	1 51.8	9 32.6	1 19.7	8 06.2	1 10.9	12 51.0	0 50.8	15 36.1	1 38.9	8 24.8
24	2 14.9	10 47.4	1 21.9	7 11.0	1 11.5	12 18.5	0 50.5	15 43.6	1 39.1	8 19.6
26	2 35.7	11 49.6	1 23.8	6 15.1	1 12.0	11 45.6	0 50.2	15 51.0	1 39.3	8 14.4
28	2 53.1	12 37.9	1 25.5	5 18.5	1 12.5	11 12.3	0 49.8	15 58.5	1 39.6	8 09.3
30	3 06.3	13 11.4	1 26.9	4 21.3	1 12.9	10 38.5	0 49.5	16 06.0	1 39.8	8 04.3
Apr. 1	3 14.7	13 29.3	1 28.0	3 23.6	1 13.3	10 04.3	0 49.2	16 13.5	1 40.0	7 59.3
3	3 17.4	13 31.5	1 28.8	2 25.4	1 13.7	9 29.8	0 48.9	16 21.0	1 40.3	7 54.3
5	3 13.9	13 18.1	1 29.4	1 27.0	1 14.1	8 54.9	0 48.6	16 28.5	1 40.6	7 49.4
7	3 04.1	12 50.0	1 29.7	-0 28.3	1 14.4	8 19.8	0 48.3	16 36.0	1 40.8	7 44.6
9	2 47.8	12 08.9	1 29.8	+0 30.5	1 14.7	7 44.3	0 48.1	16 43.5	1 41.1	7 39.8
11	2 25.7	11 17.4	1 29.6	1 29.3	1 15.0	7 08.6	0 47.8	16 51.0	1 41.4	7 35.1
13	1 58.7	10 18.8	1 29.1	2 28.1	1 15.2	6 32.7	0 47.5	16 58.5	1 41.7	7 30.5
15	1 28.1	9 16.8	1 28.3	3 26.6	1 15.4	5 56.5	0 47.3	17 05.9	1 42.0	7 26.0
17	0 55.3	8 15.2	1 27.3	4 25.0	1 15.6	5 20.2	0 47.0	17 13.3	1 42.3	7 21.6
19	+0 21.7	7 17.5	1 26.1	5 23.0	1 15.7	4 43.8	0 46.8	17 20.7	1 42.6	7 17.2
21	-0 11.3	+6 26.5	-1 24.6	+6 20.5	-1 15.9	-4 07.2	-0 46.5	+17 28.1	-1 43.0	-7 12.9

URANUS, NEPTUNE AND PLUTO, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Uranus			Neptune			Pluto			Date	Uranus			Neptune			Pluto		
	°	′	″	°	′	″	°	′	″		°	′	″	°	′	″	°	′	″
Jan. 0	49	24	23	355	3	43	299	19	37	Feb. 25	49	26	49	356	33	32	301	4	51
2	49	21	45	355	5	27	299	23	20	27	49	29	51	356	37	52	301	8	09
4	49	19	18	355	7	20	299	27	05	Mar. 29	49	33	04	356	42	14	301	11	23
6	49	17	02	355	9	20	299	30	52	2	49	36	29	356	46	38	301	14	33
8	49	14	58	355	11	28	299	34	42	4	49	40	05	356	51	05	301	17	38
10	49	13	05	355	13	44	299	38	32	6	49	43	51	356	55	34	301	20	40
12	49	11	25	355	16	07	299	42	25	8	49	47	48	357	0	04	301	23	37
14	49	9	56	355	18	38	299	46	17	10	49	51	55	357	4	35	301	26	28
16	49	8	39	355	21	15	299	50	11	12	49	56	12	357	9	07	301	29	15
18	49	7	34	355	23	59	299	54	05	14	50	0	38	357	13	39	301	31	57
20	49	6	42	355	26	49	299	57	59	16	50	5	15	357	18	13	301	34	33
22	49	6	03	355	29	47	300	1	53	18	50	10	00	357	22	46	301	37	04
24	49	5	36	355	32	51	300	5	47	20	50	14	54	357	27	19	301	39	30
26	49	5	21	355	36	01	300	9	41	22	50	19	57	357	31	52	301	41	49
28	49	5	19	355	39	16	300	13	34	24	50	25	08	357	36	24	301	44	03
30	49	5	30	355	42	38	300	17	26	26	50	30	27	357	40	55	301	46	11
Feb. 1	49	5	53	355	46	05	300	21	17	28	50	35	53	357	45	26	301	48	13
3	49	6	29	355	49	37	300	25	07	30	50	41	27	357	49	55	301	50	09
5	49	7	18	355	53	15	300	28	56	Apr. 1	50	47	09	357	54	23	301	51	59
7	49	8	19	355	56	58	300	32	43	3	50	52	57	357	58	49	301	53	42
9	49	9	34	356	0	46	300	36	28	5	50	58	52	358	3	14	301	55	19
11	49	11	00	356	4	38	300	40	11	7	51	4	53	358	7	35	301	56	50
13	49	12	39	356	8	35	300	43	51	9	51	10	60	358	11	55	301	58	14
15	49	14	31	356	12	35	300	47	28	11	51	17	12	358	16	12	301	59	31
17	49	16	34	356	16	40	300	51	03	13	51	23	30	358	20	26	302	0	42
19	49	18	50	356	20	48	300	54	35	15	51	29	54	358	24	37	302	1	46
21	49	21	18	356	24	60	300	58	04	17	51	36	21	358	28	44	302	2	43
23	49	23	58	356	29	14	301	1	29	19	51	42	53	358	32	48	302	3	33
25	49	26	49	356	33	32	301	4	51	21	51	49	28	358	36	48	302	4	17

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:

$$\text{GMST at } 0^h\,UT1 = 6^h\,41^m\,50^s.549\,377 + 864\,018\,4^s.704\,478\,T_u + 0^s.092\,772\,T_u^2 - 2^s.93 \times 10^{-8}\,T_u^3 - 1^s.997 \times 10^{-6}\,T_u^4 - 2^s.5 \times 10^{-9}\,T_u^5$$

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 2023:

On day of year d at t^h UT1 GMST $= 6^h.627\,045 + 0^h.065\,709\,8246\,d + 1^h.002\,737\,91\,t$

where day of the year d is tabulated on pages 4 to 12.

EXPLANATION

In 2023 :

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 2023 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, 2023 (Page 13).	6	41	33.918
		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	29	10.012
5.	Add equation of equinoxes at UT=0^d. 45 (second order interpolation may be used).			-0.64577
6.	Greenwich apparent sidereal time	17	29	09.366
7.	Add longitude (east positive)	5	08	52.000
8.	Local apparent sidereal time	22	38	01.366

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 $22^h\ 38^m$ 01.366 local apparent sidereal time on 2023 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	01.366
2.	Subtract longitude (east positive)	5	08	52.000
3.	Greenwich apparent sidereal time	17	29	09.366
4.	Subtract equation of equinox at 0^h U.T.			-0.6464
5.	Greenwich mean sidereal time (provisional)	17	29	10.013
6.	Subtract Greenwich mean sidereal time at 0^h U.T.	6	41	33.918
7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.095

7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.095	
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)	(-)			0.00140
9.	Mean sidereal time	10	47	36.093	
10.	Equivalent UT (MST × 0.997 269 566)	10	45	49.999	
11.	Local mean time = UT + λ	15	54	41.999	

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 - 1983, ΔT = ET − UT.

From 1984, ΔT = TDT - UT.
2001, ΔT = TT - UT.

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1820.0	+ 12.0	1863	6.97	1906	5.37	1949	28.71	1992	58.31
1821	11.7	1864	6.40	1907	6.14	1950.0	+ 29.15	1993	58.12
1822	11.4	1865.0	6.02	1908	7.75	1951	29.57	1994	59.98
1823	11.1	1866	5.41	1909	9.13	1952	29.97	1995.0	60.78
1824	10.6	1867	4.10	1910.0	+ 10.46	1953	30.36	1996	61.63
1825.0	10.2	1868	2.92	1911	11.53	1954	30.72	1997	62.29
1826	9.60	1869	1.82	1912	13.36	1955.0	31.07	1998	62.97
1827	9.10	1870.0	+ 1.61	1913	14.65	1956	31.35	1999	63.47
1828	8.60	1871	+ 0.10	1914	16.01	1957	31.68	2000.0	+ 63.83
1829	8.00	1872	− 1.02	1915.0	17.20	1958	32.18	2001	64.09
1830.0	+ 7.50	1873	1.28	1916	18.24	1959	32.68	2002	64.30
1831	7.00	1874	2.69	1917	19.06	1960.0	+ 33.15	2003	64.47
1832	6.60	1875.0	3.24	1918	20.25	1961	33.59	2004	64.57
1833	6.30	1876	3.64	1919	20.95	1962	34.00	2005.0	+ 64.69
1834	6.00	1877	4.54	1920.0	+ 21.16	1963	34.47	2006	64.85
1835.0	5.80	1878	4.71	1921	22.25	1964	35.03	2007	65.15
1836	5.70	1879	5.11	1922	22.41	1965.0	35.73	2008	65.46
1837	5.60	1880.0	− 5.40	1923	23.03	1966	36.54	2009	65.78
1838	5.60	1881	5.42	1924	23.49	1967	37.43	2010.0	+ 66.07
1839	5.60	1882	5.20	1925.0	23.62	1968	38.29	2011	66.32
1840.0	+ 5.70	1883	5.46	1926	23.86	1969	39.20	2012	66.60
1841	5.80	1884	5.46	1927	24.49	1970.0	+ 40.18	2013	66.91
1842	5.90	1885.0	5.79	1928	24.34	1971	41.17	2014	67.28
1843	6.10	1886	5.63	1929	24.08	1972	42.23	2015.0	67.64
1844	6.20	1887	5.64	1930.0	+ 24.02	1973	43.37	2016	68.10
1845.0	6.30	1888	5.80	1931	24.00	1974	44.49	2017	68.59
1846	6.50	1889	5.66	1932	23.87	1975.0	45.48	2018	68.97
1847	6.60	1890.0	− 5.87	1933	23.95	1976	46.46	2019	69.22
1848	6.80	1891	6.01	1934	23.86	1977	47.52	2020.0	+69.36
1849	6.90	1892	6.19	1935.0	23.93	1978	48.53		
1850.0	+ 7.10	1893	6.64	1936	23.73	1979	49.59		
1851	7.20	1894	6.44	1937	23.92	1980.0	+ 50.54		
1852	7.30	1895.0	6.47	1938	23.96	1981	51.38		
1853	7.40	1896	6.09	1939	24.02	1982	52.17		
1854	7.50	1897	5.76	1940.0	+ 24.33	1983	52.96		
1855.0	7.60	1898	4.66	1941	24.83	1984	53.79		
1856	7.70	1899	3.74	1942	25.30	1985.0	54.34		
1857	7.70	1900.0	− 2.72	1943	25.70	1986	54.87		
1858	7.80	1901	1.54	1944	26.24	1987	55.32		
1859	7.80	1902	− 0.02	1945.0	26.77	1988	55.82		
1860.0	+ 7.88	1903	+ 1.24	1946	27.28	1989	56.30		
1861	7.82	1904	2.64	1947	27.78	1990.0	+ 56.86		
1862	7.54	1905.0	3.86	1948	28.25	1991	57.57		

Extrapolated Values

2021	+ 69.50	2023	+ 70	2025	+ 70
2022	+ 70	2024	+ 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		= ΔAT + $32^s.184$	
						ΔTT	

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

$$\mathbf{M} = \mathbf{N\,P\,B}$$

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

$$T = (t - 2000.0)/100 = (JD_{TT} - 2451545.0)/36525, \text{ which is a function of TT.}$$

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 $S_1 = \sin\varepsilon_0$ $S_2 = \sin(-\psi_A)$ $S_3 = \sin(-\omega_A)$ $S_4 = \sin\chi_A$
$C_1 = \cos\varepsilon_0$ $C_2 = \cos(-\psi_A)$ $C_3 = \cos(-\omega_A)$ $C_4 = \cos\chi_A$

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 $\zeta_{A,}$ 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 :

$m = 4612''.604\,08 + 2''.783\,169\,4\,T + 0''.108\,859\,95\,T^2 - 0''.000\,138\,268\,T^3$ 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 $\zeta_{A,}$ $Z_{A,}$ 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 :

$$\begin{aligned} \sin(\alpha - Z_A)\cos\delta &= \sin(\alpha_o + \zeta_A)\cos\delta_o. \\ \cos(\alpha - Z_A)\cos\delta &= \cos(\alpha_o + \zeta_A)\cos\theta_A\cos\delta_o - \sin\theta_A\sin\delta_o \\ \sin\delta &= \cos(\alpha_o + \zeta_A)\sin\theta_A\cos\delta_o + \cos\theta_A\sin\delta_o \end{aligned}$$

$$\begin{aligned} \sin(\alpha_o + \zeta_A)\cos\delta_o &= \sin(\alpha - Z_A)\cos\delta \\ \cos(\alpha_o + \zeta_A)\cos\delta_o &= \cos(\alpha - Z_A)\cos\theta_A\cos\delta + \sin\theta_A\sin\delta \\ \sin\delta_o &= -\cos(\alpha - Z_A)\sin\theta_A\cos\delta + \cos\theta_A\sin\delta \end{aligned}$$

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 2023.5 — Rotation matrix P for reduction to epoch J 2023.5

$$\zeta_A = +544''.597 = +0^\circ.151\,277$$
$$Z_A = +539''.338 = +0^\circ.149\,816$$
$$\theta_A = +470''.961 = +0^\circ.130\,822$$

$$\mathbf{P} = \begin{bmatrix} +0.999\,983\,59 & -0.005\,255\,03 & -0.002\,283\,27 \\ +0.005\,255\,03 & +0.999\,986\,19 & -0.000\,005\,97 \\ +0.002\,283\,27 & -0.000\,006\,03 & +0.999\,997\,39 \end{bmatrix}$$

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 2023.5

$$\varepsilon = 23^\circ\,26'\,10''.40 = 23^\circ.436\,222$$
$$\pi_A = +11''.043 = 0^\circ.003\,067\,5$$
$$\Pi_A = 174^\circ\,49'.0 = 174^\circ.817$$

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
$\alpha_o = \alpha - M - N\sin\alpha_m \tan\delta_m$	$\alpha = \alpha_o + M + N\sin\alpha_m \tan\delta_m$
$\delta_o = \delta - N\cos\alpha_m$	$\delta = \delta_o + \text{N}\cos\alpha_m$
$\lambda_o = \lambda - \text{a} + \text{b}\cos(\lambda + \text{c}')\tan\beta_o$	$\lambda = \lambda_o + \text{a} - \text{b}\cos(\lambda_o + \text{c})\tan\beta$
$\beta_o = \beta - \text{b}\sin(\lambda + \text{c}')$	$\beta = \beta_o + \text{b}\sin(\lambda_o + \text{c})$
$\Omega_o = \Omega - \text{a} + \text{b}\sin(\Omega + \text{c}')\cot i_o$.	$\Omega = \Omega_o + \text{a} - \text{b}\sin(\Omega_o + \text{c})\cot i$
$i_o = i - \text{b}\cos(\Omega + \text{c}')$	$i = i_o + \text{b}\cos(\Omega_o + \text{c})$
$\omega_o = \omega - \text{b}\sin(\Omega + \text{c}')\,\text{cosec}\,i_o$	$\omega = \omega_o + \text{b}\sin(\Omega_o + \text{c})\,\text{cosec}\,i$

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 :

$\alpha = \alpha_1 + \tau\,(m + n \sin \alpha_1 \tan \delta_1)$ $\qquad$ $\delta = \delta_1 + \tau\, n \cos \alpha_1$

$\lambda = \lambda_1 + \tau\,\{p - \pi \cos(\lambda_1 + 6°) \tan \beta\}$ $\qquad$ $\beta = \beta_1 + \tau\,\pi \sin(\lambda_1 + 6°)$

$\Omega = \Omega_1 + \tau\,\{\rho - \pi \sin(\Omega_1 + 6°) \cot i\}$ $\qquad$ $i = i_1 + \tau\,\pi \cos(\Omega_1 + 6°)$

$\omega = \omega_1 + \tau\,\pi \sin(\Omega_1 + 6°) \operatorname{cosec} i$

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 2023.5
Annual general precession	$p =$	$+\,0°.013\,971\,16$
Annual precession in R.A.	$m =$	$+\,0°.012\,814\,15$
Annual precession in Dec.	$n =$	$+\,0°.005\,566\,97$
Annual rate of rotation	$\pi =$	$+\,0°.000\,130\,52$
Longitude of axis	$\Pi =$	$+\,175°.0911$

$$\gamma = 180° - \Pi = +\,4°.9089$$

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 $S_1 = \sin(\varepsilon) \qquad S_2 = \sin(-\Delta\psi) \qquad S_3 = \sin(-\varepsilon - \Delta\varepsilon)$

$C_1 = \cos(\varepsilon) \qquad C_2 = \cos(-\Delta\psi) \qquad C_3 = \cos(-\varepsilon - \Delta\varepsilon)$

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:

$$N = \begin{bmatrix} 1 & -\Delta\psi\cos\varepsilon & -\Delta\psi\sin\varepsilon \\ +\Delta\psi\cos\varepsilon & 1 & -\Delta\varepsilon \\ +\Delta\psi\sin\varepsilon & +\Delta\varepsilon & 1 \end{bmatrix}$$

Daily values of $\Delta\psi$ and $\Delta\varepsilon$ during 2023 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 2023 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 2023		*f* s	*g* s	*g* ′	*G* h	m	Date 2023		*f* s	*g* s	*g* ′	*G* h	m
Jan.	**- 4**	+70.0	30.4	7.61	23	57	**July**	**5**	+71.8	31.2	7.80	23	57
	6	+70.1	30.5	7.62	23	57		**15**	+71.9	31.2	7.81	23	57
	16 *	+70.2	30.5	7.63	23	57		**25**	+72.0	31.3	7.82	23	57
	26	+70.4	30.6	7.65	23	57	**Aug.**	**4** *	+72.1	31.3	7.84	23	57
Feb.	**5**	+70.5	30.6	7.66	23	57		**14**	+72.2	31.4	7.85	23	57
	15	+70.5	30.7	7.66	23	57		**24**	+72.3	31.4	7.85	23	57
	25 * †	+70.6	30.7	7.67	23	57	**Sept.**	**3**	+72.4	31.4	7.86	23	56
Mar.	**7**	+70.7	30.7	7.68	23	57		**13** *	+72.4	31.5	7.87	23	56
	17	+70.8	30.8	7.69	23	57		**23**	+72.5	31.5	7.88	23	56
	27	+70.8	30.8	7.69	23	57	**Oct.**	**3**	+72.5	31.5	7.88	23	56
Apr.	**6** *	+70.9	30.8	7.70	23	57		**13**	+72.6	31.6	7.89	23	56
	16	+71.0	30.8	7.71	23	57		**23** *	+72.7	31.6	7.90	23	56
	26	+71.1	30.9	7.72	23	57	**Nov.**	**2**	+72.8	31.6	7.91	23	57
May	**6**	+71.1	30.9	7.73	23	57		**12**	+72.9	31.7	7.92	23	57
	16 *	+71.2	31.0	7.74	23	57		**22**	+73.0	31.7	7.93	23	57
	26	+71.3	31.0	7.75	23	57	**Dec.**	**2** *	+73.1	31.8	7.94	23	57
June	**5**	+71.4	31.0	7.76	23	57		**12**	+73.2	31.8	7.95	23	57
	15	+71.5	31.1	7.77	23	57		**22**	+73.3	31.9	7.97	23	57
	25 *	+71.7	31.1	7.79	23	57		**32**	+73.5	31.9	7.98	23	57
July	**5**	+71.8	31.2	7.80	23	57		**42** *	+73.6	32.0	7.99	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 2023.5

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 $t- \Delta t$ 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 - Δt. The light time Δt is given by:

$$\Delta t \text{ (in days)} = 0.005\ 7755 \text{ x distance in a.u.}$$

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;

$\alpha = \alpha_0 + (\pi / 15 \cos \delta_0)(X \sin \alpha_0 - Y \cos \alpha_0)$ 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 2023 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 355. 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 x 10^{14} m^3s^{-2}	3.986 004 48……x 10^{14} m^3s^{-2}
Heliocentric gravitational constant, GS	1.327 124 42 099 x 10^{20} m^3s^{-2}	1.327 124 40……x 10^{20} m^3s^{-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 x 10^{11} m	1.495 978 7066 x 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 x 10^8	1.3 x 10^8
Pallas	9.709 x 10^9	9.247 x 10^9
Vesta	7.407 x 10^9	7.253 x 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 2023 only :

Geometric mean longitude	:	$L = 279^\circ.411\,448 + 0.985\,647\,36\ d$
Mean longitude of perigee	:	$\Gamma = 283^\circ.332\,781 + 0.000\,047\,08\ d$
Mean anomaly	:	$g = 356^\circ.078\,668 + 0.985\,600\,28\ d$
Eccentricity	:	$e = 0^\circ.016\,698\,94 - 0.\,000\,000\,001\ d$
Obliquity of the ecliptic w.r.t. mean equator of date	:	$\varepsilon = 23^\circ.436\,287 - 0.000\,000\,36\ d$

where d is the interval in days from 2023 January 0 at 0^h TT and is given by

d = JD − 245 9944.5 = 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 2023.0 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 2023.5. Revised value of the annual general precession p = 0°. 013 971 16 (for J 2023.5) 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 443.

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 :

$\sin(\rho + \rho_1) = \rho_1 / S$, where S 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, 2023

Number		Date of Commencement		Number		Date of Commencement		Number		Date of Commencement	
2265	2022	Dec.	5.05	2270		Apr.	20.65	2275		Sept.	3.75
2266	2023	Jan.	1.38	2271		May	17.89	2276		Oct.	1.02
2267		Jan.	28.72	2272		June	14.10	2277		Oct.	28.31
2268		Feb.	25.06	2273	2023	July	11.29	2278		Nov.	24.61
2269		Mar.	24.38	2274		Aug.	7.51	2279	2023	Dec.	21.93
								2280	2024	Jan.	18.27

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 2023 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 2023 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 :

$$i = 22^\circ.172\,1 - 0.001\,579\,d - 0.000\,000\,410\,d^2$$

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 :

$$\Delta = 222^\circ.679\,1 - 0.055\,512\,d - 0.000\,001\,367\,d^2$$

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 :

$$\Omega' = 357^\circ.371\,2 + 0.002\,790\,d + 0.000\,001\,475\,d^2$$

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 :

$$L' = 13^\circ.458\,749 + 13.176\,396\,46\,d$$

Mean longitude of the Moon's perigee measured in the same way as L' :

$$\Gamma' = 299^\circ.086\,581 + 0.111\,403\,40\,d$$

Mean longitude of the mean ascending node of the lunar orbit on the ecliptic :

$$\Omega = 40^\circ.259\,517 - 0.052\,953\,74\,d$$

Mean elongation of the Moon from the Sun :

$$D = L' - L = 94^\circ.044\,308 + 12.190\,740\,90\,d$$

Mean inclination of the lunar orbit to the ecliptic = $5^\circ.156\,689\,8$

The above expressions are valid for use in 2023 only.

In all the above expressions, the time argument d is the interval in days since 0^h TT January 0, 2023 and is given by $d = \mathrm{JD} - 245\,9944.5$

The length of the principal mean months at 2023.0 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.

EXPLANATION

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 :

$\sin a = \sin b_o \ \sin b \ + \cos b_o \ \cos b \ \sin (c_o + l)$, where (c_o, b_o) 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 :

$\Delta l \ = \ -\pi' \ \sin (Q - \ C) \ \sec b$

$\Delta b \ = \ +\pi' \ \cos (Q - \ C)$

$\Delta C \ = \ +\sin (b + \Delta b)\ \Delta l \ - \pi' \ \sin Q \ \tan \delta$, 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 :

$$\begin{aligned} \sin z \ \sin Q &= \cos\phi \ \sin h \\ \sin z \ \cos Q &= \cos\delta \ \sin\phi - \sin\delta \ \cos\phi \ \cos h \\ \cos z &= \sin\delta \ \sin\phi + \cos\delta \ \cos\phi \ \cos h \end{aligned}$$

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 442.

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 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 :

$$\text{Earth's Centre} = (\text{Earth / Moon barycentre}) - (0.000\,0312 \cos L,\ 0.000\,2865 \sin L,\ 0.0000124 \sin L,$$
$$-0.00000718 \sin L, 0.00000657 \cos L, 0.00000285 \cos L)$$

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.

EXPLANATION

The mean longitude and latitude of 445 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 2023.5. 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 2023.5 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.

EXPLANATION

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:

$$\mathbf{P} = \mathbf{q} + T\mathbf{m} - \pi\mathbf{E_B} \ldots\ldots\ldots(1)$$

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

$$\mathbf{E} = \mathbf{E}_B - \mathbf{S}_B \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

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:

$$\mathbf{p_1} = \mathbf{p} + (2\ \mu/c^2 E)\,(\mathbf{e} - (\mathbf{p.e})\,\mathbf{p})/(1 + \mathbf{p.e}) \ldots\ldots\ldots\ldots(3)$$

EXPLANATION

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 $\mathbf{V}$ 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 $\mathbf{V}$ 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 :

$$\mathbf{p_4} = \mathbf{R_2}(-x)\,\mathbf{R_1}(-y)\,\mathbf{R_3}(\mathrm{GAST})\,\mathbf{p_3}$$

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.

EXPLANATION

Example of stellar reduction :

Calculation of apparent position of a fictitious star on 2023, 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 2023 January 1, 0^h TDB (pages 202, 256 to 270) are :

Vector	Julian date	Barycentric Rectangular Components x	y	z
$\mathbf{E_B}$	245 9945.5	−0.179 310 420	+ 0.888 591 328	+ 0.385 427 198
$\dot{\mathbf{E}}_\mathbf{B}$	245 9945.5	−0.017 219 501	−0.002 806 130	−0.001 216 952
$\mathbf{S_B}$	245 9945.5	−0.009 054 441	+0.000 003 840	+0.000 230 635

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.

q = (−0.373 854 100, −0.312 594 565, −0.873 222 624)
m = (−0.000 712 680, +0.001 690 102, +0.001 655 340)
T = (245 9945.5 − 245 1545.0)/ 36525 = +0.23

The geocentric vector **P** may be computed from equation (1) by substituting the vectors **q, m** and $\mathbf{E_B}$ and time **T**.

P = (−0.374 017 360, −0.312 205 853, −0.872 841 907) and |**P**| = 0.999 607 159

The heliocentric position vector **E** of earth may be obtained using equation (2)

E = (−0.170 255 980, +0.888 587 488, +0.385 196 563) and |**E**| = 0.983 336 775

The unit vectors **p** and **e** in the direction of **P** and **E** respectively are as follows :

p = (−0.374 164 340, −0.312 328 548, −0.873 184 930)

e = (−0.173 141 060, +0.903 645 130, +0.391 723 947)

The scalar product **p. e** = −0.559 498 406 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 :

$(2\mu/c^2\,\mathbf{E})(\mathbf{e} - (\mathbf{p.e})\,\mathbf{p})/(1 + \mathbf{p.e}) = (-0.000\,000\,017,\ +0.000\,000\,033,\ -0.000\,000\,004)$

Addition of the above correction to the unit vector **p** gives geocentric direction $\mathbf{p_1}$ of the star :

$\mathbf{p_1}$ = (– 0.374 164 360, – 0.312 328 515, – 0.873 184 934)

The velocity vector $\mathbf{V} = 0.000\,1010\,\dot{\mathbf{E}}_{\mathbf{B}}$ and $\beta^{-1} = (1 - V^2)^{1/2}$ are as follows:

V = (– 0.000 099 451, – 0.000 016 207, – 0.000 007 029)

β^{-1} = 0.999 999 995

The scalar product $\mathbf{p_1}.\mathbf{V}$ = + 0.000 048 410

Now substituting quantities computed above in the equation (4), the proper direction is obtained as:

$\mathbf{p_2}$ = (– 0.374 245 700, – 0.312 329 601, – 0.873 149 689)

The precession and nutation matrix (**M**) from page 257 is as follows:

$$\mathbf{M} = \begin{bmatrix} +0.999\,984\,563 & -0.005\,096\,123 & -0.002\,214\,169 \\ +0.005\,096\,053 & +0.999\,987\,014 & -0.000\,037\,333 \\ +0.002\,214\,330 & +0.000\,026\,049 & +0.999\,997\,548 \end{bmatrix}$$

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 $\mathbf{p_3}$ = (– 0.370 714 950, – 0.314 200 124, – 0.873 984 388) and the apparent right ascension and declination:

$\alpha = \tan^{-1}(\eta/\xi) = 14^{h}\ 41^{m}\ 7^{s}.921$; $\delta = \tan^{-1}(\zeta/\beta) = -60^\circ\ 55''\ 30'.019$

EXPLANATION

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 $1'.93\ \sqrt{h}$.

EXPLANATION

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 ϕ 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 – sinδ secϕ. The values of the amplitude for certain latitudes and declinations are given in a table on page 365.

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 π, 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) = + $70^s.0$ 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*:

$H_0 + \lambda$

	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
φ	0-00	0-30	1-00	1-30	2-00	2-30	3-00	3-30	4-00	4-30	5-00	5-30	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 + $\lambda + at) + a\tau$, $x, y, \xi, \eta, \xi', \eta'$; 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 463.

Interpolation

Interpolation Coefficients have been given on pages 351 to 354 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

$B'' = n\,(n-1)/4$, $E_0'' = -\,n\,(n-1)\,(n-2)/6$ 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 351 to 354 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 359 and 360 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/sec²) = 978.031 + 5.1859 sin² φ - 0.0057 sin² 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 $c = 299\,792\,458 \text{ ms}^{-1}$

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 — $GE = 3.986\ 004\ 418 \times 10^{14}\ m^3\ s^{-2}$
7. Constant of Gravitation — $G = 6.674\ 28 \times 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$
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 — $c\tau_A = A = 1.495\ 978\ 707 \times 10^{11}$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 — $A^3 k^2/D^2 = GS = 1.327\ 124\ 42099 \times 10^{20}\ m^3\ s^{-2}$
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 — $(GS)/G = S = 1.9884 \times 10^{30}$ 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	4.72×10^{-10}
(2) Pallas	1.03×10^{-10}
(3) Vesta	1.35×10^{-10}

- -

*See page 442 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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