सत्यमेव जयते

THE

INDIAN ASTRONOMICAL EPHEMERIS

FOR THE YEAR

2018

POSITIONAL ASTRONOMY CENTRE
INDIA METEOROLOGICAL DEPARTMENT
MINISTRY OF EARTH SCIENCES

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Issued under the authority of

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INDIA METEOROLOGICAL DEPARTMENT
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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 countryøs 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 2019 which is the end of the year 1940 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). Resolutions of the International 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 Majestyøs Nautical Almanac Office, U.K.

The work of preparation and publication of the Indian Astronomical Ephemeris for 2018 has been done under the supervision of Shri S. Sen, Director, Positional Astronomy Centre, India Meteorological Department, Kolkata.

Dr. K. J. Ramesh
Director General of Meteorology

Mausam Bhawan
New Delhi - 110 003
24th July, 2017 A.D.
(2 Sravana, 1939 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	2018.0	= 2018 Jan. 0.393	=	JD	245	8118.893
J	2018.5	= 2018 July 2.625	=	JD	245	8302.125
J	2000.0	= 2000 Jan. 1.5	=	JD	245	1545.0

Tabulations of Julian date against calendar date for 2018 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 2018.5 is tabulated with the Besselian day numbers on pages 244-251.

The lengths of the principal years and mean months at 2018.0 as derived from the Sunӧs 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	V	Solar Cycle	11
Epact	13	Roman Indiction	11
Dominical Letter	G		

CHRONOLOGICAL ERAS

The year 1940 of the Saka Era (Indian National Calendar) begins on March 22, 2018.
The year 1940 of the Saka Era or Saka Shalivahana (Lunisolar, Traditional Calendar) begins on March 18, 2018.
The year 1940 of the Saka Era (Solar, Traditional Calendar) begins on April 15, 2018.
The year 5119 of the Kali Era begins on April 14, 2018.
The year 2075 of the Vikram Samvat begins on March 18, 2018 (Chaitradi) and November 8, 2018 (Kartikadi) according to different systems of reckoning.
The year 1425 of the Bengali San begins on April 15, 2018.
The year 1194 of the Kollam Era begins on August 17, 2018.
Jovian year (Barhaspatya Varsa or 60-year cycle of Jupiter) 46 Paridhavin begins on June 9, 2018 (North Indian Usage), and 32 Vilamba on March 18, 2018 (Lunar Chaitradi) or April 14, 2018 (Solar) (South Indian Usage).
Vedanga Jyotisa year 4- Annuvatsara of the 5-year cycle (388 th cycle of Paitamaha Siddhanta) begins on January 18, 2018.
The year 2562 of the Buddha Nirvana era begins on April 30, 2018.
The year 2545 of the Mahavira Nirvana Era begins on November 8, 2018.
The year 1440 of the Mohammedan Era begins on September 12, 2018.
The year 1388 of the Yazdejardi Era begins on August 17, 2018 according to the Indian Parsi (Shahenshahi) Calendar.
The year 6731 of the Julian period begins on January 14, 2018.
The year 5779 of the Jewish Era (A.M.) begins on September 10, 2018.
The year 2794 of the Greek Olympiad, being the 2nd year of the 4-Year cycle (699 th Olympiad) begins on July, 2018.
The year 2771 of the Foundation of Rome (A.U.C.) begins on January 14, 2018.
The year 2767 of the Nabonassar begins on April 19, 2018.
The year 2330 of the Seleucidean era begins in the present-day usage of the Syrians on September 14 or October 14, 2018 according to different sects.
The Gregorian Year 2018 begins on January 1, 2018.

CALENDAR, 2018

Day of Month	Day of Year	Day of Week	Days since J 2018.5	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
					2458	1939 Saka Era		
Dec. 27	361	Wed	-187.625	-0.0137	114.5	Pausha 6	281	
28	362	Thu	186.625	-0.0110	115.5	7	282	
29	363	Fri	185.625	-0.0082	116.5	8	283	
30	364	Sat	184.625	-0.0055	117.5	9	284	
Dec. 31	365	Sun	183.625	-0.0027	118.5	10	285	
Jan. 1	1	Mon	182.625	0.0000	119.5	11	286	
2	2	Tue	181.625	0.0027	120.5	12	287	2-Full Moon
								2^h 24^m U.T
3	3	Wed	-180.625	0.0055	121.5	13	288	
4	4	Thu	179.625	0.0082	122.5	14	289	
5	5	Fri	178.625	0.0110	123.5	15	290	
6	6	Sat	177.625	0.0137	124.5	16	291	
7	7	Sun	176.625	0.0164	125.5	17	292	
8	8	Mon	175.625	0.0192	126.5	18	293	8-Last Quarter
9	9	Tue	174.625	0.0219	127.5	19	294	22^h 25^m U.T
10	10	Wed	-173.625	0.0246	128.5	20	295	
11	11	Thu	172.625	0.0274	129.5	21	296	
12	12	Fri	171.625	0.0301	130.5	22	297	
13	13	Sat	170.625	0.0329	131.5	23	298	
14	14	Sun	169.625	0.0356	132.5	24	299	
15	15	Mon	168.625	0.0383	133.5	25	300	
16	16	Tue	167.625	0.0411	134.5	26	301	
17	17	Wed	-166.625	0.0438	135.5	27	302	17-New Moon
18	18	Thu	165.625	0.0465	136.5	28	303	2^h 17^m U.T.
19	19	Fri	164.625	0.0493	137.5	29	304	
20	20	Sat	163.625	0.0520	138.5	30	305	
21	21	Sun	162.625	0.0548	139.5	Magha 1	306	
22	22	Mon	161.625	0.0575	140.5	2	307	
23	23	Tue	160.625	0.0602	141.5	3	308	
24	24	Wed	-159.625	0.0630	142.5	4	309	24-First Quarter
25	25	Thu	158.625	0.0657	143.5	5	310	22^h 20^m U.T.
26	26	Fri	157.625	0.0684	144.5	6	311	
27	27	Sat	156.625	0.0712	145.5	7	312	
28	28	Sun	155.625	0.0739	146.5	8	313	
29	29	Mon	154.625	0.0767	147.5	9	314	
30	30	Tue	153.625	0.0794	148.5	10	315	
31	31	Wed	-152.625	0.0821	149.5	11	316	31-Full Moon
Feb. 1	32	Thu	151.625	0.0849	150.5	12	317	13^h 27^m U.T.
2	33	Fri	150.625	0.0876	151.5	13	318	
3	34	Sat	149.625	0.0904	152.5	14	319	
4	35	Sun	148.625	0.0931	153.5	15	320	
5	36	Mon	147.625	0.0958	154.5	16	321	
6	37	Tue	-146.625	0.0986	155.5	17	322	

CALENDAR, 2018

Day of Month		Day of Year	Day of Week	Days since J 2018.5	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
						2458	1939 Saka Era		
Feb.	7	38	Wed	-145.625	0.1013	156.5	Magha 18	323	7-Last Quarter
	8	39	Thu	144.625	0.1040	157.5	19	324	$15^h\ 54^m$ U.T.
	9	40	Fri	143.625	0.1068	158.5	20	325	
	10	41	Sat	142.625	0.1095	159.5	21	326	
	11	42	Sun	141.625	0.1123	160.5	22	327	
	12	43	Mon	140.625	0.1150	161.5	23	328	
	13	44	Tue	139.625	0.1177	162.5	24	329	
	14	45	Wed	-138.625	0.1205	163.5	25	330	
	15	46	Thu	137.625	0.1232	164.5	26	331	15-New Moon
	16	47	Fri	136.625	0.1259	165.5	27	332	$21^h\ 05^m$ U.T.
	17	48	Sat	135.625	0.1287	166.5	28	333	
	18	49	Sun	134.625	0.1314	167.5	29	334	
	19	50	Mon	133.625	0.1342	168.5	30	335	
	20	51	Tue	132.625	0.1369	169.5	Phalguna 1	336	
	21	52	Wed	-131.625	0.1396	170.5	2	337	
	22	53	Thu	130.625	0.1424	171.5	3	338	
	23	54	Fri	129.625	0.1451	172.5	4	339	23-First Quarter
	24	55	Sat	128.625	0.1478	173.5	5	340	$8^h\ 09^m$ U.T.
	25	56	Sun	127.625	0.1506	174.5	6	341	
	26	57	Mon	126.625	0.1533	175.5	7	342	
	27	58	Tue	125.625	0.1561	176.5	8	343	
	28	59	Wed	-124.625	0.1588	177.5	9	344	
Mar.	1	60	Thu	123.625	0.1615	178.5	10	345	
	2	61	Fri	122.625	0.1643	179.5	11	346	2-Full Moon
	3	62	Sat	121.625	0.1670	180.5	12	347	$0^h\ 51^m$ U.T.
	4	63	Sun	120.625	0.1698	181.5	13	348	
	5	64	Mon	119.625	0.1725	182.5	14	349	
	6	65	Tue	118.625	0.1752	183.5	15	350	
	7	66	Wed	-117.625	0.1780	184.5	16	351	
	8	67	Thu	116.625	0.1807	185.5	17	352	
	9	68	Fri	115.625	0.1834	186.5	18	353	9-Last Quarter
	10	69	Sat	114.625	0.1862	187.5	19	354	$11^h\ 20^m$ U.T.
	11	70	Sun	113.625	0.1889	188.5	20	355	
	12	71	Mon	112.625	0.1917	189.5	21	356	
	13	72	Tue	111.625	0.1944	190.5	22	357	
	14	73	Wed	-110.625	0.1971	191.5	23	358	
	15	74	Thu	109.625	0.1999	192.5	24	359	
	16	75	Fri	108.625	0.2026	193.5	25	360	
	17	76	Sat	107.625	0.2053	194.5	26	361	17-New Moon
	18	77	Sun	106.625	0.2081	195.5	27	362	13h 12^m U.T.
	19	78	Mon	105.625	0.2108	196.5	28	363	
	20	79	Tue	-104.625	0.2136	197.5	29	364	

CALENDAR, 2018

Day of Month		Day of Year	Day of Week	Days since J 2018.5	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
						2458	1939 Saka Era		
Mar.	21	80	Wed	-103.625	0.2163	198.5	Phalguna 30	365	
	22	81	Thu	102.625	0.2190	199.5	1940 Chaitra 1	1	
	23	82	Fri	101.625	0.2218	200.5	2	2	
	24	83	Sat	100.625	0.2245	201.5	3	3	24-First Quarter
	25	84	Sun	99.625	0.2272	202.5	4	4	$15^h\ 35^m$ U.T.
	26	85	Mon	98.625	0.2300	203.5	5	5	
	27	86	Tue	97.625	0.2327	204.5	6	6	
	28	87	Wed	-96.625	0.2355	205.5	7	7	
	29	88	Thu	95.625	0.2382	206.5	8	8	
	30	89	Fri	94.625	0.2409	207.5	9	9	
	31	90	Sat	93.625	0.2437	208.5	10	10	31-Full Moon
Apr.	1	91	Sun	92.625	0.2464	209.5	11	11	$12^h\ 37^m$ U.T.
	2	92	Mon	91.625	0.2491	210.5	12	12	
	3	93	Tue	90.625	0.2519	211.5	13	13	
	4	94	Wed	-89.625	0.2546	212.5	14	14	
	5	95	Thu	88.625	0.2574	213.5	15	15	
	6	96	Fri	87.625	0.2601	214.5	16	16	
	7	97	Sat	86.625	0.2628	215.5	17	17	
	8	98	Sun	85.625	0.2656	216.5	18	18	8-Last Quarter
	9	99	Mon	84.625	0.2683	217.5	19	19	$7^h\ 18^m$ U.T.
	10	100	Tue	83.625	0.2711	218.5	20	20	
	11	101	Wed	-82.625	0.2738	219.5	21	21	
	12	102	Thu	81.625	0.2765	220.5	22	22	
	13	103	Fri	80.625	0.2793	221.5	23	23	
	14	104	Sat	79.625	0.2820	222.5	24	24	
	15	105	Sun	78.625	0.2847	223.5	25	25	
	16	106	Mon	77.625	0.2875	224.5	26	26	16-New Moon
	17	107	Tue	76.625	0.2902	225.5	27	27	$1^h\ 57^m$ U.T.
	18	108	Wed	-75.625	0.2930	226.5	28	28	
	19	109	Thu	74.625	0.2957	227.5	29	29	
	20	110	Fri	73.625	0.2984	228.5	30	30	
	21	111	Sat	72.625	0.3012	229.5	Vaisakha 1	31	
	22	112	Sun	71.625	0.3039	230.5	2	32	22-First Quarter
	23	113	Mon	70.625	0.3066	231.5	3	33	$21^h\ 46^m$ U.T.
	24	114	Tue	69.625	0.3094	232.5	4	34	
	25	115	Wed	-68.625	0.3121	233.5	5	35	
	26	116	Thu	67.625	0.3149	234.5	6	36	
	27	117	Fri	66.625	0.3176	235.5	7	37	
	28	118	Sat	65.625	0.3203	236.5	8	38	
	29	119	Sun	64.625	0.3231	237.5	9	39	
	30	120	Mon	63.625	0.3258	238.5	10	40	30-Full Moon
May	1	121	Tue	-62.625	0.3285	239.5	11	41	$0^h\ 58^m$ U.T.

CALENDAR, 2018

Day of Month	Day of Year	Day of Week	Days since J 2018.5	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	
					2458	1940 Saka Era		
May 2	122	Wed	-61.625	0.3313	240.5	Vaisakha 12	42	
3	123	Thu	60.625	0.3340	241.5	13	43	
4	124	Fri	59.625	0.3368	242.5	14	44	
5	125	Sat	58.625	0.3395	243.5	15	45	
6	126	Sun	57.625	0.3422	244.5	16	46	
7	127	Mon	56.625	0.3450	245.5	17	47	
8	128	Tue	55.625	0.3477	246.5	18	48	8-Last Quarter 2^h 09^m U.T.
9	129	Wed	-54.625	0.3505	247.5	19	49	
10	130	Thu	53.625	0.3532	248.5	20	50	
11	131	Fri	52.625	0.3559	249.5	21	51	
12	132	Sat	51.625	0.3587	250.5	22	52	
13	133	Sun	50.625	0.3614	251.5	23	53	
14	134	Mon	49.625	0.3641	252.5	24	54	
15	135	Tue	48.625	0.3669	253.5	25	55	15-New Moon 11^h 48^m U.T.
16	136	Wed	-47.625	0.3696	254.5	26	56	
17	137	Thu	46.625	0.3724	255.5	27	57	
18	138	Fri	45.625	0.3751	256.5	28	58	
19	139	Sat	44.625	0.3778	257.5	29	59	
20	140	Sun	43.625	0.3806	258.5	30	60	
21	141	Mon	42.625	0.3833	259.5	31	61	
22	142	Tue	41.625	0.3860	260.5	Jyaistha 1	62	22-First Quarter 3^h 49^m U.T.
23	143	Wed	-40.625	0.3888	261.5	2	63	
24	144	Thu	39.625	0.3915	262.5	3	64	
25	145	Fri	38.625	0.3943	263.5	4	65	
26	146	Sat	37.625	0.3970	264.5	5	66	
27	147	Sun	36.625	0.3997	265.5	6	67	
28	148	Mon	35.625	0.4025	266.5	7	68	
29	149	Tue	34.625	0.4052	267.5	8	69	29-Full Moon 14^h 20^m U.T.
30	150	Wed	-33.625	0.4079	268.5	9	70	
31	151	Thu	32.625	0.4107	269.5	10	71	
June 1	152	Fri	31.625	0.4134	270.5	11	72	
2	153	Sat	30.625	0.4162	271.5	12	73	
3	154	Sun	29.625	0.4189	272.5	13	74	
4	155	Mon	28.625	0.4216	273.5	14	75	
5	156	Tue	27.625	0.4244	274.5	15	76	
6	157	Wed	-26.625	0.4271	275.5	16	77	6-Last Quarter
7	158	Thu	25.625	0.4299	276.5	17	78	18^h 32^m U.T.
8	159	Fri	24.625	0.4326	277.5	18	79	
9	160	Sat	23.625	0.4353	278.5	19	80	
10	161	Sun	22.625	0.4381	279.5	20	81	
11	162	Mon	21.625	0.4408	280.5	21	82	
12	163	Tue	-20.625	0.4435	281.5	22	83	

CALENDAR, 2018

Day of Month		Day of Year	Day of Week	Days since J 2018.5	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
						2458	1940 Saka Era		
June	13	164	Wed	-19.625	0.4463	282.5	Jyaishtha 23	84	13-New Moon
	14	165	Thu	18.625	0.4490	283.5	24	85	19^h 43^m U.T.
	15	166	Fri	17.625	0.4518	284.5	25	86	
	16	167	Sat	16.625	0.4545	285.5	26	87	
	17	168	Sun	15.625	0.4572	286.5	27	88	
	18	169	Mon	14.625	0.4600	287.5	28	89	
	19	170	Tue	13.625	0.4627	288.5	29	90	
	20	171	Wed	-12.625	0.4654	289.5	30	91	20-First Quarter
	21	172	Thu	11.625	0.4682	290.5	31	92	10^h 51^m U.T.
	22	173	Fri	10.625	0.4709	291.5	Ashadha 1	93	
	23	174	Sat	9.625	0.4737	292.5	2	94	
	24	175	Sun	8.625	0.4764	293.5	3	95	
	25	176	Mon	7.625	0.4791	294.5	4	96	
	26	177	Tue	6.625	0.4819	295.5	5	97	
	27	178	Wed	-5.625	0.4846	296.5	6	98	
	28	179	Thu	4.625	0.4873	297.5	7	99	28-Full Moon
	29	180	Fri	3.625	0.4901	298.5	8	100	4^h 53^m U.T.
	30	181	Sat	2.625	0.4928	299.5	9	101	
July	1	182	Sun	1.625	0.4956	300.5	10	102	
	2	183	Mon	-0.625	0.4983	301.5	11	103	
	3	184	Tue	+0.375	0.5010	302.5	12	104	
	4	185	Wed	+1.375	0.5038	303.5	13	105	
	5	186	Thu	2.375	0.5065	304.5	14	106	
	6	187	Fri	3.375	0.5093	305.5	15	107	6-Last Quarter
	7	188	Sat	4.375	0.5120	306.5	16	108	7^h 51^m U.T.
	8	189	Sun	5.375	0.5147	307.5	17	109	
	9	190	Mon	6.375	0.5175	308.5	18	110	
	10	191	Tue	7.375	0.5202	309.5	19	111	
	11	192	Wed	+8.375	0.5229	310.5	20	112	
	12	193	Thu	9.375	0.5257	311.5	21	113	
	13	194	Fri	10.375	0.5284	312.5	22	114	13-New Moon
	14	195	Sat	11.375	0.5312	313.5	23	115	2^h 48^m U.T.
	15	196	Sun	12.375	0.5339	314.5	24	116	
	16	197	Mon	13.375	0.5366	315.5	25	117	
	17	198	Tue	14.375	0.5394	316.5	26	118	
	18	199	Wed	+15.375	0.5421	317.5	27	119	
	19	200	Thu	16.375	0.5448	318.5	28	120	19-First Quarter
	20	201	Fri	17.375	0.5476	319.5	29	121	19^h 52^m U.T.
	21	202	Sat	18.375	0.5503	320.5	30	122	
	22	203	Sun	19.375	0.5531	321.5	31	123	
	23	204	Mon	20.375	0.5558	322.5	Sravana 1	124	
	24	205	Tue	+21.375	0.5585	323.5	2	125	

CALENDAR, 2018

Day of Month		Day of Year	Day of Week	Days since J 2018.5	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
						2458	1940 Saka Era		
July	25	206	Wed	+22.375	0.5613	324.5	Sravana 3	126	
	26	207	Thu	23.375	0.5640	325.5	4	127	
	27	208	Fri	24.375	0.5667	326.5	5	128	27-Full Moon
	28	209	Sat	25.375	0.5695	327.5	6	129	$20^h\ 20^m$ U.T.
	29	210	Sun	26.375	0.5722	328.5	7	130	
	30	211	Mon	27.375	0.5750	329.5	8	131	
	31	212	Tue	28.375	0.5777	330.5	9	132	
Aug.	1	213	Wed	+29.375	0.5804	331.5	10	133	
	2	214	Thu	30.375	0.5832	332.5	11	134	
	3	215	Fri	31.375	0.5859	333.5	12	135	
	4	216	Sat	32.375	0.5887	334.5	13	136	4-Last Quarter
	5	217	Sun	33.375	0.5914	335.5	14	137	$18^h\ 18^m$ U.T.
	6	218	Mon	34.375	0.5941	336.5	15	138	
	7	219	Tue	35.375	0.5969	337.5	16	139	
	8	220	Wed	+36.375	0.5996	338.5	17	140	
	9	221	Thu	37.375	0.6023	339.5	18	141	
	10	222	Fri	38.375	0.6051	340.5	19	142	
	11	223	Sat	39.375	0.6078	341.5	20	143	11-New Moon
	12	224	Sun	40.375	0.6106	342.5	21	144	$9^h\ 58^m$ U.T.
	13	225	Mon	41.375	0.6133	343.5	22	145	
	14	226	Tue	42.375	0.6160	344.5	23	146	
	15	227	Wed	+43.375	0.6188	345.5	24	147	
	16	228	Thu	44.375	0.6215	346.5	25	148	
	17	229	Fri	45.375	0.6242	347.5	26	149	
	18	230	Sat	46.375	0.6270	348.5	27	150	18-First Quarter
	19	231	Sun	47.375	0.6297	349.5	28	151	$7^h\ 49^m$ U.T.
	20	232	Mon	48.375	0.6325	350.5	29	152	
	21	233	Tue	49.375	0.6352	351.5	30	153	
	22	234	Wed	+50.375	0.6379	352.5	31	154	
	23	235	Thu	51.375	0.6407	353.5	Bhadra 1	155	
	24	236	Fri	52.375	0.6434	354.5	2	156	
	25	237	Sat	53.375	0.6461	355.5	3	157	
	26	238	Sun	54.375	0.6489	356.5	4	158	26-Full Moon
	27	239	Mon	55.375	0.6516	357.5	5	159	$11^h\ 56^m$ U.T.
	28	240	Tue	56.375	0.6544	358.5	6	160	
	29	241	Wed	+57.375	0.6571	359.5	7	161	
	30	242	Thu	58.375	0.6598	360.5	8	162	
	31	243	Fri	59.375	0.6626	361.5	9	163	
Sept.	1	244	Sat	60.375	0.6653	362.5	10	164	
	2	245	Sun	61.375	0.6680	363.5	11	165	
	3	246	Mon	62.375	0.6708	364.5	12	166	3-Last Quarter
	4	247	Tue	+63.375	0.6735	365.5	13	167	$2^h\ 37^m$ U.T.

CALENDAR, 2018

Day of Month	Day of Year	Day of Week	Days since J 2018.5	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
					2458	1940 Saka Era		
Sept. 5	248	Wed	+64.375	0.6763	366.5	Bhadra 14	168	
6	249	Thu	65.375	0.6790	367.5	15	169	
7	250	Fri	66.375	0.6817	368.5	16	170	
8	251	Sat	67.375	0.6845	369.5	17	171	
9	252	Sun	68.375	0.6872	370.5	18	172	9-New Moon
10	253	Mon	69.375	0.6900	371.5	19	173	$18^h\ 01^m$ U.T.
11	254	Tue	70.375	0.6927	372.5	20	174	
12	255	Wed	+71.375	0.6954	373.5	21	175	
13	256	Thu	72.375	0.6982	374.5	22	176	
14	257	Fri	73.375	0.7009	375.5	23	177	
15	258	Sat	74.375	0.7036	376.5	24	178	
16	259	Sun	75.375	0.7064	377.5	25	179	16-First Quarter
17	260	Mon	76.375	0.7091	378.5	26	180	$23^h\ 15^m$ U.T.
18	261	Tue	77.375	0.7119	379.5	27	181	
19	262	Wed	+78.375	0.7146	380.5	28	182	
20	263	Thu	79.375	0.7173	381.5	29	183	
21	264	Fri	80.375	0.7201	382.5	30	184	
22	265	Sat	81.375	0.7228	383.5	31	185	
23	266	Sun	82.375	0.7255	384.5	Asvina 1	186	
24	267	Mon	83.375	0.7283	385.5	2	187	
25	268	Tue	84.375	0.7310	386.5	3	188	25-Full Moon $2^h\ 52^m$ U.T.
26	269	Wed	+85.375	0.7338	387.5	4	189	
27	270	Thu	86.375	0.7365	388.5	5	190	
28	271	Fri	87.375	0.7392	389.5	6	191	
29	272	Sat	88.375	0.7420	390.5	7	192	
30	273	Sun	89.375	0.7447	391.5	8	193	
Oct. 1	274	Mon	90.375	0.7474	392.5	9	194	
2	275	Tue	91.375	0.7502	393.5	10	195	2-Last Quarter $9^h\ 45^m$ U.T.
3	276	Wed	+92.375	0.7529	394.5	11	196	
4	277	Thu	93.375	0.7557	395.5	12	197	
5	278	Fri	94.375	0.7584	396.5	13	198	
6	279	Sat	95.375	0.7611	397.5	14	199	
7	280	Sun	96.375	0.7639	398.5	15	200	
8	281	Mon	97.375	0.7666	399.5	16	201	
9	282	Tue	98.375	0.7694	400.5	17	202	9-New Moon $3^h\ 47^m$ U.T.
10	283	Wed	+99.375	0.7721	401.5	18	203	
11	284	Thu	100.375	0.7748	402.5	19	204	
12	285	Fri	101.375	0.7776	403.5	20	205	
13	286	Sat	102.375	0.7803	404.5	21	206	
14	287	Sun	103.375	0.7830	405.5	22	207	
15	288	Mon	104.375	0.7858	406.5	23	208	
16	289	Tue	+105.375	0.7885	407.5	24	209	16-First Quarter $18^h\ 02^m$ U.T.

CALENDAR, 2018

Day of Month		Day of Year	Day of Week	Days since J 2018.5	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
						2458	1940 Saka Era		
Oct.	17	290	Wed	+106.375	0.7913	408.5	Asvina 25	210	
	18	291	Thu	107.375	0.7940	409.5	26	211	
	19	292	Fri	108.375	0.7967	410.5	27	212	
	20	293	Sat	109.375	0.7995	411.5	28	213	
	21	294	Sun	110.375	0.8022	412.5	29	214	
	22	295	Mon	111.375	0.8049	413.5	30	215	
	23	296	Tue	112.375	0.8077	414.5	Kartika 1	216	
	24	297	Wed	+113.375	0.8104	415.5	2	217	24-Full Moon
	25	298	Thu	114.375	0.8132	416.5	3	218	$16^h 45^m$ U.T.
	26	299	Fri	115.375	0.8159	417.5	4	219	
	27	300	Sat	116.375	0.8186	418.5	5	220	
	28	301	Sun	117.375	0.8214	419.5	6	221	
	29	302	Mon	118.375	0.8241	420.5	7	222	
	30	303	Tue	119.375	0.8268	421.5	8	223	
	31	304	Wed	+120.375	0.8296	422.5	9	224	31-Last Quarter
Nov.	1	305	Thu	121.375	0.8323	423.5	10	225	$16^h 40^m$ U.T.
	2	306	Fri	122.375	0.8351	424.5	11	226	
	3	307	Sat	123.375	0.8378	425.5	12	227	
	4	308	Sun	124.375	0.8405	426.5	13	228	
	5	309	Mon	125.375	0.8433	427.5	14	229	
	6	310	Tue	126.375	0.8460	428.5	15	230	
	7	311	Wed	+127.375	0.8488	429.5	16	231	7-New Moon
	8	312	Thu	128.375	0.8515	430.5	17	232	$16^h 02^m$ U.T.
	9	313	Fri	129.375	0.8542	431.5	18	233	
	10	314	Sat	130.375	0.8570	432.5	19	234	
	11	315	Sun	131.375	0.8597	433.5	20	235	
	12	316	Mon	132.375	0.8624	434.5	21	236	
	13	317	Tue	133.375	0.8652	435.5	22	237	
	14	318	Wed	+134.375	0.8679	436.5	23	238	
	15	319	Thu	135.375	0.8707	437.5	24	239	15-First Quarter
	16	320	Fri	136.375	0.8734	438.5	25	240	$14^h 54^m$ U.T.
	17	321	Sat	137.375	0.8761	439.5	26	241	
	18	322	Sun	138.375	0.8789	440.5	27	242	
	19	323	Mon	139.375	0.8816	441.5	28	243	
	20	324	Tue	140.375	0.8843	442.5	29	244	
	21	325	Wed	+141.375	0.8871	443.5	30	245	
	22	326	Thu	142.375	0.8898	444.5	Agrahayana 1	246	
	23	327	Fri	143.375	0.8926	445.5	2	247	23-Full Moon
	24	328	Sat	144.375	0.8953	446.5	3	248	$5^h 39^m$ U.T.
	25	329	Sun	145.375	0.8980	447.5	4	249	
	26	330	Mon	146.375	0.9008	448.5	5	250	
	27	331	Tue	+147.375	0.9035	449.5	6	251	

CALENDAR, 2018

Day of Month		Day of Year	Day of Week	Days since J 2018.5	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
						2458	1940 Saka Era		
Nov.	28	332	Wed	+148.375	0.9062	450.5	Agrahayana 7	252	
	29	333	Thu	149.375	0.9090	451.5	8	253	
	30	334	Fri	150.375	0.9117	452.5	9	254	30-Last Quarter
Dec.	1	335	Sat	151.375	0.9145	453.5	10	255	0^h 19^m U.T.
	2	336	Sun	152.375	0.9172	454.5	11	256	
	3	337	Mon	153.375	0.9199	455.5	12	257	
	4	338	Tue	154.375	0.9227	456.5	13	258	
	5	339	Wed	+155.375	0.9254	457.5	14	259	
	6	340	Thu	156.375	0.9282	458.5	15	260	
	7	341	Fri	157.375	0.9309	459.5	16	261	7-New Moon
	8	342	Sat	158.375	0.9336	460.5	17	262	7^h 20^m U.T.
	9	343	Sun	159.375	0.9364	461.5	18	263	
	10	344	Mon	160.375	0.9391	462.5	19	264	
	11	345	Tue	161.375	0.9418	463.5	20	265	
	12	346	Wed	+162.375	0.9446	464.5	21	266	
	13	347	Thu	163.375	0.9473	465.5	22	267	
	14	348	Fri	164.375	0.9501	466.5	23	268	
	15	349	Sat	165.375	0.9528	467.5	24	269	15-First Quarter
	16	350	Sun	166.375	0.9555	468.5	25	270	11^h 49^m U.T.
	17	351	Mon	167.375	0.9583	469.5	26	271	
	18	352	Tue	168.375	0.9610	470.5	27	272	
	19	353	Wed	+169.375	0.9637	471.5	28	273	
	20	354	Thu	170.375	0.9665	472.5	29	274	
	21	355	Fri	171.375	0.9692	473.5	30	275	
	22	356	Sat	172.375	0.9720	474.5	Pausha 1	276	22-Full Moon
	23	357	Sun	173.375	0.9747	475.5	2	277	17^h 49^m U.T.
	24	358	Mon	174.375	0.9774	476.5	3	278	
	25	359	Tue	175.375	0.9802	477.5	4	279	
	26	360	Wed	+176.375	0.9829	478.5	5	280	
	27	361	Thu	177.375	0.9856	479.5	6	281	
	28	362	Fri	178.375	0.9884	480.5	7	282	
	29	363	Sat	179.375	0.9911	481.5	8	283	29-Last Quarter
	30	364	Sun	180.375	0.9939	482.5	9	284	9^h 34^m U.T.
	31	365	Mon	181.375	0.9966	483.5	10	285	
	32	1	Tue	+182.375	0.9993	484.5	11	286	

The new epoch is the middle of the Julian year, denoted by J 2018.5 (i.e. 2018, July 2.625) where the length of the Julian year is taken to be 365.25 days.

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

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

SIDEREAL TIME, 2018

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Jan.	0	6	38	27.260	-0.716	17	18	42.108	Feb.	15	9	39	48.807	-0.671	14	17	50.272
	1	6	42	23.815	0.707	17	14	46.198		16	9	43	45.362	0.673	14	13	54.363
	2	6	46	20.371	0.697	17	10	50.289		17	9	47	41.918	0.678	14	09	58.453
	3	6	50	16.926	0.687	17	06	54.379		18	9	51	38.473	0.685	14	06	02.544
	4	6	54	13.482	0.680	17	02	58.470		19	9	55	35.028	0.693	14	02	06.634
	5	6	58	10.037	0.676	16	59	02.560		20	9	59	31.584	0.700	13	58	10.725
	6	7	02	06.592	-0.677	16	55	06.651		21	10	03	28.139	-0.707	13	54	14.815
	7	7	06	03.148	0.679	16	51	10.742		22	10	07	24.695	0.711	13	50	18.906
	8	7	09	59.703	0.683	16	47	14.832		23	10	11	21.250	0.712	13	46	22.996
	9	7	13	56.258	0.687	16	43	18.923		24	10	15	17.805	0.710	13	42	27.087
	10	7	17	52.814	0.689	16	39	23.013		25	10	19	14.361	0.707	13	38	31.177
	11	7	21	49.369	0.690	16	35	27.104		26	10	23	10.916	0.702	13	34	35.268
	12	7	25	45.924	-0.689	16	31	31.194		27	10	27	07.471	-0.698	13	30	39.359
	13	7	29	42.480	0.686	16	27	35.285		28	10	31	04.027	0.696	13	26	43.449
	14	7	33	39.035	0.682	16	23	39.375	Mar.	1	10	34	60.582	0.698	13	22	47.540
	15	7	37	35.591	0.677	16	19	43.466		2	10	38	57.138	0.703	13	18	51.630
	16	7	41	32.146	0.671	16	15	47.556		3	10	42	53.693	0.711	13	14	55.721
	17	7	45	28.701	0.667	16	11	51.647		4	10	46	50.248	0.720	13	10	59.811
	18	7	49	25.257	-0.664	16	07	55.737		5	10	50	46.804	-0.728	13	07	03.902
	19	7	53	21.812	0.662	16	03	59.828		6	10	54	43.359	0.735	13	03	07.992
	20	7	57	18.367	0.663	16	00	03.918		7	10	58	39.914	0.739	12	59	12.083
	21	8	01	14.923	0.666	15	56	08.009		8	11	02	36.470	0.742	12	55	16.173
	22	8	05	11.478	0.670	15	52	12.099		9	11	06	33.025	0.743	12	51	20.264
	23	8	09	08.034	0.675	15	48	16.190		10	11	10	29.580	0.743	12	47	24.354
	24	8	13	04.589	-0.680	15	44	20.280		11	11	14	26.136	-0.742	12	43	28.445
	25	8	17	01.144	0.683	15	40	24.371		12	11	18	22.691	0.741	12	39	32.535
	26	8	20	57.700	0.684	15	36	28.462		13	11	22	19.247	0.742	12	35	36.626
	27	8	24	54.255	0.681	15	32	32.552		14	11	26	15.802	0.744	12	31	40.717
	28	8	28	50.810	0.676	15	28	36.643		15	11	30	12.357	0.747	12	27	44.807
	29	8	32	47.366	0.668	15	24	40.733		16	11	34	08.913	0.753	12	23	48.898
	30	8	36	43.921	-0.660	15	20	44.824		17	11	38	05.468	-0.761	12	19	52.988
	31	8	40	40.476	0.654	15	16	48.914		18	11	42	02.023	0.770	12	15	57.079
Feb.	1	8	44	37.032	0.651	15	12	53.005		19	11	45	58.579	0.779	12	12	01.169
	2	8	48	33.587	0.652	15	08	57.095		20	11	49	55.134	0.787	12	08	05.260
	3	8	52	30.143	0.656	15	05	01.186		21	11	53	51.690	0.793	12	04	09.350
	4	8	56	26.698	0.662	15	01	05.276		22	11	57	48.245	0.796	12	00	13.441
	5	9	00	23.253	-0.668	14	57	09.367		23	12	01	44.800	-0.796	11	56	17.531
	6	9	04	19.809	0.674	14	53	13.457		24	12	05	41.356	0.794	11	52	21.622
	7	9	08	16.364	0.677	14	49	17.548		25	12	09	37.911	0.790	11	48	25.712
	8	9	12	12.919	0.679	14	45	21.638		26	12	13	34.466	0.787	11	44	29.803
	9	9	16	09.475	0.679	14	41	25.729		27	12	17	31.022	0.786	11	40	33.893
	10	9	20	06.030	0.678	14	37	29.820		28	12	21	27.577	0.787	11	36	37.984
	11	9	24	02.586	-0.675	14	33	33.910		29	12	25	24.132	-0.792	11	32	42.074
	12	9	27	59.141	0.673	14	29	38.001		30	12	29	20.688	0.799	11	28	46.165
	13	9	31	55.696	0.671	14	25	42.091		31	12	33	17.243	0.808	11	24	50.255
	14	9	35	52.252	0.670	14	21	46.182	Apr.	1	12	37	13.799	0.817	11	20	54.346
	15	9	39	48.807	-0.671	14	17	50.272		2	12	41	10.354	-0.825	11	16	58.437

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

SIDEREAL TIME, 2018

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
Apr.	1	12	37	13.799	-0.817	11	20	54.346	May	17	15	38	35.346	-0.899	8	20	02.510
	2	12	41	10.354	0.825	11	16	58.437		18	15	42	31.901	0.891	8	16	06.601
	3	12	45	06.909	0.830	11	13	02.527		19	15	46	28.456	0.883	8	12	10.691
	4	12	49	03.465	0.834	11	09	06.618		20	15	50	25.012	0.876	8	08	14.782
	5	12	52	60.020	0.835	11	05	10.708		21	15	54	21.567	0.872	8	04	18.872
	6	12	56	56.575	0.834	11	01	14.799		22	15	58	18.122	0.871	8	00	22.963
	7	13	00	53.131	-0.833	10	57	18.889		23	16	02	14.678	-0.874	7	56	27.054
	8	13	04	49.686	0.832	10	53	22.980		24	16	06	11.233	0.878	7	52	31.144
	9	13	08	46.242	0.832	10	49	27.070		25	16	10	07.788	0.883	7	48	35.235
	10	13	12	42.797	0.832	10	45	31.161		26	16	14	04.344	0.887	7	44	39.325
	11	13	16	39.352	0.835	10	41	35.251		27	16	18	00.899	0.890	7	40	43.416
	12	13	20	35.908	0.839	10	37	39.342		28	16	21	57.455	0.891	7	36	47.506
	13	13	24	32.463	-0.846	10	33	43.432		29	16	25	54.010	-0.889	7	32	51.597
	14	13	28	29.018	0.854	10	29	47.523		30	16	29	50.565	0.886	7	28	55.687
	15	13	32	25.574	0.862	10	25	51.613		31	16	33	47.121	0.881	7	24	59.778
	16	13	36	22.129	0.869	10	21	55.704	June	1	16	37	43.676	0.875	7	21	03.868
	17	13	40	18.684	0.875	10	17	59.795		2	16	41	40.231	0.870	7	17	07.959
	18	13	44	15.240	0.877	10	14	03.885		3	16	45	36.787	0.865	7	13	12.049
	19	13	48	11.795	-0.877	10	10	07.976		4	16	49	33.342	-0.863	7	09	16.140
	20	13	52	08.351	0.873	10	06	12.066		5	16	53	29.898	0.862	7	05	20.230
	21	13	56	04.906	0.868	10	02	16.157		6	16	57	26.453	0.863	7	01	24.321
	22	14	00	01.461	0.863	9	58	20.247		7	17	01	23.008	0.865	6	57	28.412
	23	14	03	58.017	0.860	9	54	24.338		8	17	05	19.564	0.869	6	53	32.502
	24	14	07	54.572	0.859	9	50	28.428		9	17	09	16.119	0.873	6	49	36.593
	25	14	11	51.127	-0.861	9	46	32.519		10	17	13	12.674	-0.877	6	45	40.683
	26	14	15	47.683	0.866	9	42	36.609		11	17	17	09.230	0.878	6	41	44.774
	27	14	19	44.238	0.873	9	38	40.700		12	17	21	05.785	0.875	6	37	48.864
	28	14	23	40.794	0.880	9	34	44.790		13	17	25	02.340	0.870	6	33	52.955
	29	14	27	37.349	0.887	9	30	48.881		14	17	28	58.896	0.861	6	29	57.045
	30	14	31	33.904	0.891	9	26	52.971		15	17	32	55.451	0.851	6	26	01.136
May	1	14	35	30.460	-0.893	9	22	57.062		16	17	36	52.007	-0.841	6	22	05.226
	2	14	39	27.015	0.893	9	19	01.152		17	17	40	48.562	0.834	6	18	09.317
	3	14	43	23.570	0.891	9	15	05.243		18	17	44	45.117	0.831	6	14	13.407
	4	14	47	20.126	0.888	9	11	09.334		19	17	48	41.673	0.831	6	10	17.498
	5	14	51	16.681	0.885	9	07	13.424		20	17	52	38.228	0.834	6	06	21.588
	6	14	55	13.236	0.882	9	03	17.515		21	17	56	34.783	0.838	6	02	25.679
	7	14	59	09.792	-0.880	8	59	21.605		22	18	00	31.339	-0.842	5	58	29.770
	8	15	03	06.347	0.879	8	55	25.696		23	18	04	27.894	0.844	5	54	33.860
	9	15	07	02.903	0.881	8	51	29.786		24	18	08	24.450	0.844	5	50	37.951
	10	15	10	59.458	0.884	8	47	33.877		25	18	12	21.005	0.843	5	46	42.041
	11	15	14	56.013	0.889	8	43	37.967		26	18	16	17.560	0.839	5	42	46.132
	12	15	18	52.569	0.895	8	39	42.058		27	18	20	14.116	0.834	5	38	50.222
	13	15	22	49.124	-0.901	8	35	46.148		28	18	24	10.671	-0.828	5	34	54.313
	14	15	26	45.679	0.905	8	31	50.239		29	18	28	07.226	0.822	5	30	58.403
	15	15	30	42.235	0.907	8	27	54.329		30	18	32	03.782	0.817	5	27	02.494
	16	15	34	38.790	0.904	8	23	58.420	July	1	18	35	60.337	0.813	5	23	06.584
	17	15	38	35.346	-0.899	8	20	02.510		2	18	39	56.892	-0.812	5	19	10.675

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

SIDEREAL TIME, 2018

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
July	1	18	35	60.337	-0.813	5	23	06.584	Aug.	16	21	37	21.884	-0.808	2	22	14.749
	2	18	39	56.892	0.812	5	19	10.675		17	21	41	18.439	0.813	2	18	18.839
	3	18	43	53.448	0.812	5	15	14.765		18	21	45	14.995	0.816	2	14	22.930
	4	18	47	50.003	0.814	5	11	18.856		19	21	49	11.550	0.817	2	10	27.020
	5	18	51	46.559	0.818	5	07	22.946		20	21	53	08.106	0.815	2	06	31.111
	6	18	55	43.114	0.822	5	03	27.037		21	21	57	04.661	0.813	2	02	35.201
	7	18	59	39.669	-0.826	4	59	31.127		22	22	01	01.216	-0.811	1	58	39.292
	8	19	03	36.225	0.828	4	55	35.218		23	22	04	57.772	0.809	1	54	43.382
	9	19	07	32.780	0.828	4	51	39.309		24	22	08	54.327	0.809	1	50	47.473
	10	19	11	29.335	0.824	4	47	43.399		25	22	12	50.882	0.810	1	46	51.563
	11	19	15	25.891	0.817	4	43	47.490		26	22	16	47.438	0.813	1	42	55.654
	12	19	19	22.446	0.808	4	39	51.580		27	22	20	43.993	0.818	1	38	59.744
	13	19	23	19.002	-0.798	4	35	55.671		28	22	24	40.548	-0.825	1	35	03.835
	14	19	27	15.557	0.790	4	31	59.761		29	22	28	37.104	0.833	1	31	07.926
	15	19	31	12.112	0.786	4	28	03.852		30	22	32	33.659	0.842	1	27	12.016
	16	19	35	08.668	0.785	4	24	07.942		31	22	36	30.215	0.849	1	23	16.107
	17	19	39	05.223	0.788	4	20	12.033	Sept.	1	22	40	26.770	0.854	1	19	20.197
	18	19	43	01.778	0.793	4	16	16.123		2	22	44	23.325	0.857	1	15	24.288
	19	19	46	58.334	-0.798	4	12	20.214		3	22	48	19.881	-0.857	1	11	28.378
	20	19	50	54.889	0.802	4	08	24.304		4	22	52	16.436	0.854	1	07	32.469
	21	19	54	51.444	0.804	4	04	28.395		5	22	56	12.991	0.850	1	03	36.559
	22	19	58	48.000	0.804	4	00	32.485		6	23	00	09.547	0.846	0	59	40.650
	23	20	02	44.555	0.802	3	56	36.576		7	23	04	06.102	0.843	0	55	44.740
	24	20	06	41.111	0.798	3	52	40.666		8	23	08	02.658	0.843	0	51	48.831
	25	20	10	37.666	-0.794	3	48	44.757		9	23	11	59.213	-0.847	0	47	52.921
	26	20	14	34.221	0.789	3	44	48.847		10	23	15	55.768	0.855	0	43	57.012
	27	20	18	30.777	0.785	3	40	52.938		11	23	19	52.324	0.864	0	40	01.102
	28	20	22	27.332	0.783	3	36	57.029		12	23	23	48.879	0.872	0	36	05.193
	29	20	26	23.887	0.782	3	33	01.119		13	23	27	45.434	0.880	0	32	09.283
	30	20	30	20.443	0.784	3	29	05.210		14	23	31	41.990	0.885	0	28	13.374
	31	20	34	16.998	-0.787	3	25	09.300		15	23	35	38.545	-0.887	0	24	17.464
Aug.	1	20	38	13.554	0.792	3	21	13.391		16	23	39	35.100	0.888	0	20	21.555
	2	20	42	10.109	0.798	3	17	17.481		17	23	43	31.656	0.887	0	16	25.646
	3	20	46	06.664	0.804	3	13	21.572		18	23	47	28.211	0.886	0	12	29.736
	4	20	50	03.220	0.809	3	09	25.662		19	23	51	24.767	0.886	0	08	33.827
	5	20	53	59.775	0.812	3	05	29.753		20	23	55	21.322	0.886	0	04	37.917
	6	20	57	56.330	-0.812	3	01	33.843		21	23	59	17.877	-0.888	0	00	42.008
	7	21	01	52.886	0.808	2	57	37.934		22	0	03	14.433	0.891	23	52	50.189
	8	21	05	49.441	0.802	2	53	42.024		23	0	07	10.988	0.897	23	48	54.279
	9	21	09	45.996	0.795	2	49	46.115		24	0	11	07.543	0.905	23	44	58.370
	10	21	13	42.552	0.788	2	45	50.205		25	0	15	04.099	0.913	23	41	02.461
	11	21	17	39.107	0.785	2	41	54.296		26	0	18	60.654	0.923	23	37	06.551
	12	21	21	35.663	-0.784	2	37	58.387		27	0	22	57.210	-0.931	23	33	10.642
	13	21	25	32.218	0.788	2	34	02.477		28	0	26	53.765	0.938	23	29	14.732
	14	21	29	28.773	0.794	2	30	06.568		29	0	30	50.320	0.942	23	25	18.823
	15	21	33	25.329	0.802	2	26	10.658		30	0	34	46.876	0.943	23	21	22.913
	16	21	37	21.884	-0.808	2	22	14.749	Oct.	1	0	38	43.431	-0.941	23	17	27.004

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

SIDEREAL TIME, 2018

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
Oct.	1	0	38	43.431	-0.941	23	17	27.004	Nov.	16	3	40	04.978	-0.997	20	16	35.168
	2	0	42	39.986	0.938	23	13	31.094		17	3	44	01.533	1.000	20	12	39.259
	3	0	46	36.542	0.934	23	09	35.185		18	3	47	58.089	1.004	20	08	43.349
	4	0	50	33.097	0.931	23	05	39.275		19	3	51	54.644	1.009	20	04	47.440
	5	0	54	29.652	0.931	23	01	43.366		20	3	55	51.199	1.014	20	00	51.530
	6	0	58	26.208	0.934	22	57	47.456		21	3	59	47.755	1.018	19	56	55.621
	7	1	02	22.763	-0.940	22	53	51.547		22	4	03	44.310	-1.020	19	52	59.711
	8	1	06	19.319	0.949	22	49	55.637		23	4	07	40.866	1.018	19	49	03.802
	9	1	10	15.874	0.958	22	45	59.728		24	4	11	37.421	1.013	19	45	07.892
	10	1	14	12.429	0.965	22	42	03.818		25	4	15	33.976	1.005	19	41	11.983
	11	1	18	08.985	0.971	22	38	07.909		26	4	19	30.532	0.996	19	37	16.073
	12	1	22	05.540	0.974	22	34	12.000		27	4	23	27.087	0.987	19	33	20.164
	13	1	26	02.095	-0.975	22	30	16.090		28	4	27	23.642	-0.981	19	29	24.254
	14	1	29	58.651	0.974	22	26	20.181		29	4	31	20.198	0.978	19	25	28.345
	15	1	33	55.206	0.972	22	22	24.271		30	4	35	16.753	0.978	19	21	32.435
	16	1	37	51.762	0.969	22	18	28.362	Dec.	1	4	39	13.308	0.981	19	17	36.526
	17	1	41	48.317	0.968	22	14	32.452		2	4	43	09.864	0.985	19	13	40.617
	18	1	45	44.872	0.968	22	10	36.543		3	4	47	06.419	0.989	19	09	44.707
	19	1	49	41.428	-0.970	22	06	40.633		4	4	51	02.975	-0.991	19	05	48.798
	20	1	53	37.983	0.975	22	02	44.724		5	4	54	59.530	0.991	19	01	52.888
	21	1	57	34.538	0.980	21	58	48.814		6	4	58	56.085	0.989	18	57	56.979
	22	2	01	31.094	0.988	21	54	52.905		7	5	02	52.641	0.984	18	54	01.069
	23	2	05	27.649	0.995	21	50	56.995		8	5	06	49.196	0.978	18	50	05.160
	24	2	09	24.204	1.003	21	47	01.086		9	5	10	45.751	0.971	18	46	09.250
	25	2	13	20.760	-1.009	21	43	05.176		10	5	14	42.307	-0.964	18	42	13.341
	26	2	17	17.315	1.012	21	39	09.267		11	5	18	38.862	0.959	18	38	17.431
	27	2	21	13.871	1.012	21	35	13.358		12	5	22	35.418	0.955	18	34	21.522
	28	2	25	10.426	1.009	21	31	17.448		13	5	26	31.973	0.953	18	30	25.612
	29	2	29	06.981	1.004	21	27	21.539		14	5	30	28.528	0.953	18	26	29.703
	30	2	33	03.537	0.998	21	23	25.629		15	5	34	25.084	0.954	18	22	33.793
	31	2	36	60.092	-0.993	21	19	29.720		16	5	38	21.639	-0.957	18	18	37.884
Nov.	1	2	40	56.647	0.990	21	15	33.810		17	5	42	18.194	0.961	18	14	41.975
	2	2	44	53.203	0.990	21	11	37.901		18	5	46	14.750	0.964	18	10	46.065
	3	2	48	49.758	0.994	21	07	41.991		19	5	50	11.305	0.965	18	06	50.156
	4	2	52	46.314	0.999	21	03	46.082		20	5	54	07.860	0.963	18	02	54.246
	5	2	56	42.869	1.006	20	59	50.172		21	5	58	04.416	0.958	17	58	58.337
	6	3	00	39.424	-1.012	20	55	54.263		22	6	02	00.971	-0.950	17	55	02.427
	7	3	04	35.980	1.017	20	51	58.353		23	6	05	57.527	0.939	17	51	06.518
	8	3	08	32.535	1.018	20	48	02.444		24	6	09	54.082	0.929	17	47	10.608
	9	3	12	29.090	1.017	20	44	06.534		25	6	13	50.637	0.920	17	43	14.699
	10	3	16	25.646	1.014	20	40	10.625		26	6	17	47.193	0.914	17	39	18.789
	11	3	20	22.201	1.010	20	36	14.715		27	6	21	43.748	0.912	17	35	22.880
	12	3	24	18.756	-1.005	20	32	18.806		28	6	25	40.303	-0.913	17	31	26.970
	13	3	28	15.312	1.001	20	28	22.896		29	6	29	36.859	0.916	17	27	31.061
	14	3	32	11.867	0.998	20	24	26.987		30	6	33	33.414	0.920	17	23	35.151
	15	3	36	08.423	0.997	20	20	31.078		31	6	37	29.970	0.922	17	19	39.242
	16	3	40	04.978	-0.997	20	16	35.168	Dec	32	6	41	26.525	-0.923	17	15	43.332

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

SUN, 2018
MEAN LONGITUDE AND ANOMALY

Date		Horizontal Parallax	Mean Longitude			Mean Anomaly	Date		Horizontal Parallax	Mean Longitude			Mean Anomaly
		"	°	′	"	°			"	°	′	"	°
Jan.	1	8.94	280	36	18.052	357.358	July	10	8.65	107	52	40.846	184.622
	11	8.94	290	27	41.357	7.214		20	8.65	117	44	04.151	194.478
	21	8.94	300	19	04.662	17.070		30	8.66	127	35	27.456	204.334
	31	8.93	310	10	27.967	26.926	Aug.	9	8.67	137	26	50.761	214.190
Feb.	10	8.91	320	01	51.272	36.782		19	8.69	147	18	14.066	224.046
	20	8.89	329	53	14.576	46.638		29	8.71	157	09	37.371	233.902
Mar.	2	8.87	339	44	37.881	56.494	Sept.	8	8.73	167	01	00.676	243.758
	12	8.85	349	36	01.186	66.350		18	8.75	176	52	23.981	253.614
	22	8.83	359	27	24.491	76.206		28	8.78	186	43	47.286	263.470
Apr.	1	8.8	9	18	47.796	86.062	Oct.	8	8.8	196	35	10.591	273.326
	11	8.78	19	10	11.101	95.918		18	8.83	206	26	33.896	283.182
	21	8.75	29	01	34.406	105.774		28	8.85	216	17	57.200	293.038
May	1	8.73	38	52	57.711	115.630	Nov.	7	8.87	226	09	20.505	302.894
	11	8.71	48	44	21.016	125.486		17	8.89	236	00	43.810	312.750
	21	8.69	58	35	44.321	135.342		27	8.91	245	52	07.115	322.606
	31	8.67	68	27	07.626	145.198	Dec.	7	8.93	255	43	30.420	332.462
June	10	8.66	78	18	30.931	155.054		17	8.94	265	34	53.725	342.318
	20	8.65	88	09	54.236	164.910		27	8.94	275	26	17.030	352.174
	30	8.65	98	01	17.541	174.766		37	8.94	285	17	40.335	2.030
July	10	8.65	107	52	40.846	184.622		47	8.94	295	09	03.640	11.886

SUN, 2018
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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Jan.	0	279	29	50.39	-0.29	279	29	17.88	20.84	-25.48	-11.71	-7.35	5.63
	1	280	30	58.07	0.22	280	30	25.70	20.84	25.35	11.56	7.36	5.61
	2	281	32	05.72	-0.11	281	31	33.53	20.84	25.21	11.39	7.35	5.62
	3	282	33	13.45	+0.00	282	32	41.42	20.84	25.07	11.23	7.31	5.66
	4	283	34	21.27	0.14	283	33	49.36	20.84	24.93	11.12	7.26	5.72
	5	284	35	29.25	0.29	284	34	57.40	20.84	24.79	11.06	7.19	5.78
	6	285	36	37.37	+0.43	285	36	05.51	20.84	-24.65	-11.06	-7.13	5.83
	7	286	37	45.63	0.54	286	37	13.73	20.84	24.51	11.11	7.09	5.88
	8	287	38	54.09	0.65	287	38	22.13	20.84	24.37	11.17	7.07	5.90
	9	288	40	02.66	0.72	288	39	30.64	20.84	24.24	11.23	7.06	5.91
	10	289	41	11.28	0.76	289	40	39.22	20.84	24.10	11.27	7.06	5.90
	11	290	42	19.98	0.79	290	41	47.90	20.84	23.96	11.28	7.08	5.89
	12	291	43	28.61	+0.79	291	42	56.56	20.84	-23.82	-11.26	-7.09	5.87
	13	292	44	37.14	0.76	292	44	05.14	20.84	23.68	11.22	7.10	5.86
	14	293	45	45.51	0.68	293	45	13.57	20.84	23.54	11.15	7.10	5.86
	15	294	46	53.64	0.58	294	46	21.79	20.84	23.40	11.06	7.09	5.86
	16	295	48	01.42	0.47	295	47	29.65	20.83	23.26	10.98	7.07	5.89
	17	296	49	08.80	0.36	296	48	37.12	20.83	23.13	10.90	7.03	5.92
	18	297	50	15.68	+0.22	297	49	44.04	20.83	-22.99	-10.85	-6.98	5.97
	19	298	51	21.96	+0.11	298	50	50.35	20.83	22.85	10.83	6.93	6.03
	20	299	52	27.57	-0.04	299	51	55.94	20.83	22.71	10.84	6.87	6.08
	21	300	53	32.45	0.18	300	53	00.78	20.83	22.57	10.89	6.82	6.13
	22	301	54	36.45	0.29	301	54	04.72	20.82	22.43	10.96	6.78	6.17
	23	302	55	39.53	0.36	302	55	07.72	20.82	22.29	11.04	6.75	6.20
	24	303	56	41.67	-0.43	303	56	09.78	20.82	-22.15	-11.11	-6.74	6.21
	25	304	57	42.70	0.47	304	57	10.76	20.82	22.02	11.17	6.74	6.20
	26	305	58	42.69	0.47	305	58	10.74	20.82	21.88	11.18	6.76	6.19
	27	306	59	41.51	0.43	306	59	09.60	20.81	21.74	11.14	6.77	6.17
	28	308	00	39.19	0.36	308	00	07.38	20.81	21.60	11.05	6.78	6.16
	29	309	01	35.70	0.29	309	01	04.01	20.81	21.46	10.92	6.77	6.17
	30	310	02	31.11	-0.14	310	01	59.56	20.81	-21.32	-10.79	-6.73	6.21
	31	311	03	25.40	-0.04	311	02	53.95	20.80	21.18	10.69	6.67	6.27
Feb.	1	312	04	18.67	+0.11	312	03	47.27	20.80	21.04	10.64	6.60	6.34
	2	313	05	10.95	0.25	313	04	39.54	20.80	20.91	10.66	6.52	6.41
	3	314	06	02.28	0.40	314	05	30.80	20.80	20.77	10.72	6.46	6.47
	4	315	06	52.66	0.50	315	06	21.10	20.79	20.63	10.82	6.42	6.51
	5	316	07	42.19	+0.58	316	07	10.52	20.79	-20.49	-10.92	-6.39	6.54
	6	317	08	30.80	0.65	317	07	59.05	20.79	20.35	11.01	6.39	6.54
	7	318	09	18.49	0.68	318	08	46.68	20.78	20.21	11.08	6.39	6.53
	8	319	10	05.25	0.68	319	09	33.41	20.78	20.07	11.11	6.40	6.52
	9	320	10	51.04	0.65	320	10	19.20	20.77	19.93	11.11	6.41	6.52
	10	321	11	35.83	0.58	321	11	04.02	20.77	19.79	11.08	6.41	6.52
	11	322	12	19.53	+0.50	322	11	47.76	20.77	-19.66	-11.04	-6.40	6.53
	12	323	13	02.10	0.40	323	12	30.38	20.76	19.52	11.00	6.37	6.55
	13	324	13	43.50	0.29	324	13	11.82	20.76	19.38	10.97	6.34	6.58
	14	325	14	23.62	+0.14	325	13	51.96	20.75	19.24	10.95	6.29	6.63
	15	326	15	02.47	0.00	326	14	30.80	20.75	-19.10	-10.96	-6.23	6.69

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
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	41	17.69	-23	05	44.3	0.983 3193	16	15.92	12	03	05.47
	1	18	45	42.70	23	01	09.0	0.983 3010	16	15.94	12	03	33.76
	2	18	50	07.39	22	56	06.1	0.983 2894	16	15.95	12	04	01.72
	3	18	54	31.73	22	50	35.9	0.983 2845	16	15.96	12	04	29.33
	4	18	58	55.71	22	44	38.4	0.983 2862	16	15.96	12	04	56.57
	5	19	03	19.30	22	38	13.8	0.983 2945	16	15.95	12	05	23.40
	6	19	07	42.48	-22	31	22.4	0.983 3091	16	15.93	12	05	49.81
	7	19	12	05.21	22	24	04.2	0.983 3296	16	15.91	12	06	15.77
	8	19	16	27.48	22	16	19.6	0.983 3558	16	15.89	12	06	41.25
	9	19	20	49.26	22	08	08.7	0.983 3873	16	15.86	12	07	06.23
	10	19	25	10.52	21	59	31.7	0.983 4238	16	15.82	12	07	30.68
	11	19	29	31.25	21	50	29.0	0.983 4652	16	15.78	12	07	54.58
	12	19	33	51.42	-21	41	00.7	0.983 5111	16	15.73	12	08	17.90
	13	19	38	11.00	21	31	07.2	0.983 5613	16	15.68	12	08	40.63
	14	19	42	29.98	21	20	48.7	0.983 6156	16	15.63	12	09	02.73
	15	19	46	48.31	21	10	05.5	0.983 6740	16	15.57	12	09	24.18
	16	19	51	05.99	20	58	58.0	0.983 7362	16	15.51	12	09	44.96
	17	19	55	22.99	20	47	26.4	0.983 8022	16	15.45	12	10	05.05
	18	19	59	39.29	-20	35	31.1	0.983 8719	16	15.38	12	10	24.43
	19	20	03	54.87	20	23	12.4	0.983 9453	16	15.30	12	10	43.09
	20	20	08	09.70	20	10	30.7	0.984 0224	16	15.23	12	11	00.99
	21	20	12	23.79	19	57	26.2	0.984 1033	16	15.15	12	11	18.14
	22	20	16	37.10	19	43	59.4	0.984 1881	16	15.06	12	11	34.50
	23	20	20	49.63	19	30	10.6	0.984 2770	16	14.97	12	11	50.08
	24	20	25	01.36	-19	16	00.2	0.984 3701	16	14.88	12	12	04.86
	25	20	29	12.28	19	01	28.4	0.984 4676	16	14.79	12	12	18.82
	26	20	33	22.40	18	46	35.9	0.984 5699	16	14.68	12	12	31.97
	27	20	37	31.70	18	31	22.8	0.984 6772	16	14.58	12	12	44.29
	28	20	41	40.17	18	15	49.6	0.984 7899	16	14.47	12	12	55.79
	29	20	45	47.83	17	59	56.7	0.984 9082	16	14.35	12	13	06.46
	30	20	49	54.65	-17	43	44.5	0.985 0323	16	14.23	12	13	16.30
	31	20	54	00.65	17	27	13.4	0.985 1624	16	14.10	12	13	25.32
Feb.	1	20	58	05.83	17	10	23.7	0.985 2986	16	13.96	12	13	33.53
	2	21	02	10.19	16	53	16.0	0.985 4409	16	13.82	12	13	40.92
	3	21	06	13.74	16	35	50.4	0.985 5890	16	13.68	12	13	47.51
	4	21	10	16.49	16	18	07.5	0.985 7427	16	13.52	12	13	53.30
	5	21	14	18.44	-16	00	07.6	0.985 9017	16	13.37	12	13	58.30
	6	21	18	19.60	15	41	51.1	0.986 0657	16	13.21	12	14	02.51
	7	21	22	19.97	15	23	18.5	0.986 2343	16	13.04	12	14	05.94
	8	21	26	19.57	15	04	30.0	0.986 4072	16	12.87	12	14	08.59
	9	21	30	18.40	14	45	26.2	0.986 5842	16	12.69	12	14	10.47
	10	21	34	16.47	14	26	07.5	0.986 7648	16	12.52	12	14	11.59
	11	21	38	13.77	-14	06	34.3	0.986 9489	16	12.33	12	14	11.95
	12	21	42	10.33	13	46	47.0	0.987 1362	16	12.15	12	14	11.57
	13	21	46	06.13	13	26	46.0	0.987 3265	16	11.96	12	14	10.43
	14	21	50	01.19	13	06	31.7	0.987 5195	16	11.77	12	14	08.57
	15	21	53	55.52	-12	46	04.7	0.987 7151	16	11.58	12	14	05.97

SUN, 2018

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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Feb.	15	326	15	02.47	0.00	326	14	30.80	20.75	-19.10	-10.96	-6.23	6.69
	16	327	15	39.88	-0.11	327	15	08.17	20.75	18.96	11.01	6.17	6.74
	17	328	16	15.85	0.25	328	15	44.06	20.74	18.82	11.09	6.12	6.80
	18	329	16	50.27	0.36	329	16	18.37	20.74	18.68	11.20	6.07	6.84
	19	330	17	23.04	0.47	330	16	51.02	20.73	18.55	11.33	6.04	6.87
	20	331	17	54.08	0.54	331	17	21.95	20.73	18.41	11.45	6.03	6.88
	21	332	18	23.34	-0.58	332	17	51.11	20.72	-18.27	-11.55	-6.03	6.88
	22	333	18	50.76	0.58	333	18	18.47	20.72	18.13	11.62	6.05	6.86
	23	334	19	16.30	0.58	334	18	43.99	20.72	17.99	11.64	6.07	6.84
	24	335	19	39.85	0.50	335	19	07.57	20.71	17.85	11.62	6.08	6.83
	25	336	20	01.46	0.43	336	19	29.24	20.71	17.71	11.55	6.08	6.83
	26	337	20	21.07	0.32	337	19	48.94	20.70	17.57	11.47	6.06	6.85
	27	338	20	38.74	-0.18	338	20	06.68	20.70	-17.44	-11.41	-6.01	6.89
	28	339	20	54.45	-0.04	339	20	22.42	20.69	17.30	11.38	5.95	6.95
Mar.	1	340	21	08.26	+0.07	340	20	36.20	20.69	17.16	11.41	5.89	7.01
	2	341	21	20.26	0.22	341	20	48.12	20.68	17.02	11.50	5.83	7.07
	3	342	21	30.46	0.32	342	20	58.20	20.68	16.88	11.63	5.78	7.11
	4	343	21	38.95	0.43	343	21	06.55	20.67	16.74	11.77	5.76	7.14
	5	344	21	45.74	+0.50	344	21	13.21	20.67	-16.60	-11.90	-5.76	7.14
	6	345	21	50.92	0.54	345	21	18.29	20.66	16.46	12.01	5.77	7.12
	7	346	21	54.44	0.54	346	21	21.74	20.66	16.33	12.09	5.79	7.10
	8	347	21	56.39	0.54	347	21	23.65	20.65	16.19	12.13	5.81	7.08
	9	348	21	56.72	0.47	348	21	23.98	20.64	16.05	12.15	5.83	7.06
	10	349	21	55.45	0.40	349	21	22.72	20.64	15.91	12.14	5.83	7.06
	11	350	21	52.52	+0.32	350	21	19.80	20.63	-15.77	-12.13	-5.82	7.06
	12	351	21	47.93	0.22	351	21	15.23	20.63	15.63	12.12	5.80	7.08
	13	352	21	41.63	+0.07	352	21	08.93	20.62	15.49	12.13	5.77	7.11
	14	353	21	33.63	-0.04	353	21	00.90	20.62	15.35	12.16	5.73	7.15
	15	354	21	23.86	0.18	354	20	51.07	20.61	15.22	12.22	5.69	7.19
	16	355	21	12.25	0.32	355	20	39.37	20.61	15.08	12.32	5.64	7.24
	17	356	20	58.76	-0.43	356	20	25.76	20.60	-14.94	-12.45	-5.61	7.27
	18	357	20	43.35	0.54	357	20	10.21	20.59	14.80	12.59	5.59	7.29
	19	358	20	25.93	0.61	358	19	52.64	20.59	14.66	12.74	5.59	7.29
	20	359	20	06.40	0.65	359	19	32.99	20.58	14.52	12.87	5.61	7.27
	21	0	19	44.74	0.65	0	19	11.24	20.58	14.38	12.97	5.64	7.24
	22	1	19	20.88	0.65	1	18	47.34	20.57	14.24	13.02	5.67	7.20
	23	2	18	54.74	-0.61	2	18	21.20	20.57	-14.11	-13.02	-5.71	7.17
	24	3	18	26.26	0.54	3	17	52.76	20.56	13.97	12.98	5.73	7.15
	25	4	17	55.48	0.43	4	17	22.06	20.55	13.83	12.92	5.73	7.14
	26	5	17	22.34	0.32	5	16	48.97	20.55	13.69	12.87	5.71	7.16
	27	6	16	46.89	0.18	6	16	13.55	20.54	13.55	12.85	5.67	7.20
	28	7	16	09.11	-0.04	7	15	35.75	20.54	13.41	12.87	5.62	7.24
	29	8	15	29.04	+0.07	8	14	55.61	20.53	-13.27	-12.95	-5.58	7.28
	30	9	14	46.82	0.22	9	14	13.27	20.53	13.13	13.07	5.55	7.31
	31	10	14	02.43	0.29	10	13	28.74	20.52	12.99	13.22	5.54	7.33
Apr.	1	11	13	15.95	0.40	11	12	42.12	20.51	12.86	13.36	5.55	7.32
	2	12	12	27.47	+0.43	12	11	53.52	20.51	-12.72	-13.49	-5.57	7.29

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
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	55.52	-12	46	04.7	0.987 7151	16	11.58	12	14	05.97
	16	21	57	49.13	12	25	25.3	0.987 9131	16	11.39	12	14	02.66
	17	22	01	42.01	12	04	33.9	0.988 1135	16	11.19	12	13	58.63
	18	22	05	34.19	11	43	31.0	0.988 3162	16	10.99	12	13	53.91
	19	22	09	25.67	11	22	17.0	0.988 5212	16	10.79	12	13	48.49
	20	22	13	16.46	11	00	52.2	0.988 7285	16	10.58	20	57	42.83
	21	22	17	06.58	-10	39	17.2	0.988 9382	16	10.38	22	13	32.61
	22	22	20	56.04	10	17	32.4	0.989 1505	16	10.17	22	13	24.91
	23	22	24	44.86	9	55	38.1	0.989 3657	16	09.96	22	13	16.58
	24	22	28	33.04	9	33	34.8	0.989 5838	16	09.75	22	13	07.64
	25	22	32	20.60	9	11	22.9	0.989 8053	16	09.53	22	12	58.09
	26	22	36	07.57	8	49	02.9	0.990 0304	16	09.31	22	12	47.95
	27	22	39	53.95	-8	26	35.1	0.990 2592	16	09.08	22	12	37.26
	28	22	43	39.77	8	03	59.9	0.990 4922	16	08.86	22	12	26.02
Mar.	1	22	47	25.04	7	41	17.7	0.990 7293	16	08.62	22	12	14.27
	2	22	51	09.80	7	18	29.0	0.990 9706	16	08.39	22	12	02.02
	3	22	54	54.06	6	55	34.0	0.991 2162	16	08.15	22	11	49.29
	4	22	58	37.85	6	32	33.1	0.991 4657	16	07.91	22	11	36.12
	5	23	02	21.19	-6	09	26.7	0.991 7190	16	07.66	22	11	22.53
	6	23	06	04.11	5	46	15.2	0.991 9759	16	07.41	22	11	08.53
	7	23	09	46.63	5	22	58.9	0.992 2359	16	07.15	22	10	54.14
	8	23	13	28.76	4	59	38.2	0.992 4988	16	06.90	22	10	39.39
	9	23	17	10.54	4	36	13.4	0.992 7643	16	06.64	22	10	24.30
	10	23	20	51.97	4	12	45.1	0.993 0319	16	06.38	22	10	08.88
	11	23	24	33.09	-3	49	13.5	0.993 3015	16	06.12	22	09	53.16
	12	23	28	13.90	3	25	39.0	0.993 5726	16	05.85	22	09	37.15
	13	23	31	54.42	3	02	02.0	0.993 8450	16	05.59	22	09	20.88
	14	23	35	34.67	2	38	23.0	0.994 1184	16	05.32	22	09	04.35
	15	23	39	14.68	2	14	42.2	0.994 3925	16	05.06	22	08	47.59
	16	23	42	54.45	1	51	00.0	0.994 6671	16	04.79	22	08	30.62
	17	23	46	34.01	-1	27	17.0	0.994 9420	16	04.52	22	08	13.45
	18	23	50	13.37	1	03	33.3	0.995 2171	16	04.26	22	07	56.10
	19	23	53	52.55	0	39	49.5	0.995 4921	16	03.99	22	07	38.59
	20	23	57	31.56	-0	16	05.8	0.995 7670	16	03.72	22	07	20.93
	21	0	01	10.44	+0	07	37.3	0.996 0420	16	03.46	22	07	03.14
	22	0	04	49.18	0	31	19.4	0.996 3169	16	03.19	22	06	45.23
	23	0	08	27.82	+0	55	00.2	0.996 5921	16	02.93	22	06	27.23
	24	0	12	06.37	1	18	39.3	0.996 8676	16	02.66	22	06	09.15
	25	0	15	44.84	1	42	16.3	0.997 1438	16	02.39	22	05	51.02
	26	0	19	23.26	2	05	50.8	0.997 4208	16	02.13	22	05	32.85
	27	0	23	01.64	2	29	22.6	0.997 6990	16	01.86	22	05	14.66
	28	0	26	40.01	2	52	51.1	0.997 9786	16	01.59	22	04	56.49
	29	0	30	18.38	+3	16	16.1	0.998 2598	16	01.32	22	04	38.35
	30	0	33	56.79	3	39	37.2	0.998 5426	16	01.05	22	04	20.27
	31	0	37	35.25	4	02	54.2	0.998 8272	16	00.77	22	04	02.26
Apr.	1	0	41	13.80	4	26	06.6	0.999 1135	16	00.50	22	03	44.36
	2	0	44	52.45	+4	49	14.3	0.999 4014	16	00.22	22	03	26.59

SUN, 2018

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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Apr.	1	11	13	15.95	+0.40	11	12	42.12	20.51	-12.86	-13.36	-5.55	7.32
	2	12	12	27.47	0.43	12	11	53.52	20.51	12.72	13.49	5.57	7.29
	3	13	11	37.08	0.43	13	11	03.05	20.50	12.58	13.58	5.61	7.25
	4	14	10	44.78	0.43	14	10	10.70	20.50	12.44	13.63	5.65	7.21
	5	15	09	50.62	0.40	15	09	16.52	20.49	12.30	13.65	5.69	7.17
	6	16	08	54.66	0.32	16	08	20.58	20.48	12.16	13.64	5.71	7.14
	7	17	07	56.89	+0.25	17	07	22.84	20.48	-12.02	-13.63	-5.73	7.13
	8	18	06	57.40	0.14	18	06	23.36	20.47	11.88	13.61	5.73	7.12
	9	19	05	56.11	+0.04	19	05	22.09	20.47	11.75	13.60	5.72	7.13
	10	20	04	53.12	-0.11	20	04	19.09	20.46	11.61	13.61	5.70	7.15
	11	21	03	48.32	0.22	21	03	14.26	20.45	11.47	13.65	5.67	7.18
	12	22	02	41.78	0.36	22	02	07.66	20.45	11.33	13.72	5.64	7.20
	13	23	01	33.45	-0.47	23	00	59.22	20.44	-11.19	-13.83	-5.62	7.22
	14	24	00	23.29	0.58	23	59	48.95	20.44	11.05	13.96	5.62	7.23
	15	24	59	11.28	0.65	24	58	36.80	20.43	10.91	14.09	5.62	7.22
	16	25	57	57.38	0.68	25	57	22.79	20.43	10.77	14.21	5.65	7.19
	17	26	56	41.51	0.72	26	56	06.83	20.42	10.64	14.30	5.69	7.15
	18	27	55	23.64	0.68	27	54	48.92	20.41	10.50	14.34	5.75	7.09
	19	28	54	03.66	-0.65	28	53	28.97	20.41	-10.36	-14.33	-5.80	7.04
	20	29	52	41.59	0.58	29	52	06.96	20.40	10.22	14.27	5.84	7.00
	21	30	51	17.33	0.47	30	50	42.79	20.40	10.08	14.19	5.86	6.98
	22	31	49	50.85	0.36	31	49	16.39	20.39	9.94	14.11	5.85	6.98
	23	32	48	22.19	0.25	32	47	47.80	20.39	9.80	14.05	5.83	7.00
	24	33	46	51.31	-0.11	33	46	16.93	20.38	9.66	14.04	5.80	7.03
	25	34	45	18.25	+0.04	34	44	43.84	20.38	-9.53	-14.08	-5.77	7.06
	26	35	43	43.07	0.14	35	43	08.58	20.37	9.39	14.17	5.75	7.08
	27	36	42	05.80	0.25	36	41	31.20	20.37	9.25	14.28	5.74	7.08
	28	37	40	26.52	0.32	37	39	51.80	20.36	9.11	14.40	5.76	7.07
	29	38	38	45.31	0.36	38	38	10.50	20.35	8.97	14.50	5.79	7.04
	30	39	37	02.20	0.40	39	36	27.32	20.35	8.83	14.57	5.83	6.99
May	1	40	35	17.36	+0.40	40	34	42.46	20.34	-8.69	-14.61	-5.88	6.94
	2	41	33	30.76	0.36	41	32	55.86	20.34	8.55	14.61	5.93	6.89
	3	42	31	42.54	0.29	42	31	07.68	20.33	8.41	14.57	5.97	6.85
	4	43	29	52.76	0.22	43	29	17.95	20.33	8.28	14.52	6.00	6.82
	5	44	28	01.42	+0.11	44	27	26.68	20.32	8.14	14.46	6.01	6.80
	6	45	26	08.61	0.00	45	25	33.92	20.32	8.00	14.41	6.01	6.80
	7	46	24	14.35	-0.11	46	23	39.70	20.31	-7.86	-14.38	-6.00	6.81
	8	47	22	18.71	0.25	47	21	44.06	20.31	7.72	14.38	5.98	6.83
	9	48	20	21.69	0.36	48	19	47.03	20.30	7.58	14.40	5.96	6.85
	10	49	18	23.30	0.47	49	17	48.59	20.30	7.44	14.46	5.94	6.87
	11	50	16	23.61	0.58	50	15	48.82	20.29	7.30	14.54	5.94	6.87
	12	51	14	22.52	0.65	51	13	47.64	20.29	7.17	14.64	5.94	6.87
	13	52	12	20.14	-0.68	52	11	45.17	20.29	-7.03	-14.73	-5.96	6.84
	14	53	10	16.36	0.72	53	09	41.33	20.28	6.89	14.80	6.00	6.80
	15	54	08	11.17	0.72	54	07	36.12	20.28	6.75	14.82	6.06	6.75
	16	55	06	04.52	0.68	55	05	29.51	20.27	6.61	14.79	6.11	6.69
	17	56	03	56.38	-0.61	56	03	21.46	20.27	-6.47	-14.70	-6.16	6.64

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Apr.	1	0	41	13.80	+4	26	06.6	0.999 1135	16	00.50	22	03	44.36
	2	0	44	52.45	4	49	14.3	0.999 4014	16	00.22	22	03	26.59
	3	0	48	31.23	5	12	16.7	0.999 6907	15	59.94	22	03	08.96
	4	0	52	10.17	5	35	13.8	0.999 9811	15	59.66	22	02	51.51
	5	0	55	49.28	5	58	05.0	1.000 2724	15	59.38	22	02	34.25
	6	0	59	28.59	6	20	50.0	1.000 5643	15	59.10	22	02	17.20
	7	1	03	08.11	+6	43	28.7	1.000 8565	15	58.82	22	02	00.37
	8	1	06	47.86	7	06	00.5	1.001 1487	15	58.54	22	01	43.80
	9	1	10	27.86	7	28	25.1	1.001 4405	15	58.26	22	01	27.49
	10	1	14	08.12	7	50	42.3	1.001 7317	15	57.99	22	01	11.46
	11	1	17	48.67	8	12	51.6	1.002 0219	15	57.71	22	00	55.73
	12	1	21	29.51	8	34	52.7	1.002 3107	15	57.43	22	00	40.31
	13	1	25	10.66	+8	56	45.3	1.002 5980	15	57.16	22	00	25.22
	14	1	28	52.14	9	18	29.1	1.002 8834	15	56.89	22	00	10.46
	15	1	32	33.96	9	40	03.6	1.003 1667	15	56.62	21	59	56.06
	16	1	36	16.14	10	01	28.5	1.003 4476	15	56.35	21	59	42.02
	17	1	39	58.68	10	22	43.5	1.003 7259	15	56.08	21	59	28.36
	18	1	43	41.59	10	43	48.2	1.004 0017	15	55.82	21	59	15.07
	19	1	47	24.90	+11	04	42.3	1.004 2749	15	55.56	21	59	02.18
	20	1	51	08.60	11	25	25.5	1.004 5456	15	55.30	21	58	49.70
	21	1	54	52.70	11	45	57.2	1.004 8139	15	55.05	21	58	37.62
	22	1	58	37.22	12	06	17.3	1.005 0801	15	54.79	21	58	25.97
	23	2	02	22.17	12	26	25.4	1.005 3444	15	54.54	21	58	14.76
	24	2	06	07.55	12	46	21.0	1.005 6072	15	54.29	21	58	04.00
	25	2	09	53.37	+13	06	03.9	1.005 8686	15	54.05	21	57	53.69
	26	2	13	39.66	13	25	33.8	1.006 1289	15	53.80	21	57	43.86
	27	2	17	26.41	13	44	50.3	1.006 3883	15	53.55	21	57	34.52
	28	2	21	13.66	14	03	53.1	1.006 6469	15	53.31	21	57	25.68
	29	2	25	01.41	14	22	41.9	1.006 9047	15	53.06	21	57	17.35
	30	2	28	49.68	14	41	16.5	1.007 1619	15	52.82	21	57	09.55
May	1	2	32	38.48	+14	59	36.6	1.007 4182	15	52.58	21	57	02.29
	2	2	36	27.82	15	17	41.7	1.007 6736	15	52.34	21	56	55.58
	3	2	40	17.71	15	35	31.8	1.007 9279	15	52.10	21	56	49.42
	4	2	44	08.16	15	53	06.3	1.008 1808	15	51.86	21	56	43.83
	5	2	47	59.17	16	10	25.2	1.008 4323	15	51.62	21	56	38.81
	6	2	51	50.76	16	27	27.9	1.008 6818	15	51.38	21	56	34.36
	7	2	55	42.92	+16	44	14.4	1.008 9294	15	51.15	21	56	30.50
	8	2	59	35.67	17	00	44.1	1.009 1745	15	50.92	21	56	27.23
	9	3	03	28.99	17	16	56.9	1.009 4169	15	50.69	21	56	24.54
	10	3	07	22.91	17	32	52.4	1.009 6563	15	50.47	21	56	22.44
	11	3	11	17.41	17	48	30.4	1.009 8925	15	50.24	21	56	20.93
	12	3	15	12.50	18	03	50.5	1.010 1250	15	50.03	21	56	20.01
	13	3	19	08.18	+18	18	52.4	1.010 3535	15	49.81	21	56	19.67
	14	3	23	04.44	18	33	35.9	1.010 5778	15	49.60	21	56	19.91
	15	3	27	01.28	18	48	00.6	1.010 7976	15	49.39	21	56	20.72
	16	3	30	58.70	19	02	06.3	1.011 0128	15	49.19	21	56	22.09
	17	3	34	56.68	+19	15	52.7	1.011 2232	15	48.99	21	56	24.01

SUN, 2018

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 2018.5 of date) "	Nut. in Long. "	Nut. in Obliquity "	True Obliquity (23° 26') "
May	17	56	03	56.38	-0.61	56	03	21.46	20.27	-6.47	-14.70	-6.16	6.64
	18	57	01	46.68	0.50	57	01	11.89	20.26	6.33	14.57	6.19	6.61
	19	57	59	35.36	0.40	57	59	00.71	20.26	6.19	14.44	6.19	6.61
	20	58	57	22.41	0.25	58	56	47.87	20.26	6.06	14.33	6.17	6.62
	21	59	55	07.80	-0.11	59	54	33.34	20.25	5.92	14.26	6.14	6.66
	22	60	52	51.53	0.00	60	52	17.08	20.25	5.78	14.25	6.10	6.69
	23	61	50	33.65	+0.14	61	49	59.16	20.24	-5.64	-14.29	-6.08	6.72
	24	62	48	14.14	0.25	62	47	39.59	20.24	5.50	14.36	6.06	6.73
	25	63	45	53.10	0.32	63	45	18.47	20.24	5.36	14.44	6.07	6.72
	26	64	43	30.61	0.36	64	42	55.91	20.23	5.22	14.51	6.09	6.70
	27	65	41	06.65	0.40	65	40	31.91	20.23	5.08	14.56	6.13	6.66
	28	66	38	41.40	0.40	66	38	06.65	20.23	4.95	14.57	6.17	6.62
	29	67	36	14.88	+0.36	67	35	40.16	20.22	-4.81	-14.54	-6.21	6.57
	30	68	33	47.18	0.29	68	33	12.53	20.22	4.67	14.48	6.25	6.53
	31	69	31	18.38	0.22	69	30	43.81	20.22	4.53	14.40	6.28	6.51
June	1	70	28	48.60	+0.14	70	28	14.12	20.21	4.39	14.31	6.29	6.49
	2	71	26	17.85	0.00	71	25	43.46	20.21	4.25	14.22	6.28	6.50
	3	72	23	46.25	-0.11	72	23	11.94	20.21	4.11	14.15	6.27	6.51
	4	73	21	13.85	-0.22	73	20	39.59	20.20	-3.97	-14.10	-6.24	6.53
	5	74	18	40.65	0.36	74	18	06.41	20.20	3.83	14.09	6.21	6.56
	6	75	16	06.80	0.47	75	15	32.54	20.20	3.70	14.10	6.18	6.59
	7	76	13	32.30	0.54	76	12	58.00	20.20	3.56	14.15	6.16	6.61
	8	77	10	57.16	0.65	77	10	22.80	20.19	3.42	14.21	6.15	6.62
	9	78	08	21.45	0.68	78	07	47.03	20.19	3.28	14.28	6.15	6.62
	10	79	05	45.19	-0.72	79	05	10.72	20.19	-3.14	-14.33	-6.18	6.59
	11	80	03	08.35	0.72	80	02	33.86	20.19	3.00	14.35	6.21	6.56
	12	81	00	30.92	0.68	80	59	56.47	20.18	2.86	14.31	6.26	6.51
	13	81	57	52.93	0.61	81	57	18.58	20.18	2.72	14.22	6.30	6.47
	14	82	55	14.28	0.50	82	54	40.07	20.18	2.59	14.08	6.32	6.44
	15	83	52	34.92	0.40	83	52	00.88	20.18	2.45	13.91	6.32	6.44
	16	84	49	54.85	-0.25	84	49	20.96	20.18	-2.31	-13.75	-6.30	6.47
	17	85	47	13.96	-0.11	85	46	40.19	20.17	2.17	13.64	6.25	6.51
	18	86	44	32.26	+0.04	86	43	58.55	20.17	2.03	13.59	6.20	6.56
	19	87	41	49.76	0.14	87	41	16.04	20.17	1.89	13.59	6.15	6.61
	20	88	39	06.44	0.25	88	38	32.68	20.17	1.75	13.64	6.11	6.64
	21	89	36	22.30	0.36	89	35	48.48	20.17	1.61	13.70	6.10	6.66
	22	90	33	37.45	+0.40	90	33	03.56	20.17	-1.47	-13.76	-6.10	6.65
	23	91	30	51.85	0.43	91	30	17.93	20.17	1.34	13.80	6.12	6.63
	24	92	28	05.64	0.43	92	27	31.72	20.17	1.20	13.81	6.15	6.60
	25	93	25	18.90	0.43	93	24	45.00	20.16	1.06	13.78	6.18	6.57
	26	94	22	31.62	0.36	94	21	57.78	20.16	0.92	13.72	6.20	6.55
	27	95	19	43.95	+0.29	95	19	10.20	20.16	0.78	13.63	6.21	6.54
	28	96	16	55.95	+0.18	96	16	22.30	20.16	-0.64	-13.54	-6.21	6.54
	29	97	14	07.73	+0.07	97	13	34.18	20.16	0.50	13.44	6.20	6.55
	30	98	11	19.31	-0.04	98	10	45.84	20.16	0.36	13.36	6.17	6.58
July	1	99	08	30.81	0.18	99	07	57.40	20.16	0.23	13.30	6.13	6.62
	2	100	05	42.30	-0.29	100	05	08.92	20.16	-0.09	-13.27	-6.08	6.66

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
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	56.68	+19	15	52.7	1.011 2232	15	48.99	21	56	24.01
	18	3	38	55.21	19	29	19.5	1.011 4289	15	48.80	21	56	26.48
	19	3	42	54.29	19	42	26.4	1.011 6299	15	48.61	21	56	29.48
	20	3	46	53.90	19	55	13.2	1.011 8265	15	48.43	21	56	33.00
	21	3	50	54.03	20	07	39.4	1.012 0189	15	48.25	21	56	37.04
	22	3	54	54.66	20	19	44.9	1.012 2074	15	48.07	21	56	41.58
	23	3	58	55.80	+20	31	29.5	1.012 3923	15	47.90	21	56	46.62
	24	4	02	57.43	20	42	52.8	1.012 5739	15	47.73	21	56	52.15
	25	4	06	59.56	20	53	54.7	1.012 7524	15	47.56	21	56	58.17
	26	4	11	02.16	21	04	34.9	1.012 9281	15	47.40	21	57	04.65
	27	4	15	05.24	21	14	53.2	1.013 1010	15	47.24	21	57	11.60
	28	4	19	08.78	21	24	49.4	1.013 2712	15	47.08	21	57	19.01
	29	4	23	12.78	+21	34	23.4	1.013 4389	15	46.92	21	57	26.86
	30	4	27	17.23	21	43	34.9	1.013 6039	15	46.77	21	57	35.14
	31	4	31	22.11	21	52	23.8	1.013 7663	15	46.61	21	57	43.85
June	1	4	35	27.41	22	00	49.9	1.013 9259	15	46.46	21	57	52.97
	2	4	39	33.13	22	08	53.0	1.014 0826	15	46.32	21	58	02.49
	3	4	43	39.23	22	16	33.0	1.014 2362	15	46.17	21	58	12.38
	4	4	47	45.72	+22	23	49.6	1.014 3865	15	46.03	21	58	22.65
	5	4	51	52.57	22	30	42.7	1.014 5333	15	45.90	21	58	33.26
	6	4	55	59.76	22	37	12.3	1.014 6763	15	45.76	21	58	44.21
	7	5	00	07.29	22	43	18.1	1.014 8153	15	45.63	21	58	55.47
	8	5	04	15.12	22	48	59.9	1.014 9500	15	45.51	21	59	07.02
	9	5	08	23.25	22	54	17.8	1.015 0801	15	45.39	21	59	18.84
	10	5	12	31.64	+22	59	11.5	1.015 2053	15	45.27	21	59	30.92
	11	5	16	40.29	23	03	41.0	1.015 3252	15	45.16	21	59	43.22
	12	5	20	49.16	23	07	46.1	1.015 4395	15	45.05	21	59	55.71
	13	5	24	58.24	23	11	26.8	1.015 5480	15	44.95	22	00	08.39
	14	5	29	07.48	23	14	43.0	1.015 6505	15	44.86	22	00	21.20
	15	5	33	16.87	23	17	34.6	1.015 7469	15	44.77	22	00	34.13
	16	5	37	26.37	+23	20	01.6	1.015 8372	15	44.68	22	00	47.14
	17	5	41	35.95	23	22	03.8	1.015 9217	15	44.61	22	01	00.21
	18	5	45	45.58	23	23	41.3	1.016 0004	15	44.53	22	01	13.32
	19	5	49	55.24	23	24	54.0	1.016 0737	15	44.46	22	01	26.42
	20	5	54	04.90	23	25	41.8	1.016 1420	15	44.40	22	01	39.51
	21	5	58	14.53	23	26	04.8	1.016 2054	15	44.34	22	01	52.56
	22	6	02	24.13	+23	26	02.9	1.016 2645	15	44.29	22	02	05.54
	23	6	06	33.65	23	25	36.2	1.016 3193	15	44.24	22	02	18.44
	24	6	10	43.10	23	24	44.7	1.016 3701	15	44.19	22	02	31.23
	25	6	14	52.43	23	23	28.5	1.016 4172	15	44.14	22	02	43.90
	26	6	19	01.65	23	21	47.5	1.016 4606	15	44.10	22	02	56.42
	27	6	23	10.71	23	19	41.9	1.016 5004	15	44.07	22	03	08.77
	28	6	27	19.61	+23	17	11.7	1.016 5368	15	44.03	22	03	20.94
	29	6	31	28.33	23	14	17.0	1.016 5696	15	44.00	22	03	32.91
	30	6	35	36.83	23	10	57.9	1.016 5989	15	43.98	22	03	44.65
July	1	6	39	45.11	23	07	14.4	1.016 6247	15	43.95	22	03	56.15
	2	6	43	53.15	+23	03	06.7	1.016 6467	15	43.93	22	04	07.39

SUN, 2018

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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
July	1	99	08	30.81	-0.18	99	07	57.40	20.16	-0.23	-13.30	-6.13	6.62
	2	100	05	42.30	0.29	100	05	08.92	20.16	-0.09	13.27	6.08	6.66
	3	101	02	53.86	0.40	101	02	20.47	20.16	+0.05	13.28	6.03	6.71
	4	102	00	05.56	0.50	101	59	32.14	20.16	0.19	13.31	5.99	6.75
	5	102	57	17.43	0.58	102	56	43.94	20.16	0.33	13.37	5.96	6.78
	6	103	54	29.56	0.65	103	53	56.00	20.16	0.47	13.44	5.94	6.79
	7	104	51	42.00	-0.68	104	51	08.39	20.16	+0.61	-13.50	-5.94	6.79
	8	105	48	54.78	0.68	105	48	21.13	20.16	0.75	13.54	5.96	6.78
	9	106	46	07.92	0.65	106	45	34.27	20.16	0.88	13.53	5.98	6.75
	10	107	43	21.43	0.61	107	42	47.84	20.16	1.02	13.47	6.01	6.73
	11	108	40	35.29	0.50	108	40	01.81	20.16	1.16	13.36	6.02	6.71
	12	109	37	49.54	0.40	109	37	16.21	20.16	1.30	13.21	6.02	6.71
	13	110	35	04.07	-0.25	110	34	30.90	20.16	+1.44	-13.05	-5.99	6.74
	14	111	32	18.84	-0.11	111	31	45.80	20.16	1.58	12.92	5.93	6.80
	15	112	29	33.86	+0.04	112	29	00.89	20.16	1.72	12.85	5.86	6.86
	16	113	26	49.01	0.18	113	26	16.04	20.16	1.86	12.84	5.79	6.93
	17	114	24	04.32	0.29	114	23	31.31	20.16	2.00	12.89	5.73	6.99
	18	115	21	19.73	0.40	115	20	46.64	20.17	2.13	12.96	5.70	7.02
	19	116	18	35.26	+0.47	116	18	02.09	20.17	+2.27	-13.05	-5.68	7.04
	20	117	15	50.95	0.50	117	15	17.71	20.17	2.41	13.11	5.68	7.04
	21	118	13	06.79	0.50	118	12	33.52	20.17	2.55	13.14	5.69	7.03
	22	119	10	22.88	0.50	119	09	49.61	20.17	2.69	13.14	5.71	7.01
	23	120	07	39.26	0.43	120	07	06.02	20.17	2.83	13.11	5.72	7.00
	24	121	04	55.98	0.36	121	04	22.80	20.18	2.97	13.05	5.72	6.99
	25	122	02	13.16	+0.29	122	01	40.04	20.18	+3.11	-12.98	-5.71	7.00
	26	122	59	30.80	0.18	122	58	57.76	20.18	3.24	12.90	5.68	7.03
	27	123	56	48.99	+0.07	123	56	16.01	20.18	3.38	12.84	5.65	7.06
	28	124	54	07.85	-0.07	124	53	34.91	20.18	3.52	12.80	5.60	7.11
	29	125	51	27.43	0.18	125	50	54.49	20.19	3.66	12.79	5.54	7.17
	30	126	48	47.79	0.32	126	48	14.83	20.19	3.80	12.82	5.48	7.23
	31	127	46	09.06	-0.43	127	45	36.04	20.19	+3.94	-12.87	-5.43	7.28
Aug.	1	128	43	31.28	0.50	128	42	58.18	20.19	4.08	12.96	5.38	7.32
	2	129	40	54.53	0.58	129	40	21.32	20.19	4.22	13.05	5.35	7.35
	3	130	38	18.86	0.61	130	37	45.55	20.20	4.36	13.15	5.34	7.37
	4	131	35	44.35	0.65	131	35	10.97	20.20	4.49	13.23	5.33	7.36
	5	132	33	11.04	0.61	132	32	37.61	20.20	4.63	13.27	5.35	7.35
	6	133	30	39.01	-0.58	133	30	05.58	20.21	+4.77	-13.27	-5.36	7.34
	7	134	28	08.23	0.50	134	27	34.85	20.21	4.91	13.21	5.37	7.32
	8	135	25	38.77	0.40	135	25	05.48	20.21	5.05	13.12	5.37	7.32
	9	136	23	10.58	0.25	136	22	37.42	20.21	5.19	13.00	5.34	7.35
	10	137	20	43.64	-0.11	137	20	10.57	20.22	5.33	12.89	5.29	7.40
	11	138	18	17.92	+0.04	138	17	44.92	20.22	5.47	12.83	5.22	7.47
	12	139	15	53.34	+0.18	139	15	20.34	20.22	+5.60	-12.83	-5.15	7.54
	13	140	13	29.88	0.32	140	12	56.81	20.23	5.74	12.89	5.08	7.61
	14	141	11	07.49	0.43	141	10	34.32	20.23	5.88	12.99	5.02	7.66
	15	142	08	46.10	0.50	142	08	12.80	20.23	6.02	13.11	4.99	7.69
	16	143	06	25.71	+0.58	143	05	52.30	20.24	+6.16	-13.22	-4.99	7.70

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	True Distance from the Earth	Semi Diameter '	"	Ephemeris Transit h	m	s
July	1	6	39	45.11	+23	07	14.4	1.016 6247	15	43.95	22	03	56.15
	2	6	43	53.15	23	03	06.7	1.016 6467	15	43.93	22	04	07.39
	3	6	48	00.92	22	58	34.8	1.016 6650	15	43.91	22	04	18.35
	4	6	52	08.41	22	53	38.9	1.016 6792	15	43.90	22	04	29.02
	5	6	56	15.60	22	48	19.1	1.016 6893	15	43.89	22	04	39.37
	6	7	00	22.48	22	42	35.4	1.016 6949	15	43.89	22	04	49.39
	7	7	04	29.02	+22	36	28.1	1.016 6958	15	43.89	22	04	59.05
	8	7	08	35.21	22	29	57.3	1.016 6918	15	43.89	22	05	08.35
	9	7	12	41.03	22	23	03.1	1.016 6826	15	43.90	22	05	17.26
	10	7	16	46.46	22	15	45.8	1.016 6677	15	43.91	22	05	25.76
	11	7	20	51.49	22	08	05.4	1.016 6470	15	43.93	22	05	33.83
	12	7	24	56.09	22	00	02.1	1.016 6201	15	43.96	22	05	41.45
	13	7	29	00.24	+21	51	36.3	1.016 5870	15	43.99	22	05	48.60
	14	7	33	03.92	21	42	48.0	1.016 5474	15	44.02	22	05	55.26
	15	7	37	07.10	21	33	37.5	1.016 5016	15	44.07	22	06	01.41
	16	7	41	09.76	21	24	04.9	1.016 4495	15	44.11	22	06	07.04
	17	7	45	11.89	21	14	10.6	1.016 3916	15	44.17	22	06	12.11
	18	7	49	13.48	21	03	54.6	1.016 3281	15	44.23	22	06	16.64
	19	7	53	14.51	+20	53	17.3	1.016 2593	15	44.29	22	06	20.59
	20	7	57	14.97	20	42	18.9	1.016 1856	15	44.36	22	06	23.97
	21	8	01	14.86	20	30	59.5	1.016 1074	15	44.43	22	06	26.77
	22	8	05	14.16	20	19	19.5	1.016 0248	15	44.51	37	54	00.38
	23	8	09	12.88	20	07	19.1	1.015 9382	15	44.59	8	06	29.72
	24	8	13	11.01	19	54	58.6	1.015 8478	15	44.67	8	06	31.09
	25	8	17	08.54	+19	42	18.3	1.015 7539	15	44.76	8	06	31.86
	26	8	21	05.47	19	29	18.3	1.015 6564	15	44.85	8	06	32.02
	27	8	25	01.79	19	15	59.0	1.015 5556	15	44.95	8	06	31.58
	28	8	28	57.51	19	02	20.6	1.015 4516	15	45.04	8	06	30.54
	29	8	32	52.63	18	48	23.5	1.015 3443	15	45.14	8	06	28.90
	30	8	36	47.14	18	34	07.8	1.015 2338	15	45.25	8	06	26.66
	31	8	40	41.05	+18	19	33.8	1.015 1201	15	45.35	8	06	23.82
Aug.	1	8	44	34.37	18	04	41.8	1.015 0031	15	45.46	8	06	20.38
	2	8	48	27.08	17	49	32.1	1.014 8826	15	45.57	8	06	16.34
	3	8	52	19.21	17	34	04.9	1.014 7586	15	45.69	8	06	11.72
	4	8	56	10.75	17	18	20.6	1.014 6308	15	45.81	8	06	06.51
	5	9	00	01.70	17	02	19.4	1.014 4991	15	45.93	8	06	00.72
	6	9	03	52.08	+16	46	01.5	1.014 3630	15	46.06	8	05	54.35
	7	9	07	41.89	16	29	27.4	1.014 2225	15	46.19	8	05	47.40
	8	9	11	31.12	16	12	37.3	1.014 0771	15	46.32	8	05	39.88
	9	9	15	19.79	15	55	31.5	1.013 9265	15	46.46	8	05	31.80
	10	9	19	07.89	15	38	10.4	1.013 7707	15	46.61	8	05	23.14
	11	9	22	55.41	15	20	34.2	1.013 6093	15	46.76	8	05	13.92
	12	9	26	42.36	+15	02	43.3	1.013 4423	15	46.92	8	05	04.12
	13	9	30	28.75	14	44	38.0	1.013 2699	15	47.08	8	04	53.77
	14	9	34	14.57	14	26	18.7	1.013 0921	15	47.24	8	04	42.85
	15	9	37	59.83	14	07	45.5	1.012 9093	15	47.41	8	04	31.38
	16	9	41	44.55	+13	48	59.0	1.012 7217	15	47.59	8	04	19.37

SUN, 2018

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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Aug.	16	143	06	25.71	+0.58	143	05	52.30	20.24	+6.16	-13.22	-4.99	7.70
	17	144	04	06.33	0.61	144	03	32.83	20.24	6.30	13.30	4.99	7.69
	18	145	01	47.95	0.61	145	01	14.41	20.25	6.44	13.34	5.01	7.68
	19	145	59	30.63	0.65	145	58	57.07	20.25	6.58	13.35	5.02	7.66
	20	146	57	14.32	0.72	146	56	40.78	20.25	6.72	13.33	5.02	7.66
	21	147	54	58.93	0.76	147	54	25.42	20.26	6.85	13.30	5.01	7.66
	22	148	52	44.69	+0.50	148	52	11.21	20.26	+6.99	-13.26	-4.99	7.68
	23	149	50	31.89	0.25	149	49	58.44	20.27	7.13	13.23	4.96	7.72
	24	150	48	20.38	+0.07	150	47	46.93	20.27	7.27	13.22	4.91	7.76
	25	151	46	10.15	-0.07	151	45	36.68	20.27	7.41	13.24	4.86	7.81
	26	152	44	01.37	0.22	152	43	27.84	20.28	7.55	13.29	4.80	7.87
	27	153	41	54.02	0.32	153	41	20.40	20.28	7.69	13.38	4.75	7.92
	28	154	39	48.25	-0.43	154	39	14.51	20.29	+7.83	-13.49	-4.71	7.96
	29	155	37	44.04	0.50	155	37	10.16	20.29	7.96	13.63	4.67	7.99
	30	156	35	41.56	0.54	156	35	07.55	20.30	8.10	13.76	4.66	8.01
	31	157	33	40.87	0.58	157	33	06.73	20.30	8.24	13.88	4.66	8.00
Sept.	1	158	31	41.95	0.58	158	31	07.72	20.31	8.38	13.97	4.68	7.99
	2	159	29	44.96	0.50	159	29	10.68	20.31	8.52	14.02	4.70	7.97
	3	160	27	49.87	-0.47	160	27	15.59	20.32	+8.66	-14.01	-4.71	7.95
	4	161	25	56.79	0.36	161	25	22.55	20.32	8.80	13.97	4.72	7.94
	5	162	24	05.70	0.25	162	23	31.52	20.33	8.94	13.90	4.71	7.95
	6	163	22	16.59	-0.11	163	21	42.48	20.33	9.08	13.83	4.68	7.98
	7	164	20	29.49	+0.04	164	19	55.42	20.34	9.21	13.78	4.63	8.03
	8	165	18	44.31	0.18	165	18	10.22	20.34	9.35	13.79	4.56	8.09
	9	166	17	01.02	+0.29	166	16	26.87	20.35	+9.49	-13.86	-4.50	8.16
	10	167	15	19.59	0.43	167	14	45.31	20.35	9.63	13.97	4.45	8.21
	11	168	13	39.95	0.50	168	13	05.52	20.36	9.77	14.12	4.42	8.23
	12	169	12	02.00	0.58	169	11	27.42	20.36	9.91	14.26	4.41	8.24
	13	170	10	25.75	0.61	170	09	51.05	20.37	10.05	14.38	4.43	8.22
	14	171	08	51.09	0.61	171	08	16.30	20.37	10.19	14.47	4.45	8.20
	15	172	07	18.08	+0.58	172	06	43.24	20.38	+10.33	-14.51	-4.48	8.17
	16	173	05	46.66	0.50	173	05	11.80	20.38	10.46	14.52	4.50	8.15
	17	174	04	16.87	0.43	174	03	42.01	20.39	10.60	14.51	4.51	8.14
	18	175	02	48.69	0.32	175	02	13.85	20.39	10.74	14.49	4.50	8.14
	19	176	01	22.17	0.22	176	00	47.34	20.40	10.88	14.48	4.49	8.15
	20	176	59	57.33	+0.11	176	59	22.49	20.41	11.02	14.48	4.46	8.18
	21	177	58	34.17	-0.04	177	57	59.29	20.41	+11.16	-14.51	-4.42	8.22
	22	178	57	12.80	0.14	178	56	37.86	20.42	11.30	14.57	4.38	8.26
	23	179	55	53.20	0.25	179	55	18.16	20.42	11.44	14.67	4.34	8.30
	24	180	54	35.46	0.36	180	54	00.29	20.43	11.57	14.79	4.31	8.33
	25	181	53	19.65	0.43	181	52	44.33	20.43	11.71	14.94	4.29	8.35
	26	182	52	05.79	0.47	182	51	30.31	20.44	11.85	15.09	4.28	8.35
	27	183	50	54.01	-0.50	183	50	18.38	20.45	+11.99	-15.22	-4.30	8.33
	28	184	49	44.28	0.50	184	49	08.54	20.45	12.13	15.33	4.33	8.30
	29	185	48	36.75	0.47	185	48	00.94	20.46	12.27	15.40	4.36	8.27
	30	186	47	31.43	0.40	186	46	55.60	20.46	12.41	15.42	4.40	8.23
Oct.	1	187	46	28.37	-0.32	187	45	52.56	20.47	+12.55	-15.39	-4.43	8.20

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Aug.	16	9	41	44.55	+13	48	59.0	1.012 7217	15	47.59	8	04	19.37
	17	9	45	28.72	13	29	59.3	1.012 5298	15	47.77	8	04	06.81
	18	9	49	12.36	13	10	46.9	1.012 3339	15	47.95	8	03	53.72
	19	9	52	55.48	12	51	22.0	1.012 1343	15	48.14	8	03	40.12
	20	9	56	38.10	12	31	45.0	1.011 9314	15	48.33	8	03	26.01
	21	10	00	20.20	12	11	56.4	1.011 7254	15	48.52	8	03	11.40
	22	10	04	01.83	+11	51	55.9	1.011 5165	15	48.72	8	02	56.31
	23	10	07	42.99	11	31	44.2	1.011 3052	15	48.92	8	02	40.77
	24	10	11	23.71	11	11	21.7	1.011 0914	15	49.12	8	02	24.79
	25	10	15	03.99	10	50	48.7	1.010 8755	15	49.32	8	02	08.37
	26	10	18	43.85	10	30	05.4	1.010 6577	15	49.53	8	01	51.55
	27	10	22	23.31	10	09	12.2	1.010 4379	15	49.73	8	01	34.34
	28	10	26	02.39	+9	48	09.4	1.010 2163	15	49.94	8	01	16.74
	29	10	29	41.10	9	26	57.2	1.009 9929	15	50.15	8	00	58.80
	30	10	33	19.47	9	05	36.0	1.009 7677	15	50.36	8	00	40.51
	31	10	36	57.52	8	44	06.0	1.009 5406	15	50.58	8	00	21.91
Sept.	1	10	40	35.26	8	22	27.6	1.009 3115	15	50.79	8	00	03.01
	2	10	44	12.72	8	00	41.1	1.009 0803	15	51.01	7	59	43.83
	3	10	47	49.91	+7	38	46.7	1.008 8468	15	51.23	7	59	24.39
	4	10	51	26.86	7	16	44.8	1.008 6106	15	51.45	7	59	04.71
	5	10	55	03.58	6	54	35.8	1.008 3716	15	51.68	7	58	44.80
	6	10	58	40.09	6	32	19.8	1.008 1295	15	51.91	7	58	24.68
	7	11	02	16.40	6	09	57.4	1.007 8840	15	52.14	7	58	04.37
	8	11	05	52.51	5	47	28.8	1.007 6349	15	52.37	7	57	43.88
	9	11	09	28.46	+5	24	54.3	1.007 3820	15	52.61	7	57	23.23
	10	11	13	04.24	5	02	14.4	1.007 1253	15	52.86	7	57	02.42
	11	11	16	39.88	4	39	29.3	1.006 8650	15	53.10	7	56	41.47
	12	11	20	15.39	4	16	39.4	1.006 6011	15	53.35	7	56	20.40
	13	11	23	50.79	3	53	45.1	1.006 3340	15	53.60	7	55	59.23
	14	11	27	26.10	3	30	46.6	1.006 0639	15	53.86	7	55	37.96
	15	11	31	01.33	+3	07	44.4	1.005 7912	15	54.12	7	55	16.62
	16	11	34	36.51	2	44	38.7	1.005 5162	15	54.38	7	54	55.23
	17	11	38	11.64	2	21	30.0	1.005 2393	15	54.64	7	54	33.81
	18	11	41	46.76	1	58	18.5	1.004 9608	15	54.91	7	54	12.37
	19	11	45	21.87	1	35	04.6	1.004 6810	15	55.17	7	53	50.94
	20	11	48	57.01	1	11	48.7	1.004 4002	15	55.44	7	53	29.54
	21	11	52	32.18	+0	48	31.0	1.004 1187	15	55.71	9	27	44.14
	22	11	56	07.43	0	25	12.0	1.003 8369	15	55.98	11	52	43.37
	23	11	59	42.75	+0	01	51.9	1.003 5548	15	56.25	11	52	22.21
	24	12	03	18.19	-0	21	29.0	1.003 2727	15	56.51	11	52	01.17
	25	12	06	53.77	0	44	50.3	1.002 9909	15	56.78	11	51	40.28
	26	12	10	29.50	1	08	11.7	1.002 7094	15	57.05	11	51	19.55
	27	12	14	05.42	-1	31	32.8	1.002 4283	15	57.32	11	50	59.03
	28	12	17	41.54	1	54	53.5	1.002 1476	15	57.59	11	50	38.72
	29	12	21	17.90	2	18	13.2	1.001 8674	15	57.86	11	50	18.66
	30	12	24	54.52	2	41	31.8	1.001 5875	15	58.12	11	49	58.86
Oct.	1	12	28	31.42	-3	04	48.9	1.001 3078	15	58.39	11	49	39.36

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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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Oct.	1	187	46	28.37	-0.32	187	45	52.56	20.47	+12.55	-15.39	-4.43	8.20
	2	188	45	27.63	0.22	188	44	51.86	20.47	12.69	15.33	4.44	8.18
	3	189	44	29.25	-0.07	189	43	53.54	20.48	12.82	15.27	4.43	8.19
	4	190	43	33.19	+0.07	190	42	57.53	20.49	12.96	15.23	4.40	8.22
	5	191	42	39.48	0.18	191	42	03.82	20.49	13.10	15.22	4.36	8.26
	6	192	41	48.10	0.32	192	41	12.37	20.50	13.24	15.27	4.31	8.31
	7	193	40	58.96	+0.43	193	40	23.12	20.50	+13.38	-15.37	-4.27	8.35
	8	194	40	12.01	0.54	194	39	36.04	20.51	13.52	15.51	4.25	8.37
	9	195	39	27.16	0.61	195	38	51.04	20.51	13.66	15.66	4.26	8.36
	10	196	38	44.42	0.65	196	38	08.16	20.52	13.80	15.78	4.28	8.33
	11	197	38	03.62	0.65	197	37	27.26	20.53	13.94	15.88	4.32	8.29
	12	198	37	24.80	0.61	198	36	48.38	20.53	14.07	15.93	4.37	8.25
	13	199	36	47.81	+0.58	199	36	11.38	20.54	+14.21	-15.94	-4.41	8.20
	14	200	36	12.66	0.50	200	35	36.24	20.54	14.35	15.92	4.44	8.17
	15	201	35	39.29	0.40	201	35	02.90	20.55	14.49	15.88	4.46	8.15
	16	202	35	07.73	0.29	202	34	31.37	20.56	14.63	15.85	4.46	8.14
	17	203	34	37.91	0.18	203	34	01.56	20.56	14.77	15.83	4.45	8.15
	18	204	34	09.87	+0.07	204	33	33.52	20.57	14.91	15.83	4.43	8.17
	19	205	33	43.60	-0.04	205	33	07.20	20.57	+15.05	-15.87	-4.41	8.19
	20	206	33	19.08	0.14	206	32	42.61	20.58	15.18	15.93	4.38	8.22
	21	207	32	56.36	0.25	207	32	19.79	20.59	15.32	16.03	4.36	8.24
	22	208	32	35.46	0.32	208	31	58.76	20.59	15.46	16.15	4.35	8.25
	23	209	32	16.40	0.40	209	31	39.58	20.60	15.60	16.28	4.36	8.24
	24	210	31	59.21	0.40	210	31	22.26	20.60	15.74	16.40	4.38	8.21
	25	211	31	43.98	-0.40	211	31	06.92	20.61	+15.88	-16.49	-4.42	8.17
	26	212	31	30.75	0.36	212	30	53.64	20.61	16.02	16.54	4.48	8.12
	27	213	31	19.53	0.29	213	30	42.41	20.62	16.16	16.54	4.53	8.06
	28	214	31	10.45	0.22	214	30	33.37	20.63	16.30	16.50	4.57	8.02
	29	215	31	03.46	-0.11	215	30	26.46	20.63	16.43	16.41	4.60	7.99
	30	216	30	58.69	+0.04	216	30	21.78	20.64	16.57	16.31	4.61	7.98
	31	217	30	56.12	+0.18	217	30	19.30	20.64	+16.71	-16.23	-4.60	7.99
Nov.	1	218	30	55.76	0.32	218	30	18.97	20.65	16.85	16.19	4.57	8.01
	2	219	30	57.61	0.47	219	30	20.81	20.65	16.99	16.19	4.54	8.05
	3	220	31	01.66	0.58	220	30	24.80	20.66	17.13	16.25	4.51	8.08
	4	221	31	07.81	0.68	221	30	30.85	20.66	17.27	16.34	4.49	8.09
	5	222	31	16.06	0.76	222	30	38.99	20.67	17.41	16.45	4.50	8.08
	6	223	31	26.28	+0.79	223	30	49.10	20.67	+17.55	-16.55	-4.53	8.05
	7	224	31	38.46	0.79	224	31	01.20	20.68	17.68	16.62	4.57	8.01
	8	225	31	52.46	0.79	225	31	15.17	20.68	17.82	16.65	4.62	7.95
	9	226	32	08.21	0.76	226	31	30.94	20.69	17.96	16.64	4.68	7.90
	10	227	32	25.63	0.68	227	31	48.40	20.69	18.10	16.59	4.72	7.85
	11	228	32	44.68	0.58	228	32	07.51	20.70	18.24	16.51	4.75	7.82
	12	229	33	05.23	+0.47	229	32	28.14	20.70	+18.38	-16.43	-4.77	7.81
	13	230	33	27.31	0.36	230	32	50.28	20.71	18.52	16.36	4.77	7.80
	14	231	33	50.81	0.25	231	33	13.82	20.71	18.66	16.31	4.75	7.81
	15	232	34	15.70	+0.11	232	33	38.74	20.72	18.79	16.29	4.73	7.83
	16	233	34	41.96	0.00	233	34	04.98	20.72	+18.93	-16.31	-4.71	7.85

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Oct.	1	12	28	31.42	-3	04	48.9	1.001 3078	15	58.39	11	49	39.36
	2	12	32	08.63	3	28	04.1	1.001 0281	15	58.66	11	49	20.16
	3	12	35	46.15	3	51	17.1	1.000 7482	15	58.93	11	49	01.30
	4	12	39	24.02	4	14	27.6	1.000 4677	15	59.20	11	48	42.78
	5	12	43	02.24	4	37	35.1	1.000 1864	15	59.47	11	48	24.64
	6	12	46	40.84	5	00	39.4	0.999 9042	15	59.74	11	48	06.89
	7	12	50	19.84	-5	23	39.9	0.999 6207	16	00.01	11	47	49.53
	8	12	53	59.24	5	46	36.5	0.999 3360	16	00.28	11	47	32.60
	9	12	57	39.07	6	09	28.6	0.999 0499	16	00.56	11	47	16.10
	10	13	01	19.34	6	32	15.9	0.998 7625	16	00.83	11	47	00.05
	11	13	05	00.07	6	54	57.9	0.998 4739	16	01.11	11	46	44.47
	12	13	08	41.28	7	17	34.4	0.998 1844	16	01.39	11	46	29.36
	13	13	12	22.98	-7	40	04.9	0.997 8943	16	01.67	11	46	14.75
	14	13	16	05.18	8	02	29.1	0.997 6039	16	01.95	11	46	00.65
	15	13	19	47.90	8	24	46.4	0.997 3134	16	02.23	11	45	47.08
	16	13	23	31.16	8	46	56.6	0.997 0232	16	02.51	11	45	34.06
	17	13	27	14.98	9	08	59.2	0.996 7336	16	02.79	11	45	21.59
	18	13	30	59.36	9	30	53.9	0.996 4450	16	03.07	11	45	09.71
	19	13	34	44.33	-9	52	40.2	0.996 1576	16	03.35	11	44	58.43
	20	13	38	29.91	10	14	17.8	0.995 8718	16	03.62	11	44	47.76
	21	13	42	16.11	10	35	46.3	0.995 5879	16	03.90	11	44	37.72
	22	13	46	02.95	10	57	05.3	0.995 3061	16	04.17	11	44	28.34
	23	13	49	50.45	11	18	14.4	0.995 0267	16	04.44	11	44	19.62
	24	13	53	38.63	11	39	13.3	0.994 7500	16	04.71	11	44	11.59
	25	13	57	27.51	-12	00	01.5	0.994 4761	16	04.98	11	44	04.27
	26	14	01	17.11	12	20	38.8	0.994 2051	16	05.24	11	43	57.67
	27	14	05	07.45	12	41	04.7	0.993 9372	16	05.50	11	43	51.82
	28	14	08	58.53	13	01	18.9	0.993 6723	16	05.76	11	43	46.72
	29	14	12	50.39	13	21	20.9	0.993 4102	16	06.01	11	43	42.39
	30	14	16	43.02	13	41	10.5	0.993 1510	16	06.26	11	43	38.85
	31	14	20	36.45	-14	00	47.2	0.992 8942	16	06.51	11	43	36.12
Nov.	1	14	24	30.68	14	20	10.5	0.992 6398	16	06.76	11	43	34.19
	2	14	28	25.73	14	39	20.2	0.992 3874	16	07.01	11	43	33.08
	3	14	32	21.60	14	58	15.7	0.992 1367	16	07.25	11	43	32.80
	4	14	36	18.29	15	16	56.8	0.991 8876	16	07.49	11	43	33.35
	5	14	40	15.82	15	35	22.8	0.991 6399	16	07.74	11	43	34.74
	6	14	44	14.19	-15	53	33.6	0.991 3933	16	07.98	11	43	36.97
	7	14	48	13.40	16	11	28.5	0.991 1480	16	08.22	11	43	40.04
	8	14	52	13.45	16	29	07.2	0.990 9039	16	08.45	11	43	43.95
	9	14	56	14.35	16	46	29.3	0.990 6611	16	08.69	11	43	48.71
	10	15	00	16.09	17	03	34.4	0.990 4198	16	08.93	11	43	54.30
	11	15	04	18.68	17	20	22.1	0.990 1801	16	09.16	11	44	00.73
	12	15	08	22.10	-17	36	51.8	0.989 9423	16	09.39	11	44	08.00
	13	15	12	26.35	17	53	03.3	0.989 7068	16	09.63	11	44	16.11
	14	15	16	31.44	18	08	56.1	0.989 4737	16	09.85	11	44	25.04
	15	15	20	37.35	18	24	29.7	0.989 2433	16	10.08	11	44	34.81
	16	15	24	44.10	-18	39	43.9	0.989 0160	16	10.30	11	44	45.40

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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 2018.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Nov.	16	233	34	41.96	0.00	233	34	04.98	20.72	+18.93	-16.31	-4.71	7.85
	17	234	35	09.59	-0.07	234	34	32.56	20.73	19.07	16.35	4.69	7.87
	18	235	35	38.53	0.14	235	35	01.43	20.73	19.21	16.42	4.68	7.88
	19	236	36	08.79	0.22	236	35	31.60	20.74	19.35	16.50	4.68	7.88
	20	237	36	40.34	0.25	237	36	03.06	20.74	19.49	16.58	4.70	7.86
	21	238	37	13.24	0.25	238	36	35.89	20.75	19.63	16.64	4.74	7.82
	22	239	37	47.47	-0.22	239	37	10.09	20.75	+19.77	-16.67	-4.79	7.77
	23	240	38	23.08	0.14	240	37	45.73	20.75	19.91	16.64	4.84	7.72
	24	241	39	00.12	-0.07	241	38	22.85	20.76	20.04	16.56	4.89	7.67
	25	242	39	38.63	+0.07	242	39	01.48	20.76	20.18	16.43	4.92	7.63
	26	243	40	18.62	0.18	243	39	41.62	20.77	20.32	16.29	4.94	7.62
	27	244	41	00.17	0.32	244	40	23.30	20.77	20.46	16.14	4.92	7.63
	28	245	41	43.31	+0.47	245	41	06.54	20.77	+20.60	-16.04	-4.89	7.66
	29	246	42	28.04	0.61	246	41	51.32	20.78	20.74	15.99	4.85	7.70
	30	247	43	14.34	0.76	247	42	37.62	20.78	20.88	15.99	4.81	7.73
Dec.	1	248	44	02.20	0.83	248	43	25.43	20.78	21.02	16.03	4.79	7.76
	2	249	44	51.55	0.94	249	44	14.71	20.79	21.16	16.10	4.78	7.76
	3	250	45	42.38	0.97	250	45	05.47	20.79	21.29	16.17	4.80	7.75
	4	251	46	34.59	+0.97	251	45	57.64	20.79	+21.43	-16.21	-4.83	7.71
	5	252	47	28.09	0.97	252	46	51.13	20.80	21.57	16.21	4.87	7.67
	6	253	48	22.81	0.94	253	47	45.89	20.80	21.71	16.17	4.92	7.62
	7	254	49	18.68	0.86	254	48	41.83	20.80	21.85	16.10	4.95	7.59
	8	255	50	15.53	0.76	255	49	38.78	20.80	21.99	15.99	4.98	7.56
	9	256	51	13.38	0.65	256	50	36.74	20.81	22.13	15.88	4.99	7.55
	10	257	52	12.06	+0.50	257	51	35.53	20.81	+22.27	-15.77	-4.98	7.55
	11	258	53	11.52	0.40	258	52	35.08	20.81	22.41	15.67	4.96	7.57
	12	259	54	11.72	0.29	259	53	35.34	20.82	22.54	15.61	4.93	7.60
	13	260	55	12.53	0.14	260	54	36.18	20.82	22.68	15.58	4.90	7.63
	14	261	56	13.91	+0.04	261	55	37.56	20.82	22.82	15.58	4.86	7.67
	15	262	57	15.83	-0.04	262	56	39.44	20.82	22.96	15.61	4.84	7.69
	16	263	58	18.23	-0.11	263	57	41.80	20.82	+23.10	-15.65	-4.82	7.71
	17	264	59	21.04	0.14	264	58	44.54	20.83	23.24	15.71	4.82	7.71
	18	266	00	24.26	0.14	265	59	47.72	20.83	23.38	15.76	4.83	7.70
	19	267	01	27.86	0.14	267	00	51.30	20.83	23.52	15.78	4.85	7.67
	20	268	02	31.84	-0.07	268	01	55.31	20.83	23.66	15.75	4.89	7.63
	21	269	03	36.20	0.00	269	02	59.75	20.83	23.79	15.67	4.93	7.59
	22	270	04	40.94	+0.11	270	04	04.62	20.84	+23.93	-15.53	-4.95	7.57
	23	271	05	46.11	0.25	271	05	09.96	20.84	24.07	15.36	4.96	7.56
	24	272	06	51.78	0.40	272	06	15.80	20.84	24.21	15.18	4.94	7.58
	25	273	07	57.91	0.54	273	07	22.08	20.84	24.35	15.04	4.89	7.62
	26	274	09	04.63	0.68	274	08	28.90	20.84	24.49	14.94	4.83	7.68
	27	275	10	11.92	0.79	275	09	36.22	20.84	24.63	14.91	4.77	7.74
	28	276	11	19.80	+0.90	276	10	44.08	20.84	+24.77	-14.93	-4.72	7.79
	29	277	12	28.26	1.01	277	11	52.48	20.84	24.91	14.98	4.69	7.82
	30	278	13	37.22	1.04	278	13	01.38	20.84	25.04	15.04	4.68	7.83
	31	279	14	46.70	1.08	279	14	10.82	20.84	25.18	15.08	4.69	7.82
	32	280	15	56.59	+1.04	280	15	20.70	20.84	+25.32	-15.09	-4.71	7.79

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -15' 30".372 and subtract precession from J 2018.5.

SUN, 2018
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Nov.	16	15	24	44.10	-18	39	43.9	0.989 0160	16	10.30	11	44	45.40
	17	15	28	51.66	18	54	38.2	0.988 7921	16	10.52	11	44	56.81
	18	15	33	00.04	19	09	12.2	0.988 5718	16	10.74	11	45	09.04
	19	15	37	09.23	19	23	25.6	0.988 3555	16	10.95	11	45	22.09
	20	15	41	19.24	19	37	18.0	0.988 1434	16	11.16	11	45	35.94
	21	15	45	30.04	19	50	48.9	0.987 9360	16	11.36	11	45	50.59
	22	15	49	41.65	-20	03	58.2	0.987 7333	16	11.56	11	46	06.03
	23	15	53	54.05	20	16	45.4	0.987 5357	16	11.76	11	46	22.26
	24	15	58	07.24	20	29	10.2	0.987 3433	16	11.95	11	46	39.28
	25	16	02	21.21	20	41	12.4	0.987 1562	16	12.13	11	46	57.06
	26	16	06	35.95	20	52	51.5	0.986 9743	16	12.31	11	47	15.61
	27	16	10	51.44	21	04	07.2	0.986 7975	16	12.48	11	47	34.91
	28	16	15	07.67	-21	14	59.3	0.986 6258	16	12.65	11	47	54.95
	29	16	19	24.64	21	25	27.4	0.986 4587	16	12.82	11	48	15.71
	30	16	23	42.31	21	35	31.3	0.986 2961	16	12.98	11	48	37.18
Dec.	1	16	28	00.68	21	45	10.5	0.986 1376	16	13.13	11	48	59.34
	2	16	32	19.72	21	54	24.9	0.985 9830	16	13.29	11	49	22.15
	3	16	36	39.41	22	03	14.1	0.985 8320	16	13.44	11	49	45.61
	4	16	40	59.72	-22	11	37.8	0.985 6844	16	13.58	11	50	09.68
	5	16	45	20.64	22	19	35.8	0.985 5401	16	13.72	11	50	34.34
	6	16	49	42.14	22	27	07.8	0.985 3989	16	13.86	11	50	59.55
	7	16	54	04.17	22	34	13.7	0.985 2610	16	14.00	11	51	25.29
	8	16	58	26.72	22	40	53.1	0.985 1261	16	14.13	11	51	51.52
	9	17	02	49.75	22	47	05.8	0.984 9946	16	14.26	11	52	18.22
	10	17	07	13.22	-22	52	51.6	0.984 8664	16	14.39	11	52	45.35
	11	17	11	37.11	22	58	10.4	0.984 7417	16	14.51	11	53	12.88
	12	17	16	01.38	23	03	01.9	0.984 6208	16	14.63	11	53	40.77
	13	17	20	25.99	23	07	25.9	0.984 5038	16	14.75	11	54	09.00
	14	17	24	50.92	23	11	22.4	0.984 3909	16	14.86	11	54	37.53
	15	17	29	16.13	23	14	51.1	0.984 2825	16	14.97	11	55	06.32
	16	17	33	41.58	-23	17	52.0	0.984 1787	16	15.07	11	55	35.35
	17	17	38	07.26	23	20	24.9	0.984 0798	16	15.17	11	56	04.57
	18	17	42	33.12	23	22	29.7	0.983 9862	16	15.26	11	56	33.97
	19	17	46	59.13	23	24	06.4	0.983 8981	16	15.35	11	57	03.50
	20	17	51	25.26	23	25	15.0	0.983 8159	16	15.43	11	57	33.13
	21	17	55	51.49	23	25	55.3	0.983 7397	16	15.51	11	58	02.84
	22	18	00	17.77	-23	26	07.4	0.983 6699	16	15.58	11	58	32.60
	23	18	04	44.09	23	25	51.3	0.983 6065	16	15.64	11	59	02.36
	24	18	09	10.41	23	25	06.9	0.983 5498	16	15.70	11	59	32.12
	25	18	13	36.70	23	23	54.3	0.983 4996	16	15.75	12	00	01.83
	26	18	18	02.93	23	22	13.6	0.983 4557	16	15.79	12	00	31.47
	27	18	22	29.07	23	20	04.7	0.983 4181	16	15.83	12	01	01.00
	28	18	26	55.09	-23	17	27.7	0.983 3863	16	15.86	12	01	30.41
	29	18	31	20.96	23	14	22.7	0.983 3600	16	15.88	12	01	59.65
	30	18	35	46.64	23	10	49.8	0.983 3390	16	15.90	12	02	28.69
	31	18	40	12.12	23	06	48.9	0.983 3228	16	15.92	12	02	57.50
	32	18	44	37.34	-23	02	20.4	0.983 3113	16	15.93	12	03	26.04

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
Jan.	0	+0.158 6861	+0.157 9923	-0.890 4730	-0.890 4716	-0.385 7375	-0.386 0255
	1	0.175 9118	0.175 2201	0.887 7385	0.887 7371	0.384 5208	0.384 8397
	2	0.193 0825	0.192 3931	0.884 7295	0.884 7281	0.383 1851	0.383 5348
	3	0.210 1934	0.209 5067	0.881 4469	0.881 4456	0.381 7307	0.382 1112
	4	0.227 2397	0.226 5558	0.877 8916	0.877 8902	0.380 1582	0.380 5693
	5	0.244 2165	0.243 5356	0.874 0643	0.874 0630	0.378 4679	0.378 9095
	6	+0.261 1188	+0.260 4411	-0.869 9660	-0.869 9646	-0.376 6602	-0.377 1322
	7	0.277 9414	0.277 2671	0.865 5974	0.865 5961	0.374 7356	0.375 2379
	8	0.294 6792	0.294 0086	0.860 9596	0.860 9583	0.372 6946	0.373 2269
	9	0.311 3270	0.310 6602	0.856 0537	0.856 0524	0.370 5376	0.371 0998
	10	0.327 8794	0.327 2167	0.850 8809	0.850 8796	0.368 2652	0.368 8572
	11	0.344 3311	0.343 6727	0.845 4425	0.845 4413	0.365 8781	0.366 4996
	12	+0.360 6768	+0.360 0228	-0.839 7402	-0.839 7389	-0.363 3768	-0.364 0277
	13	0.376 9112	0.376 2619	0.833 7754	0.833 7741	0.360 7622	0.361 4422
	14	0.393 0289	0.392 3844	0.827 5500	0.827 5488	0.358 0349	0.358 7439
	15	0.409 0246	0.408 3852	0.821 0660	0.821 0647	0.355 1958	0.355 9336
	16	0.424 8931	0.424 2590	0.814 3253	0.814 3240	0.352 2458	0.353 0121
	17	0.440 6292	0.440 0006	0.807 3301	0.807 3289	0.349 1858	0.349 9803
	18	+0.456 2277	+0.455 6048	-0.800 0828	-0.800 0816	-0.346 0168	-0.346 8394
	19	0.471 6836	0.471 0665	0.792 5858	0.792 5846	0.342 7399	0.343 5902
	20	0.486 9918	0.486 3808	0.784 8417	0.784 8406	0.339 3560	0.340 2338
	21	0.502 1474	0.501 5426	0.776 8533	0.776 8521	0.335 8665	0.336 7715
	22	0.517 1456	0.516 5473	0.768 6233	0.768 6221	0.332 2725	0.333 2044
	23	0.531 9817	0.531 3900	0.760 1546	0.760 1535	0.328 5751	0.329 5337
	24	+0.546 6511	+0.546 0662	-0.751 4503	-0.751 4493	-0.324 7759	-0.325 7608
	25	0.561 1494	0.560 5716	0.742 5136	0.742 5125	0.320 8759	0.321 8869
	26	0.575 4723	0.574 9016	0.733 3475	0.733 3465	0.316 8768	0.317 9135
	27	0.589 6157	0.589 0523	0.723 9554	0.723 9544	0.312 7797	0.313 8418
	28	0.603 5755	0.603 0197	0.714 3404	0.714 3394	0.308 5863	0.309 6734
	29	0.617 3480	0.616 7998	0.704 5058	0.704 5048	0.304 2977	0.305 4096
	30	+0.630 9293	+0.630 3890	-0.694 4548	-0.694 4538	-0.299 9156	-0.301 0519
	31	0.644 3159	0.643 7836	0.684 1904	0.684 1894	0.295 4413	0.296 6016
Feb.	1	0.657 5041	0.656 9800	0.673 7157	0.673 7148	0.290 8761	0.292 0601
	2	0.670 4902	0.669 9745	0.663 0338	0.663 0329	0.286 2215	0.287 4287
	3	0.683 2707	0.682 7635	0.652 1476	0.652 1467	0.281 4787	0.282 7089
	4	0.695 8417	0.695 3431	0.641 0602	0.641 0593	0.276 6492	0.277 9019
	5	+0.708 1995	+0.707 7097	-0.629 7746	-0.629 7738	-0.271 7343	-0.273 0092
	6	0.720 3402	0.719 8594	0.618 2942	0.618 2934	0.266 7354	0.268 0321
	7	0.732 2600	0.731 7883	0.606 6222	0.606 6214	0.261 6540	0.262 9722
	8	0.743 9552	0.743 4927	0.594 7621	0.594 7613	0.256 4917	0.257 8308
	9	0.755 4218	0.754 9688	0.582 7174	0.582 7167	0.251 2499	0.252 6096
	10	0.766 6564	0.766 2129	0.570 4919	0.570 4912	0.245 9303	0.247 3102
	11	+0.777 6552	+0.777 2214	-0.558 0893	-0.558 0886	-0.240 5345	-0.241 9341
	12	0.788 4147	0.787 9907	0.545 5136	0.545 5129	0.235 0641	0.236 4830
	13	0.798 9313	0.798 5173	0.532 7686	0.532 7680	0.229 5210	0.230 9587
	14	0.809 2018	0.808 7979	0.519 8586	0.519 8580	0.223 9067	0.225 3629
	15	+0.819 2228	+0.818 8290	-0.506 7877	-0.506 7871	-0.218 2232	-0.219 6974

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MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
Feb.	15	+0.819 2228	+0.818 8290	-0.506 7877	-0.506 7871	-0.218 2232	-0.219 6974
	16	0.828 9911	0.828 6077	0.493 5602	0.493 5596	0.212 4723	0.213 9639
	17	0.838 5037	0.838 1307	0.480 1805	0.480 1799	0.206 6558	0.208 1645
	18	0.847 7576	0.847 3952	0.466 6530	0.466 6525	0.200 7756	0.202 3010
	19	0.856 7501	0.856 3984	0.452 9824	0.452 9819	0.194 8338	0.196 3752
	20	0.865 4786	0.865 1376	0.439 1733	0.439 1728	0.188 8322	0.190 3893
	21	+0.873 9405	+0.873 6105	-0.425 2302	-0.425 2297	-0.182 7729	-0.184 3452
	22	0.882 1337	0.881 8146	0.411 1579	0.411 1575	0.176 6580	0.178 2449
	23	0.890 0560	0.889 7480	0.396 9611	0.396 9607	0.170 4893	0.172 0905
	24	0.897 7055	0.897 4086	0.382 6444	0.382 6440	0.164 2690	0.165 8839
	25	0.905 0803	0.904 7947	0.368 2125	0.368 2121	0.157 9991	0.159 6272
	26	0.912 1789	0.911 9047	0.353 6699	0.353 6696	0.151 6816	0.153 3224
	27	+0.918 9998	+0.918 7370	-0.339 0212	-0.339 0208	-0.145 3185	-0.146 9715
	28	0.925 5414	0.925 2901	0.324 2706	0.324 2703	0.138 9116	0.140 5764
Mar.	1	0.931 8024	0.931 5627	0.309 4226	0.309 4223	0.132 4630	0.134 1390
	2	0.937 7814	0.937 5534	0.294 4813	0.294 4810	0.125 9746	0.127 6612
	3	0.943 4770	0.943 2607	0.279 4510	0.279 4508	0.119 4481	0.121 1449
	4	0.948 8876	0.948 6831	0.264 3359	0.264 3357	0.112 8855	0.114 5920
	5	+0.954 0118	+0.953 8192	-0.249 1402	-0.249 1401	-0.106 2886	-0.108 0043
	6	0.958 8482	0.958 6674	0.233 8684	0.233 8682	0.099 6594	0.101 3837
	7	0.963 3951	0.963 2264	0.218 5247	0.218 5245	0.092 9997	0.094 7321
	8	0.967 6513	0.967 4946	0.203 1136	0.203 1135	0.086 3115	0.088 0515
	9	0.971 6154	0.971 4707	0.187 6399	0.187 6398	0.079 5967	0.081 3439
	10	0.975 2861	0.975 1536	0.172 1080	0.172 1079	0.072 8574	0.074 6111
	11	+0.978 6623	+0.978 5418	-0.156 5226	-0.156 5226	-0.066 0956	-0.067 8554
	12	0.981 7427	0.981 6345	0.140 8886	0.140 8887	0.059 3134	0.061 0786
	13	0.984 5265	0.984 4305	0.125 2108	0.125 2109	0.052 5127	0.054 2829
	14	0.987 0128	0.986 9290	0.109 4941	0.109 4941	0.045 6957	0.047 4703
	15	0.989 2008	0.989 1293	0.093 7433	0.093 7434	0.038 8645	0.040 6430
	16	0.991 0898	0.991 0306	0.077 9635	0.077 9636	0.032 0213	0.033 8031
	17	+0.992 6794	+0.992 6325	-0.062 1598	-0.062 1599	-0.025 1681	-0.026 9527
	18	0.993 9692	0.993 9347	0.046 3371	0.046 3372	0.018 3072	0.020 0941
	19	0.994 9589	0.994 9368	0.030 5006	0.030 5008	0.011 4407	0.013 2293
	20	0.995 6487	0.995 6389	-0.014 6554	-0.014 6556	-0.004 5708	-0.006 3606
	21	0.996 0386	0.996 0411	+0.001 1934	+0.001 1931	+0.002 3003	+0.000 5098
	22	0.996 1290	0.996 1438	0.017 0407	0.017 0404	0.009 1703	0.007 3797
	23	+0.995 9204	+0.995 9476	+0.032 8815	+0.032 8812	+0.016 0372	+0.014 2470
	24	0.995 4134	0.995 4530	0.048 7109	0.048 7106	0.022 8987	0.021 1095
	25	0.994 6090	0.994 6609	0.064 5242	0.064 5238	0.029 7528	0.027 9651
	26	0.993 5080	0.993 5722	0.080 3165	0.080 3161	0.036 5975	0.034 8118
	27	0.992 1115	0.992 1879	0.096 0833	0.096 0830	0.043 4306	0.041 6475
	28	0.990 4204	0.990 5091	0.111 8203	+0.111 8198	0.050 2502	0.048 4702
	29	+0.988 4358	+0.988 5368	+0.127 5229	+0.127 5224	+0.057 0544	+0.055 2780
	30	0.986 1588	0.986 2720	0.143 1869	0.143 1864	0.063 8413	0.062 0690
	31	0.983 5904	0.983 7158	0.158 8081	0.158 8076	0.070 6090	0.068 8414
Apr.	1	0.980 7317	0.980 8692	0.174 3823	0.174 3818	0.077 3557	0.075 5933
	2	+0.977 5836	+0.977 7332	+0.189 9053	+0.189 9047	+0.084 0795	+0.082 3228

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
Apr.	1	+0.980 7317	+0.980 8692	+0.174 3823	+0.174 3818	+0.077 3557	+0.075 5933
	2	0.977 5836	0.977 7332	0.189 9053	0.189 9047	0.084 0795	0.082 3228
	3	0.974 1472	0.974 3088	0.205 3728	0.205 3722	0.090 7786	0.089 0281
	4	0.970 4233	0.970 5970	0.220 7805	0.220 7799	0.097 4511	0.095 7073
	5	0.966 4132	0.966 5988	0.236 1242	0.236 1235	0.104 0952	0.102 3587
	6	0.962 1179	0.962 3154	0.251 3994	0.251 3987	0.110 7089	0.108 9802
	7	+0.957 5387	+0.957 7480	+0.266 6017	+0.266 6011	+0.117 2905	+0.115 5700
	8	0.952 6767	0.952 8978	0.281 7268	0.281 7261	0.123 8379	0.122 1262
	9	0.947 5335	0.947 7663	0.296 7701	0.296 7694	0.130 3494	0.128 6470
	10	0.942 1104	0.942 3549	0.311 7273	0.311 7266	0.136 8229	0.135 1303
	11	0.936 4090	0.936 6651	0.326 5938	0.326 5931	0.143 2566	0.141 5743
	12	0.930 4311	0.930 6986	0.341 3651	0.341 3644	0.149 6486	0.147 9771
	13	+0.924 1783	+0.924 4573	+0.356 0368	+0.356 0360	+0.155 9970	+0.154 3367
	14	0.917 6527	0.917 9430	0.370 6043	0.370 6035	0.162 2998	0.160 6513
	15	0.910 8562	0.911 1578	0.385 0630	0.385 0622	0.168 5550	0.166 9188
	16	0.903 7911	0.904 1039	0.399 4086	0.399 4078	0.174 7609	0.173 1375
	17	0.896 4598	0.896 7837	0.413 6365	0.413 6356	0.180 9154	0.179 3052
	18	0.888 8648	0.889 1997	0.427 7423	0.427 7414	0.187 0167	0.185 4202
	19	+0.881 0089	+0.881 3546	+0.441 7217	+0.441 7208	+0.193 0629	+0.191 4806
	20	0.872 8949	0.873 2514	0.455 5705	0.455 5696	0.199 0522	0.197 4845
	21	0.864 5258	0.864 8930	0.469 2847	0.469 2837	0.204 9828	0.203 4302
	22	0.855 9048	0.856 2825	0.482 8603	0.482 8593	0.210 8530	0.209 3159
	23	0.847 0348	0.847 4231	0.496 2937	0.496 2927	0.216 6611	0.215 1400
	24	0.837 9192	0.838 3178	0.509 5811	0.509 5801	0.222 4056	0.220 9009
	25	+0.828 5611	+0.828 9699	+0.522 7192	+0.522 7182	+0.228 0848	+0.226 5970
	26	0.818 9636	0.819 3825	0.535 7046	0.535 7035	0.233 6974	0.232 2269
	27	0.809 1299	0.809 5588	0.548 5340	0.548 5329	0.239 2418	0.237 7890
	28	0.799 0629	0.799 5016	0.561 2042	0.561 2031	0.244 7167	0.243 2820
	29	0.788 7658	0.789 2142	0.573 7119	0.573 7108	0.250 1206	0.248 7045
	30	0.778 2415	0.778 6995	0.586 0541	0.586 0530	0.255 4522	0.254 0550
May	1	+0.767 4930	+0.767 9605	+0.598 2275	+0.598 2264	+0.260 7100	+0.259 3322
	2	0.756 5234	0.757 0003	0.610 2290	0.610 2278	0.265 8928	0.264 5347
	3	0.745 3357	0.745 8218	0.622 0553	0.622 0541	0.270 9991	0.269 6612
	4	0.733 9329	0.734 4281	0.633 7033	0.633 7021	0.276 0276	0.274 7102
	5	0.722 3183	0.722 8223	0.645 1697	0.645 1685	0.280 9769	0.279 6804
	6	0.710 4949	0.711 0078	0.656 4513	0.656 4500	0.285 8457	0.284 5705
	7	+0.698 4662	+0.698 9876	+0.667 5449	+0.667 5437	+0.290 6326	+0.289 3790
	8	0.686 2353	0.686 7653	0.678 4473	0.678 4461	0.295 3362	0.294 1046
	9	0.673 8058	0.674 3441	0.689 1554	0.689 1541	0.299 9552	0.298 7460
	10	0.661 1811	0.661 7276	0.699 6659	0.699 6646	0.304 4882	0.303 3018
	11	0.648 3649	0.648 9194	0.709 9757	0.709 9744	0.308 9340	0.307 7707
	12	0.635 3608	0.635 9231	0.720 0817	0.720 0804	0.313 2912	0.312 1513
	13	+0.622 1727	+0.622 7427	+0.729 9808	+0.729 9794	+0.317 5585	+0.316 4423
	14	0.608 8045	0.609 3820	0.739 6698	0.739 6685	0.321 7346	0.320 6425
	15	0.595 2603	0.595 8452	0.749 1459	0.749 1445	0.325 8183	0.324 7505
	16	0.581 5443	0.582 1364	0.758 4060	0.758 4047	0.329 8082	0.328 7651
	17	+0.567 6610	+0.568 2601	+0.767 4475	+0.767 4461	+0.333 7031	+0.332 6850

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MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
May	17	+0.567 6610	+0.568 2601	+0.767 4475	+0.767 4461	+0.333 7031	+0.332 6850
	18	0.553 6147	0.554 2207	0.776 2677	0.776 2663	0.337 5020	0.336 5091
	19	0.539 4102	0.540 0229	0.784 8641	0.784 8627	0.341 2037	0.340 2364
	20	0.525 0521	0.525 6712	0.793 2346	0.793 2332	0.344 8072	0.343 8658
	21	0.510 5448	0.511 1703	0.801 3771	0.801 3757	0.348 3117	0.347 3963
	22	+0.495 8931	0.496 5247	0.809 2896	0.809 2882	0.351 7162	0.350 8272
	23	+0.481 1013	+0.481 7389	+0.816 9704	+0.816 9690	+0.355 0199	+0.354 1575
	24	0.466 1740	0.466 8174	0.824 4178	0.824 4164	0.358 2221	0.357 3866
	25	0.451 1155	0.451 7645	0.831 6301	0.831 6287	0.361 3221	0.360 5136
	26	0.435 9302	0.436 5845	0.838 6059	0.838 6044	0.364 3191	0.363 5380
	27	0.420 6222	0.421 2818	0.845 3434	0.845 3420	0.367 2125	0.366 4589
	28	0.405 1958	0.405 8604	0.851 8414	0.851 8399	0.370 0016	0.369 2758
	29	+0.389 6552	+0.390 3247	+0.858 0981	+0.858 0966	+0.372 6859	+0.371 9880
	30	0.374 0046	0.374 6788	0.864 1122	0.864 1107	0.375 2646	0.374 5949
	31	0.358 2482	0.358 9268	0.869 8821	0.869 8806	0.377 7372	0.377 0958
June	1	0.342 3901	0.343 0731	0.875 4064	0.875 4049	0.380 1030	0.379 4902
	2	0.326 4347	0.327 1217	0.880 6836	0.880 6821	0.382 3614	0.381 7773
	3	0.310 3862	0.311 0771	0.885 7122	0.885 7106	0.384 5119	0.383 9566
	4	+0.294 2489	+0.294 9435	+0.890 4907	+0.890 4892	+0.386 5538	+0.386 0275
	5	0.278 0272	0.278 7253	0.895 0178	0.895 0163	0.388 4865	0.387 9894
	6	0.261 7254	0.262 4269	0.899 2921	0.899 2906	0.390 3096	0.389 8418
	7	0.245 3482	0.246 0527	0.903 3122	0.903 3107	0.392 0224	0.391 5841
	8	0.228 8999	0.229 6073	0.907 0768	0.907 0752	0.393 6244	0.393 2157
	9	0.212 3853	0.213 0954	0.910 5845	0.910 5830	0.395 1151	0.394 7361
	10	+0.195 8090	+0.196 5216	+0.913 8343	+0.913 8328	+0.396 4940	+0.396 1448
	11	0.179 1758	0.179 8907	0.916 8248	0.916 8233	0.397 7606	0.397 4413
	12	0.162 4906	0.163 2076	0.919 5550	0.919 5535	0.398 9144	0.398 6251
	13	0.145 7585	0.146 4774	0.922 0240	0.922 0224	0.399 9550	0.399 6958
	14	0.128 9846	0.129 7052	0.924 2307	0.924 2292	0.400 8821	0.400 6530
	15	0.112 1741	0.112 8963	0.926 1747	0.926 1732	0.401 6953	0.401 4964
	16	+0.095 3323	+0.096 0557	+0.927 8555	+0.927 8540	+0.402 3944	+0.402 2258
	17	0.078 4644	0.079 1889	0.929 2728	0.929 2712	0.402 9793	0.402 8410
	18	0.061 5755	0.062 3009	0.930 4265	0.930 4250	0.403 4499	0.403 3420
	19	0.044 6707	0.045 3968	0.931 3168	0.931 3152	0.403 8061	0.403 7287
	20	0.027 7550	0.028 4815	0.931 9438	0.931 9423	0.404 0482	0.404 0011
	21	+0.010 8332	+0.011 5599	0.932 3078	0.932 3063	0.404 1761	0.404 1595
	22	-0.006 0901	-0.005 3633	+0.932 4091	+0.932 4076	+0.404 1900	+0.404 2038
	23	0.023 0101	0.022 2834	0.932 2482	0.932 2467	0.404 0901	0.404 1342
	24	0.039 9222	0.039 1959	0.931 8252	0.931 8238	0.403 8764	0.403 9510
	25	0.056 8220	0.056 0963	0.931 1408	0.931 1393	0.403 5492	0.403 6542
	26	0.073 7050	0.072 9800	0.930 1952	0.930 1937	0.403 1087	0.403 2440
	27	0.090 5666	0.089 8426	0.928 9888	0.928 9873	0.402 5551	0.402 7207
	28	-0.107 4026	-0.106 6797	+0.927 5221	+0.927 5206	+0.401 8886	+0.402 0844
	29	0.124 2083	0.123 4869	0.925 7955	0.925 7941	0.401 1094	0.401 3354
	30	0.140 9795	0.140 2596	0.923 8095	0.923 8080	0.400 2177	0.400 4739
July	1	0.157 7117	0.156 9936	0.921 5645	0.921 5630	0.399 2138	0.399 5001
	2	-0.174 4003	-0.173 6842	+0.919 0610	+0.919 0596	+0.398 0980	+0.398 4142

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
July	1	-0.157 7117	-0.156 9936	+0.921 5645	+0.921 5630	+0.399 2138	+0.399 5001
	2	0.174 4003	0.173 6842	0.919 0610	0.919 0596	0.398 0980	0.398 4142
	3	0.191 0411	0.190 3271	0.916 2995	0.916 2981	0.396 8704	0.397 2166
	4	0.207 6293	0.206 9178	0.913 2807	0.913 2792	0.395 5314	0.395 9074
	5	0.224 1606	0.223 4516	0.910 0049	0.910 0035	0.394 0813	0.394 4870
	6	0.240 6303	0.239 9241	0.906 4730	0.906 4716	0.392 5203	0.392 9556
	7	-0.257 0338	-0.256 3306	+0.902 6856	+0.902 6842	+0.390 8489	+0.391 3136
	8	0.273 3665	0.272 6664	0.898 6433	0.898 6419	0.389 0672	0.389 5613
	9	0.289 6235	0.288 9268	0.894 3470	0.894 3456	0.387 1758	0.387 6991
	10	0.305 8001	0.305 1070	0.889 7976	0.889 7963	0.385 1749	0.385 7273
	11	0.321 8914	0.321 2021	0.884 9961	0.884 9948	0.383 0651	0.383 6464
	12	0.337 8924	0.337 2070	0.879 9437	0.879 9424	0.380 8468	0.381 4568
	13	-0.353 7981	-0.353 1169	+0.874 6417	+0.874 6404	+0.378 5206	+0.379 1592
	14	0.369 6036	0.368 9267	0.869 0917	0.869 0904	0.376 0871	0.376 7541
	15	0.385 3038	0.384 6315	0.863 2954	0.863 2941	0.373 5470	0.374 2422
	16	0.400 8942	0.400 2266	0.857 2548	0.857 2535	0.370 9012	0.371 6244
	17	0.416 3699	0.415 7072	0.850 9719	0.850 9707	0.368 1504	0.368 9015
	18	0.431 7265	0.431 0689	0.844 4489	0.844 4477	0.365 2957	0.366 0743
	19	-0.446 9597	-0.446 3074	+0.837 6880	+0.837 6868	+0.362 3379	+0.363 1439
	20	0.462 0652	0.461 4184	0.830 6914	0.830 6902	0.359 2780	0.360 1111
	21	0.477 0391	0.476 3979	0.823 4613	0.823 4601	0.356 1170	0.356 9770
	22	0.491 8772	0.491 2419	0.816 0000	0.815 9988	0.352 8558	0.353 7424
	23	0.506 5756	0.505 9463	0.808 3097	0.808 3085	0.349 4954	0.350 4085
	24	0.521 1305	0.520 5074	0.800 3926	0.800 3915	0.346 0369	0.346 9761
	25	-0.535 5380	-0.534 9213	+0.792 2510	+0.792 2499	+0.342 4811	+0.343 4462
	26	0.549 7942	0.549 1841	0.783 8871	0.783 8860	0.338 8292	0.339 8199
	27	0.563 8956	0.563 2921	0.775 3031	0.775 3020	0.335 0822	0.336 0982
	28	0.577 8382	0.577 2417	0.766 5014	0.766 5003	0.331 2409	0.332 2820
	29	0.591 6184	0.591 0289	0.757 4841	0.757 4830	0.327 3066	0.328 3723
	30	0.605 2325	0.604 6502	0.748 2535	0.748 2525	0.323 2801	0.324 3703
	31	-0.618 6767	-0.618 1018	+0.738 8121	+0.738 8110	+0.319 1625	+0.320 2769
Aug.	1	0.631 9473	0.631 3800	0.729 1620	0.729 1610	0.314 9549	0.316 0931
	2	0.645 0406	0.644 4810	0.719 3057	0.719 3047	0.310 6584	0.311 8201
	3	0.657 9529	0.657 4011	0.709 2456	0.709 2446	0.306 2739	0.307 4588
	4	0.670 6804	0.670 1366	0.698 9841	0.698 9831	0.301 8027	0.303 0104
	5	0.683 2192	0.682 6836	0.688 5237	0.688 5227	0.297 2457	0.298 4760
	6	-0.695 5656	-0.695 0383	+0.677 8670	+0.677 8661	+0.292 6042	+0.293 8566
	7	0.707 7156	0.707 1968	0.667 0167	0.667 0158	0.287 8792	0.289 1534
	8	0.719 6655	0.719 1553	0.655 9757	0.655 9748	0.283 0721	0.284 3677
	9	0.731 4112	0.730 9098	0.644 7467	0.644 7459	0.278 1839	0.279 5007
	10	0.742 9489	0.742 4564	0.633 3331	0.633 3322	0.273 2162	0.274 5536
	11	0.754 2747	0.753 7913	0.621 7380	0.621 7372	0.268 1702	0.269 5280
	12	-0.765 3850	-0.764 9107	+0.609 9649	+0.609 9641	+0.263 0474	+0.264 4251
	13	0.776 2760	0.775 8111	0.598 0176	0.598 0168	0.257 8494	0.259 2467
	14	0.786 9445	0.786 4891	0.585 8997	0.585 8989	0.252 5777	0.253 9941
	15	0.797 3873	0.796 9414	0.573 6149	0.573 6142	0.247 2340	0.248 6692
	16	-0.807 6012	-0.807 1651	+0.561 1673	+0.561 1665	+0.241 8199	+0.243 2734

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MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
Aug.	16	-0.807 6012	-0.807 1651	+0.561 1673	+0.561 1665	+0.241 8199	+0.243 2734
	17	0.817 5836	0.817 1573	0.548 5604	0.548 5597	0.236 3371	0.237 8084
	18	0.827 3316	0.826 9153	0.535 7982	0.535 7975	0.230 7871	0.232 2760
	19	0.836 8427	0.836 4364	0.522 8843	0.522 8836	0.225 1717	0.226 6776
	20	0.846 1142	0.845 7181	0.509 8225	0.509 8219	0.219 4925	0.221 0150
	21	0.855 1437	0.854 7580	0.496 6165	0.496 6159	0.213 7510	0.215 2897
	22	-0.863 9288	-0.863 5535	+0.483 2700	+0.483 2695	+0.207 9490	+0.209 5035
	23	0.872 4671	0.872 1023	0.469 7868	0.469 7862	0.202 0881	0.203 6579
	24	0.880 7564	0.880 4022	0.456 1704	0.456 1698	0.196 1699	0.197 7545
	25	0.888 7944	0.888 4509	0.442 4245	0.442 4240	0.190 1960	0.191 7950
	26	0.896 5788	0.896 2461	0.428 5529	0.428 5524	0.184 1680	0.185 7810
	27	0.904 1074	0.903 7857	0.414 5591	0.414 5587	0.178 0877	0.179 7142
	28	-0.911 3781	-0.911 0675	+0.400 4469	+0.400 4465	+0.171 9565	+0.173 5960
	29	0.918 3888	0.918 0892	0.386 2200	0.386 2196	0.165 7762	0.167 4282
	30	0.925 1372	0.924 8488	0.371 8820	0.371 8816	0.159 5483	0.161 2124
	31	0.931 6213	0.931 3441	0.357 4366	0.357 4363	0.153 2745	0.154 9503
Sept.	1	0.937 8388	0.937 5730	0.342 8877	0.342 8874	0.146 9564	0.148 6433
	2	0.943 7876	0.943 5333	0.328 2390	0.328 2387	0.140 5958	0.142 2933
	3	-0.949 4656	-0.949 2228	+0.313 4945	+0.313 4942	+0.134 1942	+0.135 9020
	4	0.954 8706	0.954 6393	0.298 6581	0.298 6578	0.127 7535	0.129 4709
	5	0.960 0004	0.959 7807	0.283 7339	0.283 7337	0.121 2753	0.123 0019
	6	0.964 8529	0.964 6450	0.268 7262	0.268 7260	0.114 7615	0.116 4967
	7	0.969 4261	0.969 2300	0.253 6393	0.253 6391	0.108 2139	0.109 9573
	8	0.973 7180	0.973 5337	0.238 4777	0.238 4776	0.101 6344	0.103 3855
	9	-0.977 7269	-0.977 5544	+0.223 2461	+0.223 2460	+0.095 0250	+0.096 7833
	10	0.981 4511	0.981 2905	0.207 9492	0.207 9491	0.088 3878	0.090 1527
	11	0.984 8891	0.984 7406	0.192 5918	0.192 5917	0.081 7247	0.083 4957
	12	0.988 0399	0.987 9034	0.177 1788	0.177 1787	0.075 0378	0.076 8145
	13	0.990 9023	0.990 7779	0.161 7149	0.161 7149	0.068 3293	0.070 1110
	14	0.993 4757	0.993 3633	0.146 2050	0.146 2050	0.061 6012	0.063 3875
	15	-0.995 7592	-0.995 6589	+0.130 6538	+0.130 6538	+0.054 8555	+0.056 6458
	16	0.997 7523	0.997 6642	0.115 0659	0.115 0659	0.048 0942	0.049 8881
	17	0.999 4544	0.999 3785	0.099 4459	0.099 4459	0.041 3195	0.043 1164
	18	1.000 8653	1.000 8016	0.083 7983	0.083 7984	0.034 5332	0.036 3326
	19	1.001 9846	1.001 9331	0.068 1277	0.068 1279	0.027 7374	0.029 5388
	20	1.002 8119	1.002 7726	0.052 4386	0.052 4387	0.020 9341	0.022 7369
	21	-1.003 3471	-1.003 3201	+0.036 7353	+0.036 7355	+0.014 1251	+0.015 9289
	22	1.003 5901	1.003 5753	0.021 0223	0.021 0225	0.007 3125	0.009 1166
	23	1.003 5406	1.003 5381	+0.005 3040	+0.005 3042	+0.000 4981	+0.002 3021
	24	1.003 1988	1.003 2085	-0.010 4154	-0.010 4151	-0.006 3161	-0.004 5128
	25	1.002 5645	1.002 5864	0.026 1314	0.026 1311	0.013 1282	0.011 3261
	26	1.001 6377	1.001 6719	0.041 8398	0.041 8395	0.019 9364	0.018 1360
	27	-1.000 4184	-1.000 4649	-0.057 5363	-0.057 5360	-0.026 7388	-0.024 9406
	28	0.998 9068	0.998 9654	0.073 2167	0.073 2163	0.033 5334	0.031 7380
	29	0.997 1027	0.997 1736	0.088 8764	0.088 8761	0.040 3185	0.038 5264
	30	0.995 0062	0.995 0893	0.104 5113	0.104 5109	0.047 0921	0.045 3038
Oct.	1	-0.992 6174	-0.992 7126	-0.120 1169	-0.120 1165	-0.053 8524	-0.052 0684

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
Oct.	1	-0.992 6174	-0.992 7126	-0.120 1169	-0.120 1165	-0.053 8524	-0.052 0684
	2	0.989 9363	0.990 0436	0.135 6887	0.135 6883	0.060 5973	0.058 8182
	3	0.986 9631	0.987 0825	0.151 2221	0.151 2216	0.067 3250	0.065 5513
	4	0.983 6979	0.983 8294	0.166 7124	0.166 7119	0.074 0335	0.072 2657
	5	0.980 1412	0.980 2847	0.182 1549	0.182 1543	0.080 7206	0.078 9593
	6	0.976 2932	0.976 4488	0.197 5446	0.197 5440	0.087 3845	0.085 6301
	7	-0.972 1548	-0.972 3222	-0.212 8766	-0.212 8761	-0.094 0228	-0.092 2759
	8	0.967 7265	0.967 9059	0.228 1460	0.228 1454	0.100 6337	0.098 8948
	9	0.963 0096	0.963 2008	0.243 3477	0.243 3471	0.107 2148	0.105 4844
	10	0.958 0052	0.958 2082	0.258 4768	0.258 4762	0.113 7640	0.112 0427
	11	0.952 7147	0.952 9294	0.273 5283	0.273 5277	0.120 2793	0.118 5675
	12	0.947 1397	0.947 3661	0.288 4975	0.288 4968	0.126 7585	0.125 0568
	13	-0.941 2820	-0.941 5200	-0.303 3795	-0.303 3788	-0.133 1996	-0.131 5085
	14	0.935 1434	0.935 3929	0.318 1698	0.318 1691	0.139 6006	0.137 9205
	15	0.928 7257	0.928 9867	0.332 8638	0.332 8631	0.145 9594	0.144 2909
	16	0.922 0311	0.922 3034	0.347 4571	0.347 4563	0.152 2741	0.150 6177
	17	0.915 0615	0.915 3452	0.361 9453	0.361 9445	0.158 5429	0.156 8990
	18	0.907 8192	0.908 1140	0.376 3241	0.376 3233	0.164 7637	0.163 1329
	19	-0.900 3062	-0.900 6122	-0.390 5893	-0.390 5884	-0.170 9347	-0.169 3175
	20	0.892 5249	0.892 8419	0.404 7366	0.404 7358	0.177 0542	0.175 4510
	21	0.884 4775	0.884 8054	0.418 7621	0.418 7612	0.183 1203	0.181 5316
	22	0.876 1664	0.876 5051	0.432 6617	0.432 6608	0.189 1312	0.187 5575
	23	0.867 5938	0.867 9432	0.446 4313	0.446 4304	0.195 0852	0.193 5270
	24	0.858 7623	0.859 1223	0.460 0671	0.460 0662	0.200 9806	0.199 4383
	25	-0.849 6740	-0.850 0445	-0.473 5652	-0.473 5643	-0.206 8157	-0.205 2897
	26	0.840 3315	0.840 7124	0.486 9218	0.486 9208	0.212 5888	0.211 0797
	27	0.830 7371	0.831 1282	0.500 1330	0.500 1320	0.218 2983	0.216 8064
	28	0.820 8930	0.821 2944	0.513 1949	0.513 1938	0.223 9424	0.222 4683
	29	0.810 8019	0.811 2133	0.526 1036	0.526 1025	0.229 5196	0.228 0637
	30	0.800 4660	0.800 8873	0.538 8551	0.538 8540	0.235 0282	0.233 5909
	31	-0.789 8878	-0.790 3189	-0.551 4455	-0.551 4444	-0.240 4664	-0.239 0481
Nov.	1	0.779 0700	0.779 5108	0.563 8705	0.563 8695	0.245 8325	0.244 4337
	2	0.768 0154	0.768 4657	0.576 1262	0.576 1251	0.251 1248	0.249 7459
	3	0.756 7267	0.757 1864	0.588 2084	0.588 2072	0.256 3415	0.254 9830
	4	0.745 2070	0.745 6760	0.600 1128	0.600 1116	0.261 4808	0.260 1430
	5	0.733 4596	0.733 9377	0.611 8353	0.611 8341	0.266 5411	0.265 2244
	6	-0.721 4880	-0.721 9751	-0.623 3719	-0.623 3707	-0.271 5204	-0.270 2254
	7	0.709 2957	0.709 7916	0.634 7185	0.634 7173	0.276 4173	0.275 1441
	8	0.696 8864	0.697 3910	0.645 8713	0.645 8701	0.281 2298	0.279 9790
	9	0.684 2641	0.684 7772	0.656 8264	0.656 8252	0.285 9564	0.284 7284
	10	0.671 4328	0.671 9543	0.667 5803	0.667 5790	0.290 5956	0.289 3906
	11	0.658 3966	0.658 9263	0.678 1294	0.678 1281	0.295 1457	0.293 9642
	12	-0.645 1597	-0.645 6974	-0.688 4704	-0.688 4691	-0.299 6053	-0.298 4476
	13	0.631 7262	0.632 2718	0.698 5999	0.698 5987	0.303 9729	0.302 8395
	14	0.618 1005	0.618 6538	0.708 5150	0.708 5137	0.308 2473	0.307 1383
	15	0.604 2868	0.604 8476	0.718 2125	0.718 2112	0.312 4270	0.311 3429
	16	-0.590 2894	-0.590 8576	-0.727 6895	-0.727 6882	-0.316 5107	-0.315 4518

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2018.5 AND J 2000.0

Date		$X_{2018.5}$	$X_{2000.0}$	$Y_{2018.5}$	$Y_{2000.0}$	$Z_{2018.5}$	$Z_{2000.0}$
Nov.	16	-0.590 2894	-0.590 8576	-0.727 6895	-0.727 6882	-0.316 5107	-0.315 4518
	17	0.576 1128	0.576 6881	0.736 9433	0.736 9419	0.320 4972	0.319 4638
	18	0.561 7612	0.562 3436	0.745 9710	0.745 9696	0.324 3854	0.323 3778
	19	0.547 2390	0.547 8283	0.754 7700	0.754 7687	0.328 1740	0.327 1926
	20	0.532 5508	0.533 1466	0.763 3379	0.763 3365	0.331 8620	0.330 9070
	21	0.517 7007	0.518 3030	0.771 6722	0.771 6708	0.335 4482	0.334 5199
	22	-0.502 6932	-0.503 3018	-0.779 7704	-0.779 7691	-0.338 9317	-0.338 0304
	23	0.487 5325	0.488 1473	0.787 6304	0.787 6290	0.342 3115	0.341 4374
	24	0.472 2230	0.472 8437	0.795 2497	0.795 2483	0.345 5865	0.344 7400
	25	0.456 7689	0.457 3953	0.802 6262	0.802 6248	0.348 7559	0.347 9372
	26	0.441 1744	0.441 8063	0.809 7574	0.809 7560	0.351 8186	0.351 0280
	27	0.425 4438	0.426 0810	0.816 6411	0.816 6396	0.354 7737	0.354 0113
	28	-0.409 5814	-0.410 2238	-0.823 2748	-0.823 2733	-0.357 6201	-0.356 8864
	29	0.393 5917	0.394 2391	0.829 6561	0.829 6546	0.360 3570	0.359 6520
	30	0.377 4793	0.378 1313	0.835 7826	0.835 7811	0.362 9833	0.362 3073
Dec.	1	0.361 2487	0.361 9054	0.841 6519	0.841 6505	0.365 4980	0.364 8512
	2	0.344 9051	0.345 5660	0.847 2617	0.847 2603	0.367 9001	0.367 2827
	3	0.328 4532	0.329 1183	0.852 6098	0.852 6083	0.370 1888	0.369 6009
	4	-0.311 8983	-0.312 5673	-0.857 6940	-0.857 6925	-0.372 3630	-0.371 8049
	5	0.295 2456	0.295 9184	0.862 5123	0.862 5109	0.374 4219	0.373 8938
	6	0.278 5005	0.279 1768	0.867 0629	0.867 0614	0.376 3648	0.375 8668
	7	0.261 6685	0.262 3481	0.871 3440	0.871 3426	0.378 1909	0.377 7231
	8	0.244 7549	0.245 4376	0.875 3542	0.875 3527	0.379 8994	0.379 4621
	9	0.227 7655	-0.228 4511	0.879 0920	0.879 0905	0.381 4898	0.381 0831
	10	-0.210 7056	-0.211 3939	-0.882 5561	-0.882 5547	-0.382 9616	-0.382 5855
	11	0.193 5810	0.194 2717	0.885 7456	0.885 7441	0.384 3141	0.383 9688
	12	0.176 3971	0.177 0901	0.888 6594	0.888 6579	0.385 5471	0.385 2327
	13	0.159 1596	0.159 8546	0.891 2967	0.891 2953	0.386 6601	0.386 3766
	14	0.141 8738	0.142 5707	0.893 6569	0.893 6554	0.387 6527	0.387 4004
	15	0.124 5454	0.125 2439	0.895 7393	0.895 7378	0.388 5248	0.388 3036
	16	-0.107 1799	-0.107 8797	-0.897 5435	-0.897 5420	-0.389 2761	-0.389 0861
	17	0.089 7826	0.090 4836	0.899 0691	0.899 0676	0.389 9064	0.389 7478
	18	0.072 3590	0.073 0609	0.900 3159	0.900 3144	0.390 4157	0.390 2884
	19	0.054 9144	0.055 6170	0.901 2837	0.901 2822	0.390 8039	0.390 7079
	20	0.037 4540	0.038 1571	0.901 9725	0.901 9711	0.391 0709	0.391 0063
	21	0.019 9830	0.020 6865	0.902 3824	0.902 3809	0.391 2168	0.391 1836
	22	-0.002 5066	-0.003 2101	-0.902 5132	-0.902 5118	-0.391 2416	-0.391 2398
	23	+0.014 9702	+0.014 2669	0.902 3652	0.902 3638	0.391 1454	0.391 1750
	24	0.032 4426	0.031 7396	0.901 9383	0.901 9369	0.390 9283	0.390 9893
	25	0.049 9055	0.049 2031	0.901 2325	0.901 2311	0.390 5902	0.390 6826
	26	0.067 3539	0.066 6523	0.900 2478	0.900 2464	0.390 1313	0.390 2551
	27	0.084 7827	0.084 0821	0.898 9842	0.898 9827	0.389 5516	0.389 7067
	28	+0.102 1868	+0.101 4874	-0.897 4415	-0.897 4401	-0.388 8510	-0.389 0374
	29	0.119 5608	0.118 8629	0.895 6199	0.895 6185	0.388 0298	0.388 2474
	30	0.136 8993	0.136 2031	0.893 5195	0.893 5181	0.387 0879	0.387 3367
	31	0.154 1969	0.153 5025	0.891 1405	0.891 1391	0.386 0255	0.386 3054
	32	+0.171 4479	+0.170 7557	-0.888 4834	-0.888 4820	-0.384 8428	-0.385 1537

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EPHEMERIS FOR PHYSICAL OBSERVATIONS

FOR 0^h TERRESTRIAL TIME

Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°
Jan. 0	+2.56	-2.89	359.16
1	2.08	3.00	345.99
2	1.60	3.12	332.82
3	1.11	3.24	319.65
4	0.63	3.35	306.48
5	0.14	3.46	293.31
6	-0.34	-3.58	280.14
7	0.82	3.69	266.97
8	1.30	3.80	253.80
9	1.79	3.91	240.63
10	2.26	4.02	227.46
11	2.74	4.12	214.29
12	-3.22	-4.23	201.12
13	3.69	4.33	187.96
14	4.16	4.43	174.79
15	4.63	4.54	161.62
16	5.10	4.64	148.45
17	5.57	4.73	135.29
18	-6.03	-4.83	122.12
19	6.49	4.93	108.95
20	6.94	5.02	95.79
21	7.40	5.11	82.62
22	7.85	5.20	69.45
23	8.29	5.29	56.29
24	-8.74	-5.38	43.12
25	9.17	5.46	29.95
26	9.61	5.55	16.79
27	10.04	5.63	3.62
28	10.47	5.71	350.45
29	10.89	5.79	337.29
30	-11.31	-5.86	324.12
31	11.72	5.94	310.95
Feb. 1	12.13	6.01	297.79
2	12.54	6.08	284.62
3	12.94	6.15	271.45
4	13.34	6.22	258.29
5	-13.73	-6.28	245.12
6	14.11	6.35	231.95
7	14.50	6.41	218.79
8	14.87	6.47	205.62
9	15.24	6.52	192.45
10	15.61	6.58	179.29
11	-15.97	-6.63	166.12
12	16.33	6.68	152.95
13	16.68	6.73	139.78
14	17.02	6.78	126.62
15	-17.36	-6.82	113.45

Date	Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°
Feb. 15	-17.36	-6.82	113.45
16	17.69	6.87	100.28
17	18.02	6.91	87.11
18	18.34	6.94	73.95
19	18.66	6.98	60.78
20	18.97	7.01	47.61
21	-19.27	-7.04	34.44
22	19.57	7.07	21.27
23	19.86	7.10	8.10
24	20.15	7.13	354.93
25	20.43	7.15	341.76
26	20.71	7.17	328.59
27	-20.97	-7.19	315.42
28	21.24	7.20	302.24
Mar. 1	21.49	7.22	289.07
2	21.74	7.23	275.90
3	21.98	7.24	262.72
4	22.22	7.24	249.55
5	-22.45	-7.25	236.38
6	22.67	7.25	223.20
7	22.89	7.25	210.02
8	23.10	7.25	196.85
9	23.31	7.25	183.67
10	23.50	7.24	170.50
11	-23.70	-7.23	157.32
12	23.88	7.22	144.14
13	24.06	7.21	130.96
14	24.23	7.19	117.78
15	24.39	7.17	104.60
16	24.55	7.16	91.42
17	-24.70	-7.13	78.24
18	24.85	7.11	65.06
19	24.99	7.08	51.88
20	25.12	7.06	38.70
21	25.24	7.03	25.51
22	25.36	6.99	12.33
23	-25.47	-6.96	359.15
24	25.57	6.92	345.96
25	25.67	6.88	332.77
26	25.75	6.84	319.59
27	25.84	6.80	306.40
28	25.91	6.76	293.21
29	-25.98	-6.71	280.02
30	26.04	6.66	266.83
31	26.09	6.61	253.64
Apr. 1	26.14	6.56	240.44
2	-26.18	-6.50	227.25

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FOR 0^h TERRESTRIAL TIME

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	-26.14	-6.56	240.44	May	17	-20.43	-2.47	352.77
	2	26.18	6.50	227.25		18	20.14	2.35	339.55
	3	26.21	6.45	214.06		19	19.84	2.24	326.32
	4	26.24	6.39	200.86		20	19.54	2.12	313.09
	5	26.25	6.33	187.67		21	19.23	2.00	299.86
	6	26.26	6.27	174.47		22	18.92	-1.89	286.64
	7	-26.27	-6.20	161.28		23	-18.60	-1.77	273.41
	8	26.26	6.14	148.08		24	18.27	1.65	260.18
	9	26.25	6.07	134.88		25	17.94	1.53	246.95
	10	26.23	6.00	121.68		26	17.60	1.41	233.71
	11	26.21	5.93	108.48		27	17.26	1.30	220.48
	12	26.17	5.86	95.28		28	16.91	1.18	207.25
	13	-26.13	-5.78	82.08		29	-16.55	-1.06	194.02
	14	26.08	5.71	68.88		30	16.19	0.94	180.79
	15	26.03	5.63	55.68		31	15.83	0.82	167.55
	16	25.97	5.55	42.47	June	1	15.46	0.70	154.32
	17	25.90	5.47	29.27		2	15.09	0.58	141.09
	18	25.82	5.39	16.06		3	14.71	0.46	127.85
	19	-25.73	-5.31	2.86		4	-14.32	-0.33	114.62
	20	25.64	5.22	349.65		5	13.93	0.21	101.38
	21	25.54	5.13	336.44		6	13.54	-0.09	88.15
	22	25.43	5.05	323.23		7	13.15	+0.03	74.91
	23	25.32	4.96	310.02		8	12.74	0.15	61.68
	24	25.20	4.87	296.81		9	12.34	0.27	48.44
	25	-25.07	-4.77	283.60		10	-11.93	+0.39	35.21
	26	24.93	4.68	270.39		11	11.52	0.51	21.97
	27	24.79	4.59	257.18		12	11.10	0.63	8.74
	28	24.64	4.49	243.96		13	10.68	0.75	355.50
	29	24.48	4.39	230.75		14	10.26	0.87	342.26
	30	24.32	4.29	217.53		15	9.83	0.99	329.03
May	1	-24.14	-4.20	204.32		16	-9.40	+1.11	315.79
	2	23.96	4.09	191.10		17	8.97	1.23	302.55
	3	23.78	3.99	177.88		18	8.54	1.35	289.32
	4	23.58	3.89	164.67		19	8.10	1.47	276.08
	5	23.38	3.79	151.45		20	7.66	1.58	262.84
	6	23.17	3.68	138.23		21	7.22	1.70	249.61
	7	-22.96	-3.57	125.01		22	-6.78	+1.82	236.37
	8	22.73	3.47	111.79		23	6.33	1.93	223.13
	9	22.51	3.36	98.57		24	5.89	2.05	209.90
	10	22.27	3.25	85.34		25	5.44	2.17	196.66
	11	22.03	3.14	72.12		26	4.99	2.28	183.42
	12	21.78	3.03	58.90		27	4.54	2.39	170.19
	13	-21.52	-2.92	45.67		28	-4.09	+2.51	156.95
	14	21.26	2.81	32.45		29	3.64	2.62	143.71
	15	20.99	2.69	19.23		30	3.19	2.73	130.47
	16	20.71	2.58	6.00	July	1	2.73	2.84	117.24
	17	-20.43	-2.47	352.77		2	-2.28	+2.95	104.00

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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	-2.73	+2.84	117.24	Aug.	16	+16.29	+6.68	228.72
	2	2.28	2.95	104.00		17	16.62	6.72	215.50
	3	1.83	3.06	90.77		18	16.95	6.77	202.28
	4	1.37	3.17	77.53		19	17.27	6.81	189.07
	5	0.92	3.28	64.29		20	17.59	6.85	175.85
	6	0.47	3.39	51.06		21	17.91	6.89	162.64
	7	-0.02	+3.49	37.82		22	+18.21	+6.93	149.42
	8	+0.44	3.60	24.59		23	18.52	6.96	136.21
	9	0.89	3.70	11.35		24	18.82	7.00	122.99
	10	1.34	3.81	358.12		25	19.11	7.03	109.78
	11	1.79	3.91	344.89		26	19.40	7.06	96.56
	12	2.24	4.01	331.65		27	19.68	7.08	83.35
	13	+2.68	+4.11	318.42		28	+19.96	+7.11	70.14
	14	3.13	4.21	305.19		29	20.23	7.13	56.93
	15	3.57	4.30	291.95		30	20.50	7.15	43.72
	16	4.02	4.40	278.72		31	20.76	7.17	30.51
	17	4.46	4.50	265.49	Sept.	1	21.02	7.19	17.30
	18	4.90	4.59	252.26		2	21.27	7.21	4.09
	19	+5.33	+4.68	239.03		3	+21.52	+7.22	350.88
	20	5.77	4.78	225.79		4	21.76	7.23	337.67
	21	6.20	4.87	212.56		5	21.99	7.24	324.46
	22	6.63	4.95	199.33		6	22.22	7.24	311.25
	23	7.06	5.04	186.10		7	22.44	7.25	298.05
	24	7.48	5.13	172.87		8	22.66	7.25	284.84
	25	+7.90	+5.21	159.64		9	+22.87	+7.25	271.64
	26	8.32	5.30	146.41		10	23.08	7.25	258.43
	27	8.74	5.38	133.18		11	23.28	7.25	245.23
	28	9.15	5.46	119.96		12	23.47	7.24	232.02
	29	9.56	5.54	106.73		13	23.66	7.23	218.82
	30	9.96	5.61	93.50		14	23.84	7.22	205.62
	31	+10.37	+5.69	80.27		15	+24.02	+7.21	192.42
Aug.	1	10.77	5.76	67.05		16	24.18	7.20	179.21
	2	11.16	5.84	53.82		17	24.35	7.18	166.01
	3	11.55	5.91	40.60		18	24.50	7.16	152.81
	4	11.94	5.98	27.37		19	24.65	7.14	139.61
	5	12.33	6.05	14.15		20	24.80	7.12	126.41
	6	+12.71	+6.11	.92		21	+24.94	+7.09	113.21
	7	13.08	6.18	347.70		22	25.07	7.07	100.01
	8	13.46	6.24	334.48		23	25.19	7.04	86.81
	9	13.83	6.30	321.26		24	25.31	7.01	73.61
	10	14.19	6.36	308.04		25	25.42	6.97	60.41
	11	14.55	6.42	294.82		26	25.52	6.94	47.21
	12	+14.91	+6.47	281.60		27	+25.62	+6.90	34.01
	13	15.26	6.53	268.38		28	25.71	6.86	20.82
	14	15.61	6.58	255.16		29	25.80	6.82	7.62
	15	15.95	6.63	241.94		30	25.88	6.78	354.42
	16	+16.29	+6.68	228.72	Oct.	1	+25.95	+6.73	341.23

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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	+25.95	+6.73	341.23	Nov.	16	+21.14	+2.76	94.55
	2	26.01	6.69	328.03		17	20.86	2.64	81.37
	3	26.07	6.64	314.84		18	20.56	2.52	68.18
	4	26.12	6.58	301.64		19	20.26	2.40	55.00
	5	26.16	6.53	288.45		20	19.96	2.28	41.82
	6	26.19	6.48	275.25		21	19.64	2.16	28.64
	7	+26.22	+6.42	262.06		22	+19.32	+2.04	15.46
	8	26.24	6.36	248.87		23	18.99	1.92	2.28
	9	26.26	6.30	235.67		24	18.66	1.79	349.09
	10	26.27	6.24	222.48		25	18.32	1.67	335.91
	11	26.26	6.17	209.29		26	17.97	1.55	322.73
	12	26.26	6.10	196.10		27	17.61	1.42	309.55
	13	+26.24	+6.04	182.91		28	+17.25	+1.30	296.37
	14	26.22	5.96	169.71		29	16.88	1.17	283.19
	15	26.19	5.89	156.52		30	16.51	1.04	270.01
	16	26.15	5.82	143.33	Dec.	1	16.13	0.92	256.83
	17	26.11	5.74	130.14		2	15.74	0.79	243.66
	18	26.05	5.66	116.95		3	15.35	0.66	230.48
	19	+25.99	+5.59	103.76		4	+14.95	+0.53	217.30
	20	25.92	5.50	90.57		5	14.55	0.41	204.12
	21	25.85	5.42	77.38		6	14.14	0.28	190.94
	22	25.76	5.34	64.19		7	13.73	0.15	177.77
	23	25.67	5.25	51.00		8	13.31	+0.02	164.59
	24	25.57	5.16	37.81		9	12.88	-0.11	151.41
	25	+25.47	+5.07	24.63		10	+12.45	-0.23	138.24
	26	25.35	4.98	11.44		11	12.02	0.36	125.06
	27	25.23	4.89	358.25		12	11.58	0.49	111.89
	28	25.10	4.80	345.06		13	11.14	0.62	98.71
	29	24.96	4.70	331.87		14	10.69	0.75	85.54
	30	24.82	4.60	318.69		15	10.24	0.87	72.36
	31	+24.66	+4.51	305.50		16	+9.79	-1.00	59.19
Nov.	1	24.50	4.41	292.31		17	9.33	1.13	46.01
	2	24.33	4.31	279.13		18	8.87	1.26	32.84
	3	24.16	4.20	265.94		19	8.41	1.38	19.66
	4	23.97	4.10	252.76		20	7.94	1.51	6.49
	5	23.78	3.99	239.57		21	7.47	1.63	353.31
	6	+23.58	+3.89	226.39		22	+7.00	-1.76	340.14
	7	23.37	3.78	213.20		23	6.53	1.88	326.97
	8	23.15	3.67	200.02		24	6.05	2.01	313.79
	9	22.93	3.56	186.83		25	5.58	2.13	300.62
	10	22.69	3.45	173.65		26	5.10	2.25	287.45
	11	22.45	3.34	160.47		27	4.62	2.37	274.28
	12	+22.21	+3.22	147.28		28	+4.14	-2.50	261.10
	13	21.95	3.11	134.10		29	3.65	2.62	247.93
	14	21.69	2.99	120.92		30	3.17	2.74	234.76
	15	21.42	2.88	107.73		31	2.69	2.85	221.59
	16	+21.14	+2.76	94.55		32	+2.20	-2.97	208.42

MOON, 2018

UNIVERSAL TIME

PHASES OF THE MOON

Lunation	New Moon				First Quarter				Full Moon				Last Quarter			
		d	h	m		d	h	m		d	h	m		d	h	m
1175	Dec.	18	06	30	Dec.	26	09	20	Jan.	2	02	24	Jan.	8	22	25
1176	Jan.	17	02	17	Jan.	24	22	20	Jan.	31	13	27	Feb.	7	15	54
1177	Feb.	15	21	05	Feb.	23	08	09	Mar.	2	00	51	Mar.	9	11	20
1178	Mar.	17	13	12	Mar.	24	15	35	Mar.	31	12	37	Apr.	8	07	18
1179	Apr.	16	01	57	Apr.	22	21	46	Apr.	30	00	58	May	8	02	09
1180	May	15	11	48	May	22	03	49	May	29	14	20	Jun.	6	18	32
1181	Jun.	13	19	43	Jun.	20	10	51	Jun.	28	04	53	Jul.	6	07	51
1182	Jul.	13	02	48	Jul.	19	19	52	Jul.	27	20	20	Aug.	4	18	18
1183	Aug.	11	09	58	Aug.	18	07	49	Aug.	26	11	56	Sep.	3	02	37
1184	Sep.	9	18	01	Sep.	16	23	15	Sep.	25	02	52	Oct.	2	09	45
1185	Oct.	9	03	47	Oct.	16	18	02	Oct.	24	16	45	Oct.	31	16	40
1186	Nov.	7	16	02	Nov.	15	14	54	Nov.	23	05	39	Nov.	30	00	19
1187	Dec.	7	07	20	Dec.	15	11	49	Dec.	22	17	49	Dec.	29	09	34

MOON AT PERIGEE

	d	h		d	h		d	h
Dec.	4	09	Apr.	20	15	Sep.	8	01
Jan.	1	22	May	17	21	Oct.	5	22
Jan.	30	10	Jun.	14	24	Oct.	31	20
Feb.	27	15	Jul.	13	08	Nov.	26	12
Mar.	26	17	Aug.	10	18	Dec.	24	10

MOON AT APOGEE

	d	h		d	h		d	h
Dec.	19	01	May	6	01	Sep.	20	01
Jan.	15	02	Jun.	2	17	Oct.	17	19
Feb.	11	14	Jun.	30	03	Nov.	14	16
Mar.	11	09	Jul.	27	06	Dec.	12	12
Apr.	8	06	Aug.	23	11	Jan.	9	04

MOON, 2018
MEAN EQUATOR, ORBIT, LONGITUDE AND ELONGATION

Date		Mean Equator			Orbit Perigee			Node			Mean Longitude			Mean Elongation
		i	æ	q '	ũ'			q			☾			D
		°	°	°	°	'	"	°	'	"	°	'	"	°
Jan.	1	24.583	319.212	357.466	95	46	31.3	136	54	00.3	86	32	06.8	165.930
	11	24.574	318.706	357.440	96	53	21.8	136	22	14.0	218	17	57.0	287.838
	21	24.564	318.200	357.414	98	00	12.4	135	50	27.7	350	03	47.3	49.745
	31	24.554	317.694	357.389	99	07	02.9	135	18	41.3	121	49	37.6	171.653
Feb.	10	24.545	317.188	357.363	100	13	53.4	134	46	55.0	253	35	27.9	293.560
	20	24.535	316.681	357.338	101	20	43.9	134	15	08.7	25	21	18.1	55.468
Mar.	2	24.525	316.175	357.313	102	27	34.4	133	43	22.3	157	07	08.4	177.375
	12	24.515	315.668	357.288	103	34	25.0	133	11	36.0	288	52	58.7	299.283
	22	24.505	315.161	357.264	104	41	15.5	132	39	49.7	60	38	48.9	61.190
Apr.	1	24.495	314.653	357.240	105	48	06.0	132	08	03.3	192	24	39.2	183.098
	11	24.485	314.146	357.216	106	54	56.5	131	36	17.0	324	10	29.5	305.005
	21	24.475	313.638	357.192	108	01	47.1	131	04	30.7	95	56	19.8	66.913
May	1	24.464	313.130	357.168	109	08	37.6	130	32	44.3	227	42	10.0	188.820
	11	24.454	312.622	357.145	110	15	28.1	130	00	58.0	359	28	00.3	310.728
	21	24.443	312.114	357.122	111	22	18.6	129	29	11.7	131	13	50.6	72.635
	31	24.433	311.605	357.099	112	29	09.2	128	57	25.3	262	59	40.9	194.543
June	10	24.422	311.097	357.076	113	35	59.7	128	25	39.0	34	45	31.1	316.450
	20	24.412	310.588	357.053	114	42	50.2	127	53	52.7	166	31	21.4	78.358
	30	24.401	310.079	357.031	115	49	40.7	127	22	06.3	298	17	11.7	200.265
July	10	24.390	309.569	357.009	116	56	31.2	126	50	20.0	70	03	01.9	322.173
	20	24.379	309.060	356.987	118	03	21.8	126	18	33.7	201	48	52.2	84.080
	30	24.368	308.550	356.966	119	10	12.3	125	46	47.3	333	34	42.5	205.988
Aug.	9	24.357	308.040	356.944	120	17	02.8	125	15	01.0	105	20	32.8	327.895
	19	24.345	307.530	356.923	121	23	53.3	124	43	14.6	237	06	23.0	89.802
	29	24.334	307.020	356.902	122	30	43.9	124	11	28.3	8	52	13.3	211.710
Sept.	8	24.323	306.509	356.882	123	37	34.4	123	39	42.0	140	38	03.6	333.617
	18	24.311	305.999	356.861	124	44	24.9	123	07	55.6	272	23	53.9	95.525
	28	24.300	305.488	356.841	125	51	15.4	122	36	09.3	44	09	44.1	217.432
Oct.	8	24.288	304.976	356.821	126	58	06.0	122	04	23.0	175	55	34.4	339.340
	18	24.276	304.465	356.801	128	04	56.5	121	32	36.6	307	41	24.7	101.247
	28	24.264	303.954	356.782	129	11	47.0	121	00	50.3	79	27	14.9	223.155
Nov.	7	24.253	303.442	356.762	130	18	37.5	120	29	04.0	211	13	05.2	345.062
	17	24.241	302.930	356.743	131	25	28.0	119	57	17.6	342	58	55.5	106.970
	27	24.228	302.418	356.724	132	32	18.6	119	25	31.3	114	44	45.8	228.877
Dec.	7	24.216	301.905	356.706	133	39	09.1	118	53	45.0	246	30	36.0	350.785
	17	24.204	301.393	356.687	134	45	59.6	118	21	58.6	18	16	26.3	112.692
	27	24.192	300.880	356.669	135	52	50.1	117	50	12.3	150	02	16.6	234.600
	37	24.179	300.367	356.651	136	59	40.7	117	18	26.0	281	48	06.9	356.507
	47	24.167	299.854	356.633	138	06	31.2	116	46	39.6	53	33	57.1	118.415

MOON, 2018

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	69	37	27.6	-4	44	12.6	2.4074	16	35.08
	0.5	77	10	41.5	4	25	01.7	2.3967	16	39.50
	1.0	84	47	14.7	4	01	00.8	2.3891	16	42.70
	1.5	92	25	50.3	3	32	34.0	2.3846	16	44.57
	2.0	100	05	07.0	3	00	13.7	2.3835	16	45.03
	2.5	107	43	42.3	2	24	39.8	2.3859	16	44.05
	3.0	115	20	16.0	-1	46	37.9	2.3915	16	41.67
	3.5	122	53	34.2	1	06	57.0	2.4004	16	37.97
	4.0	130	22	31.3	-0	26	26.7	2.4122	16	33.09
	4.5	137	46	12.6	+0	14	04.2	2.4266	16	27.18
	5.0	145	03	55.1	0	53	50.4	2.4433	16	20.45
	5.5	152	15	07.8	1	32	11.1	2.4617	16	13.10
	6.0	159	19	31.7	+2	08	31.0	2.4816	16	05.33
	6.5	166	16	58.9	2	42	20.7	2.5023	15	57.34
	7.0	173	07	31.0	3	13	16.6	2.5234	15	49.31
	7.5	179	51	18.1	3	41	00.5	2.5447	15	41.40
	8.0	186	28	36.7	4	05	19.0	2.5655	15	33.74
	8.5	192	59	49.1	4	26	03.2	2.5857	15	26.44
	9.0	199	25	21.2	+4	43	07.3	2.6050	15	19.60
	9.5	205	45	41.6	4	56	28.8	2.6230	15	13.28
	10.0	212	01	20.4	5	06	07.4	2.6396	15	07.53
	10.5	218	12	48.6	5	12	04.7	2.6547	15	02.37
	11.0	224	20	36.8	5	14	23.8	2.6682	14	57.81
	11.5	230	25	15.3	5	13	09.2	2.6800	14	53.86
	12.0	236	27	12.9	+5	08	26.6	2.6900	14	50.51
	12.5	242	26	57.1	5	00	22.5	2.6984	14	47.75
	13.0	248	24	53.8	4	49	04.7	2.7052	14	45.54
	13.5	254	21	27.0	4	34	42.0	2.7103	14	43.85
	14.0	260	16	58.9	4	17	24.2	2.7140	14	42.67
	14.5	266	11	49.8	3	57	22.1	2.7162	14	41.95
	15.0	272	06	18.6	+3	34	47.9	2.7170	14	41.67
	15.5	278	00	42.6	3	09	54.9	2.7166	14	41.80
	16.0	283	55	17.8	2	42	57.6	2.7151	14	42.30
	16.5	289	50	19.3	2	14	11.5	2.7124	14	43.16
	17.0	295	46	01.5	1	43	53.7	2.7088	14	44.35
	17.5	301	42	38.6	1	12	21.9	2.7041	14	45.87
	18.0	307	40	24.6	+0	39	55.1	2.6986	14	47.70
	18.5	313	39	33.7	+0	06	52.9	2.6921	14	49.84
	19.0	319	40	21.0	-0	26	24.0	2.6847	14	52.28
	19.5	325	43	02.0	0	59	34.8	2.6764	14	55.04
	20.0	331	47	53.6	1	32	17.7	2.6673	14	58.12
	20.5	337	55	13.5	2	04	11.0	2.6572	15	01.54
	21.0	344	05	20.8	-2	34	52.5	2.6461	15	05.30
	21.5	350	18	35.7	3	04	00.0	2.6341	15	09.42
	22.0	356	35	19.2	3	31	11.4	2.6212	15	13.90
	22.5	2	55	53.1	3	56	04.6	2.6074	15	18.75
	23.0	9	20	39.6	-4	18	17.6	2.5927	15	23.96

MOON, 2018

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	9	20	39.6	-4	18	17.6	2.5927	15	23.96
	23.5	15	50	00.2	4	37	28.9	2.5772	15	29.52
	24.0	22	24	15.8	4	53	17.6	2.5610	15	35.39
	24.5	29	03	45.1	5	05	23.8	2.5442	15	41.55
	25.0	35	48	43.9	5	13	28.7	2.5271	15	47.92
	25.5	42	39	24.3	5	17	15.5	2.5099	15	54.43
	26.0	49	35	52.8	-5	16	29.9	2.4928	16	00.99
	26.5	56	38	09.8	5	11	00.8	2.4761	16	07.46
	27.0	63	46	08.0	5	00	41.6	2.4602	16	13.72
	27.5	70	59	31.7	4	45	30.6	2.4454	16	19.61
	28.0	78	17	56.1	4	25	32.5	2.4321	16	24.96
	28.5	85	40	46.9	4	00	59.1	2.4207	16	29.61
	29.0	93	07	20.7	-3	32	09.4	2.4114	16	33.40
	29.5	100	36	45.7	2	59	30.3	2.4047	16	36.18
	30.0	108	08	03.0	2	23	36.0	2.4008	16	37.82
	30.5	115	40	08.4	1	45	07.1	2.3998	16	38.23
	31.0	123	11	54.9	1	04	49.0	2.4018	16	37.38
	31.5	130	42	14.8	-0	23	30.6	2.4069	16	35.26
Feb.	1.0	138	10	02.7	+0	17	58.7	2.4151	16	31.91
	1.5	145	34	17.6	0	58	50.1	2.4260	16	27.44
	2.0	152	54	04.8	1	38	18.4	2.4395	16	21.97
	2.5	160	08	38.3	2	15	42.7	2.4553	16	15.67
	3.0	167	17	21.1	2	50	28.0	2.4729	16	08.70
	3.5	174	19	46.0	3	22	06.0	2.4921	16	01.26
	4.0	181	15	36.1	+3	50	14.5	2.5122	15	53.55
	4.5	188	04	43.9	4	14	37.8	2.5330	15	45.73
	5.0	194	47	10.6	4	35	06.0	2.5539	15	37.98
	5.5	201	23	05.6	4	51	33.7	2.5746	15	30.43
	6.0	207	52	45.2	5	04	00.0	2.5947	15	23.23
	6.5	214	16	31.0	5	12	27.1	2.6139	15	16.47
	7.0	220	34	49.5	+5	16	59.6	2.6318	15	10.24
	7.5	226	48	10.6	5	17	44.1	2.6482	15	04.60
	8.0	232	57	06.7	5	14	48.7	2.6629	14	59.60
	8.5	239	02	11.8	5	08	22.3	2.6758	14	55.26
	9.0	245	04	00.7	4	58	34.6	2.6867	14	51.61
	9.5	251	03	08.4	4	45	35.8	2.6957	14	48.65
	10.0	257	00	09.6	+4	29	36.8	2.7027	14	46.36
	10.5	262	55	38.1	4	10	48.9	2.7076	14	44.73
	11.0	268	50	06.4	3	49	23.9	2.7107	14	43.73
	11.5	274	44	05.5	3	25	34.2	2.7119	14	43.34
	12.0	280	38	04.6	2	59	33.4	2.7114	14	43.51
	12.5	286	32	30.8	2	31	35.5	2.7093	14	44.20
	13.0	292	27	49.2	+2	01	56.0	2.7057	14	45.37
	13.5	298	24	22.7	1	30	51.3	2.7008	14	46.97
	14.0	304	22	31.8	0	58	39.1	2.6947	14	48.96
	14.5	310	22	34.9	+0	25	38.3	2.6877	14	51.30
	15.0	316	24	47.9	-0	07	50.9	2.6798	14	53.93

MOON, 2018

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Feb.	15.0	316	24	47.9	-0	07	50.9	2.6798	14	53.93
	15.5	322	29	25.1	0	41	27.1	2.6711	14	56.83
	16.0	328	36	38.3	1	14	48.1	2.6618	14	59.95
	16.5	334	46	38.0	1	47	30.6	2.6521	15	03.27
	17.0	340	59	32.8	2	19	10.9	2.6419	15	06.75
	17.5	347	15	30.2	2	49	25.1	2.6313	15	10.38
	18.0	353	34	36.3	-3	17	49.1	2.6205	15	14.15
	18.5	359	56	56.8	3	43	59.5	2.6094	15	18.03
	19.0	6	22	36.3	4	07	33.2	2.5981	15	22.04
	19.5	12	51	39.4	4	28	08.7	2.5865	15	26.15
	20.0	19	24	10.2	4	45	25.4	2.5748	15	30.37
	20.5	26	00	12.4	4	59	04.9	2.5629	15	34.70
	21.0	32	39	49.8	-5	08	50.8	2.5508	15	39.12
	21.5	39	23	05.4	5	14	28.9	2.5387	15	43.62
	22.0	46	10	01.8	5	15	48.1	2.5265	15	48.17
	22.5	53	00	40.5	5	12	40.2	2.5143	15	52.76
	23.0	59	55	01.7	5	05	00.8	2.5023	15	57.33
	23.5	66	53	03.4	4	52	49.3	2.4906	16	01.83
	24.0	73	54	41.0	-4	36	09.3	2.4794	16	06.19
	24.5	80	59	46.8	4	15	09.5	2.4688	16	10.32
	25.0	88	08	09.0	3	50	03.5	2.4592	16	14.12
	25.5	95	19	31.2	3	21	10.1	2.4506	16	17.51
	26.0	102	33	32.3	2	48	54.0	2.4435	16	20.36
	26.5	109	49	45.7	2	13	44.8	2.4380	16	22.57
	27.0	117	07	39.5	-1	36	17.3	2.4344	16	24.04
	27.5	124	26	36.9	0	57	10.3	2.4328	16	24.68
	28.0	131	45	56.5	-0	17	06.0	2.4334	16	24.43
	28.5	139	04	53.4	+0	23	11.7	2.4364	16	23.23
Mar.	1.0	146	22	40.5	1	02	58.4	2.4417	16	21.08
	1.5	153	38	29.5	1	41	30.9	2.4494	16	18.00
	2.0	160	51	33.2	+2	18	08.7	2.4594	16	14.04
	2.5	168	01	06.7	2	52	15.6	2.4714	16	09.29
	3.0	175	06	28.9	3	23	20.3	2.4854	16	03.84
	3.5	182	07	04.5	3	50	57.6	2.5010	15	57.83
	4.0	189	02	24.6	4	14	48.0	2.5179	15	51.41
	4.5	195	52	07.7	4	34	38.6	2.5357	15	44.71
	5.0	202	35	59.9	+4	50	21.9	2.5542	15	37.88
	5.5	209	13	55.6	5	01	55.3	2.5728	15	31.08
	6.0	215	45	56.6	5	09	20.8	2.5913	15	24.43
	6.5	222	12	12.0	5	12	43.7	2.6093	15	18.06
	7.0	228	32	57.3	5	12	12.2	2.6265	15	12.07
	7.5	234	48	34.0	5	07	56.4	2.6424	15	06.56
	8.0	240	59	28.2	+5	00	07.7	2.6570	15	01.59
	8.5	247	06	10.2	4	48	58.6	2.6699	14	57.24
	9.0	253	09	13.4	4	34	41.9	2.6809	14	53.54
	9.5	259	09	13.6	4	17	30.9	2.6900	14	50.53
	10.0	265	06	48.2	+3	57	39.0	2.6970	14	48.23

MOON, 2018
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	265	06	48.2	+3	57	39.0	2.6970	14	48.23
	10.5	271	02	35.4	3	35	19.7	2.7018	14	46.64
	11.0	276	57	13.9	3	10	46.7	2.7045	14	45.76
	11.5	282	51	22.1	2	44	14.1	2.7051	14	45.58
	12.0	288	45	37.5	2	15	56.3	2.7036	14	46.06
	12.5	294	40	36.6	1	46	08.3	2.7001	14	47.19
	13.0	300	36	54.0	+1	15	06.0	2.6949	14	48.91
	13.5	306	35	02.0	0	43	06.2	2.6880	14	51.18
	14.0	312	35	30.5	+0	10	27.0	2.6797	14	53.95
	14.5	318	38	46.3	-0	22	32.4	2.6701	14	57.16
	15.0	324	45	12.8	0	55	31.3	2.6595	15	00.75
	15.5	330	55	09.6	1	28	07.7	2.6481	15	04.64
	16.0	337	08	52.4	-1	59	58.4	2.6360	15	08.76
	16.5	343	26	32.4	2	30	39.2	2.6236	15	13.06
	17.0	349	48	16.6	2	59	45.0	2.6111	15	17.45
	17.5	356	14	07.4	3	26	50.5	2.5985	15	21.88
	18.0	2	44	03.0	3	51	30.7	2.5862	15	26.28
	18.5	9	17	57.5	4	13	21.0	2.5742	15	30.61
	19.0	15	55	41.4	-4	31	58.6	2.5626	15	34.81
	19.5	22	37	02.0	4	47	02.4	2.5516	15	38.85
	20.0	29	21	44.3	4	58	14.3	2.5411	15	42.70
	20.5	36	09	31.6	5	05	19.1	2.5313	15	46.34
	21.0	43	00	06.2	5	08	05.7	2.5222	15	49.76
	21.5	49	53	10.4	5	06	26.6	2.5138	15	52.95
	22.0	56	48	26.9	-5	00	19.2	2.5060	15	55.90
	22.5	63	45	39.6	4	49	45.0	2.4989	15	58.62
	23.0	70	44	33.7	4	34	50.2	2.4925	16	01.11
	23.5	77	44	56.2	4	15	45.5	2.4867	16	03.35
	24.0	84	46	35.4	3	52	46.0	2.4815	16	05.35
	24.5	91	49	21.2	3	26	11.0	2.4771	16	07.08
	25.0	98	53	04.2	-2	56	23.6	2.4734	16	08.53
	25.5	105	57	35.4	2	23	50.7	2.4705	16	09.67
	26.0	113	02	45.2	1	49	02.1	2.4684	16	10.46
	26.5	120	08	23.2	1	12	30.9	2.4674	16	10.86
	27.0	127	14	16.8	-0	34	52.0	2.4675	16	10.83
	27.5	134	20	11.2	+0	03	17.9	2.4688	16	10.33
	28.0	141	25	48.7	+0	41	21.2	2.4713	16	09.33
	28.5	148	30	48.6	1	18	40.3	2.4753	16	07.78
	29.0	155	34	47.2	1	54	38.7	2.4807	16	05.67
	29.5	162	37	17.8	2	28	41.6	2.4876	16	02.99
	30.0	169	37	52.2	3	00	17.1	2.4960	15	59.76
	30.5	176	36	00.6	3	28	56.8	2.5058	15	56.00
	31.0	183	31	13.3	+3	54	16.9	2.5169	15	51.76
	31.5	190	23	01.7	4	15	58.2	2.5294	15	47.09
Apr.	1.0	197	10	59.4	4	33	46.8	2.5428	15	42.07
	1.5	203	54	43.7	4	47	33.8	2.5572	15	36.79
	2.0	210	33	56.0	+4	57	15.2	2.5721	15	31.34

MOON, 2018
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	197	10	59.4	+4	33	46.8	2.5428	15	42.07
	1.5	203	54	43.7	4	47	33.8	2.5572	15	36.79
	2.0	210	33	56.0	4	57	15.2	2.5721	15	31.34
	2.5	217	08	23.5	5	02	51.4	2.5874	15	25.83
	3.0	223	37	58.7	5	04	27.0	2.6028	15	20.36
	3.5	230	02	40.7	5	02	09.6	2.6180	15	15.03
	4.0	236	22	34.5	+4	56	09.6	2.6326	15	09.94
	4.5	242	37	51.0	4	46	39.4	2.6465	15	05.18
	5.0	248	48	47.2	4	33	52.8	2.6593	15	00.83
	5.5	254	55	44.8	4	18	04.4	2.6707	14	56.96
	6.0	260	59	10.3	3	59	29.4	2.6806	14	53.65
	6.5	266	59	34.2	3	38	23.2	2.6888	14	50.94
	7.0	272	57	30.3	+3	15	01.4	2.6950	14	48.87
	7.5	278	53	35.1	2	49	39.2	2.6992	14	47.49
	8.0	284	48	27.2	2	22	32.0	2.7013	14	46.80
	8.5	290	42	46.5	1	53	55.3	2.7012	14	46.83
	9.0	296	37	13.9	1	24	04.6	2.6990	14	47.57
	9.5	302	32	30.4	0	53	15.6	2.6946	14	49.01
	10.0	308	29	16.6	+0	21	45.0	2.6882	14	51.14
	10.5	314	28	12.2	-0	10	10.3	2.6798	14	53.92
	11.0	320	29	55.1	0	42	12.0	2.6697	14	57.30
	11.5	326	35	00.7	1	14	00.9	2.6580	15	01.25
	12.0	332	44	01.4	1	45	16.5	2.6450	15	05.69
	12.5	338	57	25.7	2	15	36.9	2.6309	15	10.54
	13.0	345	15	37.1	-2	44	38.9	2.6160	15	15.73
	13.5	351	38	53.9	3	11	58.2	2.6005	15	21.17
	14.0	358	07	28.0	3	37	09.7	2.5849	15	26.75
	14.5	4	41	24.6	3	59	48.1	2.5693	15	32.36
	15.0	11	20	41.5	4	19	28.1	2.5541	15	37.91
	15.5	18	05	09.2	4	35	45.8	2.5395	15	43.29
	16.0	24	54	30.9	-4	48	18.8	2.5259	15	48.39
	16.5	31	48	23.0	4	56	48.1	2.5133	15	53.14
	17.0	38	46	15.9	5	00	58.1	2.5020	15	57.44
	17.5	45	47	35.2	5	00	38.0	2.4921	16	01.23
	18.0	52	51	43.3	4	55	42.1	2.4838	16	04.47
	18.5	59	58	00.9	4	46	10.6	2.4770	16	07.12
	19.0	67	05	48.7	-4	32	09.6	2.4717	16	09.18
	19.5	74	14	29.1	4	13	50.8	2.4680	16	10.65
	20.0	81	23	27.2	3	51	31.5	2.4657	16	11.56
	20.5	88	32	12.6	3	25	34.0	2.4647	16	11.92
	21.0	95	40	19.2	2	56	24.4	2.4651	16	11.79
	21.5	102	47	26.3	2	24	32.4	2.4665	16	11.21
	22.0	109	53	17.7	-1	50	30.3	2.4690	16	10.23
	22.5	116	57	41.9	1	14	52.0	2.4725	16	08.88
	23.0	124	00	31.1	0	38	12.3	2.4767	16	07.21
	23.5	131	01	40.0	-0	01	06.3	2.4818	16	05.25
	24.0	138	01	05.5	+0	35	51.0	2.4875	16	03.03

MOON, 2018

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	138	01	05.5	+0	35	51.0	2.4875	16	03.03
	24.5	144	58	45.0	1	12	05.8	2.4939	16	00.56
	25.0	151	54	36.0	1	47	05.6	2.5009	15	57.87
	25.5	158	48	34.9	2	20	19.8	2.5085	15	54.96
	26.0	165	40	36.6	2	51	20.0	2.5167	15	51.84
	26.5	172	30	34.2	3	19	40.7	2.5256	15	48.51
	27.0	179	18	18.8	+3	44	59.6	2.5350	15	44.98
	27.5	186	03	39.5	4	06	57.8	2.5450	15	41.25
	28.0	192	46	23.9	4	25	20.1	2.5556	15	37.35
	28.5	199	26	18.6	4	39	55.4	2.5667	15	33.30
	29.0	206	03	10.0	4	50	36.4	2.5783	15	29.11
	29.5	212	36	45.0	4	57	20.0	2.5902	15	24.84
	30.0	219	06	51.9	+5	00	06.8	2.6024	15	20.52
	30.5	225	33	21.2	4	59	00.9	2.6146	15	16.20
May	1.0	231	56	06.4	4	54	09.7	2.6269	15	11.93
	1.5	238	15	04.4	4	45	43.1	2.6389	15	07.79
	2.0	244	30	16.4	4	33	53.5	2.6504	15	03.82
	2.5	250	41	47.8	4	18	54.9	2.6614	15	00.10
	3.0	256	49	48.7	+4	01	02.6	2.6715	14	56.69
	3.5	262	54	33.6	3	40	32.9	2.6806	14	53.66
	4.0	268	56	21.2	3	17	42.4	2.6884	14	51.06
	4.5	274	55	34.9	2	52	48.2	2.6948	14	48.95
	5.0	280	52	41.5	2	26	07.2	2.6995	14	47.38
	5.5	286	48	11.5	1	57	56.3	2.7025	14	46.40
	6.0	292	42	38.5	+1	28	32.5	2.7036	14	46.04
	6.5	298	36	38.6	0	58	12.2	2.7027	14	46.34
	7.0	304	30	50.2	+0	27	12.2	2.6997	14	47.32
	7.5	310	25	53.3	-0	04	10.8	2.6947	14	48.99
	8.0	316	22	28.9	0	35	39.5	2.6875	14	51.36
	8.5	322	21	18.4	1	06	56.6	2.6783	14	54.42
	9.0	328	23	03.2	-1	37	43.7	2.6672	14	58.15
	9.5	334	28	23.4	2	07	41.7	2.6543	15	02.52
	10.0	340	37	57.5	2	36	30.4	2.6397	15	07.49
	10.5	346	52	21.1	3	03	48.5	2.6238	15	13.00
	11.0	353	12	06.0	3	29	13.6	2.6067	15	18.97
	11.5	359	37	38.8	3	52	22.4	2.5889	15	25.32
	12.0	6	09	20.3	-4	12	50.9	2.5705	15	31.93
	12.5	12	47	23.6	4	30	14.7	2.5520	15	38.69
	13.0	19	31	53.6	4	44	10.2	2.5337	15	45.46
	13.5	26	22	46.0	4	54	14.9	2.5160	15	52.11
	14.0	33	19	46.4	5	00	08.6	2.4993	15	58.49
	14.5	40	22	30.7	5	01	34.9	2.4838	16	04.46
	15.0	47	30	25.0	-4	58	21.6	2.4700	16	09.86
	15.5	54	42	47.1	4	50	22.5	2.4580	16	14.58
	16.0	61	58	47.4	4	37	37.9	2.4482	16	18.51
	16.5	69	17	31.5	4	20	15.3	2.4405	16	21.56
	17.0	76	38	02.0	-3	58	29.3	2.4353	16	23.68

MOON, 2018

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	76	38	02.0	-3	58	29.3	2.4353	16	23.68
	17.5	83	59	21.4	3	32	41.6	2.4324	16	24.86
	18.0	91	20	34.5	3	03	19.9	2.4318	16	25.10
	18.5	98	40	50.3	2	30	57.1	2.4334	16	24.44
	19.0	105	59	23.6	1	56	10.0	2.4371	16	22.95
	19.5	113	15	36.5	1	19	37.8	2.4426	16	20.71
	20.0	120	28	58.8	-0	42	00.6	2.4499	16	17.82
	20.5	127	39	07.7	-0	03	58.1	2.4585	16	14.39
	21.0	134	45	47.8	+0	33	51.1	2.4683	16	10.52
	21.5	141	48	49.7	1	10	50.6	2.4790	16	06.32
	22.0	148	48	09.7	1	46	27.0	2.4905	16	01.88
	22.5	155	43	48.2	2	20	10.0	2.5024	15	57.28
	23.0	162	35	48.3	+2	51	32.5	2.5147	15	52.60
	23.5	169	24	15.5	3	20	11.1	2.5272	15	47.90
	24.0	176	09	15.8	3	45	45.9	2.5397	15	43.23
	24.5	182	50	55.5	4	08	00.4	2.5522	15	38.61
	25.0	189	29	20.6	4	26	41.7	2.5646	15	34.08
	25.5	196	04	36.1	4	41	40.0	2.5768	15	29.65
	26.0	202	36	45.8	+4	52	48.9	2.5888	15	25.33
	26.5	209	05	52.5	5	00	05.3	2.6006	15	21.14
	27.0	215	31	58.2	5	03	28.7	2.6121	15	17.09
	27.5	221	55	03.9	5	03	02.1	2.6233	15	13.17
	28.0	228	15	10.5	4	58	50.8	2.6342	15	09.40
	28.5	234	32	19.0	4	51	02.8	2.6447	15	05.80
	29.0	240	46	31.2	+4	39	48.3	2.6547	15	02.37
	29.5	246	57	49.8	4	25	19.8	2.6642	14	59.14
	30.0	253	06	19.3	4	07	51.0	2.6732	14	56.13
	30.5	259	12	06.3	3	47	37.6	2.6814	14	53.38
	31.0	265	15	19.7	3	24	55.9	2.6888	14	50.91
	31.5	271	16	11.2	3	00	03.2	2.6953	14	48.77
June	1.0	277	14	55.4	+2	33	17.4	2.7008	14	46.98
	1.5	283	11	49.8	2	04	56.5	2.7050	14	45.60
	2.0	289	07	15.3	1	35	18.7	2.7079	14	44.66
	2.5	295	01	35.4	1	04	42.2	2.7093	14	44.20
	3.0	300	55	17.1	0	33	24.8	2.7091	14	44.27
	3.5	306	48	49.6	+0	01	44.7	2.7071	14	44.89
	4.0	312	42	45.2	-0	30	00.5	2.7034	14	46.10
	4.5	318	37	38.0	1	01	33.0	2.6979	14	47.94
	5.0	324	34	04.3	1	32	35.0	2.6904	14	50.41
	5.5	330	32	41.9	2	02	48.3	2.6809	14	53.54
	6.0	336	34	09.4	2	31	54.6	2.6696	14	57.32
	6.5	342	39	06.0	2	59	34.9	2.6565	15	01.76
	7.0	348	48	10.4	-3	25	29.6	2.6416	15	06.83
	7.5	355	02	00.0	3	49	18.4	2.6252	15	12.50
	8.0	1	21	10.3	4	10	40.5	2.6075	15	18.72
	8.5	7	46	13.1	4	29	14.1	2.5886	15	25.43
	9.0	14	17	35.9	-4	44	37.6	2.5689	15	32.53

MOON, 2018

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	14	17	35.9	-4	44	37.6	2.5689	15	32.53
	9.5	20	55	40.0	4	56	29.2	2.5487	15	39.92
	10.0	27	40	39.7	5	04	27.9	2.5283	15	47.48
	10.5	34	32	40.1	5	08	14.4	2.5083	15	55.05
	11.0	41	31	36.9	5	07	32.1	2.4889	16	02.49
	11.5	48	37	14.9	5	02	08.0	2.4706	16	09.60
	12.0	55	49	07.5	-4	51	54.4	2.4539	16	16.22
	12.5	63	06	37.3	4	36	49.7	2.4390	16	22.17
	13.0	70	28	56.3	4	16	59.6	2.4264	16	27.28
	13.5	77	55	08.0	3	52	37.9	2.4163	16	31.40
	14.0	85	24	08.8	3	24	06.3	2.4090	16	34.41
	14.5	92	54	51.1	2	51	54.3	2.4046	16	36.23
	15.0	100	26	05.8	-2	16	38.4	2.4031	16	36.84
	15.5	107	56	45.4	1	39	00.2	2.4046	16	36.22
	16.0	115	25	46.4	0	59	44.9	2.4089	16	34.44
	16.5	122	52	11.8	-0	19	39.4	2.4159	16	31.58
	17.0	130	15	12.3	+0	20	29.8	2.4252	16	27.77
	17.5	137	34	07.7	0	59	58.3	2.4366	16	23.14
	18.0	144	48	27.1	+1	38	05.1	2.4498	16	17.85
	18.5	151	57	48.4	2	14	13.7	2.4644	16	12.05
	19.0	159	01	58.2	2	47	52.6	2.4801	16	05.91
	19.5	166	00	50.4	3	18	35.4	2.4965	15	59.57
	20.0	172	54	25.5	3	46	01.0	2.5133	15	53.16
	20.5	179	42	49.1	4	09	52.9	2.5302	15	46.78
	21.0	186	26	10.8	+4	29	59.2	2.5470	15	40.53
	21.5	193	04	43.2	4	46	12.1	2.5634	15	34.50
	22.0	199	38	40.9	4	58	27.3	2.5794	15	28.72
	22.5	206	08	19.5	5	06	43.4	2.5947	15	23.25
	23.0	212	33	55.2	5	11	02.0	2.6092	15	18.12
	23.5	218	55	44.2	5	11	27.1	2.6228	15	13.33
	24.0	225	14	02.2	+5	08	04.7	2.6356	15	08.91
	24.5	231	29	04.5	5	01	02.9	2.6475	15	04.84
	25.0	237	41	05.4	4	50	31.6	2.6584	15	01.12
	25.5	243	50	18.8	4	36	42.1	2.6684	14	57.75
	26.0	249	56	57.7	4	19	47.4	2.6774	14	54.72
	26.5	256	01	15.0	4	00	01.7	2.6855	14	52.03
	27.0	262	03	23.3	+3	37	40.3	2.6926	14	49.66
	27.5	268	03	35.1	3	12	59.7	2.6988	14	47.62
	28.0	274	02	03.5	2	46	17.1	2.7040	14	45.91
	28.5	279	59	02.2	2	17	50.3	2.7082	14	44.54
	29.0	285	54	45.8	1	47	57.9	2.7114	14	43.51
	29.5	291	49	30.2	1	16	58.6	2.7134	14	42.84
	30.0	297	43	32.4	+0	45	11.3	2.7143	14	42.55
	30.5	303	37	11.6	+0	12	55.3	2.7140	14	42.66
July	1.0	309	30	48.1	-0	19	30.5	2.7123	14	43.20
	1.5	315	24	44.8	0	51	47.1	2.7093	14	44.19
	2.0	321	19	25.9	-1	23	35.6	2.7048	14	45.66

MOON, 2018

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude °	'	"	Apparent Latitude °	'	"	True Geocentric Distance (A. U.) (X 10^{-3})	Semi Diameter '	"
July	1.0	309	30	48.1	-0	19	30.5	2.7123	14	43.20
	1.5	315	24	44.8	0	51	47.1	2.7093	14	44.19
	2.0	321	19	25.9	1	23	35.6	2.7048	14	45.66
	2.5	327	15	17.9	1	54	37.3	2.6988	14	47.64
	3.0	333	12	49.0	2	24	33.7	2.6911	14	50.15
	3.5	339	12	29.1	2	53	06.1	2.6819	14	53.21
	4.0	345	14	49.4	-3	19	56.1	2.6711	14	56.85
	4.5	351	20	22.4	3	44	45.1	2.6586	15	01.06
	5.0	357	29	40.9	4	07	14.4	2.6445	15	05.86
	5.5	3	43	18.1	4	27	05.2	2.6289	15	11.22
	6.0	10	01	46.2	4	43	58.7	2.6120	15	17.14
	6.5	16	25	36.1	4	57	36.2	2.5938	15	23.57
	7.0	22	55	16.0	-5	07	39.3	2.5746	15	30.45
	7.5	29	31	10.5	5	13	50.3	2.5546	15	37.71
	8.0	36	13	39.3	5	15	52.7	2.5343	15	45.26
	8.5	43	02	55.6	5	13	32.1	2.5138	15	52.97
	9.0	49	59	05.3	5	06	36.8	2.4935	16	00.70
	9.5	57	02	05.2	4	54	59.4	2.4740	16	08.30
	10.0	64	11	42.3	-4	38	37.0	2.4555	16	15.57
	10.5	71	27	32.8	4	17	33.3	2.4386	16	22.34
	11.0	78	49	02.4	3	51	59.0	2.4236	16	28.41
	11.5	86	15	25.9	3	22	12.5	2.4110	16	33.59
	12.0	93	45	48.7	2	48	40.5	2.4010	16	37.72
	12.5	101	19	08.1	2	11	57.4	2.3940	16	40.65
	13.0	108	54	15.6	-1	32	44.4	2.3901	16	42.28
	13.5	116	29	59.3	0	51	48.2	2.3894	16	42.56
	14.0	124	05	07.0	-0	09	58.9	2.3920	16	41.47
	14.5	131	38	28.7	+0	31	52.4	2.3977	16	39.08
	15.0	139	08	59.0	1	12	55.3	2.4064	16	35.47
	15.5	146	35	39.9	1	52	23.1	2.4178	16	30.77
	16.0	153	57	41.8	+2	29	33.6	2.4316	16	25.16
	16.5	161	14	24.6	3	03	50.8	2.4474	16	18.80
	17.0	168	25	18.3	3	34	45.4	2.4648	16	11.89
	17.5	175	30	02.9	4	01	55.0	2.4834	16	04.61
	18.0	182	28	27.5	4	25	03.6	2.5028	15	57.14
	18.5	189	20	30.0	4	44	01.2	2.5226	15	49.65
	19.0	196	06	15.3	+4	58	43.1	2.5423	15	42.26
	19.5	202	45	54.9	5	09	08.8	2.5618	15	35.09
	20.0	209	19	45.1	5	15	21.5	2.5807	15	28.25
	20.5	215	48	05.9	5	17	27.5	2.5987	15	21.81
	21.0	222	11	20.5	5	15	35.0	2.6157	15	15.82
	21.5	228	29	53.7	5	09	54.2	2.6315	15	10.31
	22.0	234	44	11.4	+5	00	36.6	2.6461	15	05.32
	22.5	240	54	39.9	4	47	54.8	2.6592	15	00.84
	23.0	247	01	45.4	4	32	02.3	2.6709	14	56.89
	23.5	253	05	53.6	4	13	13.5	2.6812	14	53.45
	24.0	259	07	29.2	+3	51	43.3	2.6901	14	50.51

MOON, 2018
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	259	07	29.2	+3	51	43.3	2.6901	14	50.51
	24.5	265	06	55.9	3	27	47.5	2.6975	14	48.05
	25.0	271	04	36.5	3	01	42.2	2.7036	14	46.05
	25.5	277	00	52.3	2	33	44.6	2.7084	14	44.49
	26.0	282	56	03.7	2	04	12.1	2.7119	14	43.34
	26.5	288	50	30.1	1	33	22.9	2.7142	14	42.59
	27.0	294	44	29.9	+1	01	35.5	2.7153	14	42.23
	27.5	300	38	20.9	+0	29	09.0	2.7153	14	42.24
	28.0	306	32	20.4	-0	03	37.2	2.7141	14	42.61
	28.5	312	26	45.6	0	36	23.6	2.7119	14	43.34
	29.0	318	21	53.4	1	08	50.2	2.7086	14	44.42
	29.5	324	18	01.2	1	40	37.4	2.7041	14	45.87
	30.0	330	15	26.7	-2	11	25.4	2.6986	14	47.70
	30.5	336	14	28.2	2	40	54.7	2.6919	14	49.90
	31.0	342	15	24.8	3	08	46.1	2.6840	14	52.50
	31.5	348	18	36.4	3	34	40.7	2.6750	14	55.52
Aug.	1.0	354	24	24.0	3	58	20.2	2.6648	14	58.96
	1.5	0	33	09.2	4	19	26.6	2.6533	15	02.85
	2.0	6	45	14.5	-4	37	42.5	2.6406	15	07.18
	2.5	13	01	03.0	4	52	51.3	2.6268	15	11.96
	3.0	19	20	57.9	5	04	37.1	2.6118	15	17.19
	3.5	25	45	22.2	5	12	45.0	2.5958	15	22.85
	4.0	32	14	38.1	5	17	01.3	2.5788	15	28.92
	4.5	38	49	06.3	5	17	13.8	2.5611	15	35.35
	5.0	45	29	05.2	-5	13	12.3	2.5428	15	42.08
	5.5	52	14	49.8	5	04	49.1	2.5242	15	49.03
	6.0	59	06	30.7	4	51	59.5	2.5055	15	56.11
	6.5	66	04	13.0	4	34	42.9	2.4871	16	03.18
	7.0	73	07	55.3	4	13	03.4	2.4693	16	10.11
	7.5	80	17	28.5	3	47	10.6	2.4526	16	16.74
	8.0	87	32	34.9	-3	17	20.5	2.4372	16	22.89
	8.5	94	52	47.7	2	43	55.5	2.4237	16	28.39
	9.0	102	17	30.8	2	07	25.3	2.4122	16	33.07
	9.5	109	45	58.9	1	28	26.3	2.4033	16	36.76
	10.0	117	17	18.3	0	47	40.8	2.3972	16	39.31
	10.5	124	50	28.4	-0	05	55.7	2.3940	16	40.63
	11.0	132	24	23.3	+0	35	58.9	2.3940	16	40.64
	11.5	139	57	54.4	1	17	12.4	2.3971	16	39.34
	12.0	147	29	52.4	1	56	55.1	2.4034	16	36.74
	12.5	154	59	10.4	2	34	21.3	2.4126	16	32.93
	13.0	162	24	46.4	3	08	50.4	2.4245	16	28.03
	13.5	169	45	45.0	3	39	48.4	2.4389	16	22.20
	14.0	177	01	19.6	+4	06	48.8	2.4554	16	15.60
	14.5	184	10	53.4	4	29	32.8	2.4736	16	08.44
	15.0	191	13	59.8	4	47	48.9	2.4930	16	00.89
	15.5	198	10	22.5	5	01	32.3	2.5133	15	53.15
	16.0	204	59	55.4	+5	10	43.9	2.5339	15	45.38

MOON, 2018
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	204	59	55.4	+5	10	43.9	2.5339	15	45.38
	16.5	211	42	41.1	5	15	29.3	2.5546	15	37.74
	17.0	218	18	50.5	5	15	57.8	2.5748	15	30.36
	17.5	224	48	41.1	5	12	21.3	2.5944	15	23.34
	18.0	231	12	36.0	5	04	53.8	2.6130	15	16.78
	18.5	237	31	02.6	4	53	50.4	2.6303	15	10.74
	19.0	243	44	31.4	+4	39	26.9	2.6462	15	05.28
	19.5	249	53	35.3	4	21	59.8	2.6605	15	00.42
	20.0	255	58	48.1	4	01	45.4	2.6730	14	56.18
	20.5	262	00	44.2	3	39	00.4	2.6839	14	52.57
	21.0	267	59	57.8	3	14	01.4	2.6929	14	49.57
	21.5	273	57	02.5	2	47	05.2	2.7001	14	47.19
	22.0	279	52	30.6	+2	18	28.7	2.7056	14	45.39
	22.5	285	46	52.8	1	48	29.1	2.7094	14	44.15
	23.0	291	40	38.5	1	17	23.9	2.7116	14	43.44
	23.5	297	34	14.7	0	45	30.9	2.7122	14	43.23
	24.0	303	28	06.6	+0	13	08.5	2.7115	14	43.48
	24.5	309	22	37.3	-0	19	24.4	2.7094	14	44.15
	25.0	315	18	07.9	-0	51	48.5	2.7061	14	45.23
	25.5	321	14	57.1	1	23	44.2	2.7017	14	46.67
	26.0	327	13	22.1	1	54	51.4	2.6963	14	48.44
	26.5	333	13	38.0	2	24	49.8	2.6900	14	50.53
	27.0	339	15	58.4	2	53	19.5	2.6828	14	52.92
	27.5	345	20	35.4	3	20	00.3	2.6748	14	55.58
	28.0	351	27	40.2	-3	44	32.7	2.6661	14	58.51
	28.5	357	37	22.7	4	06	37.8	2.6567	15	01.69
	29.0	3	49	52.7	4	25	57.7	2.6466	15	05.14
	29.5	10	05	19.4	4	42	15.4	2.6358	15	08.84
	30.0	16	23	51.9	4	55	15.5	2.6244	15	12.79
	30.5	22	45	39.5	5	04	44.0	2.6123	15	17.00
	31.0	29	10	51.8	-5	10	28.8	2.5997	15	21.47
	31.5	35	39	38.5	5	12	19.7	2.5865	15	26.18
Sept.	1.0	42	12	09.8	5	10	09.0	2.5727	15	31.14
	1.5	48	48	35.8	5	03	51.3	2.5585	15	36.31
	2.0	55	29	06.5	4	53	24.1	2.5439	15	41.68
	2.5	62	13	51.2	4	38	48.0	2.5291	15	47.20
	3.0	69	02	57.9	-4	20	07.1	2.5142	15	52.81
	3.5	75	56	32.6	3	57	29.2	2.4994	15	58.44
	4.0	82	54	38.5	3	31	06.6	2.4850	16	04.01
	4.5	89	57	15.0	3	01	16.2	2.4711	16	09.40
	5.0	97	04	16.8	2	28	19.6	2.4582	16	14.51
	5.5	104	15	32.6	1	52	43.8	2.4464	16	19.20
	6.0	111	30	44.9	-1	15	00.6	2.4361	16	23.33
	6.5	118	49	28.6	-0	35	46.7	2.4276	16	26.77
	7.0	126	11	11.1	+0	04	17.1	2.4212	16	29.39
	7.5	133	35	12.1	0	44	27.0	2.4171	16	31.07
	8.0	141	00	44.3	+1	23	57.6	2.4155	16	31.73

MOON, 2018
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	141	00	44.3	+1	23	57.6	2.4155	16	31.73
	8.5	148	26	54.5	2	02	03.2	2.4165	16	31.31
	9.0	155	52	44.7	2	38	00.0	2.4203	16	29.77
	9.5	163	17	14.6	3	11	07.6	2.4268	16	27.13
	10.0	170	39	23.7	3	40	50.6	2.4358	16	23.45
	10.5	177	58	13.6	4	06	40.0	2.4474	16	18.82
	11.0	185	12	50.6	+4	28	14.0	2.4611	16	13.35
	11.5	192	22	27.5	4	45	18.1	2.4768	16	07.20
	12.0	199	26	25.4	4	57	45.1	2.4940	16	00.51
	12.5	206	24	14.9	5	05	34.4	2.5125	15	53.46
	13.0	213	15	36.4	5	08	51.2	2.5317	15	46.22
	13.5	220	00	20.3	5	07	45.5	2.5513	15	38.93
	14.0	226	38	26.6	+5	02	30.9	2.5710	15	31.76
	14.5	233	10	04.2	4	53	23.5	2.5902	15	24.83
	15.0	239	35	29.5	4	40	41.3	2.6088	15	18.26
	15.5	245	55	05.7	4	24	43.0	2.6263	15	12.13
	16.0	252	09	21.1	4	05	47.9	2.6425	15	06.54
	16.5	258	18	48.6	3	44	15.0	2.6571	15	01.54
	17.0	264	24	04.0	+3	20	23.1	2.6701	14	57.18
	17.5	270	25	45.3	2	54	30.6	2.6811	14	53.48
	18.0	276	24	31.6	2	26	55.4	2.6902	14	50.46
	18.5	282	21	02.7	1	57	55.1	2.6973	14	48.13
	19.0	288	15	57.8	1	27	47.0	2.7023	14	46.47
	19.5	294	09	55.7	0	56	48.3	2.7053	14	45.48
	20.0	300	03	33.6	+0	25	16.2	2.7064	14	45.13
	20.5	305	57	26.8	-0	06	31.8	2.7057	14	45.38
	21.0	311	52	08.6	0	38	17.9	2.7031	14	46.20
	21.5	317	48	09.5	1	09	43.9	2.6990	14	47.55
	22.0	323	45	57.3	1	40	31.0	2.6935	14	49.37
	22.5	329	45	56.4	2	10	19.8	2.6867	14	51.63
	23.0	335	48	28.0	-2	38	50.8	2.6788	14	54.27
	23.5	341	53	49.6	3	05	43.9	2.6699	14	57.23
	24.0	348	02	15.0	3	30	38.9	2.6603	15	00.47
	24.5	354	13	54.5	3	53	16.0	2.6501	15	03.94
	25.0	0	28	54.8	4	13	15.6	2.6395	15	07.58
	25.5	6	47	19.2	4	30	19.5	2.6285	15	11.36
	26.0	13	09	08.1	-4	44	10.3	2.6174	15	15.24
	26.5	19	34	19.2	4	54	32.7	2.6061	15	19.18
	27.0	26	02	48.3	5	01	13.5	2.5949	15	23.16
	27.5	32	34	29.5	5	04	02.0	2.5837	15	27.16
	28.0	39	09	16.3	5	02	50.8	2.5727	15	31.15
	28.5	45	47	01.8	4	57	35.2	2.5617	15	35.13
	29.0	52	27	39.4	-4	48	14.4	2.5509	15	39.09
	29.5	59	11	03.4	4	34	51.0	2.5403	15	43.01
	30.0	65	57	09.3	4	17	31.3	2.5299	15	46.89
	30.5	72	45	53.6	3	56	25.4	2.5197	15	50.71
Oct.	1.0	79	37	14.3	-3	31	47.1	2.5098	15	54.46

MOON, 2018

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	79	37	14.3	-3	31	47.1	2.5098	15	54.46
	1.5	86	31	10.2	3	03	54.0	2.5003	15	58.10
	2.0	93	27	40.9	2	33	07.2	2.4911	16	01.62
	2.5	100	26	45.6	1	59	51.4	2.4825	16	04.96
	3.0	107	28	22.8	1	24	34.6	2.4745	16	08.08
	3.5	114	32	28.9	0	47	47.9	2.4673	16	10.90
	4.0	121	38	57.4	-0	10	05.2	2.4611	16	13.37
	4.5	128	47	38.2	+0	27	57.4	2.4560	16	15.39
	5.0	135	58	16.2	1	05	41.8	2.4522	16	16.91
	5.5	143	10	31.0	1	42	29.6	2.4498	16	17.83
	6.0	150	23	56.1	2	17	42.1	2.4492	16	18.09
	6.5	157	37	59.5	2	50	42.0	2.4503	16	17.63
	7.0	164	52	03.7	+3	20	54.3	2.4534	16	16.41
	7.5	172	05	26.6	3	47	47.7	2.4584	16	14.41
	8.0	179	17	23.1	4	10	55.6	2.4655	16	11.63
	8.5	186	27	06.5	4	29	56.9	2.4744	16	08.11
	9.0	193	33	50.8	4	44	36.7	2.4853	16	03.89
	9.5	200	36	52.0	4	54	46.3	2.4978	15	59.05
	10.0	207	35	30.7	+5	00	23.6	2.5118	15	53.69
	10.5	214	29	13.3	5	01	32.2	2.5271	15	47.92
	11.0	221	17	33.6	4	58	20.9	2.5434	15	41.87
	11.5	228	00	13.1	4	51	02.8	2.5603	15	35.66
	12.0	234	37	02.1	4	39	54.4	2.5774	15	29.42
	12.5	241	07	59.2	4	25	14.6	2.5946	15	23.27
	13.0	247	33	11.0	+4	07	23.8	2.6114	15	17.33
	13.5	253	52	51.7	3	46	43.2	2.6275	15	11.70
	14.0	260	07	22.0	3	23	34.0	2.6426	15	06.49
	14.5	266	17	08.5	2	58	17.4	2.6565	15	01.76
	15.0	272	22	42.4	2	31	13.7	2.6688	14	57.60
	15.5	278	24	38.8	2	02	42.7	2.6794	14	54.05
	16.0	284	23	35.7	+1	33	03.4	2.6881	14	51.16
	16.5	290	20	13.3	1	02	34.0	2.6948	14	48.96
	17.0	296	15	12.8	0	31	32.0	2.6993	14	47.46
	17.5	302	09	16.3	+0	00	14.7	2.7017	14	46.67
	18.0	308	03	05.7	-0	31	00.9	2.7019	14	46.60
	18.5	313	57	22.1	1	01	57.9	2.7000	14	47.22
	19.0	319	52	45.4	-1	32	19.2	2.6961	14	48.51
	19.5	325	49	53.5	2	01	47.4	2.6903	14	50.43
	20.0	331	49	22.0	2	30	04.5	2.6827	14	52.96
	20.5	337	51	43.0	2	56	52.2	2.6735	14	56.02
	21.0	343	57	25.2	3	21	51.7	2.6630	14	59.57
	21.5	350	06	53.0	3	44	43.7	2.6513	15	03.54
	22.0	356	20	26.0	-4	05	08.9	2.6387	15	07.85
	22.5	2	38	18.7	4	22	47.8	2.6255	15	12.42
	23.0	9	00	39.7	4	37	22.0	2.6118	15	17.18
	23.5	15	27	32.3	4	48	33.9	2.5981	15	22.04
	24.0	21	58	53.7	-4	56	07.5	2.5844	15	26.92

MOON, 2018

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Oct.	24.0	21	58	53.7	-4	56	07.5	2.5844	15	26.92
	24.5	28	34	35.7	4	59	49.3	2.5710	15	31.73
	25.0	35	14	25.0	4	59	28.8	2.5582	15	36.41
	25.5	41	58	04.0	4	54	59.0	2.5461	15	40.88
	26.0	48	45	11.5	4	46	17.1	2.5347	15	45.08
	26.5	55	35	24.0	4	33	24.8	2.5243	15	48.97
	27.0	62	28	16.7	-4	16	28.6	2.5150	15	52.51
	27.5	69	23	24.7	3	55	39.7	2.5066	15	55.69
	28.0	76	20	24.2	3	31	14.0	2.4993	15	58.48
	28.5	83	18	53.5	3	03	31.8	2.4930	16	00.89
	29.0	90	18	33.3	2	32	57.3	2.4878	16	02.92
	29.5	97	19	07.4	1	59	58.2	2.4835	16	04.59
	30.0	104	20	22.9	-1	25	04.6	2.4801	16	05.92
	30.5	111	22	09.8	0	48	49.2	2.4775	16	06.91
	31.0	118	24	20.5	-0	11	45.9	2.4758	16	07.58
	31.5	125	26	49.1	+0	25	30.4	2.4749	16	07.95
Nov.	1.0	132	29	30.8	1	02	24.6	2.4747	16	08.01
	1.5	139	32	20.6	1	38	21.9	2.4753	16	07.76
	2.0	146	35	12.4	+2	12	48.2	2.4768	16	07.20
	2.5	153	37	58.4	2	45	11.1	2.4790	16	06.31
	3.0	160	40	27.7	3	15	00.2	2.4822	16	05.08
	3.5	167	42	26.7	3	41	47.7	2.4863	16	03.48
	4.0	174	43	37.8	4	05	09.2	2.4915	16	01.49
	4.5	181	43	40.2	4	24	44.2	2.4976	15	59.11
	5.0	188	42	10.1	+4	40	16.4	2.5049	15	56.33
	5.5	195	38	41.1	4	51	34.2	2.5133	15	53.14
	6.0	202	32	45.5	4	58	31.3	2.5228	15	49.56
	6.5	209	23	55.4	5	01	06.2	2.5333	15	45.62
	7.0	216	11	43.5	4	59	22.2	2.5448	15	41.35
	7.5	222	55	45.2	4	53	27.5	2.5571	15	36.80
	8.0	229	35	39.1	+4	43	34.2	2.5702	15	32.03
	8.5	236	11	08.3	4	29	58.0	2.5838	15	27.12
	9.0	242	42	01.0	4	12	57.1	2.5978	15	22.15
	9.5	249	08	11.3	3	52	52.0	2.6118	15	17.20
	10.0	255	29	39.4	3	30	04.5	2.6257	15	12.35
	10.5	261	46	31.3	3	04	56.8	2.6391	15	07.70
	11.0	267	58	59.2	+2	37	51.5	2.6519	15	03.32
	11.5	274	07	20.5	2	09	10.6	2.6637	14	59.31
	12.0	280	11	58.0	1	39	15.8	2.6744	14	55.72
	12.5	286	13	18.8	1	08	27.7	2.6837	14	52.63
	13.0	292	11	54.0	0	37	06.0	2.6913	14	50.11
	13.5	298	08	18.0	+0	05	29.5	2.6971	14	48.19
	14.0	304	03	07.7	-0	26	03.7	2.7009	14	46.92
	14.5	309	57	02.5	0	57	16.4	2.7027	14	46.34
	15.0	315	50	42.8	1	27	51.7	2.7023	14	46.46
	15.5	321	44	50.2	1	57	33.2	2.6998	14	47.30
	16.0	327	40	06.4	-2	26	04.4	2.6951	14	48.86

MOON, 2018

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	327	40	06.4	-2	26	04.4	2.6951	14	48.86
	16.5	333	37	12.9	2	53	08.9	2.6882	14	51.13
	17.0	339	36	49.9	3	18	29.9	2.6793	14	54.09
	17.5	345	39	36.1	3	41	50.4	2.6685	14	57.71
	18.0	351	46	07.4	4	02	52.9	2.6560	15	01.93
	18.5	357	56	56.7	4	21	19.6	2.6420	15	06.72
	19.0	4	12	32.4	-4	36	52.8	2.6267	15	11.98
	19.5	10	33	18.2	4	49	14.5	2.6105	15	17.65
	20.0	16	59	31.5	4	58	07.7	2.5936	15	23.61
	20.5	23	31	23.2	5	03	16.4	2.5765	15	29.77
	21.0	30	08	57.0	5	04	26.4	2.5593	15	36.01
	21.5	36	52	08.6	5	01	26.3	2.5425	15	42.19
	22.0	43	40	45.9	-4	54	08.0	2.5264	15	48.19
	22.5	50	34	29.2	4	42	28.2	2.5113	15	53.90
	23.0	57	32	51.4	4	26	28.2	2.4975	15	59.17
	23.5	64	35	19.5	4	06	15.5	2.4852	16	03.91
	24.0	71	41	15.5	3	42	03.2	2.4747	16	08.03
	24.5	78	49	58.0	3	14	10.9	2.4660	16	11.44
	25.0	86	00	44.0	-2	43	03.7	2.4592	16	14.10
	25.5	93	12	50.8	2	09	11.8	2.4544	16	15.99
	26.0	100	25	37.4	1	33	09.7	2.4516	16	17.11
	26.5	107	38	25.8	0	55	35.1	2.4507	16	17.49
	27.0	114	50	42.2	-0	17	07.2	2.4515	16	17.16
	27.5	122	01	57.7	+0	21	33.9	2.4540	16	16.19
	28.0	129	11	48.5	+0	59	48.7	2.4578	16	14.65
	28.5	136	19	55.4	1	36	59.3	2.4630	16	12.62
	29.0	143	26	04.2	2	12	30.0	2.4692	16	10.17
	29.5	150	30	04.2	2	45	48.4	2.4763	16	07.39
	30.0	157	31	48.1	3	16	25.0	2.4841	16	04.34
	30.5	164	31	10.6	3	43	54.6	2.4925	16	01.08
Dec.	1.0	171	28	07.9	+4	07	55.3	2.5015	15	57.65
	1.5	178	22	36.9	4	28	09.8	2.5107	15	54.11
	2.0	185	14	34.2	4	44	24.5	2.5204	15	50.47
	2.5	192	03	56.2	4	56	29.7	2.5302	15	46.76
	3.0	198	50	38.1	5	04	20.0	2.5404	15	42.98
	3.5	205	34	34.4	5	07	53.7	2.5507	15	39.16
	4.0	212	15	38.6	+5	07	13.0	2.5613	15	35.29
	4.5	218	53	43.4	5	02	23.7	2.5720	15	31.39
	5.0	225	28	41.5	4	53	35.0	2.5829	15	27.45
	5.5	232	00	25.3	4	40	59.4	2.5940	15	23.48
	6.0	238	28	48.4	4	24	51.8	2.6052	15	19.52
	6.5	244	53	45.4	4	05	30.0	2.6164	15	15.57
	7.0	251	15	12.7	+3	43	13.3	2.6277	15	11.66
	7.5	257	33	09.3	3	18	22.6	2.6387	15	07.83
	8.0	263	47	36.8	2	51	20.1	2.6496	15	04.12
	8.5	269	58	39.8	2	22	28.0	2.6600	15	00.57
	9.0	276	06	26.6	+1	52	09.1	2.6699	14	57.24

MOON, 2018

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	276	06	26.6	+1	52	09.1	2.6699	14	57.24
	9.5	282	11	08.8	1	20	45.7	2.6790	14	54.18
	10.0	288	13	01.4	0	48	39.7	2.6873	14	51.44
	10.5	294	12	23.3	+0	16	12.1	2.6944	14	49.07
	11.0	300	09	36.6	-0	16	16.8	2.7003	14	47.15
	11.5	306	05	06.4	0	48	27.7	2.7047	14	45.70
	12.0	311	59	21.2	-1	20	02.3	2.7074	14	44.79
	12.5	317	52	51.9	1	50	43.1	2.7084	14	44.47
	13.0	323	46	11.8	2	20	13.2	2.7075	14	44.76
	13.5	329	39	56.5	2	48	16.6	2.7046	14	45.71
	14.0	335	34	42.8	3	14	37.4	2.6997	14	47.34
	14.5	341	31	09.1	3	39	00.1	2.6926	14	49.66
	15.0	347	29	54.2	-4	01	09.5	2.6835	14	52.69
	15.5	353	31	36.9	4	20	50.1	2.6723	14	56.42
	16.0	359	36	55.8	4	37	46.5	2.6592	15	00.84
	16.5	5	46	27.9	4	51	43.3	2.6443	15	05.92
	17.0	12	00	47.9	5	02	24.9	2.6278	15	11.60
	17.5	18	20	27.8	5	09	36.2	2.6100	15	17.83
	18.0	24	45	54.9	-5	13	02.9	2.5911	15	24.53
	18.5	31	17	31.8	5	12	31.4	2.5714	15	31.60
	19.0	37	55	34.2	5	07	50.5	2.5514	15	38.92
	19.5	44	40	10.8	4	58	51.2	2.5313	15	46.36
	20.0	51	31	21.6	4	45	28.4	2.5117	15	53.75
	20.5	58	28	57.7	4	27	41.3	2.4929	16	00.95
	21.0	65	32	40.6	-4	05	34.8	2.4753	16	07.77
	21.5	72	42	02.2	3	39	20.1	2.4594	16	14.04
	22.0	79	56	25.6	3	09	15.4	2.4454	16	19.60
	22.5	87	15	05.4	2	35	45.7	2.4337	16	24.30
	23.0	94	37	10.1	1	59	23.1	2.4246	16	28.01
	23.5	102	01	42.9	1	20	45.5	2.4181	16	30.65
	24.0	109	27	44.8	-0	40	35.9	2.4145	16	32.15
	24.5	116	54	16.0	+0	00	19.8	2.4136	16	32.52
	25.0	124	20	18.8	0	41	14.2	2.4154	16	31.76
	25.5	131	44	58.8	1	21	20.4	2.4198	16	29.97
	26.0	139	07	27.3	1	59	54.1	2.4265	16	27.22
	26.5	146	27	01.7	2	36	14.4	2.4354	16	23.64
	27.0	153	43	06.8	+3	09	45.6	2.4460	16	19.37
	27.5	160	55	14.7	3	39	57.5	2.4581	16	14.55
	28.0	168	03	05.0	4	06	25.7	2.4713	16	09.32
	28.5	175	06	24.0	4	28	51.9	2.4854	16	03.82
	29.0	182	05	03.9	4	47	03.2	2.5001	15	58.17
	29.5	188	59	02.7	5	00	52.0	2.5151	15	52.47
	30.0	195	48	22.3	+5	10	15.4	2.5301	15	46.82
	30.5	202	33	08.4	5	15	14.3	2.5450	15	41.28
	31.0	209	13	29.1	5	15	53.4	2.5596	15	35.91
	31.5	215	49	34.3	5	12	20.4	2.5738	15	30.75
	32.0	222	21	35.3	+5	04	45.5	2.5875	15	25.82

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	0.0	4	34	48.20	+17	12	15.84	60	53.21
	0.5	5	06	03.35	18	25	10.64	61	09.41
	1.0	5	37	57.38	19	19	06.07	61	21.17
	1.5	6	10	19.12	19	52	13.30	61	28.04
	2.0	6	42	54.95	20	03	22.81	61	29.72
	2.5	7	15	29.85	19	52	11.81	61	26.13
	3.0	7	47	48.88	+19	19	06.77	61	17.39
	3.5	8	19	38.50	18	25	20.46	61	03.82
	4.0	8	50	47.71	17	12	44.24	60	45.88
	4.5	9	21	08.70	15	43	37.25	60	24.20
	5.0	9	50	37.00	14	00	34.70	59	59.49
	5.5	10	19	11.27	12	06	17.01	59	32.50
	6.0	10	46	52.77	+10	03	21.14	59	03.97
	6.5	11	13	44.77	7	54	14.57	58	34.64
	7.0	11	39	52.00	5	41	11.76	58	05.15
	7.5	12	05	20.09	3	26	12.84	57	36.09
	8.0	12	30	15.15	+1	11	03.76	57	07.97
	8.5	12	54	43.48	-1	02	42.45	56	41.20
	9.0	13	18	51.30	-3	13	43.93	56	16.08
	9.5	13	42	44.60	5	20	47.97	55	52.88
	10.0	14	06	28.99	7	22	49.05	55	31.74
	10.5	14	30	09.61	9	18	47.09	55	12.79
	11.0	14	53	51.04	11	07	46.03	54	56.07
	11.5	15	17	37.19	12	48	52.70	54	41.58
	12.0	15	41	31.28	-14	21	16.23	54	29.28
	12.5	16	05	35.71	15	44	07.81	54	19.12
	13.0	16	29	52.03	16	56	40.89	54	11.00
	13.5	16	54	20.91	17	58	11.80	54	04.82
	14.0	17	19	02.09	18	48	00.67	54	00.48
	14.5	17	43	54.45	19	25	32.65	53	57.85
	15.0	18	08	56.09	-19	50	19.18	53	56.82
	15.5	18	34	04.42	20	01	59.34	53	57.27
	16.0	18	59	16.42	20	00	20.92	53	59.12
	16.5	19	24	28.81	19	45	21.27	54	02.28
	17.0	19	49	38.30	19	17	07.73	54	06.66
	17.5	20	14	41.87	18	35	57.57	54	12.23
	18.0	20	39	36.98	-17	42	17.50	54	18.94
	18.5	21	04	21.74	16	36	42.88	54	26.78
	19.0	21	28	55.06	15	19	56.54	54	35.76
	19.5	21	53	16.73	13	52	47.61	54	45.89
	20.0	22	17	27.46	12	16	10.31	54	57.21
	20.5	22	41	28.83	10	31	02.88	55	09.75
	21.0	23	05	23.28	-8	38	26.83	55	23.56
	21.5	23	29	14.04	6	39	26.42	55	38.68
	22.0	23	53	05.04	4	35	08.61	55	55.14
	22.5	0	17	00.84	2	26	43.26	56	12.94
	23.0	0	41	06.50	-0	15	23.85	56	32.07

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	23.0	0	41	06.50	-0	15	23.85	56	32.07
	23.5	1	05	27.54	+1	57	31.64	56	52.47
	24.0	1	30	09.74	4	10	39.48	57	14.05
	24.5	1	55	19.04	6	22	28.84	57	36.65
	25.0	2	21	01.31	8	31	20.52	58	00.05
	25.5	2	47	22.08	10	35	25.88	58	23.96
	26.0	3	14	26.24	+12	32	46.41	58	48.02
	26.5	3	42	17.53	14	21	14.29	59	11.79
	27.0	4	10	58.16	15	58	34.34	59	34.76
	27.5	4	40	28.20	17	22	27.87	59	56.38
	28.0	5	10	45.15	18	30	38.61	60	16.04
	28.5	5	41	43.62	19	21	00.59	60	33.12
	29.0	6	13	15.31	+19	51	47.52	60	47.03
	29.5	6	45	09.35	20	01	42.38	60	57.22
	30.0	7	17	13.01	19	50	05.59	61	03.25
	30.5	7	49	12.84	19	17	00.39	61	04.78
	31.0	8	20	55.84	18	23	13.94	61	01.64
	31.5	8	52	10.55	17	10	14.04	60	53.85
Feb.	1.0	9	22	47.94	+15	40	01.99	60	41.58
	1.5	9	52	41.81	13	55	03.14	60	25.16
	2.0	10	21	48.83	11	57	56.55	60	05.07
	2.5	10	50	08.28	9	51	25.48	59	41.91
	3.0	11	17	41.66	7	38	09.49	59	16.34
	3.5	11	44	32.11	5	20	38.77	58	49.04
	4.0	12	10	43.95	+3	01	10.61	58	20.71
	4.5	12	36	22.25	+0	41	47.76	57	52.00
	5.0	13	01	32.45	-1	35	41.66	57	23.54
	5.5	13	26	20.12	3	49	43.36	56	55.85
	6.0	13	50	50.70	5	58	55.31	56	29.40
	6.5	14	15	09.40	8	02	05.96	56	04.58
	7.0	14	39	21.02	-9	58	12.37	55	41.69
	7.5	15	03	29.90	11	46	18.55	55	20.99
	8.0	15	27	39.79	13	25	33.98	55	02.62
	8.5	15	51	53.81	14	55	12.52	54	46.71
	9.0	16	16	14.39	16	14	31.67	54	33.31
	9.5	16	40	43.19	17	22	52.27	54	22.42
	10.0	17	05	21.10	-18	19	38.55	54	14.02
	10.5	17	30	08.21	19	04	18.53	54	08.03
	11.0	17	55	03.88	19	36	24.72	54	04.37
	11.5	18	20	06.75	19	55	34.98	54	02.92
	12.0	18	45	14.90	20	01	33.55	54	03.54
	12.5	19	10	26.00	19	54	11.96	54	06.08
	13.0	19	35	37.47	-19	33	29.91	54	10.38
	13.5	20	00	46.67	18	59	35.83	54	16.27
	14.0	20	25	51.17	18	12	47.23	54	23.58
	14.5	20	50	48.87	17	13	30.67	54	32.15
	15.0	21	15	38.20	-16	02	21.49	54	41.83

MOON, 2018

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Feb.	15.0	21	15	38.20	-16	02	21.49	54	41.83
	15.5	21	40	18.25	14	40	03.23	54	52.46
	16.0	22	04	48.81	13	07	26.94	55	03.92
	16.5	22	29	10.47	11	25	30.30	55	16.09
	17.0	22	53	24.55	9	35	16.80	55	28.89
	17.5	23	17	33.15	7	37	54.99	55	42.22
	18.0	23	41	39.03	-5	34	37.85	55	56.04
	18.5	0	05	45.56	3	26	42.31	56	10.32
	19.0	0	29	56.67	-1	15	29.00	56	25.01
	19.5	0	54	16.71	+0	57	37.72	56	40.12
	20.0	1	18	50.38	3	11	09.68	56	55.61
	20.5	1	43	42.56	5	23	34.53	57	11.49
	21.0	2	08	58.20	+7	33	15.37	57	27.72
	21.5	2	34	42.11	9	38	30.41	57	44.24
	22.0	3	00	58.71	11	37	32.84	58	00.98
	22.5	3	27	51.77	13	28	31.17	58	17.82
	23.0	3	55	24.04	15	09	30.15	58	34.60
	23.5	4	23	36.94	16	38	32.71	58	51.12
	24.0	4	52	30.16	+17	53	43.06	59	07.11
	24.5	5	22	01.40	18	53	10.99	59	22.27
	25.0	5	52	06.17	19	35	17.39	59	36.25
	25.5	6	22	37.84	19	58	40.48	59	48.68
	26.0	6	53	27.95	20	02	22.13	59	59.15
	26.5	7	24	26.73	19	45	53.47	60	07.27
	27.0	7	55	23.88	+19	09	18.54	60	12.67
	27.5	8	26	09.36	18	13	15.74	60	15.02
	28.0	8	56	34.22	16	58	56.35	60	14.08
	28.5	9	26	31.19	15	28	00.60	60	09.68
Mar.	1.0	9	55	55.04	13	42	31.78	60	01.80
	1.5	10	24	42.66	11	44	49.40	59	50.49
	2.0	10	52	53.00	+9	37	22.06	59	35.96
	2.5	11	20	26.73	7	22	40.96	59	18.49
	3.0	11	47	25.95	5	03	14.41	58	58.50
	3.5	12	13	53.79	2	41	23.58	58	36.44
	4.0	12	39	54.07	+0	19	19.68	58	12.84
	4.5	13	05	31.02	-2	00	57.80	57	48.24
	5.0	13	30	49.01	-4	17	41.74	57	23.19
	5.5	13	55	52.37	6	29	17.26	56	58.22
	6.0	14	20	45.23	8	34	21.09	56	33.81
	6.5	14	45	31.37	10	31	40.54	56	10.41
	7.0	15	10	14.16	12	20	12.34	55	48.42
	7.5	15	34	56.46	13	59	01.55	55	28.18
	8.0	15	59	40.57	-15	27	20.47	55	09.95
	8.5	16	24	28.17	16	44	27.80	54	53.97
	9.0	16	49	20.34	17	49	48.07	54	40.39
	9.5	17	14	17.51	18	42	51.26	54	29.34
	10.0	17	39	19.51	-19	23	12.66	54	20.89

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Mar.	10.0	17	39	19.51	-19	23	12.66	54	20.89
	10.5	18	04	25.64	19	50	32.95	54	15.05
	11.0	18	29	34.74	20	04	38.47	54	11.82
	11.5	18	54	45.31	20	05	21.48	54	11.14
	12.0	19	19	55.61	19	52	40.60	54	12.93
	12.5	19	45	03.89	19	26	41.10	54	17.06
	13.0	20	10	08.44	-18	47	35.24	54	23.38
	13.5	20	35	07.83	17	55	42.46	54	31.73
	14.0	21	00	00.98	16	51	29.51	54	41.91
	14.5	21	24	47.29	15	35	30.53	54	53.69
	15.0	21	49	26.70	14	08	27.00	55	06.84
	15.5	22	13	59.75	12	31	07.64	55	21.12
	16.0	22	38	27.59	-10	44	28.36	55	36.27
	16.5	23	02	51.98	8	49	32.12	55	52.04
	17.0	23	27	15.24	6	47	28.75	56	08.17
	17.5	23	51	40.22	4	39	34.85	56	24.43
	18.0	0	16	10.19	2	27	13.54	56	40.60
	18.5	0	40	48.83	-0	11	54.32	56	56.48
	19.0	1	05	40.06	+2	04	47.27	57	11.91
	19.5	1	30	47.94	4	21	10.00	57	26.75
	20.0	1	56	16.55	6	35	27.41	57	40.89
	20.5	2	22	09.78	8	45	48.53	57	54.26
	21.0	2	48	31.13	10	50	18.80	58	06.81
	21.5	3	15	23.48	12	47	01.35	58	18.51
	22.0	3	42	48.80	+14	33	58.81	58	29.36
	22.5	4	10	47.89	16	09	15.59	58	39.35
	23.0	4	39	20.12	17	31	00.93	58	48.47
	23.5	5	08	23.23	18	37	32.51	58	56.71
	24.0	5	37	53.27	19	27	20.51	59	04.04
	24.5	6	07	44.62	19	59	12.03	59	10.41
	25.0	6	37	50.32	+20	12	15.08	59	15.73
	25.5	7	08	02.44	20	06	02.05	59	19.90
	26.0	7	38	12.69	19	40	31.81	59	22.80
	26.5	8	08	13.02	18	56	10.38	59	24.27
	27.0	8	37	56.22	17	53	49.86	59	24.17
	27.5	9	07	16.37	16	34	45.98	59	22.34
	28.0	9	36	09.14	+15	00	34.47	59	18.63
	28.5	10	04	31.93	13	13	06.75	59	12.95
	29.0	10	32	23.74	11	14	25.51	59	05.21
	29.5	10	59	45.07	9	06	40.37	58	55.39
	30.0	11	26	37.61	6	52	03.97	58	43.53
	30.5	11	53	04.00	4	32	48.66	58	29.73
	31.0	12	19	07.49	+2	11	03.74	58	14.14
	31.5	12	44	51.75	-0	11	06.72	57	56.99
Apr.	1.0	13	10	20.58	2	31	45.54	57	38.57
	1.5	13	35	37.78	4	49	03.52	57	19.18
	2.0	14	00	46.92	-7	01	20.30	56	59.19

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	1.0	13	10	20.58	-2	31	45.54	57	38.57
	1.5	13	35	37.78	4	49	03.52	57	19.18
	2.0	14	00	46.92	7	01	20.30	56	59.19
	2.5	14	25	51.26	9	07	04.70	56	38.96
	3.0	14	50	53.63	11	04	54.91	56	18.87
	3.5	15	15	56.35	12	53	38.44	55	59.30
	4.0	15	41	01.15	-14	32	11.98	55	40.60
	4.5	16	06	09.15	15	59	41.15	55	23.12
	5.0	16	31	20.86	17	15	20.24	55	07.14
	5.5	16	56	36.18	18	18	31.92	54	52.95
	6.0	17	21	54.47	19	08	46.98	54	40.78
	6.5	17	47	14.62	19	45	44.10	54	30.83
	7.0	18	12	35.15	-20	09	09.48	54	23.25
	7.5	18	37	54.39	20	18	56.65	54	18.17
	8.0	19	03	10.56	20	15	06.02	54	15.65
	8.5	19	28	21.98	19	57	44.63	54	15.75
	9.0	19	53	27.19	19	27	05.66	54	18.47
	9.5	20	18	25.06	18	43	28.14	54	23.77
	10.0	20	43	14.95	-17	47	16.60	54	31.58
	10.5	21	07	56.72	16	39	00.85	54	41.77
	11.0	21	32	30.82	15	19	15.89	54	54.21
	11.5	21	56	58.31	13	48	42.00	55	08.69
	12.0	22	21	20.82	12	08	04.90	55	24.98
	12.5	22	45	40.56	10	18	16.26	55	42.81
	13.0	23	10	00.29	-8	20	14.20	56	01.87
	13.5	23	34	23.22	6	15	03.99	56	21.82
	14.0	23	58	52.97	4	03	58.74	56	42.30
	14.5	0	23	33.49	-1	48	20.14	57	02.92
	15.0	0	48	28.95	+0	30	21.05	57	23.30
	15.5	1	13	43.63	2	50	24.64	57	43.04
	16.0	1	39	21.73	+5	10	01.06	58	01.79
	16.5	2	05	27.22	7	27	11.96	58	19.20
	17.0	2	32	03.61	9	39	51.35	58	34.99
	17.5	2	59	13.63	11	45	47.57	58	48.91
	18.0	3	26	58.97	13	42	46.05	59	00.80
	18.5	3	55	19.98	15	28	33.03	59	10.55
	19.0	4	24	15.33	+17	01	00.00	59	18.12
	19.5	4	53	41.91	18	18	08.89	59	23.52
	20.0	5	23	34.71	19	18	17.48	59	26.83
	20.5	5	53	46.96	20	00	04.60	59	28.17
	21.0	6	24	10.56	20	22	34.55	59	27.70
	21.5	6	54	36.54	20	25	19.99	59	25.56
	22.0	7	24	55.82	+20	08	23.09	59	21.94
	22.5	7	54	59.86	19	32	14.55	59	16.99
	23.0	8	24	41.30	18	37	50.89	59	10.86
	23.5	8	53	54.43	17	26	30.32	59	03.67
	24.0	9	22	35.40	+15	59	48.03	58	55.51

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	24.0	9	22	35.40	+15	59	48.03	58	55.51
	24.5	9	50	42.26	14	19	31.29	58	46.47
	25.0	10	18	14.85	12	27	35.06	58	36.59
	25.5	10	45	14.50	10	25	58.26	58	25.90
	26.0	11	11	43.76	8	16	41.00	58	14.43
	26.5	11	37	46.07	6	01	42.39	58	02.20
	27.0	12	03	25.46	+3	42	59.21	57	49.23
	27.5	12	28	46.29	+1	22	24.90	57	35.56
	28.0	12	53	53.02	-0	58	11.08	57	21.24
	28.5	13	18	50.02	3	17	03.69	57	06.35
	29.0	13	43	41.39	5	32	32.76	56	51.00
	29.5	14	08	30.85	7	43	03.39	56	35.30
	30.0	14	33	21.60	-9	47	06.45	56	19.43
	30.5	14	58	16.21	11	43	19.07	56	03.57
May	1.0	15	23	16.57	13	30	25.32	55	47.91
	1.5	15	48	23.79	15	07	16.83	55	32.69
	2.0	16	13	38.23	16	32	53.48	55	18.13
	2.5	16	38	59.46	17	46	24.00	55	04.48
	3.0	17	04	26.30	-18	47	06.55	54	51.97
	3.5	17	29	57.00	19	34	29.07	54	40.83
	4.0	17	55	29.29	20	08	09.47	54	31.28
	4.5	18	21	00.60	20	27	55.50	54	23.53
	5.0	18	46	28.26	20	33	44.37	54	17.77
	5.5	19	11	49.70	20	25	42.13	54	14.17
	6.0	19	37	02.67	-20	04	02.75	54	12.86
	6.5	20	02	05.38	19	29	07.18	54	13.96
	7.0	20	26	56.65	18	41	22.23	54	17.55
	7.5	20	51	36.01	17	41	19.61	54	23.69
	8.0	21	16	03.76	16	29	35.07	54	32.39
	8.5	21	40	20.93	15	06	47.86	54	43.62
	9.0	22	04	29.33	-13	33	40.40	54	57.32
	9.5	22	28	31.44	11	50	58.37	55	13.37
	10.0	22	52	30.42	9	59	31.10	55	31.62
	10.5	23	16	29.98	8	00	12.33	55	51.84
	11.0	23	40	34.34	5	54	01.31	56	13.76
	11.5	0	04	48.16	3	42	04.02	56	37.05
	12.0	0	29	16.42	-1	25	34.73	57	01.32
	12.5	0	54	04.30	+0	54	02.58	57	26.14
	13.0	1	19	17.07	3	15	12.82	57	51.02
	13.5	1	44	59.91	5	36	08.75	58	15.44
	14.0	2	11	17.62	7	54	50.58	58	38.87
	14.5	2	38	14.37	10	09	06.42	59	00.75
	15.0	3	05	53.34	+12	16	33.93	59	20.59
	15.5	3	34	16.24	14	14	43.49	59	37.92
	16.0	4	03	22.96	16	01	02.98	59	52.34
	16.5	4	33	11.11	17	33	04.28	60	03.55
	17.0	5	03	35.84	+18	48	30.92	60	11.35

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
May	17.0	5	03	35.84	+18	48	30.92	60	11.35
	17.5	5	34	29.78	19	45	26.55	60	15.68
	18.0	6	05	43.32	20	22	22.76	60	16.56
	18.5	6	37	05.31	20	38	25.41	60	14.14
	19.0	7	08	23.85	20	33	18.19	60	08.66
	19.5	7	39	27.39	20	07	22.84	60	00.43
	20.0	8	10	05.66	+19	21	35.90	59	49.82
	20.5	8	40	10.41	18	17	23.01	59	37.22
	21.0	9	09	35.89	16	56	31.46	59	23.02
	21.5	9	38	18.89	15	21	02.61	59	07.59
	22.0	10	06	18.63	13	33	04.89	58	51.28
	22.5	10	33	36.39	11	34	48.23	58	34.41
	23.0	11	00	15.10	+9	28	20.02	58	17.24
	23.5	11	26	18.87	7	15	42.63	57	59.98
	24.0	11	51	52.60	4	58	52.15	57	42.81
	24.5	12	17	01.65	2	39	38.08	57	25.86
	25.0	12	41	51.55	+0	19	43.61	57	09.22
	25.5	13	06	27.75	-1	59	13.78	56	52.95
	26.0	13	30	55.47	-4	15	41.64	56	37.11
	26.5	13	55	19.54	6	28	11.92	56	21.73
	27.0	14	19	44.26	8	35	20.57	56	06.84
	27.5	14	44	13.29	10	35	47.41	55	52.46
	28.0	15	08	49.54	12	28	16.30	55	38.62
	28.5	15	33	35.09	14	11	35.60	55	25.38
	29.0	15	58	31.12	-15	44	38.98	55	12.80
	29.5	16	23	37.84	17	06	26.44	55	00.94
	30.0	16	48	54.55	18	16	05.43	54	49.91
	30.5	17	14	19.63	19	12	52.03	54	39.80
	31.0	17	39	50.70	19	56	12.05	54	30.74
	31.5	18	05	24.76	20	25	41.78	54	22.86
June	1.0	18	30	58.43	-20	41	08.50	54	16.31
	1.5	18	56	28.19	20	42	30.37	54	11.23
	2.0	19	21	50.68	20	29	56.05	54	07.78
	2.5	19	47	02.88	20	03	43.68	54	06.10
	3.0	20	12	02.42	19	24	19.72	54	06.33
	3.5	20	36	47.66	18	32	17.42	54	08.62
	4.0	21	01	17.84	-17	28	15.43	54	13.08
	4.5	21	25	33.14	16	12	56.36	54	19.81
	5.0	21	49	34.63	14	47	05.72	54	28.89
	5.5	22	13	24.28	13	11	31.12	54	40.38
	6.0	22	37	04.88	11	27	01.91	54	54.28
	6.5	23	00	39.97	9	34	29.25	55	10.57
	7.0	23	24	13.74	-7	34	46.59	55	29.18
	7.5	23	47	50.98	5	28	50.60	55	50.00
	8.0	0	11	36.97	3	17	42.46	56	12.84
	8.5	0	35	37.40	-1	02	29.51	56	37.45
	9.0	0	59	58.27	+1	15	32.97	57	03.53

MOON, 2018

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
June	9.0	0	59	58.27	+1	15	32.97	57	03.53
	9.5	1	24	45.77	3	34	59.71	57	30.67
	10.0	1	50	06.06	5	54	13.63	57	58.41
	10.5	2	16	05.09	8	11	24.25	58	26.23
	11.0	2	42	48.23	10	24	26.88	58	53.52
	11.5	3	10	19.92	12	31	02.90	59	19.65
	12.0	3	38	43.09	+14	28	41.66	59	43.97
	12.5	4	07	58.67	16	14	44.47	60	05.80
	13.0	4	38	05.00	17	46	31.00	60	24.55
	13.5	5	08	57.40	19	01	28.01	60	39.67
	14.0	5	40	28.01	19	57	19.76	60	50.73
	14.5	6	12	25.99	20	32	18.94	60	57.43
	15.0	6	44	38.20	+20	45	16.35	60	59.64
	15.5	7	16	50.27	20	35	47.41	60	57.39
	16.0	7	48	47.96	20	04	14.22	60	50.85
	16.5	8	20	18.44	19	11	42.66	60	40.36
	17.0	8	51	11.33	17	59	55.28	60	26.35
	17.5	9	21	19.32	16	31	01.54	60	09.35
	18.0	9	50	38.29	+14	47	27.23	59	49.92
	18.5	10	19	07.12	12	51	44.82	59	28.65
	19.0	10	46	47.22	10	46	25.65	59	06.11
	19.5	11	13	41.95	8	33	54.43	58	42.82
	20.0	11	39	56.04	6	16	26.02	58	19.27
	20.5	12	05	35.11	3	56	04.03	57	55.85
	21.0	12	30	45.26	+1	34	40.80	57	32.92
	21.5	12	55	32.73	-0	46	01.72	57	10.76
	22.0	13	20	03.66	3	04	30.63	56	49.56
	22.5	13	44	23.90	5	19	20.59	56	29.48
	23.0	14	08	38.84	7	29	12.41	56	10.63
	23.5	14	32	53.31	9	32	51.78	55	53.06
	24.0	14	57	11.46	-11	29	08.51	55	36.80
	24.5	15	21	36.62	13	16	56.02	55	21.86
	25.0	15	46	11.28	14	55	11.35	55	08.22
	25.5	16	10	56.94	16	22	55.58	54	55.85
	26.0	16	35	54.10	17	39	14.63	54	44.73
	26.5	17	01	02.24	18	43	20.35	54	34.84
	27.0	17	26	19.86	-19	34	31.86	54	26.15
	27.5	17	51	44.58	20	12	16.78	54	18.66
	28.0	18	17	13.31	20	36	12.52	54	12.38
	28.5	18	42	42.48	20	46	07.04	54	07.34
	29.0	19	08	08.30	20	41	59.34	54	03.56
	29.5	19	33	27.06	20	23	59.37	54	01.10
	30.0	19	58	35.36	-19	52	27.36	54	00.04
	30.5	20	23	30.42	19	07	52.80	54	00.46
July	1.0	20	48	10.23	18	10	53.00	54	02.43
	1.5	21	12	33.65	17	02	11.53	54	06.07
	2.0	21	36	40.54	-15	42	36.66	54	11.47

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	1.0	20	48	10.23	-18	10	53.00	54	02.43
	1.5	21	12	33.65	17	02	11.53	54	06.07
	2.0	21	36	40.54	15	42	36.66	54	11.47
	2.5	22	00	31.73	14	12	59.98	54	18.73
	3.0	22	24	08.96	12	34	15.21	54	27.95
	3.5	22	47	34.86	10	47	17.51	54	39.19
	4.0	23	10	52.86	-8	53	03.11	54	52.53
	4.5	23	34	07.11	6	52	29.39	55	08.00
	5.0	23	57	22.36	4	46	35.45	55	25.60
	5.5	0	20	43.93	-2	36	22.96	55	45.31
	6.0	0	44	17.59	+0	22	57.52	56	07.03
	6.5	1	08	09.51	1	52	29.75	56	30.63
	7.0	1	32	26.11	+4	08	40.35	56	55.90
	7.5	1	57	13.92	6	24	06.47	57	22.57
	8.0	2	22	39.39	8	37	09.13	57	50.27
	8.5	2	48	48.63	10	45	56.66	58	18.58
	9.0	3	15	46.99	12	48	23.96	58	46.97
	9.5	3	43	38.60	14	42	12.99	59	14.86
	10.0	4	12	25.82	+16	24	55.09	59	41.57
	10.5	4	42	08.61	17	53	55.54	60	06.43
	11.0	5	12	43.97	19	06	40.82	60	28.71
	11.5	5	44	05.56	20	00	48.27	60	47.74
	12.0	6	16	03.70	20	34	17.43	61	02.89
	12.5	6	48	25.78	20	45	41.53	61	13.64
	13.0	7	20	57.25	+20	34	16.97	61	19.63
	13.5	7	53	22.87	20	00	08.93	61	20.64
	14.0	8	25	28.26	19	04	11.66	61	16.67
	14.5	8	57	01.08	17	48	03.54	61	07.88
	15.0	9	27	51.98	16	13	57.86	60	54.63
	15.5	9	57	55.01	14	24	31.45	60	37.38
	16.0	10	27	07.46	+12	22	33.08	60	16.76
	16.5	10	55	29.54	10	10	53.26	59	53.41
	17.0	11	23	03.75	7	52	16.52	59	28.04
	17.5	11	49	54.30	5	29	16.17	59	01.32
	18.0	12	16	06.50	3	04	11.57	58	33.91
	18.5	12	41	46.31	+0	39	07.30	58	06.38
	19.0	13	06	59.93	-1	44	06.34	57	39.25
	19.5	13	31	53.57	4	03	51.93	57	12.95
	20.0	13	56	33.13	6	18	43.17	56	47.83
	20.5	14	21	04.14	8	27	22.97	56	24.17
	21.0	14	45	31.53	10	28	41.73	56	02.17
	21.5	15	09	59.60	12	21	35.92	55	41.96
	22.0	15	34	31.85	-14	05	07.00	55	23.63
	22.5	15	59	10.93	15	38	20.89	55	07.21
	23.0	16	23	58.56	17	00	27.82	54	52.70
	23.5	16	48	55.51	18	10	42.68	54	40.07
	24.0	17	14	01.54	-19	08	25.65	54	29.27

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	24.0	17	14	01.54	-19	08	25.65	54	29.27
	24.5	17	39	15.49	19	53	03.23	54	20.24
	25.0	18	04	35.35	20	24	09.33	54	12.89
	25.5	18	29	58.39	20	41	26.32	54	07.15
	26.0	18	55	21.42	20	44	45.98	54	02.94
	26.5	19	20	40.97	20	34	10.09	54	00.20
	27.0	19	45	53.62	-20	09	50.61	53	58.87
	27.5	20	10	56.17	19	32	09.39	53	58.89
	28.0	20	35	45.98	18	41	37.50	54	00.25
	28.5	21	00	21.04	17	38	54.15	54	02.92
	29.0	21	24	40.21	16	24	45.43	54	06.91
	29.5	21	48	43.20	15	00	02.90	54	12.24
	30.0	22	12	30.63	-13	25	42.33	54	18.93
	30.5	22	36	04.03	11	42	42.48	54	27.03
	31.0	22	59	25.72	9	52	04.23	54	36.58
	31.5	23	22	38.81	7	54	49.98	54	47.66
Aug.	1.0	23	45	47.09	5	52	03.43	55	00.30
	1.5	0	08	54.95	3	44	49.67	55	14.55
	2.0	0	32	07.31	-1	34	15.68	55	30.45
	2.5	0	55	29.55	+0	38	28.88	55	48.02
	3.0	1	19	07.41	2	52	10.55	56	07.22
	3.5	1	43	06.89	5	05	30.81	56	28.01
	4.0	2	07	34.13	7	17	04.54	56	50.29
	4.5	2	32	35.24	9	25	18.61	57	13.90
	5.0	2	58	16.06	+11	28	30.60	57	38.61
	5.5	3	24	41.83	13	24	48.00	58	04.13
	6.0	3	51	56.85	15	12	08.34	58	30.10
	6.5	4	20	03.92	16	48	20.47	58	56.06
	7.0	4	49	03.88	18	11	07.75	59	21.51
	7.5	5	18	55.08	19	18	13.16	59	45.84
	8.0	5	49	33.00	+20	07	26.68	60	08.44
	8.5	6	20	50.10	20	36	54.43	60	28.65
	9.0	6	52	36.07	20	45	08.61	60	45.82
	9.5	7	24	38.50	20	31	16.82	60	59.36
	10.0	7	56	43.86	19	55	09.01	61	08.74
	10.5	8	28	38.72	18	57	20.55	61	13.58
	11.0	9	00	11.01	+17	39	10.82	61	13.63
	11.5	9	31	10.91	16	02	37.52	61	08.82
	12.0	10	01	31.41	14	10	07.78	60	59.29
	12.5	10	31	08.48	12	04	27.81	60	45.30
	13.0	11	00	00.86	9	48	32.61	60	27.32
	13.5	11	28	09.59	7	25	16.98	60	05.89
	14.0	11	55	37.56	+4	57	28.51	59	41.68
	14.5	12	22	28.91	+2	27	42.88	59	15.37
	15.0	12	48	48.59	-0	01	38.89	58	47.67
	15.5	13	14	41.96	2	28	31.38	58	19.25
	16.0	13	40	14.47	-4	51	04.45	57	50.73

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Aug.	16.0	13	40	14.47	-4	51	04.45	57	50.73
	16.5	14	05	31.39	7	07	42.17	57	22.67
	17.0	14	30	37.67	9	17	01.16	56	55.56
	17.5	14	55	37.75	11	17	48.96	56	29.80
	18.0	15	20	35.45	13	09	02.32	56	05.71
	18.5	15	45	33.88	14	49	45.88	55	43.54
	19.0	16	10	35.39	-16	19	11.12	55	23.48
	19.5	16	35	41.45	17	36	35.74	55	05.63
	20.0	17	00	52.72	18	41	23.37	54	50.07
	20.5	17	26	08.97	19	33	03.76	54	36.81
	21.0	17	51	29.23	20	11	13.05	54	25.83
	21.5	18	16	51.80	20	35	34.41	54	17.07
	22.0	18	42	14.45	-20	45	58.54	54	10.47
	22.5	19	07	34.59	20	42	24.31	54	05.92
	23.0	19	32	49.45	20	24	59.04	54	03.31
	23.5	19	57	56.33	19	53	58.70	54	02.52
	24.0	20	22	52.82	19	09	47.70	54	03.44
	24.5	20	47	36.93	18	12	58.56	54	05.93
	25.0	21	12	07.26	-17	04	11.19	54	09.87
	25.5	21	36	23.14	15	44	12.14	54	15.15
	26.0	22	00	24.61	14	13	53.67	54	21.67
	26.5	22	24	12.49	12	34	12.93	54	29.35
	27.0	22	47	48.35	10	46	11.09	54	38.10
	27.5	23	11	14.45	8	50	52.69	54	47.87
	28.0	23	34	33.72	-6	49	25.11	54	58.62
	28.5	23	57	49.65	4	42	58.29	55	10.33
	29.0	0	21	06.24	2	32	44.61	55	22.97
	29.5	0	44	27.93	-0	19	59.04	55	36.55
	30.0	1	07	59.53	+1	54	00.55	55	51.07
	30.5	1	31	46.10	4	07	52.87	56	06.52
	31.0	1	55	52.89	+6	20	12.56	56	22.92
	31.5	2	20	25.16	8	29	29.47	56	40.23
Sept.	1.0	2	45	28.08	10	34	08.05	56	58.42
	1.5	3	11	06.42	12	32	26.79	57	17.43
	2.0	3	37	24.38	14	22	38.28	57	37.13
	2.5	4	04	25.19	16	02	49.71	57	57.39
	3.0	4	32	10.79	+17	31	04.43	58	17.99
	3.5	5	00	41.41	18	45	24.72	58	38.67
	4.0	5	29	55.26	19	43	55.88	58	59.11
	4.5	5	59	48.28	20	24	51.73	59	18.92
	5.0	6	30	14.14	20	46	41.17	59	37.66
	5.5	7	01	04.46	20	48	15.21	59	54.87
	6.0	7	32	09.34	+20	28	53.50	60	10.05
	6.5	8	03	18.08	19	48	29.46	60	22.68
	7.0	8	34	20.14	18	47	32.88	60	32.30
	7.5	9	05	05.92	17	27	09.78	60	38.49
	8.0	9	35	27.52	+15	48	59.29	60	40.91

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Sept.	8.0	9	35	27.52	+15	48	59.29	60	40.91
	8.5	10	05	19.15	13	55	08.22	60	39.34
	9.0	10	34	37.29	11	48	04.08	60	33.69
	9.5	11	03	20.58	9	30	27.56	60	24.01
	10.0	11	31	29.55	7	05	05.18	60	10.50
	10.5	11	59	06.24	4	34	42.82	59	53.49
	11.0	12	26	13.79	+2	02	00.51	59	33.42
	11.5	12	52	56.05	-0	30	31.49	59	10.82
	12.0	13	19	17.26	3	00	35.26	58	46.27
	12.5	13	45	21.73	5	26	06.62	58	20.39
	13.0	14	11	13.62	7	45	15.54	57	53.79
	13.5	14	36	56.76	9	56	25.91	57	27.05
	14.0	15	02	34.50	-11	58	14.80	57	00.72
	14.5	15	28	09.59	13	49	31.47	56	35.27
	15.0	15	53	44.10	15	29	16.38	56	11.13
	15.5	16	19	19.38	16	56	40.18	55	48.65
	16.0	16	44	56.04	18	11	02.94	55	28.12
	16.5	17	10	33.95	19	11	53.53	55	09.77
	17.0	17	36	12.35	-19	58	49.16	54	53.74
	17.5	18	01	49.86	20	31	35.08	54	40.16
	18.0	18	27	24.71	20	50	04.41	54	29.08
	18.5	18	52	54.81	20	54	17.96	54	20.52
	19.0	19	18	17.99	20	44	24.05	54	14.44
	19.5	19	43	32.13	20	20	38.23	54	10.80
	20.0	20	08	35.37	-19	43	23.03	54	09.49
	20.5	20	33	26.23	18	53	07.48	54	10.42
	21.0	20	58	03.75	17	50	26.78	54	13.43
	21.5	21	22	27.55	16	36	01.78	54	18.38
	22.0	21	46	37.88	15	10	38.59	54	25.09
	22.5	22	10	35.64	13	35	08.25	54	33.38
	23.0	22	34	22.36	-11	50	26.38	54	43.06
	23.5	22	58	00.18	9	57	33.08	54	53.94
	24.0	23	21	31.79	7	57	32.76	55	05.84
	24.5	23	45	00.37	5	51	34.18	55	18.56
	25.0	0	08	29.54	3	40	50.52	55	31.94
	25.5	0	32	03.26	-1	26	39.44	55	45.82
	26.0	0	55	45.81	+0	49	36.73	56	00.06
	26.5	1	19	41.65	3	06	30.87	56	14.53
	27.0	1	43	55.35	5	22	30.96	56	29.14
	27.5	2	08	31.44	7	36	00.09	56	43.81
	28.0	2	33	34.30	9	45	16.56	56	58.48
	28.5	2	59	07.92	11	48	34.25	57	13.09
	29.0	3	25	15.69	+13	44	03.41	57	27.61
	29.5	3	52	00.17	15	29	51.82	57	42.01
	30.0	4	19	22.74	17	04	06.66	57	56.24
	30.5	4	47	23.39	18	24	57.15	58	10.28
Oct.	1.0	5	16	00.44	+19	30	37.88	58	24.04

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Oct.	1.0	5	16	00.44	+19	30	37.88	58	24.04
	1.5	5	45	10.42	20	19	33.04	58	37.44
	2.0	6	14	48.07	20	50	20.99	58	50.35
	2.5	6	44	46.58	21	01	59.00	59	02.62
	3.0	7	14	57.95	20	53	47.56	59	14.06
	3.5	7	45	13.59	20	25	33.68	59	24.43
	4.0	8	15	24.96	+19	37	32.65	59	33.48
	4.5	8	45	24.25	18	30	28.18	59	40.92
	5.0	9	15	04.90	17	05	30.79	59	46.47
	5.5	9	44	22.00	15	24	14.75	59	49.85
	6.0	10	13	12.44	13	28	34.14	59	50.81
	6.5	10	41	34.89	11	20	38.35	59	49.12
	7.0	11	09	29.64	+9	02	47.45	59	44.64
	7.5	11	36	58.29	6	37	27.86	59	37.30
	8.0	12	04	03.50	4	07	08.35	59	27.10
	8.5	12	30	48.60	+1	34	16.51	59	14.16
	9.0	12	57	17.33	-0	58	44.23	58	58.66
	9.5	13	23	33.53	3	29	37.06	58	40.90
	10.0	13	49	40.96	-5	56	13.84	58	21.23
	10.5	14	15	43.01	8	16	36.54	58	00.06
	11.0	14	41	42.62	10	28	58.42	57	37.84
	11.5	15	07	42.08	12	31	44.74	57	15.03
	12.0	15	33	42.99	14	23	33.18	56	52.11
	12.5	15	59	46.13	16	03	14.10	56	29.54
	13.0	16	25	51.50	-17	29	50.48	56	07.72
	13.5	16	51	58.34	18	42	37.76	55	47.07
	14.0	17	18	05.19	19	41	03.56	55	27.92
	14.5	17	44	10.02	20	24	47.15	55	10.58
	15.0	18	10	10.44	20	53	38.87	54	55.29
	15.5	18	36	03.84	21	07	39.27	54	42.26
	16.0	19	01	47.63	-21	06	58.24	54	31.65
	16.5	19	27	19.44	20	51	53.89	54	23.56
	17.0	19	52	37.31	20	22	51.46	54	18.06
	17.5	20	17	39.80	19	40	22.20	54	15.18
	18.0	20	42	26.11	18	45	02.36	54	14.90
	18.5	21	06	56.15	17	37	32.31	54	17.17
	19.0	21	31	10.53	-16	18	35.91	54	21.91
	19.5	21	55	10.58	14	49	00.07	54	28.98
	20.0	22	18	58.27	13	09	34.69	54	38.24
	20.5	22	42	36.17	11	21	12.73	54	49.49
	21.0	23	06	07.42	9	24	50.60	55	02.52
	21.5	23	29	35.59	7	21	28.77	55	17.09
	22.0	23	53	04.67	-5	12	12.45	55	32.92
	22.5	0	16	39.00	2	58	12.39	55	49.72
	23.0	0	40	23.12	-0	40	45.74	56	07.20
	23.5	1	04	21.77	+1	38	43.22	56	25.04
	24.0	1	28	39.73	+3	58	42.51	56	42.95

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Oct.	24.0	1	28	39.73	+3	58	42.51	56	42.95
	24.5	1	53	21.69	6	17	32.13	57	00.62
	25.0	2	18	32.13	8	33	24.11	57	17.78
	25.5	2	44	15.02	10	44	23.13	57	34.18
	26.0	3	10	33.67	12	48	27.71	57	49.61
	26.5	3	37	30.37	14	43	32.31	58	03.90
	27.0	4	05	06.11	+16	27	30.14	58	16.91
	27.5	4	33	20.28	17	58	17.02	58	28.56
	28.0	5	02	10.43	19	13	55.96	58	38.81
	28.5	5	31	32.21	20	12	42.37	58	47.66
	29.0	6	01	19.36	20	53	09.38	58	55.13
	29.5	6	31	24.09	21	14	12.73	59	01.26
	30.0	7	01	37.55	+21	15	14.59	59	06.12
	30.5	7	31	50.49	20	56	05.81	59	09.76
	31.0	8	01	54.02	20	17	06.10	59	12.24
	31.5	8	31	40.28	19	19	02.44	59	13.58
Nov.	1.0	9	01	03.00	18	03	05.82	59	13.80
	1.5	9	29	57.78	16	30	47.07	59	12.90
	2.0	9	58	22.19	+14	43	52.26	59	10.84
	2.5	10	26	15.73	12	44	18.35	59	07.58
	3.0	10	53	39.52	10	34	09.44	59	03.04
	3.5	11	20	36.03	8	15	33.60	58	57.17
	4.0	11	47	08.76	5	50	40.63	58	49.89
	4.5	12	13	21.87	3	21	40.23	58	41.15
	5.0	12	39	19.88	+0	50	40.72	58	30.92
	5.5	13	05	07.43	-1	40	12.05	58	19.22
	6.0	13	30	49.02	4	08	55.70	58	06.08
	6.5	13	56	28.78	6	33	32.25	57	51.60
	7.0	14	22	10.34	8	52	09.24	57	35.91
	7.5	14	47	56.59	11	03	00.91	57	19.21
	8.0	15	13	49.61	-13	04	29.51	57	01.71
	8.5	15	39	50.51	14	55	06.62	56	43.69
	9.0	16	05	59.41	16	33	34.59	56	25.44
	9.5	16	32	15.38	17	58	47.74	56	07.25
	10.0	16	58	36.52	19	09	53.51	55	49.46
	10.5	17	25	00.11	20	06	13.15	55	32.37
	11.0	17	51	22.76	-20	47	22.06	55	16.31
	11.5	18	17	40.71	21	13	09.61	55	01.56
	12.0	18	43	50.08	21	23	38.39	54	48.39
	12.5	19	09	47.17	21	19	02.99	54	37.06
	13.0	19	35	28.78	20	59	48.40	54	27.78
	13.5	20	00	52.34	20	26	28.07	54	20.74
	14.0	20	25	56.17	-19	39	42.06	54	16.09
	14.5	20	50	39.48	18	40	15.10	54	13.94
	15.0	21	15	02.47	17	28	55.09	54	14.39
	15.5	21	39	06.23	16	06	31.80	54	17.48
	16.0	22	02	52.75	-14	33	56.11	54	23.20

MOON, 2018
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
Nov.	16.0	22	02	52.75	-14	33	56.11	54	23.20
	16.5	22	26	24.77	12	51	59.62	54	31.54
	17.0	22	49	45.74	11	01	34.79	54	42.40
	17.5	23	12	59.68	9	03	35.39	54	55.68
	18.0	23	36	11.11	6	58	57.37	55	11.21
	18.5	23	59	25.00	4	48	40.05	55	28.77
	19.0	0	22	46.61	-2	33	47.50	55	48.10
	19.5	0	46	21.50	-0	15	30.11	56	08.90
	20.0	1	10	15.36	+2	04	53.84	56	30.80
	20.5	1	34	33.93	4	25	56.60	56	53.41
	21.0	1	59	22.82	6	45	59.73	57	16.30
	21.5	2	24	47.32	9	03	13.31	57	39.00
	22.0	2	50	52.11	+11	15	35.84	58	01.05
	22.5	3	17	40.92	13	20	55.31	58	21.99
	23.0	3	45	16.12	15	16	51.43	58	41.36
	23.5	4	13	38.32	17	00	59.60	58	58.76
	24.0	4	42	45.91	18	30	56.41	59	13.87
	24.5	5	12	34.77	19	44	26.78	59	26.40
	25.0	5	42	58.20	+20	39	31.91	59	36.18
	25.5	6	13	47.11	21	14	37.47	59	43.12
	26.0	6	44	50.57	21	28	40.56	59	47.23
	26.5	7	15	56.67	21	21	14.51	59	48.60
	27.0	7	46	53.52	20	52	30.43	59	47.39
	27.5	8	17	30.34	20	03	15.45	59	43.83
	28.0	8	47	38.23	+18	54	47.97	59	38.18
	28.5	9	17	10.76	17	28	50.97	59	30.73
	29.0	9	46	04.16	15	47	24.49	59	21.75
	29.5	10	14	17.21	13	52	38.65	59	11.54
	30.0	10	41	50.90	11	46	47.61	59	00.33
	30.5	11	08	48.03	9	32	05.19	58	48.36
Dec.	1.0	11	35	12.76	+7	10	41.96	58	35.79
	1.5	12	01	10.15	4	44	43.64	58	22.77
	2.0	12	26	45.77	+2	16	10.58	58	09.40
	2.5	12	52	05.44	-0	13	02.19	57	55.77
	3.0	13	17	14.88	2	41	04.52	57	41.92
	3.5	13	42	19.58	5	06	10.61	57	27.89
	4.0	14	07	24.52	-7	26	38.63	57	13.68
	4.5	14	32	34.05	9	40	50.59	56	59.34
	5.0	14	57	51.69	11	47	12.64	56	44.87
	5.5	15	23	20.02	13	44	15.73	56	30.33
	6.0	15	49	00.51	15	30	36.77	56	15.76
	6.5	16	14	53.46	17	05	00.07	56	01.25
	7.0	16	40	57.93	-18	26	19.11	55	46.91
	7.5	17	07	11.81	19	33	38.32	55	32.85
	8.0	17	33	31.94	20	26	14.78	55	19.23
	8.5	17	59	54.28	21	03	39.52	55	06.21
	9.0	18	26	14.23	-21	25	38.27	54	53.98

MOON, 2018

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Dec.	9.0	18	26	14.23	-21	25	38.27	54	53.98
	9.5	18	52	26.98	21	32	11.43	54	42.73
	10.0	19	18	27.87	21	23	33.37	54	32.66
	10.5	19	44	12.71	21	00	10.95	54	23.99
	11.0	20	09	38.11	20	22	41.53	54	16.91
	11.5	20	34	41.65	19	31	50.69	54	11.61
	12.0	20	59	22.03	-18	28	29.80	54	08.28
	12.5	21	23	39.06	17	13	33.90	54	07.08
	13.0	21	47	33.68	15	47	59.78	54	08.16
	13.5	22	11	07.85	14	12	44.65	54	11.64
	14.0	22	34	24.43	12	28	45.26	54	17.61
	14.5	22	57	27.11	10	36	57.54	54	26.15
	15.0	23	20	20.24	-8	38	16.87	54	37.28
	15.5	23	43	08.77	6	33	38.63	54	50.98
	16.0	0	05	58.13	4	23	59.33	55	07.19
	16.5	0	28	54.18	-2	10	18.01	55	25.82
	17.0	0	52	03.13	+0	06	22.02	55	46.69
	17.5	1	15	31.41	2	24	51.24	56	09.57
	18.0	1	39	25.64	+4	43	51.85	56	34.17
	18.5	2	03	52.42	7	01	55.68	57	00.13
	19.0	2	28	58.15	9	17	22.40	57	27.01
	19.5	2	54	48.78	11	28	18.18	57	54.31
	20.0	3	21	29.37	13	32	35.34	58	21.47
	20.5	3	49	03.67	15	27	53.32	58	47.88
	21.0	4	17	33.52	+17	11	41.64	59	12.92
	21.5	4	46	58.31	18	41	25.06	59	35.95
	22.0	5	17	14.43	19	54	31.35	59	56.37
	22.5	5	48	15.01	20	48	41.03	60	13.62
	23.0	6	19	49.97	21	21	58.45	60	27.25
	23.5	6	51	46.60	21	33	02.40	60	36.92
	24.0	7	23	50.51	+21	21	14.30	60	42.45
	24.5	7	55	47.00	20	46	42.50	60	43.78
	25.0	8	27	22.42	19	50	21.45	60	41.02
	25.5	8	58	25.37	18	33	46.20	60	34.42
	26.0	9	28	47.49	16	59	03.49	60	24.33
	26.5	9	58	23.73	15	08	41.20	60	11.19
	27.0	10	27	12.21	+13	05	17.98	59	55.51
	27.5	10	55	13.86	10	51	34.51	59	37.81
	28.0	11	22	31.73	8	30	06.99	59	18.62
	28.5	11	49	10.50	6	03	22.90	58	58.43
	29.0	12	15	15.87	3	33	38.92	58	37.67
	29.5	12	40	54.12	+1	03	00.41	58	16.75
	30.0	13	06	11.73	-1	26	38.07	57	56.00
	30.5	13	31	15.11	3	53	31.50	57	35.66
	31.0	13	56	10.34	6	16	03.01	57	15.94
	31.5	14	21	02.99	8	32	42.46	56	57.00
	32.0	14	45	57.96	-10	42	05.26	56	38.91

MOON, 2018
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Jan.	0		U	31	22	52.7	+19	14.9
	1	13.73	L	1	11	24.5	19	51.0
	1		U	1	23	56.4	20	03.4
	2	14.73	L	2	12	28.4	19	51.3
	3	15.73	U	3	01	00.0	19	15.4
	3		L	3	13	31.1	18	17.2
	4	16.73	U	4	02	01.4	+16	58.8
	4		L	4	14	30.8	15	23.2
	5	17.73	U	5	02	59.2	13	33.1
	5		L	5	15	26.5	11	31.8
	6	18.73	U	6	03	52.9	9	22.2
	6		L	6	16	18.4	7	06.8
	7	19.73	U	7	04	43.2	+4	48.2
	7		L	7	17	07.2	2	28.5
	8	20.73	U	8	05	30.7	+0	09.4
	8		L	8	17	53.7	-2	07.5
	9	21.73	U	9	06	16.4	4	20.7
	9		L	9	18	39.0	6	29.1
	10	22.73	U	10	07	01.3	-8	31.5
	10		L	10	19	23.7	10	26.8
	11	23.73	U	11	07	46.2	12	14.2
	11		L	11	20	08.7	13	52.6
	12	24.73	U	12	08	31.5	15	21.2
	12		L	12	20	54.4	16	39.0
	13	25.73	U	13	09	17.6	-17	45.3
	13		L	13	21	41.0	18	39.3
	14	26.73	U	14	10	04.6	19	20.4
	14		L	14	22	28.4	19	47.9
	15	27.73	U	15	10	52.3	20	01.5
	15		L	15	23	16.3	20	00.8
	16	28.73	U	16	11	40.3	-19	45.9
	17	29.73	L	17	00	04.3	19	16.9
	17		U	17	12	28.1	18	34.1
	18	0.90	L	18	00	51.8	17	38.0
	18		U	18	13	15.3	16	29.2
	19	1.90	L	19	01	38.6	15	08.6
	19		U	19	14	01.7	-13	37.1
	20	2.90	L	20	02	24.6	11	55.7
	20		U	20	14	47.3	10	05.5
	21	3.90	L	21	03	09.9	8	07.6
	21		U	21	15	32.5	6	03.3
	22	4.90	L	22	03	55.1	3	53.6
	22		U	22	16	17.8	-1	40.0
	23	5.90	L	23	04	40.7	+0	36.3
	23		U	23	17	04.0	2	53.8
	24	6.90	L	24	05	27.6	+5	10.9

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Jan.	24	6.90	L	24	05	27.6	+5	10.9
	24		U	24	17	51.9	7	25.9
	25	7.90	L	25	06	16.7	9	37.0
	25		U	25	18	42.4	11	42.0
	26	8.90	L	26	07	08.9	13	38.6
	26		U	26	19	36.2	15	24.3
	27	9.90	L	27	08	04.5	+16	56.6
	27		U	27	20	33.7	18	12.8
	28	10.90	L	28	09	03.8	19	10.4
	28		U	28	21	34.4	19	47.2
	29	11.90	L	29	10	05.6	20	01.5
	29		U	29	22	37.0	19	52.5
	30	12.90	L	30	11	08.3	+19	20.1
	30		U	30	23	39.4	18	25.0
	31	13.90	L	31	12	09.9	17	09.2
Feb.	1	14.90	U	1	00	39.7	15	34.6
	1		L	1	13	08.7	13	44.4
	2	15.90	U	2	01	36.9	11	41.4
	2		L	2	14	04.1	+9	28.9
	3	16.90	U	3	02	30.5	7	09.7
	3		L	3	14	56.1	4	46.7
	4	17.90	U	4	03	21.0	+2	22.2
	4		L	4	15	45.3	-0	01.5
	5	18.90	U	5	04	09.1	-2	22.5
	5		L	5	16	32.6	-4	39.3
	6	19.90	U	6	04	55.7	6	50.3
	6		L	6	17	18.7	8	54.4
	7	20.90	U	7	05	41.6	10	50.6
	7		L	7	18	04.5	12	37.7
	8	21.90	U	8	06	27.4	14	15.0
	8		L	8	18	50.5	-15	41.7
	9	22.90	U	9	07	13.6	16	57.0
	9		L	9	19	37.0	18	00.3
	10	23.90	U	10	08	00.5	18	50.8
	10		L	10	20	24.1	19	28.1
	11	24.90	U	11	08	47.9	19	51.7
	11		L	11	21	11.8	-20	01.4
	12	25.90	U	12	09	35.8	19	56.7
	12		L	12	21	59.8	19	37.9
	13	26.90	U	13	10	23.8	19	04.9
	13		L	13	22	47.7	18	18.1
	14	27.90	U	14	11	11.4	17	17.9
	14		L	14	23	35.0	-16	05.0
	15	28.90	U	15	11	58.5	14	40.2
	16	0.12	L	16	00	21.7	13	04.5
	16		U	16	12	44.9	-11	18.9

MOON, 2018
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Feb.	16		U	16	12	44.9	-11	18.9
	17	1.12	L	17	01	07.8	9	24.5
	17		U	17	13	30.7	7	22.7
	18	2.12	L	18	01	53.5	5	14.7
	18		U	18	14	16.4	3	02.1
	19	3.12	L	19	02	39.3	-0	46.1
	19		U	19	15	02.5	+1	31.5
	20	4.12	L	20	03	25.9	3	49.2
	20		U	20	15	49.7	6	05.3
	21	5.12	L	21	04	13.9	8	18.0
	21		U	21	16	38.7	10	25.4
	22	6.12	L	22	05	04.1	12	25.5
	22		U	22	17	30.2	+14	16.2
	23	7.12	L	23	05	57.0	15	55.3
	23		U	23	18	24.6	17	20.5
	24	8.12	L	24	06	53.0	18	29.8
	24		U	24	19	21.9	19	21.2
	25	9.12	L	25	07	51.5	19	52.8
	25		U	25	20	21.5	+20	03.3
	26	10.12	L	26	08	51.7	19	52.1
	26		U	26	21	21.9	19	19.0
	27	11.12	L	27	09	51.9	18	24.6
	27		U	27	22	21.6	17	10.1
	28	12.12	L	28	10	50.8	15	37.5
	28		U	28	23	19.4	+13	48.8
Mar.	1	13.12	L	1	11	47.3	11	47.0
	2	14.12	U	2	00	14.5	9	34.7
	2		L	2	12	41.0	7	14.9
	3	15.12	U	3	01	06.8	4	50.1
	3		L	3	13	32.1	+2	23.2
	4	16.12	U	4	01	56.9	-0	03.6
	4		L	4	14	21.3	2	28.1
	5	17.12	U	5	02	45.4	4	48.4
	5		L	5	15	09.2	7	02.8
	6	18.12	U	6	03	32.8	9	09.9
	6		L	6	15	56.3	11	08.3
	7	19.12	U	7	04	19.8	-12	57.0
	7		L	7	16	43.3	14	35.1
	8	20.12	U	8	05	06.8	16	01.6
	8		L	8	17	30.4	17	15.9
	9	21.12	U	9	05	54.1	18	17.5
	9		L	9	18	17.9	19	05.6
	10	22.12	U	10	06	41.7	-19	40.1
	10		L	10	19	05.7	20	00.5
	11	23.12	U	11	07	29.6	20	06.7
	11		L	11	19	53.6	-19	58.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Mar.	11		L	11	19	53.6	-19	58.5
	12	24.12	U	12	08	17.6	19	36.1
	12		L	12	20	41.5	18	59.7
	13	25.12	U	13	09	05.3	18	09.5
	13		L	13	21	29.0	17	06.0
	14	26.12	U	14	09	52.5	15	49.8
	14		L	14	22	16.0	-14	21.7
	15	27.12	U	15	10	39.3	12	42.5
	15		L	15	23	02.5	10	53.3
	16	28.12	U	16	11	25.7	8	55.2
	16		L	16	23	48.8	6	49.4
	17	29.12	U	17	12	12.0	4	37.4
	18	0.45	L	18	00	35.3	-2	20.7
	18		U	18	12	58.7	-0	00.8
	19	1.45	L	19	01	22.4	+2	20.4
	19		U	19	13	46.4	4	41.2
	20	2.45	L	20	02	10.7	6	59.5
	20		U	20	14	35.5	9	13.3
	21	3.45	L	21	03	00.9	+11	20.4
	21		U	21	15	26.9	13	18.8
	22	4.45	L	22	03	53.4	15	06.2
	22		U	22	16	20.6	16	40.5
	23	5.45	L	23	04	48.4	17	59.6
	23		U	23	17	16.7	19	01.6
	24	6.45	L	24	05	45.5	+19	44.9
	24		U	24	18	14.7	20	08.4
	25	7.45	L	25	06	44.0	20	11.1
	25		U	25	19	13.4	19	53.0
	26	8.45	L	26	07	42.6	19	14.2
	26		U	26	20	11.6	18	15.5
	27	9.45	L	27	08	40.2	+16	58.3
	27		U	27	21	08.3	15	24.3
	28	10.45	L	28	09	35.8	13	35.6
	28		U	28	22	02.8	11	34.4
	29	11.45	L	29	10	29.2	9	23.2
	29		U	29	22	55.1	7	04.4
	30	12.45	L	30	11	20.4	+4	40.6
	30		U	30	23	45.4	+2	14.0
	31	13.45	L	31	12	09.9	-0	13.1
Apr.	1	14.45	U	1	00	34.2	2	38.4
	1		L	1	12	58.3	4	60.0
	2	15.45	U	2	01	22.3	7	16.1
	2		L	2	13	46.1	-9	25.0
	3	16.45	U	3	02	10.0	11	25.2
	3		L	3	14	33.8	13	15.6
	4	17.45	U	4	02	57.7	-14	54.9

MOON, 2018
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Apr.	1	14.45	U	1	00	34.2	-2	38.4
	1		L	1	12	58.3	4	60.0
	2	15.45	U	2	01	22.3	7	16.1
	2		L	2	13	46.1	9	25.0
	3	16.45	U	3	02	10.0	11	25.2
	3		L	3	14	33.8	13	15.6
	4	17.45	U	4	02	57.7	-14	54.9
	4		L	4	15	21.6	16	22.1
	5	18.45	U	5	03	45.7	17	36.5
	5		L	5	16	09.7	18	37.5
	6	19.45	U	6	04	33.9	19	24.4
	6		L	6	16	58.0	19	57.1
	7	20.45	U	7	05	22.2	-20	15.2
	7		L	7	17	46.3	20	18.8
	8	21.45	U	8	06	10.3	20	07.9
	8		L	8	18	34.2	19	42.6
	9	22.45	U	9	06	58.1	19	03.3
	9		L	9	19	21.7	18	10.5
	10	23.45	U	10	07	45.2	-17	04.5
	10		L	10	20	08.6	15	46.1
	11	24.45	U	11	08	31.9	14	15.9
	11		L	11	20	55.0	12	34.8
	12	25.45	U	12	09	18.1	10	43.7
	12		L	12	21	41.2	8	43.6
	13	26.45	U	13	10	04.3	-6	35.6
	13		L	13	22	27.5	4	21.1
	14	27.45	U	14	10	51.0	-2	01.5
	14		L	14	23	14.7	+0	21.6
	15	28.45	U	15	11	38.7	2	46.3
	16	29.45	L	16	00	03.2	5	10.6
	16		U	16	12	28.1	+7	32.5
	17	0.92	L	17	00	53.7	9	49.5
	17		U	17	13	19.8	11	59.2
	18	1.92	L	18	01	46.6	13	59.2
	18		U	18	14	14.1	15	46.8
	19	2.92	L	19	02	42.2	17	19.8
	19		U	19	15	10.9	+18	35.8
	20	3.92	L	20	03	40.0	19	33.1
	20		U	20	16	09.5	20	10.1
	21	4.92	L	21	04	39.1	20	26.0
	21		U	21	17	08.7	20	20.5
	22	5.92	L	22	05	38.1	19	53.8
	22		U	22	18	07.1	+19	06.7
	23	6.92	L	23	06	35.7	18	00.7
	23		U	23	19	03.7	16	37.2
	24	7.92	L	24	07	31.1	+14	58.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Apr.	24	7.92	L	24	07	31.1	+14	58.5
	24		U	24	19	57.9	13	06.4
	25	8.92	L	25	08	24.0	11	03.4
	25		U	25	20	49.5	8	51.5
	26	9.92	L	26	09	14.5	6	33.1
	26		U	26	21	39.1	4	10.3
	27	10.92	L	27	10	03.3	+1	45.2
	27		U	27	22	27.3	-0	40.1
	28	11.92	L	28	10	51.0	3	03.9
	28		U	28	23	14.6	5	24.1
	29	12.92	L	29	11	38.3	7	39.2
	30	13.92	U	30	00	01.9	9	47.4
	30		L	30	12	25.6	-11	47.3
May	1	14.92	U	1	00	49.4	13	37.4
	1		L	1	13	13.3	15	16.5
	2	15.92	U	2	01	37.4	16	43.6
	2		L	2	14	01.5	17	57.6
	3	16.92	U	3	02	25.8	18	57.8
	3		L	3	14	50.2	-19	43.7
	4	17.92	U	4	03	14.5	20	14.9
	4		L	4	15	38.9	20	31.2
	5	18.92	U	5	04	03.1	20	32.6
	5		L	5	16	27.2	20	19.2
	6	19.92	U	6	04	51.2	19	51.5
	6		L	6	17	14.9	-19	09.8
	7	20.92	U	7	05	38.5	18	14.6
	7		L	7	18	01.8	17	06.7
	8	21.92	U	8	06	24.9	15	46.7
	8		L	8	18	47.9	14	15.3
	9	22.92	U	9	07	10.7	12	33.3
	9		L	9	19	33.4	-10	41.8
	10	23.92	U	10	07	56.1	8	41.4
	10		L	10	20	18.9	6	33.4
	11	24.92	U	11	08	41.8	4	18.9
	11		L	11	21	05.0	-1	59.1
	12	25.92	U	12	09	28.4	+0	24.5
	12		L	12	21	52.4	+2	50.2
	13	26.92	U	13	10	16.8	5	16.0
	13		L	13	22	41.9	7	40.0
	14	27.92	U	14	11	07.7	9	59.5
	14		L	14	23	34.3	12	12.2
	15	28.92	U	15	12	01.7	14	15.0
	16	0.51	L	16	00	29.9	+16	05.2
	16		U	16	12	58.9	17	39.8
	17	1.51	L	17	01	28.5	18	56.5
	17		U	17	13	58.7	+19	52.9

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
May	17		U	17	13	58.7	+19	52.9
	18	2.51	L	18	02	29.2	20	27.4
	18		U	18	14	59.8	20	39.1
	19	3.51	L	19	03	30.4	20	27.9
	19		U	19	16	00.6	19	54.3
	20	4.51	L	20	04	30.2	18	59.6
	20		U	20	16	59.2	+17	45.7
	21	5.51	L	21	05	27.5	16	14.8
	21		U	21	17	54.9	14	29.3
	22	6.51	L	22	06	21.5	12	31.6
	22		U	22	18	47.4	10	24.1
	23	7.51	L	23	07	12.6	8	09.3
	23		U	23	19	37.2	+5	49.2
	24	8.51	L	24	08	01.3	3	26.0
	24		U	24	20	25.0	+1	01.5
	25	9.51	L	25	08	48.4	-1	22.4
	25		U	25	21	11.6	3	44.1
	26	10.51	L	26	09	34.8	6	01.9
	26		U	26	21	57.9	-8	14.2
	27	11.51	L	27	10	21.2	10	19.7
	27		U	27	22	44.5	12	16.9
	28	12.51	L	28	11	08.0	14	04.5
	28		U	28	23	31.7	15	41.2
	29	13.51	L	29	11	55.6	17	06.0
	30	14.51	U	30	00	19.7	-18	17.8
	30		L	30	12	44.0	19	15.9
	31	15.51	U	31	01	08.3	19	59.6
	31		L	31	13	32.7	20	28.5
June	1	16.51	U	1	01	57.1	20	42.3
	1		L	1	14	21.4	20	41.1
	2	17.51	U	2	02	45.5	-20	25.1
	2		L	2	15	09.5	19	54.6
	3	18.51	U	3	03	33.2	19	10.2
	3		L	3	15	56.6	18	12.5
	4	19.51	U	4	04	19.8	17	02.3
	4		L	4	16	42.7	15	40.4
	5	20.51	U	5	05	05.4	-14	07.7
	5		L	5	17	27.9	12	25.0
	6	21.51	U	6	05	50.2	10	33.2
	6		L	6	18	12.5	8	33.4
	7	22.51	U	7	06	34.7	6	26.4
	7		L	7	18	57.1	4	13.4
	8	23.51	U	8	07	19.8	-1	55.5
	8		L	8	19	42.7	+0	26.0
	9	24.51	U	9	08	06.1	2	49.6
	9		L	9	20	30.1	+5	13.8

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
June	9		L	9	20	30.1	+5	13.8
	10	25.51	U	10	08	54.7	7	36.4
	10		L	10	21	20.2	9	55.4
	11	26.51	U	11	09	46.5	12	08.1
	11		L	11	22	13.7	14	12.0
	12	27.51	U	12	10	41.9	16	03.8
	12		L	12	23	11.1	+17	40.8
	13	28.51	U	13	11	41.2	18	59.7
	14	0.18	L	14	00	11.9	19	58.1
	14		U	14	12	43.2	20	33.7
	15	1.18	L	15	01	14.8	20	45.3
	15		U	15	13	46.3	20	32.5
	16	2.18	L	16	02	17.5	+19	55.8
	16		U	16	14	48.2	18	56.6
	17	3.18	L	17	03	18.1	17	37.1
	17		U	17	15	47.2	15	59.9
	18	4.18	L	18	04	15.4	14	07.7
	18		U	18	16	42.6	12	03.6
	19	5.18	L	19	05	08.9	+9	50.3
	19		U	19	17	34.4	7	30.6
	20	6.18	L	20	05	59.2	5	06.6
	20		U	20	18	23.4	2	40.8
	21	7.18	L	21	06	47.2	+0	14.9
	21		U	21	19	10.6	-2	09.2
	22	8.18	L	22	07	33.7	-4	30.0
	22		U	22	19	56.7	6	46.0
	23	9.18	L	23	08	19.7	8	55.8
	23		U	23	20	42.7	10	58.1
	24	10.18	L	24	09	05.8	12	51.7
	24		U	24	21	29.1	14	35.4
	25	11.18	L	25	09	52.6	-16	08.2
	25		U	25	22	16.3	17	29.0
	26	12.18	L	26	10	40.2	18	36.9
	26		U	26	23	04.3	19	31.0
	27	13.18	L	27	11	28.5	20	10.9
	27		U	27	23	52.8	20	36.0
	28	14.18	L	28	12	17.1	-20	46.2
	29	15.18	U	29	00	41.4	20	41.3
	29		L	29	13	05.5	20	21.7
	30	16.18	U	30	01	29.4	19	47.6
	30		L	30	13	53.1	18	59.7
July	1	17.18	U	1	02	16.4	17	58.7
	1		L	1	14	39.5	-16	45.5
	2	18.18	U	2	03	02.3	15	20.8
	2		L	2	15	24.8	13	45.8
	3	19.18	U	3	03	47.1	-12	01.4

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
July	1	17.18	U	1	02	16.4	-17	58.7
	1		L	1	14	39.5	16	45.5
	2	18.18	U	2	03	02.3	15	20.8
	2		L	2	15	24.8	13	45.8
	3	19.18	U	3	03	47.1	12	01.4
	3		L	3	16	09.1	10	08.5
	4	20.18	U	4	04	31.1	-8	08.3
	4		L	4	16	53.0	6	01.8
	5	21.18	U	5	05	15.0	3	50.1
	5		L	5	17	37.1	-1	34.2
	6	22.18	U	6	05	59.5	+0	44.5
	6		L	6	18	22.3	3	04.8
	7	23.18	U	7	06	45.6	+5	25.2
	7		L	7	19	09.6	7	43.9
	8	24.18	U	8	07	34.3	9	59.0
	8		L	8	19	59.9	12	08.4
	9	25.18	U	9	08	26.4	14	09.5
	9		L	9	20	54.0	15	59.6
	10	26.18	U	10	09	22.6	+17	35.7
	10		L	10	21	52.2	18	55.0
	11	27.18	U	11	10	22.6	19	54.6
	11		L	11	22	53.9	20	32.1
	12	28.18	U	12	11	25.5	20	45.6
	12		L	12	23	57.4	20	34.4
	13	29.18	U	13	12	29.2	+19	58.3
	14	0.88	L	14	01	00.6	18	58.5
	14		U	14	13	31.4	17	37.1
	15	1.88	L	15	02	01.4	15	56.5
	15		U	15	14	30.5	14	00.0
	16	2.88	L	16	02	58.6	11	50.7
	16		U	16	15	25.8	+9	31.9
	17	3.88	L	17	03	52.1	7	06.5
	17		U	17	16	17.6	4	37.5
	18	4.88	L	18	04	42.5	+2	07.2
	18		U	18	17	06.8	-0	22.2
	19	5.88	L	19	05	30.6	2	48.8
	19		U	19	17	54.2	-5	10.9
	20	6.88	L	20	06	17.5	7	27.0
	20		U	20	18	40.7	9	35.9
	21	7.88	L	21	07	04.0	11	36.3
	21		U	21	19	27.2	13	27.1
	22	8.88	L	22	07	50.6	15	07.3
	22		U	22	20	14.1	-16	35.9
	23	9.88	L	23	08	37.8	17	52.2
	23		U	23	21	01.6	18	55.3
	24	10.88	L	24	09	25.6	-19	44.6

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
July	24	10.88	L	24	09	25.6	-19	44.6
	24		U	24	21	49.7	20	19.5
	25	11.88	L	25	10	13.9	20	39.8
	25		U	25	22	38.1	20	45.1
	26	12.88	L	26	11	02.3	20	35.5
	26		U	26	23	26.3	20	11.3
	27	13.88	L	27	11	50.1	-19	32.8
	28	14.88	U	28	00	13.8	18	40.5
	28		L	28	12	37.1	17	35.4
	29	15.88	U	29	01	00.1	16	18.1
	29		L	29	13	22.9	14	49.7
	30	16.88	U	30	01	45.4	13	11.2
	30		L	30	14	07.6	-11	23.6
	31	17.88	U	31	02	29.6	9	28.2
	31		L	31	14	51.5	7	26.1
Aug.	1	18.88	U	1	03	13.3	5	18.3
	1		L	1	15	35.1	3	06.1
	2	19.88	U	2	03	57.0	-0	50.7
	2		L	2	16	19.2	+1	26.6
	3	20.88	U	3	04	41.6	3	44.5
	3		L	3	17	04.5	6	01.5
	4	21.88	U	4	05	28.0	8	16.0
	4		L	4	17	52.1	10	26.3
	5	22.88	U	5	06	17.0	12	30.4
	5		L	5	18	42.8	+14	26.1
	6	23.88	U	6	07	09.5	16	11.0
	6		L	6	19	37.3	17	42.6
	7	24.88	U	7	08	05.9	18	58.2
	7		L	7	20	35.5	19	55.4
	8	25.88	U	8	09	05.9	20	31.6
	8		L	8	21	36.8	+20	45.2
	9	26.88	U	9	10	08.1	20	34.9
	9		L	9	22	39.6	20	00.3
	10	27.88	U	10	11	10.8	19	02.0
	10		L	10	23	41.7	17	41.4
	11	28.88	U	11	12	12.0	16	00.9
	12	0.58	L	12	00	41.5	+14	03.2
	12		U	12	13	10.2	11	51.7
	13	1.58	L	13	01	38.1	9	29.4
	13		U	13	14	05.2	6	59.9
	14	2.58	L	14	02	31.5	4	26.1
	14		U	14	14	57.1	+1	50.9
	15	3.58	L	15	03	22.2	-0	43.2
	15		U	15	15	46.8	3	14.0
	16	4.58	L	16	04	11.1	5	39.5
	16		U	16	16	35.1	-7	58.1

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Date	Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
	d		d	h	m	°	'
Aug. 16		U	16	16	35.1	-7	58.1
17	5.58	L	17	04	58.9	10	08.3
17		U	17	17	22.7	12	08.9
18	6.58	L	18	05	46.4	13	58.9
18		U	18	18	10.2	15	37.2
19	7.58	L	19	06	34.1	17	03.1
19		U	19	18	58.0	-18	15.8
20	8.58	L	20	07	22.1	19	14.7
20		U	20	19	46.2	19	59.3
21	9.58	L	21	08	10.4	20	29.3
21		U	21	20	34.5	20	44.4
22	10.58	L	22	08	58.7	20	44.6
22		U	22	21	22.8	-20	30.0
23	11.58	L	23	09	46.7	20	00.7
23		U	23	22	10.5	19	17.3
24	12.58	L	24	10	34.0	18	20.4
24		U	24	22	57.3	17	10.6
25	13.58	L	25	11	20.4	15	48.9
25		U	25	23	43.1	-14	16.1
26	14.58	L	26	12	05.6	12	33.4
27	15.58	U	27	00	27.9	10	41.8
27		L	27	12	50.0	8	42.6
28	16.58	U	28	01	12.0	6	37.0
28		L	28	13	34.0	4	26.2
29	17.58	U	29	01	55.9	-2	11.5
29		L	29	14	18.0	+0	05.6
30	18.58	U	30	02	40.3	2	23.9
30		L	30	15	02.9	4	41.7
31	19.58	U	31	03	25.8	6	57.5
31		L	31	15	49.3	9	09.8
Sept. 1	20.58	U	1	04	13.3	+11	16.6
1		L	1	16	38.0	13	16.1
2	21.58	U	2	05	03.5	15	06.2
2		L	2	17	29.8	16	44.8
3	22.58	U	3	05	56.9	18	09.8
3		L	3	18	24.9	19	18.8
4	23.58	U	4	06	53.6	+20	09.7
4		L	4	19	23.0	20	40.6
5	24.58	U	5	07	52.9	20	50.0
5		L	5	20	23.2	20	36.9
6	25.58	U	6	08	53.6	20	00.9
6		L	6	21	23.9	19	02.5
7	26.58	U	7	09	54.0	+17	42.6
7		L	7	22	23.6	16	03.1
8	27.58	U	8	10	52.7	14	06.4
8		L	8	23	21.1	+11	55.2

Date	Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
	d		d	h	m	°	'
Sept. 8		L	8	23	21.1	+11	55.2
9	28.58	U	9	11	49.0	9	32.7
10	0.25	L	10	00	16.2	7	01.8
10		U	10	12	42.7	4	25.7
11	1.25	L	11	01	08.8	+1	47.4
11		U	11	13	34.3	-0	50.4
12	2.25	L	12	01	59.5	-3	25.1
12		U	12	14	24.4	5	54.6
13	3.25	L	13	02	49.1	8	16.8
13		U	13	15	13.6	10	30.2
14	4.25	L	14	03	38.1	12	33.1
14		U	14	16	02.5	14	24.5
15	5.25	L	15	04	26.9	-16	03.1
15		U	15	16	51.3	17	28.4
16	6.25	L	16	05	15.7	18	39.4
16		U	16	17	40.2	19	35.8
17	7.25	L	17	06	04.7	20	17.2
17		U	17	18	29.1	20	43.4
18	8.25	L	18	06	53.5	-20	54.2
18		U	18	19	17.7	20	50.0
19	9.25	L	19	07	41.8	20	30.7
19		U	19	20	05.7	19	57.0
20	10.25	L	20	08	29.4	19	09.1
20		U	20	20	52.9	18	07.9
21	11.25	L	21	09	16.1	-16	54.0
21		U	21	21	39.1	15	28.2
22	12.25	L	22	10	01.8	13	51.5
22		U	22	22	24.3	12	04.8
23	13.25	L	23	10	46.7	10	09.4
23		U	23	23	08.9	8	06.3
24	14.25	L	24	11	31.1	-5	56.7
24		U	24	23	53.2	3	42.1
25	15.25	L	25	12	15.5	-1	23.7
26	16.25	U	26	00	37.9	+0	56.8
26		L	26	13	00.6	3	18.0
27	17.25	U	27	01	23.6	5	38.2
27		L	27	13	47.0	+7	55.5
28	18.25	U	28	02	11.0	10	08.2
28		L	28	14	35.5	12	14.2
29	19.25	U	29	03	00.6	14	11.6
29		L	29	15	26.4	15	58.1
30	20.25	U	30	03	53.0	17	31.8
30		L	30	16	20.2	+18	50.5
Oct. 1	21.25	U	1	04	48.1	19	52.3
1		L	1	17	16.6	20	35.4
2	22.25	U	2	05	45.5	+20	58.4

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination		Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'			d		d	h	m	°	'
Oct.	1	21.25	U	1	04	48.1	+19	52.3	Oct.	24	14.84	L	24	11	41.4	+6	14.0
	1		L	1	17	16.6	20	35.4		25	15.84	U	25	00	05.4	8	34.4
	2	22.25	U	2	05	45.5	20	58.4		25		L	25	12	30.0	10	49.7
	2		L	2	18	14.8	21	00.2		26	16.84	U	26	00	55.2	12	57.6
	3	23.25	U	3	06	44.2	20	40.4		26		L	26	13	21.1	14	55.8
	3		L	3	19	13.6	19	59.0		27	17.84	U	27	01	47.8	16	42.0
	4	24.25	U	4	07	42.9	+18	56.6		27		L	27	14	15.2	+18	13.7
	4		L	4	20	11.8	17	34.3		28	18.84	U	28	02	43.2	19	28.8
	5	25.25	U	5	08	40.4	15	53.9		28		L	28	15	11.8	20	25.3
	5		L	5	21	08.4	13	57.3		29	19.84	U	29	03	40.8	21	01.7
	6	26.25	U	6	09	35.9	11	47.1		29		L	29	16	10.1	21	16.8
	6		L	6	22	02.9	9	25.8		30	20.84	U	30	04	39.5	21	10.2
	7	27.25	U	7	10	29.5	+6	56.1		30		L	30	17	08.9	+20	41.8
	7		L	7	22	55.5	4	20.7		31	21.84	U	31	05	38.0	19	52.2
	8	28.25	U	8	11	21.2	+1	42.5		31		L	31	18	06.7	18	42.5
	8		L	8	23	46.6	-0	55.9	Nov.	1	22.84	U	1	06	34.9	17	14.4
	9	29.25	U	9	12	11.8	3	32.0		1		L	1	19	02.6	15	29.7
	10	0.84	L	10	00	36.8	6	03.6		2	23.84	U	2	07	29.7	13	30.6
	10		U	10	13	01.6	-8	28.3		2		L	2	19	56.3	+11	19.3
	11	1.84	L	11	01	26.5	10	44.3		3	24.84	U	3	08	22.3	8	58.2
	11		U	11	13	51.3	12	49.8		3		L	3	20	47.9	6	29.8
	12	2.84	L	12	02	16.2	14	43.4		4	25.84	U	4	09	13.1	3	56.5
	12		U	12	14	41.1	16	23.8		4		L	4	21	37.9	+1	20.5
	13	3.84	L	13	03	06.1	17	50.0		5	26.84	U	5	10	02.6	-1	15.7
	13		U	13	15	31.0	-19	01.3		5		L	5	22	27.2	-3	49.9
	14	4.84	L	14	03	56.0	19	57.0		6	27.84	U	6	10	51.6	6	20.0
	14		U	14	16	20.9	20	37.0		6		L	6	23	16.2	8	43.9
	15	5.84	L	15	04	45.8	21	01.0		7	28.84	U	7	11	40.8	10	59.6
	15		U	15	17	10.4	21	09.2		8	0.33	L	8	00	05.5	13	05.4
	16	6.84	L	16	05	34.9	21	01.7		8		U	8	12	30.4	14	59.5
	16		U	16	17	59.2	-20	39.1		9	1.33	L	9	00	55.4	-16	40.6
	17	7.84	L	17	06	23.1	20	01.9		9		U	9	13	20.5	18	07.5
	17		U	17	18	46.8	19	10.6		10	2.33	L	10	01	45.8	19	19.1
	18	8.84	L	18	07	10.2	18	06.1		10		U	10	14	11.0	20	14.8
	18		U	18	19	33.3	16	49.1		11	3.33	L	11	02	36.3	20	54.3
	19	9.84	L	19	07	56.1	15	20.5		11		U	11	15	01.4	21	17.2
	19		U	19	20	18.7	-13	41.1		12	4.33	L	12	03	26.4	-21	23.9
	20	10.84	L	20	08	41.1	11	52.0		12		U	12	15	51.1	21	14.5
	20		U	20	21	03.3	9	54.1		13	5.33	L	13	04	15.6	20	49.6
	21	11.84	L	21	09	25.5	7	48.5		13		U	13	16	39.7	20	09.9
	21		U	21	21	47.6	5	36.4		14	6.33	L	14	05	03.4	19	16.2
	22	12.84	L	22	10	09.9	3	19.0		14		U	14	17	26.7	18	09.3
	22		U	22	22	32.3	-0	57.6		15	7.33	L	15	05	49.7	-16	50.2
	23	13.84	L	23	10	55.0	+1	26.1		15		U	15	18	12.3	15	19.9
	23		U	23	23	18.0	3	50.6		16	8.33	L	16	06	34.7	13	39.2
	24	14.84	L	24	11	41.4	+6	14.0		16		U	16	18	56.8	-11	49.1

MOON, 2018
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Nov.	16		U	16	18	56.8	-11	49.1
	17	9.33	L	17	07	18.7	9	50.5
	17		U	17	19	40.6	7	44.6
	18	10.33	L	18	08	02.5	5	32.2
	18		U	18	20	24.5	3	14.6
	19	11.33	L	19	08	46.7	-0	52.9
	19		U	19	21	09.2	+1	31.5
	20	12.33	L	20	09	32.2	3	57.0
	20		U	20	21	55.6	6	22.0
	21	13.33	L	21	10	19.8	8	44.4
	21		U	21	22	44.6	11	02.0
	22	14.33	L	22	11	10.3	13	12.5
	22		U	22	23	36.8	+15	13.3
	23	15.33	L	23	12	04.2	17	01.5
	24	16.33	U	24	00	32.4	18	34.6
	24		L	24	13	01.4	19	49.8
	25	17.33	U	25	01	31.0	20	45.1
	25		L	25	14	01.1	21	18.4
	26	18.33	U	26	02	31.5	+21	28.9
	26		L	26	15	01.8	21	16.0
	27	19.33	U	27	03	31.9	20	40.1
	27		L	27	16	01.6	19	42.4
	28	20.33	U	28	04	30.7	18	24.5
	28		L	28	16	59.1	16	48.5
	29	21.33	U	29	05	26.7	+14	56.9
	29		L	29	17	53.6	12	52.1
	30	22.33	U	30	06	19.8	10	36.7
	30		L	30	18	45.4	8	13.2
Dec.	1	23.33	U	1	07	10.4	5	43.9
	1		L	1	19	35.0	3	11.0
	2	24.33	U	2	07	59.2	+0	36.8
	2		L	2	20	23.2	-1	56.7
	3	25.33	U	3	08	47.1	4	27.7
	3		L	3	21	11.0	6	54.2
	4	26.33	U	4	09	34.9	9	14.4
	4		L	4	21	59.0	11	26.6
	5	27.33	U	5	10	23.2	-13	29.1
	5		L	5	22	47.7	15	20.5
	6	28.33	U	6	11	12.4	16	59.1
	6		L	6	23	37.3	18	24.0
	7	29.33	U	7	12	02.4	19	33.8
	8	0.69	L	8	00	27.6	20	28.0
	8		U	8	12	52.9	-21	05.8
	9	1.69	L	9	01	18.1	21	27.1
	9		U	9	13	43.1	21	31.9
	10	2.69	L	10	02	08.0	-21	20.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Dec.	10	2.69	L	10	02	08.0	-21	20.5
	10		U	10	14	32.5	20	53.4
	11	3.69	L	11	02	56.7	20	11.4
	11		U	11	15	20.4	19	15.4
	12	4.69	L	12	03	43.8	18	06.4
	12		U	12	16	06.7	16	45.4
	13	5.69	L	13	04	29.2	-15	13.5
	13		U	13	16	51.3	13	31.7
	14	6.69	L	14	05	13.2	11	41.0
	14		U	14	17	34.8	9	42.6
	15	7.69	L	15	05	56.3	7	37.3
	15		U	15	18	17.7	5	26.2
	16	8.69	L	16	06	39.3	-3	10.3
	16		U	16	19	01.0	-0	50.7
	17	9.69	L	17	07	23.0	+1	31.4
	17		U	17	19	45.4	3	54.8
	18	10.69	L	18	08	08.4	6	17.7
	18		U	18	20	32.1	8	38.6
	19	11.69	L	19	08	56.6	+10	55.5
	19		U	19	21	21.9	13	06.0
	20	12.69	L	20	09	48.3	15	07.5
	20		U	20	22	15.6	16	57.4
	21	13.69	L	21	10	44.0	18	32.6
	21		U	21	23	13.4	19	50.3
	22	14.69	L	22	11	43.6	+20	47.6
	23	15.69	U	23	00	14.5	21	22.4
	23		L	23	12	45.8	21	32.9
	24	16.69	U	24	01	17.2	21	18.6
	24		L	24	13	48.4	20	39.6
	25	17.69	U	25	02	19.2	19	37.1
	25		L	25	14	49.3	+18	13.1
	26	18.69	U	26	03	18.7	16	30.1
	26		L	26	15	47.2	14	31.1
	27	19.69	U	27	04	14.8	12	19.0
	27		L	27	16	41.5	9	57.1
	28	20.69	U	28	05	07.5	7	28.0
	28		L	28	17	32.8	+4	54.4
	29	21.69	U	29	05	57.5	+2	18.8
	29		L	29	18	21.8	-0	16.6
	30	22.69	U	30	06	45.7	2	49.9
	30		L	30	19	09.5	5	19.2
	31	23.69	U	31	07	33.1	7	42.8
	31		L	31	19	56.8	-9	59.3
	32	24.69	U	1	08	20.6	12	07.0
	32		L	1	20	44.5	14	04.7
	33	25.69	U	2	09	08.6	-15	50.9

MOON, 2018
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Jan.	0	-3.684	+6.158	63.93	+0.96	352	253	0.932
	1	-1.676	5.231	76.06	0.93	359	254	0.980
	2	+0.444	3.924	88.18	0.90	5	210	0.999
	3	2.498	2.338	100.31	0.86	12	108	0.987
	4	4.323	+0.609	112.43	0.83	17	107	0.946
	5	5.797	-1.124	124.56	0.80	21	109	0.881
	6	+6.848	-2.738	136.69	+0.77	24	111	0.796
	7	7.453	4.140	148.83	0.74	25	112	0.700
	8	7.626	5.269	160.98	0.71	24	112	0.598
	9	7.410	6.092	173.13	0.68	23	112	0.495
	10	6.860	6.595	185.29	0.66	20	111	0.395
	11	6.038	6.780	197.46	0.63	17	109	0.301
	12	+5.004	-6.657	209.63	+0.61	13	107	0.217
	13	3.815	6.243	221.81	0.58	8	104	0.144
	14	2.523	5.564	233.99	0.56	3	101	0.085
	15	+1.172	4.648	246.17	0.54	358	98	0.040
	16	-0.198	3.533	258.36	0.52	353	97	0.011
	17	-1.552	2.262	270.55	0.50	348	138	0.000
	18	-2.853	-0.885	282.74	+0.48	344	251	0.007
	19	4.066	+0.544	294.93	0.46	340	253	0.033
	20	5.151	1.964	307.11	0.43	337	251	0.076
	21	6.062	3.313	319.30	0.41	336	250	0.137
	22	6.753	4.529	331.48	0.39	335	249	0.212
	23	7.171	5.548	343.65	0.37	336	249	0.302
	24	-7.269	+6.306	355.82	+0.34	338	249	0.402
	25	7.006	6.745	07.98	0.32	341	251	0.509
	26	6.357	6.814	20.13	0.29	345	253	0.619
	27	5.325	6.476	32.28	0.26	350	257	0.725
	28	3.946	5.721	44.42	0.23	356	261	0.823
	29	2.291	4.572	56.55	0.19	2	266	0.905
	30	-0.470	+3.097	68.69	+0.16	9	272	0.964
	31	+1.387	+1.403	80.81	0.12	15	275	0.995
Feb.	1	3.138	-0.378	92.94	0.08	19	105	0.997
	2	4.658	2.107	105.07	0.04	23	107	0.970
	3	5.845	3.660	117.20	+0.01	24	109	0.918
	4	6.632	4.947	129.34	-0.03	25	110	0.846
	5	+6.993	-5.914	141.48	-0.06	23	110	0.760
	6	6.934	6.537	153.63	0.10	21	109	0.665
	7	6.492	6.817	165.78	0.13	18	107	0.567
	8	5.722	6.769	177.94	0.15	14	105	0.468
	9	4.690	6.417	190.11	0.18	10	101	0.373
	10	3.468	5.791	202.29	0.21	5	98	0.284
	11	+2.131	-4.923	214.47	-0.23	359	93	0.203
	12	+0.746	3.848	226.65	0.26	354	89	0.133
	13	-0.621	2.606	238.84	0.28	349	84	0.076
	14	1.916	-1.243	251.04	0.30	345	79	0.033
	15	-3.090	+0.189	263.23	-0.32	341	72	0.007

MOON, 2018
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic		The Sun's Selenographic		Position Angle of		Fraction Illuminated
		Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
		°	°	°	°	°	°	
Feb.	15	-3.090	+0.189	263.23	-0.32	341	72	0.007
	16	4.103	1.630	275.43	0.34	338	292	0.000
	17	4.926	3.016	287.63	0.37	336	258	0.013
	18	5.534	4.278	299.83	0.39	335	254	0.045
	19	5.911	5.348	312.02	0.41	336	252	0.097
	20	6.045	6.161	324.21	0.43	337	252	0.168
	21	-5.931	+6.663	336.40	-0.45	340	253	0.255
	22	5.567	6.808	348.58	0.48	344	255	0.354
	23	4.956	6.570	0.75	0.50	348	258	0.463
	24	4.109	5.942	12.92	0.53	354	263	0.576
	25	3.049	4.942	25.08	0.56	0	268	0.686
	26	1.810	3.618	37.23	0.59	7	273	0.789
	27	-0.443	+2.049	49.38	-0.62	13	279	0.877
	28	+0.981	+0.341	61.53	0.65	18	286	0.943
Mar.	1	2.378	-1.385	73.67	0.68	21	294	0.985
	2	3.652	3.004	85.81	0.72	24	10	1.000
	3	4.711	4.406	97.95	0.75	25	99	0.987
	4	5.471	5.513	110.09	0.78	24	104	0.950
	5	+5.876	-6.275	122.24	-0.82	22	106	0.892
	6	5.897	6.678	134.39	0.84	19	105	0.818
	7	5.540	6.733	146.55	0.87	15	103	0.733
	8	4.837	6.464	158.71	0.90	11	100	0.642
	9	3.846	5.908	170.88	0.92	6	97	0.547
	10	2.639	5.100	183.06	0.94	1	92	0.451
	11	+1.299	-4.082	195.24	-0.96	356	88	0.359
	12	-0.087	2.893	207.43	0.98	351	83	0.271
	13	1.437	1.575	219.62	1.00	346	79	0.191
	14	2.670	-0.177	231.83	1.02	342	74	0.122
	15	3.719	+1.248	244.03	1.03	339	69	0.066
	16	4.530	2.640	256.24	1.05	337	62	0.025
	17	-5.069	+3.930	268.45	-1.06	336	42	0.004
	18	5.319	5.046	280.66	1.08	336	282	0.003
	19	5.288	5.917	292.87	1.09	337	261	0.025
	20	5.002	6.479	305.08	1.11	339	258	0.069
	21	4.503	6.684	317.29	1.12	343	258	0.134
	22	3.836	6.507	329.50	1.13	347	260	0.219
	23	-3.047	+5.946	341.69	-1.15	353	264	0.318
	24	2.175	5.026	353.88	1.17	359	268	0.427
	25	1.248	3.797	6.07	1.18	5	274	0.541
	26	-0.285	2.332	18.25	1.20	11	279	0.654
	27	+0.697	+0.722	30.42	1.22	16	284	0.758
	28	1.675	-0.930	42.59	1.24	20	289	0.849
	29	+2.617	-2.517	54.75	-1.27	23	295	0.921
	30	3.473	3.937	66.91	1.29	24	302	0.971
	31	4.185	5.104	79.06	1.31	24	323	0.995
Apr.	1	4.688	5.956	91.22	1.33	23	75	0.996
	2	+4.924	-6.459	103.38	-1.35	20	96	0.973

MOON, 2018
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	+4.688	-5.956	91.22	-1.33	23	75	0.996
	2	4.924	6.459	103.38	1.35	20	96	0.973
	3	4.850	6.608	115.54	1.37	17	99	0.930
	4	4.450	6.421	127.70	1.39	13	98	0.870
	5	3.736	5.930	139.87	1.40	8	95	0.796
	6	2.746	5.177	152.05	1.41	3	92	0.713
	7	+1.541	-4.206	164.23	-1.43	358	88	0.623
	8	+0.200	3.062	176.42	1.44	352	84	0.530
	9	-1.189	1.790	188.62	1.45	348	79	0.436
	10	2.529	-0.436	200.82	1.45	343	75	0.343
	11	3.729	+0.954	213.02	1.46	340	71	0.255
	12	4.700	2.323	225.24	1.47	337	67	0.175
	13	-5.370	+3.612	237.46	-1.47	336	64	0.106
	14	5.689	4.752	249.68	1.48	335	59	0.051
	15	5.635	5.670	261.91	1.48	336	50	0.016
	16	5.223	6.295	274.13	1.49	338	351	0.002
	17	4.500	6.567	286.36	1.49	342	274	0.013
	18	3.547	6.448	298.59	1.49	346	266	0.049
	19	-2.457	+5.931	310.81	-1.49	351	266	0.109
	20	1.323	5.043	323.04	1.49	357	269	0.190
	21	-0.220	3.840	335.25	1.50	4	274	0.289
	22	+0.800	2.403	347.46	1.50	10	279	0.398
	23	1.712	+0.829	359.66	1.50	15	284	0.512
	24	2.509	-0.783	11.86	1.51	19	288	0.624
	25	+3.192	-2.333	24.05	-1.51	22	292	0.729
	26	3.763	3.731	36.23	1.52	24	295	0.821
	27	4.211	4.899	48.42	1.53	24	298	0.897
	28	4.517	5.778	60.59	1.54	24	302	0.952
	29	4.647	6.328	72.77	1.54	21	312	0.986
	30	4.566	6.535	84.94	1.55	18	13	0.998
May	1	+4.244	-6.405	97.12	-1.55	14	82	0.988
	2	3.665	5.963	109.29	1.55	10	90	0.959
	3	2.829	5.247	121.47	1.55	5	90	0.912
	4	1.764	4.303	133.66	1.55	359	87	0.851
	5	+0.515	3.180	145.84	1.55	354	84	0.777
	6	-0.852	1.928	158.04	1.55	349	80	0.694
	7	-2.256	-0.594	170.24	-1.55	345	76	0.604
	8	3.605	+0.774	182.44	1.54	341	73	0.510
	9	4.802	2.125	194.66	1.54	338	69	0.414
	10	5.752	3.405	206.87	1.53	336	67	0.319
	11	6.369	4.555	219.10	1.53	335	64	0.230
	12	6.586	5.508	231.33	1.52	336	63	0.149
	13	-6.364	+6.194	243.57	-1.51	337	61	0.081
	14	5.708	6.547	255.80	1.51	340	57	0.032
	15	4.668	6.512	268.05	1.50	344	37	0.005
	16	3.337	6.065	280.29	1.48	349	293	0.005
	17	-1.838	+5.217	292.53	-1.47	355	275	0.033

MOON, 2018
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		°	°	°	°	°	°	
May	17	-1.838	+5.217	292.53	-1.47	355	275	0.033
	18	-0.303	4.020	304.77	1.46	2	275	0.088
	19	+1.150	2.562	317.01	1.45	8	278	0.166
	20	2.435	+0.951	329.24	1.44	14	283	0.263
	21	3.502	-0.697	341.46	1.43	19	287	0.371
	22	4.332	2.277	353.68	1.42	22	290	0.483
	23	+4.929	-3.695	5.89	-1.41	24	293	0.594
	24	5.305	4.878	18.10	1.40	25	295	0.699
	25	5.476	5.774	30.30	1.39	24	296	0.792
	26	5.449	6.348	42.50	1.38	22	297	0.870
	27	5.226	6.586	54.69	1.37	19	298	0.931
	28	4.804	6.492	66.88	1.36	15	300	0.973
	29	+4.179	-6.083	79.07	-1.35	11	316	0.995
	30	3.350	5.394	91.25	1.34	6	55	0.997
	31	2.328	4.466	103.44	1.33	1	80	0.980
June	1	+1.134	3.349	115.63	1.32	356	82	0.946
	2	-0.192	2.094	127.83	1.30	351	80	0.896
	3	1.598	-0.753	140.03	1.29	346	77	0.832
	4	-3.017	+0.621	152.23	-1.27	342	74	0.756
	5	4.369	1.979	164.44	1.26	339	71	0.670
	6	5.568	3.268	176.65	1.24	337	69	0.577
	7	6.523	4.434	188.87	1.23	336	67	0.479
	8	7.147	5.420	201.09	1.21	336	65	0.379
	9	7.365	6.164	213.33	1.20	337	65	0.281
	10	-7.126	+6.603	225.56	-1.18	339	65	0.190
	11	6.414	6.678	237.81	1.16	342	66	0.111
	12	5.261	6.348	250.05	1.14	347	66	0.049
	13	3.746	5.600	262.31	1.12	353	62	0.011
	14	1.994	4.461	274.56	1.10	359	322	0.001
	15	0.151	3.006	286.81	1.08	6	282	0.021
	16	+1.637	+1.345	299.06	-1.05	12	282	0.070
	17	3.246	-0.389	311.31	1.03	17	285	0.144
	18	4.588	2.068	323.55	1.01	21	289	0.237
	19	5.613	3.582	335.78	0.99	24	291	0.341
	20	6.304	4.845	348.01	0.96	24	293	0.451
	21	6.668	5.803	0.23	0.94	24	294	0.561
	22	+6.725	-6.426	12.45	-0.92	22	294	0.664
	23	6.503	6.705	24.66	0.90	20	293	0.758
	24	6.031	6.648	36.87	0.88	16	291	0.839
	25	5.335	6.274	49.07	0.86	12	289	0.905
	26	4.443	5.615	61.27	0.83	7	288	0.954
	27	3.380	4.709	73.46	0.81	2	288	0.986
	28	+2.173	-3.603	85.66	-0.79	357	319	0.999
	29	+0.854	2.346	97.85	0.76	352	72	0.994
	30	-0.539	-0.993	110.05	0.74	347	77	0.971
July	1	1.962	+0.402	122.25	0.72	343	75	0.932
	2	-3.360	+1.785	134.45	-0.70	340	73	0.876

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		°	°	°	°	°	°	
July	1	-1.962	+0.402	122.25	-0.72	343	75	0.932
	2	3.360	1.785	134.45	0.70	340	73	0.876
	3	4.673	3.102	146.65	0.67	337	71	0.807
	4	5.831	4.300	158.86	0.65	336	69	0.726
	5	6.761	5.325	171.08	0.63	335	68	0.634
	6	7.388	6.122	183.30	0.61	336	67	0.535
	7	-7.645	+6.639	195.52	-0.59	338	68	0.431
	8	7.478	6.822	207.75	0.56	341	69	0.327
	9	6.858	6.626	219.99	0.54	345	71	0.228
	10	5.793	6.027	232.24	0.52	350	75	0.139
	11	4.331	5.025	244.49	0.49	356	79	0.068
	12	2.566	3.663	256.74	0.47	3	82	0.020
	13	-0.627	+2.029	268.99	-0.44	9	55	0.000
	14	+1.340	+0.248	281.25	0.41	15	284	0.012
	15	3.188	-1.537	293.50	0.38	20	286	0.054
	16	4.794	3.188	305.75	0.35	23	289	0.121
	17	6.066	4.594	317.99	0.32	24	291	0.208
	18	6.949	5.680	330.23	0.29	24	292	0.307
	19	+7.427	-6.408	342.46	-0.26	23	292	0.413
	20	7.510	6.769	354.69	0.23	21	291	0.519
	21	7.230	6.774	6.91	0.21	17	289	0.621
	22	6.633	6.452	19.12	0.18	13	286	0.716
	23	5.772	5.836	31.33	0.15	9	283	0.800
	24	4.700	4.967	43.53	0.12	3	279	0.872
	25	+3.469	-3.889	55.73	-0.09	358	275	0.929
	26	2.131	2.651	67.93	0.06	353	270	0.970
	27	+0.733	-1.303	80.13	-0.03	348	266	0.994
	28	-0.680	+0.100	92.32	+0.00	344	78	1.000
	29	2.064	1.503	104.51	0.02	340	77	0.988
	30	3.376	2.850	116.71	0.05	338	74	0.959
	31	-4.570	+4.084	128.90	+0.07	336	72	0.912
Aug.	1	5.601	5.151	141.10	0.10	336	70	0.849
	2	6.418	5.998	153.31	0.12	336	70	0.772
	3	6.975	6.577	165.51	0.14	337	70	0.682
	4	7.222	6.842	177.73	0.16	340	71	0.582
	5	7.119	6.756	189.95	0.19	344	73	0.476
	6	-6.639	+6.295	202.17	+0.21	348	76	0.367
	7	5.771	5.452	214.40	0.23	354	81	0.262
	8	4.535	4.248	226.64	0.25	0	86	0.166
	9	2.980	2.740	238.88	0.28	7	92	0.087
	10	-1.194	+1.022	251.13	0.30	13	99	0.030
	11	+0.707	-0.779	263.38	0.33	18	112	0.003
	12	+2.587	-2.520	275.62	+0.36	22	277	0.005
	13	4.306	4.066	287.87	0.39	24	285	0.038
	14	5.740	5.311	300.12	0.42	24	288	0.096
	15	6.795	6.189	312.36	0.45	24	289	0.174
	16	+7.417	-6.677	324.59	+0.48	21	288	0.266

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		°	°	°	°	°	°	
Aug.	16	+7.417	-6.677	324.59	+0.48	21	288	0.266
	17	7.594	6.783	336.82	0.51	18	287	0.366
	18	7.348	6.537	349.04	0.54	14	284	0.468
	19	6.729	5.981	1.26	0.57	10	281	0.569
	20	5.802	5.162	13.47	0.60	5	277	0.664
	21	4.642	4.127	25.67	0.63	360	273	0.751
	22	+3.325	-2.925	37.87	+0.66	354	268	0.829
	23	1.924	1.606	50.06	0.69	349	263	0.894
	24	+0.505	-0.219	62.25	0.71	345	257	0.944
	25	-0.872	+1.181	74.44	0.74	341	250	0.980
	26	2.157	2.539	86.62	0.76	338	231	0.997
	27	3.309	3.797	98.81	0.79	336	95	0.997
	28	-4.297	+4.899	110.99	+0.81	336	79	0.978
	29	5.095	5.787	123.17	0.83	336	75	0.940
	30	5.682	6.413	135.36	0.85	337	73	0.883
	31	6.043	6.734	147.55	0.87	339	74	0.810
Sept.	1	6.161	6.717	159.75	0.88	343	75	0.722
	2	6.022	6.345	171.94	0.90	347	78	0.622
	3	-5.611	+5.616	184.15	+0.91	352	82	0.513
	4	4.921	4.548	196.36	0.93	358	86	0.402
	5	3.949	3.184	208.58	0.94	4	92	0.292
	6	2.713	+1.595	220.80	0.96	10	98	0.192
	7	-1.254	-0.120	233.03	0.98	16	104	0.107
	8	+0.359	1.841	245.26	1.00	20	112	0.045
	9	+2.024	-3.438	257.50	+1.02	23	126	0.009
	10	3.618	4.791	269.73	1.04	24	246	0.002
	11	5.013	5.808	281.97	1.06	24	279	0.023
	12	6.092	6.437	294.20	1.08	22	284	0.070
	13	6.773	6.667	306.43	1.11	20	284	0.137
	14	7.014	6.518	318.66	1.13	16	283	0.219
	15	+6.817	-6.034	330.88	+1.16	11	280	0.310
	16	6.220	5.269	343.09	1.18	6	277	0.407
	17	5.288	4.277	355.29	1.20	1	272	0.504
	18	4.106	3.113	7.49	1.23	356	268	0.600
	19	2.762	1.828	19.69	1.25	351	263	0.690
	20	+1.347	-0.471	31.87	1.27	346	258	0.774
	21	-0.054	+0.906	44.06	+1.30	342	253	0.847
	22	1.363	2.253	56.23	1.32	339	248	0.909
	23	2.519	3.514	68.41	1.33	337	242	0.956
	24	3.474	4.634	80.58	1.35	336	232	0.987
	25	4.200	5.553	92.74	1.36	336	175	0.999
	26	4.686	6.217	104.91	1.37	337	92	0.990
	27	-4.937	+6.579	117.08	+1.38	339	81	0.961
	28	4.970	6.605	129.25	1.39	342	79	0.912
	29	4.807	6.279	141.42	1.39	346	80	0.843
	30	4.468	5.602	153.60	1.40	351	83	0.756
Oct.	1	-3.969	4.600	165.78	+1.40	357	87	0.657

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		°	°	°	°	°	°	
Oct.	1	-3.969	+4.600	165.78	+1.40	357	87	0.657
	2	3.315	3.319	177.96	1.40	3	92	0.547
	3	2.506	1.826	190.16	1.40	9	97	0.434
	4	1.541	+0.206	202.35	1.41	14	103	0.322
	5	-0.432	-1.441	214.56	1.41	19	108	0.219
	6	+0.791	3.003	226.77	1.42	22	113	0.131
	7	+2.071	-4.374	238.99	+1.43	24	119	0.063
	8	3.324	5.457	251.20	1.43	24	128	0.019
	9	4.447	6.184	263.42	1.44	23	179	0.002
	10	5.334	6.520	275.64	1.46	21	266	0.011
	11	5.896	6.469	287.86	1.47	17	277	0.044
	12	6.075	6.060	300.08	1.48	13	277	0.097
	13	+5.853	-5.346	312.29	+1.49	8	275	0.167
	14	5.249	4.388	324.49	1.51	3	272	0.248
	15	4.317	3.245	336.69	1.52	358	268	0.337
	16	3.132	1.977	348.89	1.53	352	264	0.430
	17	1.785	-0.638	1.07	1.54	348	259	0.525
	18	+0.373	+0.723	13.26	1.56	343	255	0.618
	19	-1.006	+2.056	25.43	+1.57	340	251	0.707
	20	2.262	3.312	37.60	1.57	338	247	0.789
	21	3.315	4.438	49.76	1.58	336	244	0.862
	22	4.104	5.379	61.92	1.59	336	240	0.922
	23	4.593	6.080	74.07	1.59	336	235	0.967
	24	4.769	6.487	86.22	1.59	338	219	0.993
	25	-4.651	+6.558	98.37	+1.58	341	124	0.997
	26	4.280	6.269	110.52	1.58	345	90	0.978
	27	3.714	5.618	122.67	1.57	350	87	0.937
	28	3.012	4.630	134.82	1.55	355	88	0.872
	29	2.229	3.360	146.98	1.54	1	92	0.789
	30	1.399	1.882	159.14	1.53	8	97	0.690
	31	-0.545	+0.286	171.31	+1.51	13	102	0.580
Nov.	1	+0.329	-1.329	183.48	1.50	18	106	0.466
	2	1.218	2.862	195.66	1.49	21	111	0.354
	3	2.115	4.217	207.85	1.48	24	114	0.250
	4	2.995	5.311	220.04	1.47	24	117	0.159
	5	3.815	6.078	232.24	1.46	24	120	0.086
	6	+4.515	-6.477	244.44	+1.46	22	124	0.035
	7	5.025	6.497	256.64	1.45	19	140	0.007
	8	5.280	6.155	268.85	1.45	15	236	0.003
	9	5.231	5.490	281.05	1.45	10	267	0.021
	10	4.855	4.558	293.25	1.45	5	269	0.059
	11	4.158	3.423	305.45	1.45	360	268	0.115
	12	+3.176	-2.150	317.64	+1.45	354	264	0.184
	13	1.968	-0.800	329.83	1.45	349	260	0.264
	14	+0.612	+0.573	342.01	1.44	345	256	0.351
	15	-0.803	1.916	354.19	1.44	341	253	0.443
	16	-2.181	+3.182	6.36	+1.44	338	250	0.537

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		°	°	°	°	°	°	
Nov.	16	-2.181	+3.182	6.36	+1.44	338	250	0.537
	17	3.425	4.324	18.52	1.44	336	247	0.631
	18	4.447	5.292	30.68	1.43	336	245	0.721
	19	5.168	6.036	42.83	1.42	336	243	0.805
	20	5.534	6.504	54.98	1.41	337	242	0.879
	21	5.519	6.647	67.12	1.40	340	240	0.938
	22	-5.129	+6.428	79.25	+1.38	343	236	0.979
	23	4.409	5.833	91.39	1.36	348	202	0.998
	24	3.432	4.873	103.52	1.34	353	102	0.991
	25	2.290	3.596	115.66	1.31	360	95	0.959
	26	-1.075	2.083	127.79	1.29	6	97	0.901
	27	+0.131	+0.435	139.93	1.26	12	101	0.821
	28	+1.268	-1.233	152.08	+1.23	17	105	0.724
	29	2.299	2.811	164.23	1.20	21	109	0.616
	30	3.201	4.201	176.39	1.17	23	112	0.503
Dec.	1	3.966	5.324	188.55	1.15	24	114	0.391
	2	4.582	6.122	200.72	1.12	24	116	0.286
	3	5.039	6.561	212.90	1.10	22	116	0.194
	4	+5.316	-6.631	225.09	+1.08	20	116	0.116
	5	5.391	6.341	237.27	1.06	16	116	0.058
	6	5.240	5.724	249.46	1.05	12	118	0.019
	7	4.846	4.827	261.66	1.03	7	144	0.002
	8	4.203	3.707	273.85	1.01	1	253	0.005
	9	3.320	2.429	286.04	1.00	356	262	0.028
	10	+2.223	-1.058	298.23	+0.99	351	261	0.069
	11	+0.955	+0.346	310.41	0.97	346	258	0.125
	12	-0.426	1.724	322.60	0.96	342	255	0.194
	13	1.848	3.027	334.77	0.95	339	252	0.273
	14	3.232	4.206	346.94	0.94	337	249	0.361
	15	4.492	5.217	359.11	0.93	336	247	0.454
	16	-5.540	+6.014	11.27	+0.91	336	246	0.550
	17	6.295	6.552	23.42	0.89	337	246	0.647
	18	6.686	6.788	35.56	0.87	339	246	0.741
	19	6.665	6.682	47.70	0.85	342	247	0.827
	20	6.213	6.204	59.84	0.83	346	249	0.901
	21	5.349	5.348	71.97	0.80	351	251	0.958
	22	-4.129	+4.136	84.09	+0.77	357	249	0.992
	23	2.645	2.631	96.22	0.73	3	121	0.999
	24	-1.013	+0.934	108.34	0.69	10	100	0.977
	25	+0.646	-0.830	120.47	0.66	15	103	0.928
	26	2.220	2.527	132.60	0.62	20	106	0.854
	27	3.617	4.036	144.74	0.58	23	110	0.761
	28	+4.773	-5.262	156.88	+0.54	24	112	0.656
	29	5.647	6.143	169.03	0.51	24	113	0.546
	30	6.223	6.648	181.18	0.47	23	113	0.435
	31	6.503	6.774	193.35	0.44	20	112	0.331
	32	+6.497	- 6.536	205.52	+0.41	17	111	0.236

MERCURY, 2018

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME

MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude °	'	"	Heliocentric Latitude °	'	"	Radius Vector	Date	Heliocentric Longitude °	'	"	Heliocentric Latitude °	'	"	Radius Vector
Jan. 0	177	22	49.1	+5	28	02.9	0.383 6637	Feb. 15	319	29	42.3	-7	00	15.8	0.410 7016
1	181	24	07.0	5	08	49.6	0.389 3565	16	323	07	30.9	6	58	59.5	0.405 5010
2	185	18	16.4	4	48	42.3	0.394 9562	17	326	51	02.3	6	55	57.4	0.400 1464
3	189	05	43.1	4	27	51.9	0.400 4398	18	330	40	38.5	6	51	01.5	0.394 6560
4	192	46	52.8	4	06	27.6	0.405 7866	19	334	36	41.8	6	44	03.6	0.389 0507
5	196	22	10.4	3	44	37.6	0.410 9783	20	338	39	34.7	6	34	55.1	0.383 3535
6	199	52	00.3	+3	22	28.9	0.415 9986	21	342	49	39.8	-6	23	27.6	0.377 5903
7	203	16	46.0	3	00	07.8	0.420 8329	22	347	07	19.0	6	09	32.4	0.371 7896
8	206	36	49.9	2	37	39.6	0.425 4685	23	351	32	53.6	5	53	01.4	0.365 9831
9	209	52	33.8	2	15	08.8	0.429 8938	24	356	06	43.3	5	33	47.2	0.360 2055
10	213	04	18.2	1	52	39.4	0.434 0989	25	0	49	06.0	5	11	43.3	0.354 4948
11	216	12	22.9	1	30	14.8	0.438 0748	26	5	40	16.7	4	46	45.2	0.348 8922
12	219	17	06.7	+1	07	57.8	0.441 8137	27	10	40	27.0	-4	18	50.3	0.343 4421
13	222	18	47.7	0	45	51.1	0.445 3089	28	15	49	43.7	3	47	59.2	0.338 1914
14	225	17	43.0	0	23	56.7	0.448 5541	Mar. 1	21	08	08.1	3	14	15.9	0.333 1899
15	228	14	09.2	+0	02	16.7	0.451 5443	2	26	35	34.8	2	37	48.9	0.328 4888
16	231	08	21.9	-0	19	07.3	0.454 2747	3	32	11	50.3	1	58	51.7	0.324 1403
17	234	00	36.4	0	40	13.8	0.456 7415	4	37	56	32.3	1	17	43.4	0.320 1965
18	236	51	07.2	-1	01	01.5	0.458 9412	5	43	49	08.6	-0	34	48.9	0.316 7079
19	239	40	08.6	1	21	29.1	0.460 8709	6	49	48	56.6	+0	09	21.4	0.313 7222
20	242	27	54.1	1	41	35.5	0.462 5282	7	55	55	02.9	0	54	11.4	0.311 2824
21	245	14	37.0	2	01	19.7	0.463 9109	8	62	06	24.0	1	39	01.0	0.309 4251
22	248	00	30.5	2	20	40.5	0.465 0175	9	68	21	46.5	2	23	07.3	0.308 1793
23	250	45	47.0	2	39	37.1	0.465 8467	10	74	39	49.2	3	05	46.4	0.307 5652
24	253	30	39.2	-2	58	08.2	0.466 3974	11	80	59	05.0	+3	46	15.5	0.307 5926
25	256	15	19.5	3	16	12.9	0.466 6692	12	87	18	03.2	4	23	54.7	0.308 2611
26	258	59	60.0	3	33	50.1	0.466 6616	13	93	35	13.1	4	58	09.7	0.309 5598
27	261	44	52.9	3	50	58.5	0.466 3748	14	99	49	06.1	5	28	32.4	0.311 4680
28	264	30	10.6	4	07	36.9	0.465 8089	15	105	58	19.4	5	54	42.7	0.313 9559
29	267	16	05.1	4	23	43.9	0.464 9647	16	112	01	37.9	6	16	28.1	0.316 9861
30	270	02	49.0	-4	39	18.1	0.463 8432	17	117	57	56.3	+6	33	44.2	0.320 5153
31	272	50	34.5	4	54	17.7	0.462 4455	18	123	46	20.3	6	46	33.3	0.324 4956
Feb. 1	275	39	34.6	5	08	41.1	0.460 7735	19	129	26	07.3	6	55	04.2	0.328 8761
2	278	30	02.2	5	22	26.2	0.458 8291	20	134	56	46.0	6	59	30.0	0.333 6048
3	281	22	10.5	5	35	30.8	0.456 6149	21	140	17	56.3	7	00	07.6	0.338 6295
4	284	16	13.1	5	47	52.6	0.454 1337	22	145	29	27.7	6	57	16.1	0.343 8990
5	287	12	24.1	-5	59	28.9	0.451 3891	23	150	31	18.7	+6	51	15.8	0.349 3639
6	290	10	58.0	6	10	16.8	0.448 3850	24	155	23	34.9	6	42	27.2	0.354 9773
7	293	12	09.8	6	20	13.0	0.445 1261	25	160	06	28.2	6	31	10.4	0.360 6951
8	296	16	14.9	6	29	14.0	0.441 6176	26	164	40	15.2	6	17	44.9	0.366 4765
9	299	23	29.5	6	37	15.8	0.437 8656	27	169	05	15.9	6	02	28.6	0.372 2838
10	302	34	10.3	6	44	14.3	0.433 8771	28	173	21	53.0	5	45	38.1	0.378 0824
11	305	48	34.8	-6	50	04.7	0.429 6599	29	177	30	31.0	+5	27	28.5	0.383 8410
12	309	07	01.1	6	54	41.8	0.425 2229	30	181	31	35.3	5	08	13.3	0.389 5313
13	312	29	47.9	6	58	00.2	0.420 5763	31	185	25	31.9	4	48	04.6	0.395 1276
14	315	57	15.0	6	59	53.7	0.415 7315	Apr. 1	189	12	46.6	4	27	13.0	0.400 6071
15	319	29	42.3	-7	00	15.8	0.410 7016	2	192	53	45.1	+4	05	47.7	0.405 9493

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Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Apr.	1	189	12	46.6	+4	27	13.0	0.400 6071	May	17	330	47	56.6	-6	50	50.6	0.394 4879
	2	192	53	45.1	4	05	47.7	0.405 9493		18	334	44	11.9	6	43	48.9	0.388 8794
	3	196	28	52.2	3	43	57.0	0.411 1359		19	338	47	17.6	6	34	36.3	0.383 1798
	4	199	58	32.4	3	21	47.9	0.416 1506		20	342	57	36.1	6	23	04.4	0.377 4150
	5	203	23	09.1	2	59	26.6	0.420 9789		21	347	15	29.4	6	09	04.6	0.371 6136
	6	206	43	04.8	2	36	58.2	0.425 6080		22	351	41	18.7	5	52	28.7	0.365 8074
	7	209	58	41.0	+2	14	27.4	0.430 0267		23	356	15	23.7	-5	33	09.4	0.360 0312
	8	213	10	18.4	1	51	58.1	0.434 2248		24	0	58	02.1	5	11	00.3	0.354 3231
	9	216	18	16.6	1	29	33.6	0.438 1935		25	5	49	29.1	4	45	56.8	0.348 7244
	10	219	22	54.6	1	07	16.9	0.441 9250		26	10	49	55.8	4	17	56.5	0.343 2795
	11	222	24	30.2	0	45	10.5	0.445 4125		27	15	59	29.1	3	47	00.1	0.338 0356
	12	225	23	20.8	0	23	16.6	0.448 6500		28	21	18	10.1	3	13	11.6	0.333 0424
	13	228	19	42.6	+0	01	37.0	0.451 6322		29	26	45	53.1	-2	36	39.8	0.328 3510
	14	231	13	51.5	-0	19	46.4	0.454 3546		30	32	22	24.3	1	57	38.4	0.324 0140
	15	234	06	02.6	0	40	52.4	0.456 8132		31	38	07	21.3	1	16	26.4	0.320 0831
	16	236	56	30.5	1	01	39.5	0.459 0047	June	1	44	00	11.4	-0	33	29.0	0.316 6091
	17	239	45	29.3	1	22	06.4	0.460 9261		2	50	00	11.9	+0	10	43.0	0.313 6392
	18	242	33	12.7	1	42	12.2	0.462 5749		3	56	06	28.9	0	55	33.6	0.311 2164
	19	245	19	54.0	-2	01	55.7	0.463 9492		4	62	17	58.5	+1	40	22.6	0.309 3772
	20	248	05	46.1	2	21	15.8	0.465 0474		5	68	33	27.2	2	24	26.9	0.308 1503
	21	250	51	01.7	2	40	11.6	0.465 8680		6	74	51	33.6	3	07	02.7	0.307 5554
	22	253	35	53.4	2	58	41.9	0.466 4103		7	81	10	50.3	3	47	27.1	0.307 6023
	23	256	20	33.5	3	16	45.8	0.466 6735		8	87	29	46.8	4	25	00.6	0.308 2901
	24	259	05	14.2	3	34	22.1	0.466 6575		9	93	46	52.1	4	59	08.9	0.309 6076
	25	261	50	07.7	-3	51	29.6	0.466 3621		10	100	00	38.0	+5	29	24.3	0.311 5339
	26	264	35	26.3	4	08	07.1	0.465 7878		11	106	09	41.8	5	55	26.6	0.314 0388
	27	267	21	22.2	4	24	13.1	0.464 9351		12	112	12	48.6	6	17	03.8	0.317 0849
	28	270	08	07.7	4	39	46.3	0.463 8051		13	118	08	53.5	6	34	11.7	0.320 6286
	29	272	55	55.4	4	54	44.9	0.462 3991		14	123	57	02.5	6	46	52.8	0.324 6218
	30	275	44	57.9	5	09	07.1	0.460 7187		15	129	36	33.4	6	55	15.9	0.329 0137
May	1	278	35	28.3	-5	22	51.0	0.458 7661		16	135	06	55.2	+6	59	34.5	0.333 7522
	2	281	27	39.9	5	35	54.3	0.456 5437		17	140	27	48.1	7	00	05.4	0.338 7852
	3	284	21	46.2	5	48	14.8	0.454 0545		18	145	39	02.0	6	57	07.9	0.344 0614
	4	287	18	01.4	5	59	49.6	0.451 3020		19	150	40	35.5	6	51	02.0	0.349 5315
	5	290	16	39.8	6	10	35.9	0.448 2901		20	155	32	34.5	6	42	08.6	0.355 1488
	6	293	17	56.6	6	20	30.5	0.445 0235		21	160	15	11.0	6	30	47.6	0.360 8693
	7	296	22	07.2	-6	29	29.7	0.441 5076		22	164	48	41.7	+6	17	18.4	0.366 6521
	8	299	29	27.8	6	37	29.7	0.437 7483		23	169	13	26.8	6	01	58.9	0.372 4597
	9	302	40	15.2	6	44	26.2	0.433 7527		24	173	29	49.0	5	45	05.8	0.378 2576
	10	305	54	46.7	6	50	14.4	0.429 5287		25	177	38	12.9	5	26	54.0	0.384 0147
	11	309	13	20.6	6	54	49.2	0.425 0852		26	181	39	03.9	5	07	37.0	0.389 7025
	12	312	36	15.7	6	58	05.0	0.420 4325		27	185	32	47.8	4	47	26.7	0.395 2957
	13	316	03	51.5	-6	59	55.9	0.415 5819		28	189	19	50.8	+4	26	33.9	0.400 7715
	14	319	36	28.3	7	00	15.1	0.410 5466		29	193	00	38.2	4	05	07.8	0.406 1093
	15	323	14	27.0	6	58	55.7	0.405 3411		30	196	35	35.0	3	43	16.4	0.411 2910
	16	326	58	09.0	6	55	50.2	0.399 9820	July	1	200	05	05.7	3	21	06.9	0.416 3003
	17	330	47	56.6	-6	50	50.6	0.394 4879		2	203	29	33.5	+2	58	45.2	0.421 1229

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Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	200	05	05.7	+3	21	06.9	0.416 3003	Aug.	16	343	05	28.1	-6	22	41.1	0.377 2420
	2	203	29	33.5	2	58	45.2	0.421 1229		17	347	23	35.3	6	08	36.7	0.371 4398
	3	206	49	20.9	2	36	16.7	0.425 7459		18	351	49	39.0	5	51	56.0	0.365 6337
	4	210	04	49.5	2	13	45.9	0.430 1581		19	356	23	59.1	5	32	31.6	0.359 8587
	5	213	16	19.9	1	51	16.6	0.434 3494		20	1	06	53.2	5	10	17.3	0.354 1529
	6	216	24	11.8	1	28	52.3	0.438 3112		21	5	58	36.1	4	45	08.6	0.348 5579
	7	219	28	43.9	+1	06	35.9	0.442 0355		22	10	59	19.2	-4	17	03.0	0.343 1180
	8	222	30	14.3	0	44	29.9	0.445 5156		23	16	09	09.1	3	46	01.2	0.337 8805
	9	225	28	60.0	0	22	36.4	0.448 7455		24	21	28	06.5	3	12	07.7	0.332 8952
	10	228	25	17.5	+0	00	57.3	0.451 7200		25	26	56	05.8	2	35	31.1	0.328 2134
	11	231	19	22.5	-0	20	25.7	0.454 4346		26	32	32	52.8	1	56	25.4	0.323 8874
	12	234	11	30.2	0	41	31.1	0.456 8853		27	38	18	04.7	1	15	09.8	0.319 9692
	13	237	01	55.1	-1	02	17.6	0.459 0687		28	44	11	08.8	-0	32	09.7	0.316 5092
	14	239	50	51.4	1	22	43.9	0.460 9820		29	50	11	21.7	+0	12	04.0	0.313 5549
	15	242	38	32.6	1	42	49.0	0.462 6227		30	56	17	49.5	0	56	55.2	0.311 1488
	16	245	25	12.1	2	02	31.8	0.463 9888		31	62	29	27.9	1	41	43.5	0.309 3273
	17	248	11	02.8	2	21	51.1	0.465 0787	Sept.	1	68	45	03.1	2	25	45.9	0.308 1190
	18	250	56	17.4	2	40	46.1	0.465 8910		2	75	03	13.5	3	08	18.3	0.307 5431
	19	253	41	08.5	-2	59	15.7	0.466 4250		3	81	22	31.5	+3	48	38.2	0.307 6091
	20	256	25	48.2	3	17	18.7	0.466 6799		4	87	41	26.6	4	26	06.0	0.308 3160
	21	259	10	29.0	3	34	54.1	0.466 6554		5	93	58	27.8	5	00	07.6	0.309 6521
	22	261	55	23.0	3	52	00.7	0.466 3517		6	100	12	07.0	5	30	15.6	0.311 5962
	23	264	40	42.4	4	08	37.2	0.465 7690		7	106	21	01.7	5	56	10.0	0.314 1181
	24	267	26	39.4	4	24	42.3	0.464 9081		8	112	23	57.3	6	17	39.1	0.317 1799
	25	270	13	26.5	-4	40	14.4	0.463 7698		9	118	19	49.1	+6	34	38.7	0.320 7379
	26	273	01	16.1	4	55	11.8	0.462 3555		10	124	07	43.7	6	47	11.9	0.324 7440
	27	275	50	21.0	5	09	32.9	0.460 6669		11	129	46	58.9	6	55	27.3	0.329 1473
	28	278	40	54.1	5	23	15.5	0.458 7062		12	135	17	04.3	6	59	38.7	0.333 8957
	29	281	33	08.7	5	36	17.6	0.456 4757		13	140	37	40.2	7	00	02.9	0.338 9370
	30	284	27	18.6	5	48	36.7	0.453 9786		14	145	48	36.9	6	56	59.2	0.344 2200
	31	287	23	37.7	-6	00	10.1	0.451 2181		15	150	49	53.3	+6	50	48.0	0.349 6955
Aug.	1	290	22	20.5	6	10	54.8	0.448 1985		16	155	41	35.4	6	41	49.6	0.355 3168
	2	293	23	42.1	6	20	47.7	0.444 9243		17	160	23	55.4	6	30	24.4	0.361 0401
	3	296	27	58.0	6	29	45.2	0.441 4009		18	164	57	10.1	6	16	51.5	0.366 8245
	4	299	35	24.4	6	37	43.3	0.437 6344		19	169	21	39.9	6	01	28.9	0.372 6326
	5	302	46	18.1	6	44	37.8	0.433 6318		20	173	37	47.4	5	44	33.0	0.378 4300
	6	306	00	56.5	-6	50	23.8	0.429 4009		21	177	45	57.3	+5	26	19.0	0.384 1857
	7	309	19	37.8	6	54	56.3	0.424 9509		22	181	46	35.1	5	07	00.1	0.389 8713
	8	312	42	40.8	6	58	09.6	0.420 2919		23	185	40	06.6	4	46	48.4	0.395 4616
	9	316	10	25.2	6	59	57.8	0.415 4355		24	189	26	57.9	4	25	54.4	0.400 9337
	10	319	43	11.1	7	00	14.1	0.410 3947		25	193	07	34.3	4	04	27.3	0.406 2673
	11	323	21	19.7	6	58	51.6	0.405 1842		26	196	42	20.9	3	42	35.3	0.411 4442
	12	327	05	12.2	-6	55	42.7	0.399 8206		27	200	11	42.0	+3	20	25.2	0.416 4484
	13	330	55	10.9	6	50	39.6	0.394 3225		28	203	36	01.0	2	58	03.3	0.421 2653
	14	334	51	38.1	6	43	34.0	0.388 7108		29	206	55	40.2	2	35	34.6	0.425 8823
	15	338	54	56.3	6	34	17.4	0.383 0086		30	210	11	01.3	2	13	03.7	0.430 2881
	16	343	05	28.1	-6	22	41.1	0.377 2420	Oct.	1	213	22	24.7	+1	50	34.6	0.434 4729

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Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector	Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector
Oct. 1	213 22 24.7	+1 50 34.6	0.434 4729	Nov. 16	1 15 57.4	-5 09 33.4	0.353 9774
2	216 30 10.2	1 28 10.5	0.438 4277	17	6 07 57.0	4 44 19.1	0.348 3862
3	219 34 36.5	1 05 54.4	0.442 1448	18	11 08 57.0	4 16 08.0	0.342 9517
4	222 36 01.6	0 43 48.7	0.445 6175	19	16 19 03.9	3 45 00.9	0.337 7211
5	225 34 42.5	0 21 55.6	0.448 8399	20	21 38 18.4	3 11 02.2	0.332 7442
6	228 30 55.7	+0 00 17.0	0.451 8067	21	27 06 34.4	2 34 20.8	0.328 0724
7	231 24 56.9	-0 21 05.5	0.454 5134	22	32 43 37.5	-1 55 10.6	0.323 7580
8	234 17 01.1	0 42 10.3	0.456 9561	23	38 29 04.8	1 13 51.4	0.319 8531
9	237 07 23.1	1 02 56.2	0.459 1314	24	44 22 23.1	-0 30 48.5	0.316 4080
10	239 56 16.8	1 23 21.9	0.461 0365	25	50 22 48.7	+0 13 27.0	0.313 4698
11	242 43 55.9	1 43 26.3	0.462 6689	26	56 29 27.5	0 58 18.8	0.311 0812
12	245 30 33.7	2 03 08.3	0.464 0266	27	62 41 14.6	1 43 06.4	0.309 2783
13	248 16 23.0	-2 22 27.0	0.465 1081	28	68 56 56.2	+2 27 06.6	0.308 0892
14	251 01 36.7	2 41 21.2	0.465 9120	29	75 15 10.4	3 09 35.6	0.307 5331
15	253 46 27.1	2 59 49.9	0.466 4374	30	81 34 29.4	3 49 50.8	0.307 6190
16	256 31 06.7	3 17 52.1	0.466 6838	Dec. 1	87 53 22.6	4 27 12.7	0.308 3456
17	259 15 47.7	3 35 26.6	0.466 6508	2	94 10 19.2	5 01 07.5	0.309 7010
18	262 00 42.2	3 52 32.3	0.466 3386	3	100 23 51.1	5 31 07.8	0.311 6636
19	264 46 02.5	-4 09 07.8	0.465 7474	4	106 32 36.1	+5 56 54.2	0.314 2029
20	267 32 00.9	4 25 11.8	0.464 8779	5	112 35 19.7	6 18 14.9	0.317 2809
21	270 18 49.6	4 40 42.8	0.463 7311	6	118 30 57.7	6 35 06.2	0.320 8537
22	273 06 41.3	4 55 39.2	0.462 3084	7	124 18 36.9	6 47 31.1	0.324 8731
23	275 55 48.6	5 09 59.1	0.460 6114	8	129 57 35.7	6 55 38.8	0.329 2881
24	278 46 24.6	5 23 40.5	0.458 6423	9	135 27 23.8	6 59 42.8	0.334 0465
25	281 38 42.6	-5 36 41.3	0.456 4036	10	140 47 42.0	+7 00 00.2	0.339 0962
26	284 32 56.1	5 48 59.0	0.453 8983	11	145 58 20.8	6 56 50.4	0.344 3861
27	287 29 19.3	6 00 30.9	0.451 1298	12	150 59 19.3	6 50 33.6	0.349 8670
28	290 28 06.8	6 11 14.1	0.448 1022	13	155 50 43.8	6 41 30.4	0.355 4923
29	293 29 33.4	6 21 05.3	0.444 8203	14	160 32 46.6	6 30 00.9	0.361 2182
30	296 33 54.9	6 30 01.0	0.441 2892	15	165 05 44.7	6 16 24.3	0.367 0041
31	299 41 27.4	-6 37 57.2	0.437 5153	16	169 29 58.5	+6 00 58.5	0.372 8125
Nov. 1	302 52 27.6	6 44 49.6	0.433 5054	17	173 45 50.9	5 43 60.0	0.378 6092
2	306 07 13.2	6 50 33.4	0.429 2676	18	177 53 46.3	5 25 43.7	0.384 3632
3	309 26 02.2	6 55 03.6	0.424 8110	19	181 54 10.4	5 06 23.0	0.390 0464
4	312 49 13.5	6 58 14.4	0.420 1456	20	185 47 29.1	4 46 09.8	0.395 6334
5	316 17 06.8	6 59 59.7	0.415 2832	21	189 34 08.3	4 25 14.6	0.401 1017
6	319 50 02.4	-7 00 13.1	0.410 2368	22	193 14 33.4	+4 03 46.7	0.406 4308
7	323 28 21.1	6 58 47.4	0.405 0213	23	196 49 09.6	3 41 53.9	0.411 6027
8	327 12 24.6	6 55 35.2	0.399 6531	24	200 18 20.9	3 19 43.4	0.416 6012
9	331 02 34.9	6 50 28.4	0.394 1511	25	203 42 30.8	2 57 21.1	0.421 4122
10	334 59 14.4	6 43 18.9	0.388 5360	26	207 02 01.6	2 34 52.4	0.426 0229
11	339 02 45.7	6 33 58.0	0.382 8313	27	210 17 14.9	2 12 21.5	0.430 4220
12	343 13 31.1	-6 22 17.3	0.377 0630	28	213 28 31.3	+1 49 52.5	0.434 5998
13	347 31 52.7	6 08 08.2	0.371 2600	29	216 36 10.3	1 27 28.6	0.438 5473
14	351 58 11.5	5 51 22.6	0.365 4541	30	219 40 30.6	1 05 12.7	0.442 2570
15	356 32 47.2	5 31 53.0	0.359 6805	31	222 41 50.2	0 43 07.4	0.445 7221
16	1 15 57.4	-5 09 33.4	0.353 9774	32	225 40 26.3	+0 21 14.7	0.448 9366

MERCURY, 2018
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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	257	01	34.7	+2	08	34.2	Feb.	15	324	15	39.9	-2	03	31.6
	1	257	57	08.5	2	00	17.5		16	326	02	48.1	2	01	55.5
	2	258	56	26.1	1	51	48.6		17	327	50	46.5	1	59	50.1
	3	259	59	02.0	1	43	11.1		18	329	39	34.3	1	57	14.6
	4	261	04	34.2	1	34	27.9		19	331	29	10.3	1	54	07.8
	5	262	12	43.1	1	25	41.5		20	333	19	32.6	1	50	28.9
	6	263	23	11.6	+1	16	54.0		21	335	10	38.8	-1	46	17.0
	7	264	35	44.8	1	08	07.2		22	337	02	25.6	1	41	31.1
	8	265	50	09.7	0	59	22.7		23	338	54	48.9	1	36	10.3
	9	267	06	15.1	0	50	42.0		24	340	47	43.2	1	30	14.0
	10	268	23	51.1	0	42	06.2		25	342	41	02.0	1	23	41.4
	11	269	42	49.3	0	33	36.4		26	344	34	37.3	1	16	32.0
	12	271	03	02.4	0	25	13.4		27	346	28	19.3	-1	08	45.5
	13	272	24	23.9	0	16	58.2		28	348	21	56.5	1	00	21.7
	14	273	46	48.5	0	08	51.5	Mar.	1	350	15	15.3	0	51	20.8
	15	275	10	11.5	+0	00	53.8		2	352	07	59.9	0	41	43.4
	16	276	34	28.9	-0	06	54.0		3	353	59	52.2	0	31	30.2
	17	277	59	37.4	0	14	31.5		4	355	50	31.7	0	20	42.8
	18	279	25	34.2	-0	21	58.2		5	357	39	35.4	-0	09	22.8
	19	280	52	16.8	0	29	13.4		6	359	26	38.0	+0	02	27.1
	20	282	19	43.3	0	36	16.8		7	1	11	12.0	0	14	44.1
	21	283	47	52.2	0	43	07.8		8	2	52	48.0	0	27	24.6
	22	285	16	42.2	0	49	46.1		9	4	30	55.3	0	40	24.1
	23	286	46	12.5	0	56	11.0		10	6	05	02.1	0	53	38.1
	24	288	16	22.2	-1	02	22.3		11	7	34	36.3	+1	07	00.9
	25	289	47	11.1	1	08	19.5		12	8	59	06.1	1	20	26.6
	26	291	18	38.8	1	14	02.0		13	10	18	00.5	1	33	48.9
	27	292	50	45.4	1	19	29.4		14	11	30	50.0	1	47	00.9
	28	294	23	30.9	1	24	41.4		15	12	37	07.2	1	59	55.5
	29	295	56	55.5	1	29	37.3		16	13	36	27.2	2	12	25.2
	30	297	30	59.8	-1	34	16.8		17	14	28	28.2	+2	24	22.4
	31	299	05	44.1	1	38	39.2		18	15	12	51.7	2	35	39.3
Feb.	1	300	41	09.0	1	42	44.2		19	15	49	23.1	2	46	08.0
	2	302	17	15.3	1	46	31.1		20	16	17	51.7	2	55	40.7
	3	303	54	03.8	1	49	59.5		21	16	38	11.8	3	04	09.4
	4	305	31	35.2	1	53	08.6		22	16	50	22.5	3	11	26.5
	5	307	09	50.4	-1	55	58.0		23	16	54	28.4	+3	17	24.4
	6	308	48	50.5	1	58	27.0		24	16	50	40.3	3	21	56.2
	7	310	28	36.1	2	00	35.0		25	16	39	15.0	3	24	55.6
	8	312	09	08.3	2	02	21.1		26	16	20	36.5	3	26	17.2
	9	313	50	27.9	2	03	44.9		27	15	55	15.5	3	25	56.6
	10	315	32	35.7	2	04	45.4		28	15	23	49.7	3	23	51.0
	11	317	15	32.5	-2	05	21.9		29	14	47	03.1	+3	19	59.4
	12	318	59	18.8	2	05	33.7		30	14	05	46.0	3	14	22.3
	13	320	43	55.3	2	05	19.8		31	13	20	53.3	3	07	02.6
	14	322	29	22.3	2	04	39.4	Apr.	1	12	33	23.5	2	58	05.0
	15	324	15	39.9	-2	03	31.6		2	11	44	17.0	+2	47	36.2

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	12	33	23.5	+2	58	05.0	May	17	35	32	33.2	-2	25	05.0
	2	11	44	17.0	2	47	36.2		18	37	13	04.7	2	18	37.5
	3	10	54	34.3	2	35	44.7		19	38	55	42.6	2	11	40.8
	4	10	05	14.6	2	22	40.5		20	40	40	26.9	2	04	15.7
	5	9	17	13.8	2	08	34.4		21	42	27	17.5	1	56	23.4
	6	8	31	23.3	1	53	38.2		22	44	16	14.1	1	48	05.3
	7	7	48	28.9	+1	38	03.5		23	46	07	16.5	-1	39	22.6
	8	7	09	09.9	1	22	02.2		24	48	00	23.9	1	30	16.9
	9	6	33	59.1	1	05	45.2		25	49	55	35.1	1	20	50.1
	10	6	03	22.6	0	49	23.0		26	51	52	48.3	1	11	04.1
	11	5	37	39.8	0	33	04.8		27	53	52	00.8	1	01	01.3
	12	5	17	04.5	0	16	59.1		28	55	53	08.9	0	50	44.1
	13	5	01	44.8	+0	01	12.8		29	57	56	07.9	-0	40	15.3
	14	4	51	44.4	-0	14	07.9		30	60	00	51.8	0	29	38.1
	15	4	47	02.9	0	28	58.1		31	62	07	12.9	0	18	55.8
	16	4	47	37.1	0	43	13.6	June	1	64	15	02.2	-0	08	12.2
	17	4	53	20.8	0	56	51.4		2	66	24	09.1	+0	02	29.0
	18	5	04	06.2	1	09	49.0		3	68	34	21.4	0	13	03.5
	19	5	19	44.1	-1	22	04.7		4	70	45	25.7	+0	23	27.3
	20	5	40	04.3	1	33	37.1		5	72	57	07.0	0	33	35.9
	21	6	04	56.0	1	44	25.4		6	75	09	09.9	0	43	25.3
	22	6	34	08.4	1	54	29.4		7	77	21	17.9	0	52	51.0
	23	7	07	30.3	2	03	48.7		8	79	33	14.4	1	01	49.3
	24	7	44	51.1	2	12	23.5		9	81	44	43.2	1	10	16.7
	25	8	26	00.3	-2	20	14.0		10	83	55	28.6	+1	18	09.7
	26	9	10	47.9	2	27	20.7		11	86	05	15.6	1	25	25.7
	27	9	59	04.4	2	33	43.9		12	88	13	50.7	1	32	02.3
	28	10	50	41.0	2	39	24.2		13	90	21	01.5	1	37	57.3
	29	11	45	29.0	2	44	22.3		14	92	26	37.1	1	43	09.5
	30	12	43	20.9	2	48	38.8		15	94	30	28.3	1	47	37.7
May	1	13	44	09.2	-2	52	14.2		16	96	32	27.0	+1	51	21.3
	2	14	47	47.4	2	55	09.2		17	98	32	26.9	1	54	19.8
	3	15	54	09.3	2	57	24.5		18	100	30	22.6	1	56	33.3
	4	17	03	09.3	2	59	00.7		19	102	26	10.2	1	58	02.0
	5	18	14	42.4	2	59	58.3		20	104	19	46.6	1	58	46.2
	6	19	28	44.0	3	00	18.1		21	106	11	09.3	1	58	46.6
	7	20	45	10.2	-3	00	00.6		22	108	00	16.8	+1	58	03.9
	8	22	03	57.4	2	59	06.4		23	109	47	07.8	1	56	38.9
	9	23	25	02.6	2	57	36.0		24	111	31	41.5	1	54	32.5
	10	24	48	23.1	2	55	30.2		25	113	13	57.1	1	51	45.7
	11	26	13	56.6	2	52	49.3		26	114	53	54.3	1	48	19.3
	12	27	41	41.4	2	49	34.2		27	116	31	32.4	1	44	14.5
	13	29	11	36.0	-2	45	45.2		28	118	06	50.9	+1	39	32.2
	14	30	43	39.2	2	41	23.2		29	119	39	49.2	1	34	13.4
	15	32	17	50.2	2	36	28.6		30	121	10	26.2	1	28	19.3
	16	33	54	08.3	2	31	02.3	July	1	122	38	41.0	1	21	50.6
	17	35	32	33.2	-2	25	05.0		2	124	04	32.1	+1	14	48.6

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	122	38	41.0	+1	21	50.6	Aug.	16	132	07	29.5	-3	33	55.9
	2	124	04	32.1	1	14	48.6		17	131	48	52.7	3	18	08.5
	3	125	27	58.0	1	07	14.2		18	131	36	53.7	3	01	35.2
	4	126	48	56.6	0	59	08.4		19	131	31	55.5	2	44	27.2
	5	128	07	25.5	0	50	32.2		20	131	34	16.0	2	26	55.3
	6	129	23	22.0	0	41	26.7		21	131	44	07.3	2	09	09.8
	7	130	36	42.8	+0	31	52.9		22	132	01	36.8	-1	51	20.6
	8	131	47	24.4	0	21	51.8		23	132	26	47.0	1	33	36.7
	9	132	55	22.7	0	11	24.5		24	132	59	36.3	1	16	06.7
	10	134	00	32.9	+0	00	32.2		25	133	39	59.0	0	58	58.3
	11	135	02	50.0	-0	10	44.0		26	134	27	45.6	0	42	18.7
	12	136	02	08.2	0	22	22.7		27	135	22	43.6	0	26	14.1
	13	136	58	21.3	-0	34	22.6		28	136	24	36.7	-0	10	50.3
	14	137	51	22.5	0	46	42.4		29	137	33	06.1	+0	03	47.6
	15	138	41	04.4	0	59	20.3		30	138	47	49.9	0	17	35.2
	16	139	27	19.0	1	12	14.7		31	140	08	23.9	0	30	28.8
	17	140	09	58.2	1	25	23.5	Sept.	1	141	34	21.7	0	42	25.4
	18	140	48	53.2	1	38	44.7		2	143	05	15.0	0	53	22.6
	19	141	23	54.9	-1	52	15.8		3	144	40	34.4	+1	03	18.9
	20	141	54	54.0	2	05	54.0		4	146	19	49.7	1	12	13.3
	21	142	21	40.9	2	19	36.2		5	148	02	30.6	1	20	05.6
	22	142	44	06.3	2	33	19.0		6	149	48	07.2	1	26	56.3
	23	143	02	00.9	2	46	58.4		7	151	36	10.7	1	32	46.3
	24	143	15	15.7	3	00	30.0		8	153	26	13.5	1	37	37.3
	25	143	23	42.9	-3	13	48.8		9	155	17	50.1	+1	41	31.1
	26	143	27	15.6	3	26	49.3		10	157	10	37.0	1	44	30.1
	27	143	25	48.2	3	39	25.3		11	159	04	13.0	1	46	36.9
	28	143	19	17.5	3	51	30.2		12	160	58	19.4	1	47	54.3
	29	143	07	42.8	4	02	56.8		13	162	52	39.8	1	48	25.0
	30	142	51	06.4	4	13	37.1		14	164	46	59.9	1	48	12.2
	31	142	29	34.5	-4	23	23.0		15	166	41	07.7	+1	47	18.7
Aug.	1	142	03	17.6	4	32	06.0		16	168	34	52.9	1	45	47.3
	2	141	32	30.9	4	39	37.4		17	170	28	07.3	1	43	41.0
	3	140	57	35.3	4	45	49.0		18	172	20	43.9	1	41	02.3
	4	140	18	57.0	4	50	32.5		19	174	12	37.3	1	37	53.9
	5	139	37	08.2	4	53	40.7		20	176	03	43.1	1	34	18.2
	6	138	52	46.3	-4	55	07.4		21	177	53	58.1	+1	30	17.6
	7	138	06	34.3	4	54	47.7		22	179	43	20.0	1	25	54.0
	8	137	19	19.3	4	52	38.3		23	181	31	46.8	1	21	09.7
	9	136	31	52.1	4	48	38.0		24	183	19	17.7	1	16	06.6
	10	135	45	05.8	4	42	47.5		25	185	05	52.0	1	10	46.4
	11	134	59	54.2	4	35	09.7		26	186	51	29.6	1	05	10.8
	12	134	17	11.1	-4	25	49.2		27	188	36	10.7	+0	59	21.4
	13	133	37	48.3	4	14	52.8		28	190	19	55.7	0	53	19.6
	14	133	02	34.7	4	02	28.7		29	192	02	45.2	0	47	06.8
	15	132	32	15.1	3	48	46.2		30	193	44	40.1	0	40	44.4
	16	132	07	29.5	-3	33	55.9	Oct.	1	195	25	41.4	+0	34	13.5

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Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Oct.	1	195	25	41.4	+0	34	13.5
	2	197	05	49.8	0	27	35.2
	3	198	45	06.6	0	20	50.6
	4	200	23	32.6	0	14	00.8
	5	202	01	09.0	0	07	06.6
	6	203	37	56.6	+0	00	09.1
	7	205	13	56.6	-0	06	50.9
	8	206	49	09.9	0	13	52.6
	9	208	23	37.2	0	20	55.2
	10	209	57	19.4	0	27	57.8
	11	211	30	17.2	0	34	59.7
	12	213	02	31.1	0	42	00.2
	13	214	34	01.7	-0	48	58.4
	14	216	04	49.1	0	55	53.7
	15	217	34	53.6	1	02	45.3
	16	219	04	15.2	1	09	32.4
	17	220	32	53.6	1	16	14.3
	18	222	00	48.5	1	22	50.2
	19	223	27	59.3	-1	29	19.4
	20	224	54	25.1	1	35	41.0
	21	226	20	04.8	1	41	54.1
	22	227	44	56.9	1	47	58.0
	23	229	08	59.7	1	53	51.6
	24	230	32	11.0	1	59	34.1
	25	231	54	28.1	-2	05	04.3
	26	233	15	47.9	2	10	21.2
	27	234	36	06.7	2	15	23.7
	28	235	55	20.1	2	20	10.4
	29	237	13	23.0	2	24	39.9
	30	238	30	09.5	2	28	51.0
	31	239	45	32.6	-2	32	41.8
Nov.	1	240	59	24.4	2	36	10.7
	2	242	11	35.7	2	39	15.8
	3	243	21	55.9	2	41	55.0
	4	244	30	12.8	2	44	06.0
	5	245	36	12.6	2	45	46.2
	6	246	39	39.4	-2	46	52.8
	7	247	40	15.1	2	47	22.8
	8	248	37	39.1	2	47	12.7
	9	249	31	28.1	2	46	18.7
	10	250	21	15.8	2	44	36.8
	11	251	06	32.9	2	42	02.5
	12	251	46	46.6	-2	38	30.8
	13	252	21	20.9	2	33	56.7
	14	252	49	36.8	2	28	14.5
	15	253	10	52.5	2	21	18.6
	16	253	24	24.5	-2	13	03.5

Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Nov.	16	253	24	24.5	-2	13	03.5
	17	253	29	28.9	2	03	23.7
	18	253	25	23.3	1	52	14.8
	19	253	11	29.9	1	39	33.3
	20	252	47	19.6	1	25	18.1
	21	252	12	35.9	1	09	30.5
	22	251	27	21.1	-0	52	16.0
	23	250	32	01.1	0	33	44.3
	24	249	27	30.4	-0	14	10.5
	25	248	15	14.6	+0	06	05.0
	26	246	57	10.2	0	26	37.1
	27	245	35	39.6	0	46	57.4
	28	244	13	23.3	+1	06	36.3
	29	242	53	08.1	1	25	05.2
	30	241	37	34.2	1	41	59.5
Dec.	1	240	29	03.2	1	57	00.0
	2	239	29	29.6	2	09	53.9
	3	238	40	16.0	2	20	35.2
	4	238	02	12.1	+2	29	03.7
	5	237	35	37.8	2	35	24.1
	6	237	20	27.8	2	39	44.3
	7	237	16	17.7	2	42	14.5
	8	237	22	29.5	2	43	05.7
	9	237	38	17.0	2	42	29.5
	10	238	02	49.8	+2	40	36.7
	11	238	35	16.4	2	37	37.8
	12	239	14	46.6	2	33	42.1
	13	240	00	32.8	2	28	58.1
	14	240	51	51.2	2	23	33.3
	15	241	48	01.6	2	17	34.4
	16	242	48	28.3	+2	11	07.1
	17	243	52	39.2	2	04	16.3
	18	245	00	06.2	1	57	06.5
	19	246	10	24.6	1	49	41.3
	20	247	23	12.8	1	42	04.2
	21	248	38	12.2	1	34	17.8
	22	249	55	06.4	+1	26	24.6
	23	251	13	41.6	1	18	26.8
	24	252	33	45.4	1	10	26.3
	25	253	55	07.7	1	02	24.7
	26	255	17	39.4	0	54	23.5
	27	256	41	12.8	0	46	23.8
	28	258	05	41.6	+0	38	26.9
	29	259	31	00.2	0	30	33.7
	30	260	57	03.9	0	22	45.3
	31	262	23	48.8	0	15	02.4
	32	263	51	11.6	+0	07	25.7

MERCURY, 2018

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	17	04	30.34	-20	40	10.3	0.977 984	8.99	3.44	10	26	00
	1	17	08	23.63	20	53	31.9	0.998 838	8.80	3.36	10	26	04
	2	17	12	33.50	21	07	02.2	1.019 241	8.63	3.30	10	26	24
	3	17	16	58.30	21	20	31.1	1.039 153	8.46	3.23	10	26	59
	4	17	21	36.51	21	33	49.4	1.058 547	8.31	3.17	10	27	46
	5	17	26	26.82	21	46	49.1	1.077 402	8.16	3.12	10	28	44
	6	17	31	28.05	-21	59	23.0	1.095 703	8.03	3.07	10	29	54
	7	17	36	39.17	22	11	24.8	1.113 441	7.90	3.02	10	31	12
	8	17	41	59.24	22	22	49.0	1.130 609	7.78	2.97	10	32	39
	9	17	47	27.45	22	33	30.5	1.147 207	7.67	2.93	10	34	15
	10	17	53	03.07	22	43	24.9	1.163 233	7.56	2.89	10	35	57
	11	17	58	45.43	22	52	28.4	1.178 692	7.46	2.85	10	37	46
	12	18	04	33.95	-23	00	37.5	1.193 587	7.37	2.82	10	39	40
	13	18	10	28.11	23	07	49.0	1.207 922	7.28	2.78	10	41	40
	14	18	16	27.43	23	14	00.1	1.221 705	7.20	2.75	10	43	45
	15	18	22	31.48	23	19	08.5	1.234 943	7.12	2.72	10	45	55
	16	18	28	39.87	23	23	11.8	1.247 641	7.05	2.69	10	48	09
	17	18	34	52.25	23	26	07.9	1.259 807	6.98	2.67	10	50	27
	18	18	41	08.30	-23	27	55.1	1.271 448	6.92	2.64	10	52	48
	19	18	47	27.73	23	28	31.7	1.282 571	6.86	2.62	10	55	13
	20	18	53	50.27	23	27	56.1	1.293 183	6.80	2.60	10	57	40
	21	19	00	15.66	23	26	07.0	1.303 291	6.75	2.58	11	00	11
	22	19	06	43.68	23	23	03.2	1.312 899	6.70	2.56	11	02	43
	23	19	13	14.13	23	18	43.3	1.322 013	6.65	2.54	11	05	19
	24	19	19	46.81	-23	13	06.5	1.330 638	6.61	2.53	11	07	56
	25	19	26	21.55	23	06	11.7	1.338 779	6.57	2.51	11	10	35
	26	19	32	58.17	22	57	58.0	1.346 437	6.53	2.50	11	13	17
	27	19	39	36.54	22	48	24.6	1.353 617	6.50	2.48	11	15	59
	28	19	46	16.51	22	37	30.7	1.360 320	6.46	2.47	11	18	44
	29	19	52	57.96	22	25	15.7	1.366 545	6.44	2.46	11	21	30
	30	19	59	40.76	-22	11	38.9	1.372 295	6.41	2.45	11	24	17
	31	20	06	24.80	21	56	39.7	1.377 566	6.38	2.44	11	27	05
Feb.	1	20	13	10.00	21	40	17.5	1.382 356	6.36	2.43	11	29	55
	2	20	19	56.25	21	22	31.8	1.386 663	6.34	2.42	11	32	45
	3	20	26	43.48	21	03	22.1	1.390 480	6.32	2.42	11	35	37
	4	20	33	31.61	20	42	48.0	1.393 801	6.31	2.41	11	38	29
	5	20	40	20.59	-20	20	49.0	1.396 619	6.30	2.41	11	41	22
	6	20	47	10.34	19	57	24.9	1.398 924	6.29	2.40	11	44	16
	7	20	54	00.83	19	32	35.3	1.400 705	6.28	2.40	11	47	11
	8	21	00	51.99	19	06	20.0	1.401 951	6.27	2.40	11	50	06
	9	21	07	43.79	18	38	38.8	1.402 647	6.27	2.40	11	53	02
	10	21	14	36.18	18	09	31.5	1.402 777	6.27	2.40	11	55	58
	11	21	21	29.13	-17	38	58.1	1.402 323	6.27	2.40	11	58	55
	12	21	28	22.60	17	06	58.5	1.401 266	6.28	2.40	12	01	53
	13	21	35	16.55	16	33	33.0	1.399 584	6.28	2.40	12	04	51
	14	21	42	10.95	15	58	41.7	1.397 253	6.29	2.40	12	07	49
	15	21	49	05.76	-15	22	24.9	1.394 246	6.31	2.41	12	10	48

MERCURY, 2018

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	21	49	05.76	-15	22	24.9	1.394 246	6.31	2.41	12	10	48
	16	21	56	00.93	14	44	43.2	1.390 535	6.32	2.42	12	13	47
	17	22	02	56.40	14	05	37.2	1.386 089	6.34	2.42	12	16	47
	18	22	09	52.11	13	25	07.8	1.380 874	6.37	2.43	12	19	46
	19	22	16	47.97	12	43	16.2	1.374 855	6.40	2.44	12	22	46
	20	22	23	43.87	12	00	03.8	1.367 993	6.43	2.46	12	25	46
	21	22	30	39.69	-11	15	32.6	1.360 250	6.47	2.47	12	28	45
	22	22	37	35.26	10	29	44.8	1.351 584	6.51	2.49	12	31	45
	23	22	44	30.35	9	42	43.2	1.341 953	6.55	2.50	12	34	43
	24	22	51	24.73	8	54	31.2	1.331 315	6.61	2.52	12	37	41
	25	22	58	18.05	8	05	12.9	1.319 626	6.66	2.55	12	40	37
	26	23	05	09.92	7	14	53.3	1.306 846	6.73	2.57	12	43	32
	27	23	11	59.88	-6	23	38.2	1.292 938	6.80	2.60	12	46	24
	28	23	18	47.35	5	31	34.4	1.277 868	6.88	2.63	12	49	14
Mar.	1	23	25	31.65	4	38	49.8	1.261 609	6.97	2.66	12	52	00
	2	23	32	12.01	3	45	33.6	1.244 143	7.07	2.70	12	54	42
	3	23	38	47.50	2	51	56.2	1.225 462	7.18	2.74	12	57	18
	4	23	45	17.07	1	58	09.4	1.205 573	7.29	2.79	12	59	47
	5	23	51	39.56	-1	04	26.3	1.184 495	7.42	2.84	13	02	09
	6	23	57	53.64	-0	11	01.2	1.162 268	7.57	2.89	13	04	22
	7	0	03	57.87	+0	41	50.2	1.138 950	7.72	2.95	13	06	24
	8	0	09	50.70	1	33	51.2	1.114 621	7.89	3.01	13	08	13
	9	0	15	30.46	2	24	44.5	1.089 380	8.07	3.08	13	09	49
	10	0	20	55.44	3	14	12.0	1.063 347	8.27	3.16	13	11	08
	11	0	26	03.87	+4	01	55.5	1.036 659	8.48	3.24	13	12	10
	12	0	30	54.00	4	47	36.5	1.009 471	8.71	3.33	13	12	53
	13	0	35	24.08	5	30	57.2	0.981 949	8.96	3.42	13	13	15
	14	0	39	32.45	6	11	40.3	0.954 268	9.22	3.52	13	13	14
	15	0	43	17.55	6	49	29.0	0.926 606	9.49	3.63	13	12	49
	16	0	46	37.94	7	24	08.0	0.899 144	9.78	3.74	13	11	59
	17	0	49	32.38	+7	55	22.6	0.872 059	10.08	3.85	13	10	42
	18	0	51	59.82	8	22	59.9	0.845 522	10.40	3.97	13	08	58
	19	0	53	59.44	8	46	47.8	0.819 696	10.73	4.10	13	06	46
	20	0	55	30.69	9	06	36.1	0.794 733	11.07	4.23	13	04	05
	21	0	56	33.31	9	22	16.1	0.770 774	11.41	4.36	13	00	56
	22	0	57	07.39	9	33	41.0	0.747 949	11.76	4.49	12	57	19
	23	0	57	13.37	+9	40	45.9	0.726 374	12.11	4.63	12	53	14
	24	0	56	52.06	9	43	28.7	0.706 151	12.45	4.76	12	48	43
	25	0	56	04.70	9	41	49.9	0.687 370	12.79	4.89	12	43	47
	26	0	54	52.94	9	35	53.2	0.670 109	13.12	5.01	12	38	28
	27	0	53	18.86	9	25	46.1	0.654 428	13.44	5.13	12	32	48
	28	0	51	24.94	9	11	39.9	0.640 377	13.73	5.25	12	26	50
	29	0	49	14.03	+8	53	50.0	0.627 990	14.00	5.35	12	20	36
	30	0	46	49.27	8	32	35.9	0.617 286	14.25	5.44	12	14	11
	31	0	44	14.07	8	08	21.3	0.608 269	14.46	5.52	12	07	37
Apr.	1	0	41	31.96	7	41	32.9	0.600 930	14.63	5.59	12	00	58
	2	0	38	46.52	+7	12	40.6	0.595 245	14.77	5.64	11	54	18

MERCURY, 2018

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	0	41	31.96	+7	41	32.9	0.600 930	14.63	5.59	12	00	58
	2	0	38	46.52	7	12	40.6	0.595 245	14.77	5.64	11	54	18
	3	0	36	01.29	6	42	15.8	0.591 177	14.88	5.68	11	47	39
	4	0	33	19.62	6	10	51.2	0.588 677	14.94	5.71	11	41	06
	5	0	30	44.66	5	38	59.1	0.587 684	14.96	5.72	11	34	40
	6	0	28	19.22	5	07	10.7	0.588 131	14.95	5.71	11	28	25
	7	0	26	05.76	+4	35	55.4	0.589 942	14.91	5.70	11	22	23
	8	0	24	06.37	4	05	39.9	0.593 037	14.83	5.67	11	16	36
	9	0	22	22.71	3	36	47.5	0.597 334	14.72	5.62	11	11	05
	10	0	20	56.08	3	09	38.4	0.602 746	14.59	5.57	11	05	51
	11	0	19	47.40	2	44	29.1	0.609 192	14.44	5.52	11	00	55
	12	0	18	57.25	2	21	32.9	0.616 588	14.26	5.45	10	56	18
	13	0	18	25.94	+2	00	59.6	0.624 855	14.07	5.38	10	51	59
	14	0	18	13.52	1	42	56.3	0.633 919	13.87	5.30	10	47	59
	15	0	18	19.83	1	27	27.5	0.643 708	13.66	5.22	10	44	18
	16	0	18	44.54	1	14	35.6	0.654 155	13.44	5.14	10	40	55
	17	0	19	27.19	1	04	21.0	0.665 200	13.22	5.05	10	37	49
	18	0	20	27.25	0	56	42.8	0.676 786	12.99	4.96	10	35	00
	19	0	21	44.08	+0	51	38.7	0.688 863	12.77	4.88	10	32	28
	20	0	23	17.04	0	49	05.9	0.701 382	12.54	4.79	10	30	12
	21	0	25	05.45	0	49	00.4	0.714 304	12.31	4.70	10	28	10
	22	0	27	08.63	0	51	18.0	0.727 589	12.09	4.62	10	26	23
	23	0	29	25.91	0	55	54.3	0.741 203	11.86	4.53	10	24	50
	24	0	31	56.65	1	02	44.5	0.755 117	11.65	4.45	10	23	30
	25	0	34	40.23	+1	11	43.6	0.769 303	11.43	4.37	10	22	22
	26	0	37	36.06	1	22	47.0	0.783 736	11.22	4.29	10	21	27
	27	0	40	43.60	1	35	49.7	0.798 395	11.01	4.21	10	20	43
	28	0	44	02.34	1	50	47.0	0.813 259	10.81	4.13	10	20	09
	29	0	47	31.82	2	07	34.2	0.828 311	10.62	4.06	10	19	47
	30	0	51	11.62	2	26	06.8	0.843 534	10.43	3.98	10	19	34
May	1	0	55	01.37	+2	46	20.4	0.858 914	10.24	3.91	10	19	32
	2	0	59	00.71	3	08	10.7	0.874 435	10.06	3.84	10	19	39
	3	1	03	09.36	3	31	33.5	0.890 086	9.88	3.77	10	19	55
	4	1	07	27.07	3	56	24.7	0.905 853	9.71	3.71	10	20	20
	5	1	11	53.61	4	22	40.5	0.921 724	9.54	3.65	10	20	53
	6	1	16	28.81	4	50	16.9	0.937 688	9.38	3.58	10	21	36
	7	1	21	12.54	+5	19	10.2	0.953 731	9.22	3.52	10	22	27
	8	1	26	04.71	5	49	16.8	0.969 841	9.07	3.46	10	23	26
	9	1	31	05.25	6	20	32.9	0.986 004	8.92	3.41	10	24	34
	10	1	36	14.14	6	52	55.0	1.002 207	8.77	3.35	10	25	50
	11	1	41	31.39	7	26	19.5	1.018 432	8.63	3.30	10	27	14
	12	1	46	57.04	8	00	42.8	1.034 664	8.50	3.25	10	28	47
	13	1	52	31.19	+8	36	01.1	1.050 882	8.37	3.20	10	30	28
	14	1	58	13.93	9	12	10.8	1.067 065	8.24	3.15	10	32	19
	15	2	04	05.40	9	49	07.9	1.083 190	8.12	3.10	10	34	18
	16	2	10	05.78	10	26	48.5	1.099 228	8.00	3.06	10	36	26
	17	2	16	15.25	+11	05	08.4	1.115 150	7.89	3.01	10	38	43

MERCURY, 2018

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	16	15.25	+11	05	08.4	1.115 150	7.89	3.01	10	38	43
	18	2	22	34.02	11	44	03.1	1.130 922	7.78	2.97	10	41	09
	19	2	29	02.32	12	23	27.8	1.146 504	7.67	2.93	10	43	46
	20	2	35	40.40	13	03	17.5	1.161 855	7.57	2.89	10	46	32
	21	2	42	28.50	13	43	26.8	1.176 926	7.47	2.85	10	49	29
	22	2	49	26.89	14	23	49.7	1.191 663	7.38	2.82	10	52	36
	23	2	56	35.81	+15	04	19.7	1.206 008	7.29	2.79	10	55	53
	24	3	03	55.49	15	44	49.9	1.219 895	7.21	2.75	10	59	22
	25	3	11	26.14	16	25	12.8	1.233 252	7.13	2.72	11	03	02
	26	3	19	07.92	17	05	19.9	1.246 004	7.06	2.70	11	06	53
	27	3	27	00.92	17	45	02.4	1.258 069	6.99	2.67	11	10	55
	28	3	35	05.16	18	24	10.5	1.269 359	6.93	2.65	11	15	09
	29	3	43	20.56	+19	02	34.0	1.279 786	6.87	2.63	11	19	33
	30	3	51	46.94	19	40	01.8	1.289 257	6.82	2.61	11	24	09
	31	4	00	23.96	20	16	22.2	1.297 682	6.78	2.59	11	28	55
June	1	4	09	11.15	20	51	23.4	1.304 973	6.74	2.57	11	33	52
	2	4	18	07.87	21	24	53.2	1.311 047	6.71	2.56	11	38	57
	3	4	27	13.31	21	56	39.3	1.315 829	6.68	2.55	11	44	11
	4	4	36	26.49	+22	26	29.8	1.319 258	6.67	2.55	11	49	32
	5	4	45	46.28	22	54	13.5	1.321 284	6.66	2.54	11	54	60
	6	4	55	11.41	23	19	39.9	1.321 876	6.65	2.54	12	00	32
	7	5	04	40.48	23	42	39.6	1.321 020	6.66	2.54	12	06	07
	8	5	14	11.98	24	03	04.9	1.318 721	6.67	2.55	12	11	44
	9	5	23	44.39	24	20	49.7	1.315 002	6.69	2.56	12	17	21
	10	5	33	16.17	+24	35	49.5	1.309 905	6.71	2.57	12	22	56
	11	5	42	45.80	24	48	01.7	1.303 486	6.75	2.58	12	28	29
	12	5	52	11.80	24	57	25.6	1.295 818	6.79	2.59	12	33	57
	13	6	01	32.81	25	04	02.1	1.286 979	6.83	2.61	12	39	20
	14	6	10	47.55	25	07	53.6	1.277 058	6.89	2.63	12	44	35
	15	6	19	54.89	25	09	03.9	1.266 148	6.95	2.65	12	49	43
	16	6	28	53.80	+25	07	37.9	1.254 343	7.01	2.68	12	54	41
	17	6	37	43.42	25	03	41.4	1.241 737	7.08	2.71	12	59	30
	18	6	46	22.99	24	57	21.2	1.228 422	7.16	2.74	13	04	08
	19	6	54	51.90	24	48	44.2	1.214 484	7.24	2.77	13	08	35
	20	7	03	09.64	24	37	57.9	1.200 007	7.33	2.80	13	12	51
	21	7	11	15.80	24	25	10.0	1.185 067	7.42	2.84	13	16	55
	22	7	19	10.09	+24	10	28.3	1.169 736	7.52	2.87	13	20	47
	23	7	26	52.26	23	54	00.6	1.154 077	7.62	2.91	13	24	26
	24	7	34	22.13	23	35	54.6	1.138 150	7.73	2.95	13	27	53
	25	7	41	39.61	23	16	18.0	1.122 008	7.84	2.99	13	31	07
	26	7	48	44.60	22	55	18.0	1.105 697	7.95	3.04	13	34	09
	27	7	55	37.06	22	33	02.1	1.089 261	8.07	3.08	13	36	58
	28	8	02	16.98	+22	09	37.3	1.072 736	8.20	3.13	13	39	35
	29	8	08	44.34	21	45	10.3	1.056 157	8.33	3.18	13	41	58
	30	8	14	59.16	21	19	48.0	1.039 552	8.46	3.23	13	44	10
July	1	8	21	01.45	20	53	36.6	1.022 949	8.60	3.28	13	46	08
	2	8	26	51.20	+20	26	42.6	1.006 370	8.74	3.34	13	47	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
July	1	8	21	01.45	+20	53	36.6	1.022 949	8.60	3.28	13	46	08
	2	8	26	51.20	20	26	42.6	1.006 370	8.74	3.34	13	47	55
	3	8	32	28.41	19	59	12.1	0.989 837	8.88	3.39	13	49	28
	4	8	37	53.08	19	31	11.0	0.973 369	9.03	3.45	13	50	49
	5	8	43	05.17	19	02	45.2	0.956 982	9.19	3.51	13	51	57
	6	8	48	04.64	18	34	00.6	0.940 692	9.35	3.57	13	52	53
	7	8	52	51.42	+18	05	02.9	0.924 513	9.51	3.63	13	53	36
	8	8	57	25.41	17	35	57.7	0.908 460	9.68	3.70	13	54	06
	9	9	01	46.51	17	06	50.8	0.892 545	9.85	3.76	13	54	23
	10	9	05	54.56	16	37	47.8	0.876 782	10.03	3.83	13	54	27
	11	9	09	49.37	16	08	54.4	0.861 183	10.21	3.90	13	54	17
	12	9	13	30.75	15	40	16.5	0.845 762	10.40	3.97	13	53	54
	13	9	16	58.43	+15	12	00.1	0.830 533	10.59	4.05	13	53	17
	14	9	20	12.15	14	44	11.0	0.815 510	10.78	4.12	13	52	26
	15	9	23	11.57	14	16	55.5	0.800 710	10.98	4.20	13	51	21
	16	9	25	56.37	13	50	20.0	0.786 151	11.19	4.27	13	50	00
	17	9	28	26.16	13	24	30.9	0.771 852	11.39	4.35	13	48	25
	18	9	30	40.56	12	59	34.9	0.757 835	11.60	4.43	13	46	34
	19	9	32	39.15	+12	35	38.9	0.744 124	11.82	4.52	13	44	27
	20	9	34	21.49	12	12	50.2	0.730 746	12.03	4.60	13	42	03
	21	9	35	47.16	11	51	15.9	0.717 729	12.25	4.68	13	39	23
	22	9	36	55.72	11	31	03.7	0.705 107	12.47	4.77	13	36	25
	23	9	37	46.76	11	12	21.1	0.692 916	12.69	4.85	13	33	10
	24	9	38	19.90	10	55	16.0	0.681 194	12.91	4.93	13	29	37
	25	9	38	34.80	+10	39	56.0	0.669 986	13.13	5.02	13	25	46
	26	9	38	31.22	10	26	28.9	0.659 339	13.34	5.10	13	21	36
	27	9	38	08.99	10	15	02.2	0.649 303	13.54	5.17	13	17	08
	28	9	37	28.09	10	05	42.9	0.639 936	13.74	5.25	13	12	21
	29	9	36	28.66	9	58	37.6	0.631 295	13.93	5.32	13	07	16
	30	9	35	11.02	9	53	51.9	0.623 445	14.11	5.39	13	01	53
	31	9	33	35.73	+9	51	30.6	0.616 451	14.27	5.45	12	56	14
Aug.	1	9	31	43.61	9	51	37.0	0.610 384	14.41	5.50	12	50	18
	2	9	29	35.79	9	54	12.8	0.605 315	14.53	5.55	12	44	07
	3	9	27	13.71	9	59	17.8	0.601 317	14.62	5.59	12	37	44
	4	9	24	39.13	10	06	49.9	0.598 462	14.69	5.61	12	31	09
	5	9	21	54.16	10	16	44.4	0.596 822	14.73	5.63	12	24	25
	6	9	19	01.25	+10	28	54.2	0.596 466	14.74	5.63	12	17	34
	7	9	16	03.14	10	43	09.9	0.597 458	14.72	5.62	12	10	40
	8	9	13	02.84	10	59	19.6	0.599 858	14.66	5.60	12	03	45
	9	9	10	03.56	11	17	09.1	0.603 718	14.57	5.57	11	56	53
	10	9	07	08.63	11	36	22.6	0.609 082	14.44	5.52	11	50	07
	11	9	04	21.46	11	56	42.4	0.615 984	14.28	5.45	11	43	30
	12	9	01	45.42	+12	17	49.9	0.624 447	14.08	5.38	11	37	06
	13	8	59	23.79	12	39	25.7	0.634 486	13.86	5.30	11	30	57
	14	8	57	19.65	13	01	10.2	0.646 101	13.61	5.20	11	25	07
	15	8	55	35.86	13	22	44.2	0.659 282	13.34	5.10	11	19	39
	16	8	54	14.95	+13	43	48.5	0.674 007	13.05	4.99	11	14	34

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	8	54	14.95	+13	43	48.5	0.674 007	13.05	4.99	11	14	34
	17	8	53	19.15	14	04	05.1	0.690 243	12.74	4.87	11	09	55
	18	8	52	50.30	14	23	16.6	0.707 943	12.42	4.75	11	05	43
	19	8	52	49.87	14	41	06.8	0.727 051	12.10	4.62	11	02	00
	20	8	53	18.97	14	57	20.5	0.747 497	11.76	4.49	10	58	47
	21	8	54	18.35	15	11	43.6	0.769 202	11.43	4.37	10	56	04
	22	8	55	48.38	+15	24	02.8	0.792 072	11.10	4.24	10	53	52
	23	8	57	49.13	15	34	06.2	0.816 003	10.78	4.12	10	52	10
	24	9	00	20.32	15	41	42.6	0.840 879	10.46	4.00	10	50	58
	25	9	03	21.40	15	46	42.0	0.866 571	10.15	3.88	10	50	16
	26	9	06	51.52	15	48	55.6	0.892 942	9.85	3.76	10	50	02
	27	9	10	49.57	15	48	15.7	0.919 839	9.56	3.65	10	50	16
	28	9	15	14.20	+15	44	36.0	0.947 104	9.29	3.55	10	50	55
	29	9	20	03.83	15	37	51.7	0.974 569	9.02	3.45	10	51	59
	30	9	25	16.68	15	27	59.9	1.002 062	8.78	3.35	10	53	26
	31	9	30	50.80	15	14	59.2	1.029 409	8.54	3.26	10	55	12
Sept.	1	9	36	44.09	14	58	50.4	1.056 438	8.32	3.18	10	57	17
	2	9	42	54.38	14	39	36.2	1.082 981	8.12	3.10	10	59	38
	3	9	49	19.44	+14	17	21.2	1.108 883	7.93	3.03	11	02	13
	4	9	55	57.01	13	52	12.1	1.134 000	7.75	2.96	11	04	59
	5	10	02	44.92	13	24	17.2	1.158 204	7.59	2.90	11	07	55
	6	10	09	41.05	12	53	46.1	1.181 388	7.44	2.84	11	10	58
	7	10	16	43.43	12	20	49.7	1.203 463	7.31	2.79	11	14	07
	8	10	23	50.22	11	45	39.8	1.224 362	7.18	2.74	11	17	19
	9	10	30	59.79	+11	08	28.6	1.244 039	7.07	2.70	11	20	33
	10	10	38	10.70	10	29	28.4	1.262 465	6.97	2.66	11	23	48
	11	10	45	21.67	9	48	51.6	1.279 629	6.87	2.63	11	27	03
	12	10	52	31.67	9	06	50.1	1.295 535	6.79	2.59	11	30	16
	13	10	59	39.81	8	23	35.6	1.310 199	6.71	2.56	11	33	27
	14	11	06	45.38	7	39	18.7	1.323 647	6.64	2.54	11	36	35
	15	11	13	47.84	+6	54	09.9	1.335 913	6.58	2.52	11	39	39
	16	11	20	46.77	6	08	18.4	1.347 035	6.53	2.49	11	42	40
	17	11	27	41.85	5	21	52.9	1.357 058	6.48	2.48	11	45	37
	18	11	34	32.91	4	35	01.3	1.366 025	6.44	2.46	11	48	30
	19	11	41	19.82	3	47	50.7	1.373 983	6.40	2.45	11	51	19
	20	11	48	02.54	3	00	27.7	1.380 977	6.37	2.43	11	54	03
	21	11	54	41.09	+2	12	57.9	1.387 051	6.34	2.42	11	56	43
	22	12	01	15.52	1	25	26.5	1.392 249	6.32	2.41	11	59	19
	23	12	07	45.93	+0	37	58.3	1.396 612	6.30	2.41	12	01	52
	24	12	14	12.45	-0	09	22.5	1.400 178	6.28	2.40	12	04	20
	25	12	20	35.23	0	56	32.1	1.402 984	6.27	2.39	12	06	44
	26	12	26	54.44	1	43	27.3	1.405 064	6.26	2.39	12	09	06
	27	12	33	10.25	-2	30	05.0	1.406 449	6.25	2.39	12	11	23
	28	12	39	22.85	3	16	22.5	1.407 168	6.25	2.39	12	13	38
	29	12	45	32.42	4	02	17.2	1.407 247	6.25	2.39	12	15	50
	30	12	51	39.15	4	47	47.1	1.406 711	6.25	2.39	12	17	59
Oct.	1	12	57	43.22	-5	32	49.9	1.405 579	6.26	2.39	12	20	05

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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	12	57	43.22	-5	32	49.9	1.405 579	6.26	2.39	12	20	05
	2	13	03	44.83	6	17	23.9	1.403 873	6.26	2.39	12	22	09
	3	13	09	44.14	7	01	27.2	1.401 609	6.27	2.40	12	24	11
	4	13	15	41.32	7	44	58.3	1.398 802	6.29	2.40	12	26	11
	5	13	21	36.54	8	27	55.7	1.395 465	6.30	2.41	12	28	09
	6	13	27	29.95	9	10	17.8	1.391 612	6.32	2.41	12	30	05
	7	13	33	21.70	-9	52	03.2	1.387 250	6.34	2.42	12	31	59
	8	13	39	11.92	10	33	10.8	1.382 391	6.36	2.43	12	33	52
	9	13	45	00.74	11	13	39.1	1.377 039	6.39	2.44	12	35	44
	10	13	50	48.27	11	53	27.0	1.371 203	6.41	2.45	12	37	35
	11	13	56	34.63	12	32	33.2	1.364 886	6.44	2.46	12	39	24
	12	14	02	19.89	13	10	56.5	1.358 093	6.48	2.47	12	41	12
	13	14	08	04.15	-13	48	35.6	1.350 827	6.51	2.49	12	43	00
	14	14	13	47.44	14	25	29.4	1.343 089	6.55	2.50	12	44	46
	15	14	19	29.84	15	01	36.6	1.334 880	6.59	2.52	12	46	32
	16	14	25	11.35	15	36	56.0	1.326 201	6.63	2.53	12	48	16
	17	14	30	52.00	16	11	26.2	1.317 050	6.68	2.55	12	49	60
	18	14	36	31.77	16	45	06.0	1.307 427	6.73	2.57	12	51	43
	19	14	42	10.65	-17	17	54.0	1.297 329	6.78	2.59	12	53	25
	20	14	47	48.56	17	49	48.8	1.286 755	6.83	2.61	12	55	06
	21	14	53	25.45	18	20	49.0	1.275 700	6.89	2.63	12	56	46
	22	14	59	01.20	18	50	53.1	1.264 161	6.96	2.66	12	58	24
	23	15	04	35.67	19	19	59.6	1.252 134	7.02	2.68	13	00	01
	24	15	10	08.69	19	48	06.9	1.239 616	7.09	2.71	13	01	37
	25	15	15	40.05	-20	15	13.4	1.226 601	7.17	2.74	13	03	11
	26	15	21	09.51	20	41	17.3	1.213 086	7.25	2.77	13	04	43
	27	15	26	36.75	21	06	16.9	1.199 066	7.33	2.80	13	06	12
	28	15	32	01.42	21	30	10.2	1.184 538	7.42	2.84	13	07	39
	29	15	37	23.09	21	52	55.4	1.169 497	7.52	2.87	13	09	02
	30	15	42	41.29	22	14	30.4	1.153 942	7.62	2.91	13	10	22
	31	15	47	55.45	-22	34	53.0	1.137 870	7.73	2.95	13	11	37
Nov.	1	15	53	04.91	22	54	00.9	1.121 282	7.84	3.00	13	12	47
	2	15	58	08.93	23	11	51.8	1.104 178	7.96	3.04	13	13	51
	3	16	03	06.64	23	28	23.0	1.086 563	8.09	3.09	13	14	49
	4	16	07	57.09	23	43	32.0	1.068 443	8.23	3.14	13	15	38
	5	16	12	39.14	23	57	15.9	1.049 830	8.38	3.20	13	16	18
	6	16	17	11.54	-24	09	31.5	1.030 738	8.53	3.26	13	16	48
	7	16	21	32.86	24	20	15.7	1.011 189	8.70	3.32	13	17	06
	8	16	25	41.48	24	29	24.9	0.991 211	8.87	3.39	13	17	10
	9	16	29	35.58	24	36	55.2	0.970 839	9.06	3.46	13	16	59
	10	16	33	13.15	24	42	42.4	0.950 119	9.26	3.54	13	16	30
	11	16	36	31.92	24	46	41.8	0.929 111	9.47	3.62	13	15	41
	12	16	39	29.42	-24	48	48.4	0.907 885	9.69	3.70	13	14	29
	13	16	42	02.94	24	48	56.3	0.886 530	9.92	3.79	13	12	51
	14	16	44	09.59	24	46	59.1	0.865 154	10.16	3.88	13	10	46
	15	16	45	46.29	24	42	49.8	0.843 886	10.42	3.98	13	08	08
	16	16	46	49.91	-24	36	20.7	0.822 878	10.69	4.08	13	04	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
Nov.	16	16	46	49.91	-24	36	20.7	0.822 878	10.69	4.08	13	04	56
	17	16	47	17.31	24	27	23.4	0.802 313	10.96	4.19	13	01	07
	18	16	47	05.57	24	15	49.1	0.782 398	11.24	4.29	12	56	37
	19	16	46	12.16	24	01	29.4	0.763 373	11.52	4.40	12	51	25
	20	16	44	35.25	23	44	16.6	0.745 504	11.80	4.51	12	45	30
	21	16	42	14.02	23	24	05.3	0.729 084	12.06	4.61	12	38	51
	22	16	39	09.05	-23	00	53.9	0.714 423	12.31	4.70	12	31	29
	23	16	35	22.66	22	34	46.8	0.701 839	12.53	4.79	12	23	29
	24	16	30	59.16	22	05	56.4	0.691 642	12.71	4.86	12	14	56
	25	16	26	04.99	21	34	45.4	0.684 119	12.85	4.91	12	05	56
	26	16	20	48.59	21	01	47.8	0.679 511	12.94	4.94	11	56	39
	27	16	15	19.99	20	27	48.7	0.677 995	12.97	4.96	11	47	16
	28	16	09	50.18	-19	53	42.2	0.679 667	12.94	4.94	11	37	57
	29	16	04	30.30	19	20	27.9	0.684 535	12.85	4.91	11	28	52
	30	15	59	30.80	18	49	05.4	0.692 511	12.70	4.85	11	20	12
Dec.	1	15	55	00.68	18	20	29.4	0.703 427	12.50	4.78	11	12	04
	2	15	51	07.07	17	55	25.1	0.717 038	12.26	4.69	11	04	35
	3	15	47	54.93	17	34	25.5	0.733 051	12.00	4.58	10	57	48
	4	15	45	27.11	-17	17	50.1	0.751 137	11.71	4.47	10	51	46
	5	15	43	44.61	17	05	46.0	0.770 955	11.41	4.36	10	46	28
	6	15	42	46.90	16	58	09.0	0.792 170	11.10	4.24	10	41	54
	7	15	42	32.28	16	54	46.5	0.814 460	10.80	4.13	10	38	02
	8	15	42	58.30	16	55	19.9	0.837 530	10.50	4.01	10	34	49
	9	15	44	02.04	16	59	26.6	0.861 117	10.21	3.90	10	32	12
	10	15	45	40.34	-17	06	42.3	0.884 987	9.94	3.80	10	30	08
	11	15	47	50.02	17	16	42.1	0.908 942	9.68	3.70	10	28	34
	12	15	50	28.00	17	29	01.8	0.932 813	9.43	3.60	10	27	27
	13	15	53	31.39	17	43	18.2	0.956 461	9.19	3.51	10	26	44
	14	15	56	57.48	17	59	10.0	0.979 771	8.98	3.43	10	26	23
	15	16	00	43.85	18	16	17.8	1.002 653	8.77	3.35	10	26	21
	16	16	04	48.32	-18	34	23.7	1.025 033	8.58	3.28	10	26	36
	17	16	09	08.91	18	53	12.2	1.046 855	8.40	3.21	10	27	07
	18	16	13	43.92	19	12	29.1	1.068 079	8.23	3.15	10	27	51
	19	16	18	31.83	19	32	02.0	1.088 671	8.08	3.09	10	28	48
	20	16	23	31.29	19	51	39.9	1.108 612	7.93	3.03	10	29	55
	21	16	28	41.14	20	11	13.2	1.127 888	7.80	2.98	10	31	13
	22	16	34	00.35	-20	30	33.3	1.146 490	7.67	2.93	10	32	39
	23	16	39	28.03	20	49	32.6	1.164 416	7.55	2.89	10	34	14
	24	16	45	03.39	21	08	04.6	1.181 666	7.44	2.84	10	35	56
	25	16	50	45.74	21	26	03.4	1.198 245	7.34	2.80	10	37	45
	26	16	56	34.47	21	43	23.7	1.214 158	7.24	2.77	10	39	40
	27	17	02	29.05	22	00	00.8	1.229 413	7.15	2.73	10	41	41
	28	17	08	29.00	-22	15	50.7	1.244 018	7.07	2.70	10	43	46
	29	17	14	33.90	22	30	49.6	1.257 983	6.99	2.67	10	45	57
	30	17	20	43.39	22	44	54.2	1.271 319	6.92	2.64	10	48	12
	31	17	26	57.12	22	58	01.5	1.284 034	6.85	2.62	10	50	31
	32	17	33	14.79	-23	10	08.8	1.296 140	6.78	2.59	10	52	54

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Date		Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector	Date		Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector
Jan.	1	275 51 53.5	-1 06 28.0	0.727 3120	Apr.	3	62 08 05.0	-0 51 46.5	0.721 5823
	3	279 01 45.4	1 17 00.1	0.727 4665		5	65 21 02.2	0 40 37.8	0.721 3276
	5	282 11 34.2	1 27 18.0	0.727 6082		7	68 34 06.6	0 29 21.0	0.721 0791
	7	285 21 20.6	1 37 19.6	0.727 7366		9	71 47 18.2	0 17 58.1	0.720 8377
	9	288 31 04.9	1 47 03.3	0.727 8514		11	75 00 37.1	-0 06 31.4	0.720 6040
	11	291 40 47.9	1 56 27.3	0.727 9522		13	78 14 03.2	+0 04 56.9	0.720 3789
	13	294 50 30.0	-2 05 29.8	0.728 0388		15	81 27 36.5	+0 16 24.8	0.720 1630
	15	298 00 11.8	2 14 09.4	0.728 1108		17	84 41 17.0	0 27 49.9	0.719 9570
	17	301 09 53.7	2 22 24.4	0.728 1680		19	87 55 04.6	0 39 10.1	0.719 7616
	19	304 19 36.3	2 30 13.3	0.728 2103		21	91 08 59.3	0 50 23.2	0.719 5775
	21	307 29 19.9	2 37 34.8	0.728 2375		23	94 23 00.7	1 01 27.0	0.719 4051
	23	310 39 05.2	2 44 27.5	0.728 2496		25	97 37 08.9	1 12 19.4	0.719 2452
	25	313 48 52.4	-2 50 50.2	0.728 2465		27	100 51 23.6	+1 22 58.2	0.719 0981
	27	316 58 41.9	2 56 41.7	0.728 2282		29	104 05 44.6	1 33 21.4	0.718 9643
	29	320 08 34.1	3 02 01.0	0.728 1948	May	1	107 20 11.5	1 43 26.8	0.718 8444
	31	323 18 29.5	3 06 47.0	0.728 1464		3	110 34 44.2	1 53 12.6	0.718 7386
Feb.	2	326 28 28.1	3 10 58.9	0.728 0832		5	113 49 22.1	2 02 36.9	0.718 6474
	4	329 38 30.5	3 14 36.0	0.728 0052		7	117 04 05.1	2 11 37.6	0.718 5710
	6	332 48 36.7	-3 17 37.6	0.727 9128		9	120 18 52.5	+2 20 13.2	0.718 5096
	8	335 58 47.1	3 20 02.9	0.727 8063		11	123 33 44.1	2 28 21.9	0.718 4635
	10	339 09 01.9	3 21 51.7	0.727 6859		13	126 48 39.2	2 36 02.1	0.718 4328
	12	342 19 21.2	3 23 03.5	0.727 5520		15	130 03 37.4	2 43 12.2	0.718 4176
	14	345 29 45.4	3 23 38.0	0.727 4051		17	133 18 38.0	2 49 50.9	0.718 4179
	16	348 40 14.4	3 23 35.2	0.727 2455		19	136 33 40.5	2 55 56.8	0.718 4338
	18	351 50 48.5	-3 22 54.9	0.727 0737		21	139 48 44.3	+3 01 28.9	0.718 4652
	20	355 01 27.8	3 21 37.3	0.726 8904		23	143 03 48.6	3 06 25.9	0.718 5120
	22	358 12 12.5	3 19 42.5	0.726 6960		25	146 18 52.9	3 10 46.9	0.718 5740
	24	1 23 02.5	3 17 10.8	0.726 4911		27	149 33 56.5	3 14 31.1	0.718 6511
	26	4 33 58.1	3 14 02.5	0.726 2763		29	152 48 58.7	3 17 37.8	0.718 7430
	28	7 44 59.4	3 10 18.4	0.726 0524		31	156 03 58.7	3 20 06.3	0.718 8494
Mar.	2	10 56 06.3	-3 05 58.9	0.725 8200	June	2	159 18 55.8	+3 21 56.3	0.718 9699
	4	14 07 19.1	3 01 04.8	0.725 5797		4	162 33 49.4	3 23 07.4	0.719 1041
	6	17 18 37.7	2 55 36.9	0.725 3324		6	165 48 38.9	3 23 39.5	0.719 2517
	8	20 30 02.4	2 49 36.2	0.725 0788		8	169 03 23.3	3 23 32.4	0.719 4121
	10	23 41 33.1	2 43 03.8	0.724 8197		10	172 18 02.2	3 22 46.2	0.719 5849
	12	26 53 09.9	2 36 00.7	0.724 5558		12	175 32 34.8	3 21 21.2	0.719 7694
	14	30 04 52.9	-2 28 28.3	0.724 2881		14	178 47 00.7	+3 19 17.7	0.719 9651
	16	33 16 42.3	2 20 27.8	0.724 0173		16	182 01 19.0	3 16 36.2	0.720 1714
	18	36 28 38.0	2 12 00.7	0.723 7443		18	185 15 29.4	3 13 17.2	0.720 3875
	20	39 40 40.3	2 03 08.6	0.723 4698		20	188 29 31.2	3 09 21.4	0.720 6129
	22	42 52 49.1	1 53 53.0	0.723 1949		22	191 43 24.0	3 04 49.7	0.720 8467
	24	46 05 04.5	1 44 15.7	0.722 9203		24	194 57 07.4	2 59 43.0	0.721 0883
	26	49 17 26.8	-1 34 18.3	0.722 6469		26	198 10 41.0	+2 54 02.5	0.721 3368
	28	52 29 55.9	1 24 02.8	0.722 3755		28	201 24 04.5	2 47 49.1	0.721 5915
	30	55 42 31.9	1 13 31.0	0.722 1071		30	204 37 17.6	2 41 04.3	0.721 8515
Apr.	1	58 55 14.9	1 02 44.9	0.721 8424	July	2	207 50 20.0	2 33 49.3	0.722 1161
	3	62 08 05.0	-0 51 46.5	0.721 5823		4	211 03 11.7	+2 26 05.6	0.722 3845

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MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date		Heliocentric Longitude	Heliocentric Latitude	Radius Vector
		° ′ ″	° ′ ″				° ′ ″	° ′ ″	
July	2	207 50 20.0	+2 33 49.3	0.722 1161	Oct.	2	353 55 20.6	-3 22 08.6	0.726 9554
	4	211 03 11.7	2 26 05.6	0.722 3845		4	357 06 03.5	3 20 26.7	0.726 7655
	6	214 15 52.4	2 17 54.8	0.722 6556		6	0 16 51.6	3 18 07.8	0.726 5649
	8	217 28 22.2	2 09 18.4	0.722 9288		8	3 27 45.3	3 15 12.3	0.726 3542
	10	220 40 40.9	2 00 18.1	0.723 2032		10	6 38 44.6	3 11 40.6	0.726 1342
	12	223 52 48.8	1 50 55.7	0.723 4778		12	9 49 49.5	3 07 33.4	0.725 9055
	14	227 04 45.9	+1 41 13.0	0.723 7519		14	13 01 00.2	-3 02 51.2	0.725 6688
	16	230 16 32.3	1 31 11.9	0.724 0246		16	16 12 16.7	2 57 35.1	0.725 4248
	18	233 28 08.3	1 20 54.2	0.724 2950		18	19 23 39.2	2 51 45.7	0.725 1742
	20	236 39 34.2	1 10 21.9	0.724 5624		20	22 35 07.6	2 45 24.1	0.724 9180
	22	239 50 50.1	0 59 37.0	0.724 8257		22	25 46 42.1	2 38 31.6	0.724 6568
	24	243 01 56.5	0 48 41.5	0.725 0844		24	28 58 22.8	2 31 09.2	0.724 3914
	26	246 12 53.9	+0 37 37.4	0.725 3375		26	32 10 09.7	-2 23 18.4	0.724 1228
	28	249 23 42.5	0 26 26.9	0.725 5843		28	35 22 03.0	2 15 00.4	0.723 8516
	30	252 34 22.8	0 15 11.9	0.725 8240		30	38 34 02.6	2 06 16.8	0.723 5789
Aug.	1	255 44 55.4	+0 03 54.6	0.726 0559	Nov.	1	41 46 08.8	1 57 09.3	0.723 3054
	3	258 55 20.7	-0 07 23.1	0.726 2793		3	44 58 21.6	1 47 39.3	0.723 0319
	5	262 05 39.4	0 18 38.9	0.726 4935		5	48 10 41.0	1 37 48.7	0.722 7594
	7	265 15 51.8	-0 29 51.0	0.726 6978		7	51 23 07.2	-1 27 39.3	0.722 4886
	9	268 25 58.6	0 40 57.2	0.726 8916		9	54 35 40.3	1 17 12.9	0.722 2205
	11	271 36 00.4	0 51 55.6	0.727 0744		11	57 48 20.3	1 06 31.6	0.721 9559
	13	274 45 57.7	1 02 44.1	0.727 2455		13	61 01 07.3	0 55 37.3	0.721 6955
	15	277 55 51.2	1 13 20.9	0.727 4045		15	64 14 01.4	0 44 31.9	0.721 4403
	17	281 05 41.3	1 23 43.9	0.727 5508		17	67 27 02.5	0 33 17.8	0.721 1910
	19	284 15 28.7	-1 33 51.5	0.727 6841		19	70 40 10.9	-0 21 56.8	0.720 9484
	21	287 25 14.0	1 43 41.6	0.727 8039		21	73 53 26.4	-0 10 31.2	0.720 7132
	23	290 34 57.7	1 53 12.7	0.727 9098		23	77 06 49.1	+0 00 56.8	0.720 4864
	25	293 44 40.3	2 02 22.9	0.728 0016		25	80 20 19.0	0 12 25.1	0.720 2684
	27	296 54 22.4	2 11 10.7	0.728 0790		27	83 33 56.0	0 23 51.3	0.720 0601
	29	300 04 04.4	2 19 34.4	0.728 1416		29	86 47 40.2	0 35 13.5	0.719 8621
	31	303 13 47.0	-2 27 32.7	0.728 1895	Dec.	1	90 01 31.3	+0 46 29.3	0.719 6750
Sept.	2	306 23 30.4	2 35 03.9	0.728 2223		3	93 15 29.3	0 57 36.5	0.719 4994
	4	309 33 15.3	2 42 06.8	0.728 2400		5	96 29 34.1	1 08 33.1	0.719 3360
	6	312 43 02.0	2 48 40.1	0.728 2425		7	99 43 45.4	1 19 16.8	0.719 1851
	8	315 52 50.9	2 54 42.6	0.728 2299		9	102 58 03.0	1 29 45.6	0.719 0474
	10	319 02 42.3	3 00 13.3	0.728 2022		11	106 12 26.7	1 39 57.5	0.718 9232
	12	322 12 36.7	-3 05 11.0	0.728 1595		13	109 26 56.2	+1 49 50.4	0.718 8129
	14	325 22 34.3	3 09 35.0	0.728 1018		15	112 41 31.1	1 59 22.3	0.718 7169
	16	328 32 35.5	3 13 24.3	0.728 0294		17	115 56 11.1	2 08 31.5	0.718 6356
	18	331 42 40.5	3 16 38.3	0.727 9425		19	119 10 55.8	2 17 16.0	0.718 5691
	20	334 52 49.6	3 19 16.4	0.727 8414		21	122 25 44.7	2 25 34.3	0.718 5176
	22	338 03 02.9	3 21 18.0	0.727 7263		23	125 40 37.4	2 33 24.6	0.718 4815
	24	341 13 20.8	-3 22 42.7	0.727 5976		25	128 55 33.3	+2 40 45.4	0.718 4606
	26	344 23 43.3	3 23 30.2	0.727 4557		27	132 10 31.8	2 47 35.2	0.718 4552
	28	347 34 10.7	3 23 40.5	0.727 3011		29	135 25 32.5	2 53 52.7	0.718 4653
	30	350 44 43.1	3 23 13.2	0.727 1341		31	138 40 34.7	2 59 36.8	0.718 4907
Oct.	2	353 55 20.6	-3 22 08.6	0.726 9554		33	141 55 37.7	+3 04 46.1	0.718 5315

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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	277	15	53.8	-0	25	59.5	Feb.	15	335	02	38.2	-1	27	47.3
	1	278	31	23.7	0	28	15.8		16	336	17	44.6	1	27	48.7
	2	279	46	53.5	0	30	30.7		17	337	32	49.9	1	27	46.1
	3	281	02	23.1	0	32	44.3		18	338	47	54.1	1	27	39.6
	4	282	17	52.5	0	34	56.3		19	340	02	57.2	1	27	29.2
	5	283	33	21.8	0	37	06.7		20	341	17	59.1	1	27	14.8
	6	284	48	51.0	-0	39	15.4		21	342	32	59.7	-1	26	56.5
	7	286	04	20.0	0	41	22.4		22	343	47	59.1	1	26	34.2
	8	287	19	49.0	0	43	27.5		23	345	02	57.2	1	26	08.0
	9	288	35	18.0	0	45	30.7		24	346	17	53.9	1	25	37.9
	10	289	50	46.9	0	47	31.7		25	347	32	49.3	1	25	03.8
	11	291	06	15.6	0	49	30.7		26	348	47	43.2	1	24	25.9
	12	292	21	44.2	-0	51	27.4		27	350	02	35.6	-1	23	44.0
	13	293	37	12.7	0	53	21.9		28	351	17	26.5	1	22	58.3
	14	294	52	40.9	0	55	14.0	Mar.	1	352	32	15.9	1	22	08.8
	15	296	08	08.9	0	57	03.7		2	353	47	03.8	1	21	15.4
	16	297	23	36.5	0	58	50.9		3	355	01	50.2	1	20	18.3
	17	298	39	03.8	1	00	35.5		4	356	16	35.1	1	19	17.5
	18	299	54	30.7	-1	02	17.5		5	357	31	18.7	-1	18	12.9
	19	301	09	57.2	1	03	56.7		6	358	46	00.9	1	17	04.7
	20	302	25	23.1	1	05	33.1		7	0	00	41.7	1	15	52.8
	21	303	40	48.5	1	07	06.6		8	1	15	21.2	1	14	37.4
	22	304	56	13.2	1	08	37.2		9	2	29	59.2	1	13	18.4
	23	306	11	37.4	1	10	04.7		10	3	44	35.9	1	11	55.8
	24	307	27	00.9	-1	11	29.2		11	4	59	11.2	-1	10	29.8
	25	308	42	23.7	1	12	50.5		12	6	13	44.9	1	09	00.4
	26	309	57	45.9	1	14	08.5		13	7	28	17.2	1	07	27.7
	27	311	13	07.3	1	15	23.4		14	8	42	47.9	1	05	51.5
	28	312	28	28.1	1	16	34.9		15	9	57	17.1	1	04	12.2
	29	313	43	48.1	1	17	43.0		16	11	11	44.6	1	02	29.6
	30	314	59	07.4	-1	18	47.6		17	12	26	10.4	-1	00	43.8
	31	316	14	25.9	1	19	48.9		18	13	40	34.5	0	58	54.9
Feb.	1	317	29	43.7	1	20	46.6		19	14	54	56.9	0	57	03.0
	2	318	45	00.7	1	21	40.7		20	16	09	17.5	0	55	08.1
	3	320	00	16.9	1	22	31.3		21	17	23	36.3	0	53	10.3
	4	321	15	32.5	1	23	18.2		22	18	37	53.2	0	51	09.6
	5	322	30	47.4	-1	24	01.5		23	19	52	08.2	-0	49	06.2
	6	323	46	01.7	1	24	41.1		24	21	06	21.1	0	47	00.1
	7	325	01	15.4	1	25	17.0		25	22	20	32.0	0	44	51.3
	8	326	16	28.4	1	25	49.2		26	23	34	40.8	0	42	40.0
	9	327	31	40.7	1	26	17.6		27	24	48	47.4	0	40	26.2
	10	328	46	52.3	1	26	42.2		28	26	02	51.8	0	38	10.0
	11	330	02	03.2	-1	27	02.9		29	27	16	54.0	-0	35	51.5
	12	331	17	13.3	1	27	19.8		30	28	30	53.9	0	33	30.9
	13	332	32	22.5	1	27	32.9		31	29	44	51.7	0	31	08.1
	14	333	47	30.8	1	27	42.0	Apr.	1	30	58	47.3	0	28	43.3
	15	335	02	38.2	-1	27	47.3		2	32	12	40.8	-0	26	16.6

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	30	58	47.3	-0	28	43.3	May	17	86	56	43.8	+1	29	26.6
	2	32	12	40.8	0	26	16.6		18	88	08	39.0	1	31	28.7
	3	33	26	32.3	0	23	48.0		19	89	20	30.8	1	33	27.8
	4	34	40	21.7	0	21	17.7		20	90	32	19.1	1	35	23.6
	5	35	54	09.0	0	18	45.7		21	91	44	03.9	1	37	16.0
	6	37	07	54.3	0	16	12.2		22	92	55	45.0	1	39	05.0
	7	38	21	37.5	-0	13	37.3		23	94	07	22.4	+1	40	50.4
	8	39	35	18.7	0	11	00.9		24	95	18	56.0	1	42	32.2
	9	40	48	57.7	0	08	23.3		25	96	30	25.8	1	44	10.1
	10	42	02	34.7	0	05	44.5		26	97	41	51.7	1	45	44.2
	11	43	16	09.5	0	03	04.7		27	98	53	13.7	1	47	14.3
	12	44	29	42.1	-0	00	23.9		28	100	04	31.8	1	48	40.2
	13	45	43	12.6	+0	02	17.8		29	101	15	45.9	+1	50	02.0
	14	46	56	40.9	0	05	00.3		30	102	26	56.1	1	51	19.5
	15	48	10	07.0	0	07	43.5		31	103	38	02.3	1	52	32.7
	16	49	23	30.8	0	10	27.2	June	1	104	49	04.3	1	53	41.3
	17	50	36	52.4	0	13	11.3		2	106	00	02.3	1	54	45.5
	18	51	50	11.6	0	15	55.9		3	107	10	56.2	1	55	44.9
	19	53	03	28.5	+0	18	40.6		4	108	21	45.9	+1	56	39.7
	20	54	16	42.9	0	21	25.5		5	109	32	31.3	1	57	29.7
	21	55	29	54.7	0	24	10.5		6	110	43	12.5	1	58	14.8
	22	56	43	04.0	0	26	55.3		7	111	53	49.4	1	58	54.9
	23	57	56	10.5	0	29	39.9		8	113	04	22.0	1	59	30.0
	24	59	09	14.2	0	32	24.2		9	114	14	50.2	2	00	00.0
	25	60	22	15.2	+0	35	08.1		10	115	25	14.1	+2	00	24.8
	26	61	35	13.2	0	37	51.4		11	116	35	33.5	2	00	44.4
	27	62	48	08.5	0	40	34.0		12	117	45	48.3	2	00	58.7
	28	64	01	00.9	0	43	15.8		13	118	55	58.6	2	01	07.6
	29	65	13	50.5	0	45	56.6		14	120	06	04.2	2	01	11.1
	30	66	26	37.3	0	48	36.5		15	121	16	04.9	2	01	09.0
May	1	67	39	21.4	+0	51	15.2		16	122	26	00.6	+2	01	01.4
	2	68	52	02.7	0	53	52.6		17	123	35	50.9	2	00	48.1
	3	70	04	41.2	0	56	28.7		18	124	45	35.9	2	00	29.1
	4	71	17	17.0	0	59	03.2		19	125	55	15.2	2	00	04.3
	5	72	29	49.9	1	01	36.2		20	127	04	48.9	1	59	33.6
	6	73	42	20.1	1	04	07.4		21	128	14	16.6	1	58	57.0
	7	74	54	47.5	+1	06	36.8		22	129	23	38.4	+1	58	14.5
	8	76	07	12.1	1	09	04.3		23	130	32	54.0	1	57	25.9
	9	77	19	33.9	1	11	29.7		24	131	42	03.4	1	56	31.3
	10	78	31	52.8	1	13	53.0		25	132	51	06.5	1	55	30.5
	11	79	44	08.8	1	16	14.0		26	134	00	03.2	1	54	23.6
	12	80	56	22.0	1	18	32.7		27	135	08	53.2	1	53	10.5
	13	82	08	32.3	+1	20	48.8		28	136	17	36.6	+1	51	51.1
	14	83	20	39.6	1	23	02.4		29	137	26	13.1	1	50	25.5
	15	84	32	44.1	1	25	13.3		30	138	34	42.7	1	48	53.6
	16	85	44	45.5	1	27	21.4	July	1	139	43	05.2	1	47	15.4
	17	86	56	43.8	+1	29	26.6		2	140	51	20.5	+1	45	30.8

VENUS, 2018
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	139	43	05.2	+1	47	15.4	Aug.	16	188	59	58.0	-1	21	47.2
	2	140	51	20.5	1	45	30.8		17	189	58	00.1	1	28	10.7
	3	141	59	28.6	1	43	39.8		18	190	55	37.5	1	34	39.1
	4	143	07	29.3	1	41	42.5		19	191	52	49.3	1	41	12.2
	5	144	15	22.4	1	39	38.8		20	192	49	34.5	1	47	50.0
	6	145	23	08.0	1	37	28.6		21	193	45	52.3	1	54	32.4
	7	146	30	45.8	+1	35	12.0		22	194	41	41.6	-2	01	19.2
	8	147	38	15.8	1	32	49.0		23	195	37	01.4	2	08	10.2
	9	148	45	37.8	1	30	19.6		24	196	31	50.6	2	15	05.5
	10	149	52	51.7	1	27	43.7		25	197	26	08.3	2	22	04.7
	11	150	59	57.4	1	25	01.3		26	198	19	53.2	2	29	07.8
	12	152	06	54.5	1	22	12.6		27	199	13	04.2	2	36	14.6
	13	153	13	42.9	+1	19	17.3		28	200	05	40.2	-2	43	25.0
	14	154	20	22.3	1	16	15.6		29	200	57	39.9	2	50	38.8
	15	155	26	52.3	1	13	07.4		30	201	49	02.1	2	57	55.7
	16	156	33	12.7	1	09	52.7		31	202	39	45.4	3	05	15.7
	17	157	39	23.0	1	06	31.6	Sept.	1	203	29	48.7	3	12	38.5
	18	158	45	23.1	1	03	03.9		2	204	19	10.4	3	20	03.9
	19	159	51	12.7	+0	59	29.9		3	205	07	49.0	-3	27	31.8
	20	160	56	51.3	0	55	49.3		4	205	55	43.0	3	35	01.9
	21	162	02	18.8	0	52	02.3		5	206	42	50.9	3	42	33.9
	22	163	07	34.8	0	48	08.9		6	207	29	10.7	3	50	07.7
	23	164	12	39.0	0	44	09.1		7	208	14	40.7	3	57	43.1
	24	165	17	31.1	0	40	03.0		8	208	59	18.8	4	05	19.7
	25	166	22	10.8	+0	35	50.4		9	209	43	03.0	-4	12	57.4
	26	167	26	37.7	0	31	31.6		10	210	25	51.1	4	20	35.8
	27	168	30	51.4	0	27	06.6		11	211	07	40.7	4	28	14.6
	28	169	34	51.8	0	22	35.3		12	211	48	29.3	4	35	53.6
	29	170	38	38.3	0	17	57.8		13	212	28	14.5	4	43	32.3
	30	171	42	10.7	0	13	14.2		14	213	06	53.4	4	51	10.4
	31	172	45	28.7	+0	08	24.5		15	213	44	23.4	-4	58	47.4
Aug.	1	173	48	31.9	+0	03	28.9		16	214	20	41.4	5	06	22.8
	2	174	51	19.9	-0	01	32.8		17	214	55	44.5	5	13	56.2
	3	175	53	52.5	0	06	40.3		18	215	29	29.7	5	21	26.9
	4	176	56	09.2	0	11	53.7		19	216	01	53.7	5	28	54.4
	5	177	58	09.6	0	17	12.9		20	216	32	53.2	5	36	18.0
	6	178	59	53.4	-0	22	37.8		21	217	02	25.0	-5	43	37.1
	7	180	01	20.2	0	28	08.3		22	217	30	25.5	5	50	50.8
	8	181	02	29.4	0	33	44.5		23	217	56	51.4	5	57	58.4
	9	182	03	20.6	0	39	26.1		24	218	21	39.1	6	04	58.9
	10	183	03	53.0	0	45	13.2		25	218	44	45.1	6	11	51.3
	11	184	04	06.2	0	51	05.8		26	219	06	05.7	6	18	34.8
	12	185	03	59.5	-0	57	03.6		27	219	25	37.5	-6	25	08.1
	13	186	03	32.0	1	03	06.8		28	219	43	16.8	6	31	30.1
	14	187	02	43.1	1	09	15.2		29	219	59	00.2	6	37	39.6
	15	188	01	32.1	1	15	28.6		30	220	12	44.2	6	43	35.1
	16	188	59	58.0	-1	21	47.2	Oct.	1	220	24	25.4	-6	49	15.3

VENUS, 2018
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	220	24	25.4	-6	49	15.3	Nov.	16	205	14	47.3	-1	26	58.7
	2	220	34	00.5	6	54	38.8		17	205	14	54.1	1	13	16.9
	3	220	41	26.4	6	59	43.8		18	205	17	24.8	0	59	53.8
	4	220	46	40.0	7	04	28.8		19	205	22	17.5	0	46	50.6
	5	220	49	38.6	7	08	52.1		20	205	29	29.5	0	34	07.9
	6	220	50	19.6	7	12	51.7		21	205	38	58.1	0	21	46.3
	7	220	48	40.8	-7	16	25.9		22	205	50	40.3	-0	09	46.3
	8	220	44	40.4	7	19	32.7		23	206	04	32.8	+0	01	51.7
	9	220	38	16.9	7	22	09.9		24	206	20	32.3	0	13	07.7
	10	220	29	29.6	7	24	15.7		25	206	38	35.3	0	24	01.3
	11	220	18	18.3	7	25	47.7		26	206	58	37.9	0	34	32.6
	12	220	04	43.3	7	26	43.9		27	207	20	36.6	0	44	41.7
	13	219	48	46.2	-7	27	02.2		28	207	44	27.4	+0	54	28.7
	14	219	30	29.2	7	26	40.4		29	208	10	06.6	1	03	53.6
	15	219	09	55.5	7	25	36.5		30	208	37	30.2	1	12	56.8
	16	218	47	09.7	7	23	48.7	Dec.	1	209	06	34.4	1	21	38.6
	17	218	22	17.2	7	21	15.3		2	209	37	15.5	1	29	59.1
	18	217	55	24.8	7	17	54.7		3	210	09	29.7	1	37	58.7
	19	217	26	40.5	-7	13	45.7		4	210	43	13.6	+1	45	37.8
	20	216	56	13.3	7	08	47.4		5	211	18	23.5	1	52	56.8
	21	216	24	13.6	7	02	59.1		6	211	54	56.0	1	59	56.0
	22	215	50	52.8	6	56	20.7		7	212	32	48.0	2	06	35.8
	23	215	16	23.4	6	48	52.4		8	213	11	56.2	2	12	56.6
	24	214	40	58.8	6	40	34.8		9	213	52	17.5	2	18	58.8
	25	214	04	53.1	-6	31	29.0		10	214	33	49.3	+2	24	42.8
	26	213	28	21.1	6	21	36.5		11	215	16	28.5	2	30	09.1
	27	212	51	37.9	6	10	59.5		12	216	00	12.7	2	35	17.9
	28	212	14	58.7	5	59	40.2		13	216	44	59.2	2	40	09.7
	29	211	38	38.9	5	47	41.5		14	217	30	45.8	2	44	44.9
	30	211	02	53.3	5	35	06.6		15	218	17	30.1	2	49	03.8
	31	210	27	56.4	-5	21	58.9		16	219	05	10.0	+2	53	06.8
Nov.	1	209	54	01.9	5	08	22.1		17	219	53	43.3	2	56	54.3
	2	209	21	22.8	4	54	19.9		18	220	43	08.1	3	00	26.5
	3	208	50	11.0	4	39	56.3		19	221	33	22.6	3	03	44.0
	4	208	20	37.5	4	25	15.1		20	222	24	25.0	3	06	46.9
	5	207	52	52.2	4	10	20.3		21	223	16	13.6	3	09	35.7
	6	207	27	03.6	-3	55	15.6		22	224	08	46.7	+3	12	10.6
	7	207	03	19.2	3	40	04.6		23	225	02	02.8	3	14	32.0
	8	206	41	45.6	3	24	50.8		24	225	56	00.3	3	16	40.1
	9	206	22	27.9	3	09	37.5		25	226	50	37.8	3	18	35.3
	10	206	05	30.3	2	54	27.6		26	227	45	53.6	3	20	17.9
	11	205	50	56.1	2	39	24.0		27	228	41	46.5	3	21	48.1
	12	205	38	47.5	-2	24	29.0		28	229	38	14.9	+3	23	06.2
	13	205	29	06.0	2	09	45.2		29	230	35	17.6	3	24	12.6
	14	205	21	52.3	1	55	14.3		30	231	32	53.2	3	25	07.4
	15	205	17	06.3	1	40	58.3		31	232	31	00.4	3	25	51.1
	16	205	14	47.3	-1	26	58.7		32	233	29	38.0	+3	26	23.7

VENUS, 2018

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	18	31	44.65	-23	40	05.5	1.708 752	5.15	4.88	11	54	04
	1	18	37	14.33	23	37	51.5	1.709 158	5.15	4.88	11	55	37
	2	18	42	43.77	23	34	53.4	1.709 525	5.14	4.88	11	57	10
	3	18	48	12.92	23	31	11.5	1.709 855	5.14	4.88	11	58	43
	4	18	53	41.71	23	26	45.8	1.710 147	5.14	4.88	12	00	15
	5	18	59	10.08	23	21	36.6	1.710 401	5.14	4.88	12	01	47
	6	19	04	37.98	-23	15	44.1	1.710 618	5.14	4.88	12	03	18
	7	19	10	05.35	23	09	08.4	1.710 795	5.14	4.87	12	04	48
	8	19	15	32.14	23	01	49.9	1.710 934	5.14	4.87	12	06	18
	9	19	20	58.30	22	53	48.9	1.711 034	5.14	4.87	12	07	48
	10	19	26	23.77	22	45	05.5	1.711 095	5.14	4.87	12	09	16
	11	19	31	48.50	22	35	40.4	1.711 117	5.14	4.87	12	10	44
	12	19	37	12.43	-22	25	33.8	1.711 099	5.14	4.87	12	12	11
	13	19	42	35.53	22	14	46.2	1.711 041	5.14	4.87	12	13	37
	14	19	47	57.74	22	03	18.1	1.710 943	5.14	4.87	12	15	03
	15	19	53	19.03	21	51	10.0	1.710 805	5.14	4.87	12	16	27
	16	19	58	39.34	21	38	22.3	1.710 627	5.14	4.88	12	17	50
	17	20	03	58.64	21	24	55.6	1.710 408	5.14	4.88	12	19	13
	18	20	09	16.89	-21	10	50.5	1.710 149	5.14	4.88	12	20	34
	19	20	14	34.06	20	56	07.4	1.709 850	5.14	4.88	12	21	54
	20	20	19	50.12	20	40	47.1	1.709 510	5.14	4.88	12	23	13
	21	20	25	05.03	20	24	50.0	1.709 130	5.15	4.88	12	24	31
	22	20	30	18.77	20	08	16.9	1.708 710	5.15	4.88	12	25	47
	23	20	35	31.32	19	51	08.4	1.708 249	5.15	4.88	12	27	03
	24	20	40	42.65	-19	33	25.0	1.707 749	5.15	4.88	12	28	17
	25	20	45	52.76	19	15	07.6	1.707 208	5.15	4.89	12	29	30
	26	20	51	01.63	18	56	16.8	1.706 628	5.15	4.89	12	30	42
	27	20	56	09.25	18	36	53.3	1.706 008	5.15	4.89	12	31	52
	28	21	01	15.62	18	16	57.8	1.705 349	5.16	4.89	12	33	01
	29	21	06	20.72	17	56	31.0	1.704 652	5.16	4.89	12	34	09
	30	21	11	24.55	-17	35	33.8	1.703 915	5.16	4.89	12	35	16
	31	21	16	27.12	17	14	06.7	1.703 140	5.16	4.90	12	36	21
Feb.	1	21	21	28.43	16	52	10.6	1.702 326	5.17	4.90	12	37	26
	2	21	26	28.48	16	29	46.2	1.701 474	5.17	4.90	12	38	28
	3	21	31	27.29	16	06	54.2	1.700 583	5.17	4.90	12	39	30
	4	21	36	24.86	15	43	35.4	1.699 653	5.17	4.91	12	40	31
	5	21	41	21.21	-15	19	50.5	1.698 683	5.18	4.91	12	41	30
	6	21	46	16.36	14	55	40.3	1.697 674	5.18	4.91	12	42	28
	7	21	51	10.32	14	31	05.6	1.696 624	5.18	4.92	12	43	25
	8	21	56	03.11	14	06	07.1	1.695 534	5.19	4.92	12	44	20
	9	22	00	54.75	13	40	45.5	1.694 403	5.19	4.92	12	45	15
	10	22	05	45.26	13	15	01.8	1.693 230	5.19	4.93	12	46	08
	11	22	10	34.66	-12	48	56.6	1.692 016	5.20	4.93	12	47	00
	12	22	15	22.97	12	22	30.8	1.690 760	5.20	4.93	12	47	52
	13	22	20	10.21	11	55	45.1	1.689 462	5.21	4.94	12	48	42
	14	22	24	56.42	11	28	40.3	1.688 121	5.21	4.94	12	49	31
	15	22	29	41.61	-11	01	17.2	1.686 737	5.21	4.94	12	50	19

VENUS, 2018

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	22	29	41.61	-11	01	17.2	1.686 737	5.21	4.94	12	50	19
	16	22	34	25.82	10	33	36.6	1.685 310	5.22	4.95	12	51	06
	17	22	39	09.06	10	05	39.3	1.683 839	5.22	4.95	12	51	52
	18	22	43	51.38	9	37	26.0	1.682 325	5.23	4.96	12	52	38
	19	22	48	32.81	9	08	57.5	1.680 767	5.23	4.96	12	53	22
	20	22	53	13.36	8	40	14.5	1.679 166	5.24	4.97	12	54	06
	21	22	57	53.09	-8	11	18.0	1.677 520	5.24	4.97	12	54	49
	22	23	02	32.03	7	42	08.5	1.675 830	5.25	4.98	12	55	31
	23	23	07	10.21	7	12	47.0	1.674 096	5.25	4.98	12	56	12
	24	23	11	47.66	6	43	14.1	1.672 319	5.26	4.99	12	56	52
	25	23	16	24.43	6	13	30.7	1.670 498	5.26	4.99	12	57	32
	26	23	21	00.55	5	43	37.4	1.668 633	5.27	5.00	12	58	11
	27	23	25	36.06	-5	13	35.1	1.666 725	5.28	5.00	12	58	50
	28	23	30	11.01	4	43	24.6	1.664 773	5.28	5.01	12	59	28
Mar.	1	23	34	45.42	4	13	06.5	1.662 778	5.29	5.02	13	00	06
	2	23	39	19.35	3	42	41.6	1.660 740	5.30	5.02	13	00	43
	3	23	43	52.83	3	12	10.6	1.658 659	5.30	5.03	13	01	20
	4	23	48	25.92	2	41	34.3	1.656 534	5.31	5.03	13	01	56
	5	23	52	58.67	-2	10	53.4	1.654 365	5.32	5.04	13	02	32
	6	23	57	31.10	1	40	08.6	1.652 152	5.32	5.05	13	03	08
	7	0	02	03.28	1	09	20.6	1.649 894	5.33	5.05	13	03	43
	8	0	06	35.24	0	38	30.2	1.647 592	5.34	5.06	13	04	19
	9	0	11	07.03	-0	07	38.1	1.645 244	5.35	5.07	13	04	54
	10	0	15	38.69	+0	23	15.0	1.642 850	5.35	5.08	13	05	29
	11	0	20	10.26	+0	54	08.4	1.640 410	5.36	5.08	13	06	04
	12	0	24	41.79	1	25	01.2	1.637 923	5.37	5.09	13	06	39
	13	0	29	13.31	1	55	52.8	1.635 389	5.38	5.10	13	07	14
	14	0	33	44.87	2	26	42.5	1.632 807	5.39	5.11	13	07	49
	15	0	38	16.50	2	57	29.4	1.630 178	5.39	5.12	13	08	24
	16	0	42	48.26	3	28	12.8	1.627 500	5.40	5.12	13	08	59
	17	0	47	20.17	+3	58	52.1	1.624 774	5.41	5.13	13	09	35
	18	0	51	52.29	4	29	26.4	1.621 999	5.42	5.14	13	10	11
	19	0	56	24.64	4	59	55.0	1.619 174	5.43	5.15	13	10	47
	20	1	00	57.28	5	30	17.2	1.616 300	5.44	5.16	13	11	23
	21	1	05	30.24	6	00	32.3	1.613 376	5.45	5.17	13	11	60
	22	1	10	03.56	6	30	39.5	1.610 402	5.46	5.18	13	12	37
	23	1	14	37.27	+7	00	38.0	1.607 378	5.47	5.19	13	13	14
	24	1	19	11.42	7	30	27.1	1.604 305	5.48	5.20	13	13	52
	25	1	23	46.03	8	00	06.0	1.601 182	5.49	5.21	13	14	30
	26	1	28	21.15	8	29	34.1	1.598 009	5.50	5.22	13	15	09
	27	1	32	56.81	8	58	50.5	1.594 786	5.51	5.23	13	15	48
	28	1	37	33.04	9	27	54.4	1.591 514	5.53	5.24	13	16	28
	29	1	42	09.88	+9	56	45.2	1.588 194	5.54	5.25	13	17	09
	30	1	46	47.37	10	25	22.1	1.584 824	5.55	5.26	13	17	50
	31	1	51	25.55	10	53	44.3	1.581 405	5.56	5.27	13	18	33
Apr.	1	1	56	04.44	11	21	51.2	1.577 937	5.57	5.29	13	19	15
	2	2	00	44.09	+11	49	42.0	1.574 420	5.59	5.30	13	19	59

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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	56	04.44	+11	21	51.2	1.577 937	5.57	5.29	13	19	15
	2	2	00	44.09	11	49	42.0	1.574 420	5.59	5.30	13	19	59
	3	2	05	24.53	12	17	15.9	1.570 854	5.60	5.31	13	20	43
	4	2	10	05.79	12	44	32.3	1.567 239	5.61	5.32	13	21	28
	5	2	14	47.90	13	11	30.4	1.563 574	5.62	5.33	13	22	14
	6	2	19	30.90	13	38	09.5	1.559 859	5.64	5.35	13	23	01
	7	2	24	14.79	+14	04	28.8	1.556 095	5.65	5.36	13	23	49
	8	2	28	59.62	14	30	27.6	1.552 280	5.67	5.37	13	24	38
	9	2	33	45.40	14	56	05.1	1.548 414	5.68	5.39	13	25	28
	10	2	38	32.15	15	21	20.6	1.544 498	5.69	5.40	13	26	19
	11	2	43	19.89	15	46	13.3	1.540 530	5.71	5.41	13	27	11
	12	2	48	08.64	16	10	42.6	1.536 511	5.72	5.43	13	28	03
	13	2	52	58.41	+16	34	47.6	1.532 440	5.74	5.44	13	28	57
	14	2	57	49.23	16	58	27.6	1.528 317	5.75	5.46	13	29	52
	15	3	02	41.09	17	21	41.9	1.524 142	5.77	5.47	13	30	48
	16	3	07	34.00	17	44	29.7	1.519 914	5.79	5.49	13	31	45
	17	3	12	27.99	18	06	50.4	1.515 634	5.80	5.50	13	32	43
	18	3	17	23.04	18	28	43.1	1.511 300	5.82	5.52	13	33	42
	19	3	22	19.15	+18	50	07.2	1.506 914	5.84	5.53	13	34	42
	20	3	27	16.33	19	11	02.1	1.502 474	5.85	5.55	13	35	44
	21	3	32	14.57	19	31	26.8	1.497 982	5.87	5.57	13	36	46
	22	3	37	13.86	19	51	20.8	1.493 437	5.89	5.58	13	37	49
	23	3	42	14.18	20	10	43.4	1.488 840	5.91	5.60	13	38	54
	24	3	47	15.53	20	29	33.9	1.484 191	5.93	5.62	13	39	59
	25	3	52	17.89	+20	47	51.5	1.479 490	5.94	5.64	13	41	06
	26	3	57	21.25	21	05	35.7	1.474 738	5.96	5.66	13	42	13
	27	4	02	25.59	21	22	45.9	1.469 934	5.98	5.67	13	43	21
	28	4	07	30.89	21	39	21.3	1.465 081	6.00	5.69	13	44	31
	29	4	12	37.14	21	55	21.4	1.460 177	6.02	5.71	13	45	41
	30	4	17	44.30	22	10	45.6	1.455 223	6.04	5.73	13	46	52
May	1	4	22	52.37	+22	25	33.4	1.450 220	6.06	5.75	13	48	04
	2	4	28	01.30	22	39	44.3	1.445 167	6.09	5.77	13	49	17
	3	4	33	11.07	22	53	17.6	1.440 064	6.11	5.79	13	50	31
	4	4	38	21.64	23	06	13.0	1.434 913	6.13	5.81	13	51	46
	5	4	43	32.98	23	18	29.9	1.429 712	6.15	5.83	13	53	01
	6	4	48	45.04	23	30	07.8	1.424 463	6.17	5.85	13	54	17
	7	4	53	57.79	+23	41	06.3	1.419 164	6.20	5.88	13	55	33
	8	4	59	11.18	23	51	25.1	1.413 816	6.22	5.90	13	56	51
	9	5	04	25.15	24	01	03.6	1.408 420	6.24	5.92	13	58	08
	10	5	09	39.68	24	10	01.5	1.402 975	6.27	5.94	13	59	27
	11	5	14	54.69	24	18	18.4	1.397 480	6.29	5.97	14	00	46
	12	5	20	10.15	24	25	54.2	1.391 937	6.32	5.99	14	02	05
	13	5	25	25.99	+24	32	48.3	1.386 345	6.34	6.02	14	03	24
	14	5	30	42.16	24	39	00.7	1.380 704	6.37	6.04	14	04	44
	15	5	35	58.60	24	44	31.0	1.375 014	6.40	6.07	14	06	04
	16	5	41	15.25	24	49	19.1	1.369 275	6.42	6.09	14	07	25
	17	5	46	32.05	+24	53	24.8	1.363 487	6.45	6.12	14	08	45

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	5	46	32.05	+24	53	24.8	1.363 487	6.45	6.12	14	08	45
	18	5	51	48.92	24	56	47.9	1.357 650	6.48	6.14	14	10	05
	19	5	57	05.80	24	59	28.4	1.351 765	6.51	6.17	14	11	26
	20	6	02	22.61	25	01	26.2	1.345 832	6.53	6.20	14	12	46
	21	6	07	39.29	25	02	41.2	1.339 851	6.56	6.22	14	14	06
	22	6	12	55.77	25	03	13.4	1.333 823	6.59	6.25	14	15	26
	23	6	18	11.97	+25	03	02.9	1.327 749	6.62	6.28	14	16	45
	24	6	23	27.84	25	02	09.6	1.321 629	6.65	6.31	14	18	05
	25	6	28	43.31	25	00	33.6	1.315 464	6.69	6.34	14	19	23
	26	6	33	58.32	24	58	15.1	1.309 255	6.72	6.37	14	20	42
	27	6	39	12.80	24	55	14.2	1.303 001	6.75	6.40	14	21	59
	28	6	44	26.69	24	51	31.1	1.296 705	6.78	6.43	14	23	16
	29	6	49	39.93	+24	47	06.0	1.290 366	6.82	6.46	14	24	33
	30	6	54	52.46	24	41	59.2	1.283 985	6.85	6.50	14	25	48
	31	7	00	04.23	24	36	10.9	1.277 562	6.88	6.53	14	27	03
June	1	7	05	15.17	24	29	41.4	1.271 099	6.92	6.56	14	28	17
	2	7	10	25.23	24	22	31.2	1.264 595	6.95	6.59	14	29	30
	3	7	15	34.36	24	14	40.4	1.258 052	6.99	6.63	14	30	42
	4	7	20	42.50	+24	06	09.6	1.251 469	7.03	6.66	14	31	53
	5	7	25	49.60	23	56	59.0	1.244 846	7.06	6.70	14	33	03
	6	7	30	55.62	23	47	09.2	1.238 185	7.10	6.74	14	34	12
	7	7	36	00.51	23	36	40.5	1.231 486	7.14	6.77	14	35	19
	8	7	41	04.22	23	25	33.5	1.224 748	7.18	6.81	14	36	26
	9	7	46	06.72	23	13	48.5	1.217 973	7.22	6.85	14	37	31
	10	7	51	07.97	+23	01	26.2	1.211 160	7.26	6.89	14	38	35
	11	7	56	07.92	22	48	27.1	1.204 310	7.30	6.93	14	39	38
	12	8	01	06.55	22	34	51.7	1.197 422	7.34	6.96	14	40	39
	13	8	06	03.82	22	20	40.5	1.190 498	7.39	7.01	14	41	39
	14	8	10	59.70	22	05	54.3	1.183 537	7.43	7.05	14	42	37
	15	8	15	54.14	21	50	33.5	1.176 539	7.47	7.09	14	43	34
	16	8	20	47.12	+21	34	38.9	1.169 505	7.52	7.13	14	44	30
	17	8	25	38.60	21	18	11.1	1.162 436	7.57	7.17	14	45	24
	18	8	30	28.56	21	01	10.7	1.155 331	7.61	7.22	14	46	16
	19	8	35	16.96	20	43	38.3	1.148 192	7.66	7.26	14	47	07
	20	8	40	03.79	20	25	34.7	1.141 019	7.71	7.31	14	47	57
	21	8	44	49.03	20	07	00.5	1.133 814	7.76	7.36	14	48	44
	22	8	49	32.67	+19	47	56.3	1.126 576	7.81	7.40	14	49	30
	23	8	54	14.70	19	28	23.0	1.119 307	7.86	7.45	14	50	15
	24	8	58	55.09	19	08	21.1	1.112 007	7.91	7.50	14	50	58
	25	9	03	33.86	18	47	51.4	1.104 678	7.96	7.55	14	51	39
	26	9	08	10.98	18	26	54.5	1.097 320	8.01	7.60	14	52	19
	27	9	12	46.47	18	05	31.3	1.089 935	8.07	7.65	14	52	56
	28	9	17	20.31	+17	43	42.4	1.082 522	8.12	7.70	14	53	33
	29	9	21	52.51	17	21	28.5	1.075 083	8.18	7.76	14	54	07
	30	9	26	23.07	16	58	50.4	1.067 618	8.24	7.81	14	54	40
July	1	9	30	52.00	16	35	48.7	1.060 128	8.30	7.87	14	55	12
	2	9	35	19.30	+16	12	24.1	1.052 614	8.35	7.92	14	55	42

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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	30	52.00	+16	35	48.7	1.060 128	8.30	7.87	14	55	12
	2	9	35	19.30	16	12	24.1	1.052 614	8.35	7.92	14	55	42
	3	9	39	44.98	15	48	37.5	1.045 077	8.41	7.98	14	56	10
	4	9	44	09.04	15	24	29.4	1.037 516	8.48	8.04	14	56	36
	5	9	48	31.51	15	00	00.5	1.029 933	8.54	8.10	14	57	01
	6	9	52	52.40	14	35	11.6	1.022 328	8.60	8.16	14	57	24
	7	9	57	11.71	+14	10	03.4	1.014 702	8.67	8.22	14	57	46
	8	10	01	29.47	13	44	36.5	1.007 054	8.73	8.28	14	58	07
	9	10	05	45.69	13	18	51.7	0.999 386	8.80	8.35	14	58	25
	10	10	10	00.38	12	52	49.5	0.991 698	8.87	8.41	14	58	42
	11	10	14	13.56	12	26	30.8	0.983 990	8.94	8.48	14	58	58
	12	10	18	25.24	11	59	56.3	0.976 262	9.01	8.54	14	59	12
	13	10	22	35.44	+11	33	06.5	0.968 514	9.08	8.61	14	59	25
	14	10	26	44.16	11	06	02.4	0.960 748	9.15	8.68	14	59	36
	15	10	30	51.41	10	38	44.5	0.952 962	9.23	8.75	14	59	46
	16	10	34	57.20	10	11	13.5	0.945 159	9.30	8.82	14	59	54
	17	10	39	01.54	9	43	30.2	0.937 337	9.38	8.90	15	00	01
	18	10	43	04.45	9	15	35.3	0.929 499	9.46	8.97	15	00	07
	19	10	47	05.93	+8	47	29.4	0.921 645	9.54	9.05	15	00	11
	20	10	51	06.00	8	19	13.2	0.913 775	9.62	9.13	15	00	13
	21	10	55	04.67	7	50	47.4	0.905 891	9.71	9.21	15	00	15
	22	10	59	01.95	7	22	12.7	0.897 994	9.79	9.29	15	00	15
	23	11	02	57.86	6	53	29.8	0.890 083	9.88	9.37	15	00	13
	24	11	06	52.41	6	24	39.3	0.882 162	9.97	9.45	15	00	10
	25	11	10	45.62	+5	55	41.9	0.874 229	10.06	9.54	15	00	06
	26	11	14	37.49	5	26	38.3	0.866 286	10.15	9.63	15	00	00
	27	11	18	28.04	4	57	29.1	0.858 335	10.25	9.72	14	59	54
	28	11	22	17.28	4	28	14.9	0.850 375	10.34	9.81	14	59	45
	29	11	26	05.22	3	58	56.5	0.842 408	10.44	9.90	14	59	36
	30	11	29	51.87	3	29	34.3	0.834 434	10.54	9.99	14	59	25
	31	11	33	37.26	+3	00	09.2	0.826 455	10.64	10.09	14	59	13
Aug.	1	11	37	21.38	2	30	41.6	0.818 471	10.74	10.19	14	59	00
	2	11	41	04.24	2	01	12.2	0.810 483	10.85	10.29	14	58	46
	3	11	44	45.87	1	31	41.6	0.802 492	10.96	10.39	14	58	30
	4	11	48	26.27	1	02	10.4	0.794 498	11.07	10.50	14	58	13
	5	11	52	05.44	0	32	39.1	0.786 501	11.18	10.60	14	57	55
	6	11	55	43.40	+0	03	08.5	0.778 503	11.30	10.71	14	57	36
	7	11	59	20.14	-0	26	21.0	0.770 504	11.41	10.82	14	57	15
	8	12	02	55.67	0	55	48.6	0.762 505	11.53	10.94	14	56	53
	9	12	06	29.98	1	25	13.9	0.754 505	11.66	11.05	14	56	30
	10	12	10	03.07	1	54	36.2	0.746 506	11.78	11.17	14	56	06
	11	12	13	34.93	2	23	54.8	0.738 507	11.91	11.29	14	55	41
	12	12	17	05.53	-2	53	09.1	0.730 510	12.04	11.42	14	55	14
	13	12	20	34.87	3	22	18.6	0.722 514	12.17	11.54	14	54	46
	14	12	24	02.92	3	51	22.5	0.714 520	12.31	11.67	14	54	17
	15	12	27	29.66	4	20	20.2	0.706 530	12.45	11.80	14	53	46
	16	12	30	55.06	-4	49	11.1	0.698 543	12.59	11.94	14	53	14

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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	12	30	55.06	-4	49	11.1	0.698 543	12.59	11.94	14	53	14
	17	12	34	19.10	5	17	54.5	0.690 562	12.73	12.08	14	52	41
	18	12	37	41.75	5	46	29.7	0.682 586	12.88	12.22	14	52	06
	19	12	41	02.97	6	14	56.2	0.674 618	13.04	12.36	14	51	30
	20	12	44	22.73	6	43	13.2	0.666 658	13.19	12.51	14	50	52
	21	12	47	40.98	7	11	20.0	0.658 707	13.35	12.66	14	50	13
	22	12	50	57.69	-7	39	16.1	0.650 768	13.51	12.82	14	49	32
	23	12	54	12.80	8	07	00.8	0.642 840	13.68	12.97	14	48	49
	24	12	57	26.28	8	34	33.4	0.634 926	13.85	13.14	14	48	05
	25	13	00	38.06	9	01	53.2	0.627 026	14.03	13.30	14	47	20
	26	13	03	48.10	9	28	59.6	0.619 143	14.20	13.47	14	46	32
	27	13	06	56.33	9	55	51.9	0.611 277	14.39	13.64	14	45	43
	28	13	10	02.69	-10	22	29.5	0.603 430	14.57	13.82	14	44	51
	29	13	13	07.12	10	48	51.6	0.595 603	14.77	14.00	14	43	58
	30	13	16	09.55	11	14	57.7	0.587 797	14.96	14.19	14	43	03
	31	13	19	09.90	11	40	47.0	0.580 015	15.16	14.38	14	42	05
Sept.	1	13	22	08.10	12	06	18.9	0.572 258	15.37	14.57	14	41	05
	2	13	25	04.07	12	31	32.7	0.564 527	15.58	14.77	14	40	03
	3	13	27	57.70	-12	56	27.8	0.556 823	15.79	14.98	14	38	59
	4	13	30	48.91	13	21	03.4	0.549 148	16.01	15.19	14	37	52
	5	13	33	37.59	13	45	18.8	0.541 503	16.24	15.40	14	36	43
	6	13	36	23.63	14	09	13.3	0.533 891	16.47	15.62	14	35	31
	7	13	39	06.90	14	32	46.1	0.526 311	16.71	15.85	14	34	16
	8	13	41	47.28	14	55	56.4	0.518 766	16.95	16.08	14	32	58
	9	13	44	24.62	-15	18	43.4	0.511 258	17.20	16.31	14	31	37
	10	13	46	58.78	15	41	06.3	0.503 787	17.46	16.55	14	30	12
	11	13	49	29.59	16	03	04.1	0.496 357	17.72	16.80	14	28	45
	12	13	51	56.89	16	24	35.8	0.488 968	17.99	17.06	14	27	13
	13	13	54	20.50	16	45	40.6	0.481 624	18.26	17.32	14	25	38
	14	13	56	40.22	17	06	17.4	0.474 327	18.54	17.58	14	23	59
	15	13	58	55.88	-17	26	25.1	0.467 080	18.83	17.86	14	22	16
	16	14	01	07.25	17	46	02.6	0.459 885	19.12	18.13	14	20	28
	17	14	03	14.14	18	05	08.6	0.452 746	19.42	18.42	14	18	36
	18	14	05	16.32	18	23	42.1	0.445 666	19.73	18.71	14	16	39
	19	14	07	13.56	18	41	41.7	0.438 648	20.05	19.01	14	14	36
	20	14	09	05.65	18	59	06.0	0.431 697	20.37	19.32	14	12	29
	21	14	10	52.33	-19	15	53.7	0.424 816	20.70	19.63	14	10	16
	22	14	12	33.37	19	32	03.4	0.418 009	21.04	19.95	14	07	57
	23	14	14	08.52	19	47	33.3	0.411 280	21.38	20.28	14	05	33
	24	14	15	37.53	20	02	22.0	0.404 634	21.73	20.61	14	03	02
	25	14	17	00.16	20	16	27.8	0.398 076	22.09	20.95	14	00	24
	26	14	18	16.15	20	29	48.8	0.391 610	22.46	21.30	13	57	40
	27	14	19	25.26	-20	42	23.3	0.385 241	22.83	21.65	13	54	49
	28	14	20	27.24	20	54	09.4	0.378 976	23.21	22.01	13	51	50
	29	14	21	21.86	21	05	05.0	0.372 818	23.59	22.37	13	48	44
	30	14	22	08.87	21	15	08.1	0.366 775	23.98	22.74	13	45	31
Oct.	1	14	22	48.06	-21	24	16.4	0.360 851	24.37	23.11	13	42	09

VENUS, 2018

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	14	22	48.06	-21	24	16.4	0.360 851	24.37	23.11	13	42	09
	2	14	23	19.21	21	32	27.9	0.355 052	24.77	23.49	13	38	40
	3	14	23	42.13	21	39	40.1	0.349 386	25.17	23.87	13	35	02
	4	14	23	56.62	21	45	50.7	0.343 858	25.57	24.25	13	31	16
	5	14	24	02.53	21	50	57.2	0.338 475	25.98	24.64	13	27	21
	6	14	23	59.71	21	54	57.1	0.333 243	26.39	25.03	13	23	17
	7	14	23	48.05	-21	57	48.0	0.328 170	26.80	25.41	13	19	05
	8	14	23	27.48	21	59	27.1	0.323 263	27.20	25.80	13	14	43
	9	14	22	57.94	21	59	52.2	0.318 529	27.61	26.18	13	10	13
	10	14	22	19.45	21	59	00.6	0.313 977	28.01	26.56	13	05	34
	11	14	21	32.06	21	56	50.2	0.309 614	28.40	26.94	13	00	46
	12	14	20	35.87	21	53	18.6	0.305 449	28.79	27.30	12	55	50
	13	14	19	31.06	-21	48	24.1	0.301 490	29.17	27.66	12	50	45
	14	14	18	17.86	21	42	04.9	0.297 746	29.54	28.01	12	45	32
	15	14	16	56.59	21	34	19.8	0.294 226	29.89	28.35	12	40	11
	16	14	15	27.62	21	25	08.1	0.290 937	30.23	28.67	12	34	43
	17	14	13	51.43	21	14	29.4	0.287 888	30.55	28.97	12	29	08
	18	14	12	08.55	21	02	24.1	0.285 088	30.85	29.25	12	23	27
	19	14	10	19.59	-20	48	53.3	0.282 544	31.12	29.52	12	17	40
	20	14	08	25.24	20	33	58.6	0.280 263	31.38	29.76	12	11	48
	21	14	06	26.24	20	17	42.7	0.278 252	31.60	29.97	12	05	52
	22	14	04	23.41	20	00	08.8	0.276 518	31.80	30.16	11	59	53
	23	14	02	17.61	19	41	21.2	0.275 065	31.97	30.32	11	53	51
	24	14	00	09.74	19	21	24.7	0.273 899	32.11	30.45	11	47	47
	25	13	58	00.74	-19	00	25.3	0.273 023	32.21	30.55	11	41	43
	26	13	55	51.56	18	38	29.4	0.272 439	32.28	30.61	11	35	39
	27	13	53	43.16	18	15	44.2	0.272 151	32.31	30.64	11	29	36
	28	13	51	36.46	17	52	17.4	0.272 158	32.31	30.64	11	23	36
	29	13	49	32.39	17	28	17.3	0.272 459	32.28	30.61	11	17	38
	30	13	47	31.83	17	03	52.4	0.273 055	32.21	30.54	11	11	44
	31	13	45	35.61	-16	39	11.2	0.273 941	32.10	30.44	11	05	55
Nov.	1	13	43	44.49	16	14	22.4	0.275 114	31.97	30.31	11	00	11
	2	13	41	59.20	15	49	34.6	0.276 571	31.80	30.15	10	54	34
	3	13	40	20.35	15	24	56.1	0.278 306	31.60	29.97	10	49	03
	4	13	38	48.52	15	00	34.9	0.280 313	31.37	29.75	10	43	39
	5	13	37	24.20	14	36	38.5	0.282 586	31.12	29.51	10	38	23
	6	13	36	07.80	-14	13	13.9	0.285 118	30.84	29.25	10	33	14
	7	13	34	59.67	13	50	27.6	0.287 901	30.55	28.97	10	28	14
	8	13	34	00.09	13	28	25.5	0.290 928	30.23	28.67	10	23	23
	9	13	33	09.27	13	07	12.8	0.294 192	29.89	28.35	10	18	40
	10	13	32	27.37	12	46	54.0	0.297 684	29.54	28.02	10	14	07
	11	13	31	54.48	12	27	33.3	0.301 396	29.18	27.67	10	09	42
	12	13	31	30.67	-12	09	13.8	0.305 320	28.80	27.32	10	05	26
	13	13	31	15.93	11	51	58.4	0.309 448	28.42	26.95	10	01	19
	14	13	31	10.22	11	35	49.3	0.313 772	28.03	26.58	9	57	21
	15	13	31	13.49	11	20	48.1	0.318 283	27.63	26.20	9	53	32
	16	13	31	25.63	-11	06	56.1	0.322 973	27.23	25.82	9	49	52

VENUS, 2018

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	13	31	25.63	-11	06	56.1	0.322 973	27.23	25.82	9	49	52
	17	13	31	46.51	10	54	13.8	0.327 835	26.82	25.44	9	46	21
	18	13	32	15.99	10	42	41.8	0.332 860	26.42	25.06	9	42	57
	19	13	32	53.89	10	32	19.8	0.338 041	26.02	24.67	9	39	43
	20	13	33	40.04	10	23	07.6	0.343 371	25.61	24.29	9	36	36
	21	13	34	34.25	10	15	04.4	0.348 843	25.21	23.91	9	33	37
	22	13	35	36.30	-10	08	09.4	0.354 449	24.81	23.53	9	30	46
	23	13	36	45.99	10	02	21.3	0.360 182	24.42	23.15	9	28	02
	24	13	38	03.11	9	57	39.0	0.366 037	24.03	22.78	9	25	26
	25	13	39	27.43	9	54	00.8	0.372 005	23.64	22.42	9	22	57
	26	13	40	58.74	9	51	25.2	0.378 082	23.26	22.06	9	20	34
	27	13	42	36.81	9	49	50.3	0.384 261	22.89	21.70	9	18	19
	28	13	44	21.41	-9	49	14.3	0.390 536	22.52	21.36	9	16	09
	29	13	46	12.32	9	49	35.1	0.396 901	22.16	21.01	9	14	06
	30	13	48	09.31	9	50	50.8	0.403 352	21.80	20.68	9	12	09
Dec.	1	13	50	12.16	9	52	59.3	0.409 882	21.46	20.35	9	10	18
	2	13	52	20.68	9	55	58.4	0.416 488	21.12	20.02	9	08	32
	3	13	54	34.64	9	59	46.0	0.423 164	20.78	19.71	9	06	52
	4	13	56	53.85	-10	04	20.1	0.429 907	20.46	19.40	9	05	16
	5	13	59	18.11	10	09	38.4	0.436 713	20.14	19.10	9	03	46
	6	14	01	47.26	10	15	38.9	0.443 578	19.83	18.80	9	02	20
	7	14	04	21.10	10	22	19.6	0.450 499	19.52	18.51	9	00	60
	8	14	06	59.48	10	29	38.4	0.457 473	19.22	18.23	8	59	43
	9	14	09	42.23	10	37	33.3	0.464 496	18.93	17.95	8	58	31
	10	14	12	29.21	-10	46	02.4	0.471 566	18.65	17.69	8	57	23
	11	14	15	20.27	10	55	03.6	0.478 681	18.37	17.42	8	56	19
	12	14	18	15.29	11	04	35.2	0.485 837	18.10	17.17	8	55	19
	13	14	21	14.14	11	14	35.4	0.493 033	17.84	16.92	8	54	23
	14	14	24	16.70	11	25	02.2	0.500 266	17.58	16.67	8	53	30
	15	14	27	22.87	11	35	54.0	0.507 534	17.33	16.43	8	52	41
	16	14	30	32.54	-11	47	09.0	0.514 835	17.08	16.20	8	51	55
	17	14	33	45.62	11	58	45.6	0.522 167	16.84	15.97	8	51	13
	18	14	37	02.01	12	10	42.1	0.529 529	16.61	15.75	8	50	34
	19	14	40	21.64	12	22	56.9	0.536 918	16.38	15.53	8	49	58
	20	14	43	44.42	12	35	28.5	0.544 332	16.16	15.32	8	49	26
	21	14	47	10.28	12	48	15.3	0.551 771	15.94	15.11	8	48	56
	22	14	50	39.16	-13	01	15.9	0.559 231	15.73	14.91	8	48	30
	23	14	54	10.98	13	14	28.7	0.566 712	15.52	14.72	8	48	06
	24	14	57	45.68	13	27	52.3	0.574 211	15.32	14.52	8	47	45
	25	15	01	23.19	13	41	25.2	0.581 727	15.12	14.34	8	47	27
	26	15	05	03.46	13	55	06.0	0.589 258	14.92	14.15	8	47	12
	27	15	08	46.41	14	08	53.3	0.596 802	14.74	13.97	8	46	59
	28	15	12	32.00	-14	22	45.7	0.604 358	14.55	13.80	8	46	49
	29	15	16	20.16	14	36	41.7	0.611 923	14.37	13.63	8	46	42
	30	15	20	10.84	14	50	40.1	0.619 497	14.20	13.46	8	46	37
	31	15	24	03.98	15	04	39.5	0.627 077	14.02	13.30	8	46	34
	32	15	27	59.52	-15	18	38.6	0.634 664	13.86	13.14	8	46	34

MARS, 2018

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	194	03	10.5	+1	04	41.7	1.631 0443	Apr.	3	238	28	32.9	-0	16	55.9	1.530 0969
	3	194	57	51.8	1	03	15.1	1.629 4296		5	239	30	42.9	0	18	54.7	1.527 5053
	5	195	52	39.6	1	01	47.4	1.627 7823		7	240	33	05.6	0	20	53.6	1.524 9081
	7	196	47	34.1	1	00	18.5	1.626 1029		9	241	35	41.2	0	22	52.5	1.522 3060
	9	197	42	35.5	0	58	48.6	1.624 3916		11	242	38	29.6	0	24	51.4	1.519 7000
	11	198	37	43.8	0	57	17.6	1.622 6489		13	243	41	31.0	0	26	50.1	1.517 0910
	13	199	32	59.2	+0	55	45.5	1.620 8751		15	244	44	45.5	-0	28	48.7	1.514 4797
	15	200	28	22.0	0	54	12.3	1.619 0707		17	245	48	13.1	0	30	47.1	1.511 8671
	17	201	23	52.1	0	52	38.0	1.617 2360		19	246	51	53.9	0	32	45.3	1.509 2541
	19	202	19	29.9	0	51	02.7	1.615 3715		21	247	55	48.1	0	34	43.3	1.506 6414
	21	203	15	15.4	0	49	26.4	1.613 4775		23	248	59	55.5	0	36	40.9	1.504 0302
	23	204	11	08.8	0	47	49.1	1.611 5546		25	250	04	16.5	0	38	38.1	1.501 4212
	25	205	07	10.1	+0	46	10.8	1.609 6030		27	251	08	50.9	-0	40	35.0	1.498 8153
	27	206	03	19.7	0	44	31.5	1.607 6234		29	252	13	38.8	0	42	31.4	1.496 2136
	29	206	59	37.6	0	42	51.2	1.605 6162	May	1	253	18	40.3	0	44	27.3	1.493 6170
	31	207	56	04.0	0	41	10.0	1.603 5817		3	254	23	55.4	0	46	22.6	1.491 0263
Feb.	2	208	52	38.9	0	39	27.9	1.601 5206		5	255	29	24.2	0	48	17.4	1.488 4426
	4	209	49	22.7	0	37	44.8	1.599 4333		7	256	35	06.8	0	50	11.4	1.485 8669
	6	210	46	15.4	+0	36	00.9	1.597 3203		9	257	41	03.0	-0	52	04.8	1.483 3000
	8	211	43	17.1	0	34	16.1	1.595 1820		11	258	47	13.0	0	53	57.4	1.480 7429
	10	212	40	28.0	0	32	30.5	1.593 0192		13	259	53	36.7	0	55	49.2	1.478 1967
	12	213	37	48.3	0	30	44.0	1.590 8322		15	261	00	14.2	0	57	40.1	1.475 6624
	14	214	35	18.1	0	28	56.7	1.588 6216		17	262	07	05.6	0	59	30.1	1.473 1408
	16	215	32	57.5	0	27	08.6	1.586 3880		19	263	14	10.7	1	01	19.1	1.470 6331
	18	216	30	46.7	+0	25	19.8	1.584 1319		21	264	21	29.6	-1	03	07.1	1.468 1402
	20	217	28	45.8	0	23	30.2	1.581 8540		23	265	29	02.2	1	04	53.9	1.465 6631
	22	218	26	54.9	0	21	39.9	1.579 5547		25	266	36	48.7	1	06	39.6	1.463 2029
	24	219	25	14.3	0	19	48.9	1.577 2347		27	267	44	48.8	1	08	24.1	1.460 7605
	26	220	23	44.0	0	17	57.2	1.574 8947		29	268	53	02.6	1	10	07.4	1.458 3369
	28	221	22	24.1	0	16	04.9	1.572 5351		31	270	01	30.1	1	11	49.3	1.455 9333
Mar.	2	222	21	14.9	+0	14	11.9	1.570 1568	June	2	271	10	11.2	-1	13	29.9	1.453 5505
	4	223	20	16.3	0	12	18.4	1.567 7602		4	272	19	05.9	1	15	09.0	1.451 1897
	6	224	19	28.7	0	10	24.3	1.565 3460		6	273	28	14.0	1	16	46.6	1.448 8518
	8	225	18	52.1	0	08	29.6	1.562 9150		8	274	37	35.6	1	18	22.7	1.446 5379
	10	226	18	26.6	0	06	34.5	1.560 4678		10	275	47	10.4	1	19	57.1	1.444 2489
	12	227	18	12.3	0	04	38.8	1.558 0050		12	276	56	58.6	1	21	29.9	1.441 9859
	14	228	18	09.4	+0	02	42.7	1.555 5274		14	278	06	60.0	-1	23	00.9	1.439 7499
	16	229	18	18.1	+0	00	46.2	1.553 0357		16	279	17	14.4	1	24	30.1	1.437 5420
	18	230	18	38.3	-0	01	10.7	1.550 5306		18	280	27	41.8	1	25	57.5	1.435 3630
	20	231	19	10.3	0	03	07.9	1.548 0128		20	281	38	22.0	1	27	23.0	1.433 2141
	22	232	19	54.2	0	05	05.5	1.545 4831		22	282	49	15.0	1	28	46.4	1.431 0962
	24	233	20	50.1	0	07	03.4	1.542 9422		24	284	00	20.6	1	30	07.9	1.429 0103
	26	234	21	58.0	-0	09	01.5	1.540 3909		26	285	11	38.6	-1	31	27.3	1.426 9574
	28	235	23	18.2	0	10	59.9	1.537 8299		28	286	23	08.9	1	32	44.6	1.424 9385
	30	236	24	50.6	0	12	58.4	1.535 2600		30	287	34	51.4	1	33	59.6	1.422 9545
Apr.	1	237	26	35.5	0	14	57.1	1.532 6821	July	2	288	46	45.9	1	35	12.4	1.421 0064
	3	238	28	32.9	-0	16	55.9	1.530 0969		4	289	58	52.1	-1	36	22.9	1.419 0951

MARS, 2018

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	288 46 45.9	-1 35 12.4	1.421 0064	Oct.	2	346 15 55.1	-1 39 16.1	1.383 1662
	4	289 58 52.1	1 36 22.9	1.419 0951		4	347 31 53.8	1 38 08.9	1.383 6394
	6	291 11 10.0	1 37 31.0	1.417 2217		6	348 47 49.2	1 36 58.9	1.384 1693
	8	292 23 39.4	1 38 36.7	1.415 3869		8	350 03 40.8	1 35 46.0	1.384 7555
	10	293 36 20.0	1 39 39.9	1.413 5918		10	351 19 28.3	1 34 30.5	1.385 3977
	12	294 49 11.7	1 40 40.6	1.411 8372		12	352 35 11.3	1 33 12.3	1.386 0955
	14	296 02 14.1	-1 41 38.7	1.410 1240		14	353 50 49.5	-1 31 51.4	1.386 8485
	16	297 15 27.2	1 42 34.2	1.408 4531		16	355 06 22.5	1 30 28.0	1.387 6564
	18	298 28 50.6	1 43 27.1	1.406 8253		18	356 21 49.9	1 29 02.1	1.388 5186
	20	299 42 24.1	1 44 17.2	1.405 2416		20	357 37 11.4	1 27 33.7	1.389 4346
	22	300 56 07.6	1 45 04.5	1.403 7026		22	358 52 26.7	1 26 02.9	1.390 4041
	24	302 10 00.7	1 45 49.1	1.402 2093		24	360 07 35.5	1 24 29.8	1.391 4263
	26	303 24 03.1	-1 46 30.8	1.400 7623		26	1 22 37.3	-1 22 54.4	1.392 5009
	28	304 38 14.6	1 47 09.7	1.399 3625		28	2 37 31.9	1 21 16.7	1.393 6271
	30	305 52 34.9	1 47 45.5	1.398 0107		30	3 52 19.1	1 19 37.0	1.394 8044
Aug.	1	307 07 03.8	1 48 18.5	1.396 7074	Nov.	1	5 06 58.3	1 17 55.1	1.396 0321
	3	308 21 40.9	1 48 48.4	1.395 4535		3	6 21 29.5	1 16 11.3	1.397 3095
	5	309 36 25.9	1 49 15.4	1.394 2496		5	7 35 52.3	1 14 25.5	1.398 6360
	7	310 51 18.5	-1 49 39.2	1.393 0964		7	8 50 06.3	-1 12 37.8	1.400 0108
	9	312 06 18.5	1 49 60.0	1.391 9945		9	10 04 11.3	1 10 48.3	1.401 4333
	11	313 21 25.4	1 50 17.6	1.390 9445		11	11 18 07.1	1 08 57.1	1.402 9026
	13	314 36 39.0	1 50 32.1	1.389 9470		13	12 31 53.4	1 07 04.2	1.404 4181
	15	315 51 58.9	1 50 43.5	1.389 0025		15	13 45 29.9	1 05 09.6	1.405 9788
	17	317 07 24.8	1 50 51.6	1.388 1116		17	14 58 56.3	1 03 13.6	1.407 5839
	19	318 22 56.4	-1 50 56.6	1.387 2748		19	16 12 12.5	-1 01 16.1	1.409 2328
	21	319 38 33.3	1 50 58.4	1.386 4924		21	17 25 18.2	0 59 17.2	1.410 9244
	23	320 54 15.1	1 50 56.9	1.385 7651		23	18 38 13.2	0 57 17.1	1.412 6579
	25	322 10 01.5	1 50 52.2	1.385 0931		25	19 50 57.2	0 55 15.6	1.414 4325
	27	323 25 52.1	1 50 44.3	1.384 4770		27	21 03 30.1	0 53 13.1	1.416 2473
	29	324 41 46.6	1 50 33.2	1.383 9169		29	22 15 51.7	0 51 09.3	1.418 1013
	31	325 57 44.5	-1 50 18.7	1.383 4133	Dec.	1	23 28 01.7	-0 49 04.6	1.419 9936
Sept.	2	327 13 45.6	1 50 01.1	1.382 9663		3	24 39 60.0	0 46 58.9	1.421 9233
	4	328 29 49.4	1 49 40.2	1.382 5764		5	25 51 46.4	0 44 52.4	1.423 8894
	6	329 45 55.6	1 49 16.1	1.382 2437		7	27 03 20.8	0 42 45.0	1.425 8911
	8	331 02 03.7	1 48 48.7	1.381 9684		9	28 14 43.0	0 40 36.8	1.427 9272
	10	332 18 13.4	1 48 18.2	1.381 7506		11	29 25 52.8	0 38 28.0	1.429 9969
	12	333 34 24.4	-1 47 44.4	1.381 5905		13	30 36 50.1	-0 36 18.6	1.432 0992
	14	334 50 36.1	1 47 07.5	1.381 4882		15	31 47 34.8	0 34 08.7	1.434 2330
	16	336 06 48.3	1 46 27.4	1.381 4437		17	32 58 06.7	0 31 58.2	1.436 3975
	18	337 23 00.5	1 45 44.1	1.381 4571		19	34 08 25.8	0 29 47.4	1.438 5915
	20	338 39 12.4	1 44 57.8	1.381 5283		21	35 18 31.9	0 27 36.2	1.440 8140
	22	339 55 23.6	1 44 08.4	1.381 6574		23	36 28 24.9	0 25 24.7	1.443 0642
	24	341 11 33.6	-1 43 15.9	1.381 8442		25	37 38 04.7	-0 23 13.0	1.445 3409
	26	342 27 42.2	1 42 20.4	1.382 0886		27	38 47 31.3	0 21 01.2	1.447 6431
	28	343 43 48.9	1 41 21.9	1.382 3905		29	39 56 44.6	0 18 49.3	1.449 9698
	30	344 59 53.3	1 40 20.5	1.382 7498		31	41 05 44.4	0 16 37.3	1.452 3200
Oct.	2	346 15 55.1	-1 39 16.1	1.383 1662		33	42 14 30.8	-0 14 25.4	1.454 6927

MARS, 2018
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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	223	32	34.4	+0	54	20.0	Feb.	15	251	52	19.8	+0	28	58.4
	1	224	10	00.2	0	53	57.3		16	252	28	33.7	0	28	11.8
	2	224	47	25.1	0	53	34.2		17	253	04	44.7	0	27	24.6
	3	225	24	49.4	0	53	10.7		18	253	40	53.0	0	26	36.6
	4	226	02	12.8	0	52	46.9		19	254	16	58.3	0	25	47.8
	5	226	39	35.3	0	52	22.7		20	254	53	00.7	0	24	58.4
	6	227	16	57.0	+0	51	58.1		21	255	29	00.2	+0	24	08.2
	7	227	54	17.9	0	51	33.0		22	256	04	56.7	0	23	17.3
	8	228	31	37.8	0	51	07.6		23	256	40	50.2	0	22	25.6
	9	229	08	56.7	0	50	41.8		24	257	16	40.7	0	21	33.1
	10	229	46	14.7	0	50	15.5		25	257	52	28.1	0	20	39.9
	11	230	23	31.7	0	49	48.8		26	258	28	12.5	0	19	45.9
	12	231	00	47.6	+0	49	21.7		27	259	03	53.8	+0	18	51.0
	13	231	38	02.4	0	48	54.2		28	259	39	31.8	0	17	55.3
	14	232	15	15.9	0	48	26.1	Mar.	1	260	15	06.7	0	16	58.8
	15	232	52	28.2	0	47	57.7		2	260	50	38.4	0	16	01.4
	16	233	29	39.2	0	47	28.7		3	261	26	06.7	0	15	03.1
	17	234	06	48.7	0	46	59.4		4	262	01	31.7	0	14	03.9
	18	234	43	56.8	+0	46	29.5		5	262	36	53.3	+0	13	03.8
	19	235	21	03.4	0	45	59.2		6	263	12	11.4	0	12	02.7
	20	235	58	08.4	0	45	28.4		7	263	47	25.9	0	11	00.7
	21	236	35	11.9	0	44	57.1		8	264	22	36.7	0	09	57.7
	22	237	12	13.7	0	44	25.4		9	264	57	43.6	0	08	53.7
	23	237	49	13.9	0	43	53.1		10	265	32	46.5	0	07	48.8
	24	238	26	12.4	+0	43	20.4		11	266	07	45.3	+0	06	42.8
	25	239	03	09.4	0	42	47.2		12	266	42	39.8	0	05	35.8
	26	239	40	04.7	0	42	13.4		13	267	17	29.9	0	04	27.8
	27	240	16	58.4	0	41	39.2		14	267	52	15.4	0	03	18.7
	28	240	53	50.5	0	41	04.5		15	268	26	56.1	0	02	08.6
	29	241	30	41.1	0	40	29.2		16	269	01	32.0	+0	00	57.4
	30	242	07	30.0	+0	39	53.4		17	269	36	02.9	-0	00	14.9
	31	242	44	17.2	0	39	17.1		18	270	10	28.7	0	01	28.3
Feb.	1	243	21	02.8	0	38	40.1		19	270	44	49.2	0	02	42.8
	2	243	57	46.7	0	38	02.7		20	271	19	04.4	0	03	58.4
	3	244	34	28.9	0	37	24.6		21	271	53	14.2	0	05	15.1
	4	245	11	09.3	0	36	46.0		22	272	27	18.4	0	06	33.0
	5	245	47	47.9	+0	36	06.7		23	273	01	17.1	-0	07	52.0
	6	246	24	24.7	0	35	26.8		24	273	35	10.1	0	09	12.2
	7	247	00	59.6	0	34	46.3		25	274	08	57.3	0	10	33.7
	8	247	37	32.4	0	34	05.1		26	274	42	38.7	0	11	56.3
	9	248	14	03.3	0	33	23.3		27	275	16	14.1	0	13	20.2
	10	248	50	32.0	0	32	40.9		28	275	49	43.5	0	14	45.4
	11	249	26	58.4	+0	31	57.7		29	276	23	06.7	-0	16	11.9
	12	250	03	22.5	0	31	13.9		30	276	56	23.7	0	17	39.8
	13	250	39	44.2	0	30	29.4		31	277	29	34.3	0	19	09.0
	14	251	16	03.3	0	29	44.3	Apr.	1	278	02	38.5	0	20	39.6
	15	251	52	19.8	+0	28	58.4		2	278	35	36.1	-0	22	11.6

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	278	02	38.5	-0	20	39.6	May	17	300	18	33.6	-2	01	59.2
	2	278	35	36.1	0	22	11.6		18	300	41	36.0	2	05	03.0
	3	279	08	27.0	0	23	45.0		19	301	04	16.2	2	08	09.4
	4	279	41	10.8	0	25	19.9		20	301	26	33.8	2	11	18.5
	5	280	13	47.5	0	26	56.3		21	301	48	28.2	2	14	30.2
	6	280	46	16.8	0	28	34.2		22	302	09	59.1	2	17	44.6
	7	281	18	38.5	-0	30	13.6		23	302	31	05.9	-2	21	01.7
	8	281	50	52.2	0	31	54.6		24	302	51	48.2	2	24	21.6
	9	282	22	57.8	0	33	37.1		25	303	12	05.5	2	27	44.2
	10	282	54	55.0	0	35	21.2		26	303	31	57.2	2	31	09.6
	11	283	26	43.5	0	37	06.9		27	303	51	22.8	2	34	37.8
	12	283	58	23.1	0	38	54.3		28	304	10	21.6	2	38	08.8
	13	284	29	53.4	-0	40	43.3		29	304	28	53.1	-2	41	42.6
	14	285	01	14.3	0	42	33.9		30	304	46	56.5	2	45	19.2
	15	285	32	25.5	0	44	26.2		31	305	04	31.1	2	48	58.7
	16	286	03	26.7	0	46	20.2	June	1	305	21	36.2	2	52	40.9
	17	286	34	17.8	0	48	16.0		2	305	38	11.0	2	56	26.0
	18	287	04	58.4	0	50	13.4		3	305	54	14.7	3	00	13.8
	19	287	35	28.3	-0	52	12.7		4	306	09	46.6	-3	04	04.4
	20	288	05	47.5	0	54	13.7		5	306	24	45.7	3	07	57.6
	21	288	35	55.5	0	56	16.6		6	306	39	11.4	3	11	53.6
	22	289	05	52.3	0	58	21.3		7	306	53	02.8	3	15	52.2
	23	289	35	37.5	1	00	27.9		8	307	06	19.1	3	19	53.3
	24	290	05	11.0	1	02	36.5		9	307	18	59.6	3	23	57.0
	25	290	34	32.6	-1	04	46.9		10	307	31	03.4	-3	28	03.1
	26	291	03	42.0	1	06	59.4		11	307	42	29.8	3	32	11.5
	27	291	32	38.9	1	09	14.0		12	307	53	18.1	3	36	22.3
	28	292	01	23.3	1	11	30.6		13	308	03	27.6	3	40	35.2
	29	292	29	54.6	1	13	49.3		14	308	12	57.6	3	44	50.2
	30	292	58	12.8	1	16	10.2		15	308	21	47.6	3	49	07.2
May	1	293	26	17.3	-1	18	33.2		16	308	29	56.9	-3	53	26.0
	2	293	54	07.8	1	20	58.4		17	308	37	25.2	3	57	46.6
	3	294	21	44.0	1	23	25.9		18	308	44	12.0	4	02	08.9
	4	294	49	05.3	1	25	55.6		19	308	50	16.9	4	06	32.6
	5	295	16	11.3	1	28	27.7		20	308	55	39.5	4	10	57.8
	6	295	43	01.6	1	31	02.0		21	309	00	19.4	4	15	24.1
	7	296	09	35.7	-1	33	38.7		22	309	04	16.4	-4	19	51.6
	8	296	35	53.1	1	36	17.8		23	309	07	30.0	4	24	19.9
	9	297	01	53.2	1	38	59.2		24	309	09	59.9	4	28	48.8
	10	297	27	35.6	1	41	43.1		25	309	11	45.8	4	33	18.3
	11	297	52	59.8	1	44	29.3		26	309	12	47.4	4	37	48.0
	12	298	18	05.3	1	47	18.1		27	309	13	04.4	4	42	17.7
	13	298	42	51.5	-1	50	09.3		28	309	12	36.5	-4	46	47.1
	14	299	07	17.9	1	53	03.0		29	309	11	23.5	4	51	16.0
	15	299	31	24.0	1	55	59.2		30	309	09	25.3	4	55	44.1
	16	299	55	09.4	1	58	57.9	July	1	309	06	41.7	5	00	11.0
	17	300	18	33.6	-2	01	59.2		2	309	03	12.9	-5	04	36.5

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		°	'	"	°	'	"			°	'	"	°	'	"
July	1	309	06	41.7	-5	00	11.0	Aug.	16	299	30	30.9	-6	23	39.5
	2	309	03	12.9	5	04	36.5		17	299	21	44.7	6	21	42.1
	3	308	58	58.8	5	09	00.1		18	299	13	42.8	6	19	36.8
	4	308	53	59.6	5	13	21.6		19	299	06	26.4	6	17	24.1
	5	308	48	15.7	5	17	40.4		20	298	59	56.1	6	15	04.4
	6	308	41	47.3	5	21	56.4		21	298	54	12.8	6	12	37.9
	7	308	34	35.1	-5	26	08.9		22	298	49	17.1	-6	10	05.1
	8	308	26	39.7	5	30	17.7		23	298	45	09.3	6	07	26.2
	9	308	18	01.9	5	34	22.3		24	298	41	49.9	6	04	41.7
	10	308	08	42.7	5	38	22.2		25	298	39	19.2	6	01	51.9
	11	307	58	43.1	5	42	17.0		26	298	37	37.1	5	58	57.0
	12	307	48	04.5	5	46	06.3		27	298	36	44.0	5	55	57.4
	13	307	36	48.5	-5	49	49.7		28	298	36	39.7	-5	52	53.5
	14	307	24	56.5	5	53	26.7		29	298	37	24.3	5	49	45.4
	15	307	12	30.5	5	56	57.0		30	298	38	57.5	5	46	33.5
	16	306	59	32.5	6	00	20.0		31	298	41	19.4	5	43	18.2
	17	306	46	04.5	6	03	35.5	Sept.	1	298	44	29.6	5	39	59.5
	18	306	32	08.7	6	06	43.1		2	298	48	28.1	5	36	37.9
	19	306	17	47.4	-6	09	42.4		3	298	53	14.4	-5	33	13.5
	20	306	03	02.9	6	12	33.0		4	298	58	48.5	5	29	46.7
	21	305	47	57.5	6	15	14.7		5	299	05	09.9	5	26	17.7
	22	305	32	33.5	6	17	47.1		6	299	12	18.3	5	22	46.7
	23	305	16	53.4	6	20	09.9		7	299	20	13.5	5	19	14.0
	24	305	00	59.7	6	22	22.9		8	299	28	54.9	5	15	39.8
	25	304	44	54.7	-6	24	25.7		9	299	38	22.3	-5	12	04.3
	26	304	28	41.2	6	26	18.1		10	299	48	35.2	5	08	27.8
	27	304	12	21.4	6	28	00.0		11	299	59	33.0	5	04	50.5
	28	303	55	58.2	6	29	31.0		12	300	11	15.3	5	01	12.6
	29	303	39	34.0	6	30	51.2		13	300	23	41.4	4	57	34.3
	30	303	23	11.4	6	32	00.2		14	300	36	50.5	4	53	55.8
	31	303	06	53.1	-6	32	58.0		15	300	50	41.9	-4	50	17.1
Aug.	1	302	50	41.7	6	33	44.6		16	301	05	14.8	4	46	38.5
	2	302	34	39.9	6	34	19.9		17	301	20	28.2	4	43	00.0
	3	302	18	50.2	6	34	43.8		18	301	36	21.5	4	39	21.9
	4	302	03	15.3	6	34	56.5		19	301	52	53.6	4	35	44.1
	5	301	47	57.8	6	34	57.9		20	302	10	03.7	4	32	06.9
	6	301	33	00.2	-6	34	48.1		21	302	27	51.0	-4	28	30.2
	7	301	18	25.1	6	34	27.2		22	302	46	14.5	4	24	54.1
	8	301	04	15.0	6	33	55.5		23	303	05	13.4	4	21	18.8
	9	300	50	32.3	6	33	13.1		24	303	24	47.0	4	17	44.3
	10	300	37	19.5	6	32	20.2		25	303	44	54.3	4	14	10.6
	11	300	24	38.8	6	31	17.1		26	304	05	34.5	4	10	37.8
	12	300	12	32.5	-6	30	04.0		27	304	26	47.1	-4	07	06.0
	13	300	01	02.7	6	28	41.4		28	304	48	31.1	4	03	35.3
	14	299	50	11.3	6	27	09.6		29	305	10	45.9	4	00	05.5
	15	299	40	00.2	6	25	28.8		30	305	33	30.8	3	56	36.9
	16	299	30	30.9	-6	23	39.5	Oct.	1	305	56	45.2	-3	53	09.4

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		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	305	56	45.2	-3	53	09.4	Nov.	16	330	02	30.3	-1	40	54.3
	2	306	20	28.5	3	49	43.1		17	330	39	22.4	1	38	37.5
	3	306	44	40.0	3	46	18.0		18	331	16	23.0	1	36	22.1
	4	307	09	19.2	3	42	54.2		19	331	53	31.8	1	34	08.0
	5	307	34	25.6	3	39	31.7		20	332	30	48.4	1	31	55.4
	6	307	59	58.6	3	36	10.6		21	333	08	12.6	1	29	44.1
	7	308	25	57.8	-3	32	51.0		22	333	45	44.2	-1	27	34.2
	8	308	52	22.6	3	29	32.8		23	334	23	22.8	1	25	25.6
	9	309	19	12.5	3	26	16.0		24	335	01	08.4	1	23	18.3
	10	309	46	27.0	3	23	00.8		25	335	39	00.6	1	21	12.4
	11	310	14	05.5	3	19	47.2		26	336	16	59.3	1	19	07.8
	12	310	42	07.5	3	16	35.1		27	336	55	04.3	1	17	04.5
	13	311	10	32.4	-3	13	24.6		28	337	33	15.3	-1	15	02.5
	14	311	39	19.5	3	10	15.7		29	338	11	32.4	1	13	01.8
	15	312	08	28.1	3	07	08.3		30	338	49	55.2	1	11	02.4
	16	312	37	57.8	3	04	02.6	Dec.	1	339	28	23.9	1	09	04.3
	17	313	07	47.8	3	00	58.5		2	340	06	58.2	1	07	07.5
	18	313	37	57.6	2	57	55.9		3	340	45	38.1	1	05	12.1
	19	314	08	26.6	-2	54	55.0		4	341	24	23.6	-1	03	17.9
	20	314	39	14.2	2	51	55.6		5	342	03	14.4	1	01	25.0
	21	315	10	19.8	2	48	57.8		6	342	42	10.4	0	59	33.3
	22	315	41	43.0	2	46	01.6		7	343	21	11.6	0	57	42.9
	23	316	13	23.1	2	43	06.9		8	344	00	17.6	0	55	53.8
	24	316	45	19.9	2	40	13.8		9	344	39	28.5	0	54	05.8
	25	317	17	32.7	-2	37	22.2		10	345	18	43.9	+0	52	19.1
	26	317	50	01.1	2	34	32.1		11	345	58	03.6	0	50	33.6
	27	318	22	44.8	2	31	43.6		12	346	37	27.5	0	48	49.3
	28	318	55	43.3	2	28	56.6		13	347	16	55.5	0	47	06.1
	29	319	28	56.2	2	26	11.2		14	347	56	27.2	0	45	24.1
	30	320	02	23.3	2	23	27.2		15	348	36	02.6	0	43	43.2
	31	320	36	04.1	-2	20	44.8		16	349	15	41.5	-0	42	03.5
Nov.	1	321	09	58.5	2	18	03.9		17	349	55	23.6	0	40	24.8
	2	321	44	06.0	2	15	24.6		18	350	35	08.9	0	38	47.3
	3	322	18	26.5	2	12	46.8		19	351	14	57.3	0	37	10.8
	4	322	52	59.8	2	10	10.5		20	351	54	48.5	0	35	35.5
	5	323	27	45.5	2	07	35.8		21	352	34	42.4	0	34	01.2
	6	324	02	43.4	-2	05	02.6		22	353	14	38.8	-0	32	27.9
	7	324	37	53.3	2	02	31.0		23	353	54	37.7	0	30	55.8
	8	325	13	15.0	2	00	00.9		24	354	34	39.0	0	29	24.6
	9	325	48	48.0	1	57	32.4		25	355	14	42.3	0	27	54.6
	10	326	24	32.1	1	55	05.3		26	355	54	47.8	0	26	25.6
	11	327	00	27.0	1	52	39.8		27	356	34	55.3	0	24	57.6
	12	327	36	32.2	-1	50	15.8		28	357	15	04.9	-0	23	30.7
	13	328	12	47.5	1	47	53.2		29	357	55	16.5	0	22	04.8
	14	328	49	12.5	1	45	32.1		30	358	35	30.0	0	20	39.9
	15	329	25	46.8	1	43	12.5		31	359	15	45.6	0	19	16.1
	16	330	02	30.3	-1	40	54.3		32	359	56	03.1	-0	17	53.3

MARS, 2018

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	14	45	28.62	-15	02	13.5	1.964 498	4.48	2.38	8	06	32
	1	14	47	56.23	15	13	42.3	1.955 767	4.50	2.39	8	05	03
	2	14	50	24.06	15	25	04.9	1.947 003	4.52	2.40	8	03	35
	3	14	52	52.10	15	36	21.1	1.938 207	4.54	2.41	8	02	06
	4	14	55	20.36	15	47	30.8	1.929 378	4.56	2.43	8	00	38
	5	14	57	48.84	15	58	34.1	1.920 517	4.58	2.44	7	59	10
	6	15	00	17.53	-16	09	30.8	1.911 625	4.60	2.45	7	57	43
	7	15	02	46.43	16	20	20.7	1.902 700	4.62	2.46	7	56	15
	8	15	05	15.55	16	31	04.0	1.893 745	4.64	2.47	7	54	48
	9	15	07	44.88	16	41	40.3	1.884 759	4.67	2.48	7	53	21
	10	15	10	14.42	16	52	09.8	1.875 742	4.69	2.50	7	51	54
	11	15	12	44.17	17	02	32.3	1.866 695	4.71	2.51	7	50	27
	12	15	15	14.12	-17	12	47.7	1.857 619	4.73	2.52	7	49	01
	13	15	17	44.26	17	22	56.0	1.848 515	4.76	2.53	7	47	34
	14	15	20	14.60	17	32	57.0	1.839 383	4.78	2.54	7	46	08
	15	15	22	45.13	17	42	50.8	1.830 223	4.80	2.56	7	44	42
	16	15	25	15.84	17	52	37.2	1.821 038	4.83	2.57	7	43	17
	17	15	27	46.73	18	02	16.1	1.811 827	4.85	2.58	7	41	51
	18	15	30	17.79	-18	11	47.5	1.802 591	4.88	2.60	7	40	26
	19	15	32	49.02	18	21	11.2	1.793 331	4.90	2.61	7	39	01
	20	15	35	20.41	18	30	27.3	1.784 049	4.93	2.62	7	37	36
	21	15	37	51.97	18	39	35.7	1.774 745	4.96	2.64	7	36	11
	22	15	40	23.68	18	48	36.2	1.765 420	4.98	2.65	7	34	46
	23	15	42	55.55	18	57	28.8	1.756 074	5.01	2.67	7	33	22
	24	15	45	27.57	-19	06	13.5	1.746 710	5.03	2.68	7	31	57
	25	15	47	59.74	19	14	50.2	1.737 328	5.06	2.69	7	30	33
	26	15	50	32.07	19	23	18.9	1.727 928	5.09	2.71	7	29	09
	27	15	53	04.54	19	31	39.6	1.718 512	5.12	2.72	7	27	45
	28	15	55	37.16	19	39	52.1	1.709 079	5.15	2.74	7	26	21
	29	15	58	09.93	19	47	56.5	1.699 632	5.17	2.75	7	24	57
	30	16	00	42.83	-19	55	52.7	1.690 170	5.20	2.77	7	23	34
	31	16	03	15.87	20	03	40.7	1.680 694	5.23	2.78	7	22	10
Feb.	1	16	05	49.05	20	11	20.4	1.671 204	5.26	2.80	7	20	47
	2	16	08	22.35	20	18	51.9	1.661 700	5.29	2.82	7	19	24
	3	16	10	55.77	20	26	14.9	1.652 183	5.32	2.83	7	18	01
	4	16	13	29.31	20	33	29.6	1.642 652	5.35	2.85	7	16	38
	5	16	16	02.96	-20	40	35.8	1.633 109	5.38	2.87	7	15	15
	6	16	18	36.72	20	47	33.5	1.623 554	5.42	2.88	7	13	53
	7	16	21	10.57	20	54	22.7	1.613 986	5.45	2.90	7	12	30
	8	16	23	44.51	21	01	03.4	1.604 407	5.48	2.92	7	11	08
	9	16	26	18.52	21	07	35.5	1.594 817	5.51	2.93	7	09	45
	10	16	28	52.61	21	13	58.9	1.585 217	5.55	2.95	7	08	23
	11	16	31	26.75	-21	20	13.8	1.575 608	5.58	2.97	7	07	00
	12	16	34	00.94	21	26	20.0	1.565 990	5.62	2.99	7	05	38
	13	16	36	35.16	21	32	17.4	1.556 364	5.65	3.01	7	04	16
	14	16	39	09.41	21	38	06.2	1.546 730	5.69	3.03	7	02	54
	15	16	41	43.67	-21	43	46.2	1.537 091	5.72	3.04	7	01	31

MARS, 2018

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	16	41	43.67	-21	43	46.2	1.537 091	5.72	3.04	7	01	31
	16	16	44	17.94	21	49	17.4	1.527 446	5.76	3.06	7	00	09
	17	16	46	52.20	21	54	39.8	1.517 796	5.79	3.08	6	58	47
	18	16	49	26.45	21	59	53.4	1.508 144	5.83	3.10	6	57	25
	19	16	52	00.67	22	04	58.1	1.498 488	5.87	3.12	6	56	03
	20	16	54	34.86	22	09	54.1	1.488 831	5.91	3.14	6	54	40
	21	16	57	09.02	-22	14	41.1	1.479 173	5.95	3.16	6	53	18
	22	16	59	43.13	22	19	19.4	1.469 515	5.98	3.18	6	51	56
	23	17	02	17.19	22	23	48.9	1.459 859	6.02	3.21	6	50	33
	24	17	04	51.19	22	28	09.5	1.450 204	6.06	3.23	6	49	11
	25	17	07	25.13	22	32	21.4	1.440 553	6.10	3.25	6	47	48
	26	17	09	58.99	22	36	24.6	1.430 904	6.15	3.27	6	46	25
	27	17	12	32.78	-22	40	19.0	1.421 260	6.19	3.29	6	45	03
	28	17	15	06.48	22	44	04.7	1.411 620	6.23	3.32	6	43	40
Mar.	1	17	17	40.08	22	47	41.8	1.401 984	6.27	3.34	6	42	17
	2	17	20	13.58	22	51	10.1	1.392 354	6.32	3.36	6	40	54
	3	17	22	46.96	22	54	29.9	1.382 728	6.36	3.38	6	39	31
	4	17	25	20.23	22	57	41.0	1.373 108	6.40	3.41	6	38	08
	5	17	27	53.36	-23	00	43.5	1.363 494	6.45	3.43	6	36	44
	6	17	30	26.34	23	03	37.4	1.353 886	6.50	3.46	6	35	21
	7	17	32	59.17	23	06	22.9	1.344 285	6.54	3.48	6	33	57
	8	17	35	31.84	23	08	59.9	1.334 690	6.59	3.51	6	32	33
	9	17	38	04.31	23	11	28.5	1.325 103	6.64	3.53	6	31	09
	10	17	40	36.59	23	13	48.7	1.315 524	6.68	3.56	6	29	45
	11	17	43	08.64	-23	16	00.5	1.305 954	6.73	3.58	6	28	20
	12	17	45	40.47	23	18	04.2	1.296 392	6.78	3.61	6	26	56
	13	17	48	12.05	23	19	59.5	1.286 841	6.83	3.64	6	25	31
	14	17	50	43.37	23	21	46.8	1.277 301	6.88	3.66	6	24	06
	15	17	53	14.40	23	23	25.9	1.267 771	6.94	3.69	6	22	40
	16	17	55	45.15	23	24	56.9	1.258 255	6.99	3.72	6	21	14
	17	17	58	15.58	-23	26	20.0	1.248 751	7.04	3.75	6	19	48
	18	18	00	45.69	23	27	35.2	1.239 261	7.10	3.78	6	18	22
	19	18	03	15.46	23	28	42.5	1.229 787	7.15	3.81	6	16	55
	20	18	05	44.89	23	29	42.0	1.220 328	7.21	3.84	6	15	28
	21	18	08	13.96	23	30	33.8	1.210 886	7.26	3.86	6	14	00
	22	18	10	42.66	23	31	18.0	1.201 461	7.32	3.90	6	12	32
	23	18	13	10.98	-23	31	54.8	1.192 056	7.38	3.93	6	11	04
	24	18	15	38.91	23	32	24.1	1.182 670	7.44	3.96	6	09	36
	25	18	18	06.44	23	32	46.2	1.173 303	7.50	3.99	6	08	06
	26	18	20	33.56	23	33	01.1	1.163 958	7.56	4.02	6	06	37
	27	18	23	00.25	23	33	08.9	1.154 634	7.62	4.05	6	05	07
	28	18	25	26.52	23	33	09.8	1.145 331	7.68	4.09	6	03	37
	29	18	27	52.33	-23	33	03.8	1.136 050	7.74	4.12	6	02	06
	30	18	30	17.70	23	32	51.0	1.126 792	7.80	4.15	6	00	35
	31	18	32	42.60	23	32	31.6	1.117 556	7.87	4.19	5	59	03
Apr.	1	18	35	07.02	23	32	05.7	1.108 343	7.93	4.22	5	57	31
	2	18	37	30.95	-23	31	33.4	1.099 153	8.00	4.26	5	55	58

MARS, 2018

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	18	35	07.02	-23	32	05.7	1.108 343	7.93	4.22	5	57	31
	2	18	37	30.95	23	31	33.4	1.099 153	8.00	4.26	5	55	58
	3	18	39	54.37	23	30	54.8	1.089 986	8.07	4.29	5	54	25
	4	18	42	17.27	23	30	10.1	1.080 842	8.14	4.33	5	52	52
	5	18	44	39.63	23	29	19.5	1.071 722	8.21	4.37	5	51	17
	6	18	47	01.43	23	28	23.0	1.062 627	8.28	4.40	5	49	43
	7	18	49	22.65	-23	27	20.8	1.053 556	8.35	4.44	5	48	07
	8	18	51	43.27	23	26	13.2	1.044 510	8.42	4.48	5	46	31
	9	18	54	03.27	23	25	00.1	1.035 491	8.49	4.52	5	44	55
	10	18	56	22.62	23	23	41.8	1.026 497	8.57	4.56	5	43	17
	11	18	58	41.32	23	22	18.5	1.017 531	8.64	4.60	5	41	39
	12	19	00	59.32	23	20	50.3	1.008 593	8.72	4.64	5	40	01
	13	19	03	16.63	-23	19	17.3	0.999 683	8.80	4.68	5	38	22
	14	19	05	33.20	23	17	39.8	0.990 803	8.88	4.72	5	36	42
	15	19	07	49.04	23	15	57.9	0.981 952	8.96	4.77	5	35	01
	16	19	10	04.11	23	14	11.7	0.973 133	9.04	4.81	5	33	19
	17	19	12	18.40	23	12	21.6	0.964 346	9.12	4.85	5	31	37
	18	19	14	31.90	23	10	27.6	0.955 592	9.20	4.90	5	29	54
	19	19	16	44.58	-23	08	29.9	0.946 871	9.29	4.94	5	28	10
	20	19	18	56.43	23	06	28.8	0.938 186	9.37	4.99	5	26	25
	21	19	21	07.44	23	04	24.5	0.929 536	9.46	5.03	5	24	39
	22	19	23	17.60	23	02	17.1	0.920 922	9.55	5.08	5	22	53
	23	19	25	26.87	23	00	06.9	0.912 345	9.64	5.13	5	21	06
	24	19	27	35.26	22	57	54.1	0.903 806	9.73	5.18	5	19	17
	25	19	29	42.74	-22	55	38.8	0.895 304	9.82	5.23	5	17	28
	26	19	31	49.30	22	53	21.4	0.886 841	9.92	5.28	5	15	38
	27	19	33	54.92	22	51	01.9	0.878 417	10.01	5.33	5	13	47
	28	19	35	59.60	22	48	40.7	0.870 031	10.11	5.38	5	11	55
	29	19	38	03.30	22	46	17.9	0.861 685	10.21	5.43	5	10	02
	30	19	40	06.01	22	43	53.8	0.853 377	10.31	5.48	5	08	09
May	1	19	42	07.71	-22	41	28.6	0.845 110	10.41	5.54	5	06	14
	2	19	44	08.36	22	39	02.6	0.836 882	10.51	5.59	5	04	18
	3	19	46	07.96	22	36	36.1	0.828 695	10.61	5.65	5	02	21
	4	19	48	06.45	22	34	09.2	0.820 549	10.72	5.70	5	00	22
	5	19	50	03.82	22	31	42.4	0.812 445	10.82	5.76	4	58	23
	6	19	52	00.04	22	29	15.8	0.804 382	10.93	5.82	4	56	23
	7	19	53	55.07	-22	26	49.7	0.796 361	11.04	5.88	4	54	21
	8	19	55	48.89	22	24	24.4	0.788 384	11.15	5.94	4	52	18
	9	19	57	41.45	22	22	00.2	0.780 451	11.27	6.00	4	50	14
	10	19	59	32.73	22	19	37.4	0.772 563	11.38	6.06	4	48	09
	11	20	01	22.70	22	17	16.1	0.764 720	11.50	6.12	4	46	02
	12	20	03	11.32	22	14	56.9	0.756 924	11.62	6.18	4	43	54
	13	20	04	58.55	-22	12	39.8	0.749 175	11.74	6.25	4	41	45
	14	20	06	44.38	22	10	25.3	0.741 474	11.86	6.31	4	39	34
	15	20	08	28.75	22	08	13.5	0.733 824	11.98	6.38	4	37	22
	16	20	10	11.66	22	06	04.9	0.726 224	12.11	6.44	4	35	08
	17	20	11	53.06	-22	03	59.7	0.718 676	12.24	6.51	4	32	53

MARS, 2018

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	20	11	53.06	-22	03	59.7	0.718 676	12.24	6.51	4	32	53
	18	20	13	32.92	22	01	58.2	0.711 181	12.37	6.58	4	30	36
	19	20	15	11.22	22	00	00.7	0.703 741	12.50	6.65	4	28	18
	20	20	16	47.93	21	58	07.6	0.696 355	12.63	6.72	4	25	58
	21	20	18	23.02	21	56	19.1	0.689 026	12.76	6.79	4	23	36
	22	20	19	56.47	21	54	35.6	0.681 753	12.90	6.86	4	21	13
	23	20	21	28.24	-21	52	57.2	0.674 538	13.04	6.94	4	18	48
	24	20	22	58.31	21	51	24.3	0.667 381	13.18	7.01	4	16	22
	25	20	24	26.64	21	49	57.3	0.660 283	13.32	7.09	4	13	53
	26	20	25	53.20	21	48	36.3	0.653 244	13.46	7.16	4	11	23
	27	20	27	17.97	21	47	21.8	0.646 265	13.61	7.24	4	08	52
	28	20	28	40.90	21	46	14.1	0.639 346	13.75	7.32	4	06	18
	29	20	30	01.94	-21	45	13.4	0.632 489	13.90	7.40	4	03	42
	30	20	31	21.06	21	44	20.2	0.625 694	14.06	7.48	4	01	05
	31	20	32	38.21	21	43	34.7	0.618 962	14.21	7.56	3	58	25
June	1	20	33	53.35	21	42	57.3	0.612 293	14.36	7.64	3	55	44
	2	20	35	06.42	21	42	28.3	0.605 689	14.52	7.73	3	53	00
	3	20	36	17.37	21	42	08.1	0.599 151	14.68	7.81	3	50	15
	4	20	37	26.15	-21	41	56.9	0.592 679	14.84	7.90	3	47	27
	5	20	38	32.71	21	41	55.2	0.586 275	15.00	7.98	3	44	37
	6	20	39	37.00	21	42	03.1	0.579 940	15.16	8.07	3	41	45
	7	20	40	38.96	21	42	21.0	0.573 675	15.33	8.16	3	38	50
	8	20	41	38.54	21	42	49.3	0.567 482	15.50	8.25	3	35	53
	9	20	42	35.68	21	43	28.1	0.561 363	15.67	8.34	3	32	54
	10	20	43	30.34	-21	44	17.7	0.555 318	15.84	8.43	3	29	52
	11	20	44	22.47	21	45	18.5	0.549 350	16.01	8.52	3	26	47
	12	20	45	12.01	21	46	30.6	0.543 460	16.18	8.61	3	23	40
	13	20	45	58.92	21	47	54.2	0.537 650	16.36	8.70	3	20	31
	14	20	46	43.15	21	49	29.6	0.531 922	16.53	8.80	3	17	19
	15	20	47	24.67	21	51	17.0	0.526 279	16.71	8.89	3	14	04
	16	20	48	03.43	-21	53	16.5	0.520 720	16.89	8.99	3	10	46
	17	20	48	39.41	21	55	28.1	0.515 249	17.07	9.08	3	07	25
	18	20	49	12.56	21	57	52.1	0.509 868	17.25	9.18	3	04	02
	19	20	49	42.86	22	00	28.4	0.504 576	17.43	9.28	3	00	36
	20	20	50	10.28	22	03	17.1	0.499 377	17.61	9.37	2	57	07
	21	20	50	34.79	22	06	18.2	0.494 270	17.79	9.47	2	53	35
	22	20	50	56.37	-22	09	31.8	0.489 259	17.97	9.57	2	50	00
	23	20	51	14.98	22	12	57.7	0.484 343	18.16	9.66	2	46	23
	24	20	51	30.60	22	16	36.1	0.479 525	18.34	9.76	2	42	42
	25	20	51	43.19	22	20	26.7	0.474 805	18.52	9.86	2	38	58
	26	20	51	52.73	22	24	29.5	0.470 186	18.70	9.95	2	35	11
	27	20	51	59.20	22	28	44.4	0.465 669	18.88	10.05	2	31	22
	28	20	52	02.56	-22	33	11.3	0.461 255	19.07	10.15	2	27	29
	29	20	52	02.80	22	37	49.8	0.456 945	19.25	10.24	2	23	33
	30	20	51	59.88	22	42	39.9	0.452 743	19.42	10.34	2	19	34
July	1	20	51	53.80	22	47	41.1	0.448 649	19.60	10.43	2	15	31
	2	20	51	44.54	-22	52	53.2	0.444 665	19.78	10.52	2	11	26

MARS, 2018

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	20	51	53.80	-22	47	41.1	0.448 649	19.60	10.43	2	15	31
	2	20	51	44.54	22	52	53.2	0.444 665	19.78	10.52	2	11	26
	3	20	51	32.10	22	58	15.7	0.440 794	19.95	10.62	2	07	17
	4	20	51	16.48	23	03	48.3	0.437 036	20.12	10.71	2	03	06
	5	20	50	57.67	23	09	30.4	0.433 395	20.29	10.80	1	58	51
	6	20	50	35.70	23	15	21.5	0.429 871	20.46	10.89	1	54	33
	7	20	50	10.59	-23	21	21.0	0.426 468	20.62	10.97	1	50	12
	8	20	49	42.36	23	27	28.2	0.423 186	20.78	11.06	1	45	47
	9	20	49	11.06	23	33	42.5	0.420 029	20.94	11.14	1	41	20
	10	20	48	36.74	23	40	03.0	0.416 999	21.09	11.22	1	36	50
	11	20	47	59.46	23	46	29.1	0.414 097	21.24	11.30	1	32	17
	12	20	47	19.30	23	52	59.7	0.411 326	21.38	11.38	1	27	41
	13	20	46	36.35	-23	59	34.1	0.408 687	21.52	11.45	1	23	02
	14	20	45	50.70	24	06	11.2	0.406 183	21.65	11.52	1	18	21
	15	20	45	02.47	24	12	50.1	0.403 814	21.78	11.59	1	13	37
	16	20	44	11.79	24	19	29.6	0.401 582	21.90	11.65	1	08	50
	17	20	43	18.78	24	26	08.9	0.399 489	22.01	11.71	1	04	01
	18	20	42	23.59	24	32	46.8	0.397 534	22.12	11.77	0	59	11
	19	20	41	26.37	-24	39	22.4	0.395 720	22.22	11.83	0	54	18
	20	20	40	27.26	24	45	54.5	0.394 046	22.32	11.88	0	49	23
	21	20	39	26.43	24	52	22.1	0.392 512	22.40	11.92	0	44	27
	22	20	38	24.02	24	58	44.3	0.391 120	22.48	11.97	0	39	29
	23	20	37	20.20	25	05	00.1	0.389 869	22.56	12.00	0	34	29
	24	20	36	15.15	25	11	08.4	0.388 760	22.62	12.04	0	29	29
	25	20	35	09.02	-25	17	08.4	0.387 793	22.68	12.07	0	24	27
	26	20	34	02.00	25	22	59.1	0.386 968	22.73	12.09	0	19	24
	27	20	32	54.25	25	28	39.7	0.386 285	22.77	12.12	0	14	21
	28	20	31	45.97	25	34	09.2	0.385 744	22.80	12.13	0	09	17
	29	20	30	37.34	25	39	26.8	0.385 345	22.82	12.14	0	04	13
	30	20	29	28.54	25	44	31.7	0.385 087	22.84	12.15	23	54	05
	31	20	28	19.76	-25	49	23.3	0.384 970	22.84	12.16	23	49	01
Aug.	1	20	27	11.20	25	54	00.7	0.384 995	22.84	12.16	23	43	57
	2	20	26	03.04	25	58	23.3	0.385 160	22.83	12.15	23	38	54
	3	20	24	55.48	26	02	30.6	0.385 464	22.81	12.14	23	33	52
	4	20	23	48.72	26	06	21.9	0.385 909	22.79	12.13	23	28	51
	5	20	22	42.94	26	09	56.8	0.386 492	22.75	12.11	23	23	50
	6	20	21	38.34	-26	13	14.8	0.387 213	22.71	12.09	23	18	52
	7	20	20	35.11	26	16	15.5	0.388 071	22.66	12.06	23	13	54
	8	20	19	33.45	26	18	58.6	0.389 066	22.60	12.03	23	08	59
	9	20	18	33.54	26	21	23.9	0.390 196	22.54	11.99	23	04	05
	10	20	17	35.56	26	23	31.1	0.391 459	22.47	11.96	22	59	14
	11	20	16	39.70	26	25	20.1	0.392 855	22.39	11.91	22	54	24
	12	20	15	46.13	-26	26	50.7	0.394 382	22.30	11.87	22	49	38
	13	20	14	55.01	26	28	03.0	0.396 038	22.21	11.82	22	44	53
	14	20	14	06.49	26	28	56.9	0.397 820	22.11	11.76	22	40	12
	15	20	13	20.71	26	29	32.6	0.399 726	22.00	11.71	22	35	33
	16	20	12	37.81	-26	29	50.1	0.401 754	21.89	11.65	22	30	57

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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	20	12	37.81	-26	29	50.1	0.401 754	21.89	11.65	22	30	57
	17	20	11	57.88	26	29	49.7	0.403 902	21.77	11.59	22	26	25
	18	20	11	21.03	26	29	31.6	0.406 166	21.65	11.52	22	21	55
	19	20	10	47.35	26	28	56.0	0.408 546	21.53	11.46	22	17	29
	20	20	10	16.89	26	28	03.2	0.411 037	21.40	11.39	22	13	05
	21	20	09	49.73	26	26	53.6	0.413 639	21.26	11.31	22	08	45
	22	20	09	25.91	-26	25	27.3	0.416 348	21.12	11.24	22	04	29
	23	20	09	05.47	26	23	44.9	0.419 163	20.98	11.17	22	00	16
	24	20	08	48.44	26	21	46.5	0.422 081	20.84	11.09	21	56	06
	25	20	08	34.86	26	19	32.5	0.425 100	20.69	11.01	21	52	00
	26	20	08	24.72	26	17	03.3	0.428 219	20.54	10.93	21	47	57
	27	20	08	18.04	26	14	19.1	0.431 434	20.38	10.85	21	43	58
	28	20	08	14.83	-26	11	20.2	0.434 745	20.23	10.76	21	40	02
	29	20	08	15.08	26	08	07.1	0.438 149	20.07	10.68	21	36	09
	30	20	08	18.79	26	04	39.9	0.441 645	19.91	10.60	21	32	20
	31	20	08	25.95	26	00	59.0	0.445 231	19.75	10.51	21	28	34
Sept.	1	20	08	36.54	25	57	04.6	0.448 906	19.59	10.43	21	24	52
	2	20	08	50.54	25	52	57.1	0.452 667	19.43	10.34	21	21	13
	3	20	09	07.94	-25	48	36.7	0.456 514	19.26	10.25	21	17	37
	4	20	09	28.71	25	44	03.6	0.460 445	19.10	10.16	21	14	05
	5	20	09	52.84	25	39	18.1	0.464 458	18.93	10.08	21	10	36
	6	20	10	20.28	25	34	20.4	0.468 552	18.77	9.99	21	07	10
	7	20	10	51.03	25	29	10.8	0.472 725	18.60	9.90	21	03	48
	8	20	11	25.04	25	23	49.4	0.476 976	18.44	9.81	21	00	29
	9	20	12	02.27	-25	18	16.5	0.481 302	18.27	9.72	20	57	13
	10	20	12	42.70	25	12	32.1	0.485 703	18.11	9.64	20	54	00
	11	20	13	26.29	25	06	36.6	0.490 176	17.94	9.55	20	50	50
	12	20	14	12.98	25	00	30.1	0.494 720	17.78	9.46	20	47	43
	13	20	15	02.72	24	54	12.7	0.499 331	17.61	9.37	20	44	39
	14	20	15	55.46	24	47	44.7	0.504 010	17.45	9.29	20	41	38
	15	20	16	51.14	-24	41	06.2	0.508 753	17.29	9.20	20	38	40
	16	20	17	49.68	24	34	17.4	0.513 560	17.12	9.11	20	35	45
	17	20	18	51.02	24	27	18.4	0.518 429	16.96	9.03	20	32	52
	18	20	19	55.10	24	20	09.4	0.523 358	16.80	8.94	20	30	03
	19	20	21	01.83	24	12	50.4	0.528 346	16.64	8.86	20	27	15
	20	20	22	11.15	24	05	21.7	0.533 392	16.49	8.77	20	24	30
	21	20	23	23.00	-23	57	43.3	0.538 494	16.33	8.69	20	21	48
	22	20	24	37.29	23	49	55.4	0.543 652	16.18	8.61	20	19	08
	23	20	25	53.97	23	41	57.9	0.548 865	16.02	8.53	20	16	31
	24	20	27	12.96	23	33	51.0	0.554 131	15.87	8.45	20	13	55
	25	20	28	34.20	23	25	34.8	0.559 451	15.72	8.37	20	11	22
	26	20	29	57.62	23	17	09.4	0.564 822	15.57	8.29	20	08	51
	27	20	31	23.17	-23	08	34.7	0.570 246	15.42	8.21	20	06	22
	28	20	32	50.78	22	59	50.8	0.575 720	15.28	8.13	20	03	55
	29	20	34	20.39	22	50	57.8	0.581 245	15.13	8.05	20	01	30
	30	20	35	51.96	22	41	55.8	0.586 820	14.99	7.98	19	59	07
Oct.	1	20	37	25.42	-22	32	44.7	0.592 445	14.84	7.90	19	56	45

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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	20	37	25.42	-22	32	44.7	0.592 445	14.84	7.90	19	56	45
	2	20	39	00.74	22	23	24.7	0.598 119	14.70	7.82	19	54	26
	3	20	40	37.85	22	13	55.7	0.603 842	14.56	7.75	19	52	08
	4	20	42	16.71	22	04	17.8	0.609 614	14.43	7.68	19	49	52
	5	20	43	57.27	21	54	31.1	0.615 433	14.29	7.60	19	47	38
	6	20	45	39.50	21	44	35.4	0.621 299	14.15	7.53	19	45	25
	7	20	47	23.35	-21	34	31.0	0.627 211	14.02	7.46	19	43	14
	8	20	49	08.78	21	24	17.7	0.633 170	13.89	7.39	19	41	04
	9	20	50	55.74	21	13	55.5	0.639 172	13.76	7.32	19	38	56
	10	20	52	44.20	21	03	24.7	0.645 219	13.63	7.25	19	36	49
	11	20	54	34.10	20	52	45.0	0.651 308	13.50	7.19	19	34	44
	12	20	56	25.41	20	41	56.7	0.657 440	13.38	7.12	19	32	40
	13	20	58	18.07	-20	30	59.8	0.663 613	13.25	7.05	19	30	37
	14	21	00	12.03	20	19	54.4	0.669 826	13.13	6.99	19	28	36
	15	21	02	07.25	20	08	40.4	0.676 078	13.01	6.92	19	26	36
	16	21	04	03.68	19	57	18.1	0.682 370	12.89	6.86	19	24	37
	17	21	06	01.27	19	45	47.4	0.688 700	12.77	6.80	19	22	39
	18	21	07	59.97	19	34	08.4	0.695 068	12.65	6.73	19	20	42
	19	21	09	59.74	-19	22	21.2	0.701 474	12.54	6.67	19	18	46
	20	21	12	00.53	19	10	25.9	0.707 916	12.42	6.61	19	16	51
	21	21	14	02.31	18	58	22.6	0.714 395	12.31	6.55	19	14	57
	22	21	16	05.03	18	46	11.2	0.720 911	12.20	6.49	19	13	04
	23	21	18	08.65	18	33	51.9	0.727 463	12.09	6.43	19	11	12
	24	21	20	13.15	18	21	24.7	0.734 051	11.98	6.38	19	09	21
	25	21	22	18.47	-18	08	49.8	0.740 675	11.87	6.32	19	07	31
	26	21	24	24.59	17	56	07.1	0.747 335	11.77	6.26	19	05	41
	27	21	26	31.49	17	43	16.9	0.754 031	11.66	6.21	19	03	52
	28	21	28	39.13	17	30	19.0	0.760 763	11.56	6.15	19	02	04
	29	21	30	47.48	17	17	13.8	0.767 530	11.46	6.10	19	00	16
	30	21	32	56.52	17	04	01.1	0.774 334	11.36	6.04	18	58	29
	31	21	35	06.22	-16	50	41.1	0.781 174	11.26	5.99	18	56	43
Nov.	1	21	37	16.57	16	37	13.8	0.788 050	11.16	5.94	18	54	58
	2	21	39	27.54	16	23	39.4	0.794 961	11.06	5.89	18	53	13
	3	21	41	39.11	16	09	57.8	0.801 908	10.97	5.84	18	51	28
	4	21	43	51.28	15	56	09.2	0.808 890	10.87	5.79	18	49	44
	5	21	46	04.02	15	42	13.6	0.815 906	10.78	5.74	18	48	01
	6	21	48	17.31	-15	28	11.0	0.822 956	10.69	5.69	18	46	19
	7	21	50	31.14	15	14	01.5	0.830 040	10.59	5.64	18	44	36
	8	21	52	45.49	14	59	45.3	0.837 157	10.50	5.59	18	42	55
	9	21	55	00.35	14	45	22.4	0.844 305	10.42	5.54	18	41	13
	10	21	57	15.68	14	30	53.0	0.851 486	10.33	5.50	18	39	33
	11	21	59	31.46	14	16	17.1	0.858 697	10.24	5.45	18	37	52
	12	22	01	47.69	-14	01	34.9	0.865 939	10.16	5.40	18	36	12
	13	22	04	04.32	13	46	46.5	0.873 211	10.07	5.36	18	34	33
	14	22	06	21.35	13	31	52.0	0.880 512	9.99	5.32	18	32	54
	15	22	08	38.76	13	16	51.6	0.887 842	9.91	5.27	18	31	15
	16	22	10	56.51	-13	01	45.3	0.895 202	9.82	5.23	18	29	37

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

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		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	22	10	56.51	-13	01	45.3	0.895 202	9.82	5.23	18	29	37
	17	22	13	14.60	12	46	33.3	0.902 589	9.74	5.19	18	27	59
	18	22	15	33.01	12	31	15.8	0.910 005	9.66	5.14	18	26	21
	19	22	17	51.71	12	15	52.8	0.917 449	9.59	5.10	18	24	43
	20	22	20	10.70	12	00	24.4	0.924 921	9.51	5.06	18	23	06
	21	22	22	29.97	11	44	50.9	0.932 420	9.43	5.02	18	21	29
	22	22	24	49.48	-11	29	12.3	0.939 947	9.36	4.98	18	19	52
	23	22	27	09.25	11	13	28.8	0.947 502	9.28	4.94	18	18	16
	24	22	29	29.24	10	57	40.4	0.955 084	9.21	4.90	18	16	39
	25	22	31	49.46	10	41	47.4	0.962 694	9.13	4.86	18	15	03
	26	22	34	09.90	10	25	49.8	0.970 332	9.06	4.82	18	13	28
	27	22	36	30.54	10	09	47.9	0.977 997	8.99	4.79	18	11	52
	28	22	38	51.37	-9	53	41.6	0.985 691	8.92	4.75	18	10	16
	29	22	41	12.41	9	37	31.2	0.993 413	8.85	4.71	18	08	41
	30	22	43	33.63	9	21	16.7	1.001 162	8.78	4.67	18	07	06
Dec.	1	22	45	55.05	9	04	58.2	1.008 939	8.72	4.64	18	05	31
	2	22	48	16.65	8	48	35.8	1.016 743	8.65	4.60	18	03	56
	3	22	50	38.45	8	32	09.6	1.024 573	8.58	4.57	18	02	22
	4	22	53	00.43	-8	15	39.8	1.032 430	8.52	4.53	18	00	48
	5	22	55	22.59	7	59	06.3	1.040 312	8.45	4.50	17	59	13
	6	22	57	44.94	7	42	29.5	1.048 219	8.39	4.46	17	57	39
	7	23	00	07.47	7	25	49.3	1.056 150	8.33	4.43	17	56	06
	8	23	02	30.16	7	09	05.9	1.064 105	8.26	4.40	17	54	32
	9	23	04	53.02	6	52	19.4	1.072 083	8.20	4.37	17	52	59
	10	23	07	16.04	-6	35	30.0	1.080 083	8.14	4.33	17	51	25
	11	23	09	39.22	6	18	37.9	1.088 105	8.08	4.30	17	49	52
	12	23	12	02.53	6	01	43.2	1.096 149	8.02	4.27	17	48	19
	13	23	14	25.99	5	44	45.9	1.104 213	7.96	4.24	17	46	46
	14	23	16	49.59	5	27	46.4	1.112 298	7.91	4.21	17	45	13
	15	23	19	13.31	5	10	44.6	1.120 402	7.85	4.18	17	43	41
	16	23	21	37.16	-4	53	40.8	1.128 526	7.79	4.15	17	42	08
	17	23	24	01.13	4	36	35.1	1.136 670	7.74	4.12	17	40	36
	18	23	26	25.21	4	19	27.6	1.144 832	7.68	4.09	17	39	03
	19	23	28	49.41	4	02	18.6	1.153 012	7.63	4.06	17	37	31
	20	23	31	13.73	3	45	08.0	1.161 211	7.57	4.03	17	35	59
	21	23	33	38.15	3	27	56.2	1.169 429	7.52	4.00	17	34	27
	22	23	36	02.68	-3	10	43.2	1.177 664	7.47	3.97	17	32	55
	23	23	38	27.31	2	53	29.1	1.185 918	7.42	3.95	17	31	24
	24	23	40	52.05	2	36	14.2	1.194 190	7.36	3.92	17	29	52
	25	23	43	16.89	2	18	58.6	1.202 480	7.31	3.89	17	28	20
	26	23	45	41.83	2	01	42.4	1.210 788	7.26	3.87	17	26	49
	27	23	48	06.88	1	44	25.7	1.219 115	7.21	3.84	17	25	18
	28	23	50	32.05	-1	27	08.7	1.227 459	7.16	3.81	17	23	46
	29	23	52	57.33	1	09	51.4	1.235 821	7.12	3.79	17	22	15
	30	23	55	22.75	0	52	33.9	1.244 200	7.07	3.76	17	20	44
	31	23	57	48.29	0	35	16.4	1.252 595	7.02	3.74	17	19	14
	32	0	00	13.97	-0	17	59.0	1.261 007	6.97	3.71	17	17	43

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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	218	34	04.3	+1	09	05.9	5.432 242	Apr.	3	225	35	43.2	+1	04	06.3	5.416 517
	3	218	43	12.8	1	09	00.1	5.431 940		5	225	44	54.9	1	03	59.1	5.416 134
	5	218	52	21.4	1	08	54.2	5.431 636		7	225	54	06.6	1	03	51.9	5.415 750
	7	219	01	30.0	1	08	48.3	5.431 330		9	226	03	18.4	1	03	44.7	5.415 365
	9	219	10	38.7	1	08	42.3	5.431 023		11	226	12	30.3	1	03	37.4	5.414 977
	11	219	19	47.4	1	08	36.4	5.430 713		13	226	21	42.3	1	03	30.1	5.414 588
	13	219	28	56.2	+1	08	30.4	5.430 402		15	226	30	54.4	+1	03	22.7	5.414 197
	15	219	38	05.0	1	08	24.4	5.430 089		17	226	40	06.5	1	03	15.4	5.413 805
	17	219	47	14.0	1	08	18.3	5.429 774		19	226	49	18.7	1	03	08.0	5.413 411
	19	219	56	22.9	1	08	12.2	5.429 458		21	226	58	31.0	1	03	00.5	5.413 015
	21	220	05	32.0	1	08	06.1	5.429 139		23	227	07	43.4	1	02	53.1	5.412 617
	23	220	14	41.1	1	07	59.9	5.428 819		25	227	16	55.8	1	02	45.6	5.412 218
	25	220	23	50.3	+1	07	53.7	5.428 497		27	227	26	08.4	+1	02	38.1	5.411 817
	27	220	32	59.5	1	07	47.5	5.428 174		29	227	35	21.0	1	02	30.6	5.411 415
	29	220	42	08.8	1	07	41.3	5.427 848	May	1	227	44	33.7	1	02	23.0	5.411 011
	31	220	51	18.2	1	07	35.0	5.427 521		3	227	53	46.5	1	02	15.4	5.410 605
Feb.	2	221	00	27.7	1	07	28.8	5.427 192		5	228	02	59.3	1	02	07.8	5.410 198
	4	221	09	37.2	1	07	22.4	5.426 861		7	228	12	12.3	1	02	00.2	5.409 789
	6	221	18	46.7	+1	07	16.0	5.426 529		9	228	21	25.3	+1	01	52.5	5.409 378
	8	221	27	56.4	1	07	09.7	5.426 195		11	228	30	38.4	1	01	44.8	5.408 966
	10	221	37	06.1	1	07	03.3	5.425 859		13	228	39	51.6	1	01	37.1	5.408 552
	12	221	46	15.9	1	06	56.8	5.425 521		15	228	49	04.9	1	01	29.3	5.408 136
	14	221	55	25.7	1	06	50.3	5.425 182		17	228	58	18.2	1	01	21.5	5.407 719
	16	222	04	35.6	1	06	43.8	5.424 840		19	229	07	31.7	1	01	13.7	5.407 300
	18	222	13	45.6	+1	06	37.3	5.424 497		21	229	16	45.2	+1	01	05.9	5.406 879
	20	222	22	55.6	1	06	30.7	5.424 153		23	229	25	58.8	1	00	58.0	5.406 457
	22	222	32	05.7	1	06	24.2	5.423 806		25	229	35	12.6	1	00	50.1	5.406 033
	24	222	41	15.9	1	06	17.6	5.423 458		27	229	44	26.4	1	00	42.2	5.405 608
	26	222	50	26.2	1	06	10.9	5.423 108		29	229	53	40.2	1	00	34.3	5.405 181
	28	222	59	36.5	1	06	04.2	5.422 757		31	230	02	54.2	1	00	26.3	5.404 752
Mar.	2	223	08	46.9	+1	05	57.5	5.422 403	June	2	230	12	08.3	+1	00	18.3	5.404 322
	4	223	17	57.4	1	05	50.8	5.422 048		4	230	21	22.4	1	00	10.2	5.403 890
	6	223	27	07.9	1	05	44.0	5.421 691		6	230	30	36.6	1	00	02.2	5.403 456
	8	223	36	18.5	1	05	37.3	5.421 333		8	230	39	50.9	0	59	54.1	5.403 021
	10	223	45	29.2	1	05	30.4	5.420 973		10	230	49	05.4	0	59	46.0	5.402 585
	12	223	54	40.0	1	05	23.6	5.420 611		12	230	58	19.9	0	59	37.8	5.402 146
	14	224	03	50.8	+1	05	16.7	5.420 247		14	231	07	34.5	+0	59	29.7	5.401 706
	16	224	13	01.7	1	05	09.8	5.419 882		16	231	16	49.1	0	59	21.5	5.401 265
	18	224	22	12.7	1	05	02.9	5.419 515		18	231	26	03.9	0	59	13.3	5.400 822
	20	224	31	23.7	1	04	55.9	5.419 146		20	231	35	18.8	0	59	05.0	5.400 377
	22	224	40	34.9	1	04	48.9	5.418 775		22	231	44	33.7	0	58	56.7	5.399 931
	24	224	49	46.1	1	04	41.9	5.418 403		24	231	53	48.7	0	58	48.4	5.399 483
	26	224	58	57.3	+1	04	34.8	5.418 029		26	232	03	03.9	+0	58	40.1	5.399 034
	28	225	08	08.7	1	04	27.8	5.417 654		28	232	12	19.1	0	58	31.7	5.398 582
	30	225	17	20.1	1	04	20.6	5.417 276		30	232	21	34.4	0	58	23.3	5.398 130
Apr.	1	225	26	31.7	1	04	13.5	5.416 897	July	2	232	30	49.9	0	58	14.9	5.397 676
	3	225	35	43.2	+1	04	06.3	5.416 517		4	232	40	05.4	+0	58	06.5	5.397 220

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MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude °	′	″	Heliocentric Latitude °	′	″	Radius Vector
July	2	232	30	49.9	+0	58	14.9	5.397 676
	4	232	40	05.4	0	58	06.5	5.397 220
	6	232	49	20.9	0	57	58.0	5.396 763
	8	232	58	36.7	0	57	49.5	5.396 304
	10	233	07	52.4	0	57	41.0	5.395 843
	12	233	17	08.3	0	57	32.5	5.395 381
	14	233	26	24.3	+0	57	23.9	5.394 918
	16	233	35	40.4	0	57	15.3	5.394 452
	18	233	44	56.5	0	57	06.7	5.393 986
	20	233	54	12.8	0	56	58.1	5.393 518
	22	234	03	29.1	0	56	49.4	5.393 048
	24	234	12	45.6	0	56	40.7	5.392 576
	26	234	22	02.1	+0	56	31.9	5.392 104
	28	234	31	18.8	0	56	23.2	5.391 629
	30	234	40	35.5	0	56	14.4	5.391 153
Aug.	1	234	49	52.4	0	56	05.6	5.390 676
	3	234	59	09.3	0	55	56.8	5.390 197
	5	235	08	26.3	0	55	47.9	5.389 716
	7	235	17	43.5	+0	55	39.0	5.389 234
	9	235	27	00.7	0	55	30.1	5.388 751
	11	235	36	18.0	0	55	21.2	5.388 266
	13	235	45	35.5	0	55	12.2	5.387 779
	15	235	54	53.0	0	55	03.2	5.387 291
	17	236	04	10.6	0	54	54.2	5.386 802
	19	236	13	28.3	+0	54	45.1	5.386 311
	21	236	22	46.2	0	54	36.1	5.385 818
	23	236	32	04.1	0	54	27.0	5.385 324
	25	236	41	22.2	0	54	17.9	5.384 829
	27	236	50	40.3	0	54	08.7	5.384 332
	29	236	59	58.5	0	53	59.6	5.383 833
	31	237	09	16.9	+0	53	50.4	5.383 333
Sept.	2	237	18	35.3	0	53	41.2	5.382 832
	4	237	27	53.9	0	53	31.9	5.382 329
	6	237	37	12.5	0	53	22.7	5.381 825
	8	237	46	31.3	0	53	13.4	5.381 319
	10	237	55	50.2	0	53	04.0	5.380 812
	12	238	05	09.1	+0	52	54.7	5.380 303
	14	238	14	28.2	0	52	45.3	5.379 793
	16	238	23	47.4	0	52	35.9	5.379 282
	18	238	33	06.6	0	52	26.5	5.378 769
	20	238	42	26.0	0	52	17.0	5.378 254
	22	238	51	45.5	0	52	07.6	5.377 738
	24	239	01	05.1	+0	51	58.1	5.377 221
	26	239	10	24.8	0	51	48.6	5.376 703
	28	239	19	44.6	0	51	39.0	5.376 182
	30	239	29	04.6	0	51	29.5	5.375 661
Oct.	2	239	38	24.6	+0	51	19.9	5.375 138
Oct.	2	239	38	24.6	+0	51	19.9	5.375 138
	4	239	47	44.7	0	51	10.2	5.374 614
	6	239	57	05.0	0	51	00.6	5.374 088
	8	240	06	25.3	0	50	50.9	5.373 561
	10	240	15	45.8	0	50	41.3	5.373 032
	12	240	25	06.4	0	50	31.5	5.372 502
	14	240	34	27.0	+0	50	21.8	5.371 971
	16	240	43	47.8	0	50	12.0	5.371 438
	18	240	53	08.7	0	50	02.2	5.370 904
	20	241	02	29.8	0	49	52.4	5.370 369
	22	241	11	50.9	0	49	42.6	5.369 832
	24	241	21	12.1	0	49	32.7	5.369 294
	26	241	30	33.5	+0	49	22.9	5.368 754
	28	241	39	54.9	0	49	13.0	5.368 213
	30	241	49	16.5	0	49	03.0	5.367 671
Nov.	1	241	58	38.2	0	48	53.1	5.367 127
	3	242	07	60.0	0	48	43.1	5.366 582
	5	242	17	21.9	0	48	33.1	5.366 036
	7	242	26	43.9	+0	48	23.0	5.365 488
	9	242	36	06.1	0	48	13.0	5.364 939
	11	242	45	28.3	0	48	02.9	5.364 389
	13	242	54	50.7	0	47	52.8	5.363 837
	15	243	04	13.2	0	47	42.7	5.363 284
	17	243	13	35.8	0	47	32.5	5.362 730
	19	243	22	58.5	+0	47	22.4	5.362 174
	21	243	32	21.3	0	47	12.2	5.361 617
	23	243	41	44.3	0	47	02.0	5.361 059
	25	243	51	07.4	0	46	51.7	5.360 499
	27	244	00	30.5	0	46	41.5	5.359 939
	29	244	09	53.8	0	46	31.2	5.359 376
Dec.	1	244	19	17.3	+0	46	20.9	5.358 813
	3	244	28	40.8	0	46	10.6	5.358 248
	5	244	38	04.4	0	46	00.2	5.357 682
	7	244	47	28.2	0	45	49.8	5.357 115
	9	244	56	52.1	0	45	39.5	5.356 546
	11	245	06	16.1	0	45	29.0	5.355 977
	13	245	15	40.2	+0	45	18.6	5.355 405
	15	245	25	04.5	0	45	08.1	5.354 833
	17	245	34	28.9	0	44	57.6	5.354 259
	19	245	43	53.4	0	44	47.1	5.353 685
	21	245	53	18.0	0	44	36.6	5.353 108
	23	246	02	42.7	0	44	26.0	5.352 531
	25	246	12	07.6	+0	44	15.5	5.351 952
	27	246	21	32.6	0	44	04.9	5.351 372
	29	246	30	57.7	0	43	54.2	5.350 791
	31	246	40	22.9	0	43	43.6	5.350 209
	33	246	49	48.2	+0	43	32.9	5.349 625

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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	226	45	55.8	+1	02	54.2	Feb.	15	232	27	50.9	+1	08	45.0
	1	226	56	06.2	1	02	59.7		16	232	31	48.3	1	08	54.3
	2	227	06	10.9	1	03	05.4		17	232	35	35.2	1	09	03.5
	3	227	16	09.8	1	03	11.2		18	232	39	11.6	1	09	12.8
	4	227	26	02.7	1	03	17.0		19	232	42	37.4	1	09	22.2
	5	227	35	49.4	1	03	23.0		20	232	45	52.6	1	09	31.5
	6	227	45	30.0	+1	03	29.1		21	232	48	57.1	+1	09	40.9
	7	227	55	04.3	1	03	35.3		22	232	51	50.9	1	09	50.3
	8	228	04	32.2	1	03	41.6		23	232	54	33.9	1	09	59.7
	9	228	13	53.7	1	03	48.0		24	232	57	06.2	1	10	09.2
	10	228	23	08.6	1	03	54.5		25	232	59	27.6	1	10	18.6
	11	228	32	16.8	1	04	01.0		26	233	01	38.2	1	10	28.0
	12	228	41	18.2	+1	04	07.7		27	233	03	37.7	+1	10	37.5
	13	228	50	12.6	1	04	14.5		28	233	05	26.2	1	10	46.9
	14	228	59	00.1	1	04	21.3	Mar.	1	233	07	03.7	1	10	56.3
	15	229	07	40.4	1	04	28.3		2	233	08	30.0	1	11	05.7
	16	229	16	13.4	1	04	35.4		3	233	09	45.2	1	11	15.1
	17	229	24	39.0	1	04	42.5		4	233	10	49.3	1	11	24.4
	18	229	32	57.1	+1	04	49.8		5	233	11	42.1	+1	11	33.7
	19	229	41	07.6	1	04	57.1		6	233	12	23.8	1	11	43.0
	20	229	49	10.2	1	05	04.5		7	233	12	54.2	1	11	52.2
	21	229	57	05.0	1	05	12.0		8	233	13	13.4	1	12	01.4
	22	230	04	51.9	1	05	19.6		9	233	13	21.3	1	12	10.5
	23	230	12	30.7	1	05	27.3		10	233	13	17.9	1	12	19.6
	24	230	20	01.3	+1	05	35.1		11	233	13	03.1	+1	12	28.6
	25	230	27	23.8	1	05	43.0		12	233	12	37.0	1	12	37.5
	26	230	34	38.0	1	05	51.0		13	233	11	59.6	1	12	46.3
	27	230	41	43.8	1	05	59.0		14	233	11	10.8	1	12	55.1
	28	230	48	41.2	1	06	07.2		15	233	10	10.6	1	13	03.8
	29	230	55	30.0	1	06	15.4		16	233	08	59.1	1	13	12.4
	30	231	02	10.2	+1	06	23.7		17	233	07	36.3	+1	13	20.8
	31	231	08	41.6	1	06	32.1		18	233	06	02.2	1	13	29.2
Feb.	1	231	15	04.0	1	06	40.5		19	233	04	17.0	1	13	37.5
	2	231	21	17.5	1	06	49.0		20	233	02	20.7	1	13	45.7
	3	231	27	21.9	1	06	57.6		21	233	00	13.3	1	13	53.8
	4	231	33	17.1	1	07	06.3		22	232	57	55.0	1	14	01.7
	5	231	39	03.0	+1	07	15.0		23	232	55	25.9	+1	14	09.6
	6	231	44	39.6	1	07	23.8		24	232	52	46.1	1	14	17.3
	7	231	50	06.7	1	07	32.6		25	232	49	55.6	1	14	24.8
	8	231	55	24.2	1	07	41.5		26	232	46	54.5	1	14	32.2
	9	232	00	32.2	1	07	50.4		27	232	43	42.8	1	14	39.5
	10	232	05	30.3	1	07	59.4		28	232	40	20.8	1	14	46.6
	11	232	10	18.6	+1	08	08.5		29	232	36	48.5	+1	14	53.5
	12	232	14	56.9	1	08	17.6		30	232	33	05.9	1	15	00.2
	13	232	19	25.2	1	08	26.7		31	232	29	13.4	1	15	06.8
	14	232	23	43.2	1	08	35.8	Apr.	1	232	25	10.9	1	15	13.1
	15	232	27	50.9	+1	08	45.0		2	232	20	58.7	+1	15	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		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	232	25	10.9	+1	15	13.1	May	17	227	20	46.7	+1	15	18.5
	2	232	20	58.7	1	15	19.3		18	227	13	18.2	1	15	11.4
	3	232	16	36.8	1	15	25.3		19	227	05	52.5	1	15	04.0
	4	232	12	05.5	1	15	31.0		20	226	58	29.9	1	14	56.3
	5	232	07	24.9	1	15	36.6		21	226	51	10.7	1	14	48.4
	6	232	02	35.0	1	15	41.9		22	226	43	55.2	1	14	40.1
	7	231	57	36.1	+1	15	47.0		23	226	36	43.6	+1	14	31.5
	8	231	52	28.4	1	15	51.8		24	226	29	36.3	1	14	22.6
	9	231	47	11.9	1	15	56.5		25	226	22	33.6	1	14	13.5
	10	231	41	46.8	1	16	00.8		26	226	15	35.7	1	14	04.1
	11	231	36	13.4	1	16	05.0		27	226	08	43.0	1	13	54.4
	12	231	30	31.8	1	16	08.9		28	226	01	55.6	1	13	44.4
	13	231	24	42.3	+1	16	12.5		29	225	55	13.9	+1	13	34.2
	14	231	18	45.2	1	16	15.9		30	225	48	38.0	1	13	23.7
	15	231	12	40.5	1	16	19.0		31	225	42	08.3	1	13	12.9
	16	231	06	28.7	1	16	21.8	June	1	225	35	44.9	1	13	01.9
	17	231	00	09.9	1	16	24.4		2	225	29	28.0	1	12	50.7
	18	230	53	44.5	1	16	26.7		3	225	23	17.9	1	12	39.2
	19	230	47	12.8	+1	16	28.7		4	225	17	14.8	+1	12	27.5
	20	230	40	35.0	1	16	30.4		5	225	11	18.9	1	12	15.6
	21	230	33	51.4	1	16	31.8		6	225	05	30.4	1	12	03.5
	22	230	27	02.3	1	16	33.0		7	224	59	49.5	1	11	51.2
	23	230	20	07.8	1	16	33.8		8	224	54	16.4	1	11	38.6
	24	230	13	08.4	1	16	34.4		9	224	48	51.4	1	11	25.9
	25	230	06	04.2	+1	16	34.6		10	224	43	34.7	+1	11	13.0
	26	229	58	55.6	1	16	34.5		11	224	38	26.5	1	10	59.9
	27	229	51	42.8	1	16	34.1		12	224	33	27.1	1	10	46.6
	28	229	44	26.2	1	16	33.4		13	224	28	36.5	1	10	33.2
	29	229	37	06.1	1	16	32.4		14	224	23	55.0	1	10	19.6
	30	229	29	42.8	1	16	31.1		15	224	19	22.7	1	10	05.9
May	1	229	22	16.6	+1	16	29.4		16	224	14	59.8	+1	09	52.0
	2	229	14	47.7	1	16	27.4		17	224	10	46.3	1	09	38.0
	3	229	07	16.6	1	16	25.0		18	224	06	42.4	1	09	23.8
	4	228	59	43.4	1	16	22.4		19	224	02	48.3	1	09	09.5
	5	228	52	08.4	1	16	19.4		20	223	59	04.0	1	08	55.1
	6	228	44	32.0	1	16	16.1		21	223	55	29.6	1	08	40.5
	7	228	36	54.4	+1	16	12.4		22	223	52	05.3	+1	08	25.9
	8	228	29	16.0	1	16	08.5		23	223	48	51.2	1	08	11.1
	9	228	21	37.1	1	16	04.2		24	223	45	47.4	1	07	56.2
	10	228	13	57.9	1	15	59.6		25	223	42	53.9	1	07	41.2
	11	228	06	18.9	1	15	54.6		26	223	40	10.8	1	07	26.1
	12	227	58	40.4	1	15	49.4		27	223	37	38.2	1	07	11.0
	13	227	51	02.6	+1	15	43.8		28	223	35	16.1	+1	06	55.7
	14	227	43	26.0	1	15	38.0		29	223	33	04.4	1	06	40.4
	15	227	35	50.9	1	15	31.8		30	223	31	03.4	1	06	25.0
	16	227	28	17.7	1	15	25.3	July	1	223	29	13.0	1	06	09.6
	17	227	20	46.7	+1	15	18.5		2	223	27	33.2	+1	05	54.1

JUPITER, 2018
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	223	29	13.0	+1	06	09.6	Aug.	16	225	15	03.7	+0	54	32.5
	2	223	27	33.2	1	05	54.1		17	225	21	12.9	0	54	18.8
	3	223	26	04.0	1	05	38.6		18	225	27	30.8	0	54	05.1
	4	223	24	45.6	1	05	23.0		19	225	33	57.4	0	53	51.6
	5	223	23	38.0	1	05	07.4		20	225	40	32.4	0	53	38.1
	6	223	22	41.1	1	04	51.7		21	225	47	15.8	0	53	24.7
	7	223	21	55.1	+1	04	36.1		22	225	54	07.4	+0	53	11.4
	8	223	21	19.9	1	04	20.4		23	226	01	07.3	0	52	58.2
	9	223	20	55.7	1	04	04.7		24	226	08	15.1	0	52	45.2
	10	223	20	42.4	1	03	49.0		25	226	15	30.9	0	52	32.2
	11	223	20	40.1	1	03	33.3		26	226	22	54.6	0	52	19.3
	12	223	20	48.7	1	03	17.6		27	226	30	26.0	0	52	06.5
	13	223	21	08.3	+1	03	01.9		28	226	38	05.1	+0	51	53.8
	14	223	21	38.8	1	02	46.2		29	226	45	51.8	0	51	41.2
	15	223	22	20.1	1	02	30.5		30	226	53	46.1	0	51	28.7
	16	223	23	12.3	1	02	14.9		31	227	01	47.8	0	51	16.3
	17	223	24	15.2	1	01	59.2	Sept.	1	227	09	56.9	0	51	04.0
	18	223	25	29.0	1	01	43.6		2	227	18	13.4	0	50	51.8
	19	223	26	53.5	+1	01	28.0		3	227	26	37.1	+0	50	39.8
	20	223	28	28.7	1	01	12.4		4	227	35	08.0	0	50	27.8
	21	223	30	14.6	1	00	56.8		5	227	43	46.0	0	50	15.9
	22	223	32	11.1	1	00	41.3		6	227	52	31.0	0	50	04.2
	23	223	34	18.2	1	00	25.8		7	228	01	22.8	0	49	52.5
	24	223	36	35.8	1	00	10.3		8	228	10	21.4	0	49	41.0
	25	223	39	03.9	+0	59	54.9		9	228	19	26.7	+0	49	29.5
	26	223	41	42.2	0	59	39.5		10	228	28	38.6	0	49	18.2
	27	223	44	30.9	0	59	24.2		11	228	37	56.9	0	49	06.9
	28	223	47	29.7	0	59	08.9		12	228	47	21.7	0	48	55.7
	29	223	50	38.7	0	58	53.7		13	228	56	52.9	0	48	44.7
	30	223	53	57.8	0	58	38.6		14	229	06	30.3	0	48	33.7
	31	223	57	26.8	+0	58	23.5		15	229	16	13.9	+0	48	22.9
Aug.	1	224	01	05.8	0	58	08.5		16	229	26	03.5	0	48	12.1
	2	224	04	54.6	0	57	53.5		17	229	35	59.1	0	48	01.4
	3	224	08	53.4	0	57	38.6		18	229	46	00.5	0	47	50.9
	4	224	13	01.9	0	57	23.8		19	229	56	07.6	0	47	40.4
	5	224	17	20.1	0	57	09.1		20	230	06	20.4	0	47	30.0
	6	224	21	48.1	+0	56	54.4		21	230	16	38.6	+0	47	19.8
	7	224	26	25.7	0	56	39.9		22	230	27	02.3	0	47	09.6
	8	224	31	12.9	0	56	25.4		23	230	37	31.3	0	46	59.5
	9	224	36	09.5	0	56	11.0		24	230	48	05.6	0	46	49.6
	10	224	41	15.6	0	55	56.7		25	230	58	45.0	0	46	39.7
	11	224	46	30.9	0	55	42.4		26	231	09	29.6	0	46	29.9
	12	224	51	55.4	+0	55	28.3		27	231	20	19.2	+0	46	20.3
	13	224	57	29.0	0	55	14.2		28	231	31	13.7	0	46	10.8
	14	225	03	11.6	0	55	00.2		29	231	42	13.2	0	46	01.3
	15	225	09	03.2	0	54	46.3		30	231	53	17.6	0	45	52.0
	16	225	15	03.7	+0	54	32.5	Oct.	1	232	04	26.7	+0	45	42.7

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	232	04	26.7	+0	45	42.7	Nov.	16	241	38	58.7	+0	40	17.3
	2	232	15	40.6	0	45	33.6		17	241	52	17.9	0	40	12.3
	3	232	26	59.0	0	45	24.6		18	242	05	37.9	0	40	07.3
	4	232	38	22.0	0	45	15.6		19	242	18	58.6	0	40	02.4
	5	232	49	49.3	0	45	06.8		20	242	32	19.9	0	39	57.6
	6	233	01	20.9	0	44	58.0		21	242	45	41.9	0	39	52.9
	7	233	12	56.8	+0	44	49.4		22	242	59	04.4	+0	39	48.2
	8	233	24	36.8	0	44	40.8		23	243	12	27.4	0	39	43.7
	9	233	36	20.9	0	44	32.4		24	243	25	50.9	0	39	39.2
	10	233	48	09.1	0	44	24.0		25	243	39	14.7	0	39	35.0
	11	234	00	01.2	0	44	15.7		26	243	52	38.5	0	39	31.0
	12	234	11	57.1	0	44	07.5		27	244	06	02.4	0	39	26.4
	13	234	23	56.8	+0	43	59.4		28	244	19	26.7	+0	39	22.1
	14	234	36	00.1	0	43	51.4		29	244	32	51.0	0	39	17.9
	15	234	48	07.0	0	43	43.5		30	244	46	15.2	0	39	13.9
	16	235	00	17.4	0	43	35.6	Dec.	1	244	59	39.3	0	39	09.9
	17	235	12	31.1	0	43	27.9		2	245	13	03.0	0	39	06.0
	18	235	24	48.0	0	43	20.3		3	245	26	26.5	0	39	02.2
	19	235	37	08.1	+0	43	12.7		4	245	39	49.7	+0	38	58.5
	20	235	49	31.3	0	43	05.2		5	245	53	12.4	0	38	54.8
	21	236	01	57.4	0	42	57.9		6	246	06	34.5	0	38	51.2
	22	236	14	26.5	0	42	50.6		7	246	19	56.1	0	38	47.6
	23	236	26	58.5	0	42	43.4		8	246	33	16.9	0	38	44.1
	24	236	39	33.2	0	42	36.3		9	246	46	36.9	0	38	40.7
	25	236	52	10.7	+0	42	29.3		10	246	59	56.0	+0	38	37.4
	26	237	04	50.9	0	42	22.5		11	247	13	14.0	0	38	34.2
	27	237	17	33.7	0	42	15.6		12	247	26	30.9	0	38	31.0
	28	237	30	19.1	0	42	08.9		13	247	39	46.6	0	38	27.8
	29	237	43	07.0	0	42	02.3		14	247	53	00.9	0	38	24.8
	30	237	55	57.2	0	41	55.8		15	248	06	13.8	0	38	21.8
	31	238	08	49.8	+0	41	49.3		16	248	19	25.3	+0	38	18.9
Nov.	1	238	21	44.6	0	41	43.0		17	248	32	35.2	0	38	16.1
	2	238	34	41.5	0	41	36.7		18	248	45	43.5	0	38	13.3
	3	238	47	40.4	0	41	30.5		19	248	58	50.2	0	38	10.6
	4	239	00	41.3	0	41	24.4		20	249	11	55.1	0	38	08.0
	5	239	13	44.2	0	41	18.4		21	249	24	58.2	0	38	05.5
	6	239	26	48.9	+0	41	12.4		22	249	37	59.5	+0	38	03.0
	7	239	39	55.3	0	41	06.5		23	249	50	58.8	0	38	00.6
	8	239	53	03.5	0	41	00.8		24	250	03	56.0	0	37	58.3
	9	240	06	13.3	0	40	55.1		25	250	16	51.1	0	37	56.0
	10	240	19	24.6	0	40	49.4		26	250	29	44.0	0	37	53.8
	11	240	32	37.3	0	40	43.9		27	250	42	34.4	0	37	51.7
	12	240	45	51.4	+0	40	38.4		28	250	55	22.5	+0	37	49.6
	13	240	59	06.6	0	40	33.0		29	251	08	08.0	0	37	47.6
	14	241	12	23.0	0	40	27.7		30	251	20	51.0	0	37	45.6
	15	241	25	40.4	0	40	22.5		31	251	33	31.3	0	37	43.7
	16	241	38	58.7	+0	40	17.3		32	251	46	09.0	+0	37	41.9

JUPITER, 2018

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	14	58	26.54	-15	50	16.2	5.971 208	1.47	15.42	8	18	52
	1	14	59	07.22	15	53	03.5	5.958 106	1.48	15.45	8	15	37
	2	14	59	47.54	15	55	48.5	5.944 865	1.48	15.49	8	12	21
	3	15	00	27.50	15	58	31.3	5.931 488	1.48	15.52	8	09	04
	4	15	01	07.07	16	01	11.9	5.917 977	1.49	15.56	8	05	48
	5	15	01	46.26	16	03	50.2	5.904 334	1.49	15.59	8	02	31
	6	15	02	25.06	-16	06	26.1	5.890 561	1.49	15.63	7	59	13
	7	15	03	03.46	16	08	59.8	5.876 661	1.50	15.67	7	55	55
	8	15	03	41.45	16	11	31.1	5.862 636	1.50	15.70	7	52	37
	9	15	04	19.03	16	14	00.1	5.848 489	1.50	15.74	7	49	19
	10	15	04	56.19	16	16	26.7	5.834 222	1.51	15.78	7	45	59
	11	15	05	32.92	16	18	51.0	5.819 839	1.51	15.82	7	42	40
	12	15	06	09.21	-16	21	12.8	5.805 342	1.51	15.86	7	39	20
	13	15	06	45.06	16	23	32.3	5.790 734	1.52	15.90	7	36	00
	14	15	07	20.45	16	25	49.4	5.776 019	1.52	15.94	7	32	39
	15	15	07	55.38	16	28	04.1	5.761 199	1.53	15.98	7	29	17
	16	15	08	29.84	16	30	16.4	5.746 278	1.53	16.02	7	25	56
	17	15	09	03.82	16	32	26.1	5.731 260	1.53	16.06	7	22	33
	18	15	09	37.31	-16	34	33.4	5.716 147	1.54	16.11	7	19	11
	19	15	10	10.30	16	36	38.3	5.700 944	1.54	16.15	7	15	47
	20	15	10	42.78	16	38	40.6	5.685 654	1.55	16.19	7	12	24
	21	15	11	14.75	16	40	40.3	5.670 281	1.55	16.24	7	08	59
	22	15	11	46.20	16	42	37.6	5.654 828	1.56	16.28	7	05	35
	23	15	12	17.13	16	44	32.2	5.639 300	1.56	16.32	7	02	09
	24	15	12	47.52	-16	46	24.4	5.623 699	1.56	16.37	6	58	44
	25	15	13	17.37	16	48	13.9	5.608 030	1.57	16.42	6	55	17
	26	15	13	46.67	16	50	00.9	5.592 297	1.57	16.46	6	51	50
	27	15	14	15.43	16	51	45.3	5.576 502	1.58	16.51	6	48	23
	28	15	14	43.63	16	53	27.2	5.560 651	1.58	16.56	6	44	55
	29	15	15	11.26	16	55	06.5	5.544 745	1.59	16.60	6	41	26
	30	15	15	38.32	-16	56	43.2	5.528 790	1.59	16.65	6	37	57
	31	15	16	04.80	16	58	17.4	5.512 788	1.60	16.70	6	34	27
Feb.	1	15	16	30.69	16	59	48.9	5.496 742	1.60	16.75	6	30	57
	2	15	16	55.98	17	01	17.8	5.480 657	1.60	16.80	6	27	26
	3	15	17	20.66	17	02	44.1	5.464 535	1.61	16.85	6	23	55
	4	15	17	44.74	17	04	07.7	5.448 380	1.61	16.90	6	20	22
	5	15	18	08.20	-17	05	28.7	5.432 195	1.62	16.95	6	16	50
	6	15	18	31.03	17	06	47.0	5.415 984	1.62	17.00	6	13	16
	7	15	18	53.24	17	08	02.7	5.399 752	1.63	17.05	6	09	42
	8	15	19	14.80	17	09	15.6	5.383 502	1.63	17.10	6	06	08
	9	15	19	35.73	17	10	26.0	5.367 238	1.64	17.15	6	02	33
	10	15	19	56.00	17	11	33.6	5.350 965	1.64	17.20	5	58	57
	11	15	20	15.60	-17	12	38.5	5.334 687	1.65	17.26	5	55	20
	12	15	20	34.54	17	13	40.7	5.318 407	1.65	17.31	5	51	43
	13	15	20	52.81	17	14	40.3	5.302 131	1.66	17.36	5	48	05
	14	15	21	10.39	17	15	37.0	5.285 863	1.66	17.42	5	44	26
	15	15	21	27.27	-17	16	31.1	5.269 608	1.67	17.47	5	40	47

JUPITER, 2018

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	15	21	27.27	-17	16	31.1	5.269 608	1.67	17.47	5	40	47
	16	15	21	43.46	17	17	22.4	5.253 370	1.67	17.52	5	37	07
	17	15	21	58.95	17	18	10.9	5.237 154	1.68	17.58	5	33	26
	18	15	22	13.73	17	18	56.6	5.220 964	1.68	17.63	5	29	45
	19	15	22	27.80	17	19	39.6	5.204 806	1.69	17.69	5	26	03
	20	15	22	41.15	17	20	19.8	5.188 684	1.69	17.74	5	22	20
	21	15	22	53.78	-17	20	57.2	5.172 602	1.70	17.80	5	18	37
	22	15	23	05.70	17	21	31.8	5.156 566	1.71	17.85	5	14	52
	23	15	23	16.88	17	22	03.7	5.140 580	1.71	17.91	5	11	08
	24	15	23	27.34	17	22	32.8	5.124 649	1.72	17.96	5	07	22
	25	15	23	37.07	17	22	59.1	5.108 776	1.72	18.02	5	03	35
	26	15	23	46.06	17	23	22.7	5.092 967	1.73	18.08	4	59	48
	27	15	23	54.31	-17	23	43.6	5.077 226	1.73	18.13	4	56	01
	28	15	24	01.81	17	24	01.7	5.061 557	1.74	18.19	4	52	12
Mar.	1	15	24	08.56	17	24	17.0	5.045 964	1.74	18.24	4	48	23
	2	15	24	14.57	17	24	29.5	5.030 451	1.75	18.30	4	44	32
	3	15	24	19.82	17	24	39.2	5.015 022	1.75	18.36	4	40	42
	4	15	24	24.31	17	24	46.2	4.999 682	1.76	18.41	4	36	50
	5	15	24	28.05	-17	24	50.4	4.984 436	1.76	18.47	4	32	58
	6	15	24	31.03	17	24	51.8	4.969 286	1.77	18.53	4	29	05
	7	15	24	33.25	17	24	50.5	4.954 239	1.78	18.58	4	25	11
	8	15	24	34.70	17	24	46.4	4.939 299	1.78	18.64	4	21	16
	9	15	24	35.40	17	24	39.5	4.924 470	1.79	18.69	4	17	21
	10	15	24	35.33	17	24	29.9	4.909 757	1.79	18.75	4	13	25
	11	15	24	34.48	-17	24	17.5	4.895 165	1.80	18.81	4	09	28
	12	15	24	32.87	17	24	02.4	4.880 699	1.80	18.86	4	05	30
	13	15	24	30.50	17	23	44.5	4.866 363	1.81	18.92	4	01	32
	14	15	24	27.35	17	23	23.8	4.852 164	1.81	18.97	3	57	33
	15	15	24	23.43	17	23	00.4	4.838 105	1.82	19.03	3	53	33
	16	15	24	18.74	17	22	34.3	4.824 191	1.82	19.08	3	49	32
	17	15	24	13.29	-17	22	05.4	4.810 428	1.83	19.14	3	45	31
	18	15	24	07.08	17	21	33.7	4.796 820	1.83	19.19	3	41	28
	19	15	24	00.11	17	20	59.4	4.783 372	1.84	19.25	3	37	25
	20	15	23	52.39	17	20	22.3	4.770 090	1.84	19.30	3	33	22
	21	15	23	43.92	17	19	42.6	4.756 977	1.85	19.35	3	29	17
	22	15	23	34.71	17	19	00.2	4.744 039	1.85	19.41	3	25	12
	23	15	23	24.78	-17	18	15.2	4.731 280	1.86	19.46	3	21	06
	24	15	23	14.11	17	17	27.5	4.718 704	1.86	19.51	3	17	00
	25	15	23	02.72	17	16	37.4	4.706 316	1.87	19.56	3	12	52
	26	15	22	50.62	17	15	44.6	4.694 120	1.87	19.61	3	08	44
	27	15	22	37.80	17	14	49.3	4.682 119	1.88	19.66	3	04	36
	28	15	22	24.29	17	13	51.5	4.670 318	1.88	19.71	3	00	26
	29	15	22	10.07	-17	12	51.2	4.658 720	1.89	19.76	2	56	16
	30	15	21	55.17	17	11	48.5	4.647 329	1.89	19.81	2	52	05
	31	15	21	39.59	17	10	43.2	4.636 149	1.90	19.86	2	47	54
Apr.	1	15	21	23.34	17	09	35.6	4.625 183	1.90	19.90	2	43	42
	2	15	21	06.43	-17	08	25.5	4.614 436	1.91	19.95	2	39	29

JUPITER, 2018

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	15	21	23.34	-17	09	35.6	4.625 183	1.90	19.90	2	43	42
	2	15	21	06.43	17	08	25.5	4.614 436	1.91	19.95	2	39	29
	3	15	20	48.88	17	07	13.1	4.603 911	1.91	20.00	2	35	15
	4	15	20	30.69	17	05	58.4	4.593 611	1.91	20.04	2	31	01
	5	15	20	11.86	17	04	41.4	4.583 541	1.92	20.08	2	26	47
	6	15	19	52.42	17	03	22.2	4.573 705	1.92	20.13	2	22	31
	7	15	19	32.37	-17	02	00.7	4.564 106	1.93	20.17	2	18	15
	8	15	19	11.72	17	00	37.1	4.554 748	1.93	20.21	2	13	59
	9	15	18	50.49	16	59	11.3	4.545 636	1.93	20.25	2	09	42
	10	15	18	28.68	16	57	43.4	4.536 771	1.94	20.29	2	05	24
	11	15	18	06.31	16	56	13.4	4.528 159	1.94	20.33	2	01	06
	12	15	17	43.39	16	54	41.4	4.519 803	1.95	20.37	1	56	47
	13	15	17	19.94	-16	53	07.4	4.511 706	1.95	20.40	1	52	28
	14	15	16	55.98	16	51	31.5	4.503 872	1.95	20.44	1	48	08
	15	15	16	31.51	16	49	53.7	4.496 304	1.96	20.47	1	43	48
	16	15	16	06.57	16	48	14.1	4.489 005	1.96	20.51	1	39	27
	17	15	15	41.16	16	46	32.7	4.481 978	1.96	20.54	1	35	06
	18	15	15	15.32	16	44	49.6	4.475 227	1.97	20.57	1	30	44
	19	15	14	49.04	-16	43	05.0	4.468 753	1.97	20.60	1	26	22
	20	15	14	22.37	16	41	18.7	4.462 560	1.97	20.63	1	22	00
	21	15	13	55.31	16	39	31.0	4.456 649	1.97	20.66	1	17	37
	22	15	13	27.87	16	37	41.9	4.451 022	1.98	20.68	1	13	14
	23	15	13	00.09	16	35	51.5	4.445 681	1.98	20.71	1	08	50
	24	15	12	31.97	16	33	59.8	4.440 628	1.98	20.73	1	04	26
	25	15	12	03.55	-16	32	06.9	4.435 864	1.98	20.75	1	00	02
	26	15	11	34.82	16	30	12.8	4.431 391	1.98	20.77	0	55	38
	27	15	11	05.83	16	28	17.6	4.427 209	1.99	20.79	0	51	13
	28	15	10	36.58	16	26	21.5	4.423 320	1.99	20.81	0	46	48
	29	15	10	07.10	16	24	24.4	4.419 726	1.99	20.83	0	42	23
	30	15	09	37.41	16	22	26.5	4.416 426	1.99	20.84	0	37	57
May	1	15	09	07.54	-16	20	27.8	4.413 422	1.99	20.86	0	33	32
	2	15	08	37.49	16	18	28.5	4.410 716	1.99	20.87	0	29	06
	3	15	08	07.28	16	16	28.5	4.408 308	1.99	20.88	0	24	40
	4	15	07	36.95	16	14	28.1	4.406 199	2.00	20.89	0	20	14
	5	15	07	06.51	16	12	27.2	4.404 389	2.00	20.90	0	15	48
	6	15	06	35.97	16	10	25.9	4.402 880	2.00	20.91	0	11	22
	7	15	06	05.36	-16	08	24.3	4.401 672	2.00	20.91	0	06	55
	8	15	05	34.70	16	06	22.6	4.400 766	2.00	20.92	0	02	29
	9	15	05	04.00	16	04	20.7	4.400 162	2.00	20.92	23	53	36
	10	15	04	33.30	16	02	18.7	4.399 860	2.00	20.92	23	49	10
	11	15	04	02.61	16	00	16.8	4.399 861	2.00	20.92	23	44	43
	12	15	03	31.96	15	58	15.0	4.400 164	2.00	20.92	23	40	17
	13	15	03	01.37	-15	56	13.5	4.400 769	2.00	20.92	23	35	51
	14	15	02	30.85	15	54	12.2	4.401 676	2.00	20.91	23	31	24
	15	15	02	00.45	15	52	11.4	4.402 885	2.00	20.91	23	26	58
	16	15	01	30.17	15	50	11.1	4.404 394	2.00	20.90	23	22	33
	17	15	01	00.04	-15	48	11.5	4.406 203	2.00	20.89	23	18	07

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	True Distance from the Earth	Hor. Parallax "	Semi Diameter "	Ephemeris Transit h	m	s
May	17	15	01	00.04	-15	48	11.5	4.406 203	2.00	20.89	23	18	07
	18	15	00	30.09	15	46	12.6	4.408 310	1.99	20.88	23	13	41
	19	15	00	00.32	15	44	14.4	4.410 714	1.99	20.87	23	09	16
	20	14	59	30.77	15	42	17.2	4.413 413	1.99	20.86	23	04	51
	21	14	59	01.44	15	40	21.0	4.416 406	1.99	20.85	23	00	26
	22	14	58	32.36	15	38	25.8	4.419 690	1.99	20.83	22	56	02
	23	14	58	03.55	-15	36	31.8	4.423 262	1.99	20.81	22	51	37
	24	14	57	35.02	15	34	39.0	4.427 122	1.99	20.79	22	47	13
	25	14	57	06.80	15	32	47.5	4.431 266	1.98	20.78	22	42	50
	26	14	56	38.91	15	30	57.4	4.435 692	1.98	20.75	22	38	26
	27	14	56	11.36	15	29	08.8	4.440 398	1.98	20.73	22	34	03
	28	14	55	44.17	15	27	21.8	4.445 382	1.98	20.71	22	29	41
	29	14	55	17.35	-15	25	36.4	4.450 641	1.98	20.68	22	25	19
	30	14	54	50.93	15	23	52.7	4.456 172	1.97	20.66	22	20	57
	31	14	54	24.92	15	22	10.9	4.461 974	1.97	20.63	22	16	35
June	1	14	53	59.32	15	20	30.9	4.468 043	1.97	20.60	22	12	14
	2	14	53	34.16	15	18	52.8	4.474 378	1.97	20.57	22	07	54
	3	14	53	09.45	15	17	16.8	4.480 975	1.96	20.54	22	03	34
	4	14	52	45.21	-15	15	42.8	4.487 832	1.96	20.51	21	59	14
	5	14	52	21.44	15	14	10.9	4.494 946	1.96	20.48	21	54	55
	6	14	51	58.16	15	12	41.2	4.502 315	1.95	20.45	21	50	37
	7	14	51	35.39	15	11	13.8	4.509 935	1.95	20.41	21	46	18
	8	14	51	13.13	15	09	48.7	4.517 804	1.95	20.38	21	42	01
	9	14	50	51.41	15	08	25.9	4.525 918	1.94	20.34	21	37	44
	10	14	50	30.24	-15	07	05.7	4.534 274	1.94	20.30	21	33	27
	11	14	50	09.63	15	05	47.9	4.542 869	1.94	20.26	21	29	12
	12	14	49	49.60	15	04	32.7	4.551 699	1.93	20.23	21	24	56
	13	14	49	30.15	15	03	20.2	4.560 761	1.93	20.19	21	20	42
	14	14	49	11.31	15	02	10.4	4.570 051	1.92	20.14	21	16	27
	15	14	48	53.07	15	01	03.4	4.579 566	1.92	20.10	21	12	14
	16	14	48	35.45	-14	59	59.2	4.589 300	1.92	20.06	21	08	01
	17	14	48	18.46	14	58	57.9	4.599 249	1.91	20.02	21	03	49
	18	14	48	02.09	14	57	59.4	4.609 410	1.91	19.97	20	59	37
	19	14	47	46.37	14	57	03.9	4.619 777	1.90	19.93	20	55	26
	20	14	47	31.29	14	56	11.3	4.630 346	1.90	19.88	20	51	16
	21	14	47	16.87	14	55	21.7	4.641 113	1.89	19.84	20	47	06
	22	14	47	03.11	-14	54	35.1	4.652 074	1.89	19.79	20	42	57
	23	14	46	50.03	14	53	51.6	4.663 224	1.89	19.74	20	38	49
	24	14	46	37.62	14	53	11.2	4.674 560	1.88	19.69	20	34	41
	25	14	46	25.89	14	52	33.9	4.686 076	1.88	19.65	20	30	34
	26	14	46	14.84	14	51	59.8	4.697 769	1.87	19.60	20	26	28
	27	14	46	04.48	14	51	28.8	4.709 635	1.87	19.55	20	22	22
	28	14	45	54.81	-14	51	01.0	4.721 669	1.86	19.50	20	18	17
	29	14	45	45.83	14	50	36.4	4.733 868	1.86	19.45	20	14	13
	30	14	45	37.55	14	50	15.0	4.746 227	1.85	19.40	20	10	09
July	1	14	45	29.96	14	49	56.8	4.758 744	1.85	19.35	20	06	06
	2	14	45	23.07	-14	49	41.9	4.771 412	1.84	19.29	20	02	04

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	14	45	29.96	-14	49	56.8	4.758 744	1.85	19.35	20	06	06
	2	14	45	23.07	14	49	41.9	4.771 412	1.84	19.29	20	02	04
	3	14	45	16.89	14	49	30.1	4.784 230	1.84	19.24	19	58	03
	4	14	45	11.41	14	49	21.6	4.797 192	1.83	19.19	19	54	02
	5	14	45	06.63	14	49	16.3	4.810 295	1.83	19.14	19	50	02
	6	14	45	02.57	14	49	14.2	4.823 534	1.82	19.09	19	46	03
	7	14	44	59.22	-14	49	15.4	4.836 905	1.82	19.03	19	42	04
	8	14	44	56.58	14	49	19.8	4.850 405	1.81	18.98	19	38	06
	9	14	44	54.66	14	49	27.5	4.864 029	1.81	18.93	19	34	09
	10	14	44	53.47	14	49	38.5	4.877 773	1.80	18.87	19	30	12
	11	14	44	52.99	14	49	52.8	4.891 633	1.80	18.82	19	26	16
	12	14	44	53.24	14	50	10.4	4.905 603	1.79	18.77	19	22	21
	13	14	44	54.20	-14	50	31.2	4.919 680	1.79	18.71	19	18	27
	14	14	44	55.88	14	50	55.3	4.933 859	1.78	18.66	19	14	33
	15	14	44	58.28	14	51	22.7	4.948 134	1.78	18.60	19	10	40
	16	14	45	01.38	14	51	53.3	4.962 501	1.77	18.55	19	06	48
	17	14	45	05.20	14	52	27.1	4.976 956	1.77	18.50	19	02	57
	18	14	45	09.73	14	53	04.1	4.991 494	1.76	18.44	18	59	06
	19	14	45	14.97	-14	53	44.2	5.006 110	1.76	18.39	18	55	16
	20	14	45	20.92	14	54	27.5	5.020 800	1.75	18.34	18	51	26
	21	14	45	27.57	14	55	14.0	5.035 560	1.75	18.28	18	47	37
	22	14	45	34.92	14	56	03.6	5.050 385	1.74	18.23	18	43	49
	23	14	45	42.97	14	56	56.3	5.065 272	1.74	18.17	18	40	02
	24	14	45	51.72	14	57	52.1	5.080 215	1.73	18.12	18	36	15
	25	14	46	01.15	-14	58	50.9	5.095 213	1.73	18.07	18	32	29
	26	14	46	11.27	14	59	52.7	5.110 260	1.72	18.01	18	28	44
	27	14	46	22.06	15	00	57.6	5.125 352	1.72	17.96	18	24	59
	28	14	46	33.54	15	02	05.4	5.140 487	1.71	17.91	18	21	15
	29	14	46	45.68	15	03	16.1	5.155 660	1.71	17.86	18	17	32
	30	14	46	58.49	15	04	29.7	5.170 867	1.70	17.80	18	13	49
	31	14	47	11.96	-15	05	46.1	5.186 106	1.70	17.75	18	10	07
Aug.	1	14	47	26.09	15	07	05.4	5.201 372	1.69	17.70	18	06	26
	2	14	47	40.88	15	08	27.5	5.216 661	1.69	17.65	18	02	45
	3	14	47	56.32	15	09	52.3	5.231 971	1.68	17.60	17	59	05
	4	14	48	12.42	15	11	19.9	5.247 296	1.68	17.54	17	55	26
	5	14	48	29.16	15	12	50.2	5.262 635	1.67	17.49	17	51	47
	6	14	48	46.55	-15	14	23.1	5.277 983	1.67	17.44	17	48	09
	7	14	49	04.58	15	15	58.8	5.293 336	1.66	17.39	17	44	31
	8	14	49	23.25	15	17	37.1	5.308 690	1.66	17.34	17	40	54
	9	14	49	42.56	15	19	18.1	5.324 041	1.65	17.29	17	37	18
	10	14	50	02.49	15	21	01.6	5.339 387	1.65	17.24	17	33	43
	11	14	50	23.04	15	22	47.6	5.354 721	1.64	17.19	17	30	08
	12	14	50	44.21	-15	24	36.1	5.370 041	1.64	17.14	17	26	33
	13	14	51	05.99	15	26	27.1	5.385 342	1.63	17.09	17	22	59
	14	14	51	28.37	15	28	20.5	5.400 620	1.63	17.05	17	19	26
	15	14	51	51.35	15	30	16.2	5.415 872	1.62	17.00	17	15	54
	16	14	52	14.93	-15	32	14.2	5.431 093	1.62	16.95	17	12	22

JUPITER, 2018

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	14	52	14.93	-15	32	14.2	5.431 093	1.62	16.95	17	12	22
	17	14	52	39.10	15	34	14.6	5.446 280	1.61	16.90	17	08	50
	18	14	53	03.86	15	36	17.2	5.461 430	1.61	16.86	17	05	19
	19	14	53	29.20	15	38	22.0	5.476 539	1.61	16.81	17	01	49
	20	14	53	55.11	15	40	29.0	5.491 604	1.60	16.76	16	58	19
	21	14	54	21.59	15	42	38.1	5.506 622	1.60	16.72	16	54	50
	22	14	54	48.62	-15	44	49.3	5.521 589	1.59	16.67	16	51	21
	23	14	55	16.21	15	47	02.5	5.536 503	1.59	16.63	16	47	53
	24	14	55	44.35	15	49	17.8	5.551 361	1.58	16.58	16	44	26
	25	14	56	13.03	15	51	35.0	5.566 159	1.58	16.54	16	40	59
	26	14	56	42.24	15	53	54.0	5.580 896	1.58	16.50	16	37	32
	27	14	57	11.98	15	56	15.0	5.595 567	1.57	16.45	16	34	06
	28	14	57	42.24	-15	58	37.7	5.610 171	1.57	16.41	16	30	41
	29	14	58	13.03	16	01	02.2	5.624 704	1.56	16.37	16	27	16
	30	14	58	44.33	16	03	28.5	5.639 163	1.56	16.33	16	23	52
	31	14	59	16.14	16	05	56.4	5.653 547	1.56	16.28	16	20	28
Sept.	1	14	59	48.46	16	08	26.0	5.667 851	1.55	16.24	16	17	04
	2	15	00	21.29	16	10	57.3	5.682 074	1.55	16.20	16	13	41
	3	15	00	54.62	-16	13	30.1	5.696 212	1.54	16.16	16	10	19
	4	15	01	28.44	16	16	04.5	5.710 263	1.54	16.12	16	06	57
	5	15	02	02.76	16	18	40.5	5.724 223	1.54	16.08	16	03	36
	6	15	02	37.56	16	21	17.9	5.738 089	1.53	16.04	16	00	15
	7	15	03	12.83	16	23	56.8	5.751 858	1.53	16.01	15	56	54
	8	15	03	48.57	16	26	37.1	5.765 527	1.53	15.97	15	53	34
	9	15	04	24.78	-16	29	18.7	5.779 093	1.52	15.93	15	50	14
	10	15	05	01.45	16	32	01.6	5.792 553	1.52	15.89	15	46	55
	11	15	05	38.57	16	34	45.8	5.805 903	1.51	15.86	15	43	37
	12	15	06	16.14	16	37	31.2	5.819 141	1.51	15.82	15	40	18
	13	15	06	54.16	16	40	17.8	5.832 263	1.51	15.78	15	37	01
	14	15	07	32.62	16	43	05.5	5.845 268	1.50	15.75	15	33	43
	15	15	08	11.51	-16	45	54.3	5.858 152	1.50	15.71	15	30	26
	16	15	08	50.84	16	48	44.2	5.870 914	1.50	15.68	15	27	10
	17	15	09	30.58	16	51	35.1	5.883 550	1.49	15.65	15	23	54
	18	15	10	10.73	16	54	27.0	5.896 058	1.49	15.61	15	20	38
	19	15	10	51.29	16	57	19.8	5.908 437	1.49	15.58	15	17	23
	20	15	11	32.25	17	00	13.6	5.920 684	1.49	15.55	15	14	08
	21	15	12	13.61	-17	03	08.1	5.932 797	1.48	15.52	15	10	53
	22	15	12	55.35	17	06	03.5	5.944 774	1.48	15.49	15	07	39
	23	15	13	37.48	17	08	59.5	5.956 614	1.48	15.46	15	04	25
	24	15	14	19.98	17	11	56.3	5.968 313	1.47	15.42	15	01	12
	25	15	15	02.86	17	14	53.8	5.979 870	1.47	15.39	14	57	59
	26	15	15	46.11	17	17	51.9	5.991 284	1.47	15.37	14	54	46
	27	15	16	29.72	-17	20	50.6	6.002 552	1.47	15.34	14	51	34
	28	15	17	13.70	17	23	49.8	6.013 673	1.46	15.31	14	48	22
	29	15	17	58.04	17	26	49.6	6.024 644	1.46	15.28	14	45	11
	30	15	18	42.73	17	29	49.9	6.035 463	1.46	15.25	14	41	59
Oct.	1	15	19	27.77	-17	32	50.7	6.046 129	1.45	15.23	14	38	49

JUPITER, 2018

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	15	19	27.77	-17	32	50.7	6.046 129	1.45	15.23	14	38	49
	2	15	20	13.15	17	35	51.9	6.056 639	1.45	15.20	14	35	38
	3	15	20	58.88	17	38	53.6	6.066 991	1.45	15.17	14	32	28
	4	15	21	44.93	17	41	55.6	6.077 183	1.45	15.15	14	29	18
	5	15	22	31.32	17	44	57.9	6.087 213	1.44	15.12	14	26	08
	6	15	23	18.02	17	48	00.6	6.097 077	1.44	15.10	14	22	59
	7	15	24	05.04	-17	51	03.4	6.106 775	1.44	15.08	14	19	50
	8	15	24	52.37	17	54	06.5	6.116 304	1.44	15.05	14	16	42
	9	15	25	40.00	17	57	09.7	6.125 661	1.44	15.03	14	13	33
	10	15	26	27.94	18	00	13.1	6.134 845	1.43	15.01	14	10	25
	11	15	27	16.18	18	03	16.5	6.143 854	1.43	14.98	14	07	17
	12	15	28	04.71	18	06	20.1	6.152 685	1.43	14.96	14	04	10
	13	15	28	53.52	-18	09	23.6	6.161 337	1.43	14.94	14	01	03
	14	15	29	42.62	18	12	27.2	6.169 809	1.43	14.92	13	57	56
	15	15	30	31.99	18	15	30.7	6.178 100	1.42	14.90	13	54	49
	16	15	31	21.62	18	18	34.2	6.186 207	1.42	14.88	13	51	43
	17	15	32	11.51	18	21	37.6	6.194 129	1.42	14.86	13	48	37
	18	15	33	01.66	18	24	40.8	6.201 866	1.42	14.84	13	45	31
	19	15	33	52.05	-18	27	43.8	6.209 416	1.42	14.83	13	42	25
	20	15	34	42.68	18	30	46.6	6.216 778	1.41	14.81	13	39	20
	21	15	35	33.55	18	33	49.1	6.223 950	1.41	14.79	13	36	15
	22	15	36	24.66	18	36	51.3	6.230 932	1.41	14.77	13	33	10
	23	15	37	15.99	18	39	53.2	6.237 723	1.41	14.76	13	30	05
	24	15	38	07.55	18	42	54.7	6.244 321	1.41	14.74	13	27	01
	25	15	38	59.32	-18	45	55.8	6.250 726	1.41	14.73	13	23	57
	26	15	39	51.32	18	48	56.5	6.256 936	1.41	14.71	13	20	52
	27	15	40	43.53	18	51	56.8	6.262 951	1.40	14.70	13	17	49
	28	15	41	35.95	18	54	56.6	6.268 769	1.40	14.69	13	14	45
	29	15	42	28.57	18	57	56.0	6.274 390	1.40	14.67	13	11	42
	30	15	43	21.39	19	00	54.9	6.279 811	1.40	14.66	13	08	38
	31	15	44	14.40	-19	03	53.2	6.285 032	1.40	14.65	13	05	35
Nov.	1	15	45	07.60	19	06	51.0	6.290 050	1.40	14.64	13	02	32
	2	15	46	00.98	19	09	48.1	6.294 866	1.40	14.62	12	59	30
	3	15	46	54.53	19	12	44.7	6.299 477	1.40	14.61	12	56	27
	4	15	47	48.25	19	15	40.5	6.303 882	1.40	14.60	12	53	25
	5	15	48	42.14	19	18	35.7	6.308 080	1.39	14.59	12	50	23
	6	15	49	36.18	-19	21	30.1	6.312 069	1.39	14.58	12	47	21
	7	15	50	30.39	19	24	23.8	6.315 849	1.39	14.58	12	44	19
	8	15	51	24.75	19	27	16.8	6.319 418	1.39	14.57	12	41	17
	9	15	52	19.25	19	30	08.9	6.322 775	1.39	14.56	12	38	15
	10	15	53	13.90	19	33	00.2	6.325 921	1.39	14.55	12	35	14
	11	15	54	08.67	19	35	50.7	6.328 854	1.39	14.55	12	32	13
	12	15	55	03.57	-19	38	40.4	6.331 574	1.39	14.54	12	29	11
	13	15	55	58.59	19	41	29.1	6.334 080	1.39	14.53	12	26	10
	14	15	56	53.71	19	44	16.9	6.336 372	1.39	14.53	12	23	09
	15	15	57	48.95	19	47	03.8	6.338 449	1.39	14.52	12	20	08
	16	15	58	44.28	-19	49	49.7	6.340 312	1.39	14.52	12	17	08

JUPITER, 2018

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	58	44.28	-19	49	49.7	6.340 312	1.39	14.52	12	17	08
	17	15	59	39.70	19	52	34.5	6.341 960	1.39	14.52	12	14	07
	18	16	00	35.22	19	55	18.3	6.343 393	1.39	14.51	12	11	06
	19	16	01	30.81	19	58	01.1	6.344 611	1.39	14.51	12	08	06
	20	16	02	26.49	20	00	42.8	6.345 614	1.39	14.51	12	05	05
	21	16	03	22.24	20	03	23.3	6.346 402	1.39	14.51	12	02	05
	22	16	04	18.07	-20	06	02.8	6.346 974	1.39	14.50	11	59	05
	23	16	05	13.96	20	08	41.1	6.347 331	1.39	14.50	11	56	04
	24	16	06	09.92	20	11	18.3	6.347 472	1.39	14.50	11	53	04
	25	16	07	05.93	20	13	54.2	6.347 398	1.39	14.50	11	50	04
	26	16	08	01.98	20	16	28.7	6.347 108	1.39	14.50	11	47	04
	27	16	08	58.06	20	19	02.7	6.346 601	1.39	14.51	11	44	04
	28	16	09	54.21	-20	21	35.4	6.345 878	1.39	14.51	11	41	04
	29	16	10	50.38	20	24	06.7	6.344 939	1.39	14.51	11	38	04
	30	16	11	46.58	20	26	36.8	6.343 781	1.39	14.51	11	35	04
Dec.	1	16	12	42.80	20	29	05.6	6.342 406	1.39	14.51	11	32	04
	2	16	13	39.04	20	31	33.1	6.340 813	1.39	14.52	11	29	04
	3	16	14	35.29	20	33	59.3	6.339 001	1.39	14.52	11	26	04
	4	16	15	31.54	-20	36	24.2	6.336 971	1.39	14.53	11	23	04
	5	16	16	27.79	20	38	47.7	6.334 722	1.39	14.53	11	20	04
	6	16	17	24.04	20	41	09.9	6.332 255	1.39	14.54	11	17	04
	7	16	18	20.28	20	43	30.8	6.329 570	1.39	14.54	11	14	04
	8	16	19	16.49	20	45	50.3	6.326 666	1.39	14.55	11	11	04
	9	16	20	12.68	20	48	08.4	6.323 545	1.39	14.56	11	08	04
	10	16	21	08.83	-20	50	25.1	6.320 207	1.39	14.57	11	05	04
	11	16	22	04.93	20	52	40.5	6.316 653	1.39	14.57	11	02	04
	12	16	23	00.99	20	54	54.4	6.312 883	1.39	14.58	10	59	04
	13	16	23	56.98	20	57	06.9	6.308 898	1.39	14.59	10	56	04
	14	16	24	52.91	20	59	17.9	6.304 699	1.39	14.60	10	53	03
	15	16	25	48.78	21	01	27.4	6.300 287	1.40	14.61	10	50	03
	16	16	26	44.56	-21	03	35.5	6.295 662	1.40	14.62	10	47	03
	17	16	27	40.27	21	05	42.0	6.290 826	1.40	14.63	10	44	02
	18	16	28	35.89	21	07	47.1	6.285 779	1.40	14.65	10	41	02
	19	16	29	31.42	21	09	50.6	6.280 522	1.40	14.66	10	38	01
	20	16	30	26.85	21	11	52.6	6.275 058	1.40	14.67	10	35	00
	21	16	31	22.18	21	13	53.2	6.269 386	1.40	14.68	10	31	59
	22	16	32	17.41	-21	15	52.2	6.263 507	1.40	14.70	10	28	58
	23	16	33	12.52	21	17	49.7	6.257 423	1.41	14.71	10	25	57
	24	16	34	07.52	21	19	45.8	6.251 134	1.41	14.73	10	22	56
	25	16	35	02.38	21	21	40.3	6.244 641	1.41	14.74	10	19	54
	26	16	35	57.11	21	23	33.3	6.237 945	1.41	14.76	10	16	53
	27	16	36	51.70	21	25	24.8	6.231 046	1.41	14.77	10	13	51
	28	16	37	46.14	-21	27	14.7	6.223 945	1.41	14.79	10	10	49
	29	16	38	40.43	21	29	03.1	6.216 643	1.41	14.81	10	07	48
	30	16	39	34.55	21	30	49.9	6.209 141	1.42	14.83	10	04	45
	31	16	40	28.52	21	32	35.2	6.201 438	1.42	14.84	10	01	43
	32	16	41	22.31	-21	34	18.9	6.193 538	1.42	14.86	9	58	41

SATURN, 2018

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	270 30 50.0	+0 58 58.7	10.064 740	Apr. 3	273 16 54.7	+0 52 17.8	10.065 626
3	270 34 26.7	0 58 50.0	10.064 774	5	273 20 31.3	0 52 09.1	10.065 630
5	270 38 03.3	0 58 41.4	10.064 807	7	273 24 07.9	0 52 00.2	10.065 634
7	270 41 39.9	0 58 32.7	10.064 839	9	273 27 44.6	0 51 51.4	10.065 637
9	270 45 16.6	0 58 24.1	10.064 871	11	273 31 21.2	0 51 42.6	10.065 640
11	270 48 53.2	0 58 15.5	10.064 902	13	273 34 57.8	0 51 33.8	10.065 641
13	270 52 29.9	+0 58 06.8	10.064 932	15	273 38 34.4	+0 51 25.0	10.065 642
15	270 56 06.5	0 57 58.2	10.064 962	17	273 42 11.0	0 51 16.2	10.065 643
17	270 59 43.2	0 57 49.5	10.064 991	19	273 45 47.6	0 51 07.4	10.065 643
19	271 03 19.8	0 57 40.8	10.065 020	21	273 49 24.2	0 50 58.5	10.065 642
21	271 06 56.4	0 57 32.2	10.065 048	23	273 53 00.8	0 50 49.7	10.065 640
23	271 10 33.1	0 57 23.5	10.065 075	25	273 56 37.4	0 50 40.9	10.065 638
25	271 14 09.7	+0 57 14.8	10.065 101	27	274 00 14.1	+0 50 32.1	10.065 636
27	271 17 46.3	0 57 06.2	10.065 127	29	274 03 50.7	0 50 23.2	10.065 632
29	271 21 22.9	0 56 57.5	10.065 153	May 1	274 07 27.3	0 50 14.4	10.065 628
31	271 24 59.6	0 56 48.8	10.065 177	3	274 11 03.9	0 50 05.5	10.065 624
Feb. 2	271 28 36.2	0 56 40.1	10.065 201	5	274 14 40.5	0 49 56.7	10.065 618
4	271 32 12.8	0 56 31.4	10.065 225	7	274 18 17.1	0 49 47.8	10.065 612
6	271 35 49.4	+0 56 22.7	10.065 248	9	274 21 53.7	+0 49 38.9	10.065 606
8	271 39 26.1	0 56 14.0	10.065 270	11	274 25 30.4	0 49 30.1	10.065 599
10	271 43 02.7	0 56 05.3	10.065 291	13	274 29 07.0	0 49 21.2	10.065 591
12	271 46 39.3	0 55 56.6	10.065 312	15	274 32 43.6	0 49 12.4	10.065 582
14	271 50 15.9	0 55 47.9	10.065 332	17	274 36 20.2	0 49 03.5	10.065 573
16	271 53 52.6	0 55 39.2	10.065 352	19	274 39 56.8	0 48 54.6	10.065 564
18	271 57 29.2	+0 55 30.5	10.065 371	21	274 43 33.4	+0 48 45.8	10.065 553
20	272 01 05.8	0 55 21.8	10.065 389	23	274 47 10.1	0 48 36.9	10.065 542
22	272 04 42.4	0 55 13.0	10.065 407	25	274 50 46.7	0 48 28.0	10.065 530
24	272 08 19.1	0 55 04.3	10.065 424	27	274 54 23.3	0 48 19.1	10.065 518
26	272 11 55.7	0 54 55.6	10.065 440	29	274 57 59.9	0 48 10.2	10.065 505
28	272 15 32.3	0 54 46.9	10.065 456	31	275 01 36.5	0 48 01.3	10.065 492
Mar. 2	272 19 08.9	+0 54 38.1	10.065 471	June 2	275 05 13.2	+0 47 52.4	10.065 477
4	272 22 45.5	0 54 29.4	10.065 485	4	275 08 49.8	0 47 43.6	10.065 462
6	272 26 22.1	0 54 20.6	10.065 499	6	275 12 26.4	0 47 34.7	10.065 447
8	272 29 58.8	0 54 11.9	10.065 512	8	275 16 03.0	0 47 25.8	10.065 431
10	272 33 35.4	0 54 03.1	10.065 525	10	275 19 39.6	0 47 16.8	10.065 414
12	272 37 12.0	0 53 54.4	10.065 537	12	275 23 16.3	0 47 07.9	10.065 397
14	272 40 48.6	+0 53 45.6	10.065 548	14	275 26 52.9	+0 46 59.0	10.065 378
16	272 44 25.2	0 53 36.9	10.065 559	16	275 30 29.6	0 46 50.1	10.065 360
18	272 48 01.8	0 53 28.1	10.065 569	18	275 34 06.1	0 46 41.2	10.065 340
20	272 51 38.4	0 53 19.3	10.065 578	20	275 37 42.8	0 46 32.3	10.065 320
22	272 55 15.1	0 53 10.5	10.065 587	22	275 41 19.4	0 46 23.3	10.065 300
24	272 58 51.7	0 53 01.8	10.065 595	24	275 44 56.1	0 46 14.4	10.065 278
26	273 02 28.3	+0 52 53.0	10.065 603	26	275 48 32.7	+0 46 05.5	10.065 256
28	273 06 04.9	0 52 44.2	10.065 609	28	275 52 09.3	0 45 56.6	10.065 234
30	273 09 41.5	0 52 35.4	10.065 616	30	275 55 46.0	0 45 47.6	10.065 210
Apr. 1	273 13 18.1	0 52 26.6	10.065 621	July 2	275 59 22.6	0 45 38.7	10.065 187
3	273 16 54.7	+0 52 17.8	10.065 626	4	276 02 59.2	+0 45 29.7	10.065 162

SATURN, 2018
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	275	59	22.6	+0	45	38.7	10.065 187	Oct.	2	278	45	29.6	+0	38	44.2	10.063 384
	4	276	02	59.2	0	45	29.7	10.065 162		4	278	49	06.3	0	38	35.2	10.063 330
	6	276	06	35.9	0	45	20.8	10.065 137		6	278	52	43.0	0	38	26.1	10.063 274
	8	276	10	12.5	0	45	11.8	10.065 111		8	278	56	19.7	0	38	17.0	10.063 219
	10	276	13	49.2	0	45	02.9	10.065 084		10	278	59	56.5	0	38	07.9	10.063 162
	12	276	17	25.8	0	44	53.9	10.065 057		12	279	03	33.2	0	37	58.8	10.063 105
	14	276	21	02.4	+0	44	45.0	10.065 029		14	279	07	09.9	+0	37	49.8	10.063 048
	16	276	24	39.1	0	44	36.0	10.065 001		16	279	10	46.6	0	37	40.7	10.062 989
	18	276	28	15.8	0	44	27.0	10.064 972		18	279	14	23.4	0	37	31.6	10.062 930
	20	276	31	52.4	0	44	18.1	10.064 942		20	279	18	00.1	0	37	22.5	10.062 871
	22	276	35	29.1	0	44	09.1	10.064 912		22	279	21	36.8	0	37	13.4	10.062 811
	24	276	39	05.7	0	44	00.1	10.064 881		24	279	25	13.6	0	37	04.3	10.062 750
	26	276	42	42.4	+0	43	51.2	10.064 849		26	279	28	50.3	+0	36	55.2	10.062 688
	28	276	46	19.0	0	43	42.2	10.064 817		28	279	32	27.1	0	36	46.1	10.062 626
	30	276	49	55.7	0	43	33.2	10.064 784		30	279	36	03.8	0	36	37.0	10.062 563
Aug.	1	276	53	32.3	0	43	24.2	10.064 750	Nov.	1	279	39	40.6	0	36	27.9	10.062 500
	3	276	57	09.0	0	43	15.2	10.064 716		3	279	43	17.3	0	36	18.8	10.062 436
	5	277	00	45.6	0	43	06.2	10.064 681		5	279	46	54.1	0	36	09.6	10.062 371
	7	277	04	22.3	+0	42	57.2	10.064 645		7	279	50	30.8	+0	36	00.5	10.062 306
	9	277	07	59.0	0	42	48.2	10.064 609		9	279	54	07.6	0	35	51.4	10.062 240
	11	277	11	35.6	0	42	39.2	10.064 572		11	279	57	44.3	0	35	42.3	10.062 173
	13	277	15	12.3	0	42	30.2	10.064 534		13	280	01	21.1	0	35	33.1	10.062 106
	15	277	18	49.0	0	42	21.2	10.064 496		15	280	04	57.9	0	35	24.0	10.062 038
	17	277	22	25.6	0	42	12.2	10.064 457		17	280	08	34.6	0	35	14.9	10.061 969
	19	277	26	02.3	+0	42	03.2	10.064 418		19	280	12	11.4	+0	35	05.7	10.061 900
	21	277	29	39.0	0	41	54.2	10.064 378		21	280	15	48.2	0	34	56.6	10.061 830
	23	277	33	15.7	0	41	45.2	10.064 337		23	280	19	25.0	0	34	47.5	10.061 760
	25	277	36	52.3	0	41	36.1	10.064 295		25	280	23	01.8	0	34	38.3	10.061 689
	27	277	40	29.0	0	41	27.1	10.064 253		27	280	26	38.5	0	34	29.2	10.061 617
	29	277	44	05.7	0	41	18.1	10.064 210		29	280	30	15.4	0	34	20.0	10.061 544
	31	277	47	42.4	+0	41	09.1	10.064 167	Dec.	1	280	33	52.1	+0	34	10.9	10.061 471
Sept.	2	277	51	19.1	0	41	00.0	10.064 123		3	280	37	28.9	0	34	01.7	10.061 398
	4	277	54	55.8	0	40	51.0	10.064 078		5	280	41	05.7	0	33	52.6	10.061 324
	6	277	58	32.4	0	40	42.0	10.064 033		7	280	44	42.5	0	33	43.5	10.061 249
	8	278	02	09.1	0	40	32.9	10.063 987		9	280	48	19.3	0	33	34.3	10.061 173
	10	278	05	45.8	0	40	23.9	10.063 940		11	280	51	56.1	0	33	25.1	10.061 097
	12	278	09	22.5	+0	40	14.9	10.063 893		13	280	55	33.0	+0	33	15.9	10.061 020
	14	278	12	59.2	0	40	05.8	10.063 845		15	280	59	09.8	0	33	06.8	10.060 943
	16	278	16	35.9	0	39	56.7	10.063 796		17	281	02	46.6	0	32	57.6	10.060 865
	18	278	20	12.6	0	39	47.7	10.063 747		19	281	06	23.4	0	32	48.4	10.060 786
	20	278	23	49.3	0	39	38.6	10.063 697		21	281	10	00.2	0	32	39.3	10.060 706
	22	278	27	26.0	0	39	29.6	10.063 646		23	281	13	37.1	0	32	30.1	10.060 626
	24	278	31	02.7	+0	39	20.5	10.063 595		25	281	17	13.9	+0	32	20.9	10.060 546
	26	278	34	39.4	0	39	11.5	10.063 543		27	281	20	50.7	0	32	11.8	10.060 465
	28	278	38	16.1	0	39	02.4	10.063 491		29	281	24	27.6	0	32	02.6	10.060 383
	30	278	41	52.8	0	38	53.3	10.063 438		31	281	28	04.4	0	31	53.4	10.060 300
Oct.	2	278	45	29.6	+0	38	44.2	10.063 384		33	281	31	41.3	+0	31	44.2	10.060 217

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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	271	16	22.5	+0	53	51.1	Feb.	15	276	10	30.8	+0	52	33.9
	1	271	23	24.6	0	53	47.9		16	276	15	50.1	0	52	33.6
	2	271	30	25.9	0	53	44.8		17	276	21	05.5	0	52	33.3
	3	271	37	26.5	0	53	41.7		18	276	26	17.1	0	52	33.1
	4	271	44	26.2	0	53	38.8		19	276	31	24.7	0	52	32.9
	5	271	51	25.0	0	53	35.9		20	276	36	28.3	0	52	32.8
	6	271	58	22.8	+0	53	33.1		21	276	41	27.9	+0	52	32.8
	7	272	05	19.5	0	53	30.4		22	276	46	23.4	0	52	32.8
	8	272	12	15.1	0	53	27.7		23	276	51	14.8	0	52	32.8
	9	272	19	09.5	0	53	25.1		24	276	56	02.0	0	52	32.9
	10	272	26	02.8	0	53	22.5		25	277	00	45.0	0	52	33.0
	11	272	32	54.8	0	53	20.1		26	277	05	23.7	0	52	33.1
	12	272	39	45.5	+0	53	17.7		27	277	09	58.0	+0	52	33.3
	13	272	46	34.7	0	53	15.3		28	277	14	27.8	0	52	33.6
	14	272	53	22.4	0	53	13.1	Mar.	1	277	18	53.2	0	52	33.9
	15	273	00	08.6	0	53	10.9		2	277	23	13.9	0	52	34.2
	16	273	06	53.1	0	53	08.7		3	277	27	30.1	0	52	34.5
	17	273	13	35.9	0	53	06.7		4	277	31	41.6	0	52	34.9
	18	273	20	16.8	+0	53	04.7		5	277	35	48.5	+0	52	35.3
	19	273	26	55.8	0	53	02.7		6	277	39	50.7	0	52	35.8
	20	273	33	32.8	0	53	00.9		7	277	43	48.2	0	52	36.2
	21	273	40	07.7	0	52	59.1		8	277	47	40.8	0	52	36.7
	22	273	46	40.5	0	52	57.3		9	277	51	28.7	0	52	37.3
	23	273	53	11.2	0	52	55.6		10	277	55	11.6	0	52	37.8
	24	273	59	39.5	+0	52	54.0		11	277	58	49.5	+0	52	38.4
	25	274	06	05.6	0	52	52.5		12	278	02	22.4	0	52	39.0
	26	274	12	29.4	0	52	51.0		13	278	05	50.1	0	52	39.6
	27	274	18	50.8	0	52	49.6		14	278	09	12.7	0	52	40.3
	28	274	25	09.7	0	52	48.3		15	278	12	30.1	0	52	41.0
	29	274	31	26.1	0	52	47.0		16	278	15	42.2	0	52	41.7
	30	274	37	39.8	+0	52	45.8		17	278	18	48.9	+0	52	42.4
	31	274	43	50.9	0	52	44.6		18	278	21	50.4	0	52	43.1
Feb.	1	274	49	59.2	0	52	43.5		19	278	24	46.4	0	52	43.9
	2	274	56	04.6	0	52	42.5		20	278	27	37.0	0	52	44.7
	3	275	02	07.1	0	52	41.5		21	278	30	22.2	0	52	45.5
	4	275	08	06.7	0	52	40.6		22	278	33	02.0	0	52	46.3
	5	275	14	03.2	+0	52	39.7		23	278	35	36.3	+0	52	47.1
	6	275	19	56.7	0	52	38.9		24	278	38	05.1	0	52	48.0
	7	275	25	47.2	0	52	38.1		25	278	40	28.3	0	52	48.8
	8	275	31	34.5	0	52	37.4		26	278	42	46.0	0	52	49.7
	9	275	37	18.5	0	52	36.8		27	278	44	58.0	0	52	50.5
	10	275	42	59.3	0	52	36.2		28	278	47	04.3	0	52	51.4
	11	275	48	36.7	+0	52	35.6		29	278	49	04.9	+0	52	52.3
	12	275	54	10.6	0	52	35.1		30	278	50	59.7	0	52	53.2
	13	275	59	40.9	0	52	34.6		31	278	52	48.8	0	52	54.1
	14	276	05	07.7	0	52	34.2	Apr.	1	278	54	32.3	0	52	55.0
	15	276	10	30.8	+0	52	33.9		2	278	56	09.9	+0	52	55.8

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		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	278	54	32.3	+0	52	55.0	May	17	278	29	26.2	+0	53	7.2
	2	278	56	09.9	0	52	55.8		18	278	26	45.6	0	53	6.2
	3	278	57	41.9	0	52	56.7		19	278	24	0.4	0	53	5.2
	4	278	59	08.0	0	52	57.6		20	278	21	10.5	0	53	4.1
	5	279	00	28.4	0	52	58.4		21	278	18	16.2	0	53	2.9
	6	279	01	43.0	0	52	59.3		22	278	15	17.4	0	53	1.6
	7	279	02	51.8	+0	53	00.1		23	278	12	14.4	+0	53	00.2
	8	279	03	54.6	0	53	00.9		24	278	09	07.0	0	52	58.8
	9	279	04	51.5	0	53	01.7		25	278	05	55.6	0	52	57.2
	10	279	05	42.5	0	53	02.5		26	278	02	40.2	0	52	55.6
	11	279	06	27.6	0	53	03.3		27	277	59	20.9	0	52	53.8
	12	279	07	06.7	0	53	04.1		28	277	55	57.8	0	52	52.0
	13	279	07	39.8	+0	53	04.8		29	277	52	31.0	+0	52	50.1
	14	279	08	06.9	0	53	05.6		30	277	49	00.7	0	52	48.1
	15	279	08	28.0	0	53	06.3		31	277	45	26.8	0	52	46.0
	16	279	08	43.2	0	53	06.9	June	1	277	41	49.5	0	52	43.8
	17	279	08	52.5	0	53	07.6		2	277	38	08.9	0	52	41.5
	18	279	08	55.9	0	53	08.3		3	277	34	25.0	0	52	39.1
	19	279	08	53.4	+0	53	08.9		4	277	30	37.9	+0	52	36.6
	20	279	08	45.0	0	53	09.4		5	277	26	47.8	0	52	34.0
	21	279	08	30.8	0	53	10.0		6	277	22	54.8	0	52	31.3
	22	279	08	10.7	0	53	10.5		7	277	18	58.9	0	52	28.5
	23	279	07	44.7	0	53	11.0		8	277	15	00.3	0	52	25.6
	24	279	07	12.8	0	53	11.5		9	277	10	59.1	0	52	22.7
	25	279	06	35.1	+0	53	11.9		10	277	06	55.5	+0	52	19.6
	26	279	05	51.6	0	53	12.2		11	277	02	49.6	0	52	16.4
	27	279	05	02.3	0	53	12.6		12	276	58	41.5	0	52	13.1
	28	279	04	07.2	0	53	12.8		13	276	54	31.4	0	52	09.7
	29	279	03	06.6	0	53	13.1		14	276	50	19.4	0	52	06.3
	30	279	02	00.3	0	53	13.2		15	276	46	05.6	0	52	02.7
May	1	279	00	48.4	+0	53	13.4		16	276	41	50.2	+0	51	59.0
	2	278	59	31.0	0	53	13.4		17	276	37	33.1	0	51	55.2
	3	278	58	08.0	0	53	13.4		18	276	33	14.7	0	51	51.3
	4	278	56	39.5	0	53	13.4		19	276	28	54.9	0	51	47.3
	5	278	55	05.6	0	53	13.3		20	276	24	33.9	0	51	43.2
	6	278	53	26.2	0	53	13.1		21	276	20	12.0	0	51	39.0
	7	278	51	41.4	+0	53	12.9		22	276	15	49.2	+0	51	34.7
	8	278	49	51.1	0	53	12.6		23	276	11	25.7	0	51	30.2
	9	278	47	55.6	0	53	12.3		24	276	07	01.7	0	51	25.7
	10	278	45	54.7	0	53	11.9		25	276	02	37.3	0	51	21.1
	11	278	43	48.6	0	53	11.4		26	275	58	12.5	0	51	16.3
	12	278	41	37.3	0	53	10.9		27	275	53	47.6	0	51	11.5
	13	278	39	21.0	+0	53	10.3		28	275	49	22.6	+0	51	06.5
	14	278	36	59.6	0	53	09.6		29	275	44	57.6	0	51	01.4
	15	278	34	33.3	0	53	08.9		30	275	40	32.9	0	50	56.3
	16	278	32	02.1	0	53	08.1	July	1	275	36	08.4	0	50	51.0
	17	278	29	26.2	+0	53	07.2		2	275	31	44.3	+0	50	45.6

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		°	'	"	°	'	"			°	'	"	°	'	"
July	1	275	36	08.4	+0	50	51.0	Aug.	16	272	54	28.2	+0	45	20.6
	2	275	31	44.3	0	50	45.6		17	272	52	30.5	0	45	12.1
	3	275	27	20.7	0	50	40.2		18	272	50	38.1	0	45	03.5
	4	275	22	57.8	0	50	34.6		19	272	48	51.0	0	44	54.9
	5	275	18	35.7	0	50	29.0		20	272	47	09.3	0	44	46.3
	6	275	14	14.6	0	50	23.2		21	272	45	33.0	0	44	37.6
	7	275	09	54.5	+0	50	17.4		22	272	44	02.2	+0	44	28.9
	8	275	05	35.7	0	50	11.5		23	272	42	36.8	0	44	20.2
	9	275	01	18.2	0	50	05.4		24	272	41	17.0	0	44	11.5
	10	274	57	02.3	0	49	59.3		25	272	40	02.6	0	44	02.8
	11	274	52	48.0	0	49	53.1		26	272	38	53.8	0	43	54.0
	12	274	48	35.6	0	49	46.8		27	272	37	50.6	0	43	45.2
	13	274	44	25.0	+0	49	40.4		28	272	36	52.9	+0	43	36.5
	14	274	40	16.5	0	49	34.0		29	272	36	00.9	0	43	27.7
	15	274	36	10.0	0	49	27.4		30	272	35	14.6	0	43	18.9
	16	274	32	05.8	0	49	20.8		31	272	34	34.1	0	43	10.1
	17	274	28	03.9	0	49	14.1	Sept.	1	272	33	59.2	0	43	01.3
	18	274	24	04.5	0	49	07.2		2	272	33	30.2	0	42	52.5
	19	274	20	07.8	+0	49	00.4		3	272	33	07.0	+0	42	43.7
	20	274	16	13.9	0	48	53.4		4	272	32	49.7	0	42	34.9
	21	274	12	22.9	0	48	46.3		5	272	32	38.2	0	42	26.1
	22	274	08	34.9	0	48	39.2		6	272	32	32.6	0	42	17.3
	23	274	04	50.1	0	48	31.9		7	272	32	32.8	0	42	08.5
	24	274	01	08.5	0	48	24.6		8	272	32	38.8	0	41	59.7
	25	273	57	30.2	+0	48	17.3		9	272	32	50.7	+0	41	51.0
	26	273	53	55.3	0	48	09.8		10	272	33	08.4	0	41	42.2
	27	273	50	23.9	0	48	02.3		11	272	33	32.0	0	41	33.4
	28	273	46	56.1	0	47	54.7		12	272	34	01.6	0	41	24.7
	29	273	43	31.9	0	47	47.1		13	272	34	37.0	0	41	15.9
	30	273	40	11.5	0	47	39.4		14	272	35	18.5	0	41	07.2
	31	273	36	54.9	+0	47	31.6		15	272	36	05.8	+0	40	58.4
Aug.	1	273	33	42.3	0	47	23.8		16	272	36	59.1	0	40	49.7
	2	273	30	33.7	0	47	15.9		17	272	37	58.2	0	40	41.0
	3	273	27	29.2	0	47	08.0		18	272	39	03.2	0	40	32.3
	4	273	24	29.0	0	47	00.0		19	272	40	14.0	0	40	23.7
	5	273	21	33.1	0	46	51.9		20	272	41	30.6	0	40	15.0
	6	273	18	41.7	+0	46	43.9		21	272	42	53.0	+0	40	06.4
	7	273	15	54.9	0	46	35.7		22	272	44	21.1	0	39	57.8
	8	273	13	12.6	0	46	27.5		23	272	45	54.9	0	39	49.2
	9	273	10	35.1	0	46	19.3		24	272	47	34.4	0	39	40.7
	10	273	08	02.2	0	46	11.0		25	272	49	19.6	0	39	32.1
	11	273	05	34.2	0	46	02.7		26	272	51	10.4	0	39	23.6
	12	273	03	11.0	+0	45	54.4		27	272	53	06.9	+0	39	15.2
	13	273	00	52.7	0	45	46.0		28	272	55	09.1	0	39	06.7
	14	272	58	39.4	0	45	37.6		29	272	57	16.9	0	38	58.3
	15	272	56	31.2	0	45	29.1		30	272	59	30.3	0	38	49.9
	16	272	54	28.2	+0	45	20.6	Oct.	1	273	01	49.3	+0	38	41.6

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	273	01	49.3	+0	38	41.6	Nov.	16	276	16	45.2	+0	33	01.2
	2	273	04	13.9	0	38	33.3		17	276	22	35.3	0	32	54.9
	3	273	06	44.0	0	38	25.0		18	276	28	28.5	0	32	48.6
	4	273	09	19.5	0	38	16.8		19	276	34	24.7	0	32	42.4
	5	273	12	00.5	0	38	08.6		20	276	40	23.9	0	32	36.2
	6	273	14	46.9	0	38	00.4		21	276	46	26.1	0	32	30.1
	7	273	17	38.6	+0	37	52.3		22	276	52	31.1	+0	32	24.0
	8	273	20	35.6	0	37	44.2		23	276	58	39.0	0	32	18.0
	9	273	23	37.9	0	37	36.1		24	277	04	49.7	0	32	12.0
	10	273	26	45.6	0	37	28.1		25	277	11	03.0	0	32	06.1
	11	273	29	58.5	0	37	20.1		26	277	17	19.1	0	32	00.2
	12	273	33	16.6	0	37	12.1		27	277	23	37.6	0	31	54.4
	13	273	36	40.0	+0	37	04.2		28	277	29	58.7	+0	31	48.6
	14	273	40	08.4	0	36	56.3		29	277	36	22.1	0	31	42.9
	15	273	43	42.0	0	36	48.5		30	277	42	47.9	0	31	37.2
	16	273	47	20.5	0	36	40.7	Dec.	1	277	49	15.9	0	31	31.5
	17	273	51	03.9	0	36	32.9		2	277	55	46.2	0	31	25.9
	18	273	54	52.2	0	36	25.2		3	278	02	18.7	0	31	20.4
	19	273	58	45.4	+0	36	17.5		4	278	08	53.3	+0	31	14.9
	20	274	02	43.2	0	36	09.9		5	278	15	30.0	0	31	09.4
	21	274	06	45.8	0	36	02.3		6	278	22	08.7	0	31	04.0
	22	274	10	53.0	0	35	54.7		7	278	28	49.4	0	30	58.6
	23	274	15	04.9	0	35	47.2		8	278	35	31.9	0	30	53.3
	24	274	19	21.3	0	35	39.8		9	278	42	16.2	0	30	48.0
	25	274	23	42.2	+0	35	32.4		10	278	49	02.2	+0	30	42.8
	26	274	28	07.7	0	35	25.0		11	278	55	49.7	0	30	37.6
	27	274	32	37.7	0	35	17.7		12	279	02	38.8	0	30	32.5
	28	274	37	12.0	0	35	10.4		13	279	09	29.3	0	30	27.4
	29	274	41	50.8	0	35	03.2		14	279	16	21.2	0	30	22.3
	30	274	46	33.8	0	34	56.0		15	279	23	14.4	0	30	17.3
	31	274	51	21.0	+0	34	48.9		16	279	30	08.7	+0	30	12.4
Nov.	1	274	56	12.4	0	34	41.8		17	279	37	04.3	0	30	07.5
	2	275	01	07.8	0	34	34.8		18	279	44	01.0	0	30	02.6
	3	275	06	07.3	0	34	27.8		19	279	50	58.7	0	29	57.8
	4	275	11	10.8	0	34	20.9		20	279	57	57.5	0	29	53.0
	5	275	16	18.2	0	34	14.0		21	280	04	57.2	0	29	48.3
	6	275	21	29.6	+0	34	07.1		22	280	11	57.8	+0	29	43.6
	7	275	26	44.8	0	34	00.3		23	280	18	59.3	0	29	39.0
	8	275	32	03.9	0	33	53.6		24	280	26	01.4	0	29	34.4
	9	275	37	26.7	0	33	46.9		25	280	33	04.2	0	29	29.9
	10	275	42	53.2	0	33	40.2		26	280	40	07.5	0	29	25.4
	11	275	48	23.3	0	33	33.6		27	280	47	11.3	0	29	20.9
	12	275	53	57.0	+0	33	27.0		28	280	54	15.6	+0	29	16.5
	13	275	59	34.0	0	33	20.5		29	281	01	20.2	0	29	12.2
	14	276	05	14.5	0	33	14.0		30	281	08	25.1	0	29	07.8
	15	276	10	58.2	0	33	07.6		31	281	15	30.4	0	29	03.6
	16	276	16	45.2	+0	33	01.2		32	281	22	35.9	+0	28	59.4

SATURN, 2018

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	18	05	30.71	-22	31	52.7	11.036 844	0.80	6.69	11	25	26
	1	18	06	01.17	22	31	51.6	11.034 287	0.80	6.69	11	22	00
	2	18	06	31.58	22	31	50.1	11.031 474	0.80	6.69	11	18	35
	3	18	07	01.93	22	31	48.2	11.028 403	0.80	6.69	11	15	09
	4	18	07	32.22	22	31	46.0	11.025 077	0.80	6.70	11	11	43
	5	18	08	02.44	22	31	43.2	11.021 495	0.80	6.70	11	08	17
	6	18	08	32.59	-22	31	40.1	11.017 659	0.80	6.70	11	04	51
	7	18	09	02.66	22	31	36.5	11.013 567	0.80	6.70	11	01	25
	8	18	09	32.65	22	31	32.5	11.009 222	0.80	6.71	10	57	59
	9	18	10	02.56	22	31	28.1	11.004 623	0.80	6.71	10	54	33
	10	18	10	32.38	22	31	23.2	10.999 771	0.80	6.71	10	51	07
	11	18	11	02.11	22	31	18.0	10.994 667	0.80	6.71	10	47	40
	12	18	11	31.74	-22	31	12.3	10.989 313	0.80	6.72	10	44	14
	13	18	12	01.27	22	31	06.3	10.983 708	0.80	6.72	10	40	47
	14	18	12	30.69	22	30	59.9	10.977 855	0.80	6.72	10	37	21
	15	18	12	60.00	22	30	53.1	10.971 754	0.80	6.73	10	33	54
	16	18	13	29.18	22	30	46.0	10.965 407	0.80	6.73	10	30	27
	17	18	13	58.24	22	30	38.5	10.958 816	0.80	6.74	10	27	00
	18	18	14	27.16	-22	30	30.7	10.951 982	0.80	6.74	10	23	33
	19	18	14	55.94	22	30	22.5	10.944 906	0.80	6.74	10	20	05
	20	18	15	24.58	22	30	14.0	10.937 591	0.80	6.75	10	16	38
	21	18	15	53.07	22	30	05.1	10.930 039	0.80	6.75	10	13	10
	22	18	16	21.41	22	29	55.9	10.922 251	0.81	6.76	10	09	42
	23	18	16	49.58	22	29	46.4	10.914 230	0.81	6.76	10	06	14
	24	18	17	17.59	-22	29	36.5	10.905 979	0.81	6.77	10	02	46
	25	18	17	45.44	22	29	26.3	10.897 498	0.81	6.77	9	59	18
	26	18	18	13.11	22	29	15.8	10.888 792	0.81	6.78	9	55	50
	27	18	18	40.62	22	29	05.0	10.879 861	0.81	6.79	9	52	21
	28	18	19	07.94	22	28	53.9	10.870 710	0.81	6.79	9	48	52
	29	18	19	35.08	22	28	42.5	10.861 339	0.81	6.80	9	45	23
	30	18	20	02.03	-22	28	31.0	10.851 751	0.81	6.80	9	41	54
	31	18	20	28.79	22	28	19.2	10.841 950	0.81	6.81	9	38	25
Feb.	1	18	20	55.34	22	28	07.1	10.831 936	0.81	6.82	9	34	55
	2	18	21	21.68	22	27	54.8	10.821 712	0.81	6.82	9	31	25
	3	18	21	47.82	22	27	42.3	10.811 280	0.81	6.83	9	27	55
	4	18	22	13.73	22	27	29.6	10.800 642	0.81	6.83	9	24	25
	5	18	22	39.44	-22	27	16.6	10.789 801	0.82	6.84	9	20	55
	6	18	23	04.92	22	27	03.4	10.778 758	0.82	6.85	9	17	24
	7	18	23	30.17	22	26	50.0	10.767 516	0.82	6.86	9	13	53
	8	18	23	55.20	22	26	36.5	10.756 078	0.82	6.86	9	10	22
	9	18	24	20.00	22	26	22.7	10.744 445	0.82	6.87	9	06	51
	10	18	24	44.55	22	26	08.9	10.732 622	0.82	6.88	9	03	19
	11	18	25	08.86	-22	25	54.8	10.720 609	0.82	6.89	8	59	47
	12	18	25	32.92	22	25	40.7	10.708 411	0.82	6.89	8	56	15
	13	18	25	56.72	22	25	26.5	10.696 031	0.82	6.90	8	52	43
	14	18	26	20.26	22	25	12.1	10.683 471	0.82	6.91	8	49	10
	15	18	26	43.53	-22	24	57.7	10.670 735	0.82	6.92	8	45	37

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	18	26	43.53	-22	24	57.7	10.670 735	0.82	6.92	8	45	37
	16	18	27	06.53	22	24	43.2	10.657 826	0.83	6.93	8	42	04
	17	18	27	29.25	22	24	28.6	10.644 747	0.83	6.93	8	38	31
	18	18	27	51.69	22	24	13.9	10.631 502	0.83	6.94	8	34	57
	19	18	28	13.84	22	23	59.2	10.618 095	0.83	6.95	8	31	23
	20	18	28	35.71	22	23	44.4	10.604 530	0.83	6.96	8	27	49
	21	18	28	57.28	-22	23	29.5	10.590 809	0.83	6.97	8	24	14
	22	18	29	18.56	22	23	14.6	10.576 937	0.83	6.98	8	20	40
	23	18	29	39.54	22	22	59.7	10.562 918	0.83	6.99	8	17	05
	24	18	30	00.22	22	22	44.8	10.548 756	0.83	7.00	8	13	29
	25	18	30	20.59	22	22	29.9	10.534 454	0.83	7.01	8	09	53
	26	18	30	40.65	22	22	15.0	10.520 016	0.84	7.02	8	06	17
	27	18	31	00.39	-22	22	00.2	10.505 446	0.84	7.03	8	02	41
	28	18	31	19.81	22	21	45.5	10.490 748	0.84	7.04	7	59	04
Mar.	1	18	31	38.91	22	21	30.8	10.475 925	0.84	7.05	7	55	27
	2	18	31	57.67	22	21	16.2	10.460 980	0.84	7.06	7	51	50
	3	18	32	16.11	22	21	01.7	10.445 917	0.84	7.07	7	48	12
	4	18	32	34.21	22	20	47.2	10.430 740	0.84	7.08	7	44	34
	5	18	32	51.97	-22	20	32.8	10.415 452	0.84	7.09	7	40	56
	6	18	33	09.39	22	20	18.6	10.400 056	0.85	7.10	7	37	17
	7	18	33	26.48	22	20	04.4	10.384 556	0.85	7.11	7	33	38
	8	18	33	43.21	22	19	50.4	10.368 957	0.85	7.12	7	29	59
	9	18	33	59.60	22	19	36.5	10.353 261	0.85	7.13	7	26	19
	10	18	34	15.63	22	19	22.8	10.337 473	0.85	7.14	7	22	39
	11	18	34	31.30	-22	19	09.2	10.321 597	0.85	7.15	7	18	59
	12	18	34	46.61	22	18	55.9	10.305 637	0.85	7.16	7	15	18
	13	18	35	01.55	22	18	42.8	10.289 597	0.85	7.17	7	11	37
	14	18	35	16.12	22	18	29.9	10.273 482	0.86	7.19	7	07	55
	15	18	35	30.31	22	18	17.1	10.257 296	0.86	7.20	7	04	13
	16	18	35	44.12	22	18	04.7	10.241 043	0.86	7.21	7	00	31
	17	18	35	57.55	-22	17	52.4	10.224 728	0.86	7.22	6	56	48
	18	18	36	10.59	22	17	40.4	10.208 356	0.86	7.23	6	53	05
	19	18	36	23.24	22	17	28.6	10.191 931	0.86	7.24	6	49	22
	20	18	36	35.51	22	17	17.0	10.175 459	0.86	7.25	6	45	38
	21	18	36	47.38	22	17	05.7	10.158 943	0.87	7.27	6	41	54
	22	18	36	58.87	22	16	54.7	10.142 390	0.87	7.28	6	38	09
	23	18	37	09.96	-22	16	43.9	10.125 803	0.87	7.29	6	34	24
	24	18	37	20.65	22	16	33.5	10.109 188	0.87	7.30	6	30	39
	25	18	37	30.94	22	16	23.4	10.092 548	0.87	7.31	6	26	53
	26	18	37	40.83	22	16	13.6	10.075 890	0.87	7.33	6	23	07
	27	18	37	50.31	22	16	04.2	10.059 217	0.87	7.34	6	19	20
	28	18	37	59.39	22	15	55.0	10.042 533	0.88	7.35	6	15	33
	29	18	38	08.05	-22	15	46.3	10.025 844	0.88	7.36	6	11	46
	30	18	38	16.30	22	15	37.8	10.009 153	0.88	7.38	6	07	58
	31	18	38	24.14	22	15	29.7	9.992 464	0.88	7.39	6	04	10
Apr.	1	18	38	31.57	22	15	22.0	9.975 783	0.88	7.40	6	00	21
	2	18	38	38.58	-22	15	14.6	9.959 112	0.88	7.41	5	56	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
Apr.	1	18	38	31.57	-22	15	22.0	9.975 783	0.88	7.40	6	00	21
	2	18	38	38.58	22	15	14.6	9.959 112	0.88	7.41	5	56	32
	3	18	38	45.18	22	15	07.5	9.942 457	0.88	7.42	5	52	43
	4	18	38	51.37	22	15	00.8	9.925 822	0.89	7.44	5	48	53
	5	18	38	57.14	22	14	54.5	9.909 211	0.89	7.45	5	45	03
	6	18	39	02.50	22	14	48.7	9.892 629	0.89	7.46	5	41	12
	7	18	39	07.43	-22	14	43.2	9.876 081	0.89	7.47	5	37	21
	8	18	39	11.95	22	14	38.1	9.859 570	0.89	7.49	5	33	29
	9	18	39	16.03	22	14	33.4	9.843 102	0.89	7.50	5	29	37
	10	18	39	19.69	22	14	29.2	9.826 682	0.89	7.51	5	25	45
	11	18	39	22.93	22	14	25.4	9.810 314	0.90	7.52	5	21	52
	12	18	39	25.73	22	14	22.0	9.794 004	0.90	7.54	5	17	59
	13	18	39	28.11	-22	14	19.0	9.777 756	0.90	7.55	5	14	05
	14	18	39	30.05	22	14	16.4	9.761 576	0.90	7.56	5	10	11
	15	18	39	31.57	22	14	14.3	9.745 467	0.90	7.57	5	06	17
	16	18	39	32.66	22	14	12.5	9.729 436	0.90	7.59	5	02	22
	17	18	39	33.32	22	14	11.2	9.713 488	0.91	7.60	4	58	27
	18	18	39	33.56	22	14	10.3	9.697 628	0.91	7.61	4	54	31
	19	18	39	33.38	-22	14	09.8	9.681 860	0.91	7.62	4	50	35
	20	18	39	32.77	22	14	09.7	9.666 190	0.91	7.64	4	46	38
	21	18	39	31.74	22	14	10.1	9.650 622	0.91	7.65	4	42	41
	22	18	39	30.30	22	14	11.0	9.635 162	0.91	7.66	4	38	44
	23	18	39	28.43	22	14	12.3	9.619 814	0.91	7.67	4	34	46
	24	18	39	26.13	22	14	14.0	9.604 582	0.92	7.69	4	30	47
	25	18	39	23.42	-22	14	16.2	9.589 471	0.92	7.70	4	26	49
	26	18	39	20.29	22	14	18.8	9.574 485	0.92	7.71	4	22	50
	27	18	39	16.75	22	14	21.9	9.559 628	0.92	7.72	4	18	50
	28	18	39	12.80	22	14	25.3	9.544 905	0.92	7.73	4	14	50
	29	18	39	08.44	22	14	29.2	9.530 319	0.92	7.75	4	10	50
	30	18	39	03.67	22	14	33.4	9.515 875	0.92	7.76	4	06	49
May	1	18	38	58.50	-22	14	38.1	9.501 577	0.93	7.77	4	02	48
	2	18	38	52.94	22	14	43.2	9.487 428	0.93	7.78	3	58	47
	3	18	38	46.98	22	14	48.7	9.473 434	0.93	7.79	3	54	45
	4	18	38	40.62	22	14	54.6	9.459 597	0.93	7.80	3	50	42
	5	18	38	33.87	22	15	01.0	9.445 924	0.93	7.82	3	46	40
	6	18	38	26.73	22	15	07.7	9.432 417	0.93	7.83	3	42	37
	7	18	38	19.20	-22	15	14.9	9.419 081	0.93	7.84	3	38	33
	8	18	38	11.28	22	15	22.5	9.405 921	0.93	7.85	3	34	29
	9	18	38	02.97	22	15	30.5	9.392 940	0.94	7.86	3	30	25
	10	18	37	54.29	22	15	38.8	9.380 144	0.94	7.87	3	26	21
	11	18	37	45.23	22	15	47.5	9.367 536	0.94	7.88	3	22	16
	12	18	37	35.79	22	15	56.6	9.355 120	0.94	7.89	3	18	10
	13	18	37	25.99	-22	16	06.0	9.342 902	0.94	7.90	3	14	05
	14	18	37	15.83	22	16	15.8	9.330 885	0.94	7.91	3	09	58
	15	18	37	05.32	22	16	25.9	9.319 073	0.94	7.92	3	05	52
	16	18	36	54.46	22	16	36.3	9.307 472	0.94	7.93	3	01	45
	17	18	36	43.25	-22	16	47.0	9.296 084	0.95	7.94	2	57	38

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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	18	36	43.25	-22	16	47.0	9.296 084	0.95	7.94	2	57	38
	18	18	36	31.71	22	16	58.1	9.284 914	0.95	7.95	2	53	31
	19	18	36	19.84	22	17	09.5	9.273 966	0.95	7.96	2	49	23
	20	18	36	07.63	22	17	21.3	9.263 242	0.95	7.97	2	45	15
	21	18	35	55.10	22	17	33.4	9.252 748	0.95	7.98	2	41	07
	22	18	35	42.25	22	17	45.8	9.242 485	0.95	7.99	2	36	58
	23	18	35	29.09	-22	17	58.4	9.232 457	0.95	8.00	2	32	49
	24	18	35	15.63	22	18	11.3	9.222 667	0.95	8.00	2	28	39
	25	18	35	01.87	22	18	24.5	9.213 117	0.95	8.01	2	24	30
	26	18	34	47.82	22	18	37.9	9.203 811	0.96	8.02	2	20	20
	27	18	34	33.50	22	18	51.5	9.194 750	0.96	8.03	2	16	10
	28	18	34	18.90	22	19	05.4	9.185 939	0.96	8.04	2	11	59
	29	18	34	04.03	-22	19	19.5	9.177 379	0.96	8.04	2	07	49
	30	18	33	48.91	22	19	33.8	9.169 073	0.96	8.05	2	03	38
	31	18	33	33.53	22	19	48.4	9.161 023	0.96	8.06	1	59	26
June	1	18	33	17.90	22	20	03.1	9.153 233	0.96	8.06	1	55	15
	2	18	33	02.04	22	20	18.1	9.145 705	0.96	8.07	1	51	03
	3	18	32	45.94	22	20	33.2	9.138 441	0.96	8.08	1	46	51
	4	18	32	29.61	-22	20	48.5	9.131 444	0.96	8.08	1	42	39
	5	18	32	13.06	22	21	04.0	9.124 717	0.96	8.09	1	38	27
	6	18	31	56.30	22	21	19.7	9.118 261	0.96	8.10	1	34	14
	7	18	31	39.34	22	21	35.4	9.112 080	0.97	8.10	1	30	01
	8	18	31	22.18	22	21	51.3	9.106 176	0.97	8.11	1	25	48
	9	18	31	04.83	22	22	07.3	9.100 550	0.97	8.11	1	21	35
	10	18	30	47.31	-22	22	23.4	9.095 206	0.97	8.12	1	17	22
	11	18	30	29.62	22	22	39.6	9.090 145	0.97	8.12	1	13	08
	12	18	30	11.77	22	22	55.9	9.085 370	0.97	8.13	1	08	55
	13	18	29	53.78	22	23	12.2	9.080 883	0.97	8.13	1	04	41
	14	18	29	35.65	22	23	28.6	9.076 685	0.97	8.13	1	00	27
	15	18	29	17.39	22	23	45.1	9.072 777	0.97	8.14	0	56	13
	16	18	28	59.01	-22	24	01.7	9.069 163	0.97	8.14	0	51	59
	17	18	28	40.51	22	24	18.4	9.065 841	0.97	8.14	0	47	44
	18	18	28	21.91	22	24	35.1	9.062 814	0.97	8.15	0	43	30
	19	18	28	03.22	22	24	51.8	9.060 082	0.97	8.15	0	39	15
	20	18	27	44.44	22	25	08.5	9.057 646	0.97	8.15	0	35	01
	21	18	27	25.58	22	25	25.3	9.055 506	0.97	8.15	0	30	46
	22	18	27	06.67	-22	25	42.0	9.053 661	0.97	8.15	0	26	31
	23	18	26	47.70	22	25	58.7	9.052 114	0.97	8.16	0	22	17
	24	18	26	28.70	22	26	15.4	9.050 863	0.97	8.16	0	18	02
	25	18	26	09.66	22	26	32.0	9.049 909	0.97	8.16	0	13	47
	26	18	25	50.60	22	26	48.7	9.049 251	0.97	8.16	0	09	32
	27	18	25	31.53	22	27	05.3	9.048 891	0.97	8.16	0	05	17
	28	18	25	12.45	-22	27	21.9	9.048 827	0.97	8.16	0	01	02
	29	18	24	53.37	22	27	38.4	9.049 061	0.97	8.16	23	52	33
	30	18	24	34.31	22	27	55.0	9.049 591	0.97	8.16	23	48	18
July	1	18	24	15.26	22	28	11.4	9.050 417	0.97	8.16	23	44	03
	2	18	23	56.24	-22	28	27.9	9.051 541	0.97	8.16	23	39	48

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	18	24	15.26	-22	28	11.4	9.050 417	0.97	8.16	23	44	03
	2	18	23	56.24	22	28	27.9	9.051 541	0.97	8.16	23	39	48
	3	18	23	37.26	22	28	44.2	9.052 960	0.97	8.15	23	35	33
	4	18	23	18.33	22	29	00.5	9.054 675	0.97	8.15	23	31	19
	5	18	22	59.45	22	29	16.7	9.056 686	0.97	8.15	23	27	04
	6	18	22	40.64	22	29	32.8	9.058 992	0.97	8.15	23	22	50
	7	18	22	21.91	-22	29	48.8	9.061 593	0.97	8.15	23	18	35
	8	18	22	03.26	22	30	04.6	9.064 487	0.97	8.14	23	14	21
	9	18	21	44.72	22	30	20.4	9.067 675	0.97	8.14	23	10	07
	10	18	21	26.28	22	30	36.1	9.071 156	0.97	8.14	23	05	52
	11	18	21	07.96	22	30	51.6	9.074 929	0.97	8.13	23	01	38
	12	18	20	49.77	22	31	07.1	9.078 991	0.97	8.13	22	57	25
	13	18	20	31.72	-22	31	22.5	9.083 344	0.97	8.13	22	53	11
	14	18	20	13.81	22	31	37.8	9.087 983	0.97	8.12	22	48	57
	15	18	19	56.05	22	31	53.0	9.092 909	0.97	8.12	22	44	44
	16	18	19	38.45	22	32	08.0	9.098 118	0.97	8.11	22	40	31
	17	18	19	21.02	22	32	23.0	9.103 609	0.97	8.11	22	36	18
	18	18	19	03.77	22	32	37.8	9.109 380	0.97	8.10	22	32	05
	19	18	18	46.71	-22	32	52.5	9.115 427	0.96	8.10	22	27	52
	20	18	18	29.86	22	33	07.0	9.121 748	0.96	8.09	22	23	39
	21	18	18	13.21	22	33	21.4	9.128 341	0.96	8.09	22	19	27
	22	18	17	56.78	22	33	35.7	9.135 203	0.96	8.08	22	15	15
	23	18	17	40.57	22	33	49.8	9.142 332	0.96	8.07	22	11	03
	24	18	17	24.60	22	34	03.9	9.149 724	0.96	8.07	22	06	52
	25	18	17	08.86	-22	34	17.8	9.157 378	0.96	8.06	22	02	40
	26	18	16	53.37	22	34	31.6	9.165 291	0.96	8.05	21	58	29
	27	18	16	38.13	22	34	45.3	9.173 460	0.96	8.05	21	54	19
	28	18	16	23.15	22	34	58.8	9.181 882	0.96	8.04	21	50	08
	29	18	16	08.43	22	35	12.3	9.190 555	0.96	8.03	21	45	58
	30	18	15	53.98	22	35	25.6	9.199 475	0.96	8.02	21	41	48
	31	18	15	39.81	-22	35	38.8	9.208 641	0.95	8.02	21	37	38
Aug.	1	18	15	25.92	22	35	51.9	9.218 049	0.95	8.01	21	33	28
	2	18	15	12.32	22	36	04.8	9.227 697	0.95	8.00	21	29	19
	3	18	14	59.02	22	36	17.6	9.237 581	0.95	7.99	21	25	10
	4	18	14	46.03	22	36	30.2	9.247 699	0.95	7.98	21	21	02
	5	18	14	33.35	22	36	42.7	9.258 048	0.95	7.97	21	16	54
	6	18	14	20.99	-22	36	55.1	9.268 624	0.95	7.96	21	12	46
	7	18	14	08.96	22	37	07.3	9.279 424	0.95	7.96	21	08	38
	8	18	13	57.26	22	37	19.5	9.290 446	0.95	7.95	21	04	31
	9	18	13	45.90	22	37	31.5	9.301 685	0.95	7.94	21	00	24
	10	18	13	34.88	22	37	43.4	9.313 138	0.94	7.93	20	56	17
	11	18	13	24.20	22	37	55.3	9.324 802	0.94	7.92	20	52	11
	12	18	13	13.88	-22	38	07.0	9.336 671	0.94	7.91	20	48	05
	13	18	13	03.91	22	38	18.6	9.348 742	0.94	7.90	20	44	00
	14	18	12	54.30	22	38	30.1	9.361 011	0.94	7.89	20	39	55
	15	18	12	45.05	22	38	41.4	9.373 473	0.94	7.88	20	35	50
	16	18	12	36.19	-22	38	52.7	9.386 124	0.94	7.86	20	31	45

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	18	12	36.19	-22	38	52.7	9.386 124	0.94	7.86	20	31	45
	17	18	12	27.70	22	39	03.7	9.398 959	0.94	7.85	20	27	41
	18	18	12	19.59	22	39	14.7	9.411 974	0.93	7.84	20	23	38
	19	18	12	11.87	22	39	25.6	9.425 164	0.93	7.83	20	19	35
	20	18	12	04.54	22	39	36.3	9.438 526	0.93	7.82	20	15	32
	21	18	11	57.60	22	39	47.0	9.452 055	0.93	7.81	20	11	29
	22	18	11	51.05	-22	39	57.6	9.465 746	0.93	7.80	20	07	27
	23	18	11	44.90	22	40	08.1	9.479 596	0.93	7.79	20	03	25
	24	18	11	39.14	22	40	18.5	9.493 600	0.93	7.78	19	59	24
	25	18	11	33.79	22	40	28.7	9.507 755	0.92	7.76	19	55	23
	26	18	11	28.83	22	40	38.9	9.522 055	0.92	7.75	19	51	23
	27	18	11	24.27	22	40	49.0	9.536 496	0.92	7.74	19	47	23
	28	18	11	20.12	-22	40	58.9	9.551 075	0.92	7.73	19	43	23
	29	18	11	16.38	22	41	08.8	9.565 788	0.92	7.72	19	39	24
	30	18	11	13.05	22	41	18.5	9.580 630	0.92	7.71	19	35	25
	31	18	11	10.13	22	41	28.1	9.595 597	0.92	7.69	19	31	26
Sept.	1	18	11	07.62	22	41	37.5	9.610 684	0.92	7.68	19	27	28
	2	18	11	05.54	22	41	46.8	9.625 889	0.91	7.67	19	23	31
	3	18	11	03.88	-22	41	56.1	9.641 206	0.91	7.66	19	19	33
	4	18	11	02.64	22	42	05.2	9.656 631	0.91	7.64	19	15	37
	5	18	11	01.82	22	42	14.2	9.672 159	0.91	7.63	19	11	40
	6	18	11	01.42	22	42	23.1	9.687 787	0.91	7.62	19	07	44
	7	18	11	01.45	22	42	32.0	9.703 510	0.91	7.61	19	03	49
	8	18	11	01.90	22	42	40.7	9.719 321	0.90	7.60	18	59	53
	9	18	11	02.77	-22	42	49.3	9.735 218	0.90	7.58	18	55	59
	10	18	11	04.06	22	42	57.8	9.751 194	0.90	7.57	18	52	05
	11	18	11	05.78	22	43	06.1	9.767 245	0.90	7.56	18	48	11
	12	18	11	07.93	22	43	14.3	9.783 365	0.90	7.55	18	44	17
	13	18	11	10.50	22	43	22.4	9.799 550	0.90	7.53	18	40	24
	14	18	11	13.51	22	43	30.3	9.815 794	0.90	7.52	18	36	32
	15	18	11	16.94	-22	43	38.1	9.832 092	0.89	7.51	18	32	39
	16	18	11	20.80	22	43	45.7	9.848 440	0.89	7.50	18	28	48
	17	18	11	25.09	22	43	53.2	9.864 833	0.89	7.48	18	24	56
	18	18	11	29.80	22	44	00.6	9.881 266	0.89	7.47	18	21	05
	19	18	11	34.93	22	44	07.9	9.897 734	0.89	7.46	18	17	15
	20	18	11	40.48	22	44	15.0	9.914 234	0.89	7.45	18	13	25
	21	18	11	46.44	-22	44	22.0	9.930 759	0.89	7.43	18	09	35
	22	18	11	52.82	22	44	28.8	9.947 307	0.88	7.42	18	05	46
	23	18	11	59.61	22	44	35.5	9.963 872	0.88	7.41	18	01	57
	24	18	12	06.82	22	44	42.0	9.980 450	0.88	7.40	17	58	09
	25	18	12	14.43	22	44	48.3	9.997 037	0.88	7.38	17	54	21
	26	18	12	22.46	22	44	54.5	10.013 629	0.88	7.37	17	50	33
	27	18	12	30.89	-22	45	00.4	10.030 221	0.88	7.36	17	46	46
	28	18	12	39.73	22	45	06.1	10.046 809	0.88	7.35	17	42	59
	29	18	12	48.98	22	45	11.7	10.063 390	0.87	7.34	17	39	13
	30	18	12	58.63	22	45	17.0	10.079 958	0.87	7.32	17	35	27
Oct.	1	18	13	08.69	-22	45	22.2	10.096 509	0.87	7.31	17	31	41

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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	18	13	08.69	-22	45	22.2	10.096 509	0.87	7.31	17	31	41
	2	18	13	19.16	22	45	27.2	10.113 040	0.87	7.30	17	27	56
	3	18	13	30.02	22	45	31.9	10.129 545	0.87	7.29	17	24	11
	4	18	13	41.27	22	45	36.5	10.146 021	0.87	7.28	17	20	27
	5	18	13	52.92	22	45	40.9	10.162 463	0.87	7.26	17	16	43
	6	18	14	04.96	22	45	45.1	10.178 865	0.86	7.25	17	12	59
	7	18	14	17.38	-22	45	49.1	10.195 224	0.86	7.24	17	09	16
	8	18	14	30.19	22	45	52.8	10.211 535	0.86	7.23	17	05	33
	9	18	14	43.38	22	45	56.2	10.227 793	0.86	7.22	17	01	50
	10	18	14	56.96	22	45	59.4	10.243 992	0.86	7.21	16	58	08
	11	18	15	10.92	22	46	02.3	10.260 129	0.86	7.19	16	54	26
	12	18	15	25.25	22	46	04.9	10.276 199	0.86	7.18	16	50	45
	13	18	15	39.96	-22	46	07.3	10.292 197	0.85	7.17	16	47	04
	14	18	15	55.04	22	46	09.5	10.308 120	0.85	7.16	16	43	23
	15	18	16	10.49	22	46	11.4	10.323 962	0.85	7.15	16	39	43
	16	18	16	26.30	22	46	13.0	10.339 720	0.85	7.14	16	36	03
	17	18	16	42.46	22	46	14.3	10.355 389	0.85	7.13	16	32	23
	18	18	16	58.98	22	46	15.4	10.370 966	0.85	7.12	16	28	44
	19	18	17	15.84	-22	46	16.2	10.386 447	0.85	7.11	16	25	05
	20	18	17	33.05	22	46	16.7	10.401 828	0.85	7.10	16	21	27
	21	18	17	50.60	22	46	16.8	10.417 105	0.84	7.09	16	17	49
	22	18	18	08.48	22	46	16.7	10.432 275	0.84	7.08	16	14	11
	23	18	18	26.69	22	46	16.2	10.447 334	0.84	7.07	16	10	33
	24	18	18	45.24	22	46	15.3	10.462 278	0.84	7.06	16	06	56
	25	18	19	04.11	-22	46	14.1	10.477 104	0.84	7.05	16	03	19
	26	18	19	23.31	22	46	12.6	10.491 809	0.84	7.04	15	59	42
	27	18	19	42.84	22	46	10.7	10.506 389	0.84	7.03	15	56	06
	28	18	20	02.68	22	46	08.5	10.520 841	0.84	7.02	15	52	30
	29	18	20	22.84	22	46	05.9	10.535 161	0.83	7.01	15	48	54
	30	18	20	43.30	22	46	03.0	10.549 346	0.83	7.00	15	45	19
	31	18	21	04.07	-22	45	59.7	10.563 393	0.83	6.99	15	41	44
Nov.	1	18	21	25.14	22	45	56.1	10.577 296	0.83	6.98	15	38	09
	2	18	21	46.51	22	45	52.1	10.591 054	0.83	6.97	15	34	35
	3	18	22	08.16	22	45	47.7	10.604 662	0.83	6.96	15	31	01
	4	18	22	30.10	22	45	42.9	10.618 116	0.83	6.95	15	27	27
	5	18	22	52.33	22	45	37.7	10.631 413	0.83	6.94	15	23	53
	6	18	23	14.84	-22	45	32.0	10.644 548	0.83	6.94	15	20	20
	7	18	23	37.63	22	45	26.0	10.657 519	0.83	6.93	15	16	47
	8	18	24	00.70	22	45	19.5	10.670 321	0.82	6.92	15	13	14
	9	18	24	24.03	22	45	12.7	10.682 952	0.82	6.91	15	09	41
	10	18	24	47.63	22	45	05.4	10.695 407	0.82	6.90	15	06	09
	11	18	25	11.50	22	44	57.7	10.707 684	0.82	6.89	15	02	37
	12	18	25	35.61	-22	44	49.5	10.719 779	0.82	6.89	14	59	05
	13	18	25	59.97	22	44	41.0	10.731 690	0.82	6.88	14	55	34
	14	18	26	24.58	22	44	32.0	10.743 413	0.82	6.87	14	52	03
	15	18	26	49.42	22	44	22.6	10.754 947	0.82	6.86	14	48	31
	16	18	27	14.49	-22	44	12.8	10.766 288	0.82	6.86	14	45	01

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

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		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	18	27	14.49	-22	44	12.8	10.766 288	0.82	6.86	14	45	01
	17	18	27	39.79	22	44	02.5	10.777 433	0.82	6.85	14	41	30
	18	18	28	05.31	22	43	51.7	10.788 380	0.82	6.84	14	38	00
	19	18	28	31.05	22	43	40.5	10.799 127	0.81	6.84	14	34	29
	20	18	28	57.00	22	43	28.8	10.809 672	0.81	6.83	14	31	00
	21	18	29	23.16	22	43	16.6	10.820 012	0.81	6.82	14	27	30
	22	18	29	49.53	-22	43	03.9	10.830 144	0.81	6.82	14	24	00
	23	18	30	16.11	22	42	50.7	10.840 068	0.81	6.81	14	20	31
	24	18	30	42.88	22	42	37.1	10.849 780	0.81	6.80	14	17	02
	25	18	31	09.85	22	42	23.0	10.859 280	0.81	6.80	14	13	33
	26	18	31	37.00	22	42	08.4	10.868 563	0.81	6.79	14	10	04
	27	18	32	04.34	22	41	53.4	10.877 629	0.81	6.79	14	06	35
	28	18	32	31.86	-22	41	37.9	10.886 475	0.81	6.78	14	03	07
	29	18	32	59.54	22	41	21.9	10.895 099	0.81	6.78	13	59	39
	30	18	33	27.39	22	41	05.5	10.903 498	0.81	6.77	13	56	11
Dec.	1	18	33	55.40	22	40	48.5	10.911 670	0.81	6.77	13	52	43
	2	18	34	23.58	22	40	31.1	10.919 612	0.81	6.76	13	49	15
	3	18	34	51.90	22	40	13.1	10.927 323	0.80	6.76	13	45	47
	4	18	35	20.38	-22	39	54.6	10.934 799	0.80	6.75	13	42	20
	5	18	35	49.01	22	39	35.6	10.942 040	0.80	6.75	13	38	52
	6	18	36	17.78	22	39	16.1	10.949 042	0.80	6.74	13	35	25
	7	18	36	46.69	22	38	56.2	10.955 804	0.80	6.74	13	31	58
	8	18	37	15.73	22	38	35.7	10.962 324	0.80	6.73	13	28	31
	9	18	37	44.90	22	38	14.8	10.968 600	0.80	6.73	13	25	04
	10	18	38	14.18	-22	37	53.3	10.974 631	0.80	6.73	13	21	37
	11	18	38	43.58	22	37	31.4	10.980 416	0.80	6.72	13	18	11
	12	18	39	13.08	22	37	09.1	10.985 952	0.80	6.72	13	14	44
	13	18	39	42.68	22	36	46.2	10.991 240	0.80	6.72	13	11	18
	14	18	40	12.38	22	36	22.9	10.996 277	0.80	6.71	13	07	52
	15	18	40	42.17	22	35	59.0	11.001 063	0.80	6.71	13	04	25
	16	18	41	12.04	-22	35	34.7	11.005 597	0.80	6.71	13	00	59
	17	18	41	41.99	22	35	09.9	11.009 878	0.80	6.70	12	57	33
	18	18	42	12.02	22	34	44.5	11.013 905	0.80	6.70	12	54	07
	19	18	42	42.13	22	34	18.7	11.017 677	0.80	6.70	12	50	41
	20	18	43	12.30	22	33	52.4	11.021 195	0.80	6.70	12	47	15
	21	18	43	42.54	22	33	25.6	11.024 458	0.80	6.70	12	43	50
	22	18	44	12.84	-22	32	58.3	11.027 465	0.80	6.69	12	40	24
	23	18	44	43.20	22	32	30.6	11.030 215	0.80	6.69	12	36	58
	24	18	45	13.60	22	32	02.5	11.032 708	0.80	6.69	12	33	33
	25	18	45	44.05	22	31	33.9	11.034 944	0.80	6.69	12	30	07
	26	18	46	14.53	22	31	04.9	11.036 922	0.80	6.69	12	26	41
	27	18	46	45.04	22	30	35.4	11.038 641	0.80	6.69	12	23	16
	28	18	47	15.57	-22	30	05.5	11.040 100	0.80	6.69	12	19	50
	29	18	47	46.14	22	29	35.1	11.041 298	0.80	6.69	12	16	25
	30	18	48	16.72	22	29	04.3	11.042 236	0.80	6.69	12	12	59
	31	18	48	47.32	22	28	33.0	11.042 911	0.80	6.68	12	09	34
	32	18	49	17.93	-22	28	01.1	11.043 324	0.80	6.68	12	06	08

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Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Jan. 1	27 19 17.8	-0 33 45.0	19.902 67	Apr. 3	28 19 32.7	-0 33 11.4	19.892 69
3	27 20 36.4	0 33 44.3	19.902 45	5	28 20 51.3	0 33 10.7	19.892 47
5	27 21 54.9	0 33 43.5	19.902 24	7	28 22 10.0	0 33 09.9	19.892 25
7	27 23 13.5	0 33 42.8	19.902 02	9	28 23 28.6	0 33 09.2	19.892 03
9	27 24 32.0	0 33 42.1	19.901 81	11	28 24 47.2	0 33 08.4	19.891 82
11	27 25 50.6	0 33 41.4	19.901 59	13	28 26 05.9	0 33 07.7	19.891 60
13	27 27 09.1	-0 33 40.6	19.901 38	15	28 27 24.5	-0 33 07.0	19.891 38
15	27 28 27.7	0 33 39.9	19.901 16	17	28 28 43.1	0 33 06.2	19.891 16
17	27 29 46.2	0 33 39.2	19.900 95	19	28 30 01.8	0 33 05.5	19.890 94
19	27 31 04.8	0 33 38.5	19.900 73	21	28 31 20.4	0 33 04.7	19.890 72
21	27 32 23.3	0 33 37.7	19.900 51	23	28 32 39.0	0 33 04.0	19.890 50
23	27 33 41.9	0 33 37.0	19.900 30	25	28 33 57.7	0 33 03.2	19.890 28
25	27 35 00.5	-0 33 36.3	19.900 08	27	28 35 16.3	-0 33 02.5	19.890 06
27	27 36 19.0	0 33 35.5	19.899 87	29	28 36 35.0	0 33 01.8	19.889 84
29	27 37 37.6	0 33 34.8	19.899 65	May 1	28 37 53.7	0 33 01.0	19.889 62
31	27 38 56.2	0 33 34.1	19.899 43	3	28 39 12.3	0 33 00.3	19.889 40
Feb. 2	27 40 14.7	0 33 33.4	19.899 22	5	28 40 31.0	0 32 59.6	19.889 18
4	27 41 33.3	0 33 32.6	19.899 00	7	28 41 49.6	0 32 58.8	19.888 96
6	27 42 51.9	-0 33 31.9	19.898 79	9	28 43 08.3	-0 32 58.1	19.888 74
8	27 44 10.5	0 33 31.2	19.898 57	11	28 44 26.9	0 32 57.3	19.888 52
10	27 45 29.0	0 33 30.5	19.898 35	13	28 45 45.6	0 32 56.6	19.888 30
12	27 46 47.6	0 33 29.7	19.898 14	15	28 47 04.3	0 32 55.8	19.888 08
14	27 48 06.2	0 33 29.0	19.897 92	17	28 48 22.9	0 32 55.1	19.887 86
16	27 49 24.8	0 33 28.3	19.897 70	19	28 49 41.6	0 32 54.3	19.887 64
18	27 50 43.4	-0 33 27.5	19.897 49	21	28 51 00.2	-0 32 53.6	19.887 41
20	27 52 01.9	0 33 26.8	19.897 27	23	28 52 18.9	0 32 52.9	19.887 19
22	27 53 20.6	0 33 26.1	19.897 05	25	28 53 37.6	0 32 52.1	19.886 97
24	27 54 39.1	0 33 25.3	19.896 83	27	28 54 56.3	0 32 51.4	19.886 75
26	27 55 57.7	0 33 24.6	19.896 62	29	28 56 14.9	0 32 50.6	19.886 53
28	27 57 16.3	0 33 23.9	19.896 40	31	28 57 33.6	0 32 49.9	19.886 31
Mar. 2	27 58 34.9	-0 33 23.2	19.896 18	June 2	28 58 52.3	-0 32 49.1	19.886 09
4	27 59 53.5	0 33 22.4	19.895 97	4	29 00 11.0	0 32 48.4	19.885 87
6	28 01 12.1	0 33 21.7	19.895 75	6	29 01 29.7	0 32 47.6	19.885 65
8	28 02 30.7	0 33 20.9	19.895 53	8	29 02 48.4	0 32 46.9	19.885 42
10	28 03 49.3	0 33 20.2	19.895 31	10	29 04 07.0	0 32 46.2	19.885 20
12	28 05 07.9	0 33 19.5	19.895 09	12	29 05 25.7	0 32 45.4	19.884 98
14	28 06 26.5	-0 33 18.7	19.894 88	14	29 06 44.4	-0 32 44.6	19.884 76
16	28 07 45.1	0 33 18.0	19.894 66	16	29 08 03.1	0 32 43.9	19.884 54
18	28 09 03.7	0 33 17.3	19.894 44	18	29 09 21.8	0 32 43.2	19.884 31
20	28 10 22.4	0 33 16.5	19.894 22	20	29 10 40.5	0 32 42.4	19.884 09
22	28 11 41.0	0 33 15.8	19.894 00	22	29 11 59.2	0 32 41.7	19.883 87
24	28 12 59.6	0 33 15.1	19.893 79	24	29 13 17.9	0 32 40.9	19.883 65
26	28 14 18.2	-0 33 14.3	19.893 57	26	29 14 36.6	-0 32 40.1	19.883 43
28	28 15 36.8	0 33 13.6	19.893 35	28	29 15 55.3	0 32 39.4	19.883 20
30	28 16 55.5	0 33 12.9	19.893 13	30	29 17 14.0	0 32 38.7	19.882 98
Apr. 1	28 18 14.1	0 33 12.1	19.892 91	July 2	29 18 32.7	0 32 37.9	19.882 76
3	28 19 32.7	-0 33 11.4	19.892 69	4	29 19 51.5	-0 32 37.1	19.882 54

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Date		Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector	Date		Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector
July	2	29 18 32.7	-0 32 37.9	19.882 76	Oct.	2	30 18 55.6	-0 32 03.0	19.872 44
	4	29 19 51.5	0 32 37.1	19.882 54		4	30 20 14.4	0 32 02.3	19.872 21
	6	29 21 10.2	0 32 36.4	19.882 31		6	30 21 33.2	0 32 01.5	19.871 98
	8	29 22 28.9	0 32 35.7	19.882 09		8	30 22 52.0	0 32 00.8	19.871 76
	10	29 23 47.6	0 32 34.9	19.881 87		10	30 24 10.8	0 32 00.0	19.871 53
	12	29 25 06.3	0 32 34.1	19.881 65		12	30 25 29.6	0 31 59.2	19.871 30
	14	29 26 25.1	-0 32 33.4	19.881 42		14	30 26 48.5	-0 31 58.4	19.871 08
	16	29 27 43.8	0 32 32.7	19.881 20		16	30 28 07.2	0 31 57.7	19.870 85
	18	29 29 02.5	0 32 31.9	19.880 98		18	30 29 26.1	0 31 56.9	19.870 62
	20	29 30 21.2	0 32 31.1	19.880 75		20	30 30 44.9	0 31 56.2	19.870 40
	22	29 31 39.9	0 32 30.4	19.880 53		22	30 32 03.7	0 31 55.4	19.870 17
	24	29 32 58.7	0 32 29.6	19.880 31		24	30 33 22.6	0 31 54.6	19.869 94
	26	29 34 17.4	-0 32 28.9	19.880 08		26	30 34 41.4	-0 31 53.8	19.869 71
	28	29 35 36.2	0 32 28.1	19.879 86		28	30 36 00.2	0 31 53.1	19.869 49
	30	29 36 54.9	0 32 27.4	19.879 64		30	30 37 19.0	0 31 52.3	19.869 26
Aug.	1	29 38 13.6	0 32 26.6	19.879 41	Nov.	1	30 38 37.9	0 31 51.6	19.869 03
	3	29 39 32.4	0 32 25.8	19.879 19		3	30 39 56.7	0 31 50.8	19.868 80
	5	29 40 51.1	0 32 25.1	19.878 97		5	30 41 15.6	0 31 50.0	19.868 58
	7	29 42 09.9	-0 32 24.3	19.878 74		7	30 42 34.4	-0 31 49.2	19.868 35
	9	29 43 28.6	0 32 23.6	19.878 52		9	30 43 53.2	0 31 48.5	19.868 12
	11	29 44 47.3	0 32 22.8	19.878 29		11	30 45 12.1	0 31 47.7	19.867 89
	13	29 46 06.1	0 32 22.1	19.878 07		13	30 46 30.9	0 31 46.9	19.867 66
	15	29 47 24.9	0 32 21.3	19.877 85		15	30 47 49.8	0 31 46.2	19.867 43
	17	29 48 43.6	0 32 20.6	19.877 62		17	30 49 08.6	0 31 45.4	19.867 21
	19	29 50 02.4	-0 32 19.8	19.877 40		19	30 50 27.5	-0 31 44.6	19.866 98
	21	29 51 21.1	0 32 19.0	19.877 17		21	30 51 46.3	0 31 43.9	19.866 75
	23	29 52 39.9	0 32 18.3	19.876 95		23	30 53 05.2	0 31 43.1	19.866 52
	25	29 53 58.7	0 32 17.5	19.876 72		25	30 54 24.0	0 31 42.3	19.866 29
	27	29 55 17.4	0 32 16.8	19.876 50		27	30 55 42.9	0 31 41.5	19.866 06
	29	29 56 36.2	0 32 16.0	19.876 27		29	30 57 01.8	0 31 40.7	19.865 83
	31	29 57 55.0	-0 32 15.2	19.876 05	Dec.	1	30 58 20.6	-0 31 40.0	19.865 60
Sept.	2	29 59 13.7	0 32 14.5	19.875 82		3	30 59 39.5	0 31 39.2	19.865 38
	4	30 00 32.5	0 32 13.7	19.875 60		5	31 00 58.4	0 31 38.4	19.865 15
	6	30 01 51.3	0 32 13.0	19.875 37		7	31 02 17.2	0 31 37.7	19.864 92
	8	30 03 10.1	0 32 12.2	19.875 15		9	31 03 36.1	0 31 36.9	19.864 69
	10	30 04 28.9	0 32 11.4	19.874 92		11	31 04 55.0	0 31 36.1	19.864 46
	12	30 05 47.6	-0 32 10.7	19.874 70		13	31 06 13.9	-0 31 35.3	19.864 23
	14	30 07 06.4	0 32 09.9	19.874 47		15	31 07 32.7	0 31 34.6	19.864 00
	16	30 08 25.2	0 32 09.2	19.874 25		17	31 08 51.6	0 31 33.8	19.863 77
	18	30 09 44.0	0 32 08.4	19.874 02		19	31 10 10.5	0 31 33.0	19.863 54
	20	30 11 02.8	0 32 07.6	19.873 79		21	31 11 29.4	0 31 32.2	19.863 31
	22	30 12 21.6	0 32 06.9	19.873 57		23	31 12 48.3	0 31 31.5	19.863 08
	24	30 13 40.4	-0 32 06.1	19.873 34		25	31 14 07.1	-0 31 30.7	19.862 85
	26	30 14 59.2	0 32 05.4	19.873 12		27	31 15 26.0	0 31 29.9	19.862 62
	28	30 16 18.0	0 32 04.6	19.872 89		29	31 16 44.9	0 31 29.1	19.862 39
	30	30 17 36.8	0 32 03.8	19.872 66		31	31 18 03.8	0 31 28.4	19.862 16
Oct.	2	30 18 55.6	-0 32 03.0	19.872 44		33	31 19 22.7	-0 31 27.6	19.861 93

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	24	34	23.6	-0	34	14.4	Feb.	15	25	21	49.0	-0	32	40.7
	1	24	34	17.1	0	34	12.2		16	25	23	56.9	0	32	38.9
	2	24	34	13.7	0	34	10.1		17	25	26	07.2	0	32	37.2
	3	24	34	13.5	0	34	08.0		18	25	28	19.9	0	32	35.4
	4	24	34	16.3	0	34	05.9		19	25	30	35.0	0	32	33.7
	5	24	34	22.1	0	34	03.7		20	25	32	52.3	0	32	32.0
	6	24	34	31.0	-0	34	01.6		21	25	35	12.0	-0	32	30.3
	7	24	34	43.0	0	33	59.4		22	25	37	34.0	0	32	28.6
	8	24	34	58.1	0	33	57.3		23	25	39	58.2	0	32	27.0
	9	24	35	16.4	0	33	55.2		24	25	42	24.7	0	32	25.3
	10	24	35	37.8	0	33	53.0		25	25	44	53.3	0	32	23.7
	11	24	36	02.3	0	33	50.9		26	25	47	24.0	0	32	22.1
	12	24	36	30.1	-0	33	48.8		27	25	49	56.9	-0	32	20.5
	13	24	37	01.0	0	33	46.6		28	25	52	31.6	0	32	19.0
	14	24	37	35.0	0	33	44.5	Mar.	1	25	55	08.4	0	32	17.4
	15	24	38	12.2	0	33	42.4		2	25	57	47.0	0	32	15.9
	16	24	38	52.6	0	33	40.3		3	26	0	27.5	0	32	14.4
	17	24	39	36.0	0	33	38.1		4	26	3	09.9	0	32	12.9
	18	24	40	22.5	-0	33	36.0		5	26	5	54.2	-0	32	11.5
	19	24	41	12.0	0	33	33.9		6	26	8	40.3	0	32	10.0
	20	24	42	04.6	0	33	31.8		7	26	11	28.2	0	32	08.6
	21	24	43	00.3	0	33	29.8		8	26	14	17.9	0	32	07.2
	22	24	43	58.9	0	33	27.7		9	26	17	09.3	0	32	05.9
	23	24	45	00.6	0	33	25.6		10	26	20	02.5	0	32	04.5
	24	24	46	05.3	-0	33	23.5		11	26	22	57.3	-0	32	03.2
	25	24	47	13.1	0	33	21.5		12	26	25	53.7	0	32	01.9
	26	24	48	23.8	0	33	19.4		13	26	28	51.6	0	32	00.6
	27	24	49	37.5	0	33	17.4		14	26	31	51.1	0	31	59.4
	28	24	50	54.2	0	33	15.3		15	26	34	52.0	0	31	58.1
	29	24	52	13.9	0	33	13.3		16	26	37	54.3	0	31	56.9
	30	24	53	36.4	-0	33	11.3		17	26	40	58.0	-0	31	55.8
	31	24	55	01.8	0	33	09.2		18	26	44	03.0	0	31	54.6
Feb.	1	24	56	29.9	0	33	07.2		19	26	47	09.4	0	31	53.5
	2	24	58	00.9	0	33	05.3		20	26	50	17.0	0	31	52.4
	3	24	59	34.5	0	33	03.3		21	26	53	25.9	0	31	51.3
	4	25	1	10.9	0	33	01.3		22	26	56	36.0	0	31	50.2
	5	25	2	50.1	-0	32	59.4		23	26	59	47.3	-0	31	49.1
	6	25	4	32.0	0	32	57.4		24	27	2	59.8	0	31	48.1
	7	25	6	16.6	0	32	55.5		25	27	6	13.3	0	31	47.1
	8	25	8	04.0	0	32	53.6		26	27	9	27.8	0	31	46.1
	9	25	9	54.0	0	32	51.7		27	27	12	43.3	0	31	45.2
	10	25	11	46.8	0	32	49.8		28	27	15	59.6	0	31	44.3
	11	25	13	42.1	-0	32	48.0		29	27	19	16.7	-0	31	43.3
	12	25	15	40.0	0	32	46.1		30	27	22	34.7	0	31	42.5
	13	25	17	40.5	0	32	44.3		31	27	25	53.4	0	31	41.6
	14	25	19	43.5	0	32	42.5	Apr.	1	27	29	12.9	0	31	40.8
	15	25	21	49.0	-0	32	40.7		2	27	32	33.2	-0	31	40.0

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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	27	29	12.9	-0	31	40.8	May	17	30	4	20.6	-0	31	29.2
	2	27	32	33.2	0	31	40.0		18	30	7	30.6	0	31	29.5
	3	27	35	54.2	0	31	39.2		19	30	10	39.5	0	31	29.8
	4	27	39	15.8	0	31	38.4		20	30	13	47.1	0	31	30.2
	5	27	42	38.1	0	31	37.7		21	30	16	53.4	0	31	30.6
	6	27	46	01.1	0	31	37.0		22	30	19	58.4	0	31	30.9
	7	27	49	24.5	-0	31	36.3		23	30	23	02.0	-0	31	31.3
	8	27	52	48.5	0	31	35.7		24	30	26	04.2	0	31	31.8
	9	27	56	12.9	0	31	35.1		25	30	29	05.0	0	31	32.2
	10	27	59	37.7	0	31	34.5		26	30	32	04.4	0	31	32.7
	11	28	3	02.9	0	31	33.9		27	30	35	02.4	0	31	33.2
	12	28	6	28.3	0	31	33.3		28	30	37	58.9	0	31	33.7
	13	28	9	54.0	-0	31	32.8		29	30	40	54.0	-0	31	34.3
	14	28	13	20.0	0	31	32.3		30	30	43	47.6	0	31	34.8
	15	28	16	46.1	0	31	31.8		31	30	46	39.6	0	31	35.4
	16	28	20	12.4	0	31	31.4	June	1	30	49	30.0	0	31	36.0
	17	28	23	38.9	0	31	31.0		2	30	52	18.7	0	31	36.6
	18	28	27	05.6	0	31	30.9		3	30	55	05.8	0	31	37.3
	19	28	30	31.4	-0	31	30.7		4	30	57	51.1	-0	31	37.9
	20	28	33	58.1	0	31	29.9		5	31	0	34.7	0	31	38.6
	21	28	37	24.8	0	31	29.5		6	31	3	16.4	0	31	39.3
	22	28	40	51.3	0	31	29.2		7	31	5	56.4	0	31	40.0
	23	28	44	17.6	0	31	28.9		8	31	8	34.4	0	31	40.8
	24	28	47	43.7	0	31	28.6		9	31	11	10.6	0	31	41.5
	25	28	51	09.5	-0	31	28.3		10	31	13	44.9	-0	31	42.3
	26	28	54	34.9	0	31	28.1		11	31	16	17.3	0	31	43.1
	27	28	58	00.0	0	31	27.9		12	31	18	47.7	0	31	43.9
	28	29	1	24.8	0	31	27.8		13	31	21	16.2	0	31	44.7
	29	29	4	49.1	0	31	27.6		14	31	23	42.7	0	31	45.5
	30	29	8	13.1	0	31	27.5		15	31	26	07.1	0	31	46.4
May	1	29	11	36.7	-0	31	27.4		16	31	28	29.4	-0	31	47.3
	2	29	14	59.8	0	31	27.4		17	31	30	49.5	0	31	48.1
	3	29	18	22.4	0	31	27.3		18	31	33	07.4	0	31	49.0
	4	29	21	44.4	0	31	27.3		19	31	35	23.0	0	31	50.0
	5	29	25	05.9	0	31	27.3		20	31	37	36.4	0	31	50.9
	6	29	28	26.7	0	31	27.3		21	31	39	47.4	0	31	51.8
	7	29	31	46.8	-0	31	27.4		22	31	41	56.2	-0	31	52.8
	8	29	35	06.1	0	31	27.5		23	31	44	02.7	0	31	53.8
	9	29	38	24.7	0	31	27.6		24	31	46	06.9	0	31	54.8
	10	29	41	42.4	0	31	27.7		25	31	48	08.9	0	31	55.8
	11	29	44	59.2	0	31	27.9		26	31	50	08.4	0	31	56.8
	12	29	48	15.2	0	31	28.0		27	31	52	05.6	0	31	57.8
	13	29	51	30.2	-0	31	28.2		28	31	54	00.4	-0	31	58.9
	14	29	54	44.3	0	31	28.5		29	31	55	52.8	0	32	00.0
	15	29	57	57.4	0	31	28.7		30	31	57	42.7	0	32	01.0
	16	30	1	09.5	0	31	28.9	July	1	31	59	30.1	0	32	02.1
	17	30	4	20.6	-0	31	29.2		2	32	1	14.9	-0	32	03.2

URANUS, 2018

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	31	59	30.1	-0	32	02.1	Aug.	16	32	31	56.5	-0	32	58.5
	2	32	1	14.9	0	32	03.2		17	32	31	30.5	0	32	59.7
	3	32	2	57.2	0	32	04.4		18	32	31	01.5	0	33	00.9
	4	32	4	36.9	0	32	05.5		19	32	30	29.8	0	33	02.0
	5	32	6	13.9	0	32	06.6		20	32	29	55.2	0	33	03.2
	6	32	7	48.4	0	32	07.8		21	32	29	17.7	0	33	04.4
	7	32	9	20.3	-0	32	08.9		22	32	28	37.5	-0	33	05.5
	8	32	10	49.5	0	32	10.1		23	32	27	54.4	0	33	06.7
	9	32	12	16.1	0	32	11.2		24	32	27	08.6	0	33	07.8
	10	32	13	40.1	0	32	12.4		25	32	26	19.9	0	33	08.9
	11	32	15	01.4	0	32	13.6		26	32	25	28.5	0	33	10.0
	12	32	16	20.0	0	32	14.8		27	32	24	34.3	0	33	11.1
	13	32	17	35.9	-0	32	16.0		28	32	23	37.3	-0	33	12.2
	14	32	18	48.9	0	32	17.2		29	32	22	37.6	0	33	13.3
	15	32	19	59.1	0	32	18.4		30	32	21	35.3	0	33	14.3
	16	32	21	06.5	0	32	19.6		31	32	20	30.3	0	33	15.3
	17	32	22	10.9	0	32	20.9	Sept.	1	32	19	22.7	0	33	16.4
	18	32	23	12.5	0	32	22.1		2	32	18	12.5	0	33	17.4
	19	32	24	11.2	-0	32	23.3		3	32	16	59.8	-0	33	18.3
	20	32	25	07.1	0	32	24.6		4	32	15	44.6	0	33	19.3
	21	32	26	00.2	0	32	25.8		5	32	14	26.8	0	33	20.2
	22	32	26	50.5	0	32	27.1		6	32	13	06.6	0	33	21.1
	23	32	27	37.9	0	32	28.3		7	32	11	43.8	0	33	22.0
	24	32	28	22.4	0	32	29.6		8	32	10	18.5	0	33	22.9
	25	32	29	04.0	-0	32	30.9		9	32	8	50.8	-0	33	23.8
	26	32	29	42.8	0	32	32.1		10	32	7	20.6	0	33	24.6
	27	32	30	18.7	0	32	33.4		11	32	5	48.0	0	33	25.4
	28	32	30	51.6	0	32	34.7		12	32	4	13.1	0	33	26.3
	29	32	31	21.5	0	32	36.0		13	32	2	36.0	0	33	27.0
	30	32	31	48.6	0	32	37.3		14	32	0	56.7	0	33	27.8
	31	32	32	12.6	-0	32	38.5		15	31	59	15.2	-0	33	28.5
Aug.	1	32	32	33.7	0	32	39.8		16	31	57	31.6	0	33	29.2
	2	32	32	51.8	0	32	41.1		17	31	55	46.0	0	33	29.9
	3	32	33	07.0	0	32	42.4		18	31	53	58.3	0	33	30.6
	4	32	33	19.3	0	32	43.6		19	31	52	08.7	0	33	31.3
	5	32	33	28.6	0	32	44.9		20	31	50	17.0	0	33	31.9
	6	32	33	35.0	-0	32	46.1		21	31	48	23.4	-0	33	32.5
	7	32	33	38.6	0	32	47.4		22	31	46	27.9	0	33	33.0
	8	32	33	39.1	0	32	48.7		23	31	44	30.5	0	33	33.6
	9	32	33	36.8	0	32	49.9		24	31	42	31.3	0	33	34.1
	10	32	33	31.5	0	32	51.1		25	31	40	30.4	0	33	34.6
	11	32	33	23.1	0	32	52.4		26	31	38	27.7	0	33	35.1
	12	32	33	11.8	-0	32	53.6		27	31	36	23.5	-0	33	35.5
	13	32	32	57.4	0	32	54.8		28	31	34	17.7	0	33	35.9
	14	32	32	40.0	0	32	56.0		29	31	32	10.3	0	33	36.3
	15	32	32	19.7	0	32	57.3		30	31	30	01.5	0	33	36.6
	16	32	31	56.5	-0	32	58.5	Oct.	1	31	27	51.3	-0	33	36.9

URANUS, 2018
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	31	27	51.3	-0	33	36.9	Nov.	16	29	39	02.2	-0	33	17.2
	2	31	25	39.8	0	33	37.2		17	29	36	52.1	0	33	16.0
	3	31	23	26.8	0	33	37.4		18	29	34	43.4	0	33	14.8
	4	31	21	12.6	0	33	37.7		19	29	32	36.3	0	33	13.6
	5	31	18	57.1	0	33	37.9		20	29	30	30.8	0	33	12.4
	6	31	16	40.3	0	33	38.0		21	29	28	26.9	0	33	11.1
	7	31	14	22.4	-0	33	38.1		22	29	26	24.8	-0	33	09.8
	8	31	12	03.4	0	33	38.2		23	29	24	24.5	0	33	08.4
	9	31	9	43.3	0	33	38.3		24	29	22	26.1	0	33	07.1
	10	31	7	22.3	0	33	38.4		25	29	20	29.5	0	33	05.7
	11	31	5	00.5	0	33	38.4		26	29	18	34.9	0	33	04.2
	12	31	2	37.9	0	33	38.3		27	29	16	42.2	0	33	02.8
	13	31	0	14.6	-0	33	38.3		28	29	14	51.5	-0	33	01.3
	14	30	57	50.7	0	33	38.2		29	29	13	02.8	0	32	59.8
	15	30	55	26.1	0	33	38.1		30	29	11	16.1	0	32	58.3
	16	30	53	01.0	0	33	38.0	Dec.	1	29	9	31.5	0	32	56.8
	17	30	50	35.3	0	33	37.8		2	29	7	49.1	0	32	55.2
	18	30	48	09.2	0	33	37.6		3	29	6	09.0	0	32	53.6
	19	30	45	42.8	-0	33	37.3		4	29	4	31.1	-0	32	52.0
	20	30	43	15.9	0	33	37.1		5	29	2	55.7	0	32	50.4
	21	30	40	48.8	0	33	36.7		6	29	1	22.7	0	32	48.7
	22	30	38	21.5	0	33	36.4		7	28	59	52.1	0	32	47.1
	23	30	35	54.1	0	33	36.0		8	28	58	24.0	0	32	45.4
	24	30	33	26.6	0	33	35.6		9	28	56	58.5	0	32	43.7
	25	30	30	59.1	-0	33	35.2		10	28	55	35.5	-0	32	41.9
	26	30	28	31.7	0	33	34.7		11	28	54	15.1	0	32	40.2
	27	30	26	04.5	0	33	34.2		12	28	52	57.3	0	32	38.4
	28	30	23	37.5	0	33	33.6		13	28	51	42.1	0	32	36.7
	29	30	21	10.8	0	33	33.0		14	28	50	29.6	0	32	34.9
	30	30	18	44.4	0	33	32.4		15	28	49	19.8	0	32	33.1
	31	30	16	18.4	-0	33	31.8		16	28	48	12.7	-0	32	31.2
Nov.	1	30	13	52.7	0	33	31.1		17	28	47	08.4	0	32	29.4
	2	30	11	27.5	0	33	30.4		18	28	46	06.9	0	32	27.5
	3	30	9	02.7	0	33	29.6		19	28	45	08.3	0	32	25.7
	4	30	6	38.6	0	33	28.9		20	28	44	12.6	0	32	23.8
	5	30	4	15.1	0	33	28.1		21	28	43	19.8	0	32	21.9
	6	30	1	52.4	-0	33	27.2		22	28	42	29.9	-0	32	19.9
	7	29	59	30.5	0	33	26.4		23	28	41	43.0	0	32	18.0
	8	29	57	09.6	0	33	25.5		24	28	40	59.1	0	32	16.1
	9	29	54	49.6	0	33	24.5		25	28	40	18.1	0	32	14.1
	10	29	52	30.7	0	33	23.6		26	28	39	39.9	0	32	12.2
	11	29	50	13.0	0	33	22.6		27	28	39	04.8	0	32	10.2
	12	29	47	56.3	-0	33	21.6		28	28	38	32.5	-0	32	08.2
	13	29	45	40.9	0	33	20.5		29	28	38	03.3	0	32	06.2
	14	29	43	26.7	0	33	19.4		30	28	37	37.1	0	32	04.2
	15	29	41	13.8	0	33	18.3		31	28	37	14.0	0	32	02.2
	16	29	39	02.2	-0	33	17.2		32	28	36	54.1	-0	32	00.2

URANUS, 2018
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	1	31	53.39	+8	59	19.9	19.624 318	0.45	1.78	18	50	21
	1	1	31	52.93	8	59	19.5	19.640 956	0.45	1.78	18	46	25
	2	1	31	52.66	8	59	20.2	19.657 666	0.45	1.78	18	42	29
	3	1	31	52.59	8	59	22.1	19.674 444	0.45	1.78	18	38	33
	4	1	31	52.71	8	59	25.1	19.691 285	0.45	1.78	18	34	37
	5	1	31	53.03	8	59	29.3	19.708 184	0.45	1.78	18	30	42
	6	1	31	53.53	+8	59	34.6	19.725 136	0.45	1.78	18	26	46
	7	1	31	54.23	8	59	41.0	19.742 137	0.45	1.77	18	22	51
	8	1	31	55.13	8	59	48.5	19.759 181	0.45	1.77	18	18	56
	9	1	31	56.22	8	59	57.2	19.776 263	0.44	1.77	18	15	02
	10	1	31	57.51	9	00	07.0	19.793 377	0.44	1.77	18	11	07
	11	1	31	59.00	9	00	18.0	19.810 519	0.44	1.77	18	07	13
	12	1	32	00.69	+9	00	30.1	19.827 682	0.44	1.77	18	03	19
	13	1	32	02.58	9	00	43.4	19.844 862	0.44	1.76	17	59	25
	14	1	32	04.67	9	00	57.9	19.862 053	0.44	1.76	17	55	31
	15	1	32	06.95	9	01	13.4	19.879 249	0.44	1.76	17	51	38
	16	1	32	09.43	9	01	30.2	19.896 445	0.44	1.76	17	47	45
	17	1	32	12.11	9	01	48.1	19.913 635	0.44	1.76	17	43	51
	18	1	32	14.98	+9	02	07.0	19.930 813	0.44	1.76	17	39	58
	19	1	32	18.04	9	02	27.2	19.947 975	0.44	1.76	17	36	06
	20	1	32	21.29	9	02	48.4	19.965 115	0.44	1.75	17	32	13
	21	1	32	24.73	9	03	10.7	19.982 227	0.44	1.75	17	28	21
	22	1	32	28.37	9	03	34.1	19.999 305	0.44	1.75	17	24	29
	23	1	32	32.19	9	03	58.6	20.016 345	0.44	1.75	17	20	37
	24	1	32	36.21	+9	04	24.2	20.033 341	0.44	1.75	17	16	45
	25	1	32	40.41	9	04	50.9	20.050 289	0.44	1.75	17	12	53
	26	1	32	44.80	9	05	18.7	20.067 182	0.44	1.75	17	09	02
	27	1	32	49.39	9	05	47.5	20.084 016	0.44	1.74	17	05	11
	28	1	32	54.16	9	06	17.4	20.100 786	0.44	1.74	17	01	20
	29	1	32	59.11	9	06	48.5	20.117 489	0.44	1.74	16	57	29
	30	1	33	04.25	+9	07	20.5	20.134 118	0.44	1.74	16	53	38
	31	1	33	09.56	9	07	53.6	20.150 670	0.44	1.74	16	49	48
Feb.	1	1	33	15.06	9	08	27.7	20.167 140	0.44	1.74	16	45	57
	2	1	33	20.72	9	09	02.8	20.183 525	0.44	1.74	16	42	07
	3	1	33	26.56	9	09	38.8	20.199 819	0.44	1.73	16	38	17
	4	1	33	32.57	9	10	15.9	20.216 018	0.44	1.73	16	34	27
	5	1	33	38.75	+9	10	53.9	20.232 118	0.43	1.73	16	30	38
	6	1	33	45.11	9	11	32.9	20.248 115	0.43	1.73	16	26	48
	7	1	33	51.65	9	12	12.8	20.264 003	0.43	1.73	16	22	59
	8	1	33	58.35	9	12	53.8	20.279 778	0.43	1.73	16	19	10
	9	1	34	05.22	9	13	35.7	20.295 436	0.43	1.73	16	15	21
	10	1	34	12.27	9	14	18.5	20.310 972	0.43	1.72	16	11	32
	11	1	34	19.48	+9	15	02.3	20.326 380	0.43	1.72	16	07	44
	12	1	34	26.85	9	15	47.0	20.341 658	0.43	1.72	16	03	55
	13	1	34	34.38	9	16	32.6	20.356 800	0.43	1.72	16	00	07
	14	1	34	42.08	9	17	19.2	20.371 801	0.43	1.72	15	56	19
	15	1	34	49.92	+9	18	06.5	20.386 657	0.43	1.72	15	52	31

URANUS, 2018
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	1	34	49.92	+9	18	06.5	20.386 657	0.43	1.72	15	52	31
	16	1	34	57.93	9	18	54.8	20.401 364	0.43	1.72	15	48	43
	17	1	35	06.08	9	19	43.9	20.415 918	0.43	1.72	15	44	55
	18	1	35	14.39	9	20	33.8	20.430 314	0.43	1.71	15	41	08
	19	1	35	22.84	9	21	24.6	20.444 548	0.43	1.71	15	37	20
	20	1	35	31.45	9	22	16.1	20.458 616	0.43	1.71	15	33	33
	21	1	35	40.20	+9	23	08.5	20.472 513	0.43	1.71	15	29	46
	22	1	35	49.09	9	24	01.6	20.486 238	0.43	1.71	15	25	59
	23	1	35	58.13	9	24	55.6	20.499 785	0.43	1.71	15	22	12
	24	1	36	07.31	9	25	50.3	20.513 151	0.43	1.71	15	18	25
	25	1	36	16.63	9	26	45.8	20.526 333	0.43	1.71	15	14	39
	26	1	36	26.09	9	27	42.0	20.539 328	0.43	1.71	15	10	52
	27	1	36	35.67	+9	28	39.0	20.552 133	0.43	1.70	15	07	06
	28	1	36	45.38	9	29	36.6	20.564 744	0.43	1.70	15	03	20
Mar.	1	1	36	55.21	9	30	35.0	20.577 160	0.43	1.70	14	59	34
	2	1	37	05.17	9	31	33.9	20.589 377	0.43	1.70	14	55	48
	3	1	37	15.24	9	32	33.5	20.601 392	0.43	1.70	14	52	02
	4	1	37	25.44	9	33	33.8	20.613 203	0.43	1.70	14	48	16
	5	1	37	35.75	+9	34	34.6	20.624 806	0.43	1.70	14	44	31
	6	1	37	46.18	9	35	36.1	20.636 199	0.43	1.70	14	40	45
	7	1	37	56.73	9	36	38.2	20.647 379	0.43	1.70	14	36	60
	8	1	38	07.40	9	37	40.9	20.658 343	0.43	1.70	14	33	15
	9	1	38	18.17	9	38	44.2	20.669 088	0.43	1.69	14	29	30
	10	1	38	29.05	9	39	48.0	20.679 610	0.43	1.69	14	25	45
	11	1	38	40.04	+9	40	52.5	20.689 908	0.43	1.69	14	22	00
	12	1	38	51.13	9	41	57.4	20.699 977	0.42	1.69	14	18	15
	13	1	39	02.33	9	43	02.9	20.709 817	0.42	1.69	14	14	30
	14	1	39	13.61	9	44	08.9	20.719 423	0.42	1.69	14	10	46
	15	1	39	24.99	9	45	15.3	20.728 793	0.42	1.69	14	07	01
	16	1	39	36.47	9	46	22.3	20.737 924	0.42	1.69	14	03	17
	17	1	39	48.03	+9	47	29.6	20.746 815	0.42	1.69	13	59	32
	18	1	39	59.67	9	48	37.4	20.755 462	0.42	1.69	13	55	48
	19	1	40	11.40	9	49	45.6	20.763 863	0.42	1.69	13	52	04
	20	1	40	23.22	9	50	54.3	20.772 017	0.42	1.69	13	48	20
	21	1	40	35.12	9	52	03.3	20.779 921	0.42	1.69	13	44	36
	22	1	40	47.10	9	53	12.7	20.787 574	0.42	1.68	13	40	52
	23	1	40	59.15	+9	54	22.5	20.794 973	0.42	1.68	13	37	08
	24	1	41	11.28	9	55	32.7	20.802 117	0.42	1.68	13	33	24
	25	1	41	23.47	9	56	43.2	20.809 006	0.42	1.68	13	29	40
	26	1	41	35.74	9	57	54.0	20.815 637	0.42	1.68	13	25	57
	27	1	41	48.06	9	59	05.1	20.822 010	0.42	1.68	13	22	13
	28	1	42	00.44	10	00	16.5	20.828 124	0.42	1.68	13	18	29
	29	1	42	12.87	+10	01	28.1	20.833 978	0.42	1.68	13	14	46
	30	1	42	25.36	10	02	39.9	20.839 570	0.42	1.68	13	11	02
	31	1	42	37.90	10	03	52.0	20.844 900	0.42	1.68	13	07	19
Apr.	1	1	42	50.49	10	05	04.3	20.849 968	0.42	1.68	13	03	36
	2	1	43	03.13	+10	06	16.8	20.854 771	0.42	1.68	12	59	52

URANUS, 2018
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	42	50.49	+10	05	04.3	20.849 968	0.42	1.68	13	03	36
	2	1	43	03.13	10	06	16.8	20.854 771	0.42	1.68	12	59	52
	3	1	43	15.82	10	07	29.4	20.859 309	0.42	1.68	12	56	09
	4	1	43	28.55	10	08	42.3	20.863 581	0.42	1.68	12	52	26
	5	1	43	41.33	10	09	55.4	20.867 586	0.42	1.68	12	48	43
	6	1	43	54.15	10	11	08.6	20.871 323	0.42	1.68	12	45	00
	7	1	44	07.00	+10	12	21.9	20.874 791	0.42	1.68	12	41	16
	8	1	44	19.89	10	13	35.4	20.877 989	0.42	1.68	12	37	33
	9	1	44	32.81	10	14	49.0	20.880 916	0.42	1.68	12	33	50
	10	1	44	45.76	10	16	02.7	20.883 571	0.42	1.68	12	30	07
	11	1	44	58.73	10	17	16.4	20.885 954	0.42	1.68	12	26	24
	12	1	45	11.72	10	18	30.2	20.888 064	0.42	1.68	12	22	41
	13	1	45	24.73	+10	19	44.0	20.889 900	0.42	1.68	12	18	58
	14	1	45	37.76	10	20	57.9	20.891 461	0.42	1.68	12	15	15
	15	1	45	50.80	10	22	11.7	20.892 748	0.42	1.68	12	11	33
	16	1	46	03.85	10	23	25.6	20.893 760	0.42	1.68	12	07	50
	17	1	46	16.93	10	24	39.4	20.894 497	0.42	1.68	12	04	07
	18	1	46	30.02	10	25	53.0	20.894 959	0.42	1.68	12	00	24
	19	1	46	43.05	+10	27	06.2	20.895 145	0.42	1.68	11	56	41
	20	1	46	56.13	10	28	20.4	20.895 058	0.42	1.68	11	52	58
	21	1	47	09.22	10	29	34.2	20.894 696	0.42	1.68	11	49	15
	22	1	47	22.30	10	30	47.8	20.894 060	0.42	1.68	11	45	32
	23	1	47	35.38	10	32	01.3	20.893 153	0.42	1.68	11	41	49
	24	1	47	48.43	10	33	14.7	20.891 973	0.42	1.68	11	38	06
	25	1	48	01.48	+10	34	27.8	20.890 522	0.42	1.68	11	34	23
	26	1	48	14.50	10	35	40.8	20.888 802	0.42	1.68	11	30	40
	27	1	48	27.50	10	36	53.6	20.886 812	0.42	1.68	11	26	57
	28	1	48	40.49	10	38	06.3	20.884 555	0.42	1.68	11	23	14
	29	1	48	53.45	10	39	18.7	20.882 030	0.42	1.68	11	19	31
	30	1	49	06.39	10	40	30.9	20.879 238	0.42	1.68	11	15	48
May	1	1	49	19.31	+10	41	42.9	20.876 181	0.42	1.68	11	12	05
	2	1	49	32.20	10	42	54.7	20.872 859	0.42	1.68	11	08	22
	3	1	49	45.06	10	44	06.2	20.869 273	0.42	1.68	11	04	39
	4	1	49	57.89	10	45	17.5	20.865 424	0.42	1.68	11	00	56
	5	1	50	10.68	10	46	28.5	20.861 313	0.42	1.68	10	57	13
	6	1	50	23.43	10	47	39.3	20.856 939	0.42	1.68	10	53	29
	7	1	50	36.14	+10	48	49.8	20.852 306	0.42	1.68	10	49	46
	8	1	50	48.81	10	49	59.9	20.847 413	0.42	1.68	10	46	03
	9	1	51	01.42	10	51	09.7	20.842 261	0.42	1.68	10	42	19
	10	1	51	13.99	10	52	19.2	20.836 852	0.42	1.68	10	38	36
	11	1	51	26.50	10	53	28.3	20.831 187	0.42	1.68	10	34	53
	12	1	51	38.96	10	54	37.0	20.825 267	0.42	1.68	10	31	09
	13	1	51	51.36	+10	55	45.3	20.819 093	0.42	1.68	10	27	25
	14	1	52	03.70	10	56	53.2	20.812 667	0.42	1.68	10	23	42
	15	1	52	15.99	10	58	00.8	20.805 991	0.42	1.68	10	19	58
	16	1	52	28.21	10	59	07.9	20.799 067	0.42	1.68	10	16	14
	17	1	52	40.37	+11	00	14.7	20.791 896	0.42	1.68	10	12	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
May	17	1	52	40.37	+11	00	14.7	20.791 896	0.42	1.68	10	12	30
	18	1	52	52.47	11	01	21.0	20.784 480	0.42	1.68	10	08	47
	19	1	53	04.49	11	02	26.8	20.776 822	0.42	1.69	10	05	03
	20	1	53	16.43	11	03	32.2	20.768 925	0.42	1.69	10	01	18
	21	1	53	28.29	11	04	37.1	20.760 790	0.42	1.69	9	57	34
	22	1	53	40.07	11	05	41.5	20.752 421	0.42	1.69	9	53	50
	23	1	53	51.77	+11	06	45.3	20.743 819	0.42	1.69	9	50	06
	24	1	54	03.38	11	07	48.6	20.734 988	0.42	1.69	9	46	21
	25	1	54	14.90	11	08	51.4	20.725 930	0.42	1.69	9	42	37
	26	1	54	26.33	11	09	53.6	20.716 647	0.42	1.69	9	38	52
	27	1	54	37.68	11	10	55.2	20.707 142	0.42	1.69	9	35	08
	28	1	54	48.94	11	11	56.3	20.697 417	0.42	1.69	9	31	23
	29	1	55	00.10	+11	12	56.8	20.687 475	0.43	1.69	9	27	38
	30	1	55	11.17	11	13	56.8	20.677 318	0.43	1.69	9	23	53
	31	1	55	22.14	11	14	56.2	20.666 948	0.43	1.69	9	20	08
June	1	1	55	33.01	11	15	54.9	20.656 368	0.43	1.70	9	16	23
	2	1	55	43.78	11	16	53.1	20.645 580	0.43	1.70	9	12	38
	3	1	55	54.44	11	17	50.6	20.634 586	0.43	1.70	9	08	52
	4	1	56	05.00	+11	18	47.5	20.623 390	0.43	1.70	9	05	07
	5	1	56	15.44	11	19	43.8	20.611 993	0.43	1.70	9	01	21
	6	1	56	25.77	11	20	39.4	20.600 398	0.43	1.70	8	57	36
	7	1	56	35.98	11	21	34.3	20.588 608	0.43	1.70	8	53	50
	8	1	56	46.08	11	22	28.5	20.576 626	0.43	1.70	8	50	04
	9	1	56	56.05	11	23	22.0	20.564 454	0.43	1.70	8	46	18
	10	1	57	05.91	+11	24	14.8	20.552 096	0.43	1.70	8	42	32
	11	1	57	15.65	11	25	06.9	20.539 553	0.43	1.71	8	38	46
	12	1	57	25.27	11	25	58.3	20.526 830	0.43	1.71	8	34	59
	13	1	57	34.76	11	26	48.9	20.513 930	0.43	1.71	8	31	13
	14	1	57	44.13	11	27	38.9	20.500 855	0.43	1.71	8	27	26
	15	1	57	53.36	11	28	28.1	20.487 611	0.43	1.71	8	23	39
	16	1	58	02.46	+11	29	16.6	20.474 200	0.43	1.71	8	19	52
	17	1	58	11.43	11	30	04.2	20.460 626	0.43	1.71	8	16	05
	18	1	58	20.25	11	30	51.1	20.446 894	0.43	1.71	8	12	18
	19	1	58	28.93	11	31	37.2	20.433 007	0.43	1.71	8	08	31
	20	1	58	37.46	11	32	22.4	20.418 970	0.43	1.72	8	04	43
	21	1	58	45.85	11	33	06.8	20.404 785	0.43	1.72	8	00	56
	22	1	58	54.10	+11	33	50.4	20.390 457	0.43	1.72	7	57	08
	23	1	59	02.20	11	34	33.2	20.375 989	0.43	1.72	7	53	20
	24	1	59	10.16	11	35	15.1	20.361 385	0.43	1.72	7	49	32
	25	1	59	17.97	11	35	56.2	20.346 650	0.43	1.72	7	45	44
	26	1	59	25.63	11	36	36.5	20.331 785	0.43	1.72	7	41	55
	27	1	59	33.14	11	37	15.9	20.316 796	0.43	1.72	7	38	07
	28	1	59	40.50	+11	37	54.5	20.301 685	0.43	1.72	7	34	18
	29	1	59	47.70	11	38	32.2	20.286 456	0.43	1.73	7	30	30
	30	1	59	54.75	11	39	09.1	20.271 114	0.43	1.73	7	26	41
July	1	2	00	01.64	11	39	45.1	20.255 660	0.43	1.73	7	22	51
	2	2	00	08.36	+11	40	20.2	20.240 100	0.43	1.73	7	19	02

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	2	00	01.64	+11	39	45.1	20.255 660	0.43	1.73	7	22	51
	2	2	00	08.36	11	40	20.2	20.240 100	0.43	1.73	7	19	02
	3	2	00	14.93	11	40	54.4	20.224 437	0.43	1.73	7	15	13
	4	2	00	21.32	11	41	27.6	20.208 675	0.44	1.73	7	11	23
	5	2	00	27.56	11	41	60.0	20.192 817	0.44	1.73	7	07	33
	6	2	00	33.62	11	42	31.4	20.176 867	0.44	1.74	7	03	43
	7	2	00	39.52	+11	43	01.9	20.160 830	0.44	1.74	6	59	53
	8	2	00	45.25	11	43	31.5	20.144 709	0.44	1.74	6	56	03
	9	2	00	50.82	11	44	00.2	20.128 508	0.44	1.74	6	52	13
	10	2	00	56.22	11	44	27.9	20.112 233	0.44	1.74	6	48	22
	11	2	01	01.44	11	44	54.7	20.095 886	0.44	1.74	6	44	31
	12	2	01	06.50	11	45	20.6	20.079 474	0.44	1.74	6	40	40
	13	2	01	11.38	+11	45	45.6	20.062 999	0.44	1.75	6	36	49
	14	2	01	16.08	11	46	09.5	20.046 468	0.44	1.75	6	32	58
	15	2	01	20.59	11	46	32.5	20.029 886	0.44	1.75	6	29	07
	16	2	01	24.93	11	46	54.5	20.013 256	0.44	1.75	6	25	15
	17	2	01	29.08	11	47	15.5	19.996 584	0.44	1.75	6	21	23
	18	2	01	33.05	11	47	35.5	19.979 875	0.44	1.75	6	17	31
	19	2	01	36.83	+11	47	54.5	19.963 133	0.44	1.75	6	13	39
	20	2	01	40.44	11	48	12.5	19.946 363	0.44	1.76	6	09	47
	21	2	01	43.86	11	48	29.5	19.929 569	0.44	1.76	6	05	54
	22	2	01	47.11	11	48	45.6	19.912 757	0.44	1.76	6	02	01
	23	2	01	50.17	11	49	00.6	19.895 930	0.44	1.76	5	58	08
	24	2	01	53.05	11	49	14.7	19.879 093	0.44	1.76	5	54	15
	25	2	01	55.74	+11	49	27.8	19.862 249	0.44	1.76	5	50	22
	26	2	01	58.25	11	49	39.9	19.845 405	0.44	1.76	5	46	28
	27	2	02	00.57	11	49	51.0	19.828 563	0.44	1.77	5	42	35
	28	2	02	02.71	11	50	01.1	19.811 728	0.44	1.77	5	38	41
	29	2	02	04.66	11	50	10.2	19.794 905	0.44	1.77	5	34	47
	30	2	02	06.41	11	50	18.3	19.778 098	0.44	1.77	5	30	53
	31	2	02	07.98	+11	50	25.4	19.761 311	0.45	1.77	5	26	58
Aug.	1	2	02	09.36	11	50	31.4	19.744 549	0.45	1.77	5	23	04
	2	2	02	10.55	11	50	36.4	19.727 816	0.45	1.78	5	19	09
	3	2	02	11.55	11	50	40.4	19.711 117	0.45	1.78	5	15	14
	4	2	02	12.37	11	50	43.4	19.694 456	0.45	1.78	5	11	19
	5	2	02	12.99	11	50	45.5	19.677 837	0.45	1.78	5	07	24
	6	2	02	13.43	+11	50	46.5	19.661 266	0.45	1.78	5	03	28
	7	2	02	13.69	11	50	46.5	19.644 748	0.45	1.78	4	59	32
	8	2	02	13.76	11	50	45.5	19.628 287	0.45	1.78	4	55	37
	9	2	02	13.63	11	50	43.5	19.611 888	0.45	1.79	4	51	40
	10	2	02	13.32	11	50	40.6	19.595 556	0.45	1.79	4	47	44
	11	2	02	12.82	11	50	36.6	19.579 297	0.45	1.79	4	43	48
	12	2	02	12.12	+11	50	31.6	19.563 116	0.45	1.79	4	39	51
	13	2	02	11.22	11	50	25.5	19.547 018	0.45	1.79	4	35	54
	14	2	02	10.14	11	50	18.5	19.531 008	0.45	1.79	4	31	57
	15	2	02	08.87	11	50	10.4	19.515 091	0.45	1.79	4	28	00
	16	2	02	07.41	+11	50	01.3	19.499 271	0.45	1.80	4	24	03

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	2	02	07.41	+11	50	01.3	19.499 271	0.45	1.80	4	24	03
	17	2	02	05.77	11	49	51.3	19.483 555	0.45	1.80	4	20	05
	18	2	02	03.95	11	49	40.2	19.467 945	0.45	1.80	4	16	07
	19	2	02	01.94	11	49	28.2	19.452 448	0.45	1.80	4	12	09
	20	2	01	59.76	11	49	15.3	19.437 066	0.45	1.80	4	08	11
	21	2	01	57.39	11	49	01.3	19.421 805	0.45	1.80	4	04	13
	22	2	01	54.84	+11	48	46.5	19.406 669	0.45	1.80	4	00	15
	23	2	01	52.12	11	48	30.7	19.391 662	0.45	1.81	3	56	16
	24	2	01	49.21	11	48	13.9	19.376 789	0.45	1.81	3	52	17
	25	2	01	46.12	11	47	56.2	19.362 054	0.45	1.81	3	48	18
	26	2	01	42.85	11	47	37.5	19.347 460	0.45	1.81	3	44	19
	27	2	01	39.41	11	47	17.9	19.333 012	0.45	1.81	3	40	19
	28	2	01	35.79	+11	46	57.4	19.318 715	0.46	1.81	3	36	20
	29	2	01	32.00	11	46	36.0	19.304 572	0.46	1.81	3	32	20
	30	2	01	28.04	11	46	13.6	19.290 588	0.46	1.82	3	28	20
	31	2	01	23.90	11	45	50.3	19.276 767	0.46	1.82	3	24	20
Sept.	1	2	01	19.60	11	45	26.2	19.263 113	0.46	1.82	3	20	20
	2	2	01	15.14	11	45	01.1	19.249 630	0.46	1.82	3	16	20
	3	2	01	10.51	+11	44	35.2	19.236 323	0.46	1.82	3	12	19
	4	2	01	05.72	11	44	08.5	19.223 196	0.46	1.82	3	08	19
	5	2	01	00.78	11	43	40.9	19.210 254	0.46	1.82	3	04	18
	6	2	00	55.66	11	43	12.5	19.197 500	0.46	1.82	3	00	17
	7	2	00	50.39	11	42	43.2	19.184 940	0.46	1.83	2	56	16
	8	2	00	44.96	11	42	13.1	19.172 578	0.46	1.83	2	52	14
	9	2	00	39.37	+11	41	42.2	19.160 419	0.46	1.83	2	48	13
	10	2	00	33.62	11	41	10.4	19.148 467	0.46	1.83	2	44	11
	11	2	00	27.72	11	40	37.8	19.136 726	0.46	1.83	2	40	09
	12	2	00	21.68	11	40	04.4	19.125 200	0.46	1.83	2	36	07
	13	2	00	15.49	11	39	30.2	19.113 893	0.46	1.83	2	32	05
	14	2	00	09.16	11	38	55.3	19.102 809	0.46	1.83	2	28	03
	15	2	00	02.70	+11	38	19.6	19.091 951	0.46	1.83	2	24	01
	16	1	59	56.10	11	37	43.3	19.081 324	0.46	1.84	2	19	58
	17	1	59	49.36	11	37	06.2	19.070 930	0.46	1.84	2	15	56
	18	1	59	42.50	11	36	28.5	19.060 772	0.46	1.84	2	11	53
	19	1	59	35.51	11	35	50.1	19.050 854	0.46	1.84	2	07	50
	20	1	59	28.39	11	35	11.0	19.041 178	0.46	1.84	2	03	47
	21	1	59	21.15	+11	34	31.3	19.031 749	0.46	1.84	1	59	44
	22	1	59	13.78	11	33	50.9	19.022 568	0.46	1.84	1	55	41
	23	1	59	06.30	11	33	09.9	19.013 639	0.46	1.84	1	51	37
	24	1	58	58.70	11	32	28.3	19.004 964	0.46	1.84	1	47	34
	25	1	58	50.99	11	31	46.1	18.996 546	0.46	1.84	1	43	30
	26	1	58	43.17	11	31	03.3	18.988 388	0.46	1.84	1	39	27
	27	1	58	35.25	+11	30	19.9	18.980 492	0.46	1.85	1	35	23
	28	1	58	27.23	11	29	36.0	18.972 862	0.46	1.85	1	31	19
	29	1	58	19.11	11	28	51.6	18.965 500	0.46	1.85	1	27	15
	30	1	58	10.90	11	28	06.7	18.958 408	0.46	1.85	1	23	11
Oct.	1	1	58	02.60	+11	27	21.4	18.951 589	0.46	1.85	1	19	07

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	1	58	02.60	+11	27	21.4	18.951 589	0.46	1.85	1	19	07
	2	1	57	54.21	11	26	35.5	18.945 047	0.46	1.85	1	15	02
	3	1	57	45.73	11	25	49.3	18.938 783	0.46	1.85	1	10	58
	4	1	57	37.17	11	25	02.6	18.932 801	0.46	1.85	1	06	54
	5	1	57	28.53	11	24	15.5	18.927 103	0.46	1.85	1	02	49
	6	1	57	19.81	11	23	27.9	18.921 691	0.46	1.85	0	58	45
	7	1	57	11.02	+11	22	40.0	18.916 569	0.46	1.85	0	54	40
	8	1	57	02.15	11	21	51.7	18.911 738	0.47	1.85	0	50	35
	9	1	56	53.22	11	21	03.0	18.907 200	0.47	1.85	0	46	30
	10	1	56	44.23	11	20	14.0	18.902 958	0.47	1.85	0	42	26
	11	1	56	35.19	11	19	24.7	18.899 013	0.47	1.85	0	38	21
	12	1	56	26.10	11	18	35.2	18.895 366	0.47	1.85	0	34	16
	13	1	56	16.97	+11	17	45.4	18.892 020	0.47	1.85	0	30	11
	14	1	56	07.79	11	16	55.4	18.888 974	0.47	1.85	0	26	06
	15	1	55	58.58	11	16	05.2	18.886 230	0.47	1.85	0	22	01
	16	1	55	49.32	11	15	14.9	18.883 790	0.47	1.85	0	17	55
	17	1	55	40.04	11	14	24.3	18.881 653	0.47	1.85	0	13	50
	18	1	55	30.73	11	13	33.7	18.879 820	0.47	1.85	0	09	45
	19	1	55	21.39	+11	12	42.9	18.878 292	0.47	1.86	0	05	40
	20	1	55	12.03	11	11	52.0	18.877 069	0.47	1.86	0	01	35
	21	1	55	02.65	11	11	01.0	18.876 152	0.47	1.86	23	53	24
	22	1	54	53.26	11	10	10.0	18.875 541	0.47	1.86	23	49	19
	23	1	54	43.86	11	09	18.9	18.875 236	0.47	1.86	23	45	14
	24	1	54	34.46	11	08	27.8	18.875 237	0.47	1.86	23	41	09
	25	1	54	25.06	+11	07	36.7	18.875 545	0.47	1.86	23	37	03
	26	1	54	15.67	11	06	45.7	18.876 159	0.47	1.86	23	32	58
	27	1	54	06.29	11	05	54.7	18.877 079	0.47	1.86	23	28	53
	28	1	53	56.92	11	05	03.8	18.878 306	0.47	1.86	23	24	48
	29	1	53	47.57	11	04	13.0	18.879 839	0.47	1.85	23	20	42
	30	1	53	38.24	11	03	22.4	18.881 679	0.47	1.85	23	16	37
	31	1	53	28.93	+11	02	31.9	18.883 826	0.47	1.85	23	12	32
Nov.	1	1	53	19.65	11	01	41.6	18.886 279	0.47	1.85	23	08	27
	2	1	53	10.39	11	00	51.4	18.889 038	0.47	1.85	23	04	22
	3	1	53	01.17	11	00	01.4	18.892 103	0.47	1.85	23	00	17
	4	1	52	51.98	10	59	11.7	18.895 473	0.47	1.85	22	56	12
	5	1	52	42.84	10	58	22.1	18.899 148	0.47	1.85	22	52	07
	6	1	52	33.74	+10	57	32.8	18.903 127	0.47	1.85	22	48	02
	7	1	52	24.70	10	56	43.9	18.907 409	0.47	1.85	22	43	57
	8	1	52	15.72	10	55	55.2	18.911 992	0.47	1.85	22	39	52
	9	1	52	06.80	10	55	07.0	18.916 875	0.46	1.85	22	35	48
	10	1	51	57.95	10	54	19.1	18.922 056	0.46	1.85	22	31	43
	11	1	51	49.17	10	53	31.6	18.927 533	0.46	1.85	22	27	38
	12	1	51	40.46	+10	52	44.5	18.933 304	0.46	1.85	22	23	34
	13	1	51	31.83	10	51	57.9	18.939 368	0.46	1.85	22	19	30
	14	1	51	23.27	10	51	11.7	18.945 722	0.46	1.85	22	15	25
	15	1	51	14.80	10	50	26.0	18.952 363	0.46	1.85	22	11	21
	16	1	51	06.42	+10	49	40.8	18.959 290	0.46	1.85	22	07	17

URANUS, 2018

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	1	51	06.42	+10	49	40.8	18.959 290	0.46	1.85	22	07	17
	17	1	50	58.12	10	48	56.1	18.966 499	0.46	1.85	22	03	13
	18	1	50	49.92	10	48	11.9	18.973 988	0.46	1.85	21	59	09
	19	1	50	41.81	10	47	28.3	18.981 755	0.46	1.84	21	55	05
	20	1	50	33.81	10	46	45.2	18.989 796	0.46	1.84	21	51	01
	21	1	50	25.92	10	46	02.8	18.998 110	0.46	1.84	21	46	57
	22	1	50	18.13	+10	45	20.9	19.006 692	0.46	1.84	21	42	54
	23	1	50	10.46	10	44	39.8	19.015 541	0.46	1.84	21	38	50
	24	1	50	02.91	10	43	59.2	19.024 654	0.46	1.84	21	34	47
	25	1	49	55.48	10	43	19.4	19.034 027	0.46	1.84	21	30	44
	26	1	49	48.17	10	42	40.3	19.043 658	0.46	1.84	21	26	41
	27	1	49	40.98	10	42	01.9	19.053 544	0.46	1.84	21	22	38
	28	1	49	33.92	+10	41	24.2	19.063 683	0.46	1.84	21	18	35
	29	1	49	26.98	10	40	47.2	19.074 071	0.46	1.84	21	14	32
	30	1	49	20.17	10	40	11.0	19.084 706	0.46	1.83	21	10	30
Dec.	1	1	49	13.50	10	39	35.5	19.095 583	0.46	1.83	21	06	27
	2	1	49	06.96	10	39	00.7	19.106 701	0.46	1.83	21	02	25
	3	1	49	00.57	10	38	26.8	19.118 056	0.46	1.83	20	58	23
	4	1	48	54.33	+10	37	53.7	19.129 643	0.46	1.83	20	54	21
	5	1	48	48.23	10	37	21.4	19.141 459	0.46	1.83	20	50	19
	6	1	48	42.29	10	36	50.0	19.153 500	0.46	1.83	20	46	17
	7	1	48	36.51	10	36	19.5	19.165 761	0.46	1.83	20	42	16
	8	1	48	30.88	10	35	49.9	19.178 239	0.46	1.83	20	38	15
	9	1	48	25.42	10	35	21.3	19.190 930	0.46	1.82	20	34	13
	10	1	48	20.11	+10	34	53.5	19.203 827	0.46	1.82	20	30	12
	11	1	48	14.97	10	34	26.6	19.216 928	0.46	1.82	20	26	11
	12	1	48	09.99	10	34	00.7	19.230 226	0.46	1.82	20	22	11
	13	1	48	05.18	10	33	35.8	19.243 719	0.46	1.82	20	18	10
	14	1	48	00.54	10	33	11.8	19.257 400	0.46	1.82	20	14	10
	15	1	47	56.07	10	32	48.8	19.271 265	0.46	1.82	20	10	10
	16	1	47	51.77	+10	32	26.7	19.285 310	0.46	1.82	20	06	09
	17	1	47	47.65	10	32	05.6	19.299 528	0.46	1.81	20	02	10
	18	1	47	43.71	10	31	45.6	19.313 916	0.46	1.81	19	58	10
	19	1	47	39.95	10	31	26.5	19.328 469	0.45	1.81	19	54	10
	20	1	47	36.37	10	31	08.5	19.343 182	0.45	1.81	19	50	11
	21	1	47	32.98	10	30	51.5	19.358 050	0.45	1.81	19	46	12
	22	1	47	29.77	+10	30	35.6	19.373 068	0.45	1.81	19	42	13
	23	1	47	26.75	10	30	20.8	19.388 232	0.45	1.81	19	38	14
	24	1	47	23.92	10	30	07.0	19.403 537	0.45	1.80	19	34	16
	25	1	47	21.27	10	29	54.3	19.418 979	0.45	1.80	19	30	17
	26	1	47	18.81	10	29	42.6	19.434 552	0.45	1.80	19	26	19
	27	1	47	16.53	10	29	32.0	19.450 253	0.45	1.80	19	22	21
	28	1	47	14.44	+10	29	22.5	19.466 077	0.45	1.80	19	18	23
	29	1	47	12.54	10	29	14.0	19.482 019	0.45	1.80	19	14	26
	30	1	47	10.83	10	29	06.5	19.498 074	0.45	1.80	19	10	28
	31	1	47	09.32	10	29	00.2	19.514 236	0.45	1.79	19	06	31
	32	1	47	08.00	+10	28	55.0	19.530 502	0.45	1.79	19	02	34

NEPTUNE, 2018
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"	
Jan.	1	343	33	48.6	-0	55	35.3	29.944 79
	3	343	34	32.3	0	55	36.4	29.944 75
	5	343	35	16.0	0	55	37.6	29.944 72
	7	343	35	59.6	0	55	38.7	29.944 68
	9	343	36	43.2	0	55	39.9	29.944 65
	11	343	37	26.9	0	55	41.0	29.944 61
	13	343	38	10.5	-0	55	42.2	29.944 58
	15	343	38	54.2	0	55	43.3	29.944 54
	17	343	39	37.9	0	55	44.5	29.944 51
	19	343	40	21.5	0	55	45.6	29.944 47
	21	343	41	05.1	0	55	46.7	29.944 44
	23	343	41	48.8	0	55	47.9	29.944 40
	25	343	42	32.4	-0	55	49.0	29.944 37
	27	343	43	16.1	0	55	50.1	29.944 33
	29	343	43	59.7	0	55	51.3	29.944 30
	31	343	44	43.4	0	55	52.4	29.944 26
Feb.	2	343	45	27.1	0	55	53.6	29.944 23
	4	343	46	10.7	0	55	54.7	29.944 19
	6	343	46	54.4	-0	55	55.9	29.944 16
	8	343	47	38.0	0	55	57.0	29.944 12
	10	343	48	21.7	0	55	58.1	29.944 09
	12	343	49	05.3	0	55	59.3	29.944 05
	14	343	49	49.0	0	56	00.4	29.944 02
	16	343	50	32.6	0	56	01.5	29.943 98
	18	343	51	16.3	-0	56	02.7	29.943 95
	20	343	51	60.0	0	56	03.8	29.943 92
	22	343	52	43.6	0	56	05.0	29.943 88
	24	343	53	27.3	0	56	06.1	29.943 85
	26	343	54	10.9	0	56	07.3	29.943 81
	28	343	54	54.6	0	56	08.4	29.943 78
Mar.	2	343	55	38.2	-0	56	09.5	29.943 74
	4	343	56	21.9	0	56	10.6	29.943 71
	6	343	57	05.5	0	56	11.8	29.943 67
	8	343	57	49.2	0	56	12.9	29.943 64
	10	343	58	32.9	0	56	14.1	29.943 60
	12	343	59	16.5	0	56	15.2	29.943 57
	14	344	00	00.2	-0	56	16.4	29.943 53
	16	344	00	43.9	0	56	17.5	29.943 50
	18	344	01	27.5	0	56	18.6	29.943 47
	20	344	02	11.2	0	56	19.8	29.943 43
	22	344	02	54.8	0	56	20.9	29.943 40
	24	344	03	38.5	0	56	22.0	29.943 36
	26	344	04	22.1	-0	56	23.2	29.943 33
	28	344	05	05.8	0	56	24.3	29.943 29
	30	344	05	49.5	0	56	25.5	29.943 26
Apr.	1	344	06	33.1	0	56	26.6	29.943 22
	3	344	07	16.8	-0	56	27.7	29.943 19

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"	
Apr.	3	344	07	16.8	-0	56	27.7	29.943 19
	5	344	08	00.5	0	56	28.8	29.943 16
	7	344	08	44.1	0	56	30.0	29.943 12
	9	344	09	27.8	0	56	31.1	29.943 09
	11	344	10	11.5	0	56	32.3	29.943 05
	13	344	10	55.1	0	56	33.4	29.943 02
	15	344	11	38.8	-0	56	34.5	29.942 99
	17	344	12	22.5	0	56	35.7	29.942 95
	19	344	13	06.1	0	56	36.8	29.942 92
	21	344	13	49.8	0	56	37.9	29.942 88
	23	344	14	33.5	0	56	39.0	29.942 85
	25	344	15	17.1	0	56	40.2	29.942 81
	27	344	16	00.8	-0	56	41.3	29.942 78
	29	344	16	44.5	0	56	42.5	29.942 75
May	1	344	17	28.1	0	56	43.6	29.942 71
	3	344	18	11.8	0	56	44.7	29.942 68
	5	344	18	55.5	0	56	45.9	29.942 64
	7	344	19	39.1	0	56	47.0	29.942 61
	9	344	20	22.8	-0	56	48.1	29.942 58
	11	344	21	06.5	0	56	49.3	29.942 54
	13	344	21	50.1	0	56	50.4	29.942 51
	15	344	22	33.8	0	56	51.5	29.942 48
	17	344	23	17.5	0	56	52.7	29.942 44
	19	344	24	01.2	0	56	53.8	29.942 41
	21	344	24	44.8	-0	56	54.9	29.942 37
	23	344	25	28.5	0	56	56.1	29.942 34
	25	344	26	12.2	0	56	57.2	29.942 31
	27	344	26	55.8	0	56	58.3	29.942 27
	29	344	27	39.5	0	56	59.5	29.942 24
	31	344	28	23.2	0	57	00.6	29.942 21
June	2	344	29	06.9	-0	57	01.7	29.942 17
	4	344	29	50.5	0	57	02.9	29.942 14
	6	344	30	34.2	0	57	04.0	29.942 11
	8	344	31	17.9	0	57	05.1	29.942 07
	10	344	32	01.6	0	57	06.2	29.942 04
	12	344	32	45.2	0	57	07.4	29.942 01
	14	344	33	28.9	-0	57	08.5	29.941 97
	16	344	34	12.6	0	57	09.6	29.941 94
	18	344	34	56.2	0	57	10.8	29.941 90
	20	344	35	39.9	0	57	11.9	29.941 87
	22	344	36	23.6	0	57	13.0	29.941 84
	24	344	37	07.3	0	57	14.1	29.941 80
	26	344	37	51.0	-0	57	15.3	29.941 77
	28	344	38	34.7	0	57	16.4	29.941 74
	30	344	39	18.3	0	57	17.6	29.941 71
July	2	344	40	02.0	0	57	18.7	29.941 67
	4	344	40	45.7	-0	57	19.8	29.941 64

NEPTUNE, 2018
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	344 40 02.0	-0 57 18.7	29.941 67	Oct.	2	345 13 31.7	-0 58 10.5	29.940 16
	4	344 40 45.7	0 57 19.8	29.941 64		4	345 14 15.4	0 58 11.6	29.940 13
	6	344 41 29.4	0 57 20.9	29.941 61		6	345 14 59.1	0 58 12.7	29.940 09
	8	344 42 13.1	0 57 22.1	29.941 57		8	345 15 42.8	0 58 13.8	29.940 06
	10	344 42 56.7	0 57 23.2	29.941 54		10	345 16 26.6	0 58 14.9	29.940 03
	12	344 43 40.4	0 57 24.3	29.941 51		12	345 17 10.2	0 58 16.1	29.940 00
	14	344 44 24.1	-0 57 25.4	29.941 47		14	345 17 53.9	-0 58 17.2	29.939 96
	16	344 45 07.8	0 57 26.6	29.941 44		16	345 18 37.6	0 58 18.3	29.939 93
	18	344 45 51.5	0 57 27.7	29.941 41		18	345 19 21.4	0 58 19.4	29.939 90
	20	344 46 35.2	0 57 28.8	29.941 37		20	345 20 05.0	0 58 20.6	29.939 87
	22	344 47 18.8	0 57 30.0	29.941 34		22	345 20 48.7	0 58 21.7	29.939 83
	24	344 48 02.5	0 57 31.1	29.941 31		24	345 21 32.5	0 58 22.8	29.939 80
	26	344 48 46.2	-0 57 32.2	29.941 27		26	345 22 16.2	-0 58 23.9	29.939 77
	28	344 49 29.9	0 57 33.3	29.941 24		28	345 22 59.8	0 58 25.0	29.939 73
	30	344 50 13.6	0 57 34.5	29.941 21		30	345 23 43.6	0 58 26.2	29.939 70
Aug.	1	344 50 57.2	0 57 35.6	29.941 18	Nov.	1	345 24 27.3	0 58 27.3	29.939 67
	3	344 51 40.9	0 57 36.7	29.941 14		3	345 25 11.0	0 58 28.4	29.939 64
	5	344 52 24.6	0 57 37.8	29.941 11		5	345 25 54.7	0 58 29.5	29.939 60
	7	344 53 08.3	-0 57 39.0	29.941 08		7	345 26 38.4	-0 58 30.7	29.939 57
	9	344 53 52.0	0 57 40.1	29.941 04		9	345 27 22.1	0 58 31.8	29.939 54
	11	344 54 35.7	0 57 41.2	29.941 01		11	345 28 05.8	0 58 32.9	29.939 51
	13	344 55 19.4	0 57 42.4	29.940 98		13	345 28 49.5	0 58 34.0	29.939 47
	15	344 56 03.1	0 57 43.5	29.940 95		15	345 29 33.2	0 58 35.1	29.939 44
	17	344 56 46.8	0 57 44.6	29.940 91		17	345 30 16.9	0 58 36.2	29.939 41
	19	344 57 30.5	-0 57 45.7	29.940 88		19	345 31 00.6	-0 58 37.4	29.939 38
	21	344 58 14.2	0 57 46.9	29.940 85		21	345 31 44.3	0 58 38.5	29.939 34
	23	344 58 57.8	0 57 48.0	29.940 81		23	345 32 28.0	0 58 39.6	29.939 31
	25	344 59 41.5	0 57 49.1	29.940 78		25	345 33 11.7	0 58 40.7	29.939 28
	27	345 00 25.2	0 57 50.2	29.940 75		27	345 33 55.4	0 58 41.8	29.939 25
	29	345 01 08.9	0 57 51.4	29.940 72		29	345 34 39.2	0 58 43.0	29.939 21
	31	345 01 52.6	-0 57 52.5	29.940 68	Dec.	1	345 35 22.9	-0 58 44.1	29.939 18
Sept.	2	345 02 36.3	0 57 53.6	29.940 65		3	345 36 06.6	0 58 45.2	29.939 15
	4	345 03 20.0	0 57 54.7	29.940 62		5	345 36 50.3	0 58 46.3	29.939 12
	6	345 04 03.7	0 57 55.9	29.940 58		7	345 37 34.0	0 58 47.4	29.939 08
	8	345 04 47.4	0 57 57.0	29.940 55		9	345 38 17.7	0 58 48.6	29.939 05
	10	345 05 31.1	0 57 58.1	29.940 52		11	345 39 01.4	0 58 49.7	29.939 02
	12	345 06 14.8	-0 57 59.2	29.940 49		13	345 39 45.1	-0 58 50.8	29.938 99
	14	345 06 58.5	0 58 00.3	29.940 45		15	345 40 28.8	0 58 51.9	29.938 95
	16	345 07 42.1	0 58 01.5	29.940 42		17	345 41 12.5	0 58 53.0	29.938 92
	18	345 08 25.8	0 58 02.6	29.940 39		19	345 41 56.3	0 58 54.1	29.938 89
	20	345 09 09.6	0 58 03.7	29.940 36		21	345 42 40.0	0 58 55.2	29.938 86
	22	345 09 53.3	0 58 04.8	29.940 32		23	345 43 23.7	0 58 56.4	29.938 83
	24	345 10 36.9	-0 58 06.0	29.940 29		25	345 44 07.4	-0 58 57.5	29.938 79
	26	345 11 20.6	0 58 07.1	29.940 26		27	345 44 51.1	0 58 58.6	29.938 76
	28	345 12 04.3	0 58 08.2	29.940 22		29	345 45 34.8	0 58 59.7	29.938 73
	30	345 12 48.0	0 58 09.3	29.940 19		31	345 46 18.6	0 59 00.8	29.938 70
Oct.	2	345 13 31.7	-0 58 10.5	29.940 16		33	345 47 02.2	-0 59 01.9	29.938 66

NEPTUNE, 2018

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	341	52	57.9	-0	54	46.3	Feb.	15	343	16	23.1	-0	54	18.4
	1	341	54	15.3	0	54	45.2		16	343	18	35.3	0	54	18.4
	2	341	55	34.4	0	54	44.2		17	343	20	47.9	0	54	18.4
	3	341	56	55.2	0	54	43.1		18	343	23	01.1	0	54	18.5
	4	341	58	17.6	0	54	42.0		19	343	25	14.6	0	54	18.6
	5	341	59	41.7	0	54	41.0		20	343	27	28.6	0	54	18.7
	6	342	01	07.4	-0	54	40.0		21	343	29	43.0	-0	54	18.9
	7	342	02	34.7	0	54	39.0		22	343	31	57.8	0	54	19.1
	8	342	04	03.6	0	54	38.0		23	343	34	12.9	0	54	19.3
	9	342	05	34.1	0	54	37.1		24	343	36	28.5	0	54	19.5
	10	342	07	06.2	0	54	36.1		25	343	38	44.3	0	54	19.8
	11	342	08	39.9	0	54	35.2		26	343	41	00.3	0	54	20.1
	12	342	10	15.2	-0	54	34.3		27	343	43	16.6	-0	54	20.5
	13	342	11	52.0	0	54	33.4		28	343	45	32.9	0	54	20.8
	14	342	13	30.4	0	54	32.6	Mar.	1	343	47	49.4	0	54	21.2
	15	342	15	10.2	0	54	31.8		2	343	50	05.9	0	54	21.7
	16	342	16	51.5	0	54	31.0		3	343	52	22.5	0	54	22.2
	17	342	18	34.2	0	54	30.2		4	343	54	39.1	0	54	22.9
	18	342	20	18.3	-0	54	29.4		5	343	56	55.3	-0	54	23.5
	19	342	22	03.7	0	54	28.7		6	343	59	11.9	0	54	23.8
	20	342	23	50.4	0	54	28.0		7	344	01	28.6	0	54	24.3
	21	342	25	38.4	0	54	27.3		8	344	03	45.3	0	54	24.8
	22	342	27	27.7	0	54	26.6		9	344	06	01.8	0	54	25.5
	23	342	29	18.2	0	54	26.0		10	344	08	18.3	0	54	26.1
	24	342	31	09.9	-0	54	25.4		11	344	10	34.6	-0	54	26.8
	25	342	33	02.9	0	54	24.8		12	344	12	50.7	0	54	27.5
	26	342	34	57.1	0	54	24.2		13	344	15	06.6	0	54	28.3
	27	342	36	52.4	0	54	23.6		14	344	17	22.2	0	54	29.1
	28	342	38	49.0	0	54	23.1		15	344	19	37.5	0	54	29.9
	29	342	40	46.6	0	54	22.6		16	344	21	52.4	0	54	30.8
	30	342	42	45.3	-0	54	22.2		17	344	24	07.0	-0	54	31.6
	31	342	44	45.0	0	54	21.7		18	344	26	21.2	0	54	32.6
Feb.	1	342	46	45.6	0	54	21.3		19	344	28	34.9	0	54	33.5
	2	342	48	47.2	0	54	20.9		20	344	30	48.3	0	54	34.5
	3	342	50	49.6	0	54	20.5		21	344	33	01.1	0	54	35.5
	4	342	52	53.0	0	54	20.2		22	344	35	13.6	0	54	36.5
	5	342	54	57.2	-0	54	19.9		23	344	37	25.5	-0	54	37.5
	6	342	57	02.3	0	54	19.6		24	344	39	36.9	0	54	38.6
	7	342	59	08.3	0	54	19.4		25	344	41	47.7	0	54	39.7
	8	343	01	15.1	0	54	19.1		26	344	43	57.9	0	54	40.9
	9	343	03	22.7	0	54	18.9		27	344	46	07.4	0	54	42.0
	10	343	05	31.1	0	54	18.8		28	344	48	16.2	0	54	43.2
	11	343	07	40.2	-0	54	18.6		29	344	50	24.2	-0	54	44.5
	12	343	09	50.0	0	54	18.5		30	344	52	31.5	0	54	45.7
	13	343	12	00.5	0	54	18.5		31	344	54	38.0	0	54	47.0
	14	343	14	11.5	0	54	18.4	Apr.	1	344	56	43.7	0	54	48.3
	15	343	16	23.1	-0	54	18.4		2	344	58	48.6	-0	54	49.6

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	344	56	43.7	-0	54	48.3	May	17	346	11	53.8	-0	56	14.7
	2	344	58	48.6	0	54	49.6		18	346	12	56.2	0	56	17.1
	3	345	00	52.7	0	54	51.0		19	346	13	56.8	0	56	19.4
	4	345	02	55.9	0	54	52.4		20	346	14	55.6	0	56	21.8
	5	345	04	58.4	0	54	53.8		21	346	15	52.4	0	56	24.1
	6	345	06	59.9	0	54	55.3		22	346	16	47.4	0	56	26.5
	7	345	09	00.5	-0	54	56.8		23	346	17	40.5	-0	56	28.9
	8	345	11	00.2	0	54	58.3		24	346	18	31.7	0	56	31.3
	9	345	12	58.8	0	54	59.8		25	346	19	21.0	0	56	33.7
	10	345	14	56.4	0	55	01.4		26	346	20	08.5	0	56	36.1
	11	345	16	53.0	0	55	02.9		27	346	20	54.1	0	56	38.5
	12	345	18	48.4	0	55	04.6		28	346	21	37.8	0	56	40.9
	13	345	20	42.7	-0	55	06.2		29	346	22	19.8	-0	56	43.4
	14	345	22	35.9	0	55	07.9		30	346	22	59.8	0	56	45.8
	15	345	24	27.9	0	55	09.5		31	346	23	38.0	0	56	48.3
	16	345	26	18.7	0	55	11.2	June	1	346	24	14.2	0	56	50.7
	17	345	28	08.3	0	55	13.0		2	346	24	48.6	0	56	53.2
	18	345	29	56.8	0	55	14.7		3	346	25	21.0	0	56	55.7
	19	345	31	44.0	-0	55	16.5		4	346	25	51.4	-0	56	58.2
	20	345	33	30.0	0	55	18.3		5	346	26	19.9	0	57	00.7
	21	345	35	14.8	0	55	20.1		6	346	26	46.4	0	57	03.2
	22	345	36	58.2	0	55	22.0		7	346	27	10.9	0	57	05.7
	23	345	38	40.2	0	55	23.9		8	346	27	33.5	0	57	08.1
	24	345	40	20.8	0	55	25.8		9	346	27	54.1	0	57	10.6
	25	345	42	00.0	-0	55	27.7		10	346	28	12.7	-0	57	13.2
	26	345	43	37.7	0	55	29.6		11	346	28	29.4	0	57	15.7
	27	345	45	14.0	0	55	31.6		12	346	28	44.2	0	57	18.2
	28	345	46	48.8	0	55	33.5		13	346	28	57.1	0	57	20.7
	29	345	48	22.2	0	55	35.5		14	346	29	08.1	0	57	23.2
	30	345	49	54.1	0	55	37.6		15	346	29	17.1	0	57	25.6
May	1	345	51	24.6	-0	55	39.6		16	346	29	24.1	-0	57	28.1
	2	345	52	53.6	0	55	41.7		17	346	29	29.1	0	57	30.6
	3	345	54	21.1	0	55	43.8		18	346	29	32.0	0	57	33.1
	4	345	55	47.0	0	55	45.9		19	346	29	33.0	0	57	35.6
	5	345	57	11.4	0	55	48.0		20	346	29	32.0	0	57	38.1
	6	345	58	34.2	0	55	50.1		21	346	29	29.0	0	57	40.6
	7	345	59	55.3	-0	55	52.3		22	346	29	24.0	-0	57	43.1
	8	346	01	14.8	0	55	54.5		23	346	29	17.2	0	57	45.5
	9	346	02	32.7	0	55	56.6		24	346	29	08.4	0	57	48.0
	10	346	03	48.8	0	55	58.9		25	346	28	57.8	0	57	50.5
	11	346	05	03.2	0	56	01.1		26	346	28	45.2	0	57	52.9
	12	346	06	15.9	0	56	03.3		27	346	28	30.9	0	57	55.4
	13	346	07	26.9	-0	56	05.6		28	346	28	14.6	-0	57	57.8
	14	346	08	36.2	0	56	07.9		29	346	27	56.4	0	58	00.2
	15	346	09	43.8	0	56	10.1		30	346	27	36.3	0	58	02.7
	16	346	10	49.7	0	56	12.4	July	1	346	27	14.4	0	58	05.1
	17	346	11	53.8	-0	56	14.7		2	346	26	50.5	-0	58	07.5

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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	346	27	14.4	-0	58	05.1	Aug.	16	345	41	05.7	-0	59	35.8
	2	346	26	50.5	0	58	07.5		17	345	39	35.8	0	59	37.2
	3	346	26	24.8	0	58	09.9		18	345	38	05.1	0	59	38.5
	4	346	25	57.1	0	58	12.3		19	345	36	33.8	0	59	39.7
	5	346	25	27.6	0	58	14.6		20	345	35	01.7	0	59	41.0
	6	346	24	56.3	0	58	17.0		21	345	33	29.0	0	59	42.2
	7	346	24	23.2	-0	58	19.3		22	345	31	55.6	-0	59	43.4
	8	346	23	48.3	0	58	21.6		23	345	30	21.6	0	59	44.5
	9	346	23	11.6	0	58	24.0		24	345	28	47.0	0	59	45.7
	10	346	22	33.2	0	58	26.3		25	345	27	11.8	0	59	46.7
	11	346	21	53.1	0	58	28.5		26	345	25	36.1	0	59	47.8
	12	346	21	11.2	0	58	30.8		27	345	23	59.9	0	59	48.8
	13	346	20	27.7	-0	58	33.0		28	345	22	23.1	-0	59	49.8
	14	346	19	42.4	0	58	35.3		29	345	20	46.0	0	59	50.7
	15	346	18	55.3	0	58	37.5		30	345	19	08.5	0	59	51.6
	16	346	18	06.5	0	58	39.7		31	345	17	30.6	0	59	52.5
	17	346	17	15.9	0	58	41.8	Sept.	1	345	15	52.5	0	59	53.3
	18	346	16	23.7	0	58	44.0		2	345	14	14.2	0	59	54.1
	19	346	15	29.9	-0	58	46.1		3	345	12	35.6	-0	59	54.8
	20	346	14	34.5	0	58	48.2		4	345	10	56.9	0	59	55.5
	21	346	13	37.6	0	58	50.3		5	345	09	18.1	0	59	56.2
	22	346	12	39.2	0	58	52.4		6	345	07	39.2	0	59	56.8
	23	346	11	39.2	0	58	54.5		7	345	06	00.1	0	59	57.4
	24	346	10	37.8	0	58	56.5		8	345	04	21.0	0	59	58.0
	25	346	09	35.0	-0	58	58.5		9	345	02	41.8	-0	59	58.5
	26	346	08	30.6	0	59	00.5		10	345	01	02.5	0	59	59.0
	27	346	07	24.9	0	59	02.4		11	344	59	23.4	0	59	59.5
	28	346	06	17.7	0	59	04.4		12	344	57	44.3	0	59	59.9
	29	346	05	09.1	0	59	06.3		13	344	56	05.5	1	0	00.3
	30	346	03	59.0	0	59	08.2		14	344	54	26.9	1	0	00.6
	31	346	02	47.7	-0	59	10.0		15	344	52	48.6	-1	0	00.9
Aug.	1	346	01	34.9	0	59	11.9		16	344	51	10.5	1	0	01.2
	2	346	00	20.9	0	59	13.7		17	344	49	32.9	1	0	01.4
	3	345	59	05.6	0	59	15.4		18	344	47	55.6	1	0	01.6
	4	345	57	49.1	0	59	17.2		19	344	46	18.7	1	0	01.8
	5	345	56	31.4	0	59	18.9		20	344	44	42.2	1	0	01.9
	6	345	55	12.6	-0	59	20.6		21	344	43	06.2	-1	0	02.0
	7	345	53	52.6	0	59	22.3		22	344	41	30.6	1	0	02.0
	8	345	52	31.6	0	59	23.9		23	344	39	55.5	1	0	02.1
	9	345	51	09.5	0	59	25.5		24	344	38	21.0	1	0	02.0
	10	345	49	46.3	0	59	27.1		25	344	36	47.1	1	0	02.0
	11	345	48	22.1	0	59	28.6		26	344	35	13.8	1	0	01.9
	12	345	46	56.7	-0	59	30.1		27	344	33	41.2	-1	0	01.8
	13	345	45	30.4	0	59	31.6		28	344	32	09.4	1	0	01.6
	14	345	44	03.0	0	59	33.0		29	344	30	38.4	1	0	01.4
	15	345	42	34.8	0	59	34.4		30	344	29	08.2	1	0	01.2
	16	345	41	05.7	-0	59	35.8	Oct.	1	344	27	38.8	-1	0	00.9

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	344	27	38.8	-1	0	00.9	Nov.	16	343	43	02.9	-0	59	18.1
	2	344	26	10.3	1	0	00.6		17	343	42	45.3	0	59	16.7
	3	344	24	42.8	1	0	00.2		18	343	42	29.8	0	59	15.3
	4	344	23	16.1	0	59	59.9		19	343	42	16.2	0	59	13.9
	5	344	21	50.4	0	59	59.5		20	343	42	04.6	0	59	12.5
	6	344	20	25.6	0	59	59.0		21	343	41	55.1	0	59	11.0
	7	344	19	01.8	-0	59	58.5		22	343	41	47.7	-0	59	09.6
	8	344	17	39.1	0	59	58.0		23	343	41	42.4	0	59	08.2
	9	344	16	17.4	0	59	57.5		24	343	41	39.1	0	59	06.7
	10	344	14	56.9	0	59	56.9		25	343	41	38.0	0	59	05.2
	11	344	13	37.6	0	59	56.3		26	343	41	38.9	0	59	03.8
	12	344	12	19.6	0	59	55.7		27	343	41	41.9	0	59	02.3
	13	344	11	02.9	-0	59	55.1		28	343	41	46.9	-0	59	00.8
	14	344	09	47.5	0	59	54.4		29	343	41	53.9	0	58	59.3
	15	344	08	33.4	0	59	53.7		30	343	42	03.0	0	58	57.8
	16	344	07	20.6	0	59	52.9	Dec.	1	343	42	14.1	0	58	56.3
	17	344	06	09.2	0	59	52.1		2	343	42	27.2	0	58	54.8
	18	344	04	59.2	0	59	51.3		3	343	42	42.5	0	58	53.3
	19	344	03	50.5	-0	59	50.5		4	343	42	59.8	-0	58	51.9
	20	344	02	43.3	0	59	49.7		5	343	43	19.3	0	58	50.4
	21	344	01	37.5	0	59	48.8		6	343	43	40.9	0	58	48.9
	22	344	00	33.2	0	59	47.9		7	343	44	04.6	0	58	47.4
	23	343	59	30.4	0	59	46.9		8	343	44	30.4	0	58	45.9
	24	343	58	29.2	0	59	46.0		9	343	44	58.3	0	58	44.4
	25	343	57	29.6	-0	59	45.0		10	343	45	28.3	-0	58	43.0
	26	343	56	31.6	0	59	44.0		11	343	46	00.4	0	58	41.5
	27	343	55	35.3	0	59	42.9		12	343	46	34.4	0	58	40.0
	28	343	54	40.7	0	59	41.9		13	343	47	10.5	0	58	38.6
	29	343	53	47.7	0	59	40.8		14	343	47	48.6	0	58	37.1
	30	343	52	56.5	0	59	39.7		15	343	48	28.7	0	58	35.7
	31	343	52	07.0	-0	59	38.6		16	343	49	10.8	-0	58	34.2
Nov.	1	343	51	19.1	0	59	37.4		17	343	49	54.9	0	58	32.8
	2	343	50	33.0	0	59	36.2		18	343	50	41.0	0	58	31.4
	3	343	49	48.6	0	59	35.0		19	343	51	29.2	0	58	29.9
	4	343	49	05.9	0	59	33.8		20	343	52	19.3	0	58	28.5
	5	343	48	25.1	0	59	32.6		21	343	53	11.5	0	58	27.1
	6	343	47	46.1	-0	59	31.4		22	343	54	05.6	-0	58	25.7
	7	343	47	09.0	0	59	30.1		23	343	55	01.8	0	58	24.4
	8	343	46	33.9	0	59	28.8		24	343	55	59.8	0	58	23.0
	9	343	46	00.7	0	59	27.5		25	343	56	59.8	0	58	21.6
	10	343	45	29.4	0	59	26.2		26	343	58	01.6	0	58	20.3
	11	343	45	00.1	0	59	24.9		27	343	59	05.2	0	58	18.9
	12	343	44	32.8	-0	59	23.6		28	344	00	10.6	-0	58	17.6
	13	343	44	07.4	0	59	22.2		29	344	01	17.9	0	58	16.3
	14	343	43	43.9	0	59	20.9		30	344	02	27.0	0	58	15.0
	15	343	43	22.4	0	59	19.5		31	344	03	38.0	0	58	13.8
	16	343	43	02.9	-0	59	18.1		32	344	04	50.8	-0	58	12.5

NEPTUNE, 2018

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	22	54	33.98	-7	56	52.7	30.387 752	0.29	1.10	16	13	31
	1	22	54	38.77	7	56	22.2	30.403 055	0.29	1.10	16	09	40
	2	22	54	43.66	7	55	51.0	30.418 215	0.29	1.10	16	05	49
	3	22	54	48.66	7	55	19.2	30.433 230	0.29	1.10	16	01	58
	4	22	54	53.76	7	54	46.8	30.448 094	0.29	1.10	15	58	07
	5	22	54	58.96	7	54	13.7	30.462 805	0.29	1.10	15	54	16
	6	22	55	04.27	-7	53	40.1	30.477 357	0.29	1.10	15	50	26
	7	22	55	09.67	7	53	05.8	30.491 746	0.29	1.10	15	46	35
	8	22	55	15.17	7	52	31.0	30.505 969	0.29	1.10	15	42	45
	9	22	55	20.78	7	51	55.5	30.520 021	0.29	1.10	15	38	55
	10	22	55	26.48	7	51	19.5	30.533 898	0.29	1.10	15	35	05
	11	22	55	32.29	7	50	42.8	30.547 595	0.29	1.10	15	31	14
	12	22	55	38.19	-7	50	05.6	30.561 108	0.29	1.10	15	27	24
	13	22	55	44.18	7	49	27.8	30.574 434	0.29	1.10	15	23	35
	14	22	55	50.28	7	48	49.4	30.587 567	0.29	1.10	15	19	45
	15	22	55	56.46	7	48	10.5	30.600 503	0.29	1.09	15	15	55
	16	22	56	02.74	7	47	31.0	30.613 240	0.29	1.09	15	12	05
	17	22	56	09.11	7	46	51.0	30.625 773	0.29	1.09	15	08	16
	18	22	56	15.56	-7	46	10.6	30.638 097	0.29	1.09	15	04	26
	19	22	56	22.09	7	45	29.6	30.650 210	0.29	1.09	15	00	37
	20	22	56	28.71	7	44	48.1	30.662 108	0.29	1.09	14	56	48
	21	22	56	35.40	7	44	06.2	30.673 787	0.29	1.09	14	52	59
	22	22	56	42.18	7	43	23.8	30.685 244	0.29	1.09	14	49	10
	23	22	56	49.03	7	42	40.9	30.696 476	0.29	1.09	14	45	20
	24	22	56	55.96	-7	41	57.5	30.707 480	0.29	1.09	14	41	32
	25	22	57	02.96	7	41	13.8	30.718 252	0.29	1.09	14	37	43
	26	22	57	10.04	7	40	29.5	30.728 791	0.29	1.09	14	33	54
	27	22	57	17.19	7	39	44.8	30.739 093	0.29	1.09	14	30	05
	28	22	57	24.42	7	38	59.7	30.749 156	0.29	1.09	14	26	16
	29	22	57	31.72	7	38	14.2	30.758 978	0.29	1.09	14	22	28
	30	22	57	39.08	-7	37	28.3	30.768 557	0.29	1.09	14	18	39
	31	22	57	46.50	7	36	42.1	30.777 890	0.29	1.09	14	14	51
Feb.	1	22	57	53.99	7	35	55.5	30.786 975	0.29	1.09	14	11	02
	2	22	58	01.53	7	35	08.5	30.795 810	0.29	1.09	14	07	14
	3	22	58	09.12	7	34	21.3	30.804 393	0.29	1.09	14	03	26
	4	22	58	16.77	7	33	33.7	30.812 721	0.29	1.09	13	59	37
	5	22	58	24.48	-7	32	45.8	30.820 792	0.29	1.09	13	55	49
	6	22	58	32.24	7	31	57.6	30.828 604	0.29	1.09	13	52	01
	7	22	58	40.06	7	31	09.0	30.836 154	0.29	1.09	13	48	13
	8	22	58	47.92	7	30	20.2	30.843 440	0.29	1.09	13	44	25
	9	22	58	55.84	7	29	31.0	30.850 460	0.29	1.09	13	40	37
	10	22	59	03.81	7	28	41.6	30.857 212	0.28	1.09	13	36	49
	11	22	59	11.82	-7	27	52.0	30.863 693	0.28	1.09	13	33	01
	12	22	59	19.88	7	27	02.0	30.869 903	0.28	1.09	13	29	13
	13	22	59	27.97	7	26	11.9	30.875 838	0.28	1.08	13	25	25
	14	22	59	36.11	7	25	21.5	30.881 497	0.28	1.08	13	21	37
	15	22	59	44.28	-7	24	31.0	30.886 878	0.28	1.08	13	17	50

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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	22	59	44.28	-7	24	31.0	30.886 878	0.28	1.08	13	17	50
	16	22	59	52.48	7	23	40.3	30.891 981	0.28	1.08	13	14	02
	17	23	00	00.71	7	22	49.4	30.896 803	0.28	1.08	13	10	14
	18	23	00	08.97	7	21	58.3	30.901 344	0.28	1.08	13	06	27
	19	23	00	17.26	7	21	07.1	30.905 602	0.28	1.08	13	02	39
	20	23	00	25.58	7	20	15.7	30.909 576	0.28	1.08	12	58	51
	21	23	00	33.92	-7	19	24.2	30.913 266	0.28	1.08	12	55	04
	22	23	00	42.29	7	18	32.5	30.916 670	0.28	1.08	12	51	16
	23	23	00	50.68	7	17	40.8	30.919 790	0.28	1.08	12	47	29
	24	23	00	59.09	7	16	48.9	30.922 623	0.28	1.08	12	43	41
	25	23	01	07.52	7	15	56.9	30.925 171	0.28	1.08	12	39	53
	26	23	01	15.97	7	15	04.8	30.927 432	0.28	1.08	12	36	06
	27	23	01	24.43	-7	14	12.7	30.929 408	0.28	1.08	12	32	18
	28	23	01	32.90	7	13	20.6	30.931 097	0.28	1.08	12	28	31
Mar.	1	23	01	41.37	7	12	28.5	30.932 501	0.28	1.08	12	24	44
	2	23	01	49.85	7	11	36.3	30.933 619	0.28	1.08	12	20	56
	3	23	01	58.33	7	10	44.2	30.934 450	0.28	1.08	12	17	09
	4	23	02	06.82	7	09	52.3	30.934 996	0.28	1.08	12	13	21
	5	23	02	15.28	-7	09	00.4	30.935 255	0.28	1.08	12	09	34
	6	23	02	23.75	7	08	08.0	30.935 228	0.28	1.08	12	05	46
	7	23	02	32.24	7	07	15.8	30.934 915	0.28	1.08	12	01	59
	8	23	02	40.73	7	06	23.7	30.934 316	0.28	1.08	11	58	11
	9	23	02	49.21	7	05	31.6	30.933 430	0.28	1.08	11	54	24
	10	23	02	57.68	7	04	39.6	30.932 258	0.28	1.08	11	50	36
	11	23	03	06.15	-7	03	47.7	30.930 800	0.28	1.08	11	46	49
	12	23	03	14.60	7	02	55.9	30.929 056	0.28	1.08	11	43	01
	13	23	03	23.04	7	02	04.2	30.927 028	0.28	1.08	11	39	14
	14	23	03	31.47	7	01	12.7	30.924 714	0.28	1.08	11	35	26
	15	23	03	39.87	7	00	21.3	30.922 117	0.28	1.08	11	31	39
	16	23	03	48.25	6	59	30.0	30.919 237	0.28	1.08	11	27	51
	17	23	03	56.61	-6	58	38.9	30.916 074	0.28	1.08	11	24	04
	18	23	04	04.95	6	57	48.0	30.912 630	0.28	1.08	11	20	16
	19	23	04	13.26	6	56	57.2	30.908 906	0.28	1.08	11	16	28
	20	23	04	21.54	6	56	06.6	30.904 903	0.28	1.08	11	12	41
	21	23	04	29.80	6	55	16.2	30.900 623	0.28	1.08	11	08	53
	22	23	04	38.03	6	54	26.1	30.896 068	0.28	1.08	11	05	05
	23	23	04	46.23	-6	53	36.1	30.891 239	0.28	1.08	11	01	17
	24	23	04	54.39	6	52	46.3	30.886 139	0.28	1.08	10	57	30
	25	23	05	02.52	6	51	56.8	30.880 768	0.28	1.08	10	53	42
	26	23	05	10.62	6	51	07.5	30.875 130	0.28	1.09	10	49	54
	27	23	05	18.67	6	50	18.6	30.869 227	0.28	1.09	10	46	06
	28	23	05	26.67	6	49	29.9	30.863 060	0.28	1.09	10	42	18
	29	23	05	34.63	-6	48	41.6	30.856 631	0.29	1.09	10	38	30
	30	23	05	42.54	6	47	53.5	30.849 944	0.29	1.09	10	34	42
	31	23	05	50.40	6	47	05.8	30.842 999	0.29	1.09	10	30	54
Apr.	1	23	05	58.22	6	46	18.4	30.835 799	0.29	1.09	10	27	06
	2	23	06	05.98	-6	45	31.4	30.828 346	0.29	1.09	10	23	17

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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	05	58.22	-6	46	18.4	30.835 799	0.29	1.09	10	27	06
	2	23	06	05.98	6	45	31.4	30.828 346	0.29	1.09	10	23	17
	3	23	06	13.70	6	44	44.6	30.820 641	0.29	1.09	10	19	29
	4	23	06	21.37	6	43	58.2	30.812 686	0.29	1.09	10	15	41
	5	23	06	28.98	6	43	12.1	30.804 485	0.29	1.09	10	11	52
	6	23	06	36.54	6	42	26.4	30.796 038	0.29	1.09	10	08	04
	7	23	06	44.04	-6	41	41.1	30.787 348	0.29	1.09	10	04	16
	8	23	06	51.49	6	40	56.2	30.778 416	0.29	1.09	10	00	27
	9	23	06	58.87	6	40	11.7	30.769 247	0.29	1.09	9	56	38
	10	23	07	06.19	6	39	27.6	30.759 841	0.29	1.09	9	52	50
	11	23	07	13.44	6	38	43.9	30.750 201	0.29	1.09	9	49	01
	12	23	07	20.62	6	38	00.7	30.740 330	0.29	1.09	9	45	12
	13	23	07	27.74	-6	37	18.0	30.730 231	0.29	1.09	9	41	23
	14	23	07	34.78	6	36	35.7	30.719 906	0.29	1.09	9	37	35
	15	23	07	41.75	6	35	53.9	30.709 358	0.29	1.09	9	33	46
	16	23	07	48.65	6	35	12.5	30.698 591	0.29	1.09	9	29	56
	17	23	07	55.48	6	34	31.6	30.687 608	0.29	1.09	9	26	07
	18	23	08	02.23	6	33	51.2	30.676 412	0.29	1.09	9	22	18
	19	23	08	08.91	-6	33	11.2	30.665 006	0.29	1.09	9	18	29
	20	23	08	15.52	6	32	31.8	30.653 395	0.29	1.09	9	14	39
	21	23	08	22.04	6	31	52.9	30.641 582	0.29	1.09	9	10	50
	22	23	08	28.48	6	31	14.5	30.629 570	0.29	1.09	9	07	00
	23	23	08	34.84	6	30	36.7	30.617 364	0.29	1.09	9	03	11
	24	23	08	41.11	6	29	59.4	30.604 967	0.29	1.09	8	59	21
	25	23	08	47.30	-6	29	22.7	30.592 383	0.29	1.10	8	55	31
	26	23	08	53.39	6	28	46.6	30.579 616	0.29	1.10	8	51	41
	27	23	08	59.39	6	28	11.0	30.566 669	0.29	1.10	8	47	51
	28	23	09	05.31	6	27	36.1	30.553 546	0.29	1.10	8	44	01
	29	23	09	11.13	6	27	01.7	30.540 250	0.29	1.10	8	40	11
	30	23	09	16.87	6	26	27.9	30.526 785	0.29	1.10	8	36	21
May	1	23	09	22.51	-6	25	54.6	30.513 154	0.29	1.10	8	32	31
	2	23	09	28.07	6	25	22.0	30.499 360	0.29	1.10	8	28	40
	3	23	09	33.53	6	24	50.0	30.485 408	0.29	1.10	8	24	50
	4	23	09	38.90	6	24	18.5	30.471 301	0.29	1.10	8	20	59
	5	23	09	44.17	6	23	47.7	30.457 042	0.29	1.10	8	17	09
	6	23	09	49.34	6	23	17.6	30.442 635	0.29	1.10	8	13	18
	7	23	09	54.42	-6	22	48.1	30.428 083	0.29	1.10	8	09	27
	8	23	09	59.39	6	22	19.2	30.413 391	0.29	1.10	8	05	36
	9	23	10	04.25	6	21	51.0	30.398 563	0.29	1.10	8	01	45
	10	23	10	09.02	6	21	23.5	30.383 602	0.29	1.10	7	57	53
	11	23	10	13.68	6	20	56.6	30.368 512	0.29	1.10	7	54	02
	12	23	10	18.23	6	20	30.4	30.353 298	0.29	1.10	7	50	11
	13	23	10	22.67	-6	20	04.9	30.337 964	0.29	1.10	7	46	19
	14	23	10	27.01	6	19	40.1	30.322 514	0.29	1.10	7	42	28
	15	23	10	31.25	6	19	16.0	30.306 953	0.29	1.11	7	38	36
	16	23	10	35.38	6	18	52.5	30.291 285	0.29	1.11	7	34	44
	17	23	10	39.40	-6	18	29.7	30.275 515	0.29	1.11	7	30	52

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	23	10	39.40	-6	18	29.7	30.275 515	0.29	1.11	7	30	52
	18	23	10	43.32	6	18	07.6	30.259 648	0.29	1.11	7	27	00
	19	23	10	47.13	6	17	46.2	30.243 689	0.29	1.11	7	23	08
	20	23	10	50.82	6	17	25.5	30.227 642	0.29	1.11	7	19	16
	21	23	10	54.39	6	17	05.6	30.211 512	0.29	1.11	7	15	23
	22	23	10	57.85	6	16	46.4	30.195 305	0.29	1.11	7	11	31
	23	23	11	01.19	-6	16	28.0	30.179 024	0.29	1.11	7	07	38
	24	23	11	04.42	6	16	10.3	30.162 675	0.29	1.11	7	03	45
	25	23	11	07.53	6	15	53.3	30.146 261	0.29	1.11	6	59	53
	26	23	11	10.52	6	15	37.1	30.129 787	0.29	1.11	6	56	00
	27	23	11	13.40	6	15	21.6	30.113 258	0.29	1.11	6	52	06
	28	23	11	16.17	6	15	06.8	30.096 677	0.29	1.11	6	48	13
	29	23	11	18.82	-6	14	52.8	30.080 050	0.29	1.11	6	44	20
	30	23	11	21.36	6	14	39.4	30.063 380	0.29	1.11	6	40	27
	31	23	11	23.78	6	14	26.9	30.046 671	0.29	1.11	6	36	33
June	1	23	11	26.09	6	14	15.0	30.029 928	0.29	1.12	6	32	39
	2	23	11	28.27	6	14	04.0	30.013 156	0.29	1.12	6	28	46
	3	23	11	30.34	6	13	53.6	29.996 358	0.29	1.12	6	24	52
	4	23	11	32.29	-6	13	44.1	29.979 540	0.29	1.12	6	20	58
	5	23	11	34.11	6	13	35.3	29.962 704	0.29	1.12	6	17	04
	6	23	11	35.81	6	13	27.3	29.945 857	0.29	1.12	6	13	09
	7	23	11	37.39	6	13	20.1	29.929 003	0.29	1.12	6	09	15
	8	23	11	38.85	6	13	13.6	29.912 146	0.29	1.12	6	05	20
	9	23	11	40.19	6	13	07.9	29.895 291	0.29	1.12	6	01	26
	10	23	11	41.41	-6	13	02.9	29.878 443	0.29	1.12	5	57	31
	11	23	11	42.50	6	12	58.7	29.861 607	0.29	1.12	5	53	36
	12	23	11	43.48	6	12	55.3	29.844 787	0.29	1.12	5	49	41
	13	23	11	44.34	6	12	52.6	29.827 989	0.29	1.12	5	45	46
	14	23	11	45.08	6	12	50.6	29.811 219	0.29	1.12	5	41	51
	15	23	11	45.70	6	12	49.4	29.794 480	0.30	1.12	5	37	56
	16	23	11	46.20	-6	12	49.0	29.777 779	0.30	1.12	5	34	00
	17	23	11	46.58	6	12	49.4	29.761 120	0.30	1.13	5	30	05
	18	23	11	46.83	6	12	50.5	29.744 508	0.30	1.13	5	26	09
	19	23	11	46.95	6	12	52.4	29.727 949	0.30	1.13	5	22	13
	20	23	11	46.95	6	12	55.1	29.711 447	0.30	1.13	5	18	17
	21	23	11	46.83	6	12	58.6	29.695 007	0.30	1.13	5	14	21
	22	23	11	46.59	-6	13	02.8	29.678 633	0.30	1.13	5	10	25
	23	23	11	46.23	6	13	07.7	29.662 330	0.30	1.13	5	06	29
	24	23	11	45.75	6	13	13.4	29.646 102	0.30	1.13	5	02	32
	25	23	11	45.16	6	13	19.8	29.629 953	0.30	1.13	4	58	36
	26	23	11	44.45	6	13	26.9	29.613 888	0.30	1.13	4	54	39
	27	23	11	43.63	6	13	34.8	29.597 911	0.30	1.13	4	50	42
	28	23	11	42.68	-6	13	43.4	29.582 026	0.30	1.13	4	46	46
	29	23	11	41.62	6	13	52.7	29.566 237	0.30	1.13	4	42	49
	30	23	11	40.45	6	14	02.7	29.550 550	0.30	1.13	4	38	51
July	1	23	11	39.16	6	14	13.5	29.534 967	0.30	1.13	4	34	54
	2	23	11	37.74	-6	14	25.0	29.519 494	0.30	1.13	4	30	57

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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	11	39.16	-6	14	13.5	29.534 967	0.30	1.13	4	34	54
	2	23	11	37.74	6	14	25.0	29.519 494	0.30	1.13	4	30	57
	3	23	11	36.22	6	14	37.2	29.504 134	0.30	1.14	4	26	59
	4	23	11	34.57	6	14	50.2	29.488 892	0.30	1.14	4	23	02
	5	23	11	32.81	6	15	03.8	29.473 772	0.30	1.14	4	19	04
	6	23	11	30.94	6	15	18.2	29.458 779	0.30	1.14	4	15	06
	7	23	11	28.95	-6	15	33.2	29.443 918	0.30	1.14	4	11	08
	8	23	11	26.86	6	15	48.9	29.429 191	0.30	1.14	4	07	10
	9	23	11	24.65	6	16	05.3	29.414 605	0.30	1.14	4	03	12
	10	23	11	22.34	6	16	22.4	29.400 163	0.30	1.14	3	59	14
	11	23	11	19.92	6	16	40.0	29.385 871	0.30	1.14	3	55	16
	12	23	11	17.39	6	16	58.4	29.371 733	0.30	1.14	3	51	17
	13	23	11	14.76	-6	17	17.4	29.357 753	0.30	1.14	3	47	19
	14	23	11	12.02	6	17	37.1	29.343 937	0.30	1.14	3	43	20
	15	23	11	09.17	6	17	57.4	29.330 288	0.30	1.14	3	39	21
	16	23	11	06.21	6	18	18.4	29.316 811	0.30	1.14	3	35	22
	17	23	11	03.14	6	18	40.1	29.303 510	0.30	1.14	3	31	24
	18	23	10	59.98	6	19	02.4	29.290 389	0.30	1.14	3	27	24
	19	23	10	56.71	-6	19	25.3	29.277 452	0.30	1.14	3	23	25
	20	23	10	53.34	6	19	48.7	29.264 703	0.30	1.14	3	19	26
	21	23	10	49.88	6	20	12.8	29.252 145	0.30	1.15	3	15	27
	22	23	10	46.32	6	20	37.4	29.239 781	0.30	1.15	3	11	27
	23	23	10	42.67	6	21	02.6	29.227 616	0.30	1.15	3	07	28
	24	23	10	38.93	6	21	28.3	29.215 652	0.30	1.15	3	03	28
	25	23	10	35.09	-6	21	54.6	29.203 892	0.30	1.15	2	59	28
	26	23	10	31.17	6	22	21.4	29.192 340	0.30	1.15	2	55	28
	27	23	10	27.16	6	22	48.8	29.181 000	0.30	1.15	2	51	29
	28	23	10	23.05	6	23	16.7	29.169 874	0.30	1.15	2	47	29
	29	23	10	18.86	6	23	45.1	29.158 966	0.30	1.15	2	43	28
	30	23	10	14.59	6	24	14.0	29.148 278	0.30	1.15	2	39	28
	31	23	10	10.22	-6	24	43.5	29.137 815	0.30	1.15	2	35	28
Aug.	1	23	10	05.78	6	25	13.4	29.127 578	0.30	1.15	2	31	28
	2	23	10	01.25	6	25	43.8	29.117 572	0.30	1.15	2	27	27
	3	23	09	56.64	6	26	14.7	29.107 800	0.30	1.15	2	23	27
	4	23	09	51.95	6	26	46.0	29.098 264	0.30	1.15	2	19	26
	5	23	09	47.20	6	27	17.8	29.088 968	0.30	1.15	2	15	26
	6	23	09	42.37	-6	27	49.9	29.079 915	0.30	1.15	2	11	25
	7	23	09	37.47	6	28	22.5	29.071 108	0.30	1.15	2	07	24
	8	23	09	32.50	6	28	55.4	29.062 551	0.30	1.15	2	03	23
	9	23	09	27.47	6	29	28.8	29.054 246	0.30	1.15	1	59	22
	10	23	09	22.36	6	30	02.5	29.046 197	0.30	1.15	1	55	21
	11	23	09	17.20	6	30	36.6	29.038 407	0.30	1.15	1	51	20
	12	23	09	11.96	-6	31	11.1	29.030 879	0.30	1.15	1	47	19
	13	23	09	06.66	6	31	46.0	29.023 615	0.30	1.15	1	43	18
	14	23	09	01.30	6	32	21.2	29.016 617	0.30	1.15	1	39	17
	15	23	08	55.87	6	32	56.8	29.009 889	0.30	1.15	1	35	15
	16	23	08	50.40	-6	33	32.6	29.003 431	0.30	1.16	1	31	14

NEPTUNE, 2018
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	08	50.40	-6	33	32.6	29.003 431	0.30	1.16	1	31	14
	17	23	08	44.88	6	34	08.7	28.997 247	0.30	1.16	1	27	13
	18	23	08	39.30	6	34	45.1	28.991 337	0.30	1.16	1	23	11
	19	23	08	33.69	6	35	21.7	28.985 703	0.30	1.16	1	19	10
	20	23	08	28.03	6	35	58.5	28.980 347	0.30	1.16	1	15	08
	21	23	08	22.32	6	36	35.6	28.975 270	0.30	1.16	1	11	07
	22	23	08	16.58	-6	37	12.9	28.970 474	0.30	1.16	1	07	05
	23	23	08	10.79	6	37	50.4	28.965 960	0.30	1.16	1	03	03
	24	23	08	04.97	6	38	28.1	28.961 730	0.30	1.16	0	59	02
	25	23	07	59.11	6	39	06.0	28.957 784	0.30	1.16	0	54	60
	26	23	07	53.21	6	39	44.1	28.954 124	0.30	1.16	0	50	58
	27	23	07	47.29	6	40	22.3	28.950 751	0.30	1.16	0	46	56
	28	23	07	41.33	-6	41	00.7	28.947 667	0.30	1.16	0	42	54
	29	23	07	35.34	6	41	39.2	28.944 872	0.30	1.16	0	38	53
	30	23	07	29.33	6	42	17.8	28.942 367	0.30	1.16	0	34	51
	31	23	07	23.30	6	42	56.5	28.940 154	0.30	1.16	0	30	49
Sept.	1	23	07	17.25	6	43	35.2	28.938 234	0.30	1.16	0	26	47
	2	23	07	11.19	6	44	14.0	28.936 608	0.30	1.16	0	22	45
	3	23	07	05.11	-6	44	52.9	28.935 276	0.30	1.16	0	18	43
	4	23	06	59.02	6	45	31.7	28.934 241	0.30	1.16	0	14	41
	5	23	06	52.92	6	46	10.6	28.933 502	0.30	1.16	0	10	39
	6	23	06	46.81	6	46	49.5	28.933 060	0.30	1.16	0	06	37
	7	23	06	40.70	6	47	28.4	28.932 917	0.30	1.16	0	02	35
	8	23	06	34.58	6	48	07.3	28.933 074	0.30	1.16	23	54	31
	9	23	06	28.45	-6	48	46.2	28.933 529	0.30	1.16	23	50	29
	10	23	06	22.32	6	49	25.0	28.934 285	0.30	1.16	23	46	27
	11	23	06	16.19	6	50	03.8	28.935 340	0.30	1.16	23	42	25
	12	23	06	10.07	6	50	42.5	28.936 694	0.30	1.16	23	38	23
	13	23	06	03.96	6	51	21.1	28.938 347	0.30	1.16	23	34	21
	14	23	05	57.87	6	51	59.5	28.940 299	0.30	1.16	23	30	19
	15	23	05	51.79	-6	52	37.8	28.942 548	0.30	1.16	23	26	17
	16	23	05	45.73	6	53	16.0	28.945 094	0.30	1.16	23	22	15
	17	23	05	39.68	6	53	53.9	28.947 936	0.30	1.16	23	18	13
	18	23	05	33.66	6	54	31.7	28.951 073	0.30	1.16	23	14	12
	19	23	05	27.67	6	55	09.3	28.954 504	0.30	1.16	23	10	10
	20	23	05	21.70	6	55	46.8	28.958 227	0.30	1.16	23	06	08
	21	23	05	15.75	-6	56	24.0	28.962 242	0.30	1.16	23	02	06
	22	23	05	09.83	6	57	00.9	28.966 547	0.30	1.16	22	58	04
	23	23	05	03.95	6	57	37.7	28.971 141	0.30	1.16	22	54	03
	24	23	04	58.09	6	58	14.2	28.976 023	0.30	1.16	22	50	01
	25	23	04	52.27	6	58	50.4	28.981 192	0.30	1.16	22	45	59
	26	23	04	46.49	6	59	26.4	28.986 645	0.30	1.16	22	41	58
	27	23	04	40.76	-7	00	02.0	28.992 381	0.30	1.16	22	37	56
	28	23	04	35.06	7	00	37.3	28.998 400	0.30	1.16	22	33	55
	29	23	04	29.42	7	01	12.3	29.004 700	0.30	1.15	22	29	53
	30	23	04	23.82	7	01	46.9	29.011 279	0.30	1.15	22	25	52
Oct.	1	23	04	18.28	-7	02	21.1	29.018 135	0.30	1.15	22	21	50

NEPTUNE, 2018

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	04	18.28	-7	02	21.1	29.018 135	0.30	1.15	22	21	50
	2	23	04	12.79	7	02	55.0	29.025 268	0.30	1.15	22	17	49
	3	23	04	07.36	7	03	28.5	29.032 676	0.30	1.15	22	13	48
	4	23	04	01.98	7	04	01.6	29.040 356	0.30	1.15	22	09	46
	5	23	03	56.66	7	04	34.3	29.048 307	0.30	1.15	22	05	45
	6	23	03	51.39	7	05	06.6	29.056 527	0.30	1.15	22	01	44
	7	23	03	46.19	-7	05	38.5	29.065 014	0.30	1.15	21	57	43
	8	23	03	41.05	7	06	10.0	29.073 765	0.30	1.15	21	53	42
	9	23	03	35.97	7	06	41.0	29.082 778	0.30	1.15	21	49	41
	10	23	03	30.97	7	07	11.5	29.092 049	0.30	1.15	21	45	41
	11	23	03	26.04	7	07	41.5	29.101 576	0.30	1.15	21	41	40
	12	23	03	21.19	7	08	11.0	29.111 356	0.30	1.15	21	37	39
	13	23	03	16.41	-7	08	40.0	29.121 385	0.30	1.15	21	33	39
	14	23	03	11.72	7	09	08.4	29.131 660	0.30	1.15	21	29	38
	15	23	03	07.11	7	09	36.3	29.142 177	0.30	1.15	21	25	38
	16	23	03	02.58	7	10	03.7	29.152 933	0.30	1.15	21	21	37
	17	23	02	58.13	7	10	30.5	29.163 925	0.30	1.15	21	17	37
	18	23	02	53.77	7	10	56.8	29.175 149	0.30	1.15	21	13	37
	19	23	02	49.49	-7	11	22.5	29.186 601	0.30	1.15	21	09	37
	20	23	02	45.30	7	11	47.6	29.198 278	0.30	1.15	21	05	37
	21	23	02	41.20	7	12	12.1	29.210 176	0.30	1.15	21	01	37
	22	23	02	37.19	7	12	36.1	29.222 292	0.30	1.15	20	57	37
	23	23	02	33.28	7	12	59.4	29.234 621	0.30	1.15	20	53	37
	24	23	02	29.46	7	13	22.1	29.247 161	0.30	1.15	20	49	38
	25	23	02	25.73	-7	13	44.1	29.259 907	0.30	1.14	20	45	38
	26	23	02	22.11	7	14	05.5	29.272 856	0.30	1.14	20	41	39
	27	23	02	18.59	7	14	26.2	29.286 004	0.30	1.14	20	37	39
	28	23	02	15.18	7	14	46.3	29.299 347	0.30	1.14	20	33	40
	29	23	02	11.87	7	15	05.7	29.312 883	0.30	1.14	20	29	41
	30	23	02	08.66	7	15	24.4	29.326 607	0.30	1.14	20	25	42
	31	23	02	05.56	-7	15	42.4	29.340 515	0.30	1.14	20	21	43
Nov.	1	23	02	02.56	7	15	59.8	29.354 603	0.30	1.14	20	17	44
	2	23	01	59.67	7	16	16.5	29.368 868	0.30	1.14	20	13	46
	3	23	01	56.89	7	16	32.5	29.383 305	0.30	1.14	20	09	47
	4	23	01	54.21	7	16	47.8	29.397 910	0.30	1.14	20	05	49
	5	23	01	51.65	7	17	02.4	29.412 679	0.30	1.14	20	01	50
	6	23	01	49.20	-7	17	16.2	29.427 605	0.30	1.14	19	57	52
	7	23	01	46.87	7	17	29.3	29.442 686	0.30	1.14	19	53	54
	8	23	01	44.65	7	17	41.7	29.457 915	0.30	1.14	19	49	56
	9	23	01	42.56	7	17	53.3	29.473 289	0.30	1.14	19	45	58
	10	23	01	40.59	7	18	04.1	29.488 800	0.30	1.14	19	42	00
	11	23	01	38.73	7	18	14.1	29.504 446	0.30	1.14	19	38	03
	12	23	01	37.00	-7	18	23.4	29.520 219	0.30	1.13	19	34	05
	13	23	01	35.39	7	18	31.9	29.536 116	0.30	1.13	19	30	08
	14	23	01	33.90	7	18	39.7	29.552 131	0.30	1.13	19	26	10
	15	23	01	32.54	7	18	46.7	29.568 259	0.30	1.13	19	22	13
	16	23	01	31.29	-7	18	53.0	29.584 495	0.30	1.13	19	18	16

NEPTUNE, 2018

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	01	31.29	-7	18	53.0	29.584 495	0.30	1.13	19	18	16
	17	23	01	30.16	7	18	58.5	29.600 833	0.30	1.13	19	14	19
	18	23	01	29.16	7	19	03.2	29.617 269	0.30	1.13	19	10	22
	19	23	01	28.28	7	19	07.1	29.633 797	0.30	1.13	19	06	26
	20	23	01	27.53	7	19	10.2	29.650 413	0.30	1.13	19	02	29
	21	23	01	26.90	7	19	12.5	29.667 111	0.30	1.13	18	58	33
	22	23	01	26.40	-7	19	14.0	29.683 886	0.30	1.13	18	54	36
	23	23	01	26.03	7	19	14.7	29.700 734	0.30	1.13	18	50	40
	24	23	01	25.80	7	19	14.6	29.717 650	0.30	1.13	18	46	44
	25	23	01	25.69	7	19	13.7	29.734 629	0.30	1.13	18	42	48
	26	23	01	25.71	7	19	12.0	29.751 666	0.30	1.13	18	38	52
	27	23	01	25.85	7	19	09.5	29.768 756	0.30	1.13	18	34	57
	28	23	01	26.13	-7	19	06.2	29.785 895	0.30	1.12	18	31	01
	29	23	01	26.52	7	19	02.1	29.803 077	0.30	1.12	18	27	06
	30	23	01	27.05	7	18	57.3	29.820 298	0.29	1.12	18	23	11
Dec.	1	23	01	27.70	7	18	51.6	29.837 552	0.29	1.12	18	19	15
	2	23	01	28.47	7	18	45.2	29.854 834	0.29	1.12	18	15	20
	3	23	01	29.38	7	18	37.9	29.872 138	0.29	1.12	18	11	25
	4	23	01	30.42	-7	18	29.9	29.889 459	0.29	1.12	18	07	31
	5	23	01	31.59	7	18	21.0	29.906 792	0.29	1.12	18	03	36
	6	23	01	32.89	7	18	11.3	29.924 130	0.29	1.12	17	59	41
	7	23	01	34.32	7	18	00.8	29.941 469	0.29	1.12	17	55	47
	8	23	01	35.88	7	17	49.5	29.958 802	0.29	1.12	17	51	53
	9	23	01	37.58	7	17	37.4	29.976 123	0.29	1.12	17	47	59
	10	23	01	39.40	-7	17	24.5	29.993 428	0.29	1.12	17	44	05
	11	23	01	41.35	7	17	10.8	30.010 711	0.29	1.12	17	40	11
	12	23	01	43.42	7	16	56.3	30.027 965	0.29	1.12	17	36	17
	13	23	01	45.62	7	16	41.1	30.045 187	0.29	1.11	17	32	23
	14	23	01	47.95	7	16	25.1	30.062 370	0.29	1.11	17	28	30
	15	23	01	50.40	7	16	08.3	30.079 508	0.29	1.11	17	24	37
	16	23	01	52.97	-7	15	50.8	30.096 598	0.29	1.11	17	20	43
	17	23	01	55.67	7	15	32.5	30.113 634	0.29	1.11	17	16	50
	18	23	01	58.49	7	15	13.4	30.130 610	0.29	1.11	17	12	57
	19	23	02	01.44	7	14	53.6	30.147 522	0.29	1.11	17	09	04
	20	23	02	04.51	7	14	32.9	30.164 364	0.29	1.11	17	05	11
	21	23	02	07.71	7	14	11.6	30.181 133	0.29	1.11	17	01	19
	22	23	02	11.03	-7	13	49.4	30.197 823	0.29	1.11	16	57	26
	23	23	02	14.48	7	13	26.5	30.214 431	0.29	1.11	16	53	34
	24	23	02	18.04	7	13	02.9	30.230 950	0.29	1.11	16	49	42
	25	23	02	21.72	7	12	38.6	30.247 377	0.29	1.11	16	45	49
	26	23	02	25.52	7	12	13.5	30.263 708	0.29	1.11	16	41	57
	27	23	02	29.43	7	11	47.8	30.279 937	0.29	1.11	16	38	05
	28	23	02	33.45	-7	11	21.4	30.296 060	0.29	1.11	16	34	14
	29	23	02	37.59	7	10	54.3	30.312 073	0.29	1.11	16	30	22
	30	23	02	41.84	7	10	26.5	30.327 969	0.29	1.10	16	26	30
	31	23	02	46.21	7	09	57.9	30.343 745	0.29	1.10	16	22	39
	32	23	02	50.69	-7	09	28.7	30.359 395	0.29	1.10	16	18	47

PLUTO, 2018

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	289 01 52.2	+0 27 54.6	33.475 64	July 5	289 59 00.6	+0 10 26.6	33.594 97
6	289 03 25.2	0 27 26.2	33.478 86	10	290 00 33.0	0 09 58.3	33.598 20
11	289 04 58.1	0 26 57.8	33.482 07	15	290 02 05.3	0 09 30.1	33.601 44
16	289 06 31.0	0 26 29.4	33.485 29	20	290 03 37.6	0 09 01.9	33.604 68
21	289 08 03.9	0 26 01.0	33.488 51	25	290 05 09.9	0 08 33.7	33.607 92
26	289 09 36.8	0 25 32.5	33.491 72	30	290 06 42.2	0 08 05.5	33.611 15
31	289 11 09.7	+0 25 04.2	33.494 94	Aug. 4	290 08 14.5	+0 07 37.3	33.614 39
Feb. 5	289 12 42.5	0 24 35.8	33.498 16	9	290 09 46.7	0 07 09.1	33.617 63
10	289 14 15.4	0 24 07.4	33.501 37	14	290 11 19.0	0 06 40.9	33.620 87
15	289 15 48.2	0 23 39.0	33.504 59	19	290 12 51.2	0 06 12.7	33.624 11
20	289 17 21.0	0 23 10.6	33.507 81	24	290 14 23.4	0 05 44.6	33.627 35
25	289 18 53.8	0 22 42.3	33.511 03	29	290 15 55.6	0 05 16.4	33.630 59
Mar. 2	289 20 26.6	+0 22 13.9	33.514 25	Sept. 3	290 17 27.7	+0 04 48.2	33.633 83
7	289 21 59.3	0 21 45.6	33.517 48	8	290 18 59.9	0 04 20.1	33.637 07
12	289 23 32.1	0 21 17.2	33.520 70	13	290 20 32.0	0 03 51.9	33.640 32
17	289 25 04.8	0 20 48.9	33.523 92	18	290 22 04.1	0 03 23.8	33.643 56
22	289 26 37.5	0 20 20.5	33.527 14	23	290 23 36.2	0 02 55.6	33.646 80
27	289 28 10.2	0 19 52.2	33.530 37	28	290 25 08.3	0 02 27.5	33.650 05
Apr. 1	289 29 42.9	+0 19 23.8	33.533 59	Oct. 3	290 26 40.4	+0 01 59.3	33.653 29
6	289 31 15.5	0 18 55.5	33.536 82	8	290 28 12.4	0 01 31.2	33.656 53
11	289 32 48.2	0 18 27.2	33.540 04	13	290 29 44.5	0 01 03.1	33.659 78
16	289 34 20.8	0 17 58.9	33.543 27	18	290 31 16.5	0 00 35.0	33.663 03
21	289 35 53.4	0 17 30.6	33.546 50	23	290 32 48.5	+0 00 06.9	33.666 27
26	289 37 26.0	0 17 02.3	33.549 72	28	290 34 20.5	-0 00 21.3	33.669 52
May 1	289 38 58.6	+0 16 34.0	33.552 95	Nov. 2	290 35 52.4	-0 00 49.4	33.672 77
6	289 40 31.2	0 16 05.7	33.556 18	7	290 37 24.4	0 01 17.4	33.676 01
11	289 42 03.7	0 15 37.4	33.559 41	12	290 38 56.3	0 01 45.6	33.679 26
16	289 43 36.2	0 15 09.1	33.562 64	17	290 40 28.3	0 02 13.6	33.682 51
21	289 45 08.7	0 14 40.8	33.565 87	22	290 42 00.2	0 02 41.7	33.685 76
26	289 46 41.2	0 14 12.6	33.569 10	27	290 43 32.0	0 03 09.8	33.689 01
31	289 48 13.7	+0 13 44.3	33.572 33	Dec. 2	290 45 03.9	-0 03 37.9	33.692 26
June 5	289 49 46.2	0 13 16.1	33.575 56	7	290 46 35.8	0 04 05.9	33.695 51
10	289 51 18.6	0 12 47.8	33.578 80	12	290 48 07.6	0 04 34.0	33.698 76
15	289 52 51.1	0 12 19.5	33.582 03	17	290 49 39.4	0 05 02.0	33.702 01
20	289 54 23.4	0 11 51.3	33.585 26	22	290 51 11.2	0 05 30.1	33.705 27
25	289 55 55.9	0 11 23.0	33.588 50	27	290 52 43.0	0 05 58.1	33.708 52
30	289 57 28.2	+0 10 54.8	33.591 73	32	290 54 14.8	-0 06 26.1	33.711 77
July 5	289 59 00.6	+0 10 26.6	33.594 97	37	290 55 46.5	-0 06 54.2	33.715 03

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

PLUTO, 2018

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	288	46	44.6	+0	27	08.4	July	5	290	12	11.1	+0	10	47.0
	6	288	56	56.0	0	26	40.4		10	290	04	52.8	0	10	18.1
	11	289	07	08.8	0	26	12.8		15	289	57	33.0	0	09	49.0
	16	289	17	21.8	0	25	45.4		20	289	50	14.5	0	09	19.8
	21	289	27	29.6	0	25	18.3		25	289	43	02.8	0	08	50.5
	26	289	37	28.4	0	24	51.6		30	289	36	01.2	0	08	21.1
	31	289	47	15.8	+0	24	25.2	Aug.	4	289	29	12.9	+0	07	51.6
Feb.	5	289	56	47.1	0	23	59.0		9	289	22	42.9	0	07	22.1
	10	290	05	59.7	0	23	33.0		14	289	16	34.0	0	06	52.6
	15	290	14	50.6	0	23	07.2		19	289	10	49.8	0	06	23.1
	20	290	23	15.6	0	22	41.6		24	289	05	34.5	0	05	53.7
	25	290	31	12.5	0	22	16.1		29	289	00	49.8	0	05	24.2
Mar.	2	290	38	38.6	+0	21	50.7	Sept.	3	288	56	38.9	+0	04	54.9
	7	290	45	30.6	0	21	25.5		8	288	53	04.9	0	04	25.7
	12	290	51	47.4	0	21	00.2		13	288	50	08.8	0	03	56.5
	17	290	57	26.0	0	20	35.0		18	288	47	53.9	0	03	27.4
	22	291	02	24.4	0	20	09.8		23	288	46	21.1	0	02	58.5
	27	291	06	41.9	0	19	44.6		28	288	45	31.0	0	02	29.7
Apr.	1	291	10	16.0	+0	19	19.4	Oct.	3	288	45	25.7	+0	02	01.1
	6	291	13	06.9	0	18	54.0		8	288	46	04.8	0	01	32.6
	11	291	15	13.7	0	18	28.6		13	288	47	29.0	0	01	04.2
	16	291	16	35.1	0	18	03.0		18	288	49	38.8	0	00	36.0
	21	291	17	12.0	0	17	37.3		23	288	52	32.5	0	00	07.9
	26	291	17	04.2	0	17	11.4		28	288	56	09.9	0	00	20.0
May	1	291	16	12.2	+0	16	45.4	Nov.	2	289	00	30.4	+0	00	47.8
	6	291	14	37.8	0	16	19.1		7	289	05	31.7	0	01	15.4
	11	291	12	21.3	0	15	52.6		12	289	11	13.4	0	01	42.9
	16	291	09	24.1	0	15	26.0		17	289	17	32.9	0	02	10.4
	21	291	05	49.2	0	14	59.1		22	289	24	27.3	0	02	37.7
	26	291	01	37.3	0	14	32.0		27	289	31	55.5	0	03	04.9
	31	290	56	52.2	+0	14	04.6	Dec.	2	289	39	53.8	+0	03	32.0
June	5	290	51	36.4	0	13	37.0		7	289	48	19.9	0	03	59.1
	10	290	45	52.0	0	13	09.2		12	289	57	11.4	0	04	26.2
	15	290	39	43.2	0	12	41.2		17	290	06	23.6	0	04	53.2
	20	290	33	12.8	0	12	13.0		22	290	15	54.1	0	05	20.2
	25	290	26	24.5	0	11	44.5		27	290	25	39.7	0	05	47.2
	30	290	19	23.1	+0	11	15.9		32	290	35	35.9	+0	06	14.3
July	5	290	12	11.1	+0	10	47.0		37	290	45	40.6	+0	06	41.4

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

PLUTO, 2018

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Red. To Astrom. (J 2000.0)	Apparent Declination			Red. To Astrom. (J 2000.0)	True Distance from the Earth	Hor. Parallax	Ephemeris Transit	
		h	m	s	s	°	'	"	"		"	h	m
Jan.	1	19	21	04.05	+61.98	-21	40	16.5	-126.73	34.448 384	0.26	12	37
	6	19	21	47.76	62.04	21	39	19.8	127.70	34.460 410	0.26	12	18
	11	19	22	31.56	62.03	21	38	21.7	128.72	34.465 126	0.26	11	59
	16	19	23	15.36	62.10	21	37	22.6	129.85	34.462 486	0.26	11	40
	21	19	23	58.78	62.16	21	36	23.3	130.78	34.452 516	0.26	11	21
	26	19	24	41.55	62.21	21	35	24.2	131.83	34.435 332	0.26	11	02
	31	19	25	23.50	+62.31	-21	34	25.7	-132.98	34.411 127	0.26	10	43
Feb.	5	19	26	04.29	62.38	21	33	28.9	133.84	34.380 127	0.26	10	24
	10	19	26	43.74	62.46	21	32	33.6	134.97	34.342 554	0.26	10	05
	15	19	27	21.65	62.57	21	31	41.0	135.96	34.298 680	0.26	9	46
	20	19	27	57.71	62.65	21	30	51.6	136.81	34.248 852	0.26	9	27
	25	19	28	31.78	62.76	21	30	05.5	137.92	34.193 495	0.26	9	08
Mar.	2	19	29	03.65	+62.90	-21	29	23.7	-138.73	34.133 078	0.26	8	49
	7	19	29	33.10	62.99	21	28	46.5	139.62	34.068 059	0.26	8	30
	12	19	30	00.06	63.13	21	28	14.2	140.59	33.998 899	0.26	8	10
	17	19	30	24.31	63.26	21	27	47.6	141.28	33.926 111	0.26	7	51
	22	19	30	45.70	63.38	21	27	26.8	142.11	33.850 268	0.26	7	32
	27	19	31	04.20	63.55	21	27	12.1	142.92	33.771 989	0.26	7	12
Apr.	1	19	31	19.64	+63.68	-21	27	04.2	-143.47	33.691 882	0.26	6	53
	6	19	31	32.01	63.82	21	27	02.6	144.25	33.610 520	0.26	6	34
	11	19	31	41.27	63.99	21	27	08.2	144.80	33.528 487	0.26	6	14
	16	19	31	47.31	64.13	21	27	20.9	145.22	33.446 399	0.26	5	54
	21	19	31	50.21	64.30	21	27	40.4	145.86	33.364 911	0.26	5	35
	26	19	31	49.94	64.47	21	28	07.2	146.12	33.284 672	0.26	5	15
May	1	19	31	46.55	+64.61	-21	28	40.9	-146.47	33.206 270	0.26	4	55
	6	19	31	40.16	64.80	21	29	21.3	146.82	33.130 260	0.27	4	36
	11	19	31	30.79	64.96	21	30	08.7	146.85	33.057 196	0.27	4	16
	16	19	31	18.54	65.10	21	31	02.2	147.02	32.987 652	0.27	3	56
	21	19	31	03.61	65.30	21	32	01.9	147.08	32.922 198	0.27	3	36
	26	19	30	46.07	65.43	21	33	07.4	146.88	32.861 342	0.27	3	16
	31	19	30	26.18	+65.59	-21	34	17.9	-146.87	32.805 514	0.27	2	56
June	5	19	30	04.11	65.75	21	35	33.4	146.59	32.755 113	0.27	2	36
	10	19	29	40.00	65.87	21	36	53.3	146.18	32.710 534	0.27	2	16
	15	19	29	14.16	66.03	21	38	16.7	145.98	32.672 159	0.27	1	56
	20	19	28	46.79	66.17	21	39	43.6	145.36	32.640 326	0.27	1	36
	25	19	28	18.13	66.27	21	41	12.8	144.88	32.615 274	0.27	1	16
	30	19	27	48.54	+66.40	-21	42	44.0	-144.37	32.597 171	0.27	0	56
July	5	19	27	18.19	66.49	21	44	16.7	143.56	32.586 162	0.27	0	35
	10	19	26	47.38	66.56	21	45	49.9	142.94	32.582 376	0.27	0	15
	15	19	26	16.46	66.68	21	47	23.3	142.23	32.585 908	0.27	23	51
	20	19	25	45.62	66.72	21	48	56.3	141.32	32.596 766	0.27	23	31
	25	19	25	15.24	66.77	21	50	27.9	140.66	32.614 859	0.27	23	11
	30	19	24	45.58	+66.82	-21	51	57.9	-139.76	32.640 054	0.27	22	51
Aug.	4	19	24	16.86	66.82	21	53	25.8	138.85	32.672 202	0.27	22	30
	9	19	23	49.42	66.86	21	54	50.6	138.20	32.711 129	0.27	22	10
	14	19	23	23.48	66.86	21	56	12.4	137.22	32.756 609	0.27	21	50
	19	19	22	59.30	+66.83	-21	57	30.2	-136.51	32.808 311	0.27	21	30

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

PLUTO, 2018

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Red. To Astrom. (J 2000.0)	Apparent Declination			Red. To Astrom. (J 2000.0)	True Distance from the Earth	Hor. Parallax	Ephemeris Transit	
		h	m	s	s	°	'	"	"		"	h	m
Aug.	19	19	22	59.30	+66.83	-21	57	30.2	-136.51	32.808 311	0.27	21	30
	24	19	22	37.15	66.83	21	58	43.8	135.82	32.865 845	0.27	21	10
	29	19	22	17.19	66.78	21	59	53.0	134.96	32.928 808	0.27	20	50
Sept.	3	19	21	59.61	66.72	22	00	57.0	134.40	32.996 790	0.27	20	30
	8	19	21	44.66	66.70	22	01	55.9	133.81	33.069 359	0.27	20	10
	13	19	21	32.41	66.61	22	02	49.3	133.18	33.146 011	0.27	19	51
	18	19	21	23.09	+66.54	-22	03	36.7	-132.88	33.226 170	0.26	19	31
	23	19	21	16.77	66.47	22	04	18.3	132.41	33.309 248	0.26	19	11
	28	19	21	13.49	66.36	22	04	53.7	132.09	33.394 671	0.26	18	51
Oct.	3	19	21	13.39	66.29	22	05	22.7	132.05	33.481 875	0.26	18	32
	8	19	21	16.46	66.21	22	05	45.7	131.78	33.570 270	0.26	18	12
	13	19	21	22.74	66.10	22	06	02.0	131.87	33.659 205	0.26	17	52
	18	19	21	32.27	+66.03	-22	06	12.0	-132.00	33.748 010	0.26	17	33
	23	19	21	44.93	65.92	22	06	15.8	132.04	33.836 052	0.26	17	14
	28	19	22	00.70	65.82	22	06	13.0	132.46	33.922 732	0.26	16	54
Nov.	2	19	22	19.54	65.77	22	06	04.1	132.80	34.007 474	0.26	16	35
	7	19	22	41.28	65.66	22	05	49.2	133.19	34.089 676	0.26	16	15
	12	19	23	05.90	65.60	22	05	28.2	133.89	34.168 713	0.26	15	56
	17	19	23	33.21	+65.54	-22	05	01.7	-134.40	34.244 002	0.26	15	37
	22	19	24	03.00	65.46	22	04	29.8	135.08	34.315 023	0.26	15	18
	27	19	24	35.19	65.44	22	03	52.4	135.99	34.381 313	0.26	14	59
Dec.	2	19	25	09.52	65.39	22	03	10.6	136.65	34.442 427	0.26	14	40
	7	19	25	45.82	65.35	22	02	23.9	137.65	34.497 911	0.25	14	21
	12	19	26	23.91	65.35	22	01	33.1	138.60	34.547 340	0.25	14	02
	17	19	27	03.48	+65.31	-22	00	38.8	-139.44	34.590 370	0.25	13	43
	22	19	27	44.34	65.31	21	59	41.0	140.60	34.626 735	0.25	13	24
	27	19	28	26.26	65.35	21	58	40.5	141.58	34.656 229	0.25	13	05
	32	19	29	08.92	65.34	21	57	37.7	142.60	34.678 657	0.25	12	46
	37	19	29	52.18	+65.38	-21	56	32.9	-143.82	34.693 837	0.25	12	27

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

MAJOR PLANETS, 2018
HELIOCENTRIC OSCULATING ORBITAL ELEMENTS
REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date	Julian Date 245	Inclina- tion i	Longitude Asc. Node q	Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
					MERCURY			
		°	°	°		°		°
Nov'17 23	8080.5	7.0040	48.308	77.484	0.387 098	4.092 35	0.205 640	357.7300
Jan'18 2	8120.5	7.0040	48.308	77.483	0.387 098	4.092 35	0.205 639	161.4237
Feb 11	8160.5	7.0039	48.308	77.483	0.387 099	4.092 34	0.205 638	325.1176
Mar 23	8200.5	7.0040	48.308	77.482	0.387 099	4.092 34	0.205 634	128.8108
May 2	8240.5	7.0040	48.308	77.484	0.387 099	4.092 34	0.205 637	292.5036
Jun 11	8280.5	7.0040	48.308	77.483	0.387 099	4.092 34	0.205 637	96.1971
Jul 21	8320.5	7.0039	48.308	77.485	0.387 099	4.092 33	0.205 643	259.8894
Aug 30	8360.5	7.0039	48.308	77.486	0.387 098	4.092 35	0.205 647	63.5832
Oct 9	8400.5	7.0039	48.308	77.487	0.387 098	4.092 35	0.205 648	227.2770
Nov 18	8440.5	7.0039	48.308	77.487	0.387 097	4.092 36	0.205 653	30.9713
Dec 28	8480.5	7.0039	48.308	77.486	0.387 097	4.092 36	0.205 651	194.6656
Feb' 19 6	8520.5	7.0039	48.308	77.487	0.387 098	4.092 36	0.205 650	358.3596
					VENUS			
Nov'17 23	8080.5	3.3945	76.628	131.42	0.723 334	1.602 13	0.006 795	212.7046
Jan' 18 2	8120.5	3.3945	76.628	131.39	0.723 330	1.602 14	0.006 802	276.7892
Feb 11	8160.5	3.3945	76.628	131.38	0.723 330	1.602 14	0.006 802	340.8749
Mar 23	8200.5	3.3945	76.628	131.37	0.723 332	1.602 13	0.006 797	44.9599
May 2	8240.5	3.3945	76.628	131.40	0.723 327	1.602 15	0.006 790	109.0449
Jun 11	8280.5	3.3945	76.628	131.42	0.723 326	1.602 15	0.006 788	173.1312
Jul 21	8320.5	3.3945	76.628	131.47	0.723 331	1.602 14	0.006 791	237.2168
Aug 30	8360.5	3.3945	76.628	131.46	0.723 328	1.602 14	0.006 795	301.3022
Oct 9	8400.5	3.3945	76.627	131.41	0.723 340	1.602 11	0.006 780	5.3871
Nov 18	8440.5	3.3946	76.625	131.41	0.723 341	1.602 10	0.006 754	69.4683
Dec 28	8480.5	3.3946	76.625	131.47	0.723 327	1.602 15	0.006 735	133.5529
Feb' 19 6	8520.5	3.3946	76.625	131.49	0.723 325	1.602 16	0.006 730	197.6395
					EARTH*			
Nov'17 23	8080.5	0.0024	174.2	102.899	0.999 993	0.985 62	0.016 683	61.9119
Jan' 18 2	8120.5	0.0024	174.5	102.893	0.999 982	0.985 64	0.016 670	101.3364
Feb 11	8160.5	0.0024	174.4	102.884	0.999 977	0.985 64	0.016 666	140.7619
Mar 23	8200.5	0.0024	174.3	102.922	0.999 991	0.985 62	0.016 674	180.1871
May 2	8240.5	0.0025	174.5	102.986	1.000 008	0.985 60	0.016 681	219.6105
Jun 11	8280.5	0.0025	174.7	103.016	1.000 007	0.985 60	0.016 690	259.0330
Jul 21	8320.5	0.0025	174.7	103.020	0.999 999	0.985 61	0.016 699	298.4570
Aug 30	8360.5	0.0025	174.6	103.008	0.999 997	0.985 62	0.016 705	337.8823
Oct 9	8400.5	0.0025	174.8	103.005	0.999 996	0.985 62	0.016 713	17.3079
Nov 18	8440.5	0.0026	176.1	102.996	1.000 006	0.985 60	0.016 733	56.7342
Dec 28	8480.5	0.0026	176.2	102.990	1.000 010	0.985 60	0.016 738	96.1582
Feb' 19 6	8520.5	0.0026	176.2	102.981	0.999 999	0.985 61	0.016 727	135.5824

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

FORMULAS

Mean anomaly, $M = L - \varpi$

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

True anomaly, $\nu = M + (2e - e^3/4)\sin M + (5e^2/4)\sin 2M + (13\,e^3/12)\sin 3M$ +é . 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:

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

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

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

MAJOR PLANETS, 2018

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

Date		Julian Date 245	Inclina-tion i	Longitude Asc. Node q	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
					MARS				
			°	°	°		°		°
Nov'17	23	8080.5	1.8484	49.507	336.119	1.523 69	0.524 035	0.093 457	180.2725
Jan' 18	2	8120.5	1.8484	49.508	336.113	1.523 74	0.524 009	0.093 421	201.2322
Feb	11	8160.5	1.8483	49.508	336.114	1.523 77	0.523 995	0.093 389	222.1895
Mar	23	8200.5	1.8483	49.509	336.118	1.523 76	0.523 998	0.093 361	243.1458
May	2	8240.5	1.8484	49.508	336.131	1.523 72	0.524 017	0.093 340	264.1037
Jun	11	8280.5	1.8482	49.578	336.148	1.523 04	0.524 043	0.093 324	285.0643
Jul	21	8320.5	1.8482	49.507	336.164	1.523 64	0.524 059	0.093 321	306.0282
Aug	30	8360.5	1.8482	49.505	336.179	1.523 65	0.524 055	0.093 335	326.9935
Oct	9	8400.5	1.8482	49.504	336.192	1.523 68	0.524 039	0.093 352	347.9575
Nov	18	8440.5	1.8482	49.504	336.202	1.523 71	0.524 023	0.093 366	8.9197
Dec	28	8480.5	1.8481	49.504	336.204	1.523 73	0.524 017	0.093 373	29.8803
Feb' 19	6	8520.5	1.8481	49.504	336.203	1.523 73	0.524 015	0.093 384	50.8396
					JUPITER				
Nov'17	23	8080.5	1.3037	100.513	14.233	5.202 24	0.083 105	0.0488825	217.4331
Jan' 18	2	8120.5	1.3037	100.513	14.225	5.202 28	0.083 104	0.048 876	220.7577
Feb	11	8160.5	1.3037	100.514	14.221	5.202 29	0.083 104	0.048 875	224.0822
Mar	23	8200.5	1.3037	100.514	14.219	5.202 34	0.083 103	0.048 865	227.4059
May	2	8240.5	1.3037	100.515	14.205	5.202 44	0.083 100	0.048 849	230.7301
Jun	11	8280.5	1.3037	100.515	14.186	5.202 54	0.083 098	0.048 836	234.0547
Jul	21	8320.5	1.3037	100.514	14.167	5.202 60	0.083 096	0.048 833	237.3798
Aug	30	8360.5	1.3037	100.515	14.168	5.202 56	0.083 097	0.048 844	240.7045
Oct	9	8400.5	1.3037	100.515	14.177	5.202 52	0.083 098	0.0488474	244.0281
Nov	18	8440.5	1.3037	100.515	14.185	5.202 52	0.083 098	0.0488392	247.3508
Dec	28	8480.5	1.3037	100.515	14.170	5.202 65	0.083 095	0.048 814	250.6732
Feb' 19	6	8520.5	1.3037	100.515	14.140	5.202 82	0.083 091	0.048 792	253.9965
					SATURN				
Nov'17	23	8080.5	2.4869	113.590	93.634	9.565 5	0.033 336	0.052 295	268.5738
Jan' 18	2	8120.5	2.4868	113.591	93.587	9.566 2	0.033 332	0.052 211	269.9130
Feb	11	8160.5	2.4868	113.592	93.532	9.566 8	0.033 329	0.052 140	271.2526
Mar	23	8200.5	2.4867	113.592	93.479	9.567 4	0.033 326	0.052 079	272.5916
May	2	8240.5	2.4866	113.593	93.423	9.568 0	0.033 323	0.052 006	273.9307
Jun	11	8280.5	2.4866	113.593	93.356	9.568 7	0.033 319	0.051 930	275.2706
Jul	21	8320.5	2.4865	113.593	93.271	9.569 4	0.033 315	0.051 858	276.6121
Aug	30	8360.5	2.4865	113.594	93.177	9.569 8	0.033 313	0.051 822	277.9545
Oct	9	8400.5	2.4864	113.594	93.090	9.570 0	0.033 312	0.051 808	279.2962
Nov	18	8440.5	2.4864	113.594	93.012	9.570 1	0.033 312	0.051 805	280.6370
Dec	28	8480.5	2.4864	113.594	92.940	9.570 4	0.033 310	0.051 781	281.9768
Feb' 19	6	8520.5	2.4864	113.594	92.850	9.570 91	0.033 308	0.051 741	283.3179
					URANUS				
Nov'17	23	8080.5	0.7715	74.018	174.18	19.109 3	0.011 806	0.050 375	29.8436
Feb' 18	11	8160.5	0.7714	74.025	174.31	19.111 1	0.011 805	0.050 169	30.7632
May	2	8240.5	0.7713	74.031	174.42	19.112 9	0.011 803	0.049 970	31.6843
Jul	21	8320.5	0.7712	74.043	174.52	19.115 8	0.011 800	0.049 702	32.6017
Oct	9	8400.5	0.7711	74.049	174.50	19.120 8	0.011 796	0.049 374	33.5243
Dec	28	8480.5	0.7710	74.057	174.50	19.124 2	0.011 793	0.049 129	34.4504
Mar' 19	18	8560.5	0.7708	74.066	174.52	19.128 2	0.011 789	0.048 830	35.3703
					NEPTUNE				
Nov'17	23	8080.5	1.7720	131.815	54.92	30.002 5	0.006 001	0.005 993	343.7409
Feb' 18	11	8160.5	1.7719	131.812	50.46	30.016 0	0.005 997	0.006 027	344.2054
May	2	8240.5	1.7717	131.808	46.32	30.028 8	0.005 994	0.006 103	344.6712
Jul	21	8320.5	1.7716	131.806	41.48	30.045 0	0.005 989	0.006 276	345.1370
Oct	9	8400.5	1.7714	131.801	37.34	30.061 6	0.005 984	0.006 575	345.6128
Dec	28	8480.5	1.7712	131.798	34.37	30.074 4	0.005 980	0.006 820	346.0876
Mar' 19	18	8560.5	1.7711	131.795	30.80	30.090 8	0.005 975	0.007 148	346.5588

Distances are in astronomical units.

CENTRE OF MASS OF THE SOLAR SYSTEM, 2018

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	-18094761	-56668141	-23257029	-1808556	-5667824	-2326123
	10	17506998	57121598	23469502	1749761	5713079	2347297
	20	16911646	57567718	23678946	1690217	5757649	2368193
	30	16309362	58006487	23885277	1629961	5801528	2388804
Feb.	9	15700717	58438085	24088524	1569025	5844721	2409130
	19	15086224	58862827	24288776	1507440	5887239	2429173
Mar.	1	-14466292	-59281205	-24486232	-1445230	-5929102	-2448941
	11	13841062	59694054	24681307	1382407	5970347	2468453
	21	13209715	60102151	24874463	1318933	6011009	2487730
	31	12571227	60505335	25065693	1254763	6051075	2506769
Apr.	10	11925099	60903196	25254824	1189875	6090521	2525560
	20	11271053	61295404	25441717	1124261	6129325	2544094
	30	-10608758	-61681631	-25626246	-1057908	-6167467	-2562363
May	10	09937962	62061442	25808227	0990809	6204921	2580355
	20	09258503	62434302	25987460	0922960	6241656	2598059
	30	08570464	62799729	26163749	0854370	6277644	2615463
June	9	07873827	63157497	26337068	0785043	6312869	2632564
	19	07168034	63507109	26507302	0714957	6347303	2649354
	29	-06452854	-63847277	-26673891	-0644104	-6380877	-2665803
July	9	05728963	64176802	26836258	0572524	6413527	2681881
	19	04997372	64494876	26993962	0500272	6445209	2697564
	29	04259253	64800985	27146704	0427412	6475893	2712835
Aug.	8	03515875	65094904	27294301	0354013	6505565	2727683
	18	02768586	65376665	27436714	0280147	6534222	2742105
	28	-02018783	-65646786	-27574099	-0205890	-6561886	-2756106
Sept.	7	01267335	65906321	27706950	0131291	6588607	2769710
	17	-00514249	66156029	27835665	-0056355	6614419	2782935
	27	+00240263	66396133	27960307	+0018901	6639329	2795782
Oct.	7	00995677	66627105	28081018	0094446	6663358	2808257
	17	01751564	-66849690	-28198078	0170252	6686540	2820372
	27	+02507823	-67064703	-28311849	+0246309	-6708911	-2832144
Nov.	6	03264547	67272993	28422683	0322615	6730512	2843589
	16	04022028	67475334	28530940	0399180	6751377	2854723
	26	04780716	67672633	28637063	0476019	6771549	2865567
Dec.	6	05541787	67865785	28741572	0553186	6791069	2876145
	16	06307046	68054850	28844636	0630765	6809938	2886465
	26	+07077743	-68239049	-28945934	+0708812	-6828113	-2896509
	36	+07854576	-68417611	-29045101	+0787356	-6845553	-2906257

The heliocentric equatorial rectangular co-ordinates of the barycentre of the solar system referred to the mean equator and equinox of J 2018.5 are given by $\mathbf{r} = P\mathbf{r_0}$, where $\mathbf{r}$ and $\mathbf{r_0}$ are the column vectors of the co-ordinates X,Y, Z and X_0,Y_0, Z_0 referred to J 2018.5 and J 2000.0 respectively.

PART - II

STARS

LONGITUDE AND LATITUDE OF STARS, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
35	280	α Sculptoris	4.31	0	45	10.23	50.620	+0.025	-32	30	46.91	+0.040	-0.007
9	74	ι Ceti	3.56	1	10	29.38	50.350	-0.028	-10	01	17.69	+0.020	-0.028
82	674	ű Eridani	3.56	1	15	46.45	51.180	+0.110	-58	59	09.06	-0.030	-0.082
902	9072	ω Piscium	4.01	2	50	32.08	50.340	+0.095	+6	21	44.60	-0.100	-0.167
22	188	β Ceti	2.04	2	50	38.80	50.720	+0.242	-20	47	00.88	-0.010	-0.068
783	7957	η Cephei	3.43	4	56	26.50	51.240	+2.353	+71	46	55.51	+0.460	+0.369
156	1336	α Reticuli	3.35	7	46	37.65	52.750	+0.298	-78	02	24.10	+0.090	-0.015
869	8762	*ο* Andromedae	3.62	8	02	08.69	49.880	+0.022	+43	45	02.46	+0.090	-0.017
848	8585	α Lacertae	3.77	8	23	58.27	49.880	+0.200	+53	17	26.71	+0.030	-0.070
7	39	ɔ Pegasi	2.83	9	24	50.25	50.190	+0.001	+12	36	01.57	+0.110	-0.011
40	334	η Ceti	3.45	12	01	38.64	50.570	+0.151	-16	07	07.63	-0.080	-0.213
803	8162	α Cephei	2.44	13	01	56.36	49.480	+0.340	+68	54	50.16	+0.050	-0.100
836	8465	ζ Cephei	3.35	14	13	02.12	49.520	+0.028	+61	08	52.45	+0.140	-0.008
1	15	α Andromedae*	2.06	14	33	58.07	50.130	+0.056	+25	40	48.68	-0.040	-0.207
47	402	ɗ Ceti	3.6	16	29	03.65	50.260	-0.163	-15	46	02.73	0.000	-0.171
723	7310	δ Draconis	3.07	17	24	21.69	47.560	+0.757	+82	53	12.25	+0.090	-0.093
59	509	τ Ceti	3.5	18	04	15.94	49.120	-1.370	-24	48	26.61	+1.650	+1.463
890	8961	ɚ Andromedae	3.82v	18	32	33.45	49.750	-0.133	+43	46	28.47	-0.250	-0.441
1075	794	ι Eridani	4.11	19	02	01.46	51.010	+0.169	-51	42	50.07	+0.090	-0.095
71	585	ν Ceti	4	19	41	18.18	50.680	+0.134	-31	02	00.54	+0.120	-0.076
1033	361	ζ Piscium*	5.24	20	08	11.65	50.410	+0.112	+0	12	46.71	+0.100	-0.106
20	165	ŭ Andromedae	3.27	22	04	17.32	50.200	+0.092	+24	21	03.84	+0.070	-0.141
62	539	ζ Ceti	3.73	22	12	34.18	50.470	+0.025	-20	20	01.47	+0.160	-0.051
106	897	ɗ Eridani p	3.25	23	32	00.54	50.810	-0.051	-53	44	19.99	+0.260	+0.038
101	841	β Fornacis	4.46	26	29	46.72	50.920	+0.212	-45	51	15.38	+0.340	+0.103
1154	2015	δ Doradus	4.35	26	46	05.13	63.130	-0.277	-88	15	08.60	+0.270	+0.030
50	437	η Piscium	3.62	27	04	27.58	50.290	+0.024	+5	22	43.77	+0.230	-0.015
33	269	μ Andromedae	3.87	29	26	00.53	50.240	+0.174	+29	39	35.68	+0.230	-0.038
42	337	β Andromedae	2.06	30	39	48.19	50.240	+0.126	+25	56	37.80	+0.090	-0.178
863	8694	ι Cephei	3.52	33	29	38.03	49.280	-0.304	+62	37	02.81	+0.270	-0.017
66	553	β Arietis*	2.64	34	13	42.23	50.290	+0.051	+8	29	17.02	+0.160	-0.138
1085	919	τ^{3} Eridani	4.09	34	47	36.92	50.390	-0.198	-38	54	16.13	+0.310	+0.001
17	153	ζ Cassiopeiae	3.66	35	19	19.03	49.960	+0.016	+44	43	16.53	+0.290	-0.018
2	21	β Cassiopeiae	2.27	35	22	30.72	50.320	+0.463	+51	12	50.73	-0.170	-0.472
809	8238	β Cephei	3.23	35	47	58.30	49.280	+0.028	+71	09	15.51	+0.300	-0.008
64	544	α Trianguli	3.41	37	07	06.22	50.110	-0.079	+16	48	03.56	+0.090	-0.223
91	779	δ Ceti	4.07	37	49	49.12	50.400	+0.013	-14	27	36.44	+0.310	-0.008
74	617	α Arietis	2	37	55	16.58	50.370	+0.130	+9	57	56.52	+0.110	-0.204
21	168	α Cassiopeiae	2.23	38	02	25.73	49.970	+0.036	+46	37	24.72	+0.260	-0.056
171	1465	α Doradus	3.27	38	05	42.02	51.700	+0.155	-74	34	49.17	+0.290	-0.031
104	874	η Eridani	3.89	39	00	33.29	50.460	+0.007	-24	32	46.55	+0.090	-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, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
75	622	β Trianguli	3	42	36	39.92	50.310	+0.134	+20	34	55.20	+0.260	-0.091
79	664	ɔ Trianguli	4.01	43	46	34.18	50.210	+0.028	+18	56	59.14	+0.290	-0.064
32	264	ɔ Cassiopeiae	var.	44	11	16.37	49.970	+0.027	+48	48	59.84	+0.340	-0.019
73	603	ɔ Andromed. p	2.26	44	28	59.45	50.160	+0.024	+27	48	27.79	+0.290	-0.065
107	911	α Ceti	2.53	44	34	43.57	50.330	-0.032	-12	35	02.89	+0.280	-0.072
155	1326	α Horologii	3.86	46	05	05.59	50.770	-0.073	-61	43	48.26	+0.160	-0.211
48	403	ŭ Cassiopeiae	2.68	48	11	18.85	50.320	+0.323	+46	24	15.67	+0.180	-0.202
127	1084	ε Eridani	3.73	48	25	17.66	49.380	-1.053	-27	42	44.52	+0.660	+0.281
100	838	41 Arietis*	3.63	48	27	42.66	50.270	+0.029	+10	27	03.46	+0.240	-0.132
135	1136	δ Eridani	3.54	51	07	18.66	50.550	+0.114	-28	40	13.98	+1.130	+0.744
121	1030	*o* Tauri	3.6	51	25	18.68	50.250	-0.085	-9	19	57.16	+0.330	-0.059
123	1038	ξ Tauri	3.74	52	10	15.33	50.380	+0.049	-8	47	48.69	+0.350	-0.053
212	1922	β Doradus	3.48v	52	23	46.13	53.290	+0.072	-85	02	31.77	+0.410	+0.007
149	1231	ɔ Eridani	2.95	54	07	37.04	50.490	+0.039	-33	12	02.51	+0.280	-0.123
63	542	ε Cassiopeiae	3.38	55	01	15.10	50.060	+0.024	+47	33	00.49	+0.370	-0.034
109	921	ρ Persei	var.	55	10	09.57	50.300	+0.099	+20	34	33.66	+0.270	-0.139
1129	1502	α Caeli	4.45	56	24	25.00	50.390	-0.346	-62	59	10.45	+0.380	-0.032
111	936	β Persei	var.	56	25	32.07	50.200	+0.003	+22	25	50.44	+0.420	-0.002
103	854	τ Persei	3.95	58	10	10.19	50.150	-0.003	+34	22	24.30	+0.410	-0.005
99	834	η Persei	3.76	58	57	34.28	50.150	+0.013	+37	29	02.22	+0.400	-0.019
136	1142	17 Tauri	3.7	59	40	13.13	50.290	+0.009	+4	11	30.42	+0.380	-0.049
170	1464	ν^2 Eridani	3.82	60	08	40.69	50.470	-0.076	-51	48	54.08	+0.430	-0.002
151	1251	ν Tauri	3.91	60	10	40.36	50.350	+0.005	-14	26	58.25	+0.420	-0.004
139	1165	η Tauri*	2.87	60	15	02.86	50.290	+0.008	+4	03	10.35	+0.380	-0.049
108	915	ɔ Persei	2.93	60	16	45.15	50.150	-0.002	+34	31	56.67	+0.420	-0.004
893	8974	ɔ Cephei	3.21	60	21	03.30	50.140	+0.268	+64	40	21.77	+0.550	+0.119
150	1239	ɚ Tauri	3.47v	60	53	35.03	50.310	-0.009	-7	57	27.54	+0.420	-0.011
120	1017	α Persei	1.79	62	20	20.14	50.210	+0.018	+30	07	39.29	+0.400	-0.030
144	1203	ζ Persei	2.85	63	22	55.68	50.260	+0.004	+11	20	08.44	+0.420	-0.011
134	1135	ν Persei	3.77	64	04	52.22	50.220	-0.015	+22	09	21.07	+0.440	+0.002
131	1122	δ Persei	3.01	65	03	36.68	50.230	+0.021	+27	18	13.86	+0.400	-0.040
148	1228	ξ Persei	4.04	65	13	50.45	50.260	+0.002	+14	56	45.92	+0.440	-0.000
147	1220	ε Persei	2.89	65	56	09.66	50.260	+0.013	+19	07	00.09	+0.410	-0.029
159	1346	ɔ Tauri	3.65	66	03	53.48	50.420	+0.110	-5	43	48.79	+0.400	-0.044
162	1373	δ Tauri	3.76	67	07	47.01	50.400	+0.101	-3	58	02.85	+0.400	-0.047
164	1409	ε Tauri	3.54	68	43	26.48	50.400	+0.100	-2	33	54.48	+0.390	-0.054
168	1457	α Tauri*	0.85	70	02	52.33	50.340	+0.036	-5	27	57.67	+0.260	-0.197
1134	1543	π^3 Orionis	3.19	72	11	08.87	50.810	+0.481	-15	22	55.45	+0.410	-0.046
186	1654	ε Leporis	3.19	72	18	52.86	50.420	+0.021	-44	57	45.56	+0.380	-0.076
179	1552	π^4 Orionis	3.69	72	21	33.88	50.320	-0.001	-16	46	10.37	+0.450	+0.001
180	1567	π^5 Orionis	3.72	72	44	57.85	50.330	0.000	-20	00	09.82	+0.450	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, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
188	1666	β Eridani	2.79	75	32	02.06	50.220	-0.116	-27	51	35.09	+0.390	-0.071
1144	1702	μ Leporis	3.31v	75	39	11.76	50.410	+0.051	-39	02	52.23	+0.440	-0.030
695	6927	χ Draconis	3.57	76	09	27.06	44.150	+3.494	+83	34	16.04	+0.620	-0.501
181	1577	ι Aurigae	2.69	76	53	52.23	50.280	+0.001	+10	27	24.46	+0.440	-0.018
194	1713	β Orionis	0.12	77	05	17.60	50.330	+0.000	-31	07	13.41	+0.460	-0.001
195	1735	τ Orionis	3.6	78	06	20.59	50.310	-0.018	-29	50	07.08	+0.450	-0.007
1137	1612	ζ Aurigae	3.75	78	53	30.43	50.280	+0.007	+18	12	16.50	+0.440	-0.023
183	1605	ε Aurigae	var.	79	05	59.13	50.280	-0.001	+20	56	48.33	+0.470	-0.004
185	1641	η Aurigae	3.17	79	42	16.79	50.310	+0.024	+18	17	09.19	+0.400	-0.070
204	1829	β Leporis	2.84	79	55	51.48	50.320	-0.015	-43	54	45.36	+0.380	-0.088
201	1790	ɔ Orionis	1.64	81	12	17.58	50.300	-0.010	-16	48	49.46	+0.460	-0.013
178	1542	α Camelopardi	4.29	81	14	16.45	50.260	+0.001	+43	25	16.87	+0.470	+0.006
182	1603	β Camelopardi	4.03	81	31	33.91	50.260	-0.010	+37	26	00.12	+0.460	-0.015
207	1865	α Leporis	2.58	81	38	20.72	50.320	+0.001	-41	03	19.38	+0.470	+0.002
193	1708	α Aurigae	0.08	82	06	59.51	50.330	+0.046	+22	51	52.28	+0.040	-0.429
215	1956	α Columbae	2.64	82	25	40.59	50.340	+0.009	-57	22	22.63	+0.450	-0.027
206	1852	δ Orionis	2.23	82	39	17.88	50.310	+0.002	-22	57	11.58	+0.470	-0.002
202	1791	β Tauri	1.65	82	50	00.35	50.310	+0.012	+5	23	11.71	+0.300	-0.176
209	1899	ι Orionis	2.77	83	15	21.54	50.300	0.000	-29	11	51.28	+0.480	+0.001
210	1903	ε Orionis	1.7	83	43	19.58	50.300	+0.001	-24	30	14.40	+0.470	-0.002
(GC)	1879	λ Orionis*	3.56	83	57	55.02	50.300	-0.001	-13	22	01.33	+0.470	-0.002
211	1910	ζ Tauri	3	85	02	35.03	50.300	0.000	-2	11	35.99	+0.450	-0.021
217	1983	ɔ Leporis	3.6	85	06	07.97	49.860	-0.440	-45	49	03.56	+0.110	-0.359
219	1998	ζ Leporis	3.55	86	14	40.71	50.260	-0.020	-38	12	48.30	+0.470	0.000
220	2004	κ Orionis	2.06	86	39	25.33	50.290	+0.002	-33	04	05.78	+0.470	-0.002
223	2040	β Columbae	3.12	86	40	42.73	50.410	+0.136	-59	10	30.40	+0.870	+0.399
222	2035	δ Leporis	3.81	87	25	37.54	50.580	+0.300	-44	17	52.90	-0.190	-0.653
907	424	α Ursae Mins.	2.02	88	49	35.56	50.400	+0.037	+66	06	13.25	+0.430	-0.037
224	2061	α Orionis*	var.	89	00	47.33	50.310	+0.027	-16	01	28.44	+0.470	+0.009
226	2085	η Leporis	3.71	89	09	28.99	50.220	-0.051	-37	36	01.66	+0.610	+0.140
229	2120	η Columbae	3.96	89	52	10.90	50.260	+0.055	-66	15	06.80	+0.450	-0.014
227	2088	β Aurigae	1.9	90	10	06.88	50.250	-0.062	+21	30	38.18	+0.470	0.000
225	2077	δ Aurigae	3.72	90	10	43.30	50.410	+0.095	+30	50	50.01	+0.350	-0.125
1168	2219	κ Aurigae	4.35	93	37	22.10	50.240	-0.066	+6	06	16.87	+0.200	-0.264
241	2286	μ Geminorum	2.88	95	33	38.21	50.350	+0.059	+0	49	05.98	+0.360	-0.109
244	2298	8ε Monocerotis	4.44	96	30	47.09	50.250	-0.019	-18	42	54.33	+0.470	+0.010
1173	2343	ν Geminorum	4.15	97	03	38.91	50.280	-0.007	-3	03	14.67	+0.440	-0.014
243	2294	β Canis Maj.	1.98	97	26	44.93	50.200	-0.008	-41	15	04.91	+0.460	0.000
240	2282	ζ Canis Maj.	3.02	97	38	07.50	50.180	+0.015	-53	22	13.20	+0.460	+0.003
251	2421	ɔ Geminorum	1.93	99	21	47.85	50.330	+0.045	-6	44	25.33	+0.420	-0.039
254	2473	ε Geminorum	2.98	100	11	50.03	50.290	-0.005	+2	04	19.93	+0.440	-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, 2018.5
MEAN PLACES FOR JULY $2^d.625$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
261	2540	ɗ Geminorum	3.6	101	22	55.20	50.320	+0.002	+11	01	56.01	+0.410	-0.048
256	2484	ξ Geminorum	3.36	101	28	01.21	50.170	-0.101	-10	06	10.60	+0.250	-0.200
257	2491	α Canis Maj cg	-1.46	104	20	10.89	49.610	-0.553	-39	36	33.90	-0.810	-1.256
245	2326	α Carinae	-0.72	105	12	58.25	49.730	+0.075	-75	49	17.43	+0.460	+0.024
269	2650	ζ Geminorum	3.79v	105	14	54.87	50.290	-0.009	-2	02	11.72	+0.440	-0.002
252	2451	ν Puppis	3.17	107	24	15.73	49.900	+0.008	-66	04	19.23	+0.430	-0.006
279	2777	δ Geminorum	3.53	108	46	39.30	50.270	-0.024	+0	10	34.59	+0.410	-0.016
1180	2538	κ Canis Maj.	3.96	108	49	23.49	50.010	-0.013	-55	08	43.15	+0.430	+0.003
277	2763	λ Geminorum	3.58	109	02	13.01	50.230	-0.042	-5	37	59.64	+0.380	-0.043
282	2821	ι Geminorum	3.79	109	12	54.92	50.200	-0.109	+5	45	35.88	+0.330	-0.103
1187	2714	22 δ Monoceroti	4.15	109	39	09.41	50.210	-0.002	-21	44	33.99	+0.430	+0.005
287	2891	α Gemino. *Cg**	1.95	110	29	54.41	50.170	-0.156	+10	05	51.25	+0.300	-0.126
268	2618	ε Canis Maj.	1.5	111	01	12.09	50.050	+0.006	-51	21	28.83	+0.430	+0.003
270	2653	o^2 Canis Maj.	3.02	111	15	36.17	50.080	-0.007	-46	07	41.56	+0.420	+0.002
1183	2646	σ Canis Maj.	3.47	111	48	47.46	50.040	-0.009	-50	13	25.21	+0.420	+0.004
285	2845	β Canis Min.	2.9	112	26	58.70	50.190	-0.047	-13	29	07.11	+0.380	-0.046
317	3323	*o* Ursae Maj.	3.36	113	15	16.59	50.360	-0.121	+40	14	41.31	+0.270	-0.144
295	2990	β Geminorum	1.14	113	28	15.82	49.710	-0.614	+6	41	07.81	+0.260	-0.158
273	2693	δ Canis Maj.	1.86	113	39	11.21	50.030	-0.006	-48	27	03.82	+0.420	+0.004
294	2985	κ Geminorum	3.57	113	55	26.88	50.280	-0.024	+3	04	49.27	+0.360	-0.057
291	2943	α C. Min. *cg*	0.38	116	02	26.90	49.680	-0.541	-16	01	23.97	-0.730	-1.132
263	2553	τ Puppis	2.93	117	58	54.30	49.660	+0.187	-72	51	05.55	+0.340	-0.056
293	2970	26 α Monoceroti	3.93	119	32	17.53	50.060	-0.078	-30	27	06.23	+0.360	-0.033
283	2827	η Canis Maj.	2.45	119	47	35.51	49.960	-0.008	-50	36	24.31	+0.390	+0.004
278	2773	π Puppis	2.7	120	33	24.31	49.830	-0.019	-58	31	22.76	+0.380	+0.002
335	3569	ι Ursae Maj.	3.14	123	03	25.46	50.060	-0.399	+29	34	30.77	+0.020	-0.358
341	3594	κ Ursae Maj.	3.6	124	11	45.36	50.440	-0.015	+28	58	51.89	+0.310	-0.062
312	3249	β Cancri	3.52	124	30	55.29	50.210	-0.032	-10	17	09.69	+0.310	-0.058
321	3366	η Cancri	5.33	125	39	57.67	50.270	-0.035	+1	34	22.47	+0.300	-0.054
1204	3045	ξ Puppis	3.34	126	17	54.68	49.990	-0.003	-44	56	15.60	+0.350	-0.003
368	3888	*v* Ursae Maj.	3.8	126	31	34.82	50.320	-0.261	+42	39	10.02	+0.080	-0.269
328	3475	ι Cancri	4.02	126	36	17.21	50.340	-0.013	+10	25	41.08	+0.310	-0.047
358	3775	ɗ Ursae Maj.	3.17	127	31	09.95	49.700	-0.820	+34	53	36.13	-0.510	-0.862
1228	3449	ɔ Cancri	4.66	127	47	47.41	50.220	-0.092	+3	11	30.90	+0.280	-0.066
1194	2878	ρ Puppis	3.25	128	56	39.92	49.370	-0.262	-63	46	19.17	+0.500	+0.157
326	3461	δ Cancri*	3.94	128	58	50.36	50.340	+0.043	+0	04	39.86	+0.110	-0.225
1223	3410	δ Hydrae	4.16	130	33	43.62	50.160	-0.064	-12	23	27.59	+0.300	-0.024
433	4434	ɚ Draconis	3.84	130	35	41.17	50.800	-0.026	+57	14	33.69	+0.290	-0.040
1224	3418	σ Hydrae	4.44	131	28	03.84	50.190	-0.013	-14	36	01.12	+0.300	-0.022
308	3185	ρ Puppis	2.81	131	38	41.99	49.840	-0.128	-43	16	05.87	+0.340	+0.023
352	3705	α Lyncis	3.13	132	06	01.24	50.180	-0.227	+17	57	55.41	+0.270	-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, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
1239	3627	ξ Cancri	5.14	133	28	09.67	50.330	0.000	+5	25	31.94	+0.320	+0.005
550	5563	β Ursae Min.	2.08	133	35	01.31	51.400	-0.044	+72	59	20.64	+0.280	-0.031
337	3572	α Cancri	4.25	133	54	00.52	50.300	+0.041	-5	04	44.13	+0.290	-0.020
334	3547	ζ Hydrae	3.11	134	49	59.75	50.120	-0.101	-10	58	05.21	+0.290	-0.014
417	4301	α Ursae Maj.	1.79	135	27	27.76	50.640	-0.087	+49	40	51.93	+0.170	-0.125
(329)	3482	ε Hydrae m*	3.38	136	20	42.12	49.910	-0.228	-23	26	07.85	+0.190	-0.105
472	4787	κ Draconis	3.87v	136	31	04.93	50.890	-0.090	+61	45	48.67	+0.250	-0.042
306	3165	ζ Puppis	2.25	138	48	21.02	49.620	-0.057	-58	20	46.97	+0.280	0.000
416	4295	β Ursae Maj.	2.37	139	41	43.79	50.750	+0.071	+45	08	05.14	+0.340	+0.073
383	4033	λ Ursae Maj.	3.45	139	48	31.10	50.370	-0.154	+29	53	10.32	+0.170	-0.102
347	3665	θ Hydrae	3.88	140	32	51.46	50.430	+0.224	-13	03	07.65	+0.010	-0.255
367	3873	ε Leonis	2.98	140	57	48.44	50.320	-0.040	+9	42	59.70	+0.240	-0.026
386	4069	μ Ursae Maj.	3.05	141	29	38.32	50.410	-0.101	+28	59	57.87	+0.260	-0.003
371	3905	μ Leonis	3.88	141	41	16.69	50.200	-0.188	+12	20	58.27	+0.130	-0.127
569	5735	γ Ursae Min.	3.05	141	51	49.96	51.710	-0.080	+75	14	32.48	+0.240	-0.019
262	2550	α Pictoris	3.27	144	20	48.17	45.050	-1.937	-83	02	16.22	+0.390	+0.148
365	3852	ο Leonis	3.52	144	30	17.14	50.140	-0.122	-3	45	22.99	+0.160	-0.081
327	3468	α Pyxidis	3.68	146	45	23.01	49.800	-0.022	-48	55	18.17	+0.220	+0.006
354	3748	α Hydrae	1.98	147	32	12.04	50.090	-0.026	-22	22	52.24	+0.240	+0.026
309	3207	γ² Velorum	1.78	147	36	12.97	49.400	-0.015	-64	27	47.01	+0.220	+0.004
384	4031	ζ Leonis	3.44	147	49	28.07	50.410	+0.020	+11	51	58.18	+0.220	0.000
1250	3845	ι Hydrae	3.91	147	54	00.39	50.260	+0.070	-14	16	35.00	+0.170	-0.044
379	3975	η Leonis	3.52	148	09	49.47	50.330	-0.001	+4	52	00.45	+0.210	-0.001
420	4335	ψ Ursae Maj.	3.01	149	04	21.96	50.540	-0.054	+35	32	18.66	+0.150	-0.055
380	3982	α Leonis*	1.35	150	05	11.10	50.060	-0.235	+0	27	55.58	+0.120	-0.082
447	4554	γ Ursae Maj.	2.44	150	44	17.91	50.860	+0.104	+47	08	34.25	+0.260	+0.065
303	3117	χ Carinae	3.47	150	58	50.82	48.990	-0.105	-70	19	32.39	+0.190	+0.001
456	4660	δ Ursae Maj.	3.31	151	19	36.07	50.960	+0.119	+51	39	29.03	+0.260	+0.074
364	3849	κ Hydrae	5.06	152	56	02.57	50.060	-0.020	-26	35	55.50	+0.150	-0.028
1243	3718	θ Pyxidis	4.72	153	18	56.99	49.940	-0.008	-39	02	00.96	+0.170	-0.012
441	4518	χ Ursae Maj.	3.71	153	55	10.79	50.510	-0.177	+41	32	40.32	+0.120	-0.048
396	4133	ρ Leonis	3.85	156	38	50.49	50.300	-0.005	+0	09	01.66	+0.150	-0.005
425	4377	ν Ursae Maj.	3.48	156	54	46.89	50.480	-0.040	+26	09	47.79	+0.160	+0.014
521	5291	α Draconis	3.65	157	43	09.68	51.210	-0.111	+66	21	45.43	+0.100	-0.037
1261	3970	υ² Hydrae	4.6	158	34	55.69	50.060	-0.045	-23	10	37.83	+0.130	+0.003
483	4905	ε Ursae Maj.	1.77	159	11	45.26	51.070	+0.150	+54	19	11.42	+0.200	+0.070
381	3994	λ Hydrae	3.61	159	37	25.14	49.940	-0.165	-22	00	50.91	-0.030	-0.159
1270	4116	δ Sextantis	5.21	160	21	51.91	50.170	-0.040	-11	20	43.01	+0.090	-0.031
345	3634	λ Velorum	2.21	161	26	33.00	49.580	-0.040	-55	52	12.86	+0.110	+0.001
422	4357	δ Leonis*	2.56	161	34	35.73	50.600	+0.188	+14	20	01.69	+0.050	-0.062
423	4359	θ Leonis	3.34	163	40	54.28	50.350	-0.025	+9	40	27.35	-0.010	-0.096

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

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

LONGITUDE AND LATITUDE OF STARS, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
1227	3447	*o* Velorum	3.62	164	59	12.63	49.170	-0.073	-66	16	33.53	+0.080	+0.001
389	4094	μ Hydrae	3.81	165	17	36.15	49.990	-0.093	-24	40	18.23	-0.040	-0.125
497	5054	ζ Ursae Maj. pr	2.27	165	57	47.19	51.180	+0.188	+56	22	46.80	+0.140	+0.067
1304	4527	93 Leonis*	4.53v	169	13	58.04	50.300	-0.140	+17	18	33.30	-0.010	-0.065
410	4232	ν Hydrae	3.11	170	37	24.84	50.110	+0.004	-21	47	48.25	+0.260	+0.221
444	4534	β Leonis	2.14	171	52	27.76	49.980	-0.417	+12	15	55.53	-0.280	-0.306
392	4104	α Antliae	4.25	172	41	49.04	49.850	-0.089	-37	25	39.24	-0.010	-0.025
315	3307	ε Carinae	1.86	173	22	46.66	48.690	-0.093	-72	40	47.84	0.000	-0.011
1283	4287	α Crateris	4.08	173	56	39.35	49.590	-0.512	-22	43	00.02	-0.070	-0.074
485	4915	α CVn sq	2.9	174	49	32.34	50.390	-0.302	+40	07	14.53	-0.060	-0.069
426	4382	δ Crateris	3.56	176	56	36.99	49.940	-0.206	-17	34	18.70	+0.130	+0.139
509	5191	η Ursae Maj.	1.86	177	11	38.92	50.800	-0.155	+54	23	15.01	-0.100	-0.083
445	4540	β Virginis	3.61	177	25	36.19	51.090	+0.789	+0	41	39.72	+0.020	+0.046
353	3734	κ Velorum	2.5	179	08	44.00	49.310	-0.027	-63	43	18.82	-0.030	0.000
531	5404	ɗ Bootis	4.05	182	52	25.46	51.260	+0.148	+60	06	22.19	-0.520	-0.456
639	6396	ζ Draconis	3.17	183	39	48.98	55.080	-0.288	+84	45	40.00	-0.090	-0.014
361	3803	N Velorum	3.13	184	28	01.12	49.280	-0.056	-64	14	20.27	-0.090	-0.020
492	4983	β Com	4.26	184	37	07.33	49.280	-1.319	+32	30	50.00	+0.350	+0.429
460	4689	η Virginis	3.89	184	33	40.65	50.260	-0.051	+2	35	20.23	-0.120	-0.042
571	5744	ι Draconis	3.29	185	12	53.25	51.580	-0.059	+71	05	35.23	-0.080	+0.004
351	3699	ι Carinae	2.25	185	34	44.22	49.150	-0.048	-67	07	00.78	-0.100	-0.011
1326	4828	ρ Virginis	4.88	185	46	22.56	50.520	+0.116	+13	32	32.11	-0.140	-0.049
375	3940	ű Velorum	3.54	186	12	03.28	49.480	-0.019	-59	57	03.53	-0.100	-0.005
434	4450	ɜ Hydrae	3.54	188	14	38.81	49.820	-0.193	-31	35	59.20	-0.240	-0.131
488	4932	ε Virginis	2.83	190	11	52.88	50.150	-0.269	+16	12	13.90	-0.220	-0.091
457	4662	ɔ Corvi	2.59	190	58	57.48	50.020	-0.161	-14	30	06.51	-0.170	-0.045
484	4910	δ Virginis	3.38	191	43	03.32	49.950	-0.415	+8	36	41.47	-0.360	-0.232
453	4630	ε Corvi	3	191	55	21.43	50.060	-0.074	-19	40	27.59	-0.150	-0.018
475	4813	χ Virginis	4.66	192	24	43.61	50.210	-0.060	-3	28	08.94	-0.190	-0.052
465	4757	δ Corvi*	2.95	193	42	32.29	50.060	-0.140	-12	11	53.37	-0.360	-0.211
319	3347	β Volantis	3.77	195	25	28.54	49.130	+0.546	-75	35	11.33	-0.250	-0.082
471	4786	β Corvi	2.65	197	37	32.84	50.180	+0.026	-18	02	44.83	-0.230	-0.048
535	5435	ɔ Bootis	3.03	197	55	23.24	50.530	-0.268	+49	33	03.76	-0.110	+0.079
513	5235	η Bootis	2.68	199	35	48.13	50.620	+0.095	+28	04	27.37	-0.540	-0.354
281	2803	δ Volantis	3.98	199	39	56.75	47.020	-0.039	-82	28	41.53	-0.200	-0.006
501	5107	ζ Virginis	3.37	201	56	45.56	50.080	-0.284	+9	44	33.96	-0.280	-0.066
534	5429	ρ Bootis	3.58	203	02	43.34	50.480	-0.191	+42	27	03.48	-0.160	+0.066
498	5056	α Virginis*	0.98	204	05	58.62	50.260	-0.028	-2	03	21.08	-0.270	-0.041
526	5340	α Bootis*	-0.04	204	29	30.82	50.260	-0.285	+30	43	24.31	-2.500	-2.265
555	5602	β Bootis	3.5	204	30	42.27	50.820	-0.039	+54	08	58.52	-0.270	-0.044
495	5020	ɔ Hydrae	3	207	16	35.96	50.270	+0.079	-13	44	38.58	-0.270	-0.016

* **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, 2018.5

MEAN PLACES FOR JULY 2^d.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
452	4621	δ Centauri	2.6	207	44	19.30	49.870	-0.033	-44	30	40.01	-0.280	-0.026
406	4199	ɗ Carinae	2.76	209	26	37.61	49.510	-0.046	-62	08	25.83	-0.280	-0.012
348	3685	β Carinae	1.68	212	13	07.90	48.660	-0.463	-72	14	17.44	-0.410	-0.133
496	5028	ι Centauri	2.75	213	23	05.33	49.810	-0.305	-26	01	07.92	-0.510	-0.219
563	5681	δ Bootis	3.47	213	25	08.86	50.910	+0.189	+48	57	49.32	-0.360	-0.068
525	5338	ι Virginis	4.08	214	03	24.43	50.480	+0.140	+7	11	45.30	-0.700	-0.409
523	5315	κ Virginis	4.19	214	45	07.57	50.280	-0.039	+2	54	43.61	-0.170	+0.135
436	4467	ɚ Centauri	3.13	214	47	57.93	49.690	-0.045	-56	47	27.60	-0.330	-0.033
455	4656	δ Crucis	2.8	215	55	14.55	49.830	-0.042	-50	25	16.62	-0.340	-0.033
468	4763	ɔ Crucis	1.63v	216	59	50.35	50.160	+0.257	-47	50	01.92	-0.520	-0.199
1371	5359	ɚ Virginis	4.52	217	12	37.86	50.280	-0.024	+0	29	20.95	-0.300	+0.023
385	4037	ɤ Carinae	3.32	217	41	36.65	49.410	-0.054	-67	23	03.16	-0.360	-0.033
519	5287	π Hydrae	3.27	218	52	56.76	50.300	+0.092	-13	03	06.51	-0.440	-0.115
572	5747	β Cr. Borealis	3.68	219	22	32.06	50.360	-0.286	+46	03	08.95	-0.310	+0.018
1189	2736	ɔ´ Volantis	3.78	220	06	00.79	46.910	-0.683	-82	37	07.35	-0.350	+0.065
545	5487	μ Virginis	3.88	220	23	27.57	50.560	+0.203	+9	40	08.27	-0.600	-0.268
442	4520	ɚ Muscae	3.64	221	14	47.59	49.580	-0.181	-58	30	32.30	-0.390	-0.054
508	5193	μ Centauri	3.04v	221	47	37.23	50.100	-0.015	-28	58	52.17	-0.370	-0.028
481	4853	β Crucis	1.25	221	54	08.12	49.880	-0.046	-48	38	26.74	-0.390	-0.039
462	4730	α Crucis A	1.33	222	07	33.30	49.840	-0.031	-52	52	50.89	-0.380	-0.032
578	5793	α Cr.Borealis	2.23	222	33	24.86	50.800	+0.201	+44	19	17.56	-0.390	-0.044
520	5288	ɗ Centauri	2.06	222	33	52.98	49.850	-0.317	-22	05	06.69	-1.020	-0.672
608	6092	τ Herculis	3.89	224	38	45.82	50.910	-0.065	+65	49	41.65	-0.330	+0.032
512	5231	ζ Centauri	2.55	225	12	28.25	50.060	-0.040	-32	56	43.89	-0.420	-0.062
548	5531	α´ Librae*	2.75	225	20	26.54	50.220	-0.082	+0	19	50.57	-0.460	-0.095
504	5132	ε Centauri	2.3	225	48	42.59	50.030	-0.023	-39	35	16.88	-0.390	-0.028
297	3024	ζ Volantis	3.95	226	00	35.16	48.560	-0.031	-79	23	21.36	-0.350	+0.034
391	4102	I Carinae	4	228	20	21.71	49.660	+0.052	-67	53	06.54	-0.410	-0.027
564	5685	β Librae	2.61	229	37	47.72	50.250	-0.089	+8	29	37.44	-0.430	-0.044
583	5867	β Serpentis	3.67	230	12	30.13	50.570	+0.093	+34	19	28.40	-0.420	-0.026
537	5440	η Centauri	2.31	230	30	23.72	50.150	-0.023	-25	30	54.95	-0.440	-0.044
474	4798	α Muscae	2.69	230	37	48.56	49.840	-0.045	-56	33	33.25	-0.430	-0.043
556	5603	σ Librae	3.29	230	56	42.80	50.200	-0.059	-7	38	48.48	-0.450	-0.062
559	5652	ι Librae	4.54	231	15	46.76	50.270	-0.024	-1	51	06.51	-0.440	-0.047
582	5854	α Serpentis	2.65	232	20	05.89	50.550	+0.134	+25	30	23.05	-0.310	+0.079
591	5933	ɔ Serpentis	3.85	233	02	40.47	51.230	+0.759	+35	11	15.73	-1.570	-1.164
541	5469	α Lupi	2.3	233	45	41.23	50.140	-0.016	-30	01	40.97	-0.430	-0.024
518	5267	β Centauri	0.61	234	02	57.59	50.030	-0.026	-44	08	23.52	-0.430	-0.032
469	4773	ɔ Muscae	3.87	234	16	27.14	49.830	-0.069	-58	52	22.63	-0.450	-0.045
588	5892	ε Serpentis	3.71	234	35	26.28	50.520	+0.121	+24	00	18.37	-0.310	+0.091
553	5576	κ Centauri	3.13	235	03	09.39	50.180	-0.011	-24	02	01.27	-0.430	-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, 2018.5

MEAN PLACES FOR JULY 2^d.625 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
552	5571	β Lupi	2.68	235	16	59.98	50.170	-0.023	-25	02	54.66	-0.450	-0.048
577	5787	ɔ Librae	3.91	235	23	48.81	50.370	+0.061	+4	23	02.13	-0.380	+0.024
585	5881	μ Serpentis	3.54	236	11	51.00	50.280	-0.082	+16	14	09.09	-0.450	-0.042
487	4923	δ Muscae	3.62	236	26	54.56	50.310	+0.360	-56	46	36.72	-0.250	+0.163
566	5705	ű' Lupi	3.56	237	45	06.98	50.160	-0.067	-17	10	51.54	-0.520	-0.105
1413	5838	κ Librae	4.74	238	00	56.66	50.280	-0.013	+0	01	19.34	-0.520	-0.109
579	5794	ν Librae	3.58	238	52	03.63	50.260	-0.010	-8	30	34.64	-0.420	0.000
1402	5695	δ Lupi	3.22	238	54	53.54	50.210	-0.008	-21	25	41.81	-0.450	-0.029
626	6220	η Herculis	3.53	239	02	55.06	50.770	+0.116	+60	17	14.36	-0.490	-0.070
609	6095	ɔ Herculis	3.75	239	28	24.31	50.390	-0.072	+40	00	20.64	-0.390	+0.032
538	5460	α Centauri cg	var.	239	42	39.30	45.210	-4.889	-42	36	10.12	-1.300	-0.862
401	4174	ɔ Chamaeleontis	4.11	240	40	37.22	49.760	-0.049	-68	05	11.77	-0.470	-0.040
558	5649	ζ Lupi	3.41	241	00	53.70	50.070	-0.099	-32	50	03.42	-0.530	-0.104
618	6148	β Herculis	2.77	241	20	59.97	50.340	-0.126	+42	41	59.98	-0.460	-0.034
613	6117	ω Herculis	4.57	241	50	05.46	50.490	+0.067	+35	09	57.18	-0.490	-0.050
603	6056	δ Ophiuchi	2.74	242	33	38.85	50.330	-0.018	+17	14	17.53	-0.580	-0.149
539	5463	α Circini	3.19	242	37	10.50	50.000	-0.104	-46	12	22.73	-0.730	-0.292
594	5953	δ Scorpii*	2.32	242	49	46.73	50.290	-0.001	-1	59	18.58	-0.470	-0.038
592	5944	π Scorpii	2.89	243	11	53.64	50.270	-0.006	-5	28	39.89	-0.460	-0.027
597	5984	β Scorpii pr	2.62	243	26	54.52	50.300	-0.002	+1	00	19.61	-0.450	-0.020
605	6075	ε Ophiuchi	3.24	243	46	09.03	50.430	+0.079	+16	26	15.80	-0.380	+0.055
459	4674	β Chamaeleontis	4.26	245	41	39.18	49.890	-0.084	-63	35	48.19	-0.480	-0.034
411	4234	δ^2 Chamaeleontis	4.45	245	54	44.93	49.890	-0.030	-67	47	35.62	-0.490	-0.048
607	6084	σ Scorpii	2.89	248	03	28.70	50.270	-0.007	-4	02	23.39	-0.470	-0.022
634	6324	ε Herculis	3.92	248	35	09.50	50.390	-0.085	+53	14	46.05	-0.430	+0.019
622	6175	ζ Ophiuchi	2.56	249	29	16.22	50.330	+0.010	+11	23	20.86	-0.430	+0.028
560	5671	ɔ Tr. Austrini	2.89	249	39	02.54	50.070	-0.082	-48	06	19.88	-0.500	-0.056
616	6134	α Scorpii cg*	var.	250	01	14.09	50.280	-0.006	-4	34	20.62	-0.470	-0.022
620	6165	τ Scorpii	2.82	251	42	55.08	50.280	-0.005	-6	07	22.43	-0.480	-0.023
633	6299	κ Ophiuchi	3.2	252	04	42.75	50.020	-0.339	+31	50	00.85	-0.510	-0.047
589	5897	β Tr.Australis	2.85	252	05	55.06	50.100	-0.100	-41	57	01.81	-0.900	-0.435
653	6536	β Draconis	2.79	252	13	35.22	50.620	-0.072	+75	16	31.90	-0.440	+0.011
643	6418	π Herculis	3.16	252	19	35.66	50.420	-0.051	+59	32	54.38	-0.460	0.000
542	5470	α Apodis	3.83	254	41	15.05	50.150	-0.002	-58	14	14.59	-0.490	-0.019
641	6410	δ Herculis	3.14	255	01	20.70	50.380	-0.004	+47	40	56.72	-0.630	-0.158
628	6241	ε Scorpii	2.29	255	35	25.82	49.700	-0.588	-11	44	33.42	-0.790	-0.327
1439	6247	μ^1 Scorpii	3.08v	256	24	50.19	50.270	-0.008	-15	25	32.55	-0.490	-0.026
1435	6229	η Arae	3.76	259	09	46.02	50.310	+0.051	-36	16	44.23	-0.490	-0.023
631	6285	ζ Arae	3.13	260	04	55.74	50.260	-0.018	-33	05	39.31	-0.500	-0.038
663	6588	ι Herculis	3.8	260	08	53.32	50.380	-0.015	+69	15	47.31	-0.470	+0.005
638	6380	η Scorpii	3.33	261	00	05.61	50.340	+0.052	-20	11	14.57	-0.750	-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, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
625	6217	α Tr. Austr.	1.92	261	09	15.27	50.290	+0.028	-46	09	14.25	-0.500	-0.031
644	6453	ɗ Ophiuchi	3.27	261	39	11.91	50.290	-0.002	-1	50	45.63	-0.480	-0.020
656	6556	α Ophiuchi	2.08	262	42	28.85	50.470	+0.163	+35	49	53.97	-0.690	-0.220
611	6102	ɔ Apodis	3.89	262	57	38.99	50.070	-0.191	-56	00	36.21	-0.570	-0.106
649	6508	ν Scorpii	2.69	264	16	16.13	50.300	0.000	-14	00	39.32	-0.500	-0.031
645	6461	β Arae	2.85	264	27	51.33	50.280	-0.008	-32	16	03.04	-0.500	-0.026
658	6561	ɜ Serpentis	3.54	264	48	15.50	50.250	-0.040	+7	55	55.15	-0.530	-0.060
652	6527	ɚ Scorpii*	1.63	264	50	39.15	50.300	0.000	-13	47	27.66	-0.490	-0.029
671	6688	ɜ Draconis	3.75	265	00	59.28	50.820	+0.525	+80	16	49.80	-0.390	+0.085
651	6510	α Arae	2.95	265	11	33.36	50.260	-0.030	-26	33	48.28	-0.540	-0.072
667	6623	μ Herculis	3.42	265	28	50.61	49.840	-0.452	+51	05	50.98	-1.240	-0.762
665	6603	β Ophiuchi	2.77	265	35	41.77	50.240	-0.051	+27	56	17.20	-0.310	+0.158
648	6500	δ Arae	3.62	265	48	53.14	50.230	-0.067	-37	21	31.86	-0.570	-0.100
654	6553	ɗ Scorpii	1.87	265	51	28.89	50.320	+0.016	-19	38	51.20	-0.470	-0.001
660	6580	κ Scorpii	2.41	266	43	40.42	50.290	-0.005	-15	38	48.98	-0.500	-0.027
668	6629	ɔ Ophiuchi	3.75	266	53	27.06	50.270	-0.023	+26	06	30.18	-0.540	-0.074
666	6615	ι^1 Scorpii	3.03	267	46	51.61	50.300	0.000	-16	43	00.87	-0.470	-0.008
669	6630	*G* Scorpii	3.21	268	10	35.94	50.350	+0.049	-13	37	28.47	-0.440	+0.034
676	6705	ɔ Draconis	2.23	268	13	35.42	50.170	-0.028	+74	55	11.03	-0.490	-0.020
661	6582	η Pavonis	3.62	268	13	54.73	50.300	-0.016	-41	18	44.39	-0.530	-0.055
672	6695	ɗ Herculis	3.86	268	44	06.74	50.250	+0.009	+60	40	56.92	-0.460	+0.006
674	6703	ɜ Herculis	3.7	269	27	16.72	50.390	+0.139	+52	40	59.27	-0.490	-0.017
673	6698	ν Ophiuchi	3.34	270	00	41.65	50.280	-0.007	+13	39	44.75	-0.580	-0.116
1471	6743	ɗ Arae	3.66	271	26	54.68	50.310	-0.012	-26	39	41.72	-0.480	-0.014
679	6746	ɔ Sagittarii	2.99	271	31	10.72	50.250	-0.056	-6	59	40.23	-0.650	-0.185
680	6771	72 Ophiuchi	3.73	272	25	05.62	50.190	-0.070	+32	59	14.54	-0.390	+0.081
681	6779	*o* Herculis	3.83	272	57	16.42	50.210	+0.002	+52	10	54.44	-0.450	+0.009
682	6812	μ Sagittarii	3.86	273	28	19.04	50.290	+0.002	+2	20	22.88	-0.470	+0.001
683	6832	η Sagittarii	3.11	273	53	08.19	50.180	-0.137	-13	22	52.08	-0.630	-0.162
687	6859	δ Sagittarii*	2.7	274	50	22.53	50.340	+0.034	-6	28	29.36	-0.490	-0.029
691	6897	α Telescopii	3.51	275	19	55.56	50.310	-0.021	-22	39	01.86	-0.520	-0.053
689	6879	ε Sagittarii	1.85	275	20	12.75	50.260	-0.045	-11	03	17.45	-0.590	-0.122
688	6869	η Serpentis	3.26	275	56	03.40	49.650	-0.614	+20	25	46.70	-1.140	-0.677
692	6913	ɚ Sagittarii	2.81	276	34	31.11	50.250	-0.053	-2	08	20.21	-0.650	-0.183
697	6951	ɗ Coronae Aust.	4.64	276	48	10.08	50.360	+0.031	-19	03	56.93	-0.480	-0.024
1482	6973	α Scuti	3.85	279	16	28.74	50.230	-0.037	+14	54	58.35	-0.770	-0.310
214	1953	ɔ Mensae	5.19	279	49	33.79	50.810	+1.080	-79	59	17.73	-0.760	+0.239
1487	7039	ű Sagittarii	3.17	280	26	24.44	50.360	+0.053	-3	57	22.94	-0.460	-0.004
1489	7063	β Scuti	4.22	282	38	17.77	50.240	-0.006	+18	11	00.97	-0.460	-0.016
706	7121	σ Sagittarii*	2.02	282	38	37.88	50.310	+0.008	-3	27	07.65	-0.510	-0.055
710	7150	ɜ´ Sagittarii	3.51	283	42	34.97	50.320	+0.032	+1	39	31.89	-0.460	-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, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
1496	7234	τ Sagittarii	3.32	285	05	32.61	50.230	-0.083	-5	05	32.64	-0.690	-0.243
699	7001	α Lyrae	0.03	285	34	32.92	50.500	+0.505	+61	43	54.76	-0.190	+0.256
720	7264	π Sagittarii	2.89	286	30	36.81	50.290	-0.004	+1	26	04.63	-0.470	-0.035
717	7236	ϑ Aquilae	3.44	287	35	25.30	50.210	-0.029	+17	33	47.04	-0.520	-0.087
754	7665	δ Pavonis	3.56	287	52	42.46	51.620	+1.142	-44	42	32.59	-1.870	-1.444
712	7176	ε Aquilae	4.02	288	31	09.87	50.070	-0.075	+37	33	53.13	-0.500	-0.066
705	7106	β Lyrae	var.	289	08	26.70	50.020	+0.005	+55	58	54.93	-0.430	-0.003
810	8254	ν Octantis	3.76	289	56	51.73	50.400	-0.212	-57	46	57.66	-0.640	-0.217
716	7235	ζ Aquilae	2.99	290	03	12.97	50.130	-0.023	+36	10	58.82	-0.530	-0.094
713	7178	ɔ Lyrae	3.24	292	10	45.14	49.980	-0.003	+55	00	38.95	-0.420	+0.003
775	7913	β Pavonis	3.42	292	45	12.52	50.470	-0.055	-45	57	23.80	-0.390	+0.028
730	7377	δ Aquilae	3.36	293	53	49.77	50.490	+0.294	+24	48	54.49	-0.370	+0.040
764	7790	α Pavonis	1.94	294	04	35.90	50.440	-0.025	-36	16	12.75	-0.500	-0.087
751	7623	d^1 Sagittarii	4.37	295	07	43.64	50.360	+0.001	-14	23	16.62	-0.430	-0.027
785	7986	β Indi	3.65	298	02	42.60	50.510	+0.008	-39	09	33.30	-0.430	-0.030
769	7869	α Indi	3.11	299	21	49.63	50.510	+0.078	-27	45	19.50	-0.340	+0.048
1508	7405	α Vulpeculae	4.44	299	45	48.79	49.810	-0.209	+45	51	21.39	-0.460	-0.076
746	7570	η Aquilae	var.	300	41	30.09	50.200	+0.010	+21	31	16.51	-0.390	-0.009
741	7525	ɔ Aquilae	2.72	301	11	47.96	50.150	+0.020	+31	14	29.73	-0.390	-0.005
11	98	β Hydri	2.8	301	14	47.10	53.530	+2.662	-64	47	48.12	-2.310	-1.950
1513	7488	β Sagittae	4.37	301	27	48.01	50.080	+0.003	+38	12	57.62	-0.420	-0.033
732	7417	β Cygni *p*	3.08	301	30	30.80	49.980	+0.002	+48	57	56.60	-0.380	-0.002
745	7557	α Aquilae*	0.77	302	02	15.53	50.830	+0.697	+29	18	10.41	-0.110	+0.263
749	7602	β Aquilae	3.71	302	40	51.78	50.090	-0.064	+26	39	17.07	-0.860	-0.481
743	7536	δ Sagittae	3.82	303	38	40.25	50.070	+0.011	+38	54	39.44	-0.360	+0.006
761	7754	α^2 Capricorni	3.57	304	07	01.93	50.320	+0.063	+6	55	41.65	-0.380	-0.011
762	7776	β Capricorni	3.08	304	18	21.38	50.310	+0.042	+4	35	12.24	-0.370	-0.008
756	7710	ɗ Aquilae	3.23	305	34	13.64	50.220	+0.041	+20	19	30.81	-0.360	-0.005
752	7635	ɔ Sagittae	3.47	307	18	04.39	50.130	+0.090	+39	11	18.48	-0.340	+0.006
1550	8039	ɔ Microscopii	4.67	308	41	25.28	50.380	0.000	-14	40	01.33	-0.330	+0.006
841	8502	α Tucanae	2.86	309	55	51.34	50.510	-0.120	-45	24	19.80	-0.330	0.000
146	1208	ɔ Hydri	3.24	310	44	25.71	52.140	+0.537	-76	45	32.47	-0.410	-0.010
781	7950	ε Aquarii	3.77	311	58	53.57	50.270	+0.024	+8	04	43.23	-0.360	-0.042
1547	7990	μ Aquarii	4.73	313	18	59.29	50.280	+0.035	+8	14	17.38	-0.350	-0.041
768	7852	ε Delphini	4.03	314	19	06.72	50.100	+0.007	+29	04	17.22	-0.330	-0.024
726	7328	κ Cygni	3.77	315	10	20.46	49.440	+0.396	+73	48	04.04	-0.220	+0.080
829	8425	α Gruis	1.74	316	10	01.26	50.600	+0.064	-32	54	56.86	-0.480	-0.191
(771)	7882	β Delphini m*	3.64	316	35	56.29	50.130	+0.070	+31	54	57.92	-0.360	-0.069
806	8204	ζ Capricorni	3.74	317	11	44.33	50.350	+0.008	-6	59	32.38	-0.270	+0.022
774	7906	α Delphini	3.77	317	38	17.40	50.130	+0.074	+33	01	14.48	-0.300	-0.022
822	8353	ɔ Gruis	3.01	317	40	44.65	50.550	+0.095	-23	03	07.46	-0.340	-0.057

* **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, 2018.5

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

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
733	7420	ι Cygni	3.79	318	13	21.07	49.430	+0.252	+71	27	00.54	-0.170	+0.104
778	7928	δ Delphini	4.43	318	22	23.96	50.020	-0.037	+31	56	31.16	-0.310	-0.035
1541	7948	ɔ Delphini sq	4.27	319	37	30.56	49.940	-0.109	+32	41	59.95	-0.450	-0.177
860	8675	ε Gruis	3.49	320	59	25.69	50.690	+0.077	-39	47	23.12	-0.380	-0.115
846	8556	δ^{1} Gruis	3.97	321	51	44.33	50.560	+0.027	-31	20	55.87	-0.270	-0.017
812	8278	ɔ Capricorni	3.68	322	03	00.74	50.480	+0.172	-2	33	32.63	-0.340	-0.084
856	8636	β Gruis	2.11v	322	35	16.68	50.720	+0.145	-35	26	01.65	-0.320	-0.071
800	8131	α Equulei	3.92	323	22	30.35	50.180	+0.029	+20	07	12.16	-0.350	-0.102
808	8232	β Aquarii	2.91	323	39	11.94	50.250	+0.017	+8	36	49.18	-0.260	-0.015
819	8322	δ Capricorni	2.87	323	48	06.76	50.460	+0.149	-2	36	17.41	-0.610	-0.368
1569	8264	ξ Aquarii	4.69	324	22	38.23	50.350	+0.103	+5	57	22.03	-0.300	-0.062
765	7796	ɔ Cygni	2.2	325	05	48.39	49.670	+0.007	+57	07	23.55	-0.240	-0.001
780	7949	ε Cygni	2.46	328	00	18.62	50.510	+0.705	+49	25	19.01	-0.050	+0.155
815	8308	ε Pegasi	var.	332	08	33.47	50.150	+0.031	+22	05	55.86	-0.200	-0.011
849	8592	ν Aquarii	5.2	332	48	07.52	50.540	+0.154	-10	54	10.76	-0.390	-0.218
797	8115	ζ Cygni	3.2	333	17	51.27	49.850	-0.031	+43	41	36.83	-0.230	-0.051
827	8414	α Aquarii	2.96	333	50	32.81	50.220	+0.015	+11	15	30.35	-0.190	-0.016
867	8728	α PsA	1.16	334	07	15.26	50.720	+0.253	-21	08	16.74	-0.450	-0.287
777	7924	α Cygni	1.25	335	35	01.67	49.530	+0.007	+59	54	19.29	-0.160	+0.001
842	8518	ɔ Aquarii	3.84	336	58	22.11	50.360	+0.126	+8	14	03.05	-0.190	-0.042
834	8450	ɗ Pegasi	3.53	337	05	32.26	50.440	+0.278	+16	20	22.07	-0.220	-0.077
861	8679	τ Aquarii	4.01	338	51	15.49	50.310	-0.026	-5	39	55.28	-0.160	-0.030
866	8709	δ Aquarii	3.27	339	07	55.29	50.320	-0.047	-8	11	31.40	-0.140	-0.008
3	25	ε Phoenicis	3.88	339	54	31.29	50.710	+0.011	-41	57	28.20	-0.340	-0.220
850	8597	η Aquarii	4.02	340	45	02.06	50.290	+0.064	+8	21	49.28	-0.200	-0.087
792	8079	ξ Cygni	3.72	341	03	16.13	49.610	+0.014	+56	34	53.12	-0.120	-0.003
864	8698	ɚ Aquarii*	3.74	341	50	04.84	50.320	+0.025	+0	23	13.31	-0.080	+0.030
72	591	α Hydri	2.86	342	23	00.89	51.670	+0.419	-64	14	37.26	-0.290	-0.194
831	8430	ι Pegasi	3.76	344	40	02.20	50.320	+0.339	+34	15	16.16	-0.190	-0.104
54	472	α Eridani	0.46	345	34	27.37	51.170	+0.084	-59	22	44.42	-0.170	-0.092
12	99	α Phoenicis	2.39	345	45	14.31	50.650	-0.042	-40	38	08.79	-0.520	-0.444
855	8634	ζ Pegasi	3.4	346	24	34.94	50.220	+0.072	+17	40	43.85	-0.110	-0.043
141	1175	β Reticuli	3.85	351	40	01.60	52.980	+0.795	-76	05	22.38	-0.290	-0.260
878	8852	ɔ Piscium	3.69	351	42	54.12	50.950	+0.713	+7	15	19.74	-0.310	-0.285
871	8781	α Pegasi	2.49	353	44	36.35	50.170	+0.043	+19	24	20.22	-0.080	-0.065
1044	440	ŭ Phoenicis	3.95	353	53	07.47	51.250	+0.337	-52	34	57.10	+0.030	+0.035
862	8684	μ Pegasi	3.48	354	38	37.30	50.160	+0.130	+29	23	10.78	-0.110	-0.102
857	8650	η Pegasi	2.94	355	58	12.07	49.960	+0.002	+35	06	29.02	-0.030	-0.029
68	566	χ Eridani	3.7	356	30	58.43	52.320	+1.308	-57	01	06.40	-0.200	-0.210
49	429	ɔ Phoenicis	3.41	358	24	13.16	50.620	-0.186	-47	35	08.78	-0.130	-0.167
870	8775	β Pegasi*	2.42v	359	37	57.33	50.280	+0.270	+31	08	27.25	+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 2018.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1	15	α Andromedae*	2.06	B9 II	0	09	20.9	3.116	+104	+29	11	33.06	+19.86	-163
2	21	β Cassiopeiae*	2.27	F2 IV	0	10	10.6	3.243	+685	+59	15	06.28	19.84	-181
3	25	ε Phoenicis	3.88	K0 III	0	10	20.7	3.025	+118	-45	38	43.70	19.84	-181
7	39	ɔ Pegasi*	2.83	B2 IV	0	14	11.5	3.098	+2	+15	17	10.70	19.99	-12
9	74	ι Ceti	3.56	K1.5 III	0	20	22.2	3.056	-9	-8	43	17.42	19.93	-36
11	98	β Hydri	2.80	G0V	0	26	41.9	3.058	+6639	-77	09	01.06	20.23	+324
12	99	α Phoenicis	2.39	K0.5 III b	0	27	11.6	2.950	+183	-42	12	20.86	+19.50	-396
17	153	ζ Cassiopeiae	3.66	B2 IV	0	38	00.8	3.381	+22	+53	59	54.59	19.76	-9
20	165	ŭ Andromedae	3.27	K3 III	0	40	19.3	3.226	+106	+30	57	42.93	19.64	-92
21	168	α Cassiopeiae*	2.23	K0- IIIa	0	41	34.1	3.448	+64	+56	38	18.72	19.68	-32
22	188	β Ceti*	2.04	K0III	0	44	31.0	3.008	+164	-17	53	07.26	19.70	+32
33	269	μ Andromedae	3.87	A5 V	0	57	47.2	3.354	+130	+38	35	57.47	19.44	+33
32	264	ɔ Cassiopeiae*	2.47	B0 IVpe	0	57	50.4	3.676	+36	+60	48	59.36	+19.40	-5
35	280	α Sculptoris	4.31	B7IIIp	0	59	29.7	2.885	+17	-29	15	28.28	19.37	+4
40	334	η Ceti	3.45	K1 III	1	09	31.2	3.019	+147	-10	05	04.65	18.99	-138
42	337	β Andromedae*	2.06	M0III	1	10	46.4	3.382	+146	+35	43	05.34	18.98	-114
1033	361	ζ Piscium*	5.24	A7IV	1	14	42.0	3.143	+97	+7	40	21.64	18.93	-56
47	402	ɗ Ceti	3.60	K0 III	1	24	56.9	3.001	-53	-8	05	18.46	18.46	-218
48	403	ŭ Cassiopeiae	2.68	A5 III-IVv	1	27	02.5	3.985	+400	+60	19	50.74	+18.56	-52
49	429	ɔ Phoenicis	3.41	Mo- IIIa	1	29	10.0	2.598	-13	-43	13	26.20	18.34	-208
1044	440	ŭ Phoenicis	3.95	G9 III	1	32	01.2	2.490	+144	-48	58	37.44	18.60	+151
50	437	η Piscium	3.62	G7 IIa	1	32	28.6	3.222	+19	+15	26	26.02	18.43	-6
54	472	α Eridani*	0.46	B6Vep	1	38	24.1	2.226	+117	-57	08	35.47	18.19	-35
52	464	51 Andromedae	3.57	K3 III	1	39	08.3	3.720	+65	+48	43	16.46	18.08	-113
59	509	τ Ceti	3.50	G8.5 V	1	44	55.7	2.789	-1190	-15	50	26.13	+18.84	+858
62	539	ζ Ceti	3.73	K0 III	1	52	22.5	2.964	+28	-10	14	39.48	17.64	-39
64	544	α Trianguli	3.41	F5III	1	54	08.5	3.440	+9	+29	40	05.62	17.37	-235
66	553	β Arietis*	2.64	A5 V	1	55	40.0	3.329	+68	+20	53	51.72	17.43	-111
63	542	ε Cassiopeiae	3.38	B3III	1	55	44.8	4.392	+48	+63	45	36.92	17.52	-21
68	566	χ Eridani	3.70	G8IV	1	56	40.6	2.329	+730	-51	31	02.55	17.79	+291
72	591	α Hydri	2.86	F0IV	1	59	21.1	1.889	+369	-61	28	49.08	+17.41	+26
71	585	ν Ceti	4.00	F7III	2	00	52.6	2.827	+97	-20	59	19.90	17.29	-24
73	603	ɔ Andromed.* p	2.26	K3- IIB	2	05	02.6	3.713	+40	+42	25	03.47	17.08	-52
70	580	50 Cassiopeiae	3.98	A2V	2	05	03.2	5.266	-99	+72	30	34.71	17.15	+22
74	617	α Arietis*	2.00	K2 III	2	08	13.2	3.398	+138	+23	32	56.62	16.84	-148
75	622	β Trianguli	3.00	A5 III	2	10	39.1	3.594	+122	+35	04	26.13	16.83	-40
82	674	ű Eridani	3.56	B8IV- V	2	17	10.2	2.142	+102	-51	25	37.90	+16.53	-27
79	664	ɔ Trianguli	4.01	A1Vnn	2	18	25.2	3.590	+38	+33	55	54.75	16.44	-51
91	779	δ Ceti	4.07	B2 IV	2	40	25.8	3.072	+9	-0	14	58.57	+15.33	-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 2018.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1075	794	ι Eridani	4.11	K0III	2	41	23.8	2.367	+120	-39	46	37.16	+15.24	-32
94	801	35 Arietis	4.66	B3 V	2	44	32.5	3.539	+6	+27	47	05.30	15.08	-12
101	841	β Fornacis	4.46	G8 5 IIIb	2	49	51.9	2.512	+71	-32	19	44.59	14.94	+155
100	838	41 Arietis*	3.63	B8 Vn	2	51	04.7	3.549	+50	+27	20	08.43	14.59	-118
99	834	η Persei	3.76	K31b	2	52	03.6	4.427	+20	+55	58	15.40	14.64	-14
907	424	α Ursae Mins.*	2.02	F7:Ib-Iiv	2	54	59.0	83.731	+2127	+89	20	31.20	14.46	-19
103	854	τ Persei	3.95	G4 III+	2	55	34.9	4.297	0	+52	50	12.78	+14.44	-5
104	874	η Eridani	3.89	K1 III	2	57	20.0	2.936	+53	-8	49	31.73	14.12	-220
106	897	ɗ Eridani* p	3.25	A3 IV-V	2	58	57.8	2.276	-39	-40	13	52.85	14.25	+19
1085	919	τɔ Eridani	4.09	A3IV- V	3	03	12.5	2.647	-105	-23	33	10.02	13.92	-54
107	911	α Ceti*	2.53	M1.5 IIIa	3	03	14.9	3.144	-6	+4	09	40.49	13.89	-78
108	915	ɔ Persei	2.93	G8 III+	3	06	08.9	4.390	0	+53	34	39.05	13.78	-5
109	921	ρ Persei*	3.39	M4 II	3	06	22.1	3.870	+111	+38	54	38.55	+13.67	-106
111	936	β Persei*	2.12	B8V	3	09	22.8	3.931	+3	+41	01	32.36	13.58	-1
120	1017	α Persei*	1.79	F5 Iab	3	25	39.2	4.319	+25	+49	55	31.98	12.48	-25
121	1030	ο Tauri	3.60	G6 III	3	25	48.7	3.238	-45	+9	05	34.11	12.41	-78
123	1038	ξ Tauri	3.74	B9 Vn	3	28	10.5	3.261	+40	+9	47	45.70	12.29	-39
127	1084	ε Eridani	3.73	K2 Vk	3	33	48.2	2.832	-658	-9	23	47.94	11.96	+22
135	1136	δ Eridani	3.54	B1III-IV	3	44	08.2	2.880	-61	-9	42	06.72	+11.94	+745
131	1122	δ Persei	3.01	B5 III	3	44	15.0	4.303	+28	+47	50	42.57	11.15	-34
141	1175	β Reticuli	3.85	K2 III	3	44	26.2	0.773	+490	-64	44	56.76	11.25	+75
136	1142	17 Tauri	3.70	B6 IIIe	3	45	58.7	3.577	+14	+24	10	12.58	11.02	-46
134	1135	ν Persei	3.77	F5 Iab	3	46	27.4	4.101	-13	+42	38	07.55	11.03	-2
146	1208	ɔ Hydri	3.24	M2 III	3	46	58.3	-0.857	+116	-74	10	55.00	11.10	+114
139	1165	η Tauri*	2.87	B7 III	3	48	35.3	3.580	+14	+24	09	39.43	+10.83	-46
142	1178	27 Tauri	3.63	B8 III	3	50	16.0	3.581	+13	+24	06	30.99	10.70	-47
144	1203	ζ Persei	2.85	B1 Ib	3	55	18.0	3.788	+4	+31	56	13.56	10.36	-10
149	1231	ɔ Eridani	2.95	M 1 IIIb	3	58	53.6	2.803	+42	-13	27	25.23	10.00	-111
147	1220	ε Persei	2.89	B 0.5 V+	3	59	06.1	4.048	+16	+40	03	43.75	10.06	-26
148	1228	ξ Persei	4.04	O 7.5 IIIe	4	00	10.2	3.912	+2	+35	50	33.59	10.01	0
150	1239	λ Tauri	3.47v	B3 V+	4	01	42.5	3.333	-4	+12	32	28.73	+9.88	-12
151	1251	ν Tauri	3.91	A0.5 Va	4	04	08.5	3.199	+3	+6	02	21.68	9.70	-3
152	1273	48 Persei	4.04	B3 Ve	4	10	00.7	4.383	+20	+47	45	36.69	9.20	-31
155	1326	α Horologii	3.86	K2 III	4	14	37.0	1.992	+41	-42	14	58.87	8.69	-209
156	1336	α Reticuli	3.35	G8II-III	4	14	40.0	0.789	+65	-62	25	40.37	8.93	+45
159	1346	ɔ Tauri	3.65	K0III	4	20	50.9	3.424	+80	+15	40	15.17	8.38	-25
162	1373	δ Tauri	3.76	K0III	4	24	00.3	3.470	+75	+17	35	04.03	+8.12	-30
1121	1393	43 Eridani	3.96	K4 III	4	24	44.0	2.257	+56	-33	58	29.58	8.15	+50
164	1409	ε Tauri	3.54	G9.5 III	4	29	42.0	3.513	+76	+19	13	11.91	7.66	-38
171	1465	α Doradus	3.27	A0IIIs	4	34	23.9	1.304	+60	-55	00	26.69	7.31	-4
170	1464	ν˂ Eridani	3.82	G8IIIa	4	36	16.3	2.336	-35	-30	31	31.64	+7.15	-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 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
168	1457	α Tauri*	0.85	K5III	4	36	59.1	3.451	+44	+16	32	42.08	+6.92	-190
172	1481	53 Eridani	3.87	K1III	4	39	01.7	2.751	-52	-14	16	08.07	6.78	-155
1129	1502	α Caeli	4.45	F2 V	4	41	09.5	1.937	-126	-41	49	45.64	6.68	-77
1134	1543	π^3 Orionis	3.19	F6 V	4	50	50.8	3.263	+313	+6	59	31.71	5.97	+11
179	1552	π^4 Orionis	3.69	B2 III+	4	52	11.6	3.201	-1	+5	38	07.19	5.85	+1
180	1567	π^5 Orionis	3.72	B3 III+	4	55	13.0	3.131	0	+2	28	10.50	5.59	0
178	1542	α Camelopardi	4.29	O9.5 I ae	4	55	54.1	6.011	-1	+66	22	17.53	+5.54	+6
181	1577	ι Aurigae	2.69	K3 II	4	58	12.1	3.918	+3	+33	11	37.31	5.32	-18
183	1605	ε Aurigae*	2.99V	A8 Iab	5	03	18.0	4.320	-1	+43	50	55.60	4.90	-4
1137	1612	ζ Aurigae	3.75	K4Ib-II+	5	03	46.5	4.207	+8	+41	06	03.61	4.85	-22
182	1603	β Camelopardi	4.03	G1Ib-II	5	05	04.3	5.365	-9	+60	28	01.07	4.74	-16
186	1654	ε Leporis	3.19	K4 III	5	06	14.7	2.543	+18	-22	20	50.38	4.58	-74
185	1641	η Aurigae	3.17	B3 V	5	07	48.9	4.220	+26	+41	15	27.63	+4.46	-68
188	1666	β Eridani*	2.79	A3III	5	08	45.6	2.954	-63	-5	03	49.80	4.36	-81
1144	1702	μ Leporis	3.31	B9IV	5	13	45.8	2.698	+30	-16	11	05.49	3.99	-26
194	1713	β Orionis*	0.12	B8 Iab	5	15	25.7	2.887	0	-8	10	53.64	3.87	-1
193	1708	α Aurigae*	0.08	G5IIIe+	5	18	03.5	4.444	+72	+46	00	53.60	3.22	-425
195	1735	τ Orionis	3.60	B5 III	5	18	30.3	2.917	-10	-6	49	32.53	3.60	-8
1147	1765	22 Orionis	4.73	B2IV-V	5	22	42.5	3.067	0	-0	21	56.27	+3.25	-1
201	1790	ɔ Orionis*	1.64	B2 III	5	26	07.5	3.222	-6	+6	21	53.88	2.94	-14
202	1791	β Tauri*	1.65	B7 III	5	27	27.8	3.799	+17	+28	37	16.84	2.67	-175
204	1829	β Leporis	2.84	G5 II	5	29	02.3	2.573	-3	-20	44	45.16	2.61	-89
214	1953	ɔ Mensae	5.19	K2 III	5	31	09.5	-2.341	+320	-76	19	36.48	2.79	+282
206	1852	δ Orionis*	2.23	O9.5 II+	5	32	57.2	3.069	+1	0	17	12.50	2.36	-2
207	1865	α Leporis*	2.58	F0 Ib	5	33	32.8	2.649	+1	-17	48	36.86	+2.31	+2
212	1922	β Doradus	3.76v	F6Ia	5	33	47.3	0.528	+3	-62	28	40.88	2.30	+9
(GC)	1879	λ Orionis*	3.54	O8 III	5	36	09.5	3.308	-1	+9	56	42.26	2.08	-2
209	1899	ι Orionis	2.77	O9 III	5	36	20.3	2.938	0	-5	53	56.65	2.07	+1
210	1903	ε Orionis*	1.70	B0 Iab	5	37	09.2	3.048	+1	-1	11	29.41	1.99	-2
211	1910	ζ Tauri	3.00	B2IV	5	38	45.1	3.590	0	+21	09	07.89	1.83	-21
215	1956	α Columbae*	2.64	B7 IVe	5	40	19.2	2.176	+5	-34	03	55.16	+1.70	-26
1154	2015	δ Doradus	4.35	A7V	5	44	48.5	0.114	-49	-65	43	43.22	1.34	+8
217	1983	ɔ Leporis	3.60	F6 V	5	45	14.1	2.503	-212	-22	26	36.66	0.92	-369
219	1998	ζ Leporis	3.55	A2 IV-V(n)	5	47	47.7	2.721	-11	-14	48	58.72	1.07	-1
220	2004	κ Orionis*	2.06	B0Iab	5	48	38.1	2.848	+1	-9	39	51.70	1.00	-2
223	2040	β Columbae	3.12	K1 IIICN+1	5	51	36.8	2.119	+49	-35	45	44.67	1.13	+401
222	2035	δ Leporis	3.81	K1IVFe	5	52	07.1	2.582	+161	-20	52	43.50	+0.04	-649
224	2061	α Orionis*	0.5	M2Iab	5	56	10.4	3.251	+17	+7	24	32.51	+0.34	+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 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
226	2085	η Leporis	3.71	F2 V	5	57	14.9	2.735	-28	-14	09	56.16	+0.38	+139
229	2120	η Columbae	3.96	K01II	5	59	42.8	1.839	+20	-42	48	54.17	+0.01	-14
227	2088	β Aurigae*	1.90	A2IV+	6	00	53.2	4.404	-54	+44	56	50.44	-0.08	0
225	2077	δ Aurigae*	3.72	K0 III	6	01	03.1	4.943	+92	+54	17	02.17	0.22	-126
1163	2134	1 Geminorum	4.16	G5III	6	05	14.7	3.649	-6	+23	15	38.73	0.56	-100
1168	2219	κ Aurigae	4.35	G8.5IIIb	6	16	33.4	3.823	-57	+29	29	22.29	1.71	-262
240	2282	ζ Canis Maj.	3.02	B2.5V	6	21	01.4	2.306	+7	-30	04	21.60	-1.83	+3
243	2294	β Canis Maj.*	1.98	B1 II/III	6	23	30.9	2.644	-4	-17	57	58.69	2.05	0
241	2286	μ Geminorum	2.88	M3 III	6	24	04.8	3.630	+39	+22	30	08.75	2.21	-111
245	2326	α Carinae*	-0.72	F0II	6	24	21.8	1.333	+25	-52	42	23.12	2.11	+21
244	2298	8ε Monocerotis	4.44	A5 IV	6	24	44.9	3.181	-12	+4	34	55.27	2.14	+11
1173	2343	ν Geminorum	4.15	B6 IIIe	6	30	03.7	3.562	-5	+20	11	55.69	2.64	-14
252	2451	ν Puppis	3.17	B8 III	6	38	19.7	1.838	+2	-43	12	46.89	-3.34	-6
251	2421	ɔ Geminorum*	1.93	A0 IV	6	38	46.8	3.465	+29	+16	22	55.07	3.42	-42
254	2473	ε Geminorum	2.98	G8 Ib	6	45	04.2	3.689	-4	+25	06	40.11	3.93	-13
257	2491	α Canis Maj* cg	-1.46	A1V	6	45	57.8	2.643	-386	-16	44	33.50	5.20	-1204
256	2484	ξGeminorum	3.36	F5 IV	6	46	19.6	3.367	-79	+12	52	26.86	4.21	-191
262	2550	α Pictoris	3.27	A8VmkA6	6	48	22.8	0.613	-96	-61	57	41.50	3.93	+269
263	2553	τ Puppis	2.93	K1 III	6	50	23.7	1.490	+38	-50	38	14.53	-4.44	-70
1180	2538	κ Canis Maj.	3.96	B1.5IVe	6	50	32.0	2.243	-5	-32	31	51.07	4.38	+4
261	2540	ɗ Geminorum	3.60	A3III	6	54	00.4	3.949	-2	+33	56	13.94	4.73	-48
268	2618	ε Canis Maj.*	1.50	B2 Iab	6	59	21.2	2.360	+3	-28	59	53.83	5.13	+3
1183	2646	σ Canis Maj.	3.47	M1.5Iab	7	02	27.4	2.392	-4	-27	57	44.59	5.39	+5
270	2653	*o* ˂ Canis Maj.	3.02	B3 Ia	7	03	47.8	2.507	-3	-23	51	41.19	5.50	+3
269	2650	ζ Geminorum*	3.79v	G0Ibv	7	05	12.3	3.555	-6	+20	32	29.77	-5.63	0
1189	2736	ɔ˂ Volantis	3.78	K0III	7	08	35.1	-0.531	+47	-70	31	43.82	5.80	+106
273	2693	δ Canis Maj.	1.86	F8 Iab	7	09	08.6	2.441	-2	-26	25	25.06	5.95	+4
1187	2714	22δ Monocerotis	4.15	A2V	7	12	48.5	3.064	-1	-0	31	28.99	6.26	+5
281	2803	δ Volantis	3.98	F6II	7	16	49.0	-0.047	-12	-67	59	27.91	6.59	+5
278	2773	π Puppis	2.70	K3Ib	7	17	47.8	2.121	-8	-37	07	53.96	6.67	+4
277	2763	λ Geminorum	3.58	A3V	7	19	09.3	3.445	-33	+16	30	19.92	-6.82	-37
279	2777	δ Geminorum	3.53	F0 IV	7	21	13.6	3.578	-19	+21	56	48.23	6.97	-12
283	2827	η Canis Maj.	2.45	B5 Ia	7	24	49.6	2.375	-3	-29	20	24.71	7.24	+5
282	2821	ι Geminorum	3.79	G9 IIIb	7	26	52.4	3.719	-93	+27	45	35.05	7.50	-86
285	2845	β Canis Min.*	2.90	B8Ve	7	28	09.2	3.251	-35	+8	15	02.41	7.55	-38
1194	2878	ρ Puppis	3.25	K5 III	7	29	49.1	1.905	-50	-43	20	23.02	7.47	+187
287	2891	α Gemino.* *cg*	1.95	A2Vm	7	35	46.7	3.820	-135	+31	50	47.09	-8.23	-98
291	2943	α C. Min.* *cg*	0.38	F5 IV-V	7	40	16.2	3.137	-477	+5	10	34.76	9.51	-1022
297	3024	ζ Volantis	3.95	K0III	7	41	34.9	-0.781	+67	-72	39	00.70	-8.58	+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 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
293	2970	26α Monocerotis	3.93	G9 III	7	42	07.9	2.867	-49	-9	35	43.72	-8.66	-19
294	2985	κ Geminorum	3.57	G8 III	7	45	33.7	3.615	-24	+24	21	07.75	8.96	-52
295	2990	β Geminorum*	1.14	K0IIIb	7	46	26.7	3.663	-474	+27	58	48.15	9.02	-45
1204	3045	ξ Puppis	3.34	G6 Ia	7	50	04.4	2.525	-2	-24	54	26.10	9.26	-2
301	3080	213 G. Puppis	3.73	K1/2II+	7	52	51.2	2.064	-8	-40	37	27.88	9.47	+3
303	3117	χ Carinae	3.47	B3IVp	7	57	14.9	1.524	-32	-53	01	57.23	9.79	+21
306	3165	ζ Puppis	2.25	O4If(m)p	8	04	14.1	2.111	-24	-40	03	22.25	-10.33	+12
308	3185	ρ Puppis	2.81	F6IIp	8	08	19.9	2.557	-61	-24	21	30.94	10.60	+49
309	3207	ɔ^2 Velorum	1.78	WC8+O7.5	8	10	06.2	1.850	-4	-47	23	30.78	10.77	+6
312	3249	β Cancri	3.52	K 3:IIIv	8	17	31.1	3.249	-30	+9	07	38.30	11.37	-49
315	3307	ε Carinae	1.86	K2III	8	22	53.5	1.225	-35	-59	34	10.48	11.69	+14
319	3347	β Volantis	3.77	K2 III	8	25	56.0	0.634	-60	-66	11	56.23	12.07	-155
316	3314	Br 1197 Hydrae	3.90	A0V	8	26	35.1	2.997	-44	-3	58	04.28	-11.99	-23
317	3323	*o* Ursae Maj.	3.36	G5 III	8	31	47.2	4.931	-182	+60	39	16.44	12.43	-107
321	3366	η Cancri	5.33	K3 III	8	33	46.5	3.461	-34	+20	22	37.49	12.50	-43
1223	3410	δ Hydrae	4.16	A1Vnn	8	38	38.1	3.172	-44	+5	38	17.29	12.80	-7
1224	3418	σ Hydrae	4.44	K1 III	8	39	43.4	3.133	-12	+3	16	31.24	12.88	-18
1227	3447	*o* Velorum	3.62	B3 IV	8	40	49.4	1.719	-24	-52	59	17.77	12.92	+20
1226	3445	53 G. Velorum	3.84	F3 Ia	8	41	14.5	1.994	0	-46	42	55.01	-12.96	+3
327	3468	α Pyxidis	3.68	B1.5 III	8	44	20.2	2.414	-9	-33	15	14.04	13.16	+11
1228	3449	ɔ Cancri	4.66	A1IV	8	44	21.2	3.462	-76	+21	24	02.76	13.21	-39
326	3461	δ Cancri*	3.94	K0 III	8	45	44.0	3.401	-13	+18	05	06.51	13.49	-228
(329)	3482	ε Hydrae* m	3.38	G5III	8	47	45.2	3.170	-155	+6	20	59.75	13.43	-40
328	3475	ι Cancri	4.02	G8Iab	8	47	48.8	3.617	-19	+28	41	27.70	13.44	-42
336	3571	108 G. Carinae	3.84	B8.5II	8	55	27.9	1.355	-28	-60	42	56.72	-13.85	+38
334	3547	ζ Hydrae	3.11	G9 II-III	8	56	22.2	3.167	-66	+5	52	26.72	13.93	+15
337	3572	α Cancri*	4.25	A5 m	8	59	29.8	3.275	+23	+11	47	06.19	14.17	-31
335	3569	ι Ursae Maj.	3.14	A7 V	9	00	27.9	4.077	-443	+47	58	03.92	14.43	-226
342	3614	97 G. Velorum	3.75	K2 III	9	04	47.6	2.073	-44	-47	10	19.48	14.48	-13
341	3594	κ Ursae Maj.	3.60	A1Vn	9	04	52.8	4.066	-32	+47	04	55.55	14.52	-54
345	3634	λ Velorum	2.21	K4 Ib-II	9	08	40.7	2.211	-17	-43	30	28.69	-14.69	+13
1239	3627	ξ Cancri	5.14	G9 III	9	10	25.2	3.439	+1	+21	58	10.40	14.80	+5
348	3685	β Carinae	1.68	A2IV	9	13	23.7	0.632	-311	-69	47	36.89	14.87	+108
347	3665	ɗ Hydrae	3.88	B9.5 V	9	15	19.6	3.118	+86	+2	14	06.89	15.39	-310
351	3699	ι Carinae	2.25	A8 Ib	9	17	35.1	1.605	-26	-59	21	12.15	15.21	+8
352	3705	α Lyncis	3.13	K7 III	9	22	10.6	3.637	-179	+34	18	47.83	15.46	+19
1243	3718	ɗ Pyxidis	4.72	M0 III	9	22	18.8	2.660	-8	-26	02	41.83	-15.49	-8
353	3734	κ Velorum*	2.50	B2 IV-V	9	22	41.3	1.861	-10	-55	05	24.94	15.49	+9
354	3748	α Hydrae*	1.98	K3 II-III	9	28	29.8	2.948	-9	-8	44	22.77	15.79	+33
361	3803	N Velorum	3.13	K5 III	9	31	47.1	1.826	-39	-57	06	59.42	15.99	+4
355	3757	23 Ursae Maj.	3.67	F0 IV	9	32	58.1	4.659	+160	+62	58	46.86	16.03	+27
358	3775	ɗ Ursae Maj.	3.17	F7V	9	34	05.0	3.975	-1024	+51	35	31.03	-16.64	-530

* **No. 295 : *Pollux*, Punarvasu-1.**
No. 326 : Pusya.
No. 329 : Aslesa.
No. 337 : Acubens. (Aslesa.)
No. 353 : *Markeb* .
No. 354 : *Alphard* .

MEAN PLACES OF STARS, J 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1250	3845	ι Hydrae	3.91	K2.5 III	9	40	48.0	3.062	+32	-1	13	39.59	-16.52	-64
364	3849	κ Hydrae	5.06	B4IV/V	9	41	11.6	2.878	-19	-14	25	01.18	16.50	-20
365	3852	*o* Leonis	3.52	F5I+	9	42	08.2	3.196	-96	+9	48	26.37	16.56	-37
367	3873	ε Leonis	2.98	G1 II	9	46	53.9	3.394	-34	+23	41	17.48	16.77	-11
368	3888	*ν* Ursae Maj.	3.80	F2 IV	9	52	17.4	4.211	-379	+58	57	02.51	17.16	-151
371	3905	μ Leonis	3.88	K2 III	9	53	48.7	3.399	-160	+25	55	08.35	17.14	-56
375	3940	ű Velorum	3.54	B5 Ib	9	57	30.9	2.114	-12	-54	39	22.91	-17.24	+3
1261	3970	*ν*´ Hydrae	4.60	B8 V	10	06	01.6	2.924	-25	-13	09	18.05	17.60	+18
379	3975	η Leonis	3.52	A0 Ib	10	08	20.3	3.263	-1	+16	40	18.27	17.71	0
380	3982	α Leonis*	1.35	B7 V	10	09	21.3	3.189	-169	+11	52	33.98	17.74	+7
381	3994	ɚ Hydrae	3.61	K0IIICN+1	10	11	29.4	2.927	-138	-12	26	46.02	17.93	-88
385	4037	ɤ Carinae	3.32	B8 IIIe	10	14	10.5	1.421	-76	-70	07	48.23	17.94	+7
382	4023	191 G.Velorum	3.85	A2 Va	10	15	30.9	2.529	-131	-42	12	51.14	-17.95	+45
1264	4050	187 G. Carinae	3.40	K3 II a	10	17	42.2	2.013	-34	-61	25	30.53	18.07	+5
384	4031	ζ Leonis	3.44	F0 III	10	17	43.0	3.325	+13	+23	19	28.02	18.09	-7
383	4033	ɚ Ursae Maj.	3.45	A2 IV	10	18	12.3	3.592	-149	+42	49	16.69	18.13	-38
1268	4080	204 G.Velorum	4.83	K1 III	10	23	07.4	2.584	-20	-41	44	37.06	18.22	+56
386	4069	μ Ursae Maj.	3.05	M0 III	10	23	25.5	3.550	-72	+41	24	20.92	18.25	+35
391	4102	I Carinae	4.00	F3 V	10	24	45.4	1.173	-52	-74	07	33.39	-18.36	-26
389	4094	μ Hydrae	3.81	K4III	10	26	59.2	2.906	-89	-16	55	52.71	18.49	-80
392	4104	α Antliae	4.25	K4 III	10	28	00.0	2.754	-58	-31	09	44.95	18.44	+11
393	4114	196 G. Carinae	3.82	F2II	10	28	33.7	2.215	-17	-58	50	03.56	18.47	0
1270	4116	δ Sextantis	5.21	B9.5 V	10	30	25.1	3.047	-32	-2	50	03.62	18.54	-14
397	4140	203 G. Carinae	3.32	B4 Vne	10	32	41.1	2.147	-27	-61	46	51.16	18.60	+9
396	4133	ρ Leonis	3.85	B1 Iab	10	33	47.0	3.154	-4	+9	12	39.05	-18.64	-3
401	4174	ɔ Chamaeleontis	4.11	M0 III	10	35	40.3	0.655	-143	-78	42	13.62	18.69	+14
406	4199	ɗ Carinae	2.76	B0Vp	10	43	37.2	2.156	-35	-64	29	30.10	18.93	+10
411	4234	δ´ Chamaeleontis	4.45	B2.5 IV	10	45	55.9	0.482	-200	-80	38	16.05	19.00	+8
410	4232	ν Hydrae	3.11	K0/K1III	10	50	32.3	2.965	+66	-16	17	27.22	18.93	+200
412	4247	46 Leonis Min.	3.83	K0IIIV	10	54	20.5	3.338	+70	+34	06	52.95	19.50	-279
1283	4287	α Crateris	4.08	K1III	11	00	40.6	2.929	-323	-18	23	51.49	-19.24	+130
416	4295	β Ursae Maj.*	2.37	A1V	11	02	56.8	3.578	+99	+56	16	58.16	19.39	+34
417	4301	α Ursae Maj.*	1.80	K0 Iab	11	04	51.3	3.649	-167	+61	39	02.09	19.53	-66
1289	4337	260 G. Carinae	3.91	G0Iab	11	09	23.2	2.586	-9	-59	04	31.89	19.55	0
420	4335	ɣ Ursae Maj.	3.01	K1 III	11	10	41.8	3.349	-60	+44	23	52.03	19.61	-28
422	4357	δ Leonis*	2.56	A4V	11	15	05.4	3.182	+101	+20	25	19.37	19.79	-130
423	4359	ɗ Leonis*	3.34	A2V	11	15	12.6	3.142	-42	+15	19	41.33	-19.74	-79
425	4377	ν Ursae Maj.	3.48	K3 III	11	19	28.5	3.226	-20	+32	59	35.10	19.70	+28
426	4382	δ Crateris	3.56	K0III	11	20	16.0	3.006	-84	-14	52	44.09	19.53	+208
433	4434	ɚ Draconis	3.84	M0 III	11	32	29.0	3.490	-73	+69	13	43.55	19.91	-17
434	4450	ɝ Hydrae	3.54	G7 III	11	33	54.9	2.964	-162	-31	57	36.54	19.95	-39
436	4467	ɚ Centauri	3.13	B9III	11	36	38.6	2.801	-61	-63	07	20.20	-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 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
442	4520	ɚ Muscae	3.64	A7 V	11	46	29.5	2.874	-174	-66	49	52.87	-19.97	+37
441	4518	χ Ursae Maj.	3.71	K0.5 IIIb	11	47	01.3	3.145	-136	+47	40	36.29	19.98	+30
1304	4527	93 Leonis*	4.53v	A7V+	11	48	56.3	3.088	-106	+20	06	57.74	20.02	-3
444	4534	β Leonis*	2.14	A3 V	11	50	00.1	3.056	-342	+14	28	06.84	20.14	-114
445	4540	β Virginis	3.61	F9 V	11	51	39.6	3.126	+495	+1	39	37.34	20.30	-271
447	4554	ɔ Ursae Maj.*	2.44	A0 Ve	11	54	47.8	3.127	+107	+53	35	30.69	20.02	+12
452	4621	δ Centauri	2.60	B2 IV ne	12	09	19.5	3.138	-36	-50	49	31.40	-20.03	-8
453	4630	ε Corvi	3.00	K2III	12	11	04.8	3.097	-51	-22	43	21.29	20.00	+13
455	4656	δ Crucis	2.80	B2 IV	12	16	08.3	3.226	-53	-58	51	06.18	20.00	-9
456	4660	δ Ursae Maj.*	3.31	A3 V	12	16	20.1	2.942	+127	+56	55	47.70	19.98	+9
457	4662	ɔ Corvi*	2.59	B8III	12	16	45.6	3.095	-112	-17	38	40.39	19.97	+23
459	4674	β Chamaeleontis	4.26	B5 Vn	12	19	28.1	3.665	-174	-79	24	53.13	19.95	+17
460	4689	η Virginis	3.89	A2 IV+	12	20	51.2	3.073	-42	-0	46	10.16	-19.98	-18
462	4730	α Crucis*A	1.33	B0.5 IV	12	27	38.4	3.388	-53	-63	12	04.99	19.91	-12
465	4757	δ Corvi*	2.95	A0IV(m)kB9	12	30	49.4	3.114	-146	-16	37	05.66	20.00	-138
468	4763	ɔ Crucis	1.63v	M3.5 III	12	32	12.2	3.369	+29	-57	12	59.59	20.11	-262
469	4773	ɔ Muscae	3.87	B5V	12	33	35.7	3.672	-126	-72	14	05.62	19.83	-2
472	4787	κ Draconis	3.87v	B6IIIp	12	34	15.8	2.526	-112	+69	41	11.10	19.81	+12
471	4786	β Corvi	2.65	G5 II	12	35	21.8	3.165	+2	-23	29	55.81	-19.86	-54
474	4798	α Muscae	2.69	B2 IV-V	12	38	18.3	3.653	-90	-69	14	13.95	19.77	-13
475	4813	χ Virginis	4.66	K2 III	12	40	12.2	3.103	-51	-8	05	49.92	19.76	-25
1326	4828	ρ Virginis	4.88	A0 V	12	42	49.2	3.037	+57	+10	08	02.00	19.78	-90
481	4853	β Crucis	1.25	B0.5 IV	12	48	48.9	3.554	-63	-59	47	22.31	19.60	-14
483	4905	ε Ursae Maj.*	1.77	A0p	12	54	50.3	2.622	+132	+55	51	35.00	19.48	-6
484	4910	δ Virginis*	3.38	M3III	12	56	32.2	3.025	-313	+3	17	50.01	-19.49	-54
485	4915	α CVn sq*	2.90	A0spe	12	56	53.4	2.797	-198	+38	13	07.67	19.37	+56
488	4932	ε Virginis*	2.83	G8 III	13	03	05.9	2.987	-185	+10	51	36.23	19.27	+20
487	4923	δ Muscae	3.62	K2 III	13	03	34.3	4.233	+543	-71	38	53.15	19.30	-20
492	4983	β Com	4.26	G0 V	13	12	44.1	2.795	-604	+27	47	05.22	18.16	+881
495	5020	ɔ Hydrae	3.00	G8 III	13	19	55.9	3.276	+47	-23	16	07.22	18.88	-45
496	5028	ι Centauri	2.75	kA15hA3nA3va	13	21	38.6	3.396	-284	-36	48	33.70	-18.87	-86
497	5054	ζ Ursae Maj.*pr	2.27	A2V	13	24	40.1	2.405	+141	+54	49	45.03	18.71	-20
498	5056	α Virginis*	0.98	B1 III-IV+	13	26	10.2	3.170	-28	-11	15	26.41	18.67	-28
501	5107	ζ Virginis	3.37	A3V	13	35	38.2	3.063	-190	-0	41	23.89	18.28	+42
504	5132	ε Centauri	2.30	B1 III	13	41	04.3	3.845	-32	-53	33	35.00	18.14	-17
509	5191	η Ursae Maj.*	1.86	B3 V	13	48	16.1	2.358	-125	+49	13	17.31	17.86	-11
508	5193	μ Centauri	3.04	B2Vmpe	13	50	44.3	3.643	-21	-42	33	54.66	-17.77	-20
513	5235	η Bootis	2.68	G0 IV	13	55	33.9	2.857	-44	+18	18	20.11	17.91	-358
512	5231	ζ Centauri	2.55	B2.5 IV	13	56	42.2	3.778	-56	-47	22	43.11	-17.54	-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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(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)
521	5291	α Draconis*	3.65	A0 III	14	04	53.5	1.629	-84	+64	17	16.10	-17.12	+18
518	5267	β Centauri*	0.61	B1 III	14	05	08.7	4.295	-43	-60	27	40.57	17.15	-19
519	5287	π Hydrae	3.27	K1III-IV	14	07	25.8	3.434	+33	-26	46	14.47	17.16	-139
520	5288	ɗ Centauri	2.06	K0 III	14	07	46.7	3.555	-429	-36	27	36.73	17.53	-520
523	5315	κ Virginis	4.19	K2.5 III	14	13	53.1	3.211	+6	-10	21	32.58	16.58	+140
526	5340	α Bootis*	-0.04	K1.5 III	14	16	30.3	2.739	-769	+19	05	12.42	18.59	-2000
525	5338	ι Virginis	4.08	F7IV	14	16	59.3	3.155	-2	-6	05	16.97	-17.00	-432
1371	5359	ɚ Virginis	4.52	A1V	14	20	06.8	3.258	-11	-13	27	19.52	16.38	+30
531	5404	ɗ Bootis	4.05	F7 V	14	25	49.6	2.042	-253	+51	45	56.89	16.52	-398
534	5429	ρ Bootis	3.58	K3 III	14	32	37.6	2.585	-77	+30	17	27.37	15.64	+119
535	5435	ɔ Bootis	3.03	A7 III	14	32	49.4	2.415	-97	+38	13	40.84	15.60	+153
537	5440	η Centauri	2.31	B1.5 IVne	14	36	41.4	3.838	-31	-42	14	17.09	15.57	-35
538	5460	α Centauri* cg	0.00	G +	14	40	52.1	4.126	-4996	-60	54	38.36	-14.61	+693
541	5469	α Lupi	2.30	B1.5 III	14	43	10.1	4.025	-21	-47	27	59.21	15.19	-18
539	5463	α Circini	3.19	A 7VpSrCrEu	14	44	01.4	4.930	-302	-65	03	15.42	15.36	-232
545	5487	μ Virginis	3.88	F2 V	14	44	02.3	3.171	+73	-5	44	15.72	15.44	-316
544	5485	371 G.Cen	4.05	K5 III	14	44	47.7	3.692	-52	-35	15	08.29	15.26	-180
547	5511	109 Virginis	3.72	A0 V	14	47	11.2	3.039	-76	+1	48	56.74	14.97	-27
542	5470	α Apodis	3.83	K2.5 III	14	50	14.6	7.773	-41	-79	07	15.85	-14.79	-16
550	5563	β Ursae Min.*	2.08	K4 III	14	50	40.2	-0.107	-76	+74	04	47.38	14.72	+12
548	5531	α^{2} Librae*	2.75	A2HA5MA4IV-	14	51	54.3	3.331	-73	-16	07	03.50	14.73	-67
552	5571	β Lupi	2.68	B2 III	14	59	45.1	3.959	-32	-43	12	26.29	14.23	-39
553	5576	κ Centauri	3.13	B2 IV	15	00	22.4	3.931	-17	-42	10	38.27	14.18	-24
555	5602	β Bootis	3.50	G8 IIIa	15	02	38.6	2.261	-36	+40	19	06.04	14.03	-28
556	5603	σ Librae	3.29	M3/M4III	15	05	09.4	3.528	-54	-25	21	12.76	-13.90	-43
559	5652	ι Librae*	4.54	B9IV pSc	15	13	16.8	3.433	-25	-19	51	38.18	13.37	-39
558	5649	ζ Lupi	3.41	G7 III	15	13	37.5	4.350	-122	-52	10	05.67	13.38	-73
563	5681	δ Bootis	3.47	G8 III	15	16	15.0	2.421	+69	+33	14	47.82	13.25	-112
564	5685	β Librae*	2.61	B8 IV	15	18	00.3	3.238	-65	-9	27	00.31	13.03	-19
560	5671	ɔ Tr. Austrini	2.89	A1 IV	15	20	39.8	5.700	-132	-68	44	45.56	12.87	-31
569	5735	ɔ Ursae Min.	3.05	A 3 Iab	15	20	42.8	-0.044	-40	+71	46	05.43	-12.81	+20
1402	5695	δ Lupi	3.22	B1.5 IV	15	22	35.6	3.963	-13	-40	42	47.74	12.73	-26
566	5705	ű' Lupi	3.56	K5 III	15	22	59.2	3.829	-74	-36	19	37.95	12.77	-84
571	5744	ι Draconis	3.29	K2 III	15	25	20.6	1.345	-12	+58	54	06.25	12.51	+17
572	5747	β Cr. Borealis	3.68	F0p	15	28	35.5	2.476	-137	+29	02	34.18	12.21	+86
578	5793	α Cr.Borealis*	2.23	A0 V	15	35	28.3	2.543	+91	+26	39	12.16	11.91	-88
577	5787	ɔ Librae	3.91	K0III	15	36	33.8	3.367	+45	-14	51	00.11	-11.73	+9
579	5794	ν Librae	3.58	K5 III	15	38	09.1	3.658	-7	-28	11	41.96	11.63	+3
1413	5838	κ Librae	4.74	K5III	15	43	01.0	3.469	-26	-19	44	15.16	11.38	-103
582	5854	α Serpentis*	2.65	K2 III b	15	45	10.8	2.960	+92	+6	22	06.81	-11.07	+47

* **No. 518 : *Agena* .**
No. 521 : *Thuban* .
No. 526 : *Arcturus* , Svati.
No. 538 : Rigil *Kentaurus* Mag. 0.33 & 1.70.
No. 548 : *Zuben el Genubi*, Visakha.

No. 550 : *Kochab* .
No. 559 : Visakha.
No. 564 : *Zuben es Chamali.*
No. 578 : *Margarita, Alphecca.*
No. 582 : *Unukalhaly.*

MEAN PLACES OF STARS, J 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
583	5867	β Serpentis	3.67	A3V	15	47	02.6	2.773	+46	+15	21	53.91	-11.03	-45
585	5881	μ Serpentis	3.54	A0 V	15	50	35.3	3.138	-57	-3	29	08.33	10.75	-24
588	5892	ε Serpentis	3.71	A2 m	15	51	44.4	2.996	+86	+4	25	23.53	10.58	+63
589	5897	β Tr.Australis	2.85	F1V	15	56	47.3	5.347	-283	-63	29	08.76	10.67	-398
591	5933	ɔ Serpentis	3.85	F6 V	15	57	18.5	2.776	+217	+15	36	08.44	11.50	-1281
592	5944	π Scorpii	2.89	B1 V+	15	59	58.5	3.643	-8	-26	09	57.44	10.05	-26
594	5953	δ Scorpii*	2.32	B0.2 Ive	16	01	25.8	3.560	-8	-22	40	22.60	-9.93	-22
597	5984	β Scorpii*pr	2.62	B0.5 V	16	06	31.0	3.499	-4	-19	51	16.81	9.54	-19
603	6056	δ Ophiuchi	2.74	M0.5 III	16	15	19.0	3.151	-29	-3	44	26.43	8.98	-143
605	6075	ε Ophiuchi	3.24	G9.5 IIIb	16	19	18.1	3.181	+57	-4	44	10.67	8.48	+41
608	6092	τ Herculis	3.89	B5 IV	16	20	17.9	1.808	-11	+46	16	12.28	8.41	+40
607	6084	σ Scorpii	2.89	B1 III	16	22	19.0	3.658	-8	-25	38	08.68	8.31	-21
609	6095	ɔ Herculis	3.75	B9 III	16	22	44.2	2.650	-33	+19	06	38.72	-8.21	+43
613	6117	ω Herculis	4.57	B9 p	16	26	16.3	2.773	+30	+13	59	30.57	8.03	-59
616	6134	α Scorpii* cg	0.96	M1.5 Iab-b	16	30	32.7	3.690	-7	-26	28	17.46	7.65	-20
618	6148	β Herculis	2.77	G7 III a	16	31	01.0	2.582	-70	+21	27	01.32	7.60	-15
611	6102	ɔ Apodis	3.89	G8III	16	36	20.7	9.412	-452	-78	56	05.60	7.23	-77
620	6165	τ Scorpii	2.82	B0.2 V	16	37	02.2	3.746	-6	-28	15	10.31	7.12	-22
622	6175	ζ Ophiuchi	2.56	O9V	16	38	10.8	3.311	+9	-10	36	11.42	-6.98	+26
626	6220	η Herculis	3.53	G7 .5IIIb	16	43	31.9	2.060	+32	+38	53	16.86	6.65	-82
625	6217	α Tr. Austr.*	1.92	K2 II-III	16	50	38.3	6.411	+26	-69	03	32.48	6.01	-34
1438	6243	20 Ophiuchi	4.65	F7 V	16	50	51.5	3.326	+65	-10	48	51.58	6.05	-93
628	6241	ε Scorpii	2.29	K1 III	16	51	21.9	3.898	-493	-34	19	30.78	6.17	-257
1435	6229	η Arae	3.76	K5 III	16	51	23.5	5.211	+49	-59	04	20.25	5.94	-28
1439	6247	μ^1 Scorpii	3.08v	B1.5Vp+	16	53	07.6	4.077	-9	-38	04	38.83	-5.79	-25
633	6299	κ Ophiuchi	3.20	K2 III	16	58	32.7	2.844	-197	+9	20	50.97	5.32	-11
631	6285	ζ Arae	3.13	K3III	17	00	09.4	4.988	-23	-56	01	02.11	5.21	-36
634	6324	ε Herculis	3.92	A0 V	17	00	59.9	2.298	-36	+30	54	00.65	5.08	+28
635	6355	60 Herculis	4.91	A4 IV	17	06	14.2	2.786	+35	+12	42	59.99	4.67	-10
639	6396	ζ Draconis	3.17	B6 III	17	08	50.6	0.187	-33	+65	41	31.06	4.41	+22
638	6380	η Scorpii	3.33	F5IV	17	13	28.9	4.309	+23	-43	15	42.09	-4.33	-287
643	6418	π Herculis	3.16	K3 Ib	17	15	41.5	2.093	-22	+36	47	21.32	3.85	+4
641	6410	δ Herculis	3.14	A3IV	17	15	47.6	2.467	-15	+24	49	06.58	4.00	-157
644	6453	ɗ Ophiuchi	3.27	B2 IV	17	23	08.9	3.691	-3	-25	00	58.89	3.23	-20
645	6461	β Arae	2.85	K3 Ib-II	17	26	50.5	5.001	-10	-55	32	42.77	2.91	-25
1457	6486	44 Ophiuchi	4.17	kA5hA9mF1III	17	27	30.1	3.669	0	-24	11	26.59	2.95	-116
653	6536	β Draconis	2.79	G2Iab	17	30	51.1	1.360	-17	+52	17	18.02	-2.53	+15
649	6508	v Scorpii	2.69	B2 IV	17	32	01.4	4.086	-1	-37	18	31.76	2.47	-31
648	6500	δ Arae	3.62	B8 Vn	17	32	46.3	5.431	-80	-60	41	48.77	2.47	-96
651	6510	α Arae	2.95	B2 Vne	17	33	16.5	4.647	-32	-49	53	19.88	2.40	-70
652	6527	ɚ Scorpii*	1.63	B2 IV+	17	34	52.0	4.080	-1	-37	06	55.85	2.22	-29
656	6556	α Ophiuchi*	2.08	A5 III	17	35	47.6	2.788	+82	+12	32	52.17	-2.34	-226

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

MEAN PLACES OF STARS, J 2018.5

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

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
658	6561	ɜ Serpentis	3.54	A9IIIpSr	17	38	38.8	3.439	-29	-15	24	31.20	-1.93	-58
654	6553	ɗ Scorpii	1.87	F1 II	17	38	39.0	4.318	+14	-43	00	27.81	1.87	-2
663	6588	ι Herculis	3.80	B3 IV	17	39	59.3	1.697	-5	+45	59	50.23	1.74	+5
660	6580	κ Scorpii	2.41	B1.5 III	17	43	46.1	4.156	-5	-39	02	15.86	1.44	-27
665	6603	β Ophiuchi	2.77	K2 III	17	44	23.2	2.966	-27	+4	33	39.23	1.20	+159
667	6623	μ Herculis	3.42	G5IV	17	47	11.0	2.351	-233	+27	42	39.14	1.87	-752
661	6582	η Pavonis	3.62	K2II	17	47	33.1	5.899	-21	-64	43	48.38	-1.14	-54
668	6629	ɔ Ophiuchi	3.75	A0 V	17	48	49.3	3.011	-15	+2	42	05.99	1.05	-74
666	6615	ι¹ Scorpii	3.03	F2 I ae	17	48	52.8	4.200	-0	-40	07	56.54	0.99	-8
669	6630	*G* Scorpii	3.21	K2 III	17	51	07.1	4.087	+41	-37	02	50.62	0.74	+33
671	6688	ɜ Draconis	3.75	K2 III	17	53	51.0	1.040	+114	+56	52	12.83	0.46	+80
672	6695	ɗ Herculis	3.86	K1 IIaCn+	17	56	53.3	2.060	+4	+37	14	56.48	0.27	+6
676	6705	ɔ Draconis*	2.23	K5 III	17	57	02.2	1.396	-8	+51	29	14.71	-0.28	-19
674	6703	ɜ Herculis	3.70	G8 III	17	58	29.1	2.334	+64	+29	14	49.11	0.15	-17
673	6698	ν Ophiuchi	3.34	G 9 III	18	00	02.7	3.305	-4	-9	46	27.99	-0.11	-116
677	6714	67 Ophiuchi	3.97	B5 Ib	18	01	34.3	3.007	+1	+2	55	55.24	+0.13	-8
679	6746	ɔ Sagittarii	2.99	K1III	18	06	59.8	3.855	-41	-30	25	19.76	0.43	-185
1471	6743	ɗ Arae	3.66	B2 Ib	18	08	04.3	4.671	-10	-50	05	17.94	0.69	-14
680	6771	72 Ophiuchi	3.73	A4IVs	18	08	13.6	2.846	-41	+9	34	03.95	+0.80	+80
681	6779	*o* Herculis	3.83	B9.5V	18	08	15.9	2.342	+1	+28	45	57.97	0.73	+10
682	6812	μ Sagittarii	3.86	B2III	18	14	52.2	3.589	+1	-21	03	08.62	1.30	+1
683	6832	η Sagittarii	3.11	M3.5 III	18	18	52.7	4.059	-106	-36	45	15.74	1.48	-167
695	6927	χ Draconis	3.57	F7 V	18	20	43.3	-1.088	+1199	+72	44	25.65	1.46	-346
687	6859	δ Sagittarii*	2.70	K3IIIa	18	22	10.7	3.840	+27	-29	49	06.97	1.91	-28
688	6869	η Serpentis	3.26	K0 III-IV	18	22	16.1	3.106	-364	-2	53	33.51	+1.24	-701
690	6895	109 Herculis	3.84	K2 III	18	24	29.2	2.559	+141	+21	46	45.51	1.90	-242
689	6879	ε Sagittarii*	1.85	B9.5III	18	25	24.0	3.981	-31	-34	22	27.00	2.09	-124
691	6897	α Telescopii	3.51	B3 IV	18	28	20.7	4.445	-15	-45	57	22.78	2.42	-54
692	6913	ə Sagittarii	2.81	K0IV	18	29	06.7	3.702	-32	-25	24	35.52	2.35	-185
697	6951	ɗ Coronae Aust.	4.64	G8 III	18	34	49.4	4.280	+28	-42	17	50.44	3.01	-22
1482	6973	α Scuti	3.85	K3 III	18	36	12.8	3.265	-10	-8	13	46.86	+2.84	-312
699	7001	α Lyrae*	0.03	A0 V	18	37	33.9	2.033	+172	+38	48	06.47	3.56	+287
1487	7039	ű Sagittarii	3.17	B8 III	18	46	48.7	3.745	+40	-26	58	12.52	4.07	+1
1489	7063	β Scuti	4.22	G4 IIa	18	48	09.4	3.183	-3	-4	43	36.10	4.16	-16
705	7106	β Lyrae*	3.45	B7 Ve+	18	50	45.8	2.217	+3	+33	23	06.51	4.40	-3
706	7121	σ Sagittarii*	2.02	B2V	18	56	24.7	3.716	+10	-26	16	19.79	4.83	-54
710	7150	ɜ² Sagittarii	3.51	G9II/III	18	58	50.0	3.576	+24	-21	04	50.91	+5.08	-12
713	7178	ɔ Lyrae	3.24	B9 III	18	59	38.2	2.246	-2	+32	42	57.32	5.16	+2
712	7176	ε Aquilae	4.02	K1 III	19	00	27.8	2.724	-35	+15	05	40.48	5.15	-73
716	7235	ζ Aquilae	2.99	A0 Vn	19	06	15.6	2.758	-3	+13	53	31.70	5.62	-96
717	7236	ə Aquilae	3.44	B9Vn	19	07	13.8	3.183	-11	-4	51	12.35	5.71	-90
1496	7234	τ Sagittarii	3.32	K1III	19	08	05.6	3.740	-40	-27	38	30.55	+5.62	-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 2018.5

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

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension h	m	s	Annual Variation s	Annual Proper motion s (0.0001)
720	7264	π Sagittarii	2.89	F2 II/III	19	10	51.8	3.564	0
723	7310	δ Draconis	3.07	G9 III	19	12	33.3	-0.003	+164
726	7328	κ Cygni	3.77	G9 III	19	17	31.8	1.385	+66
730	7377	δ Aquilae	3.36	F0IV	19	26	25.9	3.024	+171
1508	7405	α Vulpeculae	4.44	M0III	19	29	28.5	2.498	-92
733	7420	ι Cygni	3.79	A5V	19	30	10.3	1.511	+22
732	7417	β Cygni**p*	3.08	K3II+	19	31	28.1	2.421	+2
1513	7488	β Sagittae	4.37	G8III a	19	41	52.8	2.695	+7
741	7525	ɔ Aquilae	2.72	K3 II	19	47	08.4	2.852	+12
743	7536	δ Sagittae	3.82	M2 II+	19	48	12.8	2.676	+5
745	7557	α Aquilae*	0.77	A7 V	19	51	41.1	2.926	+363
746	7570	η Aquilae	3.90V.	F6Iab	19	53	24.9	3.054	+7
749	7602	β Aquilae*	3.71	G9.5IV	19	56	13.3	2.946	+33
752	7635	ɔ Sagittae	3.47	M0 III	19	59	34.8	2.669	+46
751	7623	d' Sagittarii	4.37	B3 IV	20	00	56.2	3.891	+5
754	7665	δ Pavonis	3.56	G8 IV	20	10	31.4	5.818	+1997
756	7710	ɗ Aquilae	3.23	B9.5 III+	20	12	15.5	3.093	+26
757	7735	31 *o*ˊ Cygni	3.79	K2II+	20	14	12.9	1.890	+4
761	7754	αˊ Capricorni*	3.57	G8.5III-IV	20	19	04.8	3.323	+44
762	7776	β Capricorni	3.08	K0:II:+	20	22	02.9	3.364	+29
765	7796	ɔ Cygni	2.20	F8 I ab	20	22	53.6	2.155	+4
764	7790	α Pavonis	1.94	B2IV	20	27	06.0	4.704	+8
768	7852	ε Delphini	4.03	B6 III	20	34	05.8	2.866	+9
(771)	7882	β Delphini*m	3.64	F5 IV	20	38	25.0	2.814	+81
769	7869	α Indi	3.11	K0 III-IV	20	38	51.7	4.191	+52
774	7906	α Delphini*	3.77	B9 IV	20	40	29.9	2.787	+46
777	7924	α Cygni*	1.25	A2 Iae	20	42	03.8	2.047	+3
778	7928	δ Delphini	4.43	A7IIIp	20	44	19.4	2.801	-13
783	7957	η Cephei	3.43	K0 IV	20	45	39.8	1.210	+120
775	7913	β Pavonis	3.42	A7III	20	46	36.2	5.324	-76
780	7949	ε Cygni	2.46	K0 III	20	46	57.6	2.430	+286
1541	7948	ɔ Delphini sq	4.27	K1 IV	20	47	31.0	2.784	-22
781	7950	ε Aquarii	3.77	A1.5V	20	48	40.6	3.242	+24
1547	7990	μ Aquarii	4.73	A3m	20	53	39.0	3.231	+30
785	7986	β Indi	3.65	K1 II	20	56	14.5	4.637	+21
1550	8039	ɔ Microscopii	4.67	G6III	21	02	25.3	3.663	-2
792	8079	ξ Cygni	3.72	K4.5 Ib-II	21	05	36.3	2.186	+8
797	8115	ζ Cygni	3.20	G8III	21	13	43.5	2.557	+1
800	8131	α Equulei	3.92	G0III+	21	16	44.9	2.998	+39
803	8162	α Cephei*	2.44	A7IV	21	19	01.2	1.427	+218
806	8204	ζ Capricorni	3.74	G4 Ibp	21	27	43.2	3.414	+1

Cat. No. FK5	Declination °	'	"	Annual Variation "	Annual Proper motion " (0.001)
720	-20	59	33.73	+6.06	-35
723	+67	41	38.71	6.33	+93
726	+53	24	11.58	6.78	+125
730	+3	09	10.53	7.46	+83
1508	+24	42	12.23	7.52	-106
733	+51	46	11.47	7.81	+130
732	+27	59	58.33	+7.79	-2
1513	+17	31	12.00	8.59	-32
741	+10	39	34.19	9.03	-2
743	+18	34	51.53	9.12	+8
745	+8	55	06.16	9.77	+387
746	+1	03	15.66	9.51	-7
749	+6	27	14.81	+9.25	-482
752	+19	32	36.46	10.01	+24
751	-35	13	29.36	10.07	-26
754	-66	07	57.64	9.68	-1127
756	-0	45	55.57	10.94	+4
757	+46	47	53.46	11.08	+3
761	-12	29	10.59	+11.43	+4
762	-14	43	18.27	11.64	+2
765	+40	19	00.20	11.70	0
764	-56	40	26.99	11.91	-89
768	+11	22	01.79	12.46	-22
(771)	+14	39	37.25	12.73	-48
769	-47	13	32.07	+12.87	+66
774	+15	58	41.67	12.91	-2
777	+45	20	49.84	13.02	+2
778	+15	08	30.74	13.13	-43
783	+61	54	39.84	14.08	+819
775	-66	08	05.80	13.32	+11
780	+34	02	25.39	+13.67	+328
1541	+16	11	30.79	13.18	-197
781	-9	25	37.06	13.42	-34
1547	-8	54	46.26	13.74	-30
785	-58	22	58.48	13.91	-26
1550	-32	11	03.54	14.33	+5
792	+44	00	08.44	+14.51	+1
797	+30	18	13.01	14.94	-56
800	+5	19	30.77	15.08	-88
803	+62	39	51.77	15.35	+50
806	-22	19	49.00	+15.80	+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 2018.5

FOR JULY 2^{d}.625 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
809	8238	β Cephei	3.23	B2 IIIev	21	28	53.5	0.748	+21	+70	38	31.68	+15.85	+7
808	8232	β Aquarii*	2.91	G0 Ib	21	32	31.9	3.154	+14	-5	29	20.24	16.03	-8
1569	8264	ξ Aquarii	4.69	A7 V	21	38	44.1	3.189	+78	-7	46	13.58	16.33	-25
812	8278	ɔ Capricorni	3.68	A7 mp	21	41	06.8	3.315	+132	-16	34	40.55	16.45	-23
810	8254	ν Octantis	3.76	K1 III	21	43	27.9	6.418	+140	-77	18	22.63	16.35	-240
815	8308	ε Pegasi*	2.34	K2 Ib	21	45	05.7	2.947	+21	+9	57	37.88	16.67	-1
819	8322	δ Capricorni	2.87	kA5hF0mF2III	21	48	03.6	3.303	+183	-16	02	33.19	+16.51	-296
822	8353	ɔ Gruis	3.01	B8III	21	55	02.6	3.611	+86	-37	16	37.44	17.11	-21
827	8414	α Aquarii*	2.96	G2 Ib	22	06	44.0	3.079	+13	-0	13	45.60	17.63	-10
831	8430	ι Pegasi	3.76	F5 V	22	07	52.4	2.799	+220	+25	26	09.74	17.72	+25
829	8425	α Gruis*	1.74	B6V	22	09	23.4	3.750	+126	-46	52	14.39	17.60	-151
834	8450	ɗ Pegasi	3.53	A1Va	22	11	08.0	3.026	+185	+6	17	22.15	17.85	+27
836	8465	ζ Cephei	3.35	K1.5 Iab	22	11	30.0	2.091	+19	+58	17	34.34	+17.84	+4
841	8502	α Tucanae	2.86	K3 III	22	19	45.2	4.053	-96	-60	09	59.95	18.11	-43
842	8518	ɔ Aquarii	3.84	A0V	22	22	36.7	3.097	+88	-1	17	36.82	18.27	+7
846	8556	δ¹ Gruis	3.97	G7III	22	30	22.1	3.560	+26	-43	24	01.78	18.52	-5
848	8585	α Lacertae	3.77	A1 V	22	32	03.4	2.486	+144	+50	22	40.97	18.60	+19
849	8592	v Aquarii	5.20	F7 V	22	35	42.2	3.272	+158	-20	36	46.53	18.56	-144
850	8597	η Aquarii	4.02	B9 IV-V:n	22	36	18.4	3.082	+61	-0	01	17.99	+18.66	-56
855	8634	ζ Pegasi	3.40	B8V	22	42	23.1	2.995	+55	+10	55	42.09	18.89	-12
856	8636	β Gruis	2.10	M5 III	22	43	45.9	3.553	+133	-46	47	14.68	18.93	-8
857	8650	η Pegasi	2.94	G2II-III+	22	43	52.3	2.822	+11	+30	19	06.34	18.92	-25
860	8675	ε Gruis	3.49	A2IVnSB2	22	49	39.8	3.589	+115	-51	13	08.88	19.03	-71
863	8694	ι Cephei	3.52	K0III	22	50	20.6	2.154	-108	+66	17	52.82	19.00	-125
861	8679	τ Aquarii	4.01	K5III	22	50	34.2	3.170	-8	-13	29	40.49	+19.09	-38
862	8684	μ Pegasi	3.48	G8 III	22	50	53.9	2.903	+108	+24	41	58.77	19.10	-42
864	8698	ɚ Aquarii*	3.74	M2 III	22	53	34.7	3.126	+8	-7	28	50.82	19.24	+37
866	8709	δ Aquarii	3.27	A3 V	22	55	37.8	3.177	-28	-15	43	19.39	19.23	-25
867	8728	α PsA*	1.16	A4 V	22	58	40.2	3.301	+255	-29	31	25.78	19.16	-165
869	8762	ο Andromedae	3.62	B6III pe+	23	02	46.6	2.776	+20	+42	25	32.49	19.41	-6
870	8775	β Pegasi*	2.42	M2.5 II-III	23	04	40.4	2.918	+143	+28	11	00.50	+19.60	+137
871	8781	α Pegasi*	2.49	B9III	23	05	41.0	2.994	+44	+15	18	18.36	19.44	-42
873	8812	88 Aquarii	3.66	K1III	23	10	25.8	3.190	+40	-21	04	18.08	19.61	+31
878	8852	ɔ Piscium	3.69	G9 III	23	18	07.5	3.112	+509	+3	23	00.97	19.72	+17
890	8961	ɚ Andromedae	3.82v	G8 III	23	38	28.5	2.959	+157	+46	33	30.72	19.53	-421
893	8974	ɔ Cephei	3.21	K1 IV	23	40	07.3	2.522	-212	+77	44	08.93	20.12	+151
902	9072	ω Piscium	4.01	F4V	0	00	15.8	3.086	+103	+6	57	56.47	+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, 2018

FOR 0^h TERRESTRIAL TIME

Name		γ Pegasi						α Phoenicis						β Ceti						β Andromedae					
Mag. Spect.		2.83			B2 IV			2.39			K0 III			2.04			K0 III			2.06			M0 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	0	14	09	+15	17	00	0	27	09	-42	12	49	0	44	29	-17	53	30	1	10	45	+35	43	00
	11	0	14	09	15	16	59	0	27	09	42	12	49	0	44	29	17	53	30	1	10	44	35	43	00
	21	0	14	09	15	16	58	0	27	09	42	12	48	0	44	28	17	53	31	1	10	44	35	42	59
	31	0	14	09	15	16	57	0	27	09	42	12	47	0	44	28	17	53	31	1	10	44	35	42	58
Feb.	10	0	14	09	15	16	56	0	27	08	42	12	46	0	44	28	17	53	30	1	10	44	35	42	57
	20	0	14	09	15	16	55	0	27	08	42	12	45	0	44	28	17	53	30	1	10	44	35	42	55
Mar.	2	0	14	09	+15	16	54	0	27	08	-42	12	42	0	44	28	-17	53	29	1	10	44	+35	42	54
	12	0	14	09	15	16	53	0	27	08	42	12	40	0	44	28	17	53	28	1	10	43	35	42	52
	22	0	14	09	15	16	52	0	27	08	42	12	38	0	44	28	17	53	27	1	10	43	35	42	50
Apr.	1	0	14	09	15	16	52	0	27	08	42	12	35	0	44	28	17	53	25	1	10	43	35	42	49
	11	0	14	09	15	16	52	0	27	08	42	12	32	0	44	28	17	53	23	1	10	43	35	42	47
	21	0	14	09	15	16	52	0	27	08	42	12	29	0	44	28	17	53	21	1	10	44	35	42	46
May	1	0	14	09	+15	16	52	0	27	09	-42	12	26	0	44	28	-17	53	19	1	10	44	+35	42	45
	11	0	14	09	15	16	53	0	27	09	42	12	23	0	44	29	17	53	17	1	10	44	35	42	45
	21	0	14	10	15	16	54	0	27	09	42	12	20	0	44	29	17	53	15	1	10	44	35	42	45
	31	0	14	10	15	16	55	0	27	09	42	12	17	0	44	29	17	53	12	1	10	44	35	42	45
June	10	0	14	10	15	16	57	0	27	10	42	12	15	0	44	29	17	53	10	1	10	45	35	42	45
	20	0	14	10	15	16	59	0	27	10	42	12	12	0	44	30	17	53	08	1	10	45	35	42	46
	30	0	14	11	+15	17	01	0	27	11	-42	12	11	0	44	30	-17	53	06	1	10	46	+35	42	48
July	10	0	14	11	15	17	03	0	27	11	42	12	09	0	44	30	17	53	04	1	10	46	35	42	49
	20	0	14	11	15	17	05	0	27	11	42	12	08	0	44	31	17	53	02	1	10	46	35	42	51
	30	0	14	12	15	17	07	0	27	12	42	12	08	0	44	31	17	53	01	1	10	47	35	42	53
Aug.	9	0	14	12	15	17	09	0	27	12	42	12	08	0	44	31	17	53	00	1	10	47	35	42	56
	19	0	14	12	15	17	11	0	27	12	42	12	09	0	44	31	17	53	00	1	10	47	35	42	58
	29	0	14	12	+15	17	13	0	27	13	-42	12	09	0	44	32	-17	52	59	1	10	47	+35	43	00
Sept.	8	0	14	12	15	17	15	0	27	13	42	12	11	0	44	32	17	52	59	1	10	48	35	43	03
	18	0	14	13	15	17	16	0	27	13	42	12	12	0	44	32	17	53	00	1	10	48	35	43	05
	28	0	14	13	15	17	17	0	27	13	42	12	15	0	44	32	17	53	00	1	10	48	35	43	07
Oct.	8	0	14	13	15	17	19	0	27	13	42	12	17	0	44	32	17	53	01	1	10	48	35	43	10
	18	0	14	13	15	17	19	0	27	13	42	12	19	0	44	32	17	53	02	1	10	48	35	43	12
	28	0	14	13	+15	17	20	0	27	13	-42	12	21	0	44	32	-17	53	04	1	10	48	+35	43	13
Nov.	7	0	14	13	15	17	20	0	27	13	42	12	24	0	44	32	17	53	05	1	10	48	35	43	15
	17	0	14	13	15	17	20	0	27	13	42	12	26	0	44	32	17	53	06	1	10	48	35	43	16
	27	0	14	12	15	17	20	0	27	13	42	12	27	0	44	32	17	53	07	1	10	48	35	43	17
Dec.	7	0	14	12	15	17	20	0	27	12	42	12	29	0	44	32	17	53	09	1	10	48	35	43	18
	17	0	14	12	15	17	20	0	27	12	42	12	30	0	44	32	17	53	10	1	10	48	35	43	19
	27	0	14	12	+15	17	19	0	27	12	-42	12	30	0	44	32	-17	53	10	1	10	48	+35	43	19
	37	0	14	12	+15	17	18	0	27	12	-42	12	31	0	44	32	-17	53	11	1	10	48	+35	43	18

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		ζ Ceti						ν Ceti						α Arietis						α Ceti					
Mag. Spect.		3.73			K0 III			4.00			F7III			2.00			K2 III			2.53			M1.5IIIa		
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	21	-10	15	00	2	00	51	-20	59	44	2	08	12	+23	32	47	3	03	13	+4	09	25
	11	1	52	21	10	15	01	2	00	51	20	59	44	2	08	11	23	32	47	3	03	13	4	09	24
	21	1	52	20	10	15	01	2	00	51	20	59	45	2	08	11	23	32	46	3	03	13	4	09	24
	31	1	52	20	10	15	01	2	00	50	20	59	45	2	08	11	23	32	46	3	03	13	4	09	23
Feb.	10	1	52	20	10	15	02	2	00	50	20	59	45	2	08	11	23	32	45	3	03	13	4	09	23
	20	1	52	20	10	15	02	2	00	50	20	59	45	2	08	11	23	32	44	3	03	13	4	09	22
Mar.	2	1	52	20	-10	15	01	2	00	50	-20	59	44	2	08	11	+23	32	43	3	03	13	+4	09	22
	12	1	52	20	10	15	01	2	00	50	20	59	43	2	08	10	23	32	42	3	03	13	4	09	22
	22	1	52	20	10	15	00	2	00	50	20	59	42	2	08	10	23	32	41	3	03	12	4	09	22
Apr.	1	1	52	20	10	15	00	2	00	50	20	59	40	2	08	10	23	32	40	3	03	12	4	09	22
	11	1	52	20	10	14	58	2	00	50	20	59	38	2	08	10	23	32	40	3	03	12	4	09	23
	21	1	52	20	10	14	56	2	00	50	20	59	36	2	08	10	23	32	39	3	03	12	4	09	23
May	1	1	52	20	-10	14	55	2	00	50	-20	59	34	2	08	10	+23	32	39	3	03	12	+4	09	24
	11	1	52	20	10	14	53	2	00	50	20	59	32	2	08	11	23	32	39	3	03	12	4	09	25
	21	1	52	20	10	14	50	2	00	50	20	59	29	2	08	11	23	32	39	3	03	12	4	09	26
	31	1	52	20	10	14	48	2	00	50	20	59	27	2	08	11	23	32	39	3	03	13	4	09	27
June	10	1	52	21	10	14	46	2	00	51	20	59	24	2	08	11	23	32	40	3	03	13	4	09	29
	20	1	52	21	10	14	44	2	00	51	20	59	21	2	08	12	23	32	41	3	03	13	4	09	31
	30	1	52	21	-10	14	42	2	00	51	-20	59	19	2	08	12	+23	32	43	3	03	13	+4	09	32
July	10	1	52	21	10	14	40	2	00	51	20	59	17	2	08	12	23	32	44	3	03	14	4	09	34
	20	1	52	22	10	14	38	2	00	52	20	59	15	2	08	12	23	32	46	3	03	14	4	09	36
	30	1	52	22	10	14	36	2	00	52	20	59	13	2	08	13	23	32	47	3	03	14	4	09	38
Aug.	9	1	52	22	10	14	35	2	00	52	20	59	12	2	08	13	23	32	49	3	03	14	4	09	39
	19	1	52	23	10	14	33	2	00	53	20	59	11	2	08	13	23	32	51	3	03	15	4	09	40
	29	1	52	23	-10	14	33	2	00	53	-20	59	11	2	08	14	+23	32	53	3	03	15	+4	09	42
Sept.	8	1	52	23	10	14	32	2	00	53	20	59	11	2	08	14	23	32	54	3	03	15	4	09	43
	18	1	52	23	10	14	32	2	00	53	20	59	11	2	08	14	23	32	56	3	03	16	4	09	43
	28	1	52	23	10	14	32	2	00	54	20	59	12	2	08	14	23	32	57	3	03	16	4	09	44
Oct.	8	1	52	24	10	14	33	2	00	54	20	59	13	2	08	15	23	32	59	3	03	16	4	09	44
	18	1	52	24	10	14	34	2	00	54	20	59	14	2	08	15	23	33	00	3	03	16	4	09	44
	28	1	52	24	-10	14	35	2	00	54	-20	59	16	2	08	15	+23	33	01	3	03	16	+4	09	44
Nov.	7	1	52	24	10	14	36	2	00	54	20	59	18	2	08	15	23	33	02	3	03	16	4	09	43
	17	1	52	24	10	14	37	2	00	54	20	59	19	2	08	15	23	33	03	3	03	16	4	09	43
	27	1	52	24	10	14	38	2	00	54	20	59	21	2	08	15	23	33	03	3	03	16	4	09	42
Dec.	7	1	52	24	10	14	39	2	00	54	20	59	23	2	08	15	23	33	04	3	03	16	4	09	41
	17	1	52	24	10	14	41	2	00	54	20	59	24	2	08	15	23	33	04	3	03	16	4	09	41
	27	1	52	24	-10	14	41	2	00	54	-20	59	25	2	08	15	+23	33	04	3	03	16	+4	09	40
	37	1	52	23	-10	14	42	2	00	54	-20	59	27	2	08	15	+23	33	04	3	03	16	+4	09	39

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		η Tauri						α Tauri						β Eridani						ɔ Orionis					
Mag. Spect.		2.87			B7 III			0.85			K5 III			2.79			K4 III			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	34	+24	09	30	4	36	58	+16	32	32	5	08	45	-5	04	01	5	26	06	+6	21	44
	11	3	48	34	24	09	30	4	36	58	16	32	32	5	08	45	5	04	03	5	26	06	6	21	43
	21	3	48	34	24	09	30	4	36	58	16	32	32	5	08	45	5	04	04	5	26	06	6	21	43
	31	3	48	34	24	09	30	4	36	58	16	32	31	5	08	45	5	04	05	5	26	06	6	21	42
Feb.	10	3	48	33	24	09	30	4	36	57	16	32	31	5	08	44	5	04	06	5	26	06	6	21	41
	20	3	48	33	24	09	30	4	36	57	16	32	31	5	08	44	5	04	06	5	26	06	6	21	41
Mar.	2	3	48	33	+24	09	29	4	36	57	+16	32	31	5	08	44	-5	04	06	5	26	06	+6	21	41
	12	3	48	33	24	09	29	4	36	57	16	32	30	5	08	44	5	04	07	5	26	06	6	21	41
	22	3	48	33	24	09	28	4	36	57	16	32	30	5	08	44	5	04	06	5	26	06	6	21	41
Apr.	1	3	48	33	24	09	28	4	36	57	16	32	30	5	08	44	5	04	06	5	26	05	6	21	41
	11	3	48	32	24	09	27	4	36	56	16	32	30	5	08	43	5	04	06	5	26	05	6	21	41
	21	3	48	32	24	09	26	4	36	56	16	32	30	5	08	43	5	04	05	5	26	05	6	21	42
May	1	3	48	32	+24	09	26	4	36	56	+16	32	30	5	08	43	-5	04	04	5	26	05	+6	21	42
	11	3	48	32	24	09	26	4	36	56	16	32	30	5	08	43	5	04	02	5	26	05	6	21	43
	21	3	48	33	24	09	26	4	36	56	16	32	30	5	08	43	5	04	01	5	26	05	6	21	44
	31	3	48	33	24	09	26	4	36	56	16	32	31	5	08	43	5	04	00	5	26	05	6	21	44
June	10	3	48	33	24	09	26	4	36	57	16	32	31	5	08	43	5	03	58	5	26	05	6	21	45
	20	3	48	33	24	09	27	4	36	57	16	32	32	5	08	43	5	03	56	5	26	05	6	21	47
	30	3	48	33	+24	09	27	4	36	57	+16	32	33	5	08	44	-5	03	54	5	26	05	+6	21	48
July	10	3	48	34	24	09	28	4	36	57	16	32	34	5	08	44	5	03	52	5	26	05	6	21	49
	20	3	48	34	24	09	29	4	36	57	16	32	35	5	08	44	5	03	51	5	26	06	6	21	50
	30	3	48	34	24	09	30	4	36	58	16	32	36	5	08	44	5	03	49	5	26	06	6	21	51
Aug.	9	3	48	35	24	09	31	4	36	58	16	32	37	5	08	44	5	03	47	5	26	06	6	21	52
	19	3	48	35	24	09	32	4	36	58	16	32	38	5	08	45	5	03	46	5	26	06	6	21	54
	29	3	48	35	+24	09	34	4	36	59	+16	32	39	5	08	45	-5	03	45	5	26	07	+6	21	54
Sept.	8	3	48	35	24	09	35	4	36	59	16	32	39	5	08	45	5	03	44	5	26	07	6	21	55
	18	3	48	36	24	09	36	4	36	59	16	32	40	5	08	46	5	03	44	5	26	07	6	21	55
	28	3	48	36	24	09	37	4	36	59	16	32	41	5	08	46	5	03	44	5	26	08	6	21	56
Oct.	8	3	48	36	24	09	38	4	37	00	16	32	41	5	08	46	5	03	44	5	26	08	6	21	56
	18	3	48	36	24	09	38	4	37	00	16	32	41	5	08	46	5	03	45	5	26	08	6	21	55
	28	3	48	37	+24	09	39	4	37	00	+16	32	41	5	08	47	-5	03	46	5	26	08	+6	21	55
Nov.	7	3	48	37	24	09	40	4	37	00	16	32	41	5	08	47	5	03	47	5	26	09	6	21	54
	17	3	48	37	24	09	41	4	37	01	16	32	41	5	08	47	5	03	48	5	26	09	6	21	53
	27	3	48	37	24	09	41	4	37	01	16	32	41	5	08	47	5	03	50	5	26	09	6	21	52
Dec.	7	3	48	37	24	09	41	4	37	01	16	32	41	5	08	47	5	03	51	5	26	09	6	21	51
	17	3	48	37	24	09	42	4	37	01	16	32	41	5	08	47	5	03	52	5	26	09	6	21	51
	27	3	48	37	+24	09	42	4	37	01	+16	32	41	5	08	47	-5	03	54	5	26	09	+6	21	50
	37	3	48	37	+24	09	42	4	37	01	+16	32	40	5	08	47	-5	03	56	5	26	09	+6	21	49

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		β Leporis						ι Orionis						α Columbae						κ Orionis					
Mag.	Spect.	2.84			G5 II			2.77			O9 III			2.64			B5 Ive			2.06			B0Iab		
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	02	-20	44	57	5	36	20	-5	54	07	5	40	19	-34	04	07	5	48	37	-9	40	01
	11	5	29	02	20	44	59	5	36	20	5	54	08	5	40	19	34	04	09	5	48	37	9	40	02
	21	5	29	02	20	45	01	5	36	20	5	54	09	5	40	19	34	04	12	5	48	37	9	40	04
	31	5	29	02	20	45	02	5	36	19	5	54	10	5	40	19	34	04	14	5	48	37	9	40	05
Feb.	10	5	29	02	20	45	04	5	36	19	5	54	11	5	40	19	34	04	15	5	48	37	9	40	06
	20	5	29	01	20	45	05	5	36	19	5	54	12	5	40	19	34	04	17	5	48	37	9	40	07
Mar.	2	5	29	01	-20	45	05	5	36	19	-5	54	12	5	40	18	-34	04	17	5	48	37	-9	40	08
	12	5	29	01	20	45	05	5	36	19	5	54	13	5	40	18	34	04	18	5	48	37	9	40	08
	22	5	29	01	20	45	05	5	36	19	5	54	13	5	40	18	34	04	18	5	48	36	9	40	08
Apr.	1	5	29	01	20	45	05	5	36	18	5	54	12	5	40	18	34	04	17	5	48	36	9	40	08
	11	5	29	00	20	45	04	5	36	18	5	54	12	5	40	17	34	04	16	5	48	36	9	40	07
	21	5	29	00	20	45	03	5	36	18	5	54	11	5	40	17	34	04	15	5	48	36	9	40	06
May	1	5	29	00	-20	45	01	5	36	18	-5	54	10	5	40	17	-34	04	13	5	48	36	-9	40	05
	11	5	29	00	20	45	00	5	36	18	5	54	09	5	40	17	34	04	11	5	48	36	9	40	04
	21	5	29	00	20	44	58	5	36	18	5	54	08	5	40	17	34	04	09	5	48	36	9	40	03
	31	5	29	00	20	44	55	5	36	18	5	54	06	5	40	17	34	04	06	5	48	36	9	40	01
June	10	5	29	00	20	44	53	5	36	18	5	54	04	5	40	17	34	04	03	5	48	36	9	40	00
	20	5	29	00	20	44	50	5	36	18	5	54	02	5	40	17	34	04	00	5	48	36	9	39	57
	30	5	29	00	-20	44	48	5	36	18	-5	54	01	5	40	17	-34	03	57	5	48	36	-9	39	55
July	10	5	29	00	20	44	45	5	36	18	5	53	59	5	40	17	34	03	54	5	48	36	9	39	53
	20	5	29	01	20	44	43	5	36	19	5	53	57	5	40	17	34	03	51	5	48	36	9	39	51
	30	5	29	01	20	44	41	5	36	19	5	53	55	5	40	18	34	03	49	5	48	37	9	39	49
Aug.	9	5	29	01	20	44	39	5	36	19	5	53	54	5	40	18	34	03	46	5	48	37	9	39	48
	19	5	29	01	20	44	37	5	36	19	5	53	53	5	40	18	34	03	44	5	48	37	9	39	46
	29	5	29	02	-20	44	36	5	36	20	-5	53	51	5	40	18	-34	03	43	5	48	37	-9	39	45
Sept.	8	5	29	02	20	44	35	5	36	20	5	53	51	5	40	19	34	03	42	5	48	38	9	39	44
	18	5	29	02	20	44	35	5	36	20	5	53	50	5	40	19	34	03	41	5	48	38	9	39	44
	28	5	29	02	20	44	34	5	36	20	5	53	50	5	40	19	34	03	41	5	48	38	9	39	44
Oct.	8	5	29	03	20	44	35	5	36	21	5	53	50	5	40	20	34	03	42	5	48	38	9	39	44
	18	5	29	03	20	44	36	5	36	21	5	53	51	5	40	20	34	03	43	5	48	39	9	39	45
	28	5	29	03	-20	44	37	5	36	21	-5	53	52	5	40	20	-34	03	45	5	48	39	-9	39	46
Nov.	7	5	29	04	20	44	39	5	36	21	5	53	53	5	40	20	34	03	47	5	48	39	9	39	47
	17	5	29	04	20	44	41	5	36	22	5	53	55	5	40	21	34	03	49	5	48	39	9	39	49
	27	5	29	04	20	44	44	5	36	22	5	53	56	5	40	21	34	03	52	5	48	40	9	39	51
Dec.	7	5	29	04	20	44	46	5	36	22	5	53	58	5	40	21	34	03	55	5	48	40	9	39	53
	17	5	29	04	20	44	48	5	36	22	5	54	00	5	40	21	34	03	58	5	48	40	9	39	54
	27	5	29	04	-20	44	51	5	36	22	-5	54	01	5	40	21	-34	04	01	5	48	40	-9	39	56
	37	5	29	04	-20	44	53	5	36	22	-5	54	03	5	40	21	-34	04	04	5	48	40	-9	39	58

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		α Orionis						ζ Canis Majoris						α Carinae						ɔ Geminorum					
Mag.	Spect.	0.4 - 1.3			M2Iab			3.02			B2.5V			-0.72			F0II			1.93			A0 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	5	56	09	+7	24	24	6	21	29	+30	03	08	6	24	23	-52	42	30	6	38	46	+16	22	48
	11	5	56	09	7	24	23	6	21	29	30	03	09	6	24	23	52	42	33	6	38	46	16	22	48
	21	5	56	09	7	24	23	6	21	29	30	03	09	6	24	23	52	42	36	6	38	46	16	22	48
	31	5	56	09	7	24	22	6	21	29	30	03	10	6	24	23	52	42	39	6	38	46	16	22	48
Feb.	10	5	56	09	7	24	22	6	21	29	30	03	10	6	24	23	52	42	41	6	38	46	16	22	48
	20	5	56	09	7	24	21	6	21	29	30	03	11	6	24	22	52	42	43	6	38	46	16	22	48
Mar.	2	5	56	09	+7	24	21	6	21	28	+30	03	12	6	24	22	-52	42	45	6	38	45	+16	22	48
	12	5	56	09	7	24	21	6	21	28	30	03	12	6	24	22	52	42	46	6	38	45	16	22	48
	22	5	56	09	7	24	21	6	21	28	30	03	12	6	24	21	52	42	46	6	38	45	16	22	48
Apr.	1	5	56	08	7	24	21	6	21	28	30	03	12	6	24	21	52	42	46	6	38	45	16	22	48
	11	5	56	08	7	24	21	6	21	28	30	03	12	6	24	21	52	42	46	6	38	45	16	22	48
	21	5	56	08	7	24	22	6	21	27	30	03	12	6	24	20	52	42	45	6	38	45	16	22	49
May	1	5	56	08	+7	24	22	6	21	27	+30	03	12	6	24	20	-52	42	43	6	38	44	+16	22	49
	11	5	56	08	7	24	23	6	21	27	30	03	12	6	24	20	52	42	41	6	38	44	16	22	49
	21	5	56	08	7	24	23	6	21	27	30	03	11	6	24	20	52	42	39	6	38	44	16	22	49
	31	5	56	08	7	24	24	6	21	27	30	03	11	6	24	19	52	42	36	6	38	44	16	22	50
June	10	5	56	08	7	24	25	6	21	27	30	03	10	6	24	19	52	42	33	6	38	44	16	22	50
	20	5	56	08	7	24	26	6	21	27	30	03	10	6	24	19	52	42	30	6	38	44	16	22	50
	30	5	56	08	+7	24	27	6	21	27	+30	03	09	6	24	19	-52	42	26	6	38	44	+16	22	51
July	10	5	56	08	7	24	28	6	21	27	30	03	09	6	24	19	52	42	23	6	38	45	16	22	51
	20	5	56	09	7	24	29	6	21	28	30	03	09	6	24	19	52	42	20	6	38	45	16	22	52
	30	5	56	09	7	24	30	6	21	28	30	03	09	6	24	20	52	42	17	6	38	45	16	22	52
Aug.	9	5	56	09	7	24	31	6	21	28	30	03	08	6	24	20	52	42	14	6	38	45	16	22	52
	19	5	56	09	7	24	32	6	21	28	30	03	08	6	24	20	52	42	11	6	38	45	16	22	53
	29	5	56	10	+7	24	33	6	21	29	+30	03	08	6	24	21	-52	42	09	6	38	46	+16	22	53
Sept.	8	5	56	10	7	24	33	6	21	29	30	03	08	6	24	21	52	42	08	6	38	46	16	22	53
	18	5	56	10	7	24	34	6	21	29	30	03	08	6	24	21	52	42	07	6	38	46	16	22	53
	28	5	56	10	7	24	34	6	21	30	30	03	08	6	24	22	52	42	06	6	38	46	16	22	53
Oct.	8	5	56	11	7	24	34	6	21	30	30	03	08	6	24	22	52	42	07	6	38	47	16	22	53
	18	5	56	11	7	24	33	6	21	30	30	03	08	6	24	23	52	42	08	6	38	47	16	22	52
	28	5	56	11	+7	24	33	6	21	31	+30	03	07	6	24	23	-52	42	09	6	38	47	+16	22	52
Nov.	7	5	56	12	7	24	32	6	21	31	30	03	07	6	24	23	52	42	11	6	38	48	16	22	51
	17	5	56	12	7	24	31	6	21	31	30	03	08	6	24	24	52	42	14	6	38	48	16	22	50
	27	5	56	12	7	24	30	6	21	32	30	03	07	6	24	24	52	42	17	6	38	48	16	22	50
Dec.	7	5	56	12	7	24	29	6	21	32	30	03	08	6	24	24	52	42	20	6	38	48	16	22	49
	17	5	56	12	7	24	28	6	21	32	30	03	08	6	24	24	52	42	24	6	38	49	16	22	48
	27	5	56	12	+7	24	27	6	21	32	+30	03	09	6	24	24	-52	42	27	6	38	49	+16	22	48
	37	5	56	13	+7	24	26	6	21	32	+30	03	09	6	24	24	-52	42	31	6	38	49	+16	22	47

APPARENT PLACES OF STARS, 2018

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			A1V			3.02			B3 Ia			2.90			B8Ve			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	45	57	-16	44	38	7	03	48	-23	51	44	7	28	08	+8	14	59	7	40	15	+5	10	32
	11	6	45	57	16	44	40	7	03	48	23	51	46	7	28	08	8	14	58	7	40	15	5	10	31
	21	6	45	57	16	44	42	7	03	48	23	51	49	7	28	08	8	14	57	7	40	15	5	10	30
	31	6	45	57	16	44	44	7	03	48	23	51	51	7	28	08	8	14	56	7	40	15	5	10	29
Feb.	10	6	45	57	16	44	46	7	03	48	23	51	53	7	28	08	8	14	56	7	40	15	5	10	29
	20	6	45	57	16	44	47	7	03	47	23	51	55	7	28	08	8	14	56	7	40	15	5	10	28
Mar.	2	6	45	57	-16	44	48	7	03	47	-23	51	56	7	28	08	+8	14	56	7	40	15	+5	10	28
	12	6	45	57	16	44	49	7	03	47	23	51	57	7	28	08	8	14	56	7	40	15	5	10	28
	22	6	45	57	16	44	49	7	03	47	23	51	57	7	28	08	8	14	56	7	40	15	5	10	28
Apr.	1	6	45	56	16	44	49	7	03	47	23	51	57	7	28	08	8	14	56	7	40	15	5	10	28
	11	6	45	56	16	44	49	7	03	47	23	51	57	7	28	08	8	14	56	7	40	15	5	10	28
	21	6	45	56	16	44	48	7	03	46	23	51	57	7	28	07	8	14	56	7	40	14	5	10	28
May	1	6	45	56	-16	44	47	7	03	46	-23	51	56	7	28	07	+8	14	57	7	40	14	+5	10	29
	11	6	45	56	16	44	46	7	03	46	23	51	55	7	28	07	8	14	57	7	40	14	5	10	29
	21	6	45	56	16	44	45	7	03	46	23	51	53	7	28	07	8	14	58	7	40	14	5	10	30
	31	6	45	56	16	44	43	7	03	46	23	51	51	7	28	07	8	14	59	7	40	14	5	10	30
June	10	6	45	56	16	44	41	7	03	46	23	51	49	7	28	07	8	14	59	7	40	14	5	10	31
	20	6	45	56	16	44	39	7	03	46	23	51	47	7	28	07	8	15	00	7	40	14	5	10	32
	30	6	45	56	-16	44	37	7	03	46	-23	51	45	7	28	07	+8	15	01	7	40	14	+5	10	33
July	10	6	45	56	16	44	35	7	03	46	23	51	42	7	28	07	8	15	01	7	40	14	5	10	34
	20	6	45	56	16	44	33	7	03	46	23	51	40	7	28	07	8	15	02	7	40	14	5	10	35
	30	6	45	56	16	44	31	7	03	46	23	51	37	7	28	07	8	15	03	7	40	14	5	10	36
Aug.	9	6	45	56	16	44	29	7	03	46	23	51	35	7	28	07	8	15	03	7	40	14	5	10	36
	19	6	45	56	16	44	27	7	03	46	23	51	33	7	28	08	8	15	04	7	40	15	5	10	37
	29	6	45	57	-16	44	26	7	03	47	-23	51	31	7	28	08	+8	15	04	7	40	15	+5	10	37
Sept.	8	6	45	57	16	44	25	7	03	47	23	51	30	7	28	08	8	15	05	7	40	15	5	10	37
	18	6	45	57	16	44	24	7	03	47	23	51	29	7	28	08	8	15	04	7	40	15	5	10	37
	28	6	45	58	16	44	24	7	03	47	23	51	29	7	28	09	8	15	04	7	40	16	5	10	37
Oct.	8	6	45	58	16	44	24	7	03	48	23	51	29	7	28	09	8	15	04	7	40	16	5	10	37
	18	6	45	58	16	44	25	7	03	48	23	51	30	7	28	09	8	15	03	7	40	16	5	10	36
	28	6	45	58	-16	44	26	7	03	48	-23	51	31	7	28	10	+8	15	02	7	40	16	+5	10	35
Nov.	7	6	45	59	16	44	28	7	03	49	23	51	32	7	28	10	8	15	01	7	40	17	5	10	34
	17	6	45	59	16	44	30	7	03	49	23	51	34	7	28	10	8	15	00	7	40	17	5	10	33
	27	6	45	59	16	44	32	7	03	49	23	51	37	7	28	10	8	14	59	7	40	17	5	10	31
Dec.	7	6	45	59	16	44	34	7	03	49	23	51	39	7	28	11	8	14	57	7	40	18	5	10	30
	17	6	46	00	16	44	36	7	03	50	23	51	42	7	28	11	8	14	56	7	40	18	5	10	28
	27	6	46	00	-16	44	39	7	03	50	-23	51	45	7	28	11	+8	14	55	7	40	18	+5	10	27
	37	6	46	00	-16	44	41	7	03	50	-23	51	48	7	28	11	+8	14	54	7	40	18	+5	10	25

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		β Geminorum						ξ Puppis						ρ Puppis						ζ Hydrae					
Mag. Spect.		1.14			K0IIIb			3.34			G6 Ia			2.81			F6IIp			3.11			G9 II-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	7	46	25	+27	58	44	7	50	04	-24	54	23	8	08	20	-24	21	27	8	56	21	+5	52	29
	11	7	46	26	27	58	44	7	50	04	24	54	26	8	08	20	24	21	29	8	56	21	5	52	28
	21	7	46	26	27	58	45	7	50	04	24	54	29	8	08	20	24	21	32	8	56	21	5	52	26
	31	7	46	26	27	58	45	7	50	04	24	54	32	8	08	20	24	21	35	8	56	22	5	52	25
Feb.	10	7	46	26	27	58	46	7	50	04	24	54	34	8	08	20	24	21	37	8	56	22	5	52	25
	20	7	46	26	27	58	47	7	50	04	24	54	36	8	08	20	24	21	39	8	56	22	5	52	24
Mar.	2	7	46	26	+27	58	47	7	50	04	-24	54	37	8	08	20	-24	21	41	8	56	22	+5	52	24
	12	7	46	25	27	58	48	7	50	04	24	54	39	8	08	20	24	21	42	8	56	21	5	52	23
	22	7	46	25	27	58	49	7	50	04	24	54	40	8	08	19	24	21	43	8	56	21	5	52	24
Apr.	1	7	46	25	27	58	49	7	50	04	24	54	40	8	08	19	24	21	44	8	56	21	5	52	24
	11	7	46	25	27	58	50	7	50	03	24	54	40	8	08	19	24	21	44	8	56	21	5	52	24
	21	7	46	25	27	58	50	7	50	03	24	54	40	8	08	19	24	21	44	8	56	21	5	52	24
May	1	7	46	25	+27	58	50	7	50	03	-24	54	39	8	08	19	-24	21	44	8	56	21	+5	52	25
	11	7	46	24	27	58	50	7	50	03	24	54	39	8	08	18	24	21	43	8	56	21	5	52	25
	21	7	46	24	27	58	50	7	50	03	24	54	37	8	08	18	24	21	42	8	56	21	5	52	26
	31	7	46	24	27	58	50	7	50	02	24	54	36	8	08	18	24	21	41	8	56	20	5	52	27
June	10	7	46	24	27	58	50	7	50	02	24	54	34	8	08	18	24	21	39	8	56	20	5	52	27
	20	7	46	24	27	58	50	7	50	02	24	54	32	8	08	18	24	21	37	8	56	20	5	52	28
	30	7	46	24	+27	58	49	7	50	02	-24	54	30	8	08	18	-24	21	35	8	56	20	+5	52	29
July	10	7	46	24	27	58	49	7	50	02	24	54	27	8	08	18	24	21	33	8	56	20	5	52	29
	20	7	46	24	27	58	48	7	50	02	24	54	25	8	08	18	24	21	30	8	56	20	5	52	30
	30	7	46	25	27	58	48	7	50	03	24	54	22	8	08	18	24	21	28	8	56	20	5	52	31
Aug.	9	7	46	25	27	58	47	7	50	03	24	54	21	8	08	18	24	21	26	8	56	20	5	52	31
	19	7	46	25	27	58	47	7	50	03	24	54	18	8	08	18	24	21	24	8	56	21	5	52	32
	29	7	46	25	+27	58	46	7	50	03	-24	54	17	8	08	19	-24	21	22	8	56	21	+5	52	32
Sept.	8	7	46	25	27	58	45	7	50	03	24	54	15	8	08	19	24	21	21	8	56	21	5	52	32
	18	7	46	26	27	58	44	7	50	04	24	54	14	8	08	19	24	21	20	8	56	21	5	52	31
	28	7	46	26	27	58	44	7	50	04	24	54	14	8	08	19	24	21	19	8	56	21	5	52	31
Oct.	8	7	46	26	27	58	43	7	50	04	24	54	13	8	08	20	24	21	19	8	56	22	5	52	30
	18	7	46	27	27	58	42	7	50	04	24	54	14	8	08	20	24	21	19	8	56	22	5	52	29
	28	7	46	27	+27	58	41	7	50	05	-24	54	15	8	08	20	-24	21	20	8	56	22	+5	52	28
Nov.	7	7	46	27	27	58	40	7	50	05	24	54	16	8	08	20	24	21	21	8	56	22	5	52	27
	17	7	46	28	27	58	40	7	50	05	24	54	18	8	08	21	24	21	23	8	56	23	5	52	25
	27	7	46	28	27	58	39	7	50	06	24	54	20	8	08	21	24	21	25	8	56	23	5	52	24
Dec.	7	7	46	28	27	58	38	7	50	06	24	54	23	8	08	21	24	21	27	8	56	23	5	52	22
	17	7	46	29	27	58	38	7	50	06	24	54	25	8	08	22	24	21	30	8	56	24	5	52	20
	27	7	46	29	+27	58	38	7	50	06	-24	54	28	8	08	22	-24	21	33	8	56	24	+5	52	19
	37	7	46	29	+27	58	38	7	50	06	-24	54	31	8	08	22	-24	21	36	8	56	24	+5	52	17

APPARENT PLACES OF STARS, 2018

FOR 0^{h} TERRESTRIAL TIME

Name		λ Velorum						α Hydrae						α Leonis						α Antliae					
Mag. Spect.		2.21			K4 Ib-II			1.98			K3 II-III			1.35			B7 V			4.25			K4 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	41	-43	30	14	9	28	29	-8	44	14	10	09	20	+11	52	39	10	27	59	-31	09	26
	11	9	08	41	43	30	18	9	28	29	8	44	16	10	09	20	11	52	37	10	27	59	31	09	28
	21	9	08	41	43	30	21	9	28	29	8	44	18	10	09	20	11	52	36	10	28	00	31	09	31
	31	9	08	41	43	30	25	9	28	29	8	44	20	10	09	20	11	52	35	10	28	00	31	09	34
Feb.	10	9	08	41	43	30	28	9	28	29	8	44	22	10	09	21	11	52	35	10	28	00	31	09	37
	20	9	08	41	43	30	31	9	28	29	8	44	23	10	09	21	11	52	34	10	28	00	31	09	40
Mar.	2	9	08	41	-43	30	34	9	28	29	-8	44	25	10	09	21	+11	52	34	10	28	00	-31	09	43
	12	9	08	41	43	30	36	9	28	29	8	44	26	10	09	21	11	52	34	10	28	00	31	09	45
	22	9	08	41	43	30	38	9	28	29	8	44	26	10	09	21	11	52	35	10	28	00	31	09	47
Apr.	1	9	08	41	43	30	40	9	28	29	8	44	27	10	09	21	11	52	35	10	28	00	31	09	49
	11	9	08	41	43	30	41	9	28	29	8	44	27	10	09	20	11	52	36	10	28	00	31	09	50
	21	9	08	40	43	30	42	9	28	29	8	44	27	10	09	20	11	52	36	10	28	00	31	09	51
May	1	9	08	40	-43	30	43	9	28	29	-8	44	27	10	09	20	+11	52	37	10	28	00	-31	09	52
	11	9	08	40	43	30	43	9	28	29	8	44	27	10	09	20	11	52	38	10	27	59	31	09	52
	21	9	08	40	43	30	42	9	28	28	8	44	26	10	09	20	11	52	38	10	27	59	31	09	53
	31	9	08	39	43	30	41	9	28	28	8	44	25	10	09	20	11	52	39	10	27	59	31	09	52
June	10	9	08	39	43	30	40	9	28	28	8	44	24	10	09	20	11	52	40	10	27	59	31	09	51
	20	9	08	39	43	30	38	9	28	28	8	44	23	10	09	20	11	52	40	10	27	59	31	09	50
	30	9	08	39	-43	30	36	9	28	28	-8	44	22	10	09	20	+11	52	40	10	27	59	-31	09	49
July	10	9	08	39	43	30	33	9	28	28	8	44	21	10	09	20	11	52	41	10	27	59	31	09	48
	20	9	08	39	43	30	31	9	28	28	8	44	19	10	09	19	11	52	41	10	27	58	31	09	46
	30	9	08	39	43	30	28	9	28	28	8	44	18	10	09	19	11	52	41	10	27	58	31	09	44
Aug.	9	9	08	39	43	30	25	9	28	28	8	44	17	10	09	19	11	52	41	10	27	58	31	09	42
	19	9	08	39	43	30	22	9	28	28	8	44	16	10	09	20	11	52	41	10	27	58	31	09	40
	29	9	08	39	-43	30	20	9	28	28	-8	44	15	10	09	20	+11	52	41	10	27	58	-31	09	38
Sept.	8	9	08	39	43	30	18	9	28	28	8	44	14	10	09	20	11	52	40	10	27	58	31	09	36
	18	9	08	39	43	30	16	9	28	29	8	44	14	10	09	20	11	52	40	10	27	59	31	09	34
	28	9	08	40	43	30	14	9	28	29	8	44	13	10	09	20	11	52	39	10	27	59	31	09	33
Oct.	8	9	08	40	43	30	13	9	28	29	8	44	13	10	09	20	11	52	38	10	27	59	31	09	32
	18	9	08	40	43	30	13	9	28	29	8	44	14	10	09	20	11	52	36	10	27	59	31	09	31
	28	9	08	41	-43	30	13	9	28	29	-8	44	15	10	09	21	+11	52	35	10	27	59	-31	09	31
Nov.	7	9	08	41	43	30	13	9	28	30	8	44	16	10	09	21	11	52	33	10	28	00	31	09	31
	17	9	08	41	43	30	14	9	28	30	8	44	18	10	09	21	11	52	31	10	28	00	31	09	32
	27	9	08	42	43	30	16	9	28	30	8	44	19	10	09	22	11	52	29	10	28	00	31	09	34
Dec.	7	9	08	42	43	30	19	9	28	31	8	44	21	10	09	22	11	52	28	10	28	01	31	09	35
	17	9	08	42	43	30	21	9	28	31	8	44	24	10	09	22	11	52	26	10	28	01	31	09	38
	27	9	08	43	-43	30	25	9	28	31	-8	44	26	10	09	23	+11	52	24	10	28	01	-31	09	40
	37	9	08	43	-43	30	28	9	28	32	-8	44	28	10	09	23	+11	52	23	10	28	02	-31	09	43

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		ν Hydrae						ξ Hydrae						β Leonis						γ Corvi					
Mag. Spect.		3.11			K0/K1III			3.54			G7 III			2.14			A3 V			2.59			B8III		
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	31	-16	17	11	11	33	54	-31	57	13	11	49	58	+14	28	15	12	16	44	-17	38	19
	11	10	50	31	16	17	13	11	33	54	31	57	15	11	49	58	14	28	13	12	16	44	17	38	22
	21	10	50	32	16	17	16	11	33	54	31	57	18	11	49	59	14	28	11	12	16	44	17	38	24
	31	10	50	32	16	17	18	11	33	54	31	57	21	11	49	59	14	28	10	12	16	45	17	38	26
Feb.	10	10	50	32	16	17	20	11	33	55	31	57	23	11	49	59	14	28	10	12	16	45	17	38	29
	20	10	50	32	16	17	22	11	33	55	31	57	26	11	49	59	14	28	09	12	16	45	17	38	31
Mar.	2	10	50	32	-16	17	24	11	33	55	-31	57	29	11	50	00	+14	28	09	12	16	45	-17	38	33
	12	10	50	32	16	17	26	11	33	55	31	57	31	11	50	00	14	28	09	12	16	45	17	38	34
	22	10	50	32	16	17	27	11	33	55	31	57	34	11	50	00	14	28	10	12	16	45	17	38	36
Apr.	1	10	50	32	16	17	28	11	33	55	31	57	36	11	50	00	14	28	10	12	16	45	17	38	37
	11	10	50	32	16	17	29	11	33	55	31	57	37	11	50	00	14	28	11	12	16	45	17	38	38
	21	10	50	32	16	17	30	11	33	55	31	57	39	11	50	00	14	28	12	12	16	45	17	38	39
May	1	10	50	32	-16	17	30	11	33	55	-31	57	40	11	50	00	+14	28	13	12	16	45	-17	38	39
	11	10	50	32	16	17	30	11	33	55	31	57	41	11	49	59	14	28	14	12	16	45	17	38	40
	21	10	50	32	16	17	30	11	33	55	31	57	41	11	49	59	14	28	15	12	16	45	17	38	40
	31	10	50	31	16	17	29	11	33	54	31	57	41	11	49	59	14	28	16	12	16	45	17	38	40
June	10	10	50	31	16	17	28	11	33	54	31	57	41	11	49	59	14	28	17	12	16	45	17	38	39
	20	10	50	31	16	17	28	11	33	54	31	57	41	11	49	59	14	28	18	12	16	45	17	38	39
	30	10	50	31	-16	17	27	11	33	54	-31	57	40	11	49	59	+14	28	18	12	16	45	-17	38	39
July	10	10	50	31	16	17	25	11	33	54	31	57	39	11	49	59	14	28	19	12	16	45	17	38	38
	20	10	50	31	16	17	24	11	33	54	31	57	38	11	49	59	14	28	19	12	16	45	17	38	37
	30	10	50	31	16	17	23	11	33	54	31	57	36	11	49	59	14	28	19	12	16	44	17	38	36
Aug.	9	10	50	31	16	17	22	11	33	53	31	57	34	11	49	59	14	28	19	12	16	44	17	38	35
	19	10	50	31	16	17	20	11	33	53	31	57	33	11	49	59	14	28	19	12	16	44	17	38	34
	29	10	50	31	-16	17	19	11	33	53	-31	57	31	11	49	58	+14	28	18	12	16	44	-17	38	33
Sept.	8	10	50	31	16	17	18	11	33	53	31	57	29	11	49	59	14	28	17	12	16	44	17	38	32
	18	10	50	31	16	17	17	11	33	53	31	57	27	11	49	59	14	28	16	12	16	44	17	38	31
	28	10	50	31	16	17	16	11	33	53	31	57	26	11	49	59	14	28	15	12	16	44	17	38	30
Oct.	8	10	50	31	16	17	16	11	33	54	31	57	24	11	49	59	14	28	14	12	16	44	17	38	29
	18	10	50	31	16	17	16	11	33	54	31	57	24	11	49	59	14	28	12	12	16	44	17	38	29
	28	10	50	32	-16	17	16	11	33	54	-31	57	23	11	49	59	+14	28	10	12	16	45	-17	38	29
Nov.	7	10	50	32	16	17	17	11	33	54	31	57	23	11	49	59	14	28	08	12	16	45	17	38	30
	17	10	50	32	16	17	18	11	33	55	31	57	23	11	49	59	14	28	06	12	16	45	17	38	31
	27	10	50	33	16	17	20	11	33	55	31	57	24	11	50	00	14	28	04	12	16	45	17	38	32
Dec.	7	10	50	33	16	17	22	11	33	55	31	57	26	11	50	00	14	28	01	12	16	46	17	38	33
	17	10	50	33	16	17	24	11	33	56	31	57	27	11	50	00	14	27	59	12	16	46	17	38	35
	27	10	50	34	-16	17	26	11	33	56	-31	57	30	11	50	01	+14	27	57	12	16	46	-17	38	37
	37	10	50	34	-16	17	29	11	33	56	-31	57	32	11	50	01	+14	27	55	12	16	47	-17	38	39

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		β Corvi						δ Virginis						ε Virginis						ι Centauri					
Mag. Spect.		2.65			G5 II			3.38			M3III			2.83			G8 III			2.75			kA15hA3nA3va		
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	20	-23	29	32	12	56	30	+3	18	03	13	03	03	+10	51	47	13	21	36	-36	48	05
	11	12	35	20	23	29	35	12	56	30	3	18	01	13	03	04	10	51	45	13	21	36	36	48	07
	21	12	35	20	23	29	37	12	56	30	3	17	59	13	03	04	10	51	43	13	21	37	36	48	09
	31	12	35	21	23	29	39	12	56	31	3	17	58	13	03	04	10	51	41	13	21	37	36	48	11
Feb.	10	12	35	21	23	29	42	12	56	31	3	17	56	13	03	05	10	51	40	13	21	38	36	48	14
	20	12	35	21	23	29	44	12	56	31	3	17	55	13	03	05	10	51	40	13	21	38	36	48	16
Mar.	2	12	35	21	-23	29	46	12	56	31	+3	17	54	13	03	05	+10	51	39	13	21	38	-36	48	19
	12	12	35	21	23	29	48	12	56	32	3	17	54	13	03	05	10	51	39	13	21	38	36	48	21
	22	12	35	22	23	29	50	12	56	32	3	17	54	13	03	05	10	51	39	13	21	38	36	48	23
Apr.	1	12	35	22	23	29	51	12	56	32	3	17	54	13	03	06	10	51	40	13	21	39	36	48	26
	11	12	35	22	23	29	53	12	56	32	3	17	54	13	03	06	10	51	40	13	21	39	36	48	28
	21	12	35	22	23	29	54	12	56	32	3	17	54	13	03	06	10	51	41	13	21	39	36	48	30
May	1	12	35	22	-23	29	55	12	56	32	+3	17	55	13	03	06	+10	51	42	13	21	39	-36	48	31
	11	12	35	22	23	29	56	12	56	32	3	17	55	13	03	06	10	51	43	13	21	39	36	48	33
	21	12	35	22	23	29	56	12	56	32	3	17	56	13	03	06	10	51	44	13	21	39	36	48	34
	31	12	35	21	23	29	56	12	56	32	3	17	57	13	03	05	10	51	45	13	21	39	36	48	35
June	10	12	35	21	23	29	56	12	56	32	3	17	58	13	03	05	10	51	46	13	21	39	36	48	36
	20	12	35	21	23	29	56	12	56	32	3	17	58	13	03	05	10	51	47	13	21	38	36	48	36
	30	12	35	21	-23	29	56	12	56	31	+3	17	59	13	03	05	+10	51	48	13	21	38	-36	48	36
July	10	12	35	21	23	29	55	12	56	31	3	18	00	13	03	05	10	51	49	13	21	38	36	48	36
	20	12	35	21	23	29	54	12	56	31	3	18	00	13	03	05	10	51	49	13	21	38	36	48	36
	30	12	35	21	23	29	53	12	56	31	3	18	01	13	03	05	10	51	50	13	21	38	36	48	35
Aug.	9	12	35	21	23	29	52	12	56	31	3	18	01	13	03	05	10	51	50	13	21	38	36	48	34
	19	12	35	20	23	29	51	12	56	31	3	18	02	13	03	05	10	51	50	13	21	37	36	48	32
	29	12	35	20	-23	29	49	12	56	31	+3	18	02	13	03	04	+10	51	49	13	21	37	-36	48	31
Sept.	8	12	35	20	23	29	48	12	56	31	3	18	01	13	03	04	10	51	49	13	21	37	36	48	30
	18	12	35	20	23	29	47	12	56	31	3	18	01	13	03	04	10	51	48	13	21	37	36	48	28
	28	12	35	20	23	29	46	12	56	31	3	18	01	13	03	04	10	51	47	13	21	37	36	48	26
Oct.	8	12	35	20	23	29	45	12	56	31	3	18	00	13	03	04	10	51	46	13	21	37	36	48	25
	18	12	35	20	23	29	45	12	56	31	3	17	59	13	03	04	10	51	44	13	21	37	36	48	23
	28	12	35	21	-23	29	44	12	56	31	+3	17	58	13	03	05	+10	51	43	13	21	37	-36	48	22
Nov.	7	12	35	21	23	29	44	12	56	31	3	17	56	13	03	05	10	51	41	13	21	37	36	48	21
	17	12	35	21	23	29	45	12	56	31	3	17	54	13	03	05	10	51	39	13	21	38	36	48	21
	27	12	35	21	23	29	46	12	56	32	3	17	52	13	03	05	10	51	36	13	21	38	36	48	21
Dec.	7	12	35	22	23	29	47	12	56	32	3	17	50	13	03	05	10	51	34	13	21	38	36	48	21
	17	12	35	22	23	29	48	12	56	32	3	17	48	13	03	06	10	51	32	13	21	39	36	48	22
	27	12	35	22	-23	29	50	12	56	32	+3	17	46	13	03	06	+10	51	29	13	21	39	-36	48	23
	37	12	35	23	-23	29	52	12	56	33	+3	17	44	13	03	06	+10	51	27	13	21	39	-36	48	25

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		α Virginis						ɗ Centauri						α^2 Librae						β Lupi					
Mag. Spect.		0.98			B1 III-V+			2.06			K0 III			2.75			KA2HA5MA4IV-V			2.68			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	13	26	08	-11	15	07	14	07	44	-36	27	09	14	51	51	-16	06	43	14	59	41	-43	12	00
	11	13	26	08	11	15	09	14	07	44	36	27	10	14	51	52	16	06	45	14	59	42	43	12	00
	21	13	26	08	11	15	11	14	07	44	36	27	12	14	51	52	16	06	47	14	59	42	43	12	01
	31	13	26	09	11	15	13	14	07	45	36	27	14	14	51	52	16	06	48	14	59	43	43	12	02
Feb.	10	13	26	09	11	15	15	14	07	45	36	27	15	14	51	52	16	06	50	14	59	43	43	12	03
	20	13	26	09	11	15	16	14	07	46	36	27	18	14	51	53	16	06	51	14	59	43	43	12	05
Mar.	2	13	26	09	-11	15	18	14	07	46	-36	27	20	14	51	53	-16	06	53	14	59	44	-43	12	07
	12	13	26	10	11	15	19	14	07	46	36	27	22	14	51	53	16	06	54	14	59	44	43	12	08
	22	13	26	10	11	15	20	14	07	46	36	27	24	14	51	54	16	06	55	14	59	44	43	12	10
Apr.	1	13	26	10	11	15	21	14	07	46	36	27	26	14	51	54	16	06	56	14	59	45	43	12	13
	11	13	26	10	11	15	22	14	07	47	36	27	28	14	51	54	16	06	57	14	59	45	43	12	15
	21	13	26	10	11	15	22	14	07	47	36	27	30	14	51	54	16	06	57	14	59	45	43	12	16
May	1	13	26	10	-11	15	22	14	07	47	-36	27	32	14	51	54	-16	06	58	14	59	45	-43	12	18
	11	13	26	10	11	15	22	14	07	47	36	27	33	14	51	54	16	06	58	14	59	45	43	12	20
	21	13	26	10	11	15	22	14	07	47	36	27	35	14	51	54	16	06	58	14	59	46	43	12	22
	31	13	26	10	11	15	22	14	07	47	36	27	36	14	51	54	16	06	58	14	59	46	43	12	23
June	10	13	26	10	11	15	22	14	07	47	36	27	36	14	51	54	16	06	58	14	59	46	43	12	25
	20	13	26	10	11	15	21	14	07	47	36	27	37	14	51	54	16	06	58	14	59	45	43	12	26
	30	13	26	10	-11	15	21	14	07	47	-36	27	38	14	51	54	-16	06	58	14	59	45	-43	12	27
July	10	13	26	10	11	15	20	14	07	46	36	27	38	14	51	54	16	06	57	14	59	45	43	12	28
	20	13	26	10	11	15	20	14	07	46	36	27	38	14	51	54	16	06	57	14	59	45	43	12	28
	30	13	26	09	11	15	19	14	07	46	36	27	37	14	51	54	16	06	57	14	59	45	43	12	28
Aug.	9	13	26	09	11	15	18	14	07	46	36	27	37	14	51	54	16	06	56	14	59	45	43	12	28
	19	13	26	09	11	15	18	14	07	46	36	27	36	14	51	54	16	06	56	14	59	44	43	12	28
	29	13	26	09	-11	15	17	14	07	46	-36	27	35	14	51	54	-16	06	55	14	59	44	-43	12	27
Sept.	8	13	26	09	11	15	17	14	07	45	36	27	33	14	51	53	16	06	55	14	59	44	43	12	26
	18	13	26	09	11	15	16	14	07	45	36	27	32	14	51	53	16	06	54	14	59	44	43	12	25
	28	13	26	09	11	15	16	14	07	45	36	27	31	14	51	53	16	06	54	14	59	44	43	12	23
Oct.	8	13	26	09	11	15	16	14	07	45	36	27	29	14	51	53	16	06	54	14	59	44	43	12	22
	18	13	26	09	11	15	16	14	07	45	36	27	28	14	51	53	16	06	54	14	59	44	43	12	20
	28	13	26	09	-11	15	16	14	07	45	-36	27	27	14	51	53	-16	06	53	14	59	44	-43	12	19
Nov.	7	13	26	09	11	15	17	14	07	45	36	27	26	14	51	53	16	06	54	14	59	44	43	12	17
	17	13	26	09	11	15	18	14	07	46	36	27	25	14	51	53	16	06	54	14	59	44	43	12	16
	27	13	26	10	11	15	19	14	07	46	36	27	25	14	51	53	16	06	55	14	59	44	43	12	15
Dec.	7	13	26	10	11	15	20	14	07	46	36	27	25	14	51	54	16	06	56	14	59	44	43	12	14
	17	13	26	10	11	15	22	14	07	46	36	27	25	14	51	54	16	06	57	14	59	44	43	12	14
	27	13	26	10	-11	15	24	14	07	47	-36	27	26	14	51	54	-16	06	58	14	59	45	-43	12	14
	37	13	26	11	-11	15	26	14	07	47	-36	27	27	14	51	54	-16	07	00	14	59	45	-43	12	14

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		β Librae						α Serpentis						δ Scorpii						δ Ophiuchi					
Mag. Spect.		2.61			B8 IV			2.65			K2 III b			2.32			B0.2 Ive			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	17	57	-9	26	43	15	45	08	+6	22	18	16	01	22	-22	40	05	16	15	16	-3	44	13
	11	15	17	57	9	26	45	15	45	08	6	22	16	16	01	22	22	40	06	16	15	16	3	44	15
	21	15	17	58	9	26	47	15	45	08	6	22	14	16	01	23	22	40	07	16	15	16	3	44	17
	31	15	17	58	9	26	48	15	45	09	6	22	12	16	01	23	22	40	08	16	15	16	3	44	18
Feb.	10	15	17	58	9	26	50	15	45	09	6	22	10	16	01	23	22	40	09	16	15	17	3	44	19
	20	15	17	59	9	26	51	15	45	09	6	22	09	16	01	24	22	40	10	16	15	17	3	44	21
Mar.	2	15	17	59	-9	26	52	15	45	09	+6	22	08	16	01	24	-22	40	11	16	15	17	-3	44	22
	12	15	17	59	9	26	53	15	45	10	6	22	08	16	01	24	22	40	12	16	15	18	3	44	22
	22	15	17	59	9	26	54	15	45	10	6	22	08	16	01	25	22	40	13	16	15	18	3	44	23
Apr.	1	15	18	00	9	26	54	15	45	10	6	22	08	16	01	25	22	40	14	16	15	18	3	44	23
	11	15	18	00	9	26	55	15	45	10	6	22	08	16	01	25	22	40	15	16	15	18	3	44	23
	21	15	18	00	9	26	55	15	45	11	6	22	09	16	01	25	22	40	15	16	15	19	3	44	22
May	1	15	18	00	-9	26	55	15	45	11	+6	22	10	16	01	26	-22	40	16	16	15	19	-3	44	22
	11	15	18	00	9	26	54	15	45	11	6	22	11	16	01	26	22	40	16	16	15	19	3	44	21
	21	15	18	00	9	26	54	15	45	11	6	22	12	16	01	26	22	40	17	16	15	19	3	44	20
	31	15	18	00	9	26	54	15	45	11	6	22	14	16	01	26	22	40	17	16	15	19	3	44	20
June	10	15	18	00	9	26	53	15	45	11	6	22	15	16	01	26	22	40	17	16	15	19	3	44	19
	20	15	18	00	9	26	53	15	45	11	6	22	16	16	01	26	22	40	18	16	15	19	3	44	18
	30	15	18	00	-9	26	52	15	45	11	+6	22	17	16	01	26	-22	40	18	16	15	19	-3	44	17
July	10	15	18	00	9	26	52	15	45	11	6	22	19	16	01	26	22	40	18	16	15	19	3	44	16
	20	15	18	00	9	26	52	15	45	11	6	22	19	16	01	26	22	40	18	16	15	19	3	44	16
	30	15	18	00	9	26	51	15	45	11	6	22	20	16	01	26	22	40	18	16	15	19	3	44	15
Aug.	9	15	18	00	9	26	51	15	45	11	6	22	21	16	01	26	22	40	18	16	15	19	3	44	15
	19	15	18	00	9	26	50	15	45	10	6	22	21	16	01	26	22	40	17	16	15	19	3	44	14
	29	15	18	00	-9	26	50	15	45	10	+6	22	21	16	01	25	-22	40	17	16	15	19	-3	44	14
Sept.	8	15	17	59	9	26	50	15	45	10	6	22	21	16	01	25	22	40	17	16	15	18	3	44	14
	18	15	17	59	9	26	49	15	45	10	6	22	21	16	01	25	22	40	16	16	15	18	3	44	14
	28	15	17	59	9	26	49	15	45	10	6	22	21	16	01	25	22	40	16	16	15	18	3	44	14
Oct.	8	15	17	59	9	26	49	15	45	10	6	22	20	16	01	25	22	40	16	16	15	18	3	44	14
	18	15	17	59	9	26	50	15	45	10	6	22	19	16	01	25	22	40	15	16	15	18	3	44	15
	28	15	17	59	-9	26	50	15	45	10	+6	22	18	16	01	25	-22	40	15	16	15	18	-3	44	15
Nov.	7	15	17	59	9	26	50	15	45	10	6	22	16	16	01	25	22	40	15	16	15	18	3	44	16
	17	15	17	59	9	26	51	15	45	10	6	22	15	16	01	25	22	40	14	16	15	18	3	44	17
	27	15	17	59	9	26	52	15	45	10	6	22	13	16	01	25	22	40	14	16	15	18	3	44	18
Dec.	7	15	17	59	9	26	53	15	45	10	6	22	11	16	01	25	22	40	15	16	15	18	3	44	20
	17	15	18	00	9	26	55	15	45	10	6	22	09	16	01	25	22	40	15	16	15	18	3	44	21
	27	15	18	00	-9	26	56	15	45	10	+6	22	06	16	01	25	-22	40	16	16	15	18	-3	44	23
	37	15	18	00	-9	26	58	15	45	11	+6	22	04	16	01	26	-22	40	17	16	15	19	-3	44	25

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		α Scorpii A						ζ Ophiuchi						ε Scorpii						ɗ Ophiuchi					
Mag. Spect.		0.9 - 1.8			M1.5 Iab-b			2.56			O9V			2.29			K1 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	29	-26	28	01	16	38	07	-10	35	58	16	51	18	-34	19	14	17	23	05	-25	00	47
	11	16	30	29	26	28	01	16	38	07	10	36	00	16	51	18	34	19	14	17	23	05	25	00	47
	21	16	30	29	26	28	02	16	38	08	10	36	01	16	51	18	34	19	14	17	23	05	25	00	48
	31	16	30	30	26	28	02	16	38	08	10	36	02	16	51	19	34	19	15	17	23	06	25	00	48
Feb.	10	16	30	30	26	28	03	16	38	08	10	36	03	16	51	19	34	19	15	17	23	06	25	00	49
	20	16	30	30	26	28	04	16	38	09	10	36	04	16	51	19	34	19	16	17	23	06	25	00	49
Mar.	2	16	30	31	-26	28	05	16	38	09	-10	36	05	16	51	20	-34	19	16	17	23	06	-25	00	50
	12	16	30	31	26	28	06	16	38	09	10	36	06	16	51	20	34	19	17	17	23	07	25	00	50
	22	16	30	31	26	28	07	16	38	09	10	36	06	16	51	20	34	19	18	17	23	07	25	00	50
Apr.	1	16	30	32	26	28	08	16	38	10	10	36	07	16	51	21	34	19	19	17	23	07	25	00	51
	11	16	30	32	26	28	08	16	38	10	10	36	07	16	51	21	34	19	19	17	23	08	25	00	51
	21	16	30	32	26	28	09	16	38	10	10	36	06	16	51	21	34	19	20	17	23	08	25	00	51
May	1	16	30	32	-26	28	09	16	38	10	-10	36	06	16	51	22	-34	19	21	17	23	08	-25	00	51
	11	16	30	33	26	28	10	16	38	11	10	36	06	16	51	22	34	19	22	17	23	09	25	00	52
	21	16	30	33	26	28	10	16	38	11	10	36	05	16	51	22	34	19	23	17	23	09	25	00	52
	31	16	30	33	26	28	11	16	38	11	10	36	05	16	51	22	34	19	23	17	23	09	25	00	52
June	10	16	30	33	26	28	11	16	38	11	10	36	04	16	51	22	34	19	24	17	23	09	25	00	52
	20	16	30	33	26	28	12	16	38	11	10	36	04	16	51	22	34	19	25	17	23	09	25	00	52
	30	16	30	33	-26	28	12	16	38	11	-10	36	03	16	51	22	-34	19	26	17	23	09	-25	00	53
July	10	16	30	33	26	28	12	16	38	11	10	36	03	16	51	22	34	19	27	17	23	09	25	00	53
	20	16	30	33	26	28	13	16	38	11	10	36	03	16	51	22	34	19	28	17	23	09	25	00	53
	30	16	30	33	26	28	13	16	38	11	10	36	02	16	51	22	34	19	28	17	23	09	25	00	53
Aug.	9	16	30	33	26	28	13	16	38	11	10	36	02	16	51	22	34	19	28	17	23	09	25	00	54
	19	16	30	33	26	28	13	16	38	11	10	36	02	16	51	22	34	19	29	17	23	09	25	00	54
	29	16	30	32	-26	28	13	16	38	11	-10	36	01	16	51	22	-34	19	29	17	23	09	-25	00	54
Sept.	8	16	30	32	26	28	13	16	38	10	10	36	01	16	51	22	34	19	29	17	23	09	25	00	54
	18	16	30	32	26	28	12	16	38	10	10	36	01	16	51	21	34	19	29	17	23	08	25	00	54
	28	16	30	32	26	28	12	16	38	10	10	36	01	16	51	21	34	19	28	17	23	08	25	00	54
Oct.	8	16	30	32	26	28	12	16	38	10	10	36	01	16	51	21	34	19	28	17	23	08	25	00	54
	18	16	30	32	26	28	11	16	38	10	10	36	01	16	51	21	34	19	27	17	23	08	25	00	53
	28	16	30	31	-26	28	11	16	38	10	-10	36	01	16	51	21	-34	19	26	17	23	08	-25	00	53
Nov.	7	16	30	31	26	28	10	16	38	10	10	36	02	16	51	21	34	19	25	17	23	08	25	00	53
	17	16	30	31	26	28	10	16	38	10	10	36	03	16	51	21	34	19	25	17	23	08	25	00	53
	27	16	30	32	26	28	10	16	38	10	10	36	03	16	51	21	34	19	24	17	23	08	25	00	52
Dec.	7	16	30	32	26	28	09	16	38	10	10	36	04	16	51	21	34	19	23	17	23	08	25	00	52
	17	16	30	32	26	28	10	16	38	10	10	36	05	16	51	21	34	19	23	17	23	08	25	00	52
	27	16	30	32	-26	28	10	16	38	10	-10	36	06	16	51	21	-34	19	23	17	23	08	-25	00	53
	37	16	30	32	-26	28	10	16	38	10	-10	36	07	16	51	21	-34	19	22	17	23	08	-25	00	53

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		θ Scorpii						α Ophiuchi						β Ophiuchi						δ Sagittarii					
Mag. Spect.		1.63			B2 IV+			2.08			A5 III			2.77			K2 III			2.70			K3IIIa		
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	34	47	-37	06	44	17	35	44	+12	32	58	17	44	20	+4	33	46	18	22	06	-29	49	00
	11	17	34	48	37	06	43	17	35	44	12	32	56	17	44	20	4	33	44	18	22	06	29	49	00
	21	17	34	48	37	06	43	17	35	45	12	32	54	17	44	20	4	33	42	18	22	07	29	49	00
	31	17	34	48	37	06	43	17	35	45	12	32	52	17	44	20	4	33	40	18	22	07	29	49	00
Feb.	10	17	34	49	37	06	43	17	35	45	12	32	50	17	44	21	4	33	39	18	22	07	29	49	00
	20	17	34	49	37	06	43	17	35	45	12	32	49	17	44	21	4	33	37	18	22	07	29	49	00
Mar.	2	17	34	49	-37	06	43	17	35	46	+12	32	48	17	44	21	+4	33	37	18	22	08	-29	49	00
	12	17	34	50	37	06	43	17	35	46	12	32	47	17	44	21	4	33	36	18	22	08	29	49	00
	22	17	34	50	37	06	43	17	35	46	12	32	47	17	44	22	4	33	36	18	22	08	29	48	59
Apr.	1	17	34	50	37	06	44	17	35	47	12	32	47	17	44	22	4	33	36	18	22	09	29	48	59
	11	17	34	51	37	06	44	17	35	47	12	32	48	17	44	22	4	33	37	18	22	09	29	48	59
	21	17	34	51	37	06	45	17	35	47	12	32	49	17	44	23	4	33	38	18	22	09	29	48	58
May	1	17	34	51	-37	06	45	17	35	47	+12	32	50	17	44	23	+4	33	38	18	22	10	-29	48	58
	11	17	34	52	37	06	46	17	35	48	12	32	52	17	44	23	4	33	40	18	22	10	29	48	59
	21	17	34	52	37	06	47	17	35	48	12	32	54	17	44	23	4	33	41	18	22	10	29	48	58
	31	17	34	52	37	06	47	17	35	48	12	32	55	17	44	23	4	33	43	18	22	11	29	48	59
June	10	17	34	52	37	06	48	17	35	48	12	32	57	17	44	24	4	33	44	18	22	11	29	48	59
	20	17	34	52	37	06	49	17	35	48	12	32	59	17	44	24	4	33	46	18	22	11	29	49	00
	30	17	34	53	-37	06	50	17	35	48	+12	33	01	17	44	24	+4	33	47	18	22	11	-29	49	00
July	10	17	34	53	37	06	51	17	35	48	12	33	03	17	44	24	4	33	49	18	22	11	29	49	00
	20	17	34	53	37	06	52	17	35	48	12	33	04	17	44	24	4	33	50	18	22	11	29	49	01
	30	17	34	52	37	06	53	17	35	48	12	33	06	17	44	24	4	33	51	18	22	11	29	49	01
Aug.	9	17	34	52	37	06	54	17	35	48	12	33	07	17	44	24	4	33	52	18	22	11	29	49	02
	19	17	34	52	37	06	54	17	35	48	12	33	08	17	44	23	4	33	52	18	22	11	29	49	02
	29	17	34	52	-37	06	55	17	35	48	+12	33	08	17	44	23	+4	33	53	18	22	11	-29	49	03
Sept.	8	17	34	52	37	06	55	17	35	48	12	33	09	17	44	23	4	33	53	18	22	11	29	49	03
	18	17	34	52	37	06	55	17	35	47	12	33	09	17	44	23	4	33	53	18	22	11	29	49	04
	28	17	34	51	37	06	55	17	35	47	12	33	08	17	44	23	4	33	53	18	22	10	29	49	04
Oct.	8	17	34	51	37	06	55	17	35	47	12	33	08	17	44	23	4	33	53	18	22	10	29	49	04
	18	17	34	51	37	06	54	17	35	47	12	33	07	17	44	22	4	33	52	18	22	10	29	49	04
	28	17	34	51	-37	06	53	17	35	47	+12	33	06	17	44	22	+4	33	52	18	22	10	-29	49	04
Nov.	7	17	34	51	37	06	53	17	35	47	12	33	05	17	44	22	4	33	51	18	22	10	29	49	03
	17	17	34	51	37	06	52	17	35	47	12	33	03	17	44	22	4	33	49	18	22	10	29	49	03
	27	17	34	51	37	06	51	17	35	47	12	33	02	17	44	22	4	33	48	18	22	10	29	49	03
Dec.	7	17	34	51	37	06	50	17	35	47	12	32	59	17	44	22	4	33	46	18	22	10	29	49	02
	17	17	34	51	37	06	49	17	35	47	12	32	57	17	44	22	4	33	45	18	22	10	29	49	02
	27	17	34	51	-37	06	49	17	35	47	+12	32	55	17	44	22	+4	33	43	18	22	10	-29	49	01
	37	17	34	51	-37	06	48	17	35	47	+12	32	53	17	44	23	+4	33	41	18	22	10	-29	49	01

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		ε Sagittarii						σ Sagittarii						ζ Aquilae						ɔ Aquilae					
Mag. Spect.		1.85			B9.5III			2.02			B2V			2.99			A0 Vn			2.72			G9.5IV		
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	19	-34	22	21	18	56	20	-26	16	17	19	06	12	+13	53	34	19	47	05	+10	39	34
	11	18	25	20	34	22	20	18	56	21	26	16	17	19	06	12	13	53	32	19	47	05	10	39	32
	21	18	25	20	34	22	20	18	56	21	26	16	17	19	06	12	13	53	29	19	47	05	10	39	30
	31	18	25	20	34	22	19	18	56	21	26	16	17	19	06	13	13	53	28	19	47	05	10	39	28
Feb.	10	18	25	20	34	22	19	18	56	21	26	16	16	19	06	13	13	53	26	19	47	05	10	39	27
	20	18	25	21	34	22	18	18	56	21	26	16	16	19	06	13	13	53	24	19	47	06	10	39	25
Mar.	2	18	25	21	-34	22	18	18	56	22	-26	16	16	19	06	13	+13	53	23	19	47	06	+10	39	24
	12	18	25	21	34	22	18	18	56	22	26	16	15	19	06	14	13	53	22	19	47	06	10	39	24
	22	18	25	22	34	22	18	18	56	22	26	16	15	19	06	14	13	53	22	19	47	06	10	39	23
Apr.	1	18	25	22	34	22	18	18	56	23	26	16	15	19	06	14	13	53	22	19	47	07	10	39	23
	11	18	25	22	34	22	17	18	56	23	26	16	14	19	06	14	13	53	22	19	47	07	10	39	24
	21	18	25	23	34	22	17	18	56	23	26	16	14	19	06	15	13	53	23	19	47	07	10	39	25
May	1	18	25	23	-34	22	17	18	56	24	-26	16	13	19	06	15	+13	53	25	19	47	07	+10	39	26
	11	18	25	23	34	22	18	18	56	24	26	16	13	19	06	15	13	53	26	19	47	08	10	39	27
	21	18	25	24	34	22	18	18	56	24	26	16	12	19	06	16	13	53	28	19	47	08	10	39	29
	31	18	25	24	34	22	18	18	56	24	26	16	12	19	06	16	13	53	30	19	47	08	10	39	31
June	10	18	25	24	34	22	19	18	56	25	26	16	12	19	06	16	13	53	32	19	47	08	10	39	33
	20	18	25	24	34	22	19	18	56	25	26	16	12	19	06	16	13	53	34	19	47	09	10	39	35
	30	18	25	24	-34	22	20	18	56	25	-26	16	12	19	06	16	+13	53	37	19	47	09	+10	39	37
July	10	18	25	25	34	22	20	18	56	25	26	16	12	19	06	16	13	53	39	19	47	09	10	39	39
	20	18	25	25	34	22	21	18	56	25	26	16	13	19	06	16	13	53	40	19	47	09	10	39	41
	30	18	25	25	34	22	22	18	56	25	26	16	13	19	06	16	13	53	42	19	47	09	10	39	43
Aug.	9	18	25	25	34	22	23	18	56	25	26	16	13	19	06	16	13	53	44	19	47	09	10	39	44
	19	18	25	24	34	22	24	18	56	25	26	16	14	19	06	16	13	53	45	19	47	09	10	39	46
	29	18	25	24	-34	22	24	18	56	25	-26	16	15	19	06	16	+13	53	46	19	47	09	+10	39	47
Sept.	8	18	25	24	34	22	25	18	56	25	26	16	15	19	06	16	13	53	47	19	47	09	10	39	48
	18	18	25	24	34	22	25	18	56	25	26	16	15	19	06	16	13	53	48	19	47	09	10	39	48
	28	18	25	24	34	22	26	18	56	25	26	16	16	19	06	16	13	53	48	19	47	09	10	39	49
Oct.	8	18	25	23	34	22	26	18	56	24	26	16	16	19	06	16	13	53	48	19	47	08	10	39	49
	18	18	25	23	34	22	26	18	56	24	26	16	16	19	06	15	13	53	48	19	47	08	10	39	49
	28	18	25	23	-34	22	25	18	56	24	-26	16	16	19	06	15	+13	53	47	19	47	08	+10	39	48
Nov.	7	18	25	23	34	22	25	18	56	24	26	16	16	19	06	15	13	53	46	19	47	08	10	39	48
	17	18	25	23	34	22	24	18	56	24	26	16	16	19	06	15	13	53	45	19	47	08	10	39	47
	27	18	25	23	34	22	24	18	56	24	26	16	16	19	06	15	13	53	43	19	47	08	10	39	46
Dec.	7	18	25	23	34	22	23	18	56	24	26	16	16	19	06	15	13	53	42	19	47	08	10	39	44
	17	18	25	23	34	22	22	18	56	24	26	16	16	19	06	15	13	53	40	19	47	08	10	39	42
	27	18	25	23	-34	22	22	18	56	24	-26	16	15	19	06	15	+13	53	38	19	47	08	+10	39	41
	37	18	25	23	-34	22	21	18	56	24	-26	16	15	19	06	15	+13	53	36	19	47	08	+10	39	39

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		α Aquilae						ɔ Cygni						α Cygni						β Aquarii					
Mag. Spect.		0.77			A7 V			2.20			F8 I ab			1.25			A2 Iae			2.91			A1.5V		
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	38	+8	55	05	20	22	51	+40	19	02	20	42	01	+45	20	52	21	32	29	-5	29	29
	11	19	51	38	8	55	03	20	22	51	40	18	59	20	42	01	45	20	49	21	32	29	5	29	30
	21	19	51	38	8	55	02	20	22	51	40	18	56	20	42	01	45	20	46	21	32	29	5	29	31
	31	19	51	38	8	55	00	20	22	51	40	18	53	20	42	01	45	20	43	21	32	29	5	29	31
Feb.	10	19	51	38	8	54	58	20	22	51	40	18	51	20	42	01	45	20	40	21	32	29	5	29	32
	20	19	51	38	8	54	57	20	22	51	40	18	48	20	42	01	45	20	37	21	32	29	5	29	32
Mar.	2	19	51	39	+8	54	56	20	22	51	+40	18	46	20	42	01	+45	20	35	21	32	29	-5	29	32
	12	19	51	39	8	54	56	20	22	51	40	18	44	20	42	02	45	20	33	21	32	29	5	29	32
	22	19	51	39	8	54	55	20	22	52	40	18	42	20	42	02	45	20	31	21	32	29	5	29	31
Apr.	1	19	51	39	8	54	55	20	22	52	40	18	41	20	42	02	45	20	30	21	32	29	5	29	31
	11	19	51	40	8	54	56	20	22	52	40	18	41	20	42	02	45	20	29	21	32	30	5	29	30
	21	19	51	40	8	54	57	20	22	53	40	18	41	20	42	03	45	20	30	21	32	30	5	29	29
May	1	19	51	40	+8	54	58	20	22	53	+40	18	42	20	42	03	+45	20	30	21	32	30	-5	29	27
	11	19	51	40	8	54	59	20	22	53	40	18	44	20	42	04	45	20	31	21	32	30	5	29	26
	21	19	51	41	8	55	01	20	22	54	40	18	46	20	42	04	45	20	33	21	32	31	5	29	24
	31	19	51	41	8	55	03	20	22	54	40	18	48	20	42	04	45	20	35	21	32	31	5	29	22
June	10	19	51	41	8	55	05	20	22	54	40	18	50	20	42	05	45	20	38	21	32	31	5	29	21
	20	19	51	41	8	55	07	20	22	55	40	18	53	20	42	05	45	20	41	21	32	32	5	29	19
	30	19	51	42	+8	55	09	20	22	55	+40	18	57	20	42	05	+45	20	44	21	32	32	-5	29	17
July	10	19	51	42	8	55	11	20	22	55	40	19	00	20	42	05	45	20	47	21	32	32	5	29	16
	20	19	51	42	8	55	13	20	22	55	40	19	03	20	42	05	45	20	50	21	32	32	5	29	15
	30	19	51	42	8	55	15	20	22	55	40	19	06	20	42	06	45	20	54	21	32	33	5	29	13
Aug.	9	19	51	42	8	55	16	20	22	55	40	19	09	20	42	06	45	20	57	21	32	33	5	29	12
	19	19	51	42	8	55	17	20	22	55	40	19	12	20	42	05	45	21	00	21	32	33	5	29	12
	29	19	51	42	+8	55	18	20	22	55	+40	19	14	20	42	05	+45	21	03	21	32	33	-5	29	11
Sept.	8	19	51	42	8	55	19	20	22	55	40	19	16	20	42	05	45	21	05	21	32	33	5	29	11
	18	19	51	42	8	55	20	20	22	55	40	19	18	20	42	05	45	21	07	21	32	33	5	29	11
	28	19	51	41	8	55	20	20	22	54	40	19	20	20	42	05	45	21	09	21	32	33	5	29	11
Oct.	8	19	51	41	8	55	20	20	22	54	40	19	21	20	42	05	45	21	10	21	32	32	5	29	11
	18	19	51	41	8	55	20	20	22	54	40	19	21	20	42	04	45	21	11	21	32	32	5	29	11
	28	19	51	41	+8	55	20	20	22	54	+40	19	21	20	42	04	+45	21	12	21	32	32	-5	29	12
Nov.	7	19	51	41	8	55	19	20	22	53	40	19	21	20	42	04	45	21	12	21	32	32	5	29	12
	17	19	51	41	8	55	18	20	22	53	40	19	20	20	42	04	45	21	11	21	32	32	5	29	13
	27	19	51	41	8	55	17	20	22	53	40	19	19	20	42	03	45	21	10	21	32	32	5	29	13
Dec.	7	19	51	40	8	55	16	20	22	53	40	19	17	20	42	03	45	21	08	21	32	32	5	29	14
	17	19	51	40	8	55	14	20	22	53	40	19	15	20	42	03	45	21	06	21	32	32	5	29	15
	27	19	51	40	+8	55	13	20	22	53	+40	19	12	20	42	03	+45	21	04	21	32	32	-5	29	16
	37	19	51	40	+8	55	11	20	22	53	+40	19	10	20	42	03	+45	21	01	21	32	31	-5	29	16

APPARENT PLACES OF STARS, 2018

FOR 0^h TERRESTRIAL TIME

Name		ε Pegasi						α Aquarii						δ Aquarii						α Pegasi					
Mag.	Spect.	0.7 - 3.5			K2 Ib			2.96			G2 Ib			3.27			A3 V			2.49			B9III		
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	03	+9	57	31	22	06	41	-0	13	56	22	55	35	-15	43	37	23	05	38	+15	18	10
	11	21	45	03	9	57	30	22	06	41	0	13	56	22	55	35	15	43	37	23	05	38	15	18	08
	21	21	45	03	9	57	28	22	06	41	0	13	57	22	55	35	15	43	37	23	05	38	15	18	07
	31	21	45	03	9	57	27	22	06	41	0	13	58	22	55	35	15	43	37	23	05	38	15	18	06
Feb.	10	21	45	03	9	57	26	22	06	41	0	13	59	22	55	35	15	43	37	23	05	38	15	18	04
	20	21	45	03	9	57	24	22	06	41	0	14	00	22	55	35	15	43	36	23	05	38	15	18	03
Mar.	2	21	45	03	+9	57	23	22	06	41	-0	14	00	22	55	35	-15	43	36	23	05	38	+15	18	02
	12	21	45	03	9	57	23	22	06	41	0	14	00	22	55	35	15	43	35	23	05	38	15	18	01
	22	21	45	03	9	57	22	22	06	41	0	14	00	22	55	35	15	43	34	23	05	38	15	18	00
Apr.	1	21	45	03	9	57	22	22	06	41	0	14	00	22	55	35	15	43	32	23	05	38	15	18	00
	11	21	45	04	9	57	23	22	06	42	0	13	58	22	55	35	15	43	31	23	05	39	15	18	00
	21	21	45	04	9	57	23	22	06	42	0	13	57	22	55	35	15	43	29	23	05	39	15	18	00
May	1	21	45	04	+9	57	24	22	06	42	-0	13	56	22	55	36	-15	43	27	23	05	39	+15	18	01
	11	21	45	04	9	57	26	22	06	42	0	13	55	22	55	36	15	43	25	23	05	39	15	18	02
	21	21	45	05	9	57	27	22	06	43	0	13	53	22	55	36	15	43	23	23	05	40	15	18	03
	31	21	45	05	9	57	29	22	06	43	0	13	51	22	55	36	15	43	21	23	05	40	15	18	05
June	10	21	45	05	9	57	31	22	06	43	0	13	49	22	55	37	15	43	19	23	05	40	15	18	06
	20	21	45	06	9	57	33	22	06	44	0	13	47	22	55	37	15	43	17	23	05	41	15	18	09
	30	21	45	06	+9	57	35	22	06	44	-0	13	45	22	55	37	-15	43	16	23	05	41	+15	18	11
July	10	21	45	06	9	57	37	22	06	44	0	13	44	22	55	38	15	43	15	23	05	41	15	18	13
	20	21	45	06	9	57	40	22	06	44	0	13	42	22	55	38	15	43	13	23	05	41	15	18	15
	30	21	45	06	9	57	42	22	06	45	0	13	40	22	55	38	15	43	12	23	05	42	15	18	18
Aug.	9	21	45	07	9	57	43	22	06	45	0	13	39	22	55	38	15	43	12	23	05	42	15	18	20
	19	21	45	07	9	57	45	22	06	45	0	13	38	22	55	39	15	43	11	23	05	42	15	18	22
	29	21	45	07	+9	57	47	22	06	45	-0	13	37	22	55	39	-15	43	11	23	05	42	+15	18	23
Sept.	8	21	45	07	9	57	48	22	06	45	0	13	36	22	55	39	15	43	11	23	05	42	15	18	25
	18	21	45	07	9	57	49	22	06	45	0	13	36	22	55	39	15	43	12	23	05	42	15	18	27
	28	21	45	07	9	57	49	22	06	45	0	13	36	22	55	39	15	43	13	23	05	42	15	18	28
Oct.	8	21	45	06	9	57	50	22	06	45	0	13	35	22	55	39	15	43	13	23	05	42	15	18	29
	18	21	45	06	9	57	50	22	06	45	0	13	36	22	55	39	15	43	14	23	05	42	15	18	30
	28	21	45	06	+9	57	50	22	06	45	-0	13	36	22	55	38	-15	43	15	23	05	42	+15	18	30
Nov.	7	21	45	06	9	57	50	22	06	44	0	13	36	22	55	38	15	43	16	23	05	42	15	18	30
	17	21	45	06	9	57	50	22	06	44	0	13	37	22	55	38	15	43	17	23	05	42	15	18	30
	27	21	45	06	9	57	49	22	06	44	0	13	37	22	55	38	15	43	18	23	05	42	15	18	30
Dec.	7	21	45	06	9	57	48	22	06	44	0	13	38	22	55	38	15	43	18	23	05	41	15	18	29
	17	21	45	05	9	57	47	22	06	44	0	13	39	22	55	38	15	43	19	23	05	41	15	18	28
	27	21	45	05	+9	57	46	22	06	44	-0	13	40	22	55	38	-15	43	19	23	05	41	+15	18	28
	37	21	45	05	+9	57	45	22	06	44	-0	13	41	22	55	38	-15	43	20	23	05	41	+15	18	27

BESSELIAN DAY NUMBERS, 2018.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Jan.	0	-0.5027	-14.733	+7.352	-3.173	+20.545	-16	-0.205	-0.065
	1	0.5000	14.618	7.365	3.501	20.482	15	-0.090	0.092
	2	0.4973	14.494	7.354	3.827	20.412	15	+0.048	0.094
	3	0.4945	14.376	7.317	4.152	20.336	15	0.173	0.072
	4	0.4918	14.275	7.260	4.476	20.255	15	0.254	-0.031
	5	0.4890	14.199	7.196	4.799	20.168	15	0.274	+0.017
	6	-0.4863	-14.145	+7.138	-5.121	+20.075	-15	+0.239	+0.058
	7	0.4836	14.108	7.095	5.442	19.976	15	0.163	0.084
	8	0.4808	14.078	7.070	5.762	19.870	15	+0.071	0.091
	9	0.4781	14.046	7.062	6.080	19.759	15	-0.018	0.080
	10	0.4754	14.008	7.068	6.397	19.640	15	0.087	0.056
	11	0.4726	13.958	7.081	6.712	19.516	15	0.127	+0.023
	12	-0.4699	-13.895	+7.095	-7.025	+19.385	-15	-0.135	-0.012
	13	0.4671	13.821	7.106	7.336	19.248	15	0.112	0.043
	14	0.4644	13.738	7.107	7.644	19.105	15	0.065	0.066
	15	0.4617	13.650	7.096	7.951	18.955	15	-0.004	0.077
	16	0.4589	13.562	7.072	8.255	18.799	15	+0.059	0.075
	17	0.4562	13.477	7.034	8.556	18.637	15	0.113	0.060
	18	-0.4535	-13.402	+6.985	-8.854	+18.469	-15	+0.147	-0.034
	19	0.4507	13.339	6.929	9.149	18.295	14	0.151	-0.002
	20	0.4480	13.289	6.873	9.441	18.115	14	0.123	+0.031
	21	0.4452	13.252	6.821	9.730	17.929	15	+0.064	0.058
	22	0.4425	13.224	6.779	10.015	17.737	15	-0.019	0.075
	23	0.4398	13.202	6.752	10.297	17.540	15	0.111	0.077
	24	-0.4370	-13.177	+6.740	-10.575	+17.338	-15	-0.197	+0.063
	25	0.4343	13.143	6.745	10.849	17.130	15	0.257	+0.033
	26	0.4316	13.093	6.759	11.120	16.918	15	0.275	-0.007
	27	0.4288	13.022	6.775	11.386	16.700	15	0.240	0.049
	28	0.4261	12.932	6.781	11.649	16.478	15	0.153	0.082
	29	0.4233	12.827	6.769	11.908	16.252	15	-0.030	0.096
	30	-0.4206	-12.721	+6.732	-12.163	+16.021	-14	+0.101	-0.085
	31	0.4179	12.625	6.672	12.414	15.786	14	0.204	0.052
Feb.	1	0.4151	12.551	6.599	12.662	15.546	14	0.256	-0.006
	2	0.4124	12.502	6.525	12.906	15.302	14	0.247	+0.041
	3	0.4097	12.474	6.463	13.146	15.054	14	0.188	0.076
	4	0.4069	12.458	6.420	13.383	14.801	14	0.099	0.092
	5	-0.4042	-12.444	+6.398	-13.616	+14.544	-15	+0.007	+0.088
	6	0.4014	12.424	6.392	13.845	14.282	15	-0.070	0.066
	7	0.3987	12.394	6.397	14.070	14.016	15	0.118	+0.035
	8	0.3960	12.352	6.406	14.291	13.745	15	0.134	-0.001
	9	0.3932	12.297	6.412	14.508	13.470	15	0.117	0.034
	10	0.3905	12.232	6.412	14.720	13.190	15	0.074	0.060
	11	-0.3877	-12.162	+6.400	-14.927	+12.906	-15	-0.014	-0.074
	12	0.3850	12.090	6.375	15.130	12.618	15	+0.050	0.076
	13	0.3823	12.022	6.338	15.328	12.326	15	0.109	0.064
	14	0.3795	11.961	6.289	15.521	12.030	15	0.150	0.041
	15	-0.3768	-11.911	+6.233	-15.709	+11.730	-15	+0.163	-0.010

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Feb.	15	-0.3768	-11.911	+6.233	-15.709	+11.730	-15	+0.163	-0.010
	16	0.3741	11.875	6.174	15.892	11.427	15	0.145	+0.023
	17	0.3713	11.852	6.120	16.069	11.120	15	0.094	0.053
	18	0.3686	11.841	6.075	16.241	10.809	15	+0.016	0.073
	19	0.3658	11.836	6.045	16.408	10.495	15	-0.075	0.079
	20	0.3631	11.830	6.032	16.569	10.179	15	0.164	0.069
	21	-0.3604	-11.816	+6.035	-16.724	+9.859	-15	-0.232	+0.043
	22	0.3576	11.788	6.049	16.874	9.537	16	0.262	+0.005
	23	0.3549	11.742	6.068	17.018	9.213	16	0.244	-0.036
	24	0.3522	11.676	6.081	17.157	8.886	16	0.178	0.071
	25	0.3494	11.596	6.080	17.290	8.557	15	-0.073	0.091
	26	0.3467	11.510	6.058	17.418	8.227	15	+0.047	0.090
	27	-0.3439	-11.430	+6.014	-17.540	+7.894	-15	+0.156	-0.067
	28	0.3412	11.365	5.953	17.658	7.561	15	0.226	-0.026
Mar.	1	0.3385	11.322	5.887	17.770	7.225	15	0.241	+0.021
	2	0.3357	11.301	5.827	17.877	6.888	15	0.202	0.062
	3	0.3330	11.296	5.784	17.979	6.549	16	0.123	0.087
	4	0.3303	11.298	5.761	18.076	6.208	16	+0.030	0.092
	5	-0.3275	-11.297	+5.759	-18.168	+5.866	-16	-0.056	+0.077
	6	0.3248	11.286	5.772	18.255	5.521	16	0.116	0.048
	7	0.3220	11.262	5.793	18.336	5.175	16	0.141	+0.011
	8	0.3193	11.224	5.813	18.412	4.828	16	0.132	-0.024
	9	0.3166	11.175	5.828	18.483	4.479	16	0.093	0.053
	10	0.3138	11.118	5.832	18.548	4.128	16	-0.035	0.072
	11	-0.3111	-11.058	+5.825	-18.607	+3.777	-16	+0.031	-0.077
	12	0.3084	11.000	5.804	18.661	3.424	16	0.094	0.069
	13	0.3056	10.948	5.772	18.709	3.069	16	0.142	0.049
	14	0.3029	10.905	5.732	18.751	2.714	16	0.166	-0.020
	15	0.3001	10.876	5.688	18.787	2.358	16	0.158	+0.014
	16	0.2974	10.859	5.646	18.817	2.002	16	0.117	0.046
	17	-0.2947	-10.855	+5.613	-18.841	+1.645	-17	+0.047	+0.070
	18	0.2919	10.858	5.594	18.859	1.287	17	-0.043	0.081
	19	0.2892	10.862	5.592	18.871	0.930	17	0.135	0.075
	20	0.2864	10.859	5.608	18.877	0.573	17	0.210	0.052
	21	0.2837	10.843	5.638	18.877	+0.215	17	0.249	+0.016
	22	0.2810	10.807	5.673	18.871	-0.141	17	0.242	-0.025
	23	-0.2782	-10.753	+5.706	-18.858	-0.497	-17	-0.185	-0.063
	24	0.2755	10.682	5.726	18.841	0.852	17	-0.090	0.087
	25	0.2728	10.604	5.727	18.817	1.205	17	+0.024	0.091
	26	0.2700	10.529	5.706	18.788	1.558	17	0.132	0.074
	27	0.2673	10.465	5.669	18.753	1.909	17	0.208	-0.039
	28	0.2645	10.421	5.623	18.714	2.259	17	0.237	+0.005
	29	-0.2618	-10.397	+5.580	-18.669	-2.608	-17	+0.213	+0.048
	30	0.2591	10.391	5.549	18.619	2.956	17	0.147	0.079
	31	0.2563	10.393	5.536	18.564	3.302	18	+0.056	0.092
Apr.	1	0.2536	10.396	5.545	18.504	3.647	18	-0.036	0.084
	2	-0.2509	-10.391	+5.571	-18.439	-3.991	-18	-0.109	+0.060

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Apr.	1	-0.2536	-10.396	+5.545	-18.504	-3.647	-18	-0.036	+0.084
	2	0.2509	10.391	5.571	18.439	3.991	18	0.109	0.060
	3	0.2481	10.372	5.608	18.369	4.334	18	0.148	+0.025
	4	0.2454	10.339	5.649	18.294	4.675	18	0.150	-0.013
	5	0.2426	10.291	5.685	18.213	5.015	18	0.119	0.045
	6	0.2399	10.234	5.712	18.128	5.354	18	-0.064	0.069
	7	-0.2372	-10.172	+5.727	-18.037	-5.691	-18	+0.003	-0.079
	8	0.2344	10.109	5.729	17.941	6.026	18	0.070	0.075
	9	0.2317	10.051	5.718	17.840	6.360	18	0.125	0.058
	10	0.2290	10.002	5.697	17.733	6.692	18	0.158	-0.031
	11	0.2262	9.963	5.671	17.621	7.022	18	0.161	+0.002
	12	0.2235	9.938	5.644	17.504	7.350	18	0.131	0.036
	13	-0.2207	-9.924	+5.623	-17.381	-7.676	-18	+0.070	+0.064
	14	0.2180	9.920	5.615	17.253	7.999	19	-0.015	0.080
	15	0.2153	9.918	5.624	17.119	8.320	19	0.109	0.080
	16	0.2125	9.912	5.651	16.980	8.638	19	0.193	0.062
	17	0.2098	9.894	5.694	16.836	8.953	19	0.245	+0.029
	18	0.2070	9.855	5.745	16.687	9.265	19	0.250	-0.013
	19	-0.2043	-9.795	+5.796	-16.532	-9.574	-19	-0.202	-0.054
	20	0.2016	9.717	5.836	16.373	9.879	19	-0.109	0.083
	21	0.1988	9.629	5.856	16.209	10.180	19	+0.007	0.093
	22	0.1961	9.541	5.854	16.041	10.478	19	0.121	0.080
	23	0.1934	9.465	5.834	15.868	10.771	19	0.206	0.048
	24	0.1906	9.406	5.802	15.691	11.062	19	0.245	-0.005
	25	-0.1879	-9.367	+5.771	-15.510	-11.348	-19	+0.232	+0.038
	26	0.1851	9.345	5.748	15.325	11.630	19	0.174	0.072
	27	0.1824	9.335	5.743	15.136	11.909	19	+0.087	0.090
	28	0.1797	9.327	5.756	14.943	12.184	19	-0.008	0.089
	29	0.1769	9.313	5.788	14.746	12.456	19	0.090	0.069
	30	0.1742	9.287	5.833	14.546	12.724	19	0.143	+0.037
May	1	-0.1715	-9.246	+5.883	-14.342	-12.988	-20	-0.159	0.000
	2	0.1687	9.191	5.931	14.134	13.249	20	0.140	-0.036
	3	0.1660	9.123	5.972	13.923	13.506	19	0.091	0.063
	4	0.1632	9.047	5.999	13.707	13.760	19	-0.025	0.078
	5	0.1605	8.970	6.013	13.488	14.009	19	+0.044	0.079
	6	0.1578	8.895	6.013	13.265	14.255	19	0.105	0.067
	7	-0.1550	-8.828	+6.002	-13.038	-14.497	-19	+0.146	-0.043
	8	0.1523	8.771	5.983	12.807	14.735	19	0.159	-0.011
	9	0.1496	8.727	5.962	12.573	14.968	19	0.140	+0.023
	10	0.1468	8.694	5.944	12.335	15.198	19	0.088	0.054
	11	0.1441	8.672	5.934	12.093	15.423	19	+0.010	0.075
	12	0.1413	8.655	5.940	11.847	15.643	20	-0.083	0.082
	13	-0.1386	-8.637	+5.963	-11.598	-15.859	-20	-0.175	+0.071
	14	0.1359	8.609	6.003	11.345	16.070	20	0.243	0.043
	15	0.1331	8.563	6.056	11.089	16.276	20	0.267	+0.002
	16	0.1304	8.494	6.112	10.829	16.477	20	0.235	-0.042
	17	-0.1277	-8.404	+6.158	-10.566	-16.673	-20	-0.150	-0.078

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
May	17	-0.1277	-8.404	+6.158	-10.566	-16.673	-20	-0.150	-0.078
	18	0.1249	8.298	6.186	10.301	16.863	19	-0.029	0.095
	19	0.1222	8.190	6.190	10.032	17.048	19	+0.097	0.088
	20	0.1194	8.091	6.172	9.761	17.227	19	0.200	0.059
	21	0.1167	8.010	6.140	9.487	17.401	19	0.255	-0.017
	22	0.1140	7.951	6.104	9.211	17.569	19	0.256	+0.029
	23	-0.1112	-7.911	+6.075	-8.934	-17.732	-19	+0.206	+0.066
	24	0.1085	7.884	6.062	8.654	17.889	19	0.123	0.089
	25	0.1057	7.861	6.067	8.372	18.042	19	+0.027	0.092
	26	0.1030	7.835	6.090	8.089	18.189	19	-0.061	0.077
	27	0.1003	7.798	6.127	7.804	18.332	19	0.124	0.048
	28	0.0975	7.748	6.171	7.517	18.469	19	0.153	+0.012
	29	-0.0948	-7.683	+6.214	-7.228	-18.602	-19	-0.146	-0.025
	30	0.0921	7.604	6.251	6.938	18.729	19	0.107	0.056
	31	0.0893	7.517	6.277	6.645	18.851	19	-0.046	0.075
June	1	0.0866	7.426	6.288	6.351	18.969	19	+0.023	0.081
	2	0.0838	7.336	6.284	6.056	19.081	19	0.088	0.072
	3	0.0811	7.253	6.268	5.758	19.188	19	0.136	0.052
	4	-0.0784	-7.179	+6.242	-5.459	-19.290	-19	+0.158	-0.022
	5	0.0756	7.118	6.212	5.158	19.387	19	0.148	+0.011
	6	0.0729	7.070	6.183	4.856	19.478	19	0.105	0.043
	7	0.0702	7.033	6.160	4.552	19.564	19	+0.034	0.068
	8	0.0674	7.003	6.149	4.247	19.644	19	-0.056	0.080
	9	0.0647	6.975	6.154	3.940	19.720	19	0.150	0.077
	10	-0.0619	-6.940	+6.176	-3.631	-19.789	-19	-0.231	+0.055
	11	0.0592	6.892	6.212	3.321	19.852	19	0.277	+0.019
	12	0.0565	6.823	6.256	3.011	19.910	19	0.271	-0.026
	13	0.0537	6.731	6.296	2.698	19.962	19	0.206	0.067
	14	0.0510	6.619	6.320	2.386	20.007	19	-0.093	0.094
	15	0.0483	6.498	6.320	2.072	20.046	19	+0.043	0.097
	16	-0.0455	-6.381	+6.295	-1.758	-20.079	-18	+0.167	-0.074
	17	0.0428	6.282	6.250	1.444	20.106	18	0.248	-0.033
	18	0.0400	6.206	6.197	1.130	20.126	18	0.270	+0.015
	19	0.0373	6.152	6.148	0.816	20.141	18	0.236	0.058
	20	0.0346	6.115	6.114	0.503	20.150	18	0.160	0.087
	21	0.0318	6.085	6.099	-0.190	20.153	18	+0.065	0.095
	22	-0.0291	-6.055	+6.103	+0.123	-20.151	-18	-0.028	+0.084
	23	0.0264	6.015	6.121	0.435	20.143	18	0.099	0.058
	24	0.0236	5.963	6.148	0.747	20.129	18	0.138	+0.023
	25	0.0209	5.897	6.176	1.058	20.111	18	0.140	-0.014
	26	0.0181	5.818	6.199	1.369	20.087	18	0.110	0.047
	27	0.0154	5.729	6.212	1.679	20.057	18	-0.055	0.070
	28	-0.0127	-5.635	+6.211	+1.989	-20.023	-18	+0.012	-0.080
	29	0.0099	5.542	6.195	2.298	19.983	18	0.078	0.075
	30	0.0072	5.454	6.166	2.607	19.938	18	0.131	0.058
July	1	0.0044	5.376	6.126	2.915	19.887	18	0.160	-0.031
	2	-0.0017	-5.310	+6.080	+3.222	-19.832	-18	+0.159	+0.001

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
July	1	-0.0044	-5.376	+6.126	+2.915	-19.887	-18	+0.160	-0.031
	2	-0.0017	5.310	6.080	3.222	19.832	18	0.159	+0.001
	3	+0.0010	5.257	6.034	3.529	19.771	18	0.125	0.033
	4	0.0038	5.217	5.992	3.835	19.704	18	+0.061	0.060
	5	0.0065	5.185	5.961	4.140	19.632	18	-0.025	0.076
	6	0.0092	5.157	5.944	4.445	19.555	18	0.120	0.078
	7	+0.0120	-5.127	+5.942	+4.748	-19.472	-18	-0.208	+0.063
	8	0.0147	5.087	5.956	5.051	19.383	18	0.270	+0.033
	9	0.0175	5.030	5.980	5.353	19.289	18	0.289	-0.008
	10	0.0202	4.951	6.005	5.653	19.189	18	0.253	0.052
	11	0.0229	4.851	6.021	5.952	19.083	18	0.162	0.086
	12	0.0257	4.736	6.017	6.250	18.972	18	-0.033	0.100
	13	+0.0284	-4.618	+5.986	+6.546	-18.854	-17	+0.103	-0.089
	14	0.0311	4.513	5.931	6.840	18.730	17	0.211	0.054
	15	0.0339	4.429	5.861	7.132	18.601	17	0.264	-0.005
	16	0.0366	4.371	5.792	7.421	18.466	17	0.253	+0.044
	17	0.0394	4.334	5.734	7.708	18.326	17	0.190	0.080
	18	0.0421	4.310	5.697	7.992	18.180	17	0.099	0.096
	19	+0.0448	-4.287	+5.680	+8.273	-18.029	-17	+0.003	+0.091
	20	0.0476	4.257	5.680	8.552	17.873	18	-0.075	0.068
	21	0.0503	4.216	5.691	8.828	17.713	18	0.122	+0.034
	22	0.0530	4.161	5.706	9.102	17.548	18	0.133	-0.003
	23	0.0558	4.093	5.717	9.373	17.378	18	0.110	0.038
	24	0.0585	4.014	5.719	9.641	17.204	17	-0.060	0.064
	25	+0.0613	-3.930	+5.708	+9.906	-17.025	-17	+0.005	-0.077
	26	0.0640	3.846	5.683	10.169	16.841	17	0.073	0.077
	27	0.0667	3.766	5.645	10.429	16.653	17	0.130	0.063
	28	0.0695	3.696	5.595	10.686	16.461	17	0.166	0.038
	29	0.0722	3.637	5.539	10.941	16.264	17	0.173	-0.007
	30	0.0749	3.592	5.481	11.192	16.063	17	0.147	+0.026
	31	+0.0777	-3.560	+5.427	+11.441	-15.857	-17	+0.090	+0.054
Aug.	1	0.0804	3.538	5.382	11.688	15.647	17	+0.008	0.074
	2	0.0832	3.522	5.351	11.931	15.433	17	-0.086	0.079
	3	0.0859	3.505	5.335	12.172	15.214	18	0.178	0.069
	4	0.0886	3.481	5.335	12.409	14.990	18	0.250	0.043
	5	0.0914	3.443	5.346	12.643	14.763	18	0.285	+0.006
	6	+0.0941	-3.387	+5.362	+12.875	-14.530	-18	-0.273	-0.036
	7	0.0969	3.310	5.373	13.103	14.293	18	0.209	0.074
	8	0.0996	3.217	5.370	13.327	14.051	18	-0.100	0.097
	9	0.1023	3.115	5.344	13.548	13.805	17	+0.031	0.097
	10	0.1051	3.017	5.293	13.765	13.554	17	0.152	0.072
	11	0.1078	2.937	5.223	13.978	13.298	17	0.232	-0.028
	12	+0.1105	-2.881	+5.145	+14.187	-13.038	-17	+0.251	+0.023
	13	0.1133	2.850	5.075	14.391	12.774	17	0.209	0.068
	14	0.1160	2.837	5.023	14.591	12.506	17	0.126	0.094
	15	0.1188	2.829	4.994	14.787	12.235	18	+0.029	0.096
	16	+0.1215	-2.817	+4.987	+14.977	-11.960	-18	-0.056	+0.078

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Aug.	16	+0.1215	-2.817	+4.987	+14.977	-11.960	-18	-0.056	+0.078
	17	0.1242	2.794	4.994	15.164	11.681	18	0.112	0.046
	18	0.1270	2.757	5.007	15.345	11.400	18	0.131	+0.008
	19	0.1297	2.706	5.018	15.522	11.115	18	0.115	-0.029
	20	0.1324	2.644	5.022	15.695	10.828	18	0.069	0.057
	21	0.1352	2.576	5.014	15.864	10.537	18	-0.005	0.074
	22	+0.1379	-2.505	+4.993	+16.028	-10.244	-18	+0.065	-0.077
	23	0.1407	2.439	4.958	16.187	9.948	18	0.127	0.067
	24	0.1434	2.380	4.912	16.342	9.649	18	0.169	0.044
	25	0.1461	2.333	4.859	16.493	9.348	18	0.185	-0.014
	26	0.1489	2.299	4.803	16.639	9.044	18	0.168	+0.019
	27	0.1516	2.279	4.750	16.781	8.737	18	0.118	0.049
	28	+0.1543	-2.269	+4.706	+16.919	-8.428	-18	+0.042	+0.071
	29	0.1571	2.267	4.675	17.052	8.117	18	-0.051	0.080
	30	0.1598	2.265	4.660	17.181	7.802	18	0.145	0.074
	31	0.1626	2.258	4.661	17.305	7.486	19	0.223	0.052
Sept.	1	0.1653	2.239	4.675	17.425	7.166	19	0.270	+0.017
	2	0.1680	2.202	4.696	17.540	6.844	19	0.273	-0.024
	3	+0.1708	-2.147	+4.715	+17.651	-6.520	-19	-0.227	-0.062
	4	0.1735	2.074	4.723	17.756	6.193	19	0.137	0.090
	5	0.1762	1.991	4.713	17.857	5.864	19	-0.020	0.098
	6	0.1790	1.907	4.680	17.953	5.532	18	+0.099	0.083
	7	0.1817	1.835	4.626	18.043	5.197	18	0.192	-0.047
	8	0.1845	1.782	4.561	18.128	4.861	18	0.234	+0.002
	9	+0.1872	-1.754	+4.496	+18.207	-4.522	-19	+0.217	+0.050
	10	0.1899	1.746	4.446	18.281	4.182	19	0.149	0.085
	11	0.1927	1.749	4.417	18.348	3.840	19	+0.053	0.098
	12	0.1954	1.752	4.413	18.410	3.497	19	-0.040	0.088
	13	0.1982	1.745	4.427	18.467	3.153	19	0.109	0.059
	14	0.2009	1.723	4.452	18.517	2.808	19	0.139	+0.021
	15	+0.2036	-1.686	+4.478	+18.562	-2.462	-19	-0.131	-0.018
	16	0.2064	1.635	4.499	18.602	2.115	19	0.089	0.051
	17	0.2091	1.576	4.508	18.636	1.768	19	-0.025	0.072
	18	0.2118	1.514	4.504	18.664	1.421	19	+0.047	0.079
	19	0.2146	1.454	4.487	18.688	1.073	19	0.114	0.071
	20	0.2173	1.400	4.458	18.706	0.725	19	0.165	0.052
	21	+0.2201	-1.357	+4.420	+18.718	-0.377	-19	+0.190	-0.023
	22	0.2228	1.326	4.378	18.726	-0.029	19	0.183	+0.011
	23	0.2255	1.309	4.338	18.728	+0.320	20	0.142	0.043
	24	0.2283	1.304	4.306	18.725	0.668	20	+0.072	0.068
	25	0.2310	1.306	4.287	18.718	1.016	20	-0.018	0.081
	26	0.2337	1.311	4.284	18.704	1.365	20	0.114	0.079
	27	+0.2365	-1.311	+4.298	+18.686	+1.713	-20	-0.198	+0.060
	28	0.2392	1.299	4.326	18.663	2.061	20	0.253	+0.028
	29	0.2420	1.271	4.363	18.634	2.409	21	0.266	-0.013
	30	0.2447	1.223	4.400	18.601	2.758	21	0.231	0.053
Oct.	1	+0.2474	-1.158	+4.428	+18.562	+3.106	-21	-0.152	-0.083

BESSELIAN DAY NUMBERS, 2018.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Oct.	1	+0.2474	-1.158	+4.428	+18.562	+3.106	-21	-0.152	-0.083
	2	0.2502	1.081	4.440	18.517	3.454	20	-0.044	0.096
	3	0.2529	1.001	4.430	18.467	3.801	20	+0.071	0.088
	4	0.2556	0.928	4.401	18.412	4.149	20	0.167	0.059
	5	0.2584	0.872	4.357	18.350	4.496	20	0.221	-0.015
	6	0.2611	0.837	4.311	18.283	4.842	20	0.220	+0.033
	7	+0.2639	-0.823	+4.273	+18.210	+5.187	-21	+0.168	+0.073
	8	0.2666	0.822	4.253	18.131	5.532	21	+0.080	0.094
	9	0.2693	0.825	4.256	18.046	5.874	21	-0.018	0.094
	10	0.2721	0.821	4.282	17.955	6.216	21	0.100	0.072
	11	0.2748	0.803	4.321	17.858	6.555	21	0.147	+0.036
	12	0.2775	0.768	4.367	17.756	6.893	21	0.152	-0.005
	13	+0.2803	-0.717	+4.409	+17.648	+7.228	-21	-0.119	-0.042
	14	0.2830	0.655	4.441	17.535	7.561	21	-0.057	0.068
	15	0.2858	0.587	4.459	17.416	7.892	21	+0.018	0.080
	16	0.2885	0.519	4.463	17.292	8.220	21	0.091	0.077
	17	0.2912	0.457	4.453	17.163	8.546	21	0.150	0.061
	18	0.2940	0.403	4.434	17.029	8.869	21	0.185	-0.034
	19	+0.2967	-0.361	+4.409	+16.889	+9.189	-21	+0.189	0.000
	20	0.2995	0.333	4.383	16.745	9.507	21	0.159	+0.034
	21	0.3022	0.316	4.364	16.596	9.822	21	0.098	0.062
	22	0.3049	0.308	4.355	16.443	10.134	22	+0.012	0.080
	23	0.3077	0.304	4.362	16.284	10.444	22	-0.085	0.083
	24	0.3104	0.298	4.386	16.121	10.750	22	0.175	0.069
	25	+0.3131	-0.280	+4.426	+15.954	+11.054	-22	-0.241	+0.039
	26	0.3159	0.246	4.477	15.781	11.355	22	0.266	-0.001
	27	0.3186	0.192	4.530	15.605	11.653	22	0.240	0.043
	28	0.3214	0.117	4.576	15.423	11.948	22	0.167	0.078
	29	0.3241	-0.029	4.606	15.237	12.240	22	-0.060	0.096
	30	0.3268	+0.064	4.614	15.046	12.529	22	+0.057	0.092
	31	+0.3296	+0.152	+4.602	+14.851	+12.816	-22	+0.159	-0.067
Nov.	1	0.3323	0.225	4.573	14.650	13.099	22	0.222	-0.026
	2	0.3350	0.277	4.538	14.445	13.378	22	0.232	+0.021
	3	0.3378	0.310	4.509	14.234	13.654	22	0.191	0.063
	4	0.3405	0.327	4.494	14.019	13.927	22	0.110	0.090
	5	0.3433	0.339	4.501	13.799	14.195	22	+0.012	0.096
	6	+0.3460	+0.354	+4.528	+13.574	+14.459	-22	-0.079	+0.082
	7	0.3487	0.380	4.572	13.344	14.719	22	0.142	0.050
	8	0.3515	0.424	4.625	13.110	14.974	22	0.164	+0.010
	9	0.3542	0.485	4.678	12.871	15.225	22	0.145	-0.030
	10	0.3569	0.560	4.722	12.628	15.470	22	0.091	0.061
	11	0.3597	0.643	4.753	12.381	15.711	22	-0.018	-0.079
	12	+0.3624	+0.730	+4.768	+12.130	+15.946	-22	+0.060	-0.082
	13	0.3652	0.812	4.769	11.876	16.177	22	0.127	0.070
	14	0.3679	0.886	4.757	11.617	16.402	22	0.173	0.045
	15	0.3706	0.950	4.738	11.356	16.623	22	0.188	-0.014
	16	+0.3734	+1.000	+4.715	+11.090	+16.838	-22	+0.169	+0.021

BESSELIAN DAY NUMBERS, 2018.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Nov.	16	+0.3734	+1.000	+4.715	+11.090	+16.838	-22	+0.169	+0.021
	17	0.3761	1.038	4.696	10.822	17.048	22	0.118	0.052
	18	0.3789	1.066	4.685	10.550	17.252	22	+0.039	0.075
	19	0.3816	1.087	4.687	10.275	17.452	22	-0.056	0.084
	20	0.3843	1.110	4.706	9.998	17.646	22	0.152	0.076
	21	0.3871	1.139	4.741	9.717	17.835	22	0.230	0.052
	22	+0.3898	+1.184	+4.789	+9.434	+18.019	-22	-0.272	+0.014
	23	0.3925	1.250	4.843	9.148	18.197	22	0.264	-0.030
	24	0.3953	1.337	4.893	8.859	18.371	22	0.202	0.070
	25	0.3980	1.442	4.927	8.568	18.540	22	-0.096	0.095
	26	0.4008	1.556	4.939	8.273	18.703	22	+0.030	0.098
	27	0.4035	1.667	4.927	7.976	18.861	22	0.146	0.077
	28	+0.4062	+1.763	+4.896	+7.676	+19.014	-21	+0.225	-0.038
	29	0.4090	1.839	4.856	7.374	19.162	21	0.251	+0.009
	30	0.4117	1.893	4.818	7.068	19.304	21	0.221	0.054
Dec.	1	0.4144	1.930	4.793	6.760	19.441	21	0.147	0.086
	2	0.4172	1.958	4.787	6.449	19.572	22	+0.050	0.098
	3	0.4199	1.988	4.802	6.135	19.696	22	-0.046	0.088
	4	+0.4227	+2.026	+4.834	+5.819	+19.814	-22	-0.120	+0.062
	5	0.4254	2.080	4.876	5.501	19.926	22	0.157	+0.024
	6	0.4281	2.150	4.920	5.180	20.032	22	0.153	-0.017
	7	0.4309	2.235	4.958	4.858	20.131	22	0.112	0.052
	8	0.4336	2.331	4.983	4.534	20.223	21	-0.045	0.075
	9	0.4363	2.432	4.993	4.208	20.309	21	+0.032	0.083
	10	+0.4391	+2.531	+4.987	+3.881	+20.388	-21	+0.105	-0.076
	11	0.4418	2.622	4.967	3.553	20.461	21	0.159	0.056
	12	0.4446	2.703	4.937	3.224	20.527	21	0.185	-0.026
	13	0.4473	2.771	4.902	2.894	20.586	21	0.177	+0.008
	14	0.4500	2.826	4.868	2.563	20.639	21	0.136	0.041
	15	0.4528	2.869	4.840	2.232	20.685	21	+0.065	0.067
	16	+0.4555	+2.904	+4.822	+1.900	+20.725	-21	-0.026	+0.081
	17	0.4582	2.937	4.819	1.568	20.758	21	0.124	0.080
	18	0.4610	2.973	4.832	1.235	20.785	21	0.212	0.063
	19	0.4637	3.021	4.859	0.903	20.805	21	0.273	+0.030
	20	0.4665	3.086	4.895	0.570	20.819	21	0.289	-0.012
	21	0.4692	3.174	4.932	+0.238	20.828	21	0.250	0.056
	22	+0.4719	+3.282	+4.958	-0.094	+20.830	-21	-0.158	-0.089
	23	0.4747	3.405	4.963	0.426	20.826	21	-0.030	0.103
	24	0.4774	3.530	4.942	0.759	20.816	20	+0.103	0.091
	25	0.4802	3.644	4.897	1.091	20.801	20	0.207	0.055
	26	0.4829	3.736	4.837	1.423	20.779	20	0.258	-0.006
	27	0.4856	3.803	4.777	1.755	20.751	20	0.247	+0.043
	28	+0.4884	+3.849	+4.727	-2.088	+20.717	-20	+0.184	+0.081
	29	0.4911	3.884	4.696	2.420	20.677	20	+0.090	0.099
	30	0.4938	3.916	4.687	2.751	20.630	20	-0.009	0.094
	31	0.4966	3.955	4.696	3.083	20.577	20	0.090	0.071
	32	+0.4993	+4.007	+4.717	-3.414	+20.516	-20	-0.137	+0.035

SECOND-ORDER DAY NUMBERS, 2018
J FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2018.5

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.	1	+21	+241	+397	+446	+376	+205	-22	-242	-397	-446	-375	-204	+22
	11	+2	+224	+386	+445	+384	+220	-3	-225	-387	-445	-384	-220	+3
	21	-15	+207	+373	+440	+389	+233	+15	-207	-374	-440	-388	-232	-14
	31	-30	+190	+359	+432	+389	+242	+30	-190	-359	-432	-388	-241	-29
Feb.	10	-43	+172	+342	+419	+385	+247	+43	-173	-342	-420	-384	-246	-42
	20	-54	+156	+324	+405	+378	+249	+53	-156	-324	-405	-378	-249	-53
Mar.	2	-61	+143	+308	+391	+369	+248	+60	-143	-308	-391	-368	-247	-60
	12	-63	+132	+293	+375	+356	+242	+63	-133	-293	-375	-356	-242	-63
	22	-64	+124	+278	+358	+342	+234	+63	-124	-279	-358	-342	-234	-63
Apr.	1	-61	+119	+267	+343	+328	+224	+61	-119	-267	-343	-328	-224	-60
	11	-55	+117	+258	+330	+313	+213	+55	-117	-258	-330	-313	-212	-55
	21	-47	+118	+252	+318	+298	+199	+47	-118	-252	-318	-298	-199	-46
May	1	-38	+121	+247	+307	+285	+186	+37	-121	-247	-307	-285	-186	-37
	11	-27	+126	+246	+299	+273	+173	+27	-127	-246	-299	-273	-173	-26
	21	-15	+134	+247	+294	+262	+160	+14	-135	-248	-294	-262	-159	-14
	31	-2	+144	+250	+290	+252	+146	+1	-144	-251	-290	-252	-146	-1
June	10	+11	+154	+255	+288	+244	+135	-11	-154	-255	-288	-244	-134	+12
	20	+24	+166	+263	+290	+239	+124	-25	-166	-263	-290	-239	-123	+25
	30	+38	+180	+273	+293	+235	+113	-38	-180	-273	-293	-234	-113	+39
July	10	+51	+193	+283	+297	+232	+104	-52	-193	-283	-297	-232	-104	+52
	20	+63	+208	+296	+305	+233	+97	-64	-208	-296	-305	-232	-97	+64
	30	+76	+223	+311	+315	+235	+92	-76	-223	-311	-315	-235	-91	+76
Aug.	9	+87	+239	+327	+326	+239	+87	-88	-239	-327	-326	-239	-87	+88
	19	+97	+254	+343	+340	+246	+85	-98	-254	-343	-340	-245	-85	+98
	29	+105	+269	+361	+355	+255	+86	-106	-269	-361	-355	-255	-86	+106
Sept.	8	+113	+284	+380	+373	+267	+89	-113	-285	-380	-373	-266	-88	+114
	18	+118	+298	+398	+391	+280	+93	-118	-298	-398	-391	-279	-93	+119
	28	+120	+309	+416	+411	+296	+101	-120	-309	-416	-410	-295	-101	+121
Oct.	8	+119	+319	+434	+432	+314	+112	-120	-320	-434	-432	-314	-112	+121
	18	+117	+328	+451	+453	+333	+124	-118	-328	-451	-453	-333	-124	+118
	28	+111	+333	+465	+472	+353	+139	-112	-333	-465	-472	-353	-139	+113
Nov.	7	+102	+334	+477	+492	+375	+157	-102	-335	-477	-492	-375	-157	+103
	17	+90	+333	+487	+510	+397	+177	-90	-333	-487	-510	-396	-176	+91
	27	+76	+328	+493	+526	+417	+197	-76	-329	-494	-526	-417	-196	+77
Dec.	7	+58	+319	+495	+538	+436	+218	-59	-320	-495	-538	-436	-217	+60
	17	+38	+306	+493	+547	+454	+240	-39	-307	-493	-547	-454	-239	+40
	27	+18	+292	+488	+552	+469	+260	-19	-293	-488	-552	-469	-259	+20

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 2018.5

SECOND-ORDER DAY NUMBERS, 2018
J' FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2018.5

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.	1	0	-53	-181	-351	-516	-633	-670	-617	-488	-319	-153	-37	0
	11	0	-46	-168	-335	-502	-623	-667	-621	-499	-331	-165	-44	0
	21	0	-39	-155	-319	-485	-610	-660	-622	-505	-341	-175	-50	0
	31	-1	-33	-143	-302	-467	-594	-648	-616	-505	-347	-182	-55	-1
Feb.	10	-2	-28	-131	-284	-446	-573	-631	-605	-501	-348	-186	-60	-2
	20	-3	-23	-120	-266	-424	-550	-611	-590	-493	-347	-189	-63	-3
Mar.	2	-4	-20	-111	-251	-404	-528	-590	-573	-482	-342	-189	-65	-3
	12	-4	-18	-103	-238	-384	-505	-566	-552	-466	-332	-185	-65	-4
	22	-4	-16	-97	-225	-366	-482	-541	-529	-448	-320	-179	-64	-4
Apr.	1	-4	-16	-93	-216	-351	-462	-519	-507	-430	-307	-172	-61	-4
	11	-3	-16	-91	-209	-339	-445	-498	-486	-410	-292	-163	-57	-3
	21	-3	-17	-91	-206	-329	-429	-479	-465	-390	-276	-152	-52	-3
May	1	-2	-18	-92	-204	-323	-418	-463	-446	-372	-260	-141	-46	-2
	11	-1	-21	-96	-205	-320	-410	-450	-430	-355	-246	-130	-41	-1
	21	0	-24	-101	-210	-322	-406	-441	-417	-340	-231	-120	-35	0
	31	0	-29	-108	-216	-325	-405	-435	-406	-327	-218	-110	-30	0
June	10	0	-33	-115	-225	-332	-408	-433	-400	-317	-208	-101	-25	0
	20	-1	-39	-125	-236	-343	-416	-436	-397	-311	-200	-93	-21	-1
	30	-2	-46	-137	-250	-356	-426	-441	-397	-306	-193	-87	-17	-2
July	10	-3	-52	-148	-265	-371	-439	-449	-400	-304	-188	-81	-14	-3
	20	-5	-59	-161	-282	-390	-456	-463	-408	-307	-186	-78	-12	-5
	30	-7	-67	-174	-300	-411	-476	-479	-419	-312	-186	-75	-10	-7
Aug.	9	-9	-74	-188	-319	-433	-498	-498	-432	-319	-187	-74	-8	-9
	19	-10	-81	-201	-338	-456	-522	-520	-449	-329	-192	-74	-8	-10
	29	-11	-87	-213	-357	-480	-549	-545	-469	-343	-199	-76	-8	-12
Sept.	8	-12	-92	-226	-377	-506	-577	-572	-492	-359	-207	-79	-8	-13
	18	-13	-97	-236	-395	-530	-605	-600	-516	-376	-218	-83	-8	-13
	28	-13	-99	-245	-411	-553	-632	-629	-542	-397	-230	-89	-9	-13
Oct.	8	-12	-100	-252	-426	-576	-661	-660	-571	-420	-246	-96	-11	-12
	18	-11	-101	-257	-439	-597	-689	-690	-601	-444	-262	-104	-13	-11
	28	-10	-99	-259	-448	-614	-713	-718	-629	-468	-280	-114	-15	-10
Nov.	7	-8	-95	-259	-453	-628	-735	-746	-658	-495	-300	-126	-19	-8
	17	-6	-91	-256	-456	-639	-754	-771	-686	-521	-321	-138	-23	-6
	27	-4	-85	-251	-455	-645	-768	-793	-711	-546	-341	-151	-28	-4
Dec.	7	-2	-78	-242	-450	-645	-777	-809	-733	-569	-361	-166	-34	-2
	17	-1	-70	-231	-440	-641	-780	-821	-751	-590	-382	-180	-41	-1
	27	0	-63	-219	-428	-634	-780	-829	-766	-609	-400	-195	-48	0

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 2018.5

SECOND-ORDER DAY NUMBERS, 2018
J FOR SOUTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2018.5

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.	1	+44	+164	+240	+251	+196	+88	-44	-164	-240	-251	-196	-87	+44
	11	+56	+177	+251	+257	+194	+79	-57	-178	-251	-257	-194	-79	+57
	21	+69	+192	+264	+265	+195	+73	-69	-193	-264	-265	-195	-72	+70
	31	+81	+208	+279	+275	+198	+67	-82	-208	-279	-275	-197	-67	+82
Feb.	10	+92	+223	+294	+287	+202	+63	-92	-223	-294	-287	-202	-63	+93
	20	+101	+238	+311	+301	+210	+63	-101	-238	-311	-301	-210	-62	+102
Mar.	2	+109	+253	+329	+317	+220	+64	-109	-253	-329	-317	-220	-64	+110
	12	+115	+267	+347	+334	+232	+67	-116	-267	-347	-334	-231	-66	+116
	22	+119	+279	+364	+352	+245	+73	-119	-279	-364	-352	-245	-72	+120
Apr.	1	+119	+289	+382	+372	+262	+82	-120	-290	-382	-371	-262	-82	+120
	11	+119	+298	+398	+391	+279	+93	-119	-299	-398	-391	-279	-92	+120
	21	+115	+305	+413	+410	+298	+105	-115	-305	-413	-410	-297	-105	+116
May	1	+107	+307	+425	+428	+317	+121	-108	-308	-425	-428	-317	-120	+108
	11	+97	+307	+435	+446	+337	+138	-98	-308	-435	-446	-337	-137	+99
	21	+86	+305	+443	+461	+356	+156	-86	-306	-443	-461	-356	-155	+87
	31	+72	+299	+446	+473	+374	+174	-72	-300	-446	-473	-373	-173	+73
June	10	+55	+289	+446	+483	+391	+193	-56	-290	-446	-483	-390	-193	+56
	20	+37	+278	+444	+491	+406	+212	-38	-278	-444	-491	-406	-212	+39
	30	+20	+265	+438	+494	+417	+229	-21	-265	-438	-494	-417	-228	+22
July	10	+2	+248	+428	+493	+425	+244	-3	-249	-428	-493	-425	-243	+3
	20	-16	+231	+416	+489	+431	+258	+15	-231	-416	-489	-431	-257	-15
	30	-32	+214	+402	+482	+433	+268	+31	-214	-402	-482	-433	-268	-31
Aug.	9	-45	+197	+386	+472	+431	+275	+45	-197	-386	-472	-431	-274	-44
	19	-57	+180	+369	+459	+426	+278	+57	-180	-369	-459	-425	-278	-56
	29	-66	+165	+351	+444	+418	+279	+66	-165	-352	-444	-417	-279	-65
Sept.	8	-72	+152	+336	+429	+407	+276	+71	-153	-336	-429	-407	-276	-71
	18	-73	+143	+320	+412	+393	+269	+73	-143	-321	-412	-393	-269	-72
	28	-73	+135	+306	+395	+378	+260	+72	-135	-306	-395	-378	-260	-72
Oct.	8	-69	+130	+295	+380	+364	+250	+69	-131	-295	-380	-364	-249	-68
	18	-62	+130	+287	+366	+348	+236	+61	-130	-287	-366	-348	-236	-61
	28	-52	+132	+280	+354	+332	+222	+52	-132	-280	-354	-332	-221	-51
Nov.	7	-42	+136	+277	+343	+318	+207	+41	-136	-277	-343	-318	-207	-41
	17	-29	+143	+277	+336	+305	+193	+28	-144	-277	-336	-305	-192	-28
	27	-14	+153	+280	+331	+294	+178	+14	-154	-280	-331	-293	-177	-13
Dec.	7	+0	+164	+284	+328	+284	+163	-1	-165	-284	-328	-283	-163	+1
	17	+15	+177	+292	+328	+277	+151	-15	-177	-292	-328	-276	-151	+16
	27	+30	+192	+302	+332	+272	+139	-31	-192	-302	-331	-272	-139	+31

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 2018.5

SECOND-ORDER DAY NUMBERS, 2018
J' FOR SOUTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2018.5

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.	1	-3	-45	-126	-224	-314	-371	-380	-338	-257	-158	-68	-12	-3
	11	-5	-52	-138	-240	-330	-385	-390	-343	-257	-155	-64	-9	-5
	21	-7	-59	-151	-257	-350	-403	-404	-352	-260	-153	-61	-7	-7
	31	-9	-67	-165	-276	-371	-425	-422	-363	-265	-154	-59	-6	-9
Feb.	10	-11	-74	-178	-295	-393	-447	-441	-377	-273	-156	-58	-5	-11
	20	-12	-80	-191	-314	-416	-471	-463	-395	-285	-162	-59	-5	-13
Mar.	2	-14	-86	-203	-333	-441	-498	-489	-417	-299	-169	-62	-5	-14
	12	-15	-91	-215	-352	-466	-526	-516	-439	-315	-178	-65	-5	-15
	22	-15	-95	-224	-368	-488	-552	-543	-462	-333	-189	-69	-5	-15
Apr.	1	-14	-96	-231	-382	-510	-579	-571	-489	-354	-203	-75	-6	-14
	11	-13	-97	-237	-396	-531	-605	-600	-516	-376	-217	-83	-8	-13
	21	-12	-96	-240	-406	-548	-629	-627	-543	-398	-233	-91	-10	-12
May	1	-10	-93	-240	-412	-562	-650	-652	-569	-421	-250	-100	-13	-10
	11	-8	-89	-239	-416	-573	-668	-676	-595	-445	-268	-111	-16	-8
	21	-6	-85	-235	-417	-581	-684	-698	-619	-469	-287	-123	-20	-6
	31	-4	-79	-228	-413	-584	-694	-714	-639	-489	-305	-134	-24	-4
June	10	-2	-72	-219	-406	-582	-699	-727	-657	-509	-323	-147	-30	-2
	20	-1	-64	-210	-397	-578	-702	-737	-673	-528	-340	-160	-36	-1
	30	0	-58	-199	-386	-569	-699	-741	-683	-542	-355	-172	-42	0
July	10	0	-50	-186	-371	-556	-690	-739	-688	-552	-367	-183	-48	0
	20	0	-43	-173	-355	-540	-679	-734	-690	-560	-378	-193	-55	0
	30	-1	-37	-161	-339	-523	-664	-724	-687	-563	-386	-202	-61	-1
Aug.	9	-2	-32	-149	-322	-503	-645	-709	-679	-561	-389	-207	-66	-2
	19	-3	-27	-138	-304	-482	-623	-691	-666	-555	-389	-211	-70	-3
	29	-4	-23	-127	-287	-460	-600	-670	-650	-546	-386	-213	-73	-4
Sept.	8	-4	-21	-119	-273	-441	-578	-648	-631	-533	-379	-211	-74	-4
	18	-5	-19	-112	-259	-421	-554	-623	-609	-515	-368	-206	-73	-5
	28	-5	-17	-106	-247	-402	-531	-598	-585	-496	-355	-200	-72	-5
Oct.	8	-5	-17	-102	-238	-388	-511	-575	-563	-477	-341	-192	-68	-5
	18	-4	-18	-101	-233	-376	-494	-553	-540	-456	-324	-181	-63	-4
	28	-3	-19	-102	-229	-367	-478	-533	-517	-434	-307	-169	-58	-3
Nov.	7	-2	-21	-104	-228	-361	-467	-517	-498	-415	-290	-157	-52	-2
	17	-1	-24	-108	-232	-361	-461	-505	-482	-397	-274	-145	-45	-1
	27	0	-28	-115	-238	-364	-458	-497	-469	-382	-259	-133	-39	0
Dec.	7	0	-33	-123	-246	-369	-459	-492	-459	-368	-245	-122	-33	0
	17	0	-39	-133	-258	-379	-465	-492	-454	-359	-235	-113	-27	0
	27	-1	-46	-145	-272	-394	-476	-498	-454	-354	-227	-105	-23	-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 2018.5

POSITION AND VELOCITY OF THE EARTH, 2018
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	-0.156 183 71	+0.896 139 41	+0.388 351 59	-1725 9374	-259 2336	-112 3891
	1	0.173 417 35	0.893 409 50	0.387 167 98	1720 7098	286 7324	124 3260
	2	0.190 596 29	0.890 405 07	0.385 865 21	1714 9964	314 1379	136 2193
	3	0.207 715 67	0.887 127 03	0.384 443 73	1708 7994	341 4556	148 0703
	4	0.224 770 65	0.883 576 24	0.382 903 94	1702 1152	368 6900	159 8806
	5	0.241 756 32	0.879 753 51	0.381 246 25	1694 9361	395 8422	171 6504
	6	-0.258 667 69	+0.875 659 68	+0.379 471 07	-1687 2521	-422 9089	-183 3786
	7	0.275 499 65	0.871 295 64	0.377 578 83	1679 0536	449 8826	195 0629
	8	0.292 247 02	0.866 662 37	0.375 569 97	1670 3328	476 7529	206 6994
	9	0.308 904 55	0.861 760 97	0.373 445 01	1661 0839	503 5069	218 2835
	10	0.325 466 93	0.856 592 66	0.371 204 49	1651 3031	530 1314	229 8103
	11	0.341 928 83	0.851 158 82	0.368 849 02	1640 9891	556 6125	241 2746
	12	-0.358 284 93	+0.845 460 94	+0.366 379 23	-1630 1414	-582 9362	-252 6709
	13	0.374 529 89	0.839 500 66	0.363 795 84	1618 7613	609 0890	263 9939
	14	0.390 658 39	0.833 279 77	0.361 099 61	1606 8507	635 0571	275 2381
	15	0.406 665 14	0.826 800 18	0.358 291 36	1594 4126	660 8269	286 3983
	16	0.422 544 89	0.820 063 94	0.355 371 95	1581 4509	686 3848	297 4688
	17	0.438 292 43	0.813 073 24	0.352 342 30	1567 9708	711 7172	308 4441
	18	-0.453 902 60	+0.805 830 39	+0.349 203 40	-1553 9782	-736 8107	-319 3188
	19	0.469 370 31	0.798 337 86	0.345 956 28	1539 4803	761 6522	330 0875
	20	0.484 690 55	0.790 598 23	0.342 602 02	1524 4859	786 2289	340 7444
	21	0.499 858 40	0.782 614 21	0.339 141 78	1509 0045	810 5290	351 2848
	22	0.514 869 05	0.774 388 61	0.335 576 73	1493 0469	834 5410	361 7034
	23	0.529 717 79	0.765 924 38	0.331 908 13	1476 6251	858 2548	371 9955
	24	-0.544 400 05	+0.757 224 54	+0.328 137 26	-1459 7520	-881 6612	-382 1569
	25	0.558 911 38	0.748 292 21	0.324 265 44	1442 4418	904 7526	392 1834
	26	0.573 247 48	0.739 130 56	0.320 294 05	1424 7096	927 5235	402 0723
	27	0.587 404 22	0.729 742 82	0.316 224 47	1406 5709	949 9707	411 8209
	28	0.601 377 59	0.720 132 22	0.312 058 10	1388 0407	972 0942	421 4280
	29	0.615 163 77	0.710 302 00	0.307 796 38	1369 1322	993 8972	430 8941
	30	-0.628 759 01	+0.700 255 33	+0.303 440 69	-1349 8556	-1015 3853	-440 2201
	31	0.642 159 67	0.689 995 32	0.298 992 43	1330 2161	1036 5654	449 4081
Feb.	1	0.655 362 13	0.679 525 03	0.294 452 98	1310 2140	1057 4431	458 4601
	2	0.668 362 73	0.668 847 46	0.289 823 68	1289 8454	1078 0210	467 3773
	3	0.681 157 79	0.657 965 61	0.285 105 88	1269 1049	1098 2976	476 1596
	4	0.693 743 57	0.646 882 53	0.280 300 95	1247 9868	1118 2670	484 8051
	5	-0.706 116 26	+0.635 601 33	+0.275 410 25	-1226 4871	-1137 9201	-493 3110
	6	0.718 272 04	0.624 125 22	0.270 435 20	1204 6048	1157 2457	501 6736
	7	0.730 207 08	0.612 457 54	0.265 377 27	1182 3408	1176 2321	509 8884
	8	0.741 917 59	0.600 601 75	0.260 237 94	1159 6990	1194 8674	517 9512
	9	0.753 399 82	0.588 561 40	0.255 018 76	1136 6841	1213 1400	525 8575
	10	0.764 650 05	0.576 340 19	0.249 721 33	1113 3022	1231 0390	533 6032
	11	-0.775 664 66	+0.563 941 90	+0.244 347 25	-1089 5605	-1248 5539	-541 1841
	12	0.786 440 09	0.551 370 43	0.238 898 21	1065 4665	1265 6743	548 5962
	13	0.796 972 85	0.538 629 77	0.233 375 90	1041 0288	1282 3898	555 8353
	14	0.807 259 55	0.525 724 02	0.227 782 09	1016 2565	1298 6905	562 8975
	15	-0.817 296 90	+0.512 657 37	+0.222 118 55	-991 1602	-1314 5667	-569 7788

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-938	-397 243	-172 598	+397 249	-789	+3225	+172 584	-3911	-149
	1	939	397 371	172 654	397 377	790	3232	172 639	3918	149
	2	939	397 509	172 714	397 515	790	3226	172 699	3912	149
	3	940	397 642	172 771	397 648	791	3208	172 757	3895	149
	4	940	397 754	172 820	397 760	791	3180	172 806	3867	149
	5	941	397 840	172 857	397 846	791	3149	172 843	3837	149
	6	-941	-397 899	-172 883	+397 905	-792	+3121	+172 869	-3809	-149
	7	941	397 941	172 901	397 947	792	3100	172 887	3788	150
	8	941	397 975	172 916	397 981	792	3087	172 902	3775	150
	9	942	398 010	172 931	398 016	792	3083	172 917	3772	150
	10	942	398 053	172 950	398 059	792	3086	172 936	3774	150
	11	942	398 108	172 974	398 114	793	3092	172 960	3781	150
	12	-942	-398 178	-173 004	+398 184	-793	+3099	+172 990	-3788	-150
	13	943	398 260	173 040	398 266	793	3104	173 026	3793	150
	14	943	398 353	173 080	398 359	794	3105	173 066	3794	150
	15	944	398 452	173 123	398 458	794	3099	173 109	3789	150
	16	944	398 551	173 166	398 557	794	3087	173 152	3777	150
	17	945	398 645	173 207	398 651	795	3069	173 193	3759	150
	18	-945	-398 729	-173 243	+398 735	-795	+3045	+173 230	-3736	-150
	19	945	398 800	173 274	398 806	795	3018	173 261	3709	150
	20	946	398 856	173 298	398 861	795	2990	173 285	3682	150
	21	946	398 897	173 316	398 903	796	2965	173 303	3656	150
	22	946	398 927	173 329	398 933	796	2945	173 316	3636	150
	23	946	398 952	173 340	398 958	796	2932	173 327	3623	150
	24	-946	-398 979	-173 352	+398 985	-796	+2926	+173 339	-3618	-150
	25	946	399 017	173 369	399 023	796	2928	173 356	3620	150
	26	947	399 073	173 393	399 079	796	2935	173 380	3627	150
	27	947	399 152	173 427	399 158	797	2942	173 414	3635	150
	28	947	399 253	173 471	399 259	797	2945	173 458	3638	151
	29	948	399 370	173 522	399 375	798	2939	173 509	3632	151
	30	-949	-399 489	-173 573	+399 494	-798	+2921	+173 560	-3615	-151
	31	949	399 595	173 620	399 601	798	2892	173 607	3586	151
Feb.	1	949	399 678	173 656	399 684	799	2856	173 643	3550	151
	2	950	399 733	173 680	399 739	799	2821	173 667	3515	151
	3	950	399 765	173 693	399 770	799	2790	173 681	3485	151
	4	950	399 783	173 701	399 789	799	2770	173 689	3464	151
	5	-950	-399 798	-173 708	+399 804	-799	+2759	+173 696	-3453	-151
	6	950	399 820	173 717	399 825	799	2756	173 705	3450	151
	7	950	399 853	173 732	399 859	799	2758	173 719	3453	151
	8	951	399 901	173 753	399 906	800	2762	173 740	3457	151
	9	951	399 962	173 779	399 967	800	2766	173 767	3461	151
	10	951	400 033	173 810	400 039	800	2765	173 798	3460	151
	11	-952	-400 112	-173 844	+400 117	-801	+2759	+173 832	-3455	-151
	12	952	400 192	173 879	400 198	801	2747	173 867	3443	151
	13	952	400 269	173 913	400 274	801	2729	173 900	3425	151
	14	953	400 337	173 942	400 343	801	2705	173 930	3402	151
	15	-953	-400 393	-173 966	+400 398	-802	+2678	+173 954	-3374	-151

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018
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	-0.817 296 90	+0.512 657 37	+0.222 118 55	-991 1602	-1314 5667	-569 7788
	16	0.827 081 71	0.499 434 13	0.216 387 13	965 7511	1330 0084	576 4748
	17	0.836 610 92	0.486 058 68	0.210 589 69	940 0421	1345 0066	582 9820
	18	0.845 881 60	0.472 535 51	0.204 728 13	914 0474	1359 5533	589 2968
	19	0.854 890 96	0.458 869 15	0.198 804 41	887 7822	1373 6416	595 4156
	20	0.863 636 39	0.445 064 22	0.192 820 48	861 2630	1387 2660	601 3357
	21	-0.872 115 43	+0.431 125 39	+0.186 778 36	-834 5067	-1400 4230	-607 0553
	22	0.880 325 80	0.417 057 32	0.180 680 05	807 5306	1413 1111	612 5727
	23	0.888 265 37	0.402 864 73	0.174 527 58	780 3521	1425 3308	617 8872
	24	0.895 932 22	0.388 552 26	0.168 322 98	752 9877	1437 0852	622 9993
	25	0.903 324 56	0.374 124 55	0.162 068 27	725 4527	1448 3796	627 9101
	26	0.910 440 75	0.359 586 18	0.155 765 44	697 7599	1459 2214	632 6217
	27	-0.917 279 26	+0.344 941 61	+0.149 416 49	-669 9189	-1469 6193	-637 1371
	28	0.923 838 65	0.330 195 24	0.143 023 34	641 9356	1479 5821	641 4596
Mar.	1	0.930 117 50	0.315 351 39	0.136 587 93	613 8118	1489 1179	645 5921
	2	0.936 114 41	0.300 414 29	0.130 112 13	585 5461	1498 2315	649 5370
	3	0.941 827 94	0.285 388 16	0.123 597 81	557 1353	1506 9241	653 2956
	4	0.947 256 63	0.270 277 22	0.117 046 84	528 5767	1515 1934	656 8677
	5	-0.952 398 98	+0.255 085 72	+0.110 461 08	-499 8686	-1523 0335	-660 2517
	6	0.957 253 50	0.239 818 00	0.103 842 44	471 0123	1530 4373	663 4455
	7	0.961 818 74	0.224 478 46	0.097 192 82	442 0113	1537 3966	666 4465
	8	0.966 093 27	0.209 071 58	0.090 514 16	412 8711	1543 9031	669 2518
	9	0.970 075 72	0.193 601 93	0.083 808 44	383 5992	1549 9491	671 8588
	10	0.973 764 84	0.178 074 15	0.077 077 65	354 2042	1555 5278	674 2650
	11	-0.977 159 43	+0.162 492 95	+0.070 323 82	-324 6951	-1560 6329	-676 4678
	12	0.980 258 39	0.146 863 09	0.063 548 98	295 0820	1565 2585	678 4653
	13	0.983 060 75	0.131 189 40	0.056 755 20	265 3748	1569 3988	680 2552
	14	0.985 565 61	0.115 476 75	0.049 944 58	235 5847	1573 0482	681 8353
	15	0.987 772 21	0.099 730 09	0.043 119 21	205 7235	1576 2016	683 2035
	16	0.989 679 89	0.083 954 39	0.036 281 22	175 8040	1578 8536	684 3576
	17	-0.991 288 14	+0.068 154 71	+0.029 432 77	-145 8406	-1580 9997	-685 2956
	18	0.992 596 61	0.052 336 10	0.022 576 03	115 8489	1582 6363	686 0159
	19	0.993 605 08	0.036 503 68	0.015 713 19	85 8463	1583 7616	686 5171
	20	0.994 313 55	0.020 662 57	0.008 846 42	55 8506	1584 3758	686 7987
	21	0.994 722 18	+0.004 817 86	+0.001 977 94	-25 8801	1584 4811	686 8612
	22	0.994 831 30	-0.011 025 37	-0.004 890 07	+4 0472	1584 0829	686 7054
	23	-0.994 641 43	-0.026 862 14	-0.011 755 45	+33 9148	-1583 1886	-686 3339
	24	0.994 153 25	0.042 687 52	0.018 616 04	63 7078	1581 8078	685 7498
	25	0.993 367 57	0.058 496 71	0.025 469 75	93 4140	1579 9514	684 9568
	26	0.992 285 30	0.074 285 01	0.032 314 50	123 0239	1577 6311	683 9593
	27	0.990 907 43	0.090 047 83	0.039 148 27	152 5313	1574 8591	682 7618
	28	0.989 235 02	0.105 780 72	0.045 969 08	181 9332	1571 6462	681 3690
	29	-0.987 269 12	-0.121 479 31	-0.052 775 01	+211 2290	-1568 0016	-679 7846
	30	0.985 010 79	0.137 139 34	0.059 564 15	240 4203	1563 9321	678 0122
	31	0.982 461 06	0.152 756 55	0.066 334 63	269 5097	1559 4412	676 0540
Apr.	1	0.979 620 93	0.168 326 76	0.073 084 61	298 4996	1554 5295	673 9109
	2	-0.976 491 39	-0.183 845 73	-0.079 812 24	+327 3907	-1549 1951	-671 5833

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-953	-400 393	-173 966	+400 398	-802	+2678	+173 954	-3374	-151
	16	953	400 433	173 984	400 438	802	2649	173 972	3346	151
	17	953	400 458	173 995	400 463	802	2623	173 983	3320	151
	18	953	400 471	174 000	400 476	802	2601	173 988	3298	151
	19	953	400 477	174 003	400 482	802	2587	173 991	3283	151
	20	953	400 483	174 006	400 488	802	2580	173 994	3277	151
	21	-953	-400 498	-174 012	+400 503	-802	+2582	+174 001	-3279	-151
	22	954	400 529	174 026	400 534	802	2589	174 014	3286	151
	23	954	400 581	174 048	400 586	802	2598	174 037	3295	151
	24	954	400 654	174 080	400 659	803	2604	174 068	3302	152
	25	955	400 743	174 119	400 748	803	2603	174 107	3301	152
	26	955	400 839	174 160	400 844	803	2593	174 149	3291	152
	27	-955	-400 929	-174 200	+400 934	-804	+2571	+174 188	-3270	-152
	28	956	401 002	174 231	401 007	804	2542	174 219	3240	152
Mar.	1	956	401 050	174 252	401 055	804	2510	174 240	3208	152
	2	956	401 073	174 262	401 078	804	2481	174 251	3179	152
	3	956	401 078	174 264	401 083	804	2459	174 253	3158	152
	4	956	401 076	174 263	401 081	804	2449	174 252	3148	152
	5	-956	-401 077	-174 264	+401 082	-804	+2448	+174 253	-3147	-152
	6	956	401 089	174 269	401 094	804	2454	174 258	3153	152
	7	956	401 116	174 281	401 121	805	2464	174 270	3163	152
	8	957	401 158	174 299	401 163	805	2474	174 288	3173	152
	9	957	401 213	174 323	401 218	805	2481	174 312	3180	152
	10	957	401 277	174 351	401 281	805	2483	174 339	3183	152
	11	-957	-401 344	-174 380	+401 348	-805	+2479	+174 368	-3179	-152
	12	958	401 409	174 408	401 414	806	2469	174 397	3169	152
	13	958	401 467	174 434	401 472	806	2454	174 422	3154	152
	14	958	401 515	174 454	401 519	806	2434	174 443	3134	152
	15	958	401 548	174 469	401 553	806	2412	174 457	3113	152
	16	958	401 566	174 476	401 571	806	2392	174 465	3093	152
	17	-959	-401 571	-174 479	+401 575	-806	+2376	+174 468	-3076	-152
	18	958	401 567	174 477	401 572	806	2366	174 466	3067	152
	19	958	401 562	174 475	401 567	806	2366	174 464	3066	152
	20	958	401 565	174 476	401 570	806	2374	174 465	3074	152
	21	959	401 584	174 484	401 588	806	2388	174 473	3089	152
	22	959	401 623	174 502	401 628	807	2405	174 491	3106	152
	23	-959	-401 684	-174 528	+401 689	-807	+2421	+174 517	-3122	-152
	24	959	401 763	174 562	401 767	807	2431	174 551	3132	152
	25	960	401 850	174 600	401 854	807	2431	174 589	3132	152
	26	960	401 934	174 637	401 939	808	2421	174 626	3123	153
	27	961	402 005	174 667	402 010	808	2403	174 656	3105	153
	28	961	402 055	174 689	402 059	808	2381	174 678	3083	153
	29	-961	-402 081	-174 701	+402 086	-808	+2359	+174 690	-3062	-153
	30	961	402 089	174 704	402 093	808	2344	174 693	3047	153
	31	961	402 085	174 703	402 090	808	2338	174 692	3041	153
Apr.	1	961	402 082	174 701	402 087	808	2343	174 690	3045	153
	2	-961	-402 088	-174 704	+402 092	-808	+2355	+174 693	-3058	-153

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018
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	-0.979 620 93	-0.168 326 76	-0.073 084 61	+298 4996	-1554 5295	-673 9109
	2	0.976 491 39	0.183 845 73	0.079 812 24	327 3907	1549 1951	671 5833
	3	0.973 073 45	0.199 309 24	0.086 515 66	356 1818	1543 4349	669 0706
	4	0.969 368 10	0.214 712 99	0.093 193 03	384 8696	1537 2440	666 3716
	5	0.965 376 42	0.230 052 67	0.099 842 47	413 4485	1530 6187	663 4854
	6	0.961 099 52	0.245 323 91	0.106 462 11	441 9117	1523 5551	660 4108
	7	-0.956 538 60	-0.260 522 30	-0.113 050 05	+470 2511	-1516 0499	-657 1468
	8	0.951 694 94	0.275 643 43	0.119 604 41	498 4579	1508 1010	653 6930
	9	0.946 569 91	0.290 682 84	0.126 123 28	526 5226	1499 7064	650 0485
	10	0.941 164 99	0.305 636 06	0.132 604 75	554 4356	1490 8644	646 2131
	11	0.935 481 74	0.320 498 63	0.139 046 90	582 1868	1481 5736	642 1861
	12	0.929 521 83	0.335 266 04	0.145 447 83	609 7653	1471 8327	637 9671
	13	-0.923 287 05	-0.349 933 78	-0.151 805 60	+637 1590	-1461 6407	-633 5557
	14	0.916 779 31	0.364 497 34	0.158 118 30	664 3546	1450 9968	628 9515
	15	0.910 000 67	0.378 952 21	0.164 383 99	691 3374	1439 9016	624 1544
	16	0.902 953 33	0.393 293 88	0.170 600 75	718 0908	1428 3572	619 1649
	17	0.895 639 67	0.407 517 87	0.176 766 65	744 5976	1416 3685	613 9842
	18	0.888 062 25	0.421 619 79	0.182 879 80	770 8406	1403 9431	608 6146
	19	-0.880 223 79	-0.435 595 32	-0.188 938 32	+796 8036	-1391 0920	-603 0598
	20	0.872 127 16	0.449 440 26	0.194 940 39	822 4725	1377 8283	597 3245
	21	0.863 775 36	0.463 150 56	0.200 884 23	847 8369	1364 1670	591 4142
	22	0.855 171 46	0.476 722 32	0.206 768 11	872 8893	1350 1239	585 3348
	23	0.846 318 62	0.490 151 81	0.212 590 38	897 6263	1335 7140	579 0923
	24	0.837 219 99	0.503 435 43	0.218 349 44	922 0467	1320 9511	572 6927
	25	-0.827 878 74	-0.516 569 70	-0.224 043 73	+946 1521	-1305 8468	-566 1411
	26	0.818 297 99	0.529 551 26	0.229 671 77	969 9454	1290 4107	559 4417
	27	0.808 480 86	0.542 376 83	0.235 232 09	993 4302	1274 6498	552 5986
	28	0.798 430 40	0.555 043 18	0.240 723 27	1016 6104	1258 5685	545 6142
	29	0.788 149 66	0.567 547 14	0.246 143 91	1039 4887	1242 1692	538 4903
	30	0.777 641 63	0.579 885 51	0.251 492 61	1062 0671	1225 4527	531 2283
May	1	-0.766 909 32	-0.592 055 13	-0.256 768 01	+1084 3454	-1208 4180	-523 8286
	2	0.755 955 73	0.604 052 81	0.261 968 73	1106 3218	1191 0643	516 2916
	3	0.744 783 90	0.615 875 35	0.267 093 39	1127 9928	1173 3901	508 6171
	4	0.733 396 91	0.627 519 54	0.272 140 61	1149 3534	1155 3947	500 8054
	5	0.721 797 88	0.638 982 17	0.277 109 04	1170 3976	1137 0778	492 8568
	6	0.709 990 03	0.650 260 02	0.281 997 29	1191 1187	1118 4396	484 7715
	7	-0.697 976 61	-0.661 349 89	-0.286 804 01	+1211 5094	-1099 4811	-476 5502
	8	0.685 760 97	0.672 248 58	0.291 527 84	1231 5622	1080 2035	468 1936
	9	0.673 346 52	0.682 952 90	0.296 167 43	1251 2690	1060 6080	459 7022
	10	0.660 736 77	0.693 459 69	0.300 721 44	1270 6210	1040 6965	451 0769
	11	0.647 935 31	0.703 765 79	0.305 188 53	1289 6086	1020 4706	442 3182
	12	0.634 945 85	0.713 868 06	0.309 567 36	1308 2211	999 9327	433 4271
	13	-0.621 772 19	-0.723 763 41	-0.313 856 63	+1326 4457	-979 0859	-424 4044
	14	0.608 418 27	0.733 448 77	0.318 055 02	1344 2686	957 9355	415 2518
	15	0.594 888 20	0.742 921 13	0.322 161 24	1361 6750	936 4893	405 9719
	16	0.581 186 21	0.752 177 60	0.326 174 04	1378 6498	914 7585	396 5682
	17	-0.567 316 69	-0.761 215 40	-0.330 092 21	+1395 1799	-892 7579	-387 0461

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-961	-402 082	-174 701	+402 087	-808	+2343	+174 690	-3045	-153
	2	961	402 088	174 704	402 092	808	2355	174 693	3058	153
	3	961	402 108	174 713	402 113	809	2373	174 702	3076	153
	4	961	402 146	174 729	402 151	809	2393	174 718	3095	153
	5	962	402 198	174 752	402 203	809	2410	174 741	3113	153
	6	962	402 262	174 779	402 267	809	2424	174 768	3127	153
	7	-962	-402 332	-174 810	+402 336	-809	+2431	+174 799	-3134	-153
	8	962	402 402	174 840	402 406	810	2431	174 829	3135	153
	9	963	402 467	174 868	402 471	810	2426	174 857	3130	153
	10	963	402 522	174 892	402 527	810	2416	174 881	3120	153
	11	963	402 565	174 911	402 570	810	2403	174 900	3107	153
	12	963	402 593	174 924	402 598	810	2390	174 913	3094	153
	13	-963	-402 608	-174 930	+402 613	-811	+2380	+174 919	-3084	-153
	14	963	402 613	174 932	402 618	811	2376	174 921	3080	153
	15	964	402 615	174 933	402 619	811	2380	174 922	3084	153
	16	964	402 621	174 936	402 626	811	2393	174 925	3097	153
	17	964	402 642	174 945	402 647	811	2414	174 934	3118	153
	18	964	402 685	174 964	402 690	811	2439	174 952	3144	153
	19	-964	-402 752	-174 993	+402 757	-811	+2464	+174 981	-3168	-153
	20	965	402 839	175 030	402 844	811	2483	175 019	3188	153
	21	965	402 937	175 073	402 942	812	2492	175 062	3198	153
	22	966	403 035	175 115	403 040	812	2491	175 104	3197	153
	23	966	403 121	175 153	403 126	813	2481	175 141	3187	153
	24	966	403 187	175 181	403 192	813	2466	175 170	3172	153
	25	-966	-403 230	-175 200	+403 235	-813	+2450	+175 189	-3157	-154
	26	967	403 254	175 211	403 259	813	2439	175 199	3146	154
	27	967	403 266	175 216	403 271	813	2437	175 205	3143	154
	28	967	403 274	175 220	403 279	813	2443	175 208	3150	154
	29	967	403 290	175 226	403 295	813	2459	175 215	3165	154
	30	967	403 318	175 239	403 323	813	2480	175 227	3187	154
May	1	-967	-403 364	-175 259	+403 369	-814	+2504	+175 247	-3211	-154
	2	967	403 426	175 286	403 431	814	2528	175 274	3235	154
	3	968	403 502	175 319	403 507	814	2547	175 307	3255	154
	4	968	403 586	175 355	403 591	814	2561	175 343	3268	154
	5	969	403 673	175 393	403 678	815	2567	175 381	3275	154
	6	969	403 756	175 429	403 761	815	2567	175 417	3275	154
	7	-969	-403 831	-175 462	+403 836	-815	+2562	+175 450	-3270	-154
	8	970	403 895	175 489	403 900	816	2552	175 477	3261	154
	9	970	403 944	175 511	403 949	816	2542	175 499	3251	154
	10	970	403 980	175 526	403 985	816	2533	175 515	3242	154
	11	970	404 005	175 537	404 010	816	2528	175 525	3238	154
	12	970	404 023	175 545	404 028	816	2531	175 534	3240	154
	13	-970	-404 043	-175 554	+404 049	-816	+2542	+175 542	-3251	-154
	14	971	404 075	175 568	404 080	816	2561	175 556	3271	154
	15	971	404 126	175 590	404 131	817	2587	175 578	3297	154
	16	971	404 203	175 623	404 208	817	2614	175 611	3324	154
	17	-972	-404 304	-175 667	+404 309	-817	+2637	+175 655	-3347	-154

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018
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	-0.567 316 69	-0.761 215 40	-0.330 092 21	+1395 1799	-892 7579	-387 0461
	18	0.553 284 13	0.770 031 92	0.333 914 59	1411 2554	870 5049	377 4119
	19	0.539 093 11	0.778 624 72	0.337 640 10	1426 8706	848 0183	367 6728
	20	0.524 748 26	0.786 991 57	0.341 267 72	1442 0243	825 3167	357 8362
	21	0.510 254 16	0.795 130 39	0.344 796 52	1456 7190	802 4165	347 9092
	22	0.495 615 39	0.803 039 29	0.348 225 63	1470 9600	779 3319	337 8980
	23	-0.480 836 45	-0.810 716 46	-0.351 554 22	+1484 7540	-756 0739	-327 8079
	24	0.465 921 78	0.818 160 21	0.354 781 54	1498 1076	732 6508	317 6430
	25	0.450 875 74	0.825 368 94	0.357 906 84	1511 0276	709 0684	307 4069
	26	0.435 702 65	0.832 341 07	0.360 929 44	1523 5194	685 3311	297 1019
	27	0.420 406 76	0.839 075 05	0.363 848 66	1535 5877	661 4412	286 7302
	28	0.404 992 30	0.845 569 39	0.366 663 83	1547 2355	637 4004	276 2932
	29	-0.389 463 45	-0.851 822 56	-0.369 374 31	+1558 4644	-613 2094	-265 7919
	30	0.373 824 41	0.857 833 08	0.371 979 46	1569 2747	588 8689	255 2272
	31	0.358 079 36	0.863 599 44	0.374 478 64	1579 6654	564 3794	244 6000
June	1	0.342 232 51	0.869 120 17	0.376 871 25	1589 6340	539 7416	233 9108
	2	0.326 288 09	0.874 393 78	0.379 156 66	1599 1774	514 9569	223 1606
	3	0.310 250 39	0.879 418 82	0.381 334 26	1608 2915	490 0268	212 3503
	4	-0.294 123 71	-0.884 193 84	-0.383 403 47	+1616 9717	-464 9538	-201 4810
	5	0.277 912 42	0.888 717 43	0.385 363 69	1625 2130	439 7406	190 5540
	6	0.261 620 93	0.892 988 20	0.387 214 36	1633 0099	414 3898	179 5704
	7	0.245 253 72	0.897 004 78	0.388 954 91	1640 3564	388 9052	168 5315
	8	0.228 815 33	0.900 765 87	0.390 584 81	1647 2456	363 2899	157 4388
	9	0.212 310 36	0.904 270 16	0.392 103 51	1653 6693	337 5482	146 2937
	10	-0.195 743 52	-0.907 516 42	-0.393 510 51	+1659 6184	-311 6852	-135 0979
	11	0.179 119 61	0.910 503 48	0.394 805 31	1665 0818	285 7078	123 8536
	12	0.162 443 54	0.913 230 23	0.395 987 43	1670 0482	259 6258	112 5641
	13	0.145 720 34	0.915 695 69	0.397 056 46	1674 5060	233 4521	101 2340
	14	0.128 955 15	0.917 899 02	0.398 012 00	1678 4456	207 2036	89 8689
	15	0.112 153 18	0.919 839 58	0.398 853 74	1681 8616	180 8999	78 4765
	16	-0.095 319 67	-0.921 516 91	-0.399 581 46	+1684 7531	-154 5615	-67 0647
	17	0.078 459 85	0.922 930 76	0.400 195 00	1687 1248	128 2083	55 6416
	18	0.061 578 88	0.924 081 08	0.400 694 28	1688 9854	101 8568	44 2147
	19	0.044 681 81	0.924 967 95	0.401 079 30	1690 3457	75 5202	32 7900
	20	0.027 773 59	0.925 591 56	0.401 350 11	1691 2175	49 2074	21 3723
	21	-0.010 859 05	0.925 952 19	0.401 506 78	1691 6112	-22 9244	-9 9651
	22	+0.006 057 07	-0.926 050 16	-0.401 549 45	+1691 5362	+3 3245	+1 4291
	23	0.022 970 14	0.925 885 82	0.401 478 25	1691 0004	29 5369	12 8081
	24	0.039 875 56	0.925 459 55	0.401 293 35	1690 0096	55 7110	24 1704
	25	0.056 768 83	0.924 771 74	0.400 994 90	1688 5687	81 8458	35 5149
	26	0.073 645 45	0.923 822 77	0.400 583 11	1686 6811	107 9399	46 8402
	27	0.090 500 97	0.922 613 08	0.400 058 17	1684 3492	133 9925	58 1456
	28	+0.107 330 95	-0.921 143 06	-0.399 420 27	+1681 5742	+160 0024	+69 4304
	29	0.124 130 98	0.919 413 17	0.398 669 63	1678 3566	185 9684	80 6932
	30	0.140 896 61	0.917 423 85	0.397 806 48	1674 6956	211 8886	91 9334
July	1	0.157 623 41	0.915 175 56	0.396 831 04	1670 5901	237 7613	103 1499
	2	+0.174 306 92	-0.912 668 79	-0.395 743 56	+1666 0383	+263 5838	+114 3415

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

FRAME BIAS, PRECESSION AND NUTATION, 2018

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	-972	-404 304	-175 667	+404 309	-817	+2637	+175 655	-3347	-154
	18	972	404 421	175 718	404 426	818	2650	175 706	3361	154
	19	973	404 542	175 770	404 547	818	2652	175 758	3363	155
	20	973	404 652	175 818	404 658	819	2642	175 806	3354	155
	21	974	404 743	175 858	404 748	819	2626	175 846	3338	155
	22	974	404 809	175 886	404 814	819	2609	175 874	3321	155
	23	-974	-404 854	-175 906	+404 859	-820	+2595	+175 894	-3307	-155
	24	974	404 884	175 919	404 890	820	2589	175 907	3301	155
	25	975	404 910	175 930	404 915	820	2591	175 918	3303	155
	26	975	404 939	175 943	404 944	820	2602	175 931	3315	155
	27	975	404 979	175 960	404 984	820	2620	175 948	3332	155
	28	975	405 035	175 985	405 041	820	2641	175 973	3354	155
	29	-975	-405 108	-176 016	+405 114	-821	+2662	+176 004	-3375	-155
	30	976	405 196	176 054	405 201	821	2680	176 042	3393	155
	31	976	405 293	176 097	405 299	821	2692	176 084	3406	155
June	1	977	405 395	176 141	405 400	822	2697	176 129	3411	155
	2	977	405 495	176 184	405 501	822	2695	176 172	3410	155
	3	978	405 588	176 225	405 594	823	2687	176 212	3402	155
	4	-978	-405 670	-176 260	+405 675	-823	+2675	+176 248	-3390	-155
	5	979	405 738	176 290	405 743	823	2660	176 278	3375	155
	6	979	405 792	176 313	405 797	823	2646	176 301	3361	155
	7	979	405 834	176 331	405 839	824	2635	176 319	3350	155
	8	979	405 867	176 346	405 872	824	2629	176 334	3345	156
	9	979	405 898	176 359	405 903	824	2631	176 347	3347	156
	10	-979	-405 936	-176 376	+405 941	-824	+2642	+176 364	-3358	-156
	11	980	405 989	176 399	405 995	824	2659	176 387	3375	156
	12	980	406 066	176 433	406 072	825	2680	176 420	3397	156
	13	981	406 169	176 477	406 175	825	2700	176 465	3416	156
	14	981	406 294	176 532	406 300	825	2711	176 519	3428	156
	15	982	406 430	176 590	406 435	826	2711	176 578	3429	156
	16	-982	-406 560	-176 647	+406 565	-827	+2698	+176 634	-3417	-156
	17	983	406 671	176 695	406 676	827	2676	176 683	3395	156
	18	983	406 756	176 732	406 762	827	2650	176 720	3369	156
	19	984	406 816	176 758	406 821	828	2627	176 746	3346	156
	20	984	406 857	176 776	406 863	828	2610	176 764	3330	156
	21	984	406 890	176 790	406 895	828	2603	176 778	3322	156
	22	-984	-406 924	-176 805	+406 930	-828	+2605	+176 793	-3324	-156
	23	984	406 968	176 824	406 973	828	2613	176 812	3333	156
	24	985	407 026	176 849	407 031	828	2626	176 837	3346	156
	25	985	407 100	176 881	407 105	829	2640	176 869	3360	156
	26	986	407 188	176 920	407 193	829	2651	176 907	3371	157
	27	986	407 287	176 963	407 293	829	2657	176 950	3378	157
	28	-987	-407 392	-177 008	+407 397	-830	+2656	+176 996	-3377	-157
	29	987	407 496	177 053	407 501	830	2649	177 041	3370	157
	30	987	407 594	177 096	407 599	831	2634	177 084	3356	157
July	1	988	407 681	177 134	407 687	831	2615	177 122	3337	157
	2	-988	-407 755	-177 166	+407 760	-831	+2592	+177 154	-3315	-157

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018
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	+0.157 623 41	-0.915 175 56	-0.396 831 04	+1670 5901	+237 7613	+103 1499
	2	0.174 306 92	0.912 668 79	0.395 743 56	1666 0383	263 5838	114 3415
	3	0.190 942 68	0.909 904 06	0.394 544 30	1661 0375	289 3529	125 5072
	4	0.207 526 17	0.906 881 92	0.393 233 51	1655 5849	315 0655	136 6453
	5	0.224 052 86	0.903 602 95	0.391 811 49	1649 6769	340 7176	147 7545
	6	0.240 518 17	0.900 067 78	0.390 278 52	1643 3092	366 3048	158 8332
	7	+0.256 917 49	-0.896 277 09	-0.388 634 93	+1636 4767	+391 8218	+169 8796
	8	0.273 246 14	0.892 231 60	0.386 881 05	1629 1732	417 2627	180 8916
	9	0.289 499 36	0.887 932 12	0.385 017 22	1621 3914	442 6194	191 8667
	10	0.305 672 35	0.883 379 53	0.383 043 85	1613 1238	467 8812	202 8010
	11	0.321 760 19	0.878 574 85	0.380 961 35	1604 3630	493 0346	213 6901
	12	0.337 757 94	0.873 519 26	0.378 770 22	1595 1036	518 0624	224 5277
	13	+0.353 660 60	-0.868 214 09	-0.376 470 99	+1585 3445	+542 9449	+235 3064
	14	0.369 463 18	0.862 660 91	0.374 064 31	1575 0898	567 6614	246 0180
	15	0.385 160 77	0.856 861 48	0.371 550 88	1564 3491	592 1927	256 6544
	16	0.400 748 59	0.850 817 73	0.368 931 50	1553 1360	616 5236	267 2086
	17	0.416 221 97	0.844 531 71	0.366 207 01	1541 4665	640 6429	277 6750
	18	0.431 576 45	0.838 005 60	0.363 378 30	1529 3564	664 5440	288 0499
	19	+0.446 807 68	-0.831 241 57	-0.360 446 32	+1516 8197	+688 2237	+298 3307
	20	0.461 911 46	0.824 241 86	0.357 412 01	1503 8681	711 6807	308 5158
	21	0.476 883 69	0.817 008 70	0.354 276 33	1490 5113	734 9147	318 6041
	22	0.491 720 36	0.809 544 31	0.351 040 25	1476 7574	757 9256	328 5950
	23	0.506 417 54	0.801 850 93	0.347 704 75	1462 6120	780 7135	338 4879
	24	0.520 971 32	0.793 930 79	0.344 270 82	1448 0807	803 2780	348 2820
	25	+0.535 377 88	-0.785 786 12	-0.340 739 44	+1433 1679	+825 6188	+357 9768
	26	0.549 633 42	0.777 419 16	0.337 111 62	1417 8768	847 7352	367 5717
	27	0.563 734 16	0.768 832 16	0.333 388 35	1402 2101	869 6265	377 0661
	28	0.577 676 37	0.760 027 38	0.329 570 63	1386 1700	891 2914	386 4594
	29	0.591 456 32	0.751 007 09	0.325 659 50	1369 7578	912 7289	395 7509
	30	0.605 070 29	0.741 773 57	0.321 655 96	1352 9737	933 9369	404 9399
	31	+0.618 514 56	-0.732 329 13	-0.317 561 04	+1335 8179	+954 9130	+414 0254
Aug.	1	0.631 785 41	0.722 676 09	0.313 375 80	1318 2895	975 6546	423 0067
	2	0.644 879 10	0.712 816 83	0.309 101 26	1300 3872	996 1580	431 8822
	3	0.657 791 90	0.702 753 74	0.304 738 51	1282 1092	1016 4187	440 6506
	4	0.670 520 02	0.692 489 28	0.300 288 61	1263 4528	1036 4314	449 3100
	5	0.683 059 68	0.682 025 96	0.295 752 68	1244 4148	1056 1895	457 8585
	6	+0.695 407 04	-0.671 366 37	-0.291 131 82	+1224 9918	+1075 6845	+466 2932
	7	0.707 558 22	0.660 513 18	0.286 427 21	1205 1802	1094 9059	474 6104
	8	0.719 509 34	0.649 469 21	0.281 640 02	1184 9774	1113 8402	482 8054
	9	0.731 256 46	0.638 237 39	0.276 771 52	1164 3830	1132 4715	490 8726
	10	0.742 795 70	0.626 820 85	0.271 823 02	1143 4004	1150 7817	498 8049
	11	0.754 123 21	0.615 222 89	0.266 795 90	1122 0382	1168 7523	506 5949
	12	+0.765 235 25	-0.603 446 99	-0.261 691 62	+1100 3099	+1186 3666	+514 2356
	13	0.776 128 24	0.591 496 79	0.256 511 71	1078 2331	1203 6116	521 7205
	14	0.786 798 81	0.579 376 02	0.251 257 74	1055 8273	1220 4792	529 0456
	15	0.797 243 76	0.567 088 47	0.245 931 34	1033 1114	1236 9658	536 2080
	16	+0.807 460 06	-0.554 637 97	-0.240 534 13	+1010 1022	+1253 0715	+543 2065

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-988	-407 681	-177 134	+407 687	-831	+2615	+177 122	-3337	-157
	2	988	407 755	177 166	407 760	831	2592	177 154	3315	157
	3	989	407 814	177 191	407 819	832	2570	177 179	3292	157
	4	989	407 859	177 211	407 864	832	2549	177 199	3272	157
	5	989	407 894	177 226	407 899	832	2534	177 215	3257	157
	6	989	407 925	177 240	407 930	832	2526	177 228	3249	157
	7	-989	-407 958	-177 254	+407 963	-832	+2525	+177 242	-3248	-157
	8	989	408 003	177 274	408 008	832	2531	177 262	3255	157
	9	990	408 066	177 301	408 072	833	2543	177 289	3266	157
	10	990	408 154	177 339	408 159	833	2555	177 327	3279	157
	11	991	408 266	177 388	408 271	833	2563	177 376	3287	157
	12	991	408 394	177 444	408 400	834	2560	177 432	3285	157
	13	-992	-408 526	-177 501	+408 531	-835	+2545	+177 489	-3270	-158
	14	993	408 644	177 552	408 649	835	2518	177 540	3244	158
	15	993	408 737	177 592	408 742	835	2484	177 581	3210	158
	16	993	408 802	177 621	408 807	836	2450	177 609	3177	158
	17	994	408 843	177 638	408 848	836	2423	177 627	3149	158
	18	994	408 870	177 650	408 875	836	2404	177 639	3131	158
	19	-994	-408 896	-177 661	+408 901	-836	+2396	+177 650	-3123	-158
	20	994	408 928	177 676	408 933	836	2396	177 664	3123	158
	21	994	408 974	177 696	408 979	836	2402	177 684	3128	158
	22	994	409 036	177 722	409 041	837	2409	177 711	3135	158
	23	995	409 112	177 755	409 117	837	2414	177 744	3141	158
	24	995	409 199	177 793	409 204	837	2415	177 782	3142	158
	25	-996	-409 293	-177 834	+409 298	-838	+2409	+177 822	-3137	-158
	26	996	409 387	177 875	409 392	838	2397	177 863	3125	158
	27	997	409 476	177 913	409 481	838	2378	177 902	3107	158
	28	997	409 555	177 948	409 560	839	2354	177 936	3083	158
	29	997	409 620	177 976	409 625	839	2327	177 965	3056	158
	30	998	409 671	177 998	409 675	839	2298	177 987	3027	158
	31	-998	-409 706	-178 013	+409 711	-839	+2272	+178 003	-3001	-158
Aug.	1	998	409 731	178 024	409 735	839	2250	178 013	2980	158
	2	998	409 749	178 032	409 753	840	2235	178 021	2965	159
	3	998	409 767	178 040	409 772	840	2227	178 029	2957	159
	4	998	409 794	178 052	409 798	840	2227	178 041	2957	159
	5	998	409 835	178 070	409 840	840	2233	178 059	2962	159
	6	-999	-409 898	-178 097	+409 903	-840	+2240	+178 086	-2970	-159
	7	999	409 984	178 134	409 988	840	2246	178 123	2976	159
	8	1000	410 088	178 179	410 093	841	2244	178 169	2975	159
	9	1000	410 202	178 229	410 206	841	2231	178 218	2962	159
	10	1001	410 311	178 276	410 315	842	2206	178 265	2938	159
	11	1001	410 401	178 315	410 405	842	2172	178 305	2904	159
	12	-1001	-410 463	-178 342	+410 467	-842	+2134	+178 332	-2866	-159
	13	1002	410 497	178 357	410 502	843	2100	178 347	2832	159
	14	1002	410 513	178 364	410 517	843	2075	178 354	2807	159
	15	1002	410 521	178 367	410 525	843	2061	178 357	2793	159
	16	-1002	-410 534	-178 373	+410 538	-843	+2057	+178 363	-2789	-159

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018

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	+0.807 460 06	-0.554 637 97	-0.240 534 13	+1010 1022	+1253 0715	+543 2065
	17	0.817 444 87	0.542 028 31	0.235 067 76	986 8137	1268 7979	550 0408
	18	0.827 195 44	0.529 263 27	0.229 533 86	963 2574	1284 1478	556 7112
	19	0.836 709 15	0.516 346 60	0.223 934 08	939 4422	1299 1235	563 2181
	20	0.845 983 45	0.503 282 04	0.218 270 04	915 3760	1313 7270	569 5617
	21	0.855 015 86	0.490 073 29	0.212 543 39	891 0654	1327 9602	575 7425
	22	+0.863 803 96	-0.476 724 07	-0.206 755 74	+866 5163	+1341 8239	+581 7606
	23	0.872 345 41	0.463 238 04	0.200 908 72	841 7340	1355 3194	587 6162
	24	0.880 637 88	0.449 618 90	0.195 003 95	816 7233	1368 4471	593 3093
	25	0.888 679 13	0.435 870 32	0.189 043 07	791 4882	1381 2077	598 8403
	26	0.896 466 91	0.421 995 97	0.183 027 69	766 0322	1393 6016	604 2091
	27	0.903 999 04	0.407 999 51	0.176 959 43	740 3577	1405 6286	609 4161
	28	+0.911 273 34	-0.393 884 62	-0.170 839 91	+714 4666	+1417 2882	+614 4608
	29	0.918 287 66	0.379 654 98	0.164 670 75	688 3599	1428 5790	619 3434
	30	0.925 039 82	0.365 314 28	0.158 453 58	662 0378	1439 4988	624 0632
	31	0.931 527 69	0.350 866 25	0.152 190 03	635 5002	1450 0439	628 6191
Sept.	1	0.937 749 11	0.336 314 67	0.145 881 75	608 7468	1460 2097	633 0099
	2	0.943 701 91	0.321 663 34	0.139 530 39	581 7770	1469 9901	637 2337
	3	+0.949 383 93	-0.306 916 18	-0.133 137 64	+554 5906	+1479 3766	+641 2878
	4	0.954 793 00	0.292 077 16	0.126 705 21	527 1883	1488 3597	645 1689
	5	0.959 926 98	0.277 150 37	0.120 234 86	499 5721	1496 9275	648 8728
	6	0.964 783 74	0.262 140 04	0.113 728 37	471 7468	1505 0662	652 3945
	7	0.969 361 24	0.247 050 52	0.107 187 59	443 7203	1512 7612	655 7283
	8	0.973 657 52	0.231 886 34	0.100 614 44	415 5054	1519 9984	658 8685
	9	+0.977 670 78	-0.216 652 12	-0.094 010 89	+387 1186	+1526 7651	+661 8093
	10	0.981 399 39	0.201 352 63	0.087 378 94	358 5798	1533 0529	664 5463
	11	0.984 841 94	0.185 992 68	0.080 720 65	329 9103	1538 8573	667 0769
	12	0.987 997 23	0.170 577 10	0.074 038 09	301 1308	1544 1787	669 4000
	13	0.990 864 25	0.155 110 70	0.067 333 34	272 2598	1549 0206	671 5159
	14	0.993 442 17	0.139 598 27	0.060 608 46	243 3126	1553 3881	673 4258
	15	+0.995 730 29	-0.124 044 50	-0.053 865 51	+214 3017	+1557 2877	+675 1315
	16	0.997 728 03	0.108 454 06	0.047 106 51	185 2373	1560 7249	676 6350
	17	0.999 434 89	0.092 831 53	0.040 333 47	156 1279	1563 7047	677 9380
	18	1.000 850 46	0.077 181 47	0.033 548 41	126 9811	1566 2319	679 0420
	19	1.001 974 41	0.061 508 39	0.026 753 29	97 8038	1568 3101	679 9487
	20	1.002 806 46	0.045 816 75	0.019 950 09	68 6022	1569 9430	680 6593
	21	+1.003 346 39	-0.030 111 00	-0.013 140 75	+39 3824	+1571 1338	+681 1754
	22	1.003 594 06	-0.014 395 54	-0.006 327 23	+10 1498	1571 8858	681 4981
	23	1.003 549 36	+0.001 325 26	+0.000 488 57	-19 0912	1572 2021	681 6290
	24	1.003 212 22	0.017 047 06	0.007 304 72	48 3367	1572 0855	681 5695
	25	1.002 582 62	0.032 765 54	0.014 119 33	77 5840	1571 5382	681 3208
	26	1.001 660 54	0.048 476 39	0.020 930 51	106 8311	1570 5615	680 8839
	27	+1.000 446 00	+0.064 175 34	+0.027 736 38	-136 0775	+1569 1556	+680 2594
	28	0.998 939 00	0.079 858 07	0.034 535 07	165 3222	1567 3189	679 4475
	29	0.997 139 56	0.095 520 27	0.041 324 70	194 5647	1565 0481	678 4473
	30	0.995 047 72	0.111 157 57	0.048 103 39	223 8040	1562 3384	677 2580
Oct.	1	+0.992 663 50	+0.126 765 55	+0.054 869 22	-253 0375	+1559 1830	+675 8772

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-1002	-410 534	-178 373	+410 538	-843	+2057	+178 363	-2789	-159
	17	1002	410 559	178 384	410 564	843	2060	178 374	2793	159
	18	1002	410 601	178 402	410 605	843	2067	178 392	2799	159
	19	1002	410 658	178 427	410 662	843	2072	178 417	2805	159
	20	1003	410 727	178 457	410 731	844	2074	178 447	2807	159
	21	1003	410 803	178 490	410 808	844	2070	178 480	2804	159
	22	-1003	-410 881	-178 524	+410 886	-844	+2060	+178 514	-2793	-159
	23	1004	410 956	178 557	410 960	844	2043	178 547	2777	159
	24	1004	411 021	178 585	411 026	845	2020	178 575	2754	159
	25	1004	411 074	178 608	411 078	845	1994	178 598	2728	160
	26	1005	411 112	178 624	411 116	845	1967	178 615	2701	160
	27	1005	411 135	178 634	411 139	845	1941	178 625	2676	160
	28	-1005	-411 145	-178 639	+411 149	-845	+1920	+178 629	-2654	-160
	29	1005	411 147	178 640	411 152	845	1905	178 631	2639	160
	30	1005	411 149	178 641	411 153	845	1898	178 631	2632	160
	31	1005	411 157	178 644	411 161	845	1898	178 635	2633	160
Sept.	1	1005	411 178	178 654	411 183	845	1905	178 644	2639	160
	2	1005	411 219	178 671	411 223	846	1915	178 662	2650	160
	3	-1005	-411 281	-178 698	+411 285	-846	+1924	+178 689	-2659	-160
	4	1006	411 362	178 733	411 366	846	1928	178 724	2663	160
	5	1006	411 455	178 773	411 459	847	1923	178 764	2658	160
	6	1007	411 548	178 814	411 552	847	1907	178 805	2642	160
	7	1007	411 629	178 849	411 633	847	1880	178 840	2617	160
	8	1007	411 688	178 875	411 692	847	1848	178 866	2585	160
	9	-1008	-411 719	-178 888	+411 723	-848	+1817	+178 879	-2554	-160
	10	1008	411 728	178 892	411 732	848	1792	178 883	2529	160
	11	1008	411 725	178 891	411 728	848	1779	178 882	2515	160
	12	1008	411 721	178 889	411 725	848	1776	178 881	2513	160
	13	1008	411 729	178 893	411 733	848	1783	178 884	2520	160
	14	1008	411 753	178 903	411 757	848	1795	178 895	2532	160
	15	-1008	-411 795	-178 922	+411 799	-848	+1808	+178 913	-2545	-160
	16	1008	411 851	178 946	411 855	848	1818	178 937	2555	160
	17	1009	411 917	178 975	411 921	848	1823	178 966	2560	160
	18	1009	411 987	179 005	411 991	849	1821	178 996	2558	160
	19	1009	412 054	179 034	412 058	849	1812	179 025	2550	160
	20	1010	412 114	179 060	412 118	849	1798	179 051	2536	160
	21	-1010	-412 162	-179 081	+412 166	-849	+1779	+179 072	-2517	-160
	22	1010	412 196	179 096	412 200	850	1759	179 087	2497	160
	23	1010	412 215	179 104	412 219	850	1739	179 096	2478	160
	24	1010	412 221	179 107	412 225	850	1724	179 098	2462	160
	25	1010	412 218	179 106	412 222	850	1714	179 097	2453	160
	26	1010	412 213	179 103	412 217	850	1713	179 095	2451	160
	27	-1010	-412 213	-179 103	+412 217	-850	+1720	+179 095	-2458	-160
	28	1010	412 226	179 109	412 229	850	1733	179 100	2472	160
	29	1010	412 257	179 123	412 261	850	1751	179 114	2490	160
	30	1010	412 311	179 146	412 314	850	1769	179 137	2508	160
Oct.	1	-1011	-412 384	-179 178	+412 387	-850	+1783	+179 169	-2522	-161

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018
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	+0.992 663 50	+0.126 765 55	+0.054 869 22	-253 0375	+1559 1830	+675 8772
	2	0.989 987 00	0.142 339 72	0.061 620 28	282 2613	1555 5735	674 3024
	3	0.987 018 33	0.157 875 48	0.068 354 61	311 4693	1551 5008	672 5302
	4	0.983 757 69	0.173 368 16	0.075 070 22	340 6523	1546 9549	670 5569
	5	0.980 205 40	0.188 812 97	0.081 765 07	369 7983	1541 9262	668 3787
	6	0.976 361 90	0.204 205 04	0.088 437 09	398 8919	1536 4063	665 9916
	7	+0.972 227 80	+0.219 539 43	+0.095 084 19	-427 9148	+1530 3888	+663 3929
	8	0.967 803 91	0.234 811 15	0.101 704 24	456 8463	1523 8708	660 5806
	9	0.963 091 25	0.250 015 19	0.108 295 09	485 6656	1516 8537	657 5540
	10	0.958 091 04	0.265 146 57	0.114 854 61	514 3525	1509 3419	654 3139
	11	0.952 804 70	0.280 200 40	0.121 380 67	542 8889	1501 3428	650 8628
	12	0.947 233 82	0.295 171 84	0.127 871 17	571 2597	1492 8661	647 2036
	13	+0.941 380 10	+0.310 056 16	+0.134 324 06	-599 4523	+1483 9215	+643 3398
	14	0.935 245 40	0.324 848 74	0.140 737 30	627 4570	1474 5187	639 2752
	15	0.928 831 62	0.339 545 04	0.147 108 90	655 2655	1464 6666	635 0131
	16	0.922 140 76	0.354 140 60	0.153 436 91	682 8707	1454 3733	630 5568
	17	0.915 174 90	0.368 631 06	0.159 719 40	710 2663	1443 6463	625 9097
	18	0.907 936 16	0.383 012 11	0.165 954 48	737 4462	1432 4928	621 0747
	19	+0.900 426 71	+0.397 279 51	+0.172 140 28	-764 4049	+1420 9193	+616 0546
	20	0.892 648 81	0.411 429 12	0.178 274 96	791 1374	1408 9328	610 8526
	21	0.884 604 74	0.425 456 82	0.184 356 73	817 6394	1396 5397	605 4715
	22	0.876 296 80	0.439 358 58	0.190 383 81	843 9075	1383 7464	599 9144
	23	0.867 727 37	0.453 130 43	0.196 354 45	869 9397	1370 5587	594 1844
	24	0.858 898 80	0.466 768 45	0.202 266 93	895 7351	1356 9815	588 2838
	25	+0.849 813 46	+0.480 268 77	+0.208 119 56	-921 2935	+1343 0181	+582 2148
	26	0.840 473 72	0.493 627 53	0.213 910 67	946 6156	1328 6696	575 9790
	27	0.830 881 93	0.506 840 88	0.219 638 59	971 7016	1313 9354	569 5768
	28	0.821 040 48	0.519 904 94	0.225 301 65	996 5505	1298 8122	563 0078
	29	0.810 951 72	0.532 815 81	0.230 898 18	1021 1593	1283 2951	556 2710
	30	0.800 618 11	0.545 569 51	0.236 426 50	1045 5222	1267 3783	549 3642
	31	+0.790 042 13	+0.558 162 02	+0.241 884 89	-1069 6305	+1251 0557	+542 2857
Nov.	1	0.779 226 39	0.570 589 26	0.247 271 63	1093 4729	1234 3222	535 0331
	2	0.768 173 61	0.582 847 08	0.252 584 97	1117 0349	1217 1737	527 6048
	3	0.756 886 68	0.594 931 34	0.257 823 14	1140 3002	1199 6084	519 9996
	4	0.745 368 65	0.606 837 86	0.262 984 37	1163 2510	1181 6275	512 2174
	5	0.733 622 77	0.618 562 52	0.268 066 90	1185 8687	1163 2347	504 2589
	6	+0.721 652 45	+0.630 101 21	+0.273 068 97	-1208 1349	+1144 4367	+496 1260
	7	0.709 461 30	0.641 449 93	0.277 988 85	1230 0330	1125 2436	487 8221
	8	0.697 053 07	0.652 604 80	0.282 824 85	1251 5478	1105 6667	479 3511
	9	0.684 431 66	0.663 562 03	0.287 575 33	1272 6667	1085 7191	470 7180
	10	0.671 601 08	0.674 317 99	0.292 238 69	1293 3802	1065 4147	461 9279
	11	0.658 565 43	0.684 869 18	0.296 813 39	1313 6805	1044 7665	452 9863
	12	+0.645 328 87	+0.695 212 22	+0.301 297 93	-1333 5616	+1023 7873	+443 8982
	13	0.631 895 61	0.705 343 86	0.305 690 88	1353 0190	1002 4890	434 6686
	14	0.618 269 92	0.715 260 97	0.309 990 85	1372 0488	980 8826	425 3026
	15	0.604 456 07	0.724 960 52	0.314 196 49	1390 6476	958 9788	415 8047
	16	+0.590 458 41	+0.734 439 59	+0.318 306 52	-1408 8128	+936 7878	+406 1794

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-1011	-412 384	-179 178	+412 387	-850	+1783	+179 169	-2522	-161
	2	1011	412 470	179 215	412 474	851	1788	179 206	2527	161
	3	1012	412 559	179 254	412 563	851	1784	179 245	2523	161
	4	1012	412 640	179 289	412 644	851	1769	179 280	2509	161
	5	1012	412 703	179 316	412 707	852	1748	179 308	2488	161
	6	1013	412 742	179 333	412 746	852	1725	179 325	2465	161
	7	-1013	-412 758	-179 340	+412 762	-852	+1706	+179 332	-2446	-161
	8	1013	412 759	179 341	412 762	852	1697	179 332	2437	161
	9	1013	412 755	179 339	412 759	852	1698	179 331	2439	161
	10	1013	412 759	179 341	412 763	852	1711	179 332	2451	161
	11	1013	412 779	179 350	412 783	852	1730	179 341	2470	161
	12	1013	412 818	179 367	412 822	852	1752	179 358	2492	161
	13	-1013	-412 875	-179 391	+412 879	-852	+1772	+179 383	-2513	-161
	14	1014	412 945	179 422	412 948	853	1788	179 413	2528	161
	15	1014	413 021	179 455	413 024	853	1796	179 446	2538	161
	16	1014	413 097	179 488	413 100	853	1798	179 479	2539	161
	17	1015	413 167	179 518	413 171	854	1793	179 509	2535	161
	18	1015	413 226	179 544	413 230	854	1784	179 535	2526	161
	19	-1015	-413 273	-179 564	+413 277	-854	+1771	+179 555	-2514	-161
	20	1015	413 305	179 578	413 309	854	1759	179 569	2501	161
	21	1015	413 324	179 586	413 327	854	1749	179 578	2492	161
	22	1015	413 332	179 590	413 336	854	1745	179 581	2487	161
	23	1016	413 336	179 592	413 340	854	1748	179 583	2491	161
	24	1016	413 344	179 595	413 348	854	1760	179 587	2502	161
	25	-1016	-413 363	-179 604	+413 367	-854	+1779	+179 595	-2522	-161
	26	1016	413 401	179 620	413 405	855	1804	179 611	2547	161
	27	1016	413 462	179 647	413 466	855	1830	179 638	2573	161
	28	1017	413 545	179 683	413 549	855	1852	179 674	2595	161
	29	1017	413 644	179 726	413 648	856	1866	179 716	2610	162
	30	1018	413 748	179 771	413 752	856	1870	179 762	2614	162
	31	-1018	-413 846	-179 813	+413 850	-856	+1863	+179 804	-2608	-162
Nov.	1	1018	413 927	179 849	413 931	857	1849	179 839	2594	162
	2	1019	413 986	179 874	413 990	857	1832	179 865	2577	162
	3	1019	414 022	179 890	414 026	857	1818	179 881	2563	162
	4	1019	414 042	179 899	414 046	857	1811	179 890	2556	162
	5	1019	414 054	179 904	414 058	857	1814	179 895	2559	162
	6	-1019	-414 071	-179 911	+414 075	-857	+1827	+179 902	-2572	-162
	7	1019	414 101	179 924	414 105	857	1849	179 915	2594	162
	8	1020	414 149	179 945	414 153	858	1874	179 936	2620	162
	9	1020	414 217	179 975	414 221	858	1900	179 965	2645	162
	10	1020	414 301	180 011	414 305	858	1921	180 002	2667	162
	11	1021	414 394	180 052	414 399	859	1936	180 042	2682	162
	12	-1021	-414 491	-180 094	+414 495	-859	+1943	+180 084	-2690	-162
	13	1022	414 583	180 134	414 587	859	1943	180 124	2690	162
	14	1022	414 666	180 170	414 670	860	1937	180 160	2684	162
	15	1022	414 737	180 200	414 741	860	1928	180 191	2675	162
	16	-1023	-414 793	-180 225	+414 797	-860	+1917	+180 215	-2664	-162

Values are in units of 10^{-8}

POSITION AND VELOCITY OF THE EARTH, 2018
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	+0.590 458 41	+0.734 439 59	+0.318 306 52	-1408 8128	+936 7878	+406 1794
	17	0.576 281 27	0.743 695 35	0.322 319 67	1426 5420	914 3196	396 4311
	18	0.561 929 03	0.752 725 09	0.326 234 74	1443 8334	891 5839	386 5644
	19	0.547 406 07	0.761 526 17	0.330 050 58	1460 6864	868 5906	376 5839
	20	0.532 716 76	0.770 096 07	0.333 766 06	1477 1017	845 3487	366 4938
	21	0.517 865 48	0.778 432 35	0.337 380 10	1493 0813	821 8660	356 2983
	22	+0.502 856 58	+0.786 532 62	+0.340 891 68	-1508 6284	+798 1494	+346 0010
	23	0.487 694 35	0.794 394 57	0.344 299 79	1523 7466	774 2027	335 6047
	24	0.472 383 06	0.802 015 91	0.347 603 45	1538 4395	750 0269	325 1107
	25	0.456 926 97	0.809 394 34	0.350 801 68	1552 7089	725 6211	314 5197
	26	0.441 330 30	0.816 527 55	0.353 893 52	1566 5536	700 9816	303 8312
	27	0.425 597 33	0.823 413 18	0.356 877 98	1579 9685	676 1044	293 0438
	28	+0.409 732 39	+0.830 048 84	+0.359 754 06	-1592 9451	+650 9866	+282 1565
	29	0.393 739 92	0.836 432 10	0.362 520 77	1605 4718	625 6268	271 1687
	30	0.377 624 50	0.842 560 57	0.365 177 10	1617 5347	600 0265	260 0804
Dec.	1	0.361 390 83	0.848 431 85	0.367 722 05	1629 1190	574 1903	248 8930
	2	0.345 043 76	0.854 043 61	0.370 154 64	1640 2100	548 1253	237 6087
	3	0.328 588 32	0.859 393 62	0.372 473 91	1650 7937	521 8416	226 2308
	4	+0.312 029 62	+0.864 479 75	+0.374 678 96	-1660 8570	+495 3510	+214 7637
	5	0.295 372 95	0.869 300 00	0.376 768 90	1670 3892	468 6671	203 2122
	6	0.278 623 64	0.873 852 50	0.378 742 94	1679 3810	441 8052	191 5821
	7	0.261 787 15	0.878 135 56	0.380 600 31	1687 8254	414 7806	179 8796
	8	0.244 868 98	0.882 147 62	0.382 340 31	1695 7175	387 6091	168 1106
	9	0.227 874 65	0.885 887 31	0.383 962 32	1703 0543	360 3065	156 2821
	10	+0.210 809 74	+0.889 353 37	+0.385 465 77	-1709 8348	+332 8877	+144 4001
	11	0.193 679 81	0.892 544 72	0.386 850 16	1716 0587	305 3668	132 4706
	12	0.176 490 42	0.895 460 41	0.388 115 05	1721 7269	277 7572	120 4996
	13	0.159 247 12	0.898 099 61	0.389 260 04	1726 8413	250 0718	108 4928
	14	0.141 955 44	0.900 461 63	0.390 284 80	1731 4036	222 3225	96 4555
	15	0.124 620 88	0.902 545 89	0.391 189 06	1735 4165	194 5212	84 3932
	16	+0.107 248 93	+0.904 351 92	+0.391 972 60	-1738 8833	+166 6794	+72 3111
	17	0.089 845 02	0.905 879 38	0.392 635 23	1741 8083	138 8080	60 2144
	18	0.072 414 55	0.907 128 02	0.393 176 85	1744 1966	110 9176	48 1082
	19	0.054 962 86	0.908 097 70	0.393 597 38	1746 0550	83 0177	35 9971
	20	0.037 495 19	0.908 788 36	0.393 896 79	1747 3913	55 1157	23 8856
	21	0.020 016 74	0.909 200 02	0.394 075 10	1748 2141	+27 2170	+11 7766
	22	+0.002 532 60	+0.909 332 72	+0.394 132 34	-1748 5318	-0 6763	-0 3277
	23	-0.014 952 23	0.909 186 51	0.394 068 57	1748 3508	28 5654	12 4267
	24	0.032 432 77	0.908 761 42	0.393 883 82	1747 6737	56 4533	24 5209
	25	0.049 904 05	0.908 057 44	0.393 578 16	1746 4992	84 3437	36 6113
	26	0.067 361 07	0.907 074 53	0.393 151 61	1744 8207	112 2391	48 6991
	27	0.084 798 75	0.905 812 64	0.392 604 19	1742 6286	140 1388	60 7844
	28	-0.102 211 90	+0.904 271 75	+0.391 935 93	-1739 9119	-168 0380	-72 8660
	29	0.119 595 20	0.902 451 91	0.391 146 89	1736 6590	195 9284	84 9414
	30	0.136 943 26	0.900 353 25	0.390 237 14	1732 8601	223 7987	97 0066
	31	0.154 250 56	0.897 976 05	0.389 206 80	1728 5075	251 6356	109 0569
	32	-0.171 511 54	+0.895 320 70	+0.388 056 06	-1723 5952	-279 4242	-121 0869

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

FRAME BIAS, PRECESSION AND NUTATION, 2018
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	-1023	-414 793	-180 225	+414 797	-860	+1917	+180 215	-2664	-162
	17	1023	414 835	180 243	414 839	860	1907	180 234	2655	162
	18	1023	414 866	180 257	414 870	861	1902	180 247	2649	162
	19	1023	414 890	180 267	414 895	861	1903	180 258	2651	162
	20	1023	414 915	180 278	414 919	861	1911	180 269	2659	163
	21	1023	414 948	180 292	414 952	861	1928	180 283	2676	163
	22	-1024	-414 998	-180 314	+415 002	-861	+1952	+180 304	-2700	-163
	23	1024	415 071	180 346	415 075	861	1978	180 336	2726	163
	24	1025	415 169	180 388	415 173	862	2002	180 378	2751	163
	25	1025	415 287	180 439	415 291	862	2018	180 429	2768	163
	26	1026	415 414	180 495	415 418	863	2024	180 485	2774	163
	27	1026	415 538	180 548	415 542	863	2018	180 538	2768	163
	28	-1027	-415 645	-180 595	+415 650	-864	+2002	+180 585	-2753	-163
	29	1027	415 730	180 632	415 734	864	1983	180 622	2734	163
	30	1028	415 790	180 658	415 795	864	1964	180 648	2715	163
Dec.	1	1028	415 832	180 676	415 836	865	1952	180 666	2703	163
	2	1028	415 863	180 690	415 867	865	1949	180 680	2701	163
	3	1028	415 896	180 704	415 900	865	1956	180 694	2708	163
	4	-1028	-415 939	-180 723	+415 943	-865	+1972	+180 713	-2723	-163
	5	1029	415 998	180 748	416 002	865	1992	180 739	2744	163
	6	1029	416 076	180 782	416 081	866	2013	180 772	2765	163
	7	1029	416 172	180 824	416 176	866	2031	180 814	2784	164
	8	1030	416 279	180 870	416 283	866	2044	180 860	2796	164
	9	1031	416 392	180 919	416 396	867	2048	180 909	2802	164
	10	-1031	-416 502	-180 967	+416 506	-867	+2045	+180 957	-2799	-164
	11	1032	416 605	181 012	416 609	868	2035	181 002	2789	164
	12	1032	416 695	181 051	416 699	868	2020	181 041	2775	164
	13	1032	416 771	181 084	416 775	869	2003	181 074	2758	164
	14	1033	416 831	181 110	416 836	869	1986	181 100	2741	164
	15	1033	416 880	181 131	416 884	869	1973	181 121	2728	164
	16	-1033	-416 919	-181 148	+416 923	-869	+1964	+181 138	-2719	-164
	17	1033	416 955	181 164	416 959	869	1962	181 154	2718	164
	18	1034	416 996	181 182	417 000	869	1968	181 172	2724	164
	19	1034	417 049	181 205	417 053	870	1981	181 195	2737	164
	20	1034	417 122	181 237	417 126	870	1999	181 227	2755	164
	21	1035	417 220	181 279	417 224	870	2016	181 269	2773	164
	22	-1035	-417 341	-181 332	+417 345	-871	+2029	+181 322	-2786	-164
	23	1036	417 478	181 391	417 483	871	2031	181 381	2788	165
	24	1037	417 618	181 452	417 622	872	2021	181 442	2778	165
	25	1037	417 745	181 507	417 749	873	1999	181 497	2757	165
	26	1038	417 848	181 552	417 852	873	1969	181 542	2728	165
	27	1038	417 923	181 584	417 927	873	1940	181 575	2699	165
	28	-1038	-417 975	-181 607	+417 979	-874	+1915	+181 597	-2675	-165
	29	1039	418 013	181 623	418 017	874	1901	181 614	2660	165
	30	1039	418 049	181 639	418 053	874	1896	181 629	2656	165
	31	1039	418 092	181 658	418 096	874	1901	181 648	2660	165
	32	-1039	-418 150	-181 683	+418 154	-874	+1911	+181 673	-2670	-165

Values are in units of 10^{-8}

APPARENT PLACES OF POLARIS, 2018

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris									Mag. 2.02										Sp. F8v					
	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	2	55	37	+89	20	33	2	54	45	+89	20	38	2	53	52	+89	20	36	2	53	08	+89	20	30
2	2	55	36	+89	20	33	2	54	42	+89	20	38	2	53	50	+89	20	36	2	53	07	+89	20	30
3	2	55	35	+89	20	33	2	54	40	+89	20	38	2	53	48	+89	20	36	2	53	06	+89	20	29
4	2	55	33	+89	20	34	2	54	38	+89	20	38	2	53	46	+89	20	36	2	53	05	+89	20	29
5	2	55	32	+89	20	34	2	54	36	+89	20	38	2	53	44	+89	20	36	2	53	05	+89	20	29
6	2	55	30	+89	20	34	2	54	34	+89	20	38	2	53	43	+89	20	36	2	53	04	+89	20	28
7	2	55	28	+89	20	34	2	54	32	+89	20	38	2	53	41	+89	20	35	2	53	03	+89	20	28
8	2	55	26	+89	20	35	2	54	30	+89	20	38	2	53	40	+89	20	35	2	53	03	+89	20	28
9	2	55	25	+89	20	35	2	54	29	+89	20	38	2	53	38	+89	20	35	2	53	02	+89	20	28
10	2	55	23	+89	20	35	2	54	27	+89	20	38	2	53	37	+89	20	35	2	53	01	+89	20	27
11	2	55	22	+89	20	35	2	54	25	+89	20	38	2	53	35	+89	20	35	2	53	00	+89	20	27
12	2	55	20	+89	20	35	2	54	23	+89	20	38	2	53	34	+89	20	35	2	52	60	+89	20	27
13	2	55	19	+89	20	35	2	54	21	+89	20	38	2	53	32	+89	20	34	2	52	59	+89	20	27
14	2	55	17	+89	20	36	2	54	20	+89	20	38	2	53	31	+89	20	34	2	52	58	+89	20	26
15	2	55	16	+89	20	36	2	54	17	+89	20	38	2	53	29	+89	20	34	2	52	57	+89	20	26
16	2	55	14	+89	20	36	2	54	15	+89	20	38	2	53	27	+89	20	34	2	52	57	+89	20	26
17	2	55	12	+89	20	36	2	54	13	+89	20	38	2	53	26	+89	20	34	2	52	56	+89	20	25
18	2	55	10	+89	20	36	2	54	11	+89	20	37	2	53	24	+89	20	33	2	52	56	+89	20	25
19	2	55	08	+89	20	36	2	54	09	+89	20	37	2	53	23	+89	20	33	2	52	56	+89	20	25
20	2	55	06	+89	20	37	2	54	07	+89	20	37	2	53	21	+89	20	33	2	52	56	+89	20	24
21	2	55	04	+89	20	37	2	54	05	+89	20	37	2	53	20	+89	20	33	2	52	56	+89	20	24
22	2	55	02	+89	20	37	2	54	04	+89	20	37	2	53	19	+89	20	32	2	52	56	+89	20	24
23	2	55	00	+89	20	37	2	54	02	+89	20	37	2	53	18	+89	20	32	2	52	56	+89	20	23
24	2	54	58	+89	20	37	2	54	00	+89	20	37	2	53	17	+89	20	32	2	52	55	+89	20	23
25	2	54	57	+89	20	37	2	53	59	+89	20	37	2	53	16	+89	20	32	2	52	55	+89	20	23
26	2	54	55	+89	20	37	2	53	57	+89	20	37	2	53	15	+89	20	31	2	52	55	+89	20	23
27	2	54	53	+89	20	37	2	53	55	+89	20	37	2	53	14	+89	20	31	2	52	54	+89	20	22
28	2	54	52	+89	20	37	2	53	54	+89	20	37	2	53	13	+89	20	31	2	52	54	+89	20	22
29	2	54	50	+89	20	37							2	53	11	+89	20	31	2	52	54	+89	20	22
30	2	54	48	+89	20	37							2	53	10	+89	20	31	2	52	54	+89	20	21
31	2	54	47	+89	20	37							2	53	09	+89	20	30						

APPARENT PLACES OF POLARIS, 2018

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02								Sp. F8v				
	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	52	54	+89	20	21	2	53	13	+89	20	12	2	53	56	+89	20	07	2	54	54	+89	20	06
2	2	52	55	+89	20	21	2	53	15	+89	20	12	2	53	58	+89	20	07	2	54	56	+89	20	06
3	2	52	55	+89	20	20	2	53	16	+89	20	12	2	53	59	+89	20	07	2	54	58	+89	20	06
4	2	52	55	+89	20	20	2	53	17	+89	20	12	2	54	01	+89	20	06	2	54	60	+89	20	06
5	2	52	56	+89	20	20	2	53	18	+89	20	11	2	54	03	+89	20	06	2	55	02	+89	20	06
6	2	52	56	+89	20	19	2	53	19	+89	20	11	2	54	04	+89	20	06	2	55	04	+89	20	06
7	2	52	56	+89	20	19	2	53	20	+89	20	11	2	54	06	+89	20	06	2	55	06	+89	20	06
8	2	52	56	+89	20	19	2	53	21	+89	20	11	2	54	08	+89	20	06	2	55	09	+89	20	06
9	2	52	56	+89	20	19	2	53	22	+89	20	10	2	54	10	+89	20	06	2	55	11	+89	20	06
10	2	52	57	+89	20	18	2	53	23	+89	20	10	2	54	12	+89	20	06	2	55	13	+89	20	06
11	2	52	57	+89	20	18	2	53	25	+89	20	10	2	54	14	+89	20	06	2	55	15	+89	20	06
12	2	52	57	+89	20	18	2	53	26	+89	20	10	2	54	16	+89	20	06	2	55	17	+89	20	06
13	2	52	57	+89	20	17	2	53	28	+89	20	09	2	54	18	+89	20	06	2	55	18	+89	20	07
14	2	52	58	+89	20	17	2	53	29	+89	20	09	2	54	20	+89	20	06	2	55	20	+89	20	07
15	2	52	59	+89	20	17	2	53	31	+89	20	09	2	54	22	+89	20	06	2	55	22	+89	20	07
16	2	52	59	+89	20	16	2	53	33	+89	20	09	2	54	23	+89	20	06	2	55	24	+89	20	07
17	2	53	00	+89	20	16	2	53	34	+89	20	09	2	54	25	+89	20	06	2	55	26	+89	20	07
18	2	53	01	+89	20	16	2	53	35	+89	20	09	2	54	27	+89	20	06	2	55	28	+89	20	07
19	2	53	02	+89	20	16	2	53	37	+89	20	09	2	54	29	+89	20	06	2	55	30	+89	20	07
20	2	53	03	+89	20	15	2	53	38	+89	20	08	2	54	31	+89	20	06	2	55	32	+89	20	07
21	2	53	04	+89	20	15	2	53	39	+89	20	08	2	54	33	+89	20	05	2	55	34	+89	20	07
22	2	53	04	+89	20	15	2	53	41	+89	20	08	2	54	35	+89	20	05	2	55	36	+89	20	08
23	2	53	05	+89	20	15	2	53	42	+89	20	08	2	54	37	+89	20	05	2	55	38	+89	20	08
24	2	53	05	+89	20	14	2	53	44	+89	20	08	2	54	39	+89	20	05	2	55	40	+89	20	08
25	2	53	06	+89	20	14	2	53	46	+89	20	07	2	54	41	+89	20	05	2	55	42	+89	20	08
26	2	53	07	+89	20	14	2	53	48	+89	20	07	2	54	43	+89	20	05	2	55	44	+89	20	08
27	2	53	08	+89	20	13	2	53	49	+89	20	07	2	54	45	+89	20	05	2	55	45	+89	20	09
28	2	53	09	+89	20	13	2	53	51	+89	20	07	2	54	47	+89	20	06	2	55	47	+89	20	09
29	2	53	10	+89	20	13	2	53	53	+89	20	07	2	54	49	+89	20	06	2	55	49	+89	20	09
30	2	53	11	+89	20	13	2	53	55	+89	20	07	2	54	51	+89	20	06	2	55	50	+89	20	09
31	2	53	12	+89	20	12							2	54	52	+89	20	06	2	55	52	+89	20	09

APPARENT PLACES OF POLARIS, 2018

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02									Sp. F8v			
	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	2	55	54	+89	20	09	2	56	43	+89	20	17	2	57	14	+89	20	28	2	57	15	+89	20	39
2	2	55	56	+89	20	09	2	56	45	+89	20	17	2	57	14	+89	20	28	2	57	14	+89	20	39
3	2	55	58	+89	20	10	2	56	47	+89	20	18	2	57	15	+89	20	28	2	57	14	+89	20	39
4	2	56	00	+89	20	10	2	56	48	+89	20	18	2	57	15	+89	20	29	2	57	13	+89	20	40
5	2	56	02	+89	20	10	2	56	49	+89	20	18	2	57	15	+89	20	29	2	57	13	+89	20	40
6	2	56	04	+89	20	10	2	56	50	+89	20	19	2	57	15	+89	20	29	2	57	12	+89	20	40
7	2	56	06	+89	20	11	2	56	51	+89	20	19	2	57	16	+89	20	30	2	57	12	+89	20	41
8	2	56	08	+89	20	11	2	56	52	+89	20	19	2	57	16	+89	20	30	2	57	11	+89	20	41
9	2	56	09	+89	20	11	2	56	53	+89	20	20	2	57	17	+89	20	30	2	57	11	+89	20	41
10	2	56	11	+89	20	11	2	56	54	+89	20	20	2	57	17	+89	20	31	2	57	10	+89	20	42
11	2	56	12	+89	20	12	2	56	56	+89	20	20	2	57	18	+89	20	31	2	57	09	+89	20	42
12	2	56	14	+89	20	12	2	56	57	+89	20	20	2	57	18	+89	20	32	2	57	09	+89	20	42
13	2	56	16	+89	20	12	2	56	58	+89	20	21	2	57	18	+89	20	32	2	57	08	+89	20	43
14	2	56	17	+89	20	12	2	56	59	+89	20	21	2	57	18	+89	20	32	2	57	07	+89	20	43
15	2	56	19	+89	20	12	2	57	01	+89	20	21	2	57	18	+89	20	33	2	57	05	+89	20	43
16	2	56	21	+89	20	13	2	57	02	+89	20	22	2	57	18	+89	20	33	2	57	04	+89	20	44
17	2	56	23	+89	20	13	2	57	03	+89	20	22	2	57	18	+89	20	34	2	57	03	+89	20	44
18	2	56	25	+89	20	13	2	57	04	+89	20	23	2	57	18	+89	20	34	2	57	02	+89	20	44
19	2	56	26	+89	20	13	2	57	04	+89	20	23	2	57	18	+89	20	34	2	57	01	+89	20	44
20	2	56	28	+89	20	14	2	57	05	+89	20	23	2	57	17	+89	20	35	2	57	00	+89	20	45
21	2	56	29	+89	20	14	2	57	06	+89	20	24	2	57	17	+89	20	35	2	56	59	+89	20	45
22	2	56	31	+89	20	14	2	57	06	+89	20	24	2	57	17	+89	20	35	2	56	58	+89	20	45
23	2	56	32	+89	20	15	2	57	07	+89	20	24	2	57	17	+89	20	36	2	56	58	+89	20	46
24	2	56	33	+89	20	15	2	57	08	+89	20	25	2	57	17	+89	20	36	2	56	57	+89	20	46
25	2	56	35	+89	20	15	2	57	08	+89	20	25	2	57	17	+89	20	36	2	56	55	+89	20	46
26	2	56	36	+89	20	15	2	57	09	+89	20	25	2	57	17	+89	20	37	2	56	54	+89	20	47
27	2	56	37	+89	20	16	2	57	10	+89	20	26	2	57	17	+89	20	37	2	56	53	+89	20	47
28	2	56	39	+89	20	16	2	57	11	+89	20	26	2	57	17	+89	20	38	2	56	51	+89	20	47
29	2	56	40	+89	20	16	2	57	12	+89	20	26	2	57	16	+89	20	38	2	56	50	+89	20	47
30	2	56	42	+89	20	17	2	57	13	+89	20	27	2	57	16	+89	20	38	2	56	48	+89	20	48
31							2	57	14	+89	20	27							2	56	47	+89	20	48
32																			2	56	45	+89	20	48

POLARIS TABLE, 2018

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	-28.5	+27.7	-34.7	+19.3	-38.5	+9.5	-39.6	-0.9	-38.0	-11.2	-33.8	-20.8
3	28.8	27.3	34.9	18.8	38.6	9.0	39.6	1.4	37.9	11.7	33.5	21.2
6	29.2	26.9	35.2	18.4	38.7	8.5	39.6	1.9	37.7	12.2	33.2	21.7
9	29.5	26.5	35.4	17.9	38.8	8.0	39.5	2.5	37.5	12.7	32.9	22.1
12	29.9	26.1	35.6	17.4	38.9	7.5	39.5	3.0	37.4	13.2	32.7	22.5
15	-30.2	+25.7	-35.8	+16.9	-39.0	+7.0	-39.5	-3.5	-37.2	-13.7	-32.4	-23.0
18	30.6	25.3	36.1	16.5	39.1	6.5	39.4	4.0	37.0	14.2	32.1	23.4
21	30.9	24.9	36.3	16.0	39.2	5.9	39.4	4.5	36.8	14.7	31.7	23.8
24	31.2	24.5	36.5	15.5	39.2	5.4	39.3	5.1	36.6	15.2	31.4	24.2
27	31.5	24.1	36.7	15.0	39.3	4.9	39.2	5.6	36.4	15.7	31.1	24.6
30	-31.8	+23.7	-36.9	+14.5	-39.4	+4.4	-39.1	-6.1	-36.2	-16.2	-30.8	-25.1
33	32.2	23.3	37.1	14.1	39.4	3.8	39.1	6.6	36.0	16.6	30.5	25.5
36	32.5	22.8	37.2	13.6	39.5	3.3	39.0	7.1	35.8	17.1	30.1	25.9
39	32.8	22.4	37.4	13.1	39.5	2.8	38.9	7.7	35.5	17.6	29.8	26.3
42	33.0	22.0	37.6	12.6	39.5	2.3	38.8	8.2	35.3	18.0	29.4	26.6
45	-33.3	+21.5	-37.8	+12.1	-39.6	+1.8	-38.7	-8.7	-35.1	-18.5	-29.1	-27.0
48	33.6	21.1	37.9	11.6	39.6	1.2	38.5	9.2	34.8	19.0	28.7	27.4
51	33.9	20.6	38.1	11.1	39.6	0.7	38.4	9.7	34.6	19.4	28.4	27.8
54	34.1	20.2	38.2	10.6	39.6	+0.2	38.3	10.2	34.3	19.9	28.0	28.2
57	34.4	19.7	38.3	10.0	39.6	-0.3	38.1	10.7	34.1	20.3	27.6	28.5
60	-34.7	+19.3	-38.5	+9.5	-39.6	-0.9	-38.0	-11.2	-33.8	-20.8	-27.2	-28.9
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	-.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	-.1	+.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	+.2	.0	+.1	.0	+.1	.0	.0	.0	-.1	.0	-.1
64	+.1	+.2	.0	+.2	.0	+.1	.0	.0	.0	-.1	+.1	-.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.	+.2	-.1	+.2	-.1	+.2	.0	+.2	.0	+.2	+.1	+.2	+.1
Feb.	+.1	-.2	+.1	-.2	+.2	-.2	+.2	-.1	+.3	-.1	+.3	.0
Mar.	-.1	-.3	.0	-.3	+.1	-.3	+.2	-.3	+.2	-.2	+.3	-.1
Apr.	-.2	-.3	-.1	-.3	.0	-.3	.0	-.3	+.1	-.3	+.2	-.3
May	-.3	-.2	-.3	-.2	-.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	+.1	+.3	+.1	+.3	.0	+.3	-.1	+.3	-.2	+.3
Nov.	+.4	+.2	+.3	+.3	+.2	+.3	+.1	+.4	.0	+.4	-.1	+.4
Dec.	+.5	.0	+.5	+.2	+.4	+.3	+.3	+.4	+.2	+.4	+.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, 2018

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	-27.2	-28.9	-18.8	-35.0	-9.2	-38.6	+1.1	-39.6	+11.3	-37.9	+20.7	-33.6
3	26.9	29.2	18.4	35.2	8.7	38.7	1.7	39.6	11.8	37.7	21.2	33.3
6	26.5	29.6	17.9	35.4	8.1	38.8	2.2	39.5	12.3	37.6	21.6	33.1
9	26.1	29.9	17.5	35.7	7.6	38.9	2.7	39.5	12.8	37.4	22.1	32.8
12	25.7	30.3	17.0	35.9	7.1	39.0	3.2	39.5	13.3	37.2	22.5	32.5
15	-25.3	-30.6	-16.5	-36.1	-6.6	-39.1	+3.7	-39.4	+13.8	-37.0	+22.9	-32.2
18	24.9	30.9	16.0	36.3	6.1	39.2	4.2	39.4	14.3	36.9	23.3	31.9
21	24.5	31.3	15.6	36.5	5.6	39.3	4.8	39.3	14.8	36.7	23.7	31.6
24	24.1	31.6	15.1	36.7	5.1	39.3	5.3	39.2	15.2	36.5	24.1	31.3
27	23.7	31.9	14.6	36.9	4.6	39.4	5.8	39.1	15.7	36.3	24.6	30.9
30	-23.2	-32.2	-14.1	-37.1	-4.0	-39.4	+6.3	-39.1	+16.2	-36.1	+25.0	-30.6
33	22.8	32.5	13.6	37.3	3.5	39.5	6.8	39.0	16.7	35.8	25.4	30.3
36	22.4	32.8	13.1	37.5	3.0	39.5	7.3	38.9	17.1	35.6	25.8	30.0
39	22.0	33.1	12.7	37.6	2.5	39.6	7.8	38.8	17.6	35.4	26.1	29.6
42	21.5	33.4	12.2	37.8	2.0	39.6	8.3	38.7	18.0	35.2	26.5	29.3
45	-21.1	-33.7	-11.7	-37.9	-1.5	-39.6	+8.8	-38.6	+18.5	-34.9	+26.9	-28.9
48	20.6	33.9	11.2	38.1	0.9	39.6	9.3	38.4	19.0	34.7	27.3	28.6
51	20.2	34.2	10.7	38.2	-0.4	39.6	9.8	38.3	19.4	34.4	27.7	28.2
54	19.8	34.5	10.2	38.4	+0.1	39.6	10.3	38.2	19.9	34.2	28.0	27.9
57	19.3	34.7	9.7	38.5	0.6	39.6	10.8	38.0	20.3	33.9	28.4	27.5
60	-18.8	-35.0	-9.2	-38.6	+1.1	-39.6	+11.3	-37.9	+20.7	-33.6	+28.7	-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	-.2	+.2	-.3	+.1	-.3	.0	-.3	-.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	+.1	.0	+.1	.0	.0	.0	.0	.0
60	+.1	-.1	+.1	-.1	+.1	-.1	+.1	.0	+.1	+.1	+.1	+.1
62	+.1	-.2	+.1	-.1	+.1	-.1	+.2	.0	+.1	+.1	+.1	+.1
64	+.1	-.2	+.2	-.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	+.2	+.1	+.2	.0	+.2	.0	+.2	-.1	+.2	-.1	+.2
Feb.	+.2	+.1	+.2	+.1	+.2	+.2	+.1	+.2	+.1	+.3	.0	+.3
Mar.	+.3	-.1	+.3	-.1	+.3	+.1	+.3	+.2	+.2	+.2	+.1	+.3
Apr.	+.3	-.2	+.3	-.2	+.3	.0	+.3	.0	+.3	+.1	+.3	+.2
May	+.2	-.3	+.2	-.3	+.3	-.2	+.3	-.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	-.3	+.1	-.3	.0	-.3	-.1	-.3	-.2
Nov.	-.2	+.4	-.3	+.4	-.3	+.2	-.4	+.1	-.4	.0	-.4	-.1
Dec.	.0	+.5	-.2	+.5	-.3	+.4	-.4	+.3	-.4	+.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, 2018

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	+28.7	-27.1	+34.8	-18.8	+38.5	-9.3	+39.6	+0.9	+38.0	+10.9	+33.9	+20.3
3	29.1	26.7	35.0	18.4	38.6	8.8	39.6	1.4	37.9	11.4	33.7	20.7
6	29.4	26.4	35.3	17.9	38.7	8.3	39.6	1.9	37.7	11.9	33.4	21.2
9	29.8	26.0	35.5	17.5	38.8	7.8	39.5	2.4	37.6	12.4	33.1	21.6
12	30.1	25.6	35.7	17.0	38.9	7.3	39.5	2.9	37.4	12.9	32.8	22.0
15	+30.5	-25.2	+35.9	-16.5	+39.0	-6.8	+39.5	+3.4	+37.3	+13.4	+32.5	+22.5
18	30.8	24.8	36.2	16.1	39.1	6.3	39.4	3.9	37.1	13.9	32.2	22.9
21	31.1	24.4	36.4	15.6	39.2	5.8	39.4	4.4	36.9	14.3	31.9	23.3
24	31.4	24.0	36.6	15.1	39.3	5.3	39.3	4.9	36.7	14.8	31.6	23.7
27	31.7	23.6	36.8	14.6	39.3	4.8	39.2	5.4	36.5	15.3	31.3	24.1
30	+32.0	-23.2	+37.0	-14.2	+39.4	-4.3	+39.2	+5.9	+36.3	+15.8	+31.0	+24.5
33	32.3	22.7	37.1	13.7	39.4	3.7	39.1	6.4	36.1	16.2	30.7	24.9
36	32.6	22.3	37.3	13.2	39.5	3.2	39.0	7.0	35.9	16.7	30.3	25.3
39	32.9	21.9	37.5	12.7	39.5	2.7	38.9	7.5	35.7	17.1	30.0	25.7
42	33.2	21.5	37.6	12.2	39.5	2.2	38.8	8.0	35.4	17.6	29.7	26.1
45	+33.5	-21.0	+37.8	-11.8	+39.6	-1.7	+38.7	+8.5	+35.2	+18.1	+29.3	+26.5
48	33.8	20.6	38.0	11.3	39.6	1.2	38.6	9.0	35.0	18.5	29.0	26.9
51	34.0	20.2	38.1	10.8	39.6	0.7	38.4	9.5	34.7	19.0	28.6	27.2
54	34.3	19.7	38.2	10.3	39.6	-0.2	38.3	10.0	34.5	19.4	28.3	27.6
57	34.5	19.3	38.4	9.8	39.6	+0.3	38.2	10.4	34.2	19.9	27.9	28.0
60	+34.8	-18.8	+38.5	-9.3	+39.6	+0.9	+38.0	+10.9	+33.9	+20.3	+27.5	+28.3
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	-.1	+.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	+.2	.0	+.1	.0	+.1	.0	.0	.0	-.1	.0	-.1
64	+.1	+.2	.0	+.2	.0	+.1	.0	.0	.0	-.1	+.1	-.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.	-.2	+.1	-.2	+.1	-.2	.0	-.2	.0	-.2	-.1	-.2	-.1
Feb.	-.1	+.2	-.1	+.2	-.2	+.2	-.2	+.1	-.3	+.1	-.3	.0
Mar.	+.1	+.3	.0	+.3	-.1	+.3	-.2	+.3	-.2	+.2	-.3	+.1
Apr.	+.2	+.3	+.1	+.3	.0	+.3	.0	+.3	-.1	+.3	-.2	+.3
May	+.3	+.2	+.3	+.2	+.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	-.1	-.3	-.1	-.3	.0	-.3	+.1	-.3	+.2	-.3
Nov.	-.4	-.2	-.3	-.3	-.2	-.3	-.1	-.4	.0	-.4	.1	-.4
Dec.	-.5	.0	-.5	-.2	-.4	-.3	-.3	-.4	-.2	-.4	-.1	-.5

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

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

POLARIS TABLE, 2018

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	+27.5	+28.3	+19.3	+34.5	+9.7	+38.3	-0.6	+39.6	-10.8	+38.2	-20.3	+34.1
3	27.2	28.7	18.8	34.7	9.2	38.5	1.1	39.6	11.3	38.0	20.8	33.8
6	26.8	29.0	18.4	35.0	8.7	38.6	1.6	39.6	11.8	37.9	21.2	33.6
9	26.4	29.4	17.9	35.2	8.2	38.7	2.1	39.6	12.3	37.7	21.7	33.3
12	26.0	29.7	17.4	35.5	7.7	38.8	2.7	39.5	12.8	37.6	22.1	33.0
15	+25.6	+30.1	+17.0	+35.7	+7.1	+38.9	-3.2	+39.5	-13.3	+37.4	-22.5	+32.7
18	25.2	30.4	16.5	35.9	6.6	39.0	3.7	39.5	13.8	37.2	23.0	32.4
21	24.8	30.7	16.0	36.1	6.1	39.1	4.2	39.4	14.3	37.0	23.4	32.1
24	24.4	31.1	15.5	36.3	5.6	39.2	4.7	39.4	14.8	36.9	23.8	31.8
27	24.0	31.4	15.1	36.5	5.1	39.2	5.2	39.3	15.2	36.7	24.2	31.5
30	+23.6	+31.7	+14.6	+36.7	+4.6	+39.3	-5.8	+39.2	-15.7	+36.5	-24.6	+31.2
33	23.2	32.0	14.1	36.9	4.1	39.4	6.3	39.2	16.2	36.2	25.0	30.8
36	22.8	32.3	13.6	37.1	3.6	39.4	6.8	39.1	16.7	36.0	25.4	30.5
39	22.3	32.6	13.1	37.3	3.0	39.5	7.3	39.0	17.1	35.8	25.8	30.2
42	21.9	32.9	12.7	37.5	2.5	39.5	7.8	38.9	17.6	35.6	26.2	29.8
45	+21.5	+33.2	+12.2	+37.6	+2.0	+39.5	-8.3	+38.8	-18.1	+35.4	-26.6	+29.5
48	21.0	33.4	11.7	37.8	1.5	39.6	8.8	38.7	18.5	35.1	27.0	29.1
51	20.6	33.7	11.2	37.9	1.0	39.6	9.3	38.6	19.0	34.9	27.4	28.8
54	20.2	34.0	10.7	38.1	+0.4	39.6	9.8	38.4	19.4	34.6	27.7	28.4
57	19.7	34.2	10.2	38.2	-0.1	39.6	10.3	38.3	19.9	34.4	28.1	28.0
60	+19.3	+34.5	+9.7	+38.3	-0.6	+39.6	-10.8	+38.2	-20.3	+34.1	-28.5	+27.7
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	-.3	+.1	-.3	.0	-.3	-.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	+.1	.0	+.1	.0	.0	.0	.0	.0
60	+.1	-.1	+.1	-.1	+.1	-.1	+.1	.0	+.1	+.1	+.1	+.1
62	+.1	-.2	+.1	-.1	+.1	-.1	+.2	.0	+.1	+.1	+.1	+.1
64	+.1	-.2	+.2	-.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	-.2	-.1	-.2	.0	-.2	.0	-.2	+.1	-.2	+.1	-.2
Feb.	-.2	-.1	-.2	-.1	-.2	-.2	-.1	-.2	-.1	-.3	.0	-.3
Mar.	-.3	+.1	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2	-.1	-.3
Apr.	-.3	+.2	-.3	+.1	-.3	.0	-.3	.0	-.3	-.1	-.3	-.2
May	-.2	+.3	-.2	+.3	-.3	+.2	-.3	+.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	-.1	+.3	-.1	+.3	.0	+.3	+.1	+.3	+.2
Nov.	+.2	-.4	+.3	-.3	+.3	-.2	+.4	-.1	+.4	.0	+.4	+.1
Dec.	.0	-.5	+.2	-.5	+.3	-.4	+.4	-.3	+.4	-.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, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

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

BEGINNING OF MORNING TWILIGHT

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

SUNRISE, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

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

BEGINNING OF MORNING TWILIGHT

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

SUNRISE, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

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

BEGINNING OF MORNING TWILIGHT

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

SUNRISE, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

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

BEGINNING OF MORNING TWILIGHT

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

SUNSET, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

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

END OF EVENING TWILIGHT

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

SUNSET, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

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

END OF EVENING TWILIGHT

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 6	19 15	19 21	19 30	19 43	19 52	20 03	20 17	20 36	20 45	20 56	21 09	21 25	21 44
14	19 13	19 22	19 33	19 49	20 00	20 14	20 31	20 54	21 06	21 20	21 37	21 58	22 27
22	19 12	19 23	19 37	19 56	20 09	20 25	20 45	21 14	21 29	21 47	22 10	22 44	
30	19 12	19 24	19 41	20 03	20 18	20 36	21 01	21 35	21 54	22 19	22 58		
May 8	19 12	19 27	19 45	20 10	20 27	20 48	21 17	21 59	22 25	23 07			
16	19 13	19 29	19 50	20 18	20 36	21 00	21 33	22 26	23 07				
24	19 14	19 32	19 54	20 25	20 45	21 11	21 49	22 59					
June 1	19 16	19 35	19 59	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 19						
11	19 23	19 42	20 06	20 38	21 00	21 29	22 10						

SUNSET, 2018

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

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian. In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

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

END OF EVENING TWILIGHT

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

SUNSET, 2018

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

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

END OF EVENING TWILIGHT

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

DURATION OF TWILIGHT, 2018

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

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

DURATION OF TWILIGHT, 2018
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, 2018
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, 2018
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, 2018

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

Date		Kolkata 22º N 32'				Varanasi 25º N 18'				Chennai 13º N 00'				Delhi 28º N 35'				Mumbai 18º N 54'			
		Rise		Set		Rise		Set		Rise		Set		Rise		Set		Rise		Set	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Jan.	0	6	16.4	17	02.8	6	43.4	17	18.6	6	30.9	17	53.1	7	14.1	17	34.7	7	11.8	18	11.6
	2	6	17.0	17	04.1	6	44.0	17	19.9	6	31.7	17	54.2	7	14.6	17	36.1	7	12.5	18	12.8
	4	6	17.5	17	05.5	6	44.5	17	21.3	6	32.4	17	55.3	7	15.1	17	37.5	7	13.1	18	14.0
	6	6	18.0	17	06.8	6	44.9	17	22.7	6	33.0	17	56.4	7	15.4	17	39.0	7	13.6	18	15.3
	8	6	18.4	17	08.2	6	45.2	17	24.2	6	33.6	17	57.5	7	15.6	17	40.5	7	14.1	18	16.5
	10	6	18.7	17	09.6	6	45.4	17	25.6	6	34.2	17	58.6	7	15.7	17	42.1	7	14.5	18	17.8
	12	6	18.9	17	11.0	6	45.5	17	27.1	6	34.6	17	59.7	7	15.7	17	43.6	7	14.8	18	19.1
	14	6	19.0	17	12.4	6	45.5	17	28.6	6	35.0	18	00.8	7	15.6	17	45.3	7	15.0	18	20.4
	16	6	19.0	17	13.8	6	45.4	17	30.1	6	35.4	18	01.9	7	15.4	17	46.9	7	15.2	18	21.6
	18	6	18.9	17	15.2	6	45.2	17	31.6	6	35.6	18	02.9	7	15.1	17	48.5	7	15.2	18	22.9
	20	6	18.8	17	16.7	6	45.0	17	33.2	6	35.8	18	04.0	7	14.6	17	50.2	7	15.2	18	24.2
	22	6	18.5	17	18.1	6	44.6	17	34.7	6	35.9	18	05.0	7	14.1	17	51.8	7	15.1	18	25.4
	24	6	18.1	17	19.5	6	44.1	17	36.2	6	36.0	18	05.9	7	13.4	17	53.5	7	14.9	18	26.7
	26	6	17.7	17	20.8	6	43.5	17	37.7	6	35.9	18	06.9	7	12.7	17	55.1	7	14.6	18	27.9
	28	6	17.2	17	22.2	6	42.8	17	39.2	6	35.8	18	07.8	7	11.8	17	56.8	7	14.2	18	29.0
	30	6	16.6	17	23.5	6	42.1	17	40.7	6	35.6	18	08.7	7	10.9	17	58.4	7	13.8	18	30.2
Feb.	1	6	15.9	17	24.9	6	41.2	17	42.1	6	35.4	18	09.5	7	09.8	17	60.0	7	13.2	18	31.3
	3	6	15.1	17	26.2	6	40.3	17	43.5	6	35.1	18	10.3	7	08.7	18	01.6	7	12.6	18	32.5
	5	6	14.2	17	27.4	6	39.2	17	44.9	6	34.7	18	11.1	7	07.4	18	03.2	7	11.9	18	33.5
	7	6	13.3	17	28.6	6	38.1	17	46.3	6	34.2	18	11.8	7	06.1	18	04.7	7	11.1	18	34.6
	9	6	12.2	17	29.9	6	36.9	17	47.7	6	33.7	18	12.5	7	04.7	18	06.3	7	10.3	18	35.6
	11	6	11.1	17	31.0	6	35.6	17	49.0	6	33.1	18	13.2	7	03.2	18	07.8	7	09.4	18	36.6
	13	6	10.0	17	32.2	6	34.3	17	50.3	6	32.4	18	13.8	7	01.6	18	09.3	7	08.4	18	37.5
	15	6	08.7	17	33.3	6	32.9	17	51.5	6	31.7	18	14.4	7	00.0	18	10.7	7	07.3	18	38.4
	17	6	07.5	17	34.4	6	31.4	17	52.8	6	30.9	18	14.9	6	58.3	18	12.2	7	06.2	18	39.3
	19	6	06.1	17	35.4	6	29.8	17	54.0	6	30.0	18	15.4	6	56.5	18	13.6	7	05.0	18	40.1
	21	6	04.7	17	36.4	6	28.2	17	55.1	6	29.2	18	15.9	6	54.6	18	15.0	7	03.8	18	40.9
	23	6	03.2	17	37.4	6	26.5	17	56.3	6	28.2	18	16.3	6	52.7	18	16.4	7	02.5	18	41.7
	25	6	01.7	17	38.4	6	24.8	17	57.4	6	27.2	18	16.7	6	50.8	18	17.8	7	01.2	18	42.5
	27	6	00.2	17	39.3	6	23.1	17	58.5	6	26.2	18	17.1	6	48.8	18	19.1	6	59.8	18	43.2
Mar.	1	5	58.6	17	40.2	6	21.2	17	59.5	6	25.1	18	17.4	6	46.7	18	20.4	6	58.4	18	43.9
	3	5	56.9	17	41.1	6	19.4	18	00.6	6	24.0	18	17.7	6	44.6	18	21.7	6	56.9	18	44.5
	5	5	55.2	17	41.9	6	17.5	18	01.6	6	22.9	18	18.0	6	42.4	18	22.9	6	55.4	18	45.2
	7	5	53.5	17	42.7	6	15.6	18	02.6	6	21.7	18	18.2	6	40.3	18	24.2	6	53.8	18	45.8
	9	5	51.7	17	43.5	6	13.6	18	03.6	6	20.5	18	18.5	6	38.0	18	25.4	6	52.2	18	46.4
	11	5	49.9	17	44.3	6	11.6	18	04.5	6	19.2	18	18.7	6	35.8	18	26.6	6	50.6	18	46.9
	13	5	48.1	17	45.1	6	09.6	18	05.5	6	18.0	18	18.9	6	33.5	18	27.8	6	49.0	18	47.5
	15	5	46.3	17	45.8	6	07.6	18	06.4	6	16.7	18	19.0	6	31.3	18	29.0	6	47.3	18	48.0
	17	5	44.4	17	46.6	6	05.6	18	07.3	6	15.4	18	19.2	6	29.0	18	30.1	6	45.7	18	48.5
	19	5	42.6	17	47.3	6	03.6	18	08.2	6	14.1	18	19.4	6	26.6	18	31.3	6	44.0	18	49.0
	21	5	40.7	17	48.0	6	01.5	18	09.1	6	12.8	18	19.5	6	24.3	18	32.4	6	42.3	18	49.5
	23	5	38.8	17	48.7	5	59.5	18	10.0	6	11.5	18	19.6	6	22.0	18	33.6	6	40.6	18	50.0
	25	5	36.9	17	49.4	5	57.4	18	10.9	6	10.2	18	19.8	6	19.7	18	34.7	6	38.9	18	50.5
	27	5	34.9	17	50.1	5	55.4	18	11.7	6	08.9	18	19.9	6	17.4	18	35.8	6	37.2	18	51.0
	29	5	33.0	17	50.8	5	53.3	18	12.6	6	07.5	18	20.0	6	15.1	18	36.9	6	35.5	18	51.5
	31	5	31.1	17	51.5	5	51.3	18	13.5	6	06.2	18	20.2	6	12.8	18	38.0	6	33.8	18	52.0
Apr.	2	5	29.2	17	52.2	5	49.2	18	14.4	6	04.9	18	20.3	6	10.5	18	39.2	6	32.2	18	52.5

SUNRISE AND SUNSET, 2018

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
Apr.	2	5	29.2	17	52.2	5	49.2	18	14.4	6	04.9	18	20.3	6	10.5	18	39.2	6	32.2	18	52.5
	4	5	27.4	17	52.9	5	47.2	18	15.2	6	03.7	18	20.4	6	08.3	18	40.3	6	30.5	18	52.9
	6	5	25.5	17	53.6	5	45.2	18	16.1	6	02.4	18	20.6	6	06.0	18	41.4	6	28.9	18	53.4
	8	5	23.6	17	54.3	5	43.2	18	17.0	6	01.1	18	20.7	6	03.8	18	42.5	6	27.2	18	53.9
	10	5	21.8	17	55.0	5	41.2	18	17.9	5	59.9	18	20.9	6	01.7	18	43.7	6	25.6	18	54.5
	12	5	20.0	17	55.7	5	39.2	18	18.8	5	58.7	18	21.1	5	59.5	18	44.8	6	24.1	18	55.0
	14	5	18.3	17	56.4	5	37.3	18	19.7	5	57.5	18	21.3	5	57.4	18	45.9	6	22.5	18	55.5
	16	5	16.5	17	57.2	5	35.4	18	20.6	5	56.3	18	21.5	5	55.3	18	47.1	6	21.0	18	56.1
	18	5	14.8	17	57.9	5	33.6	18	21.6	5	55.2	18	21.7	5	53.3	18	48.3	6	19.6	18	56.6
	20	5	13.2	17	58.7	5	31.7	18	22.5	5	54.1	18	21.9	5	51.3	18	49.4	6	18.1	18	57.2
	22	5	11.5	17	59.5	5	30.0	18	23.5	5	53.1	18	22.2	5	49.3	18	50.6	6	16.7	18	57.8
	24	5	10.0	18	00.2	5	28.2	18	24.4	5	52.0	18	22.5	5	47.4	18	51.8	6	15.4	18	58.4
	26	5	08.4	18	01.0	5	26.6	18	25.4	5	51.1	18	22.8	5	45.6	18	53.0	6	14.1	18	59.0
	28	5	07.0	18	01.9	5	24.9	18	26.4	5	50.1	18	23.1	5	43.7	18	54.2	6	12.8	18	59.6
	30	5	05.5	18	02.7	5	23.4	18	27.4	5	49.2	18	23.5	5	42.0	18	55.4	6	11.7	19	00.3
May	2	5	04.2	18	03.5	5	21.8	18	28.4	5	48.4	18	23.8	5	40.3	18	56.6	6	10.5	19	01.0
	4	5	02.9	18	04.4	5	20.4	18	29.4	5	47.6	18	24.2	5	38.7	18	57.9	6	09.4	19	01.7
	6	5	01.6	18	05.2	5	19.0	18	30.5	5	46.8	18	24.7	5	37.1	18	59.1	6	08.4	19	02.4
	8	5	00.5	18	06.1	5	17.7	18	31.5	5	46.1	18	25.1	5	35.6	19	00.3	6	07.4	19	03.1
	10	4	59.4	18	07.0	5	16.5	18	32.5	5	45.5	18	25.6	5	34.2	19	01.6	6	06.5	19	03.8
	12	4	58.3	18	07.9	5	15.3	18	33.6	5	44.9	18	26.1	5	32.9	19	02.8	6	05.7	19	04.6
	14	4	57.4	18	08.8	5	14.2	18	34.6	5	44.3	18	26.6	5	31.6	19	04.0	6	04.9	19	05.4
	16	4	56.5	18	09.7	5	13.2	18	35.7	5	43.8	18	27.1	5	30.4	19	05.3	6	04.2	19	06.1
	18	4	55.6	18	10.6	5	12.2	18	36.7	5	43.4	18	27.6	5	29.3	19	06.5	6	03.5	19	06.9
	20	4	54.9	18	11.5	5	11.3	18	37.8	5	43.0	18	28.2	5	28.3	19	07.7	6	03.0	19	07.7
	22	4	54.2	18	12.4	5	10.6	18	38.8	5	42.7	18	28.8	5	27.4	19	08.9	6	02.4	19	08.5
	24	4	53.6	18	13.3	5	09.9	18	39.8	5	42.5	18	29.3	5	26.6	19	10.0	6	02.0	19	09.3
	26	4	53.1	18	14.2	5	09.2	18	40.8	5	42.3	18	29.9	5	25.8	19	11.2	6	01.6	19	10.1
	28	4	52.7	18	15.1	5	08.7	18	41.8	5	42.1	18	30.5	5	25.2	19	12.3	6	01.3	19	10.8
	30	4	52.3	18	16.0	5	08.3	18	42.8	5	42.0	18	31.2	5	24.6	19	13.3	6	01.0	19	11.6
June	1	4	52.0	18	16.8	5	07.9	18	43.7	5	42.0	18	31.8	5	24.1	19	14.4	6	00.9	19	12.4
	3	4	51.8	18	17.6	5	07.6	18	44.7	5	42.0	18	32.4	5	23.8	19	15.4	6	00.8	19	13.1
	5	4	51.7	18	18.4	5	07.4	18	45.5	5	42.1	18	33.0	5	23.5	19	16.4	6	00.7	19	13.9
	7	4	51.6	18	19.2	5	07.3	18	46.4	5	42.2	18	33.6	5	23.3	19	17.3	6	00.7	19	14.6
	9	4	51.6	18	20.0	5	07.2	18	47.2	5	42.4	18	34.2	5	23.1	19	18.1	6	00.8	19	15.3
	11	4	51.7	18	20.7	5	07.3	18	47.9	5	42.6	18	34.7	5	23.1	19	19.0	6	00.9	19	15.9
	13	4	51.8	18	21.3	5	07.4	18	48.6	5	42.9	18	35.3	5	23.2	19	19.7	6	01.1	19	16.5
	15	4	52.1	18	21.9	5	07.6	18	49.3	5	43.2	18	35.8	5	23.3	19	20.4	6	01.4	19	17.1
	17	4	52.3	18	22.5	5	07.8	18	49.9	5	43.5	18	36.3	5	23.6	19	21.0	6	01.7	19	17.7
	19	4	52.7	18	23.0	5	08.1	18	50.4	5	43.9	18	36.8	5	23.9	19	21.5	6	02.0	19	18.2
	21	4	53.1	18	23.5	5	08.5	18	50.9	5	44.3	18	37.3	5	24.3	19	22.0	6	02.4	19	18.6
	23	4	53.5	18	23.9	5	09.0	18	51.3	5	44.8	18	37.7	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	38.1	5	25.2	19	22.7	6	03.3	19	19.4
	27	4	54.6	18	24.5	5	10.1	18	51.9	5	45.7	18	38.4	5	25.8	19	23.0	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	26.5	19	23.1	6	04.4	19	20.0
July	1	4	55.8	18	24.8	5	11.4	18	52.2	5	46.8	18	39.0	5	27.2	19	23.1	6	05.0	19	20.1
	3	4	56.5	18	24.9	5	12.1	18	52.2	5	47.3	18	39.2	5	28.0	19	23.1	6	05.6	19	20.3

SUNRISE AND SUNSET, 2018

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

Date	Kolkata 22° N 32'		Varanasi 25° N 18'		Chennai 13° N 00'		Delhi 28° N 35'		Mumbai 18° N 54'	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 1	4 55.8	18 24.8	5 11.4	18 52.2	5 46.8	18 39.0	5 27.2	19 23.1	6 05.0	19 20.1
3	4 56.5	18 24.9	5 12.1	18 52.2	5 47.3	18 39.2	5 28.0	19 23.1	6 05.6	19 20.3
5	4 57.2	18 24.9	5 12.9	18 52.1	5 47.8	18 39.3	5 28.8	19 23.0	6 06.2	19 20.3
7	4 58.0	18 24.8	5 13.7	18 52.0	5 48.4	18 39.4	5 29.7	19 22.8	6 06.9	19 20.3
9	4 58.8	18 24.7	5 14.5	18 51.7	5 49.0	18 39.5	5 30.6	19 22.5	6 07.6	19 20.2
11	4 59.6	18 24.4	5 15.4	18 51.4	5 49.5	18 39.5	5 31.5	19 22.0	6 08.3	19 20.1
13	5 00.4	18 24.1	5 16.3	18 51.0	5 50.1	18 39.4	5 32.5	19 21.5	6 09.0	19 19.9
15	5 01.2	18 23.7	5 17.2	18 50.6	5 50.6	18 39.3	5 33.6	19 21.0	6 09.7	19 19.6
17	5 02.0	18 23.3	5 18.1	18 50.0	5 51.2	18 39.1	5 34.6	19 20.3	6 10.4	19 19.2
19	5 02.9	18 22.7	5 19.1	18 49.3	5 51.7	18 38.8	5 35.7	19 19.5	6 11.1	19 18.8
21	5 03.7	18 22.1	5 20.0	18 48.6	5 52.2	18 38.5	5 36.7	19 18.6	6 11.8	19 18.3
23	5 04.6	18 21.4	5 21.0	18 47.8	5 52.7	18 38.2	5 37.8	19 17.6	6 12.5	19 17.7
25	5 05.5	18 20.6	5 22.0	18 46.9	5 53.2	18 37.8	5 38.9	19 16.6	6 13.2	19 17.1
27	5 06.3	18 19.8	5 22.9	18 45.9	5 53.7	18 37.3	5 40.1	19 15.4	6 13.9	19 16.3
29	5 07.2	18 18.8	5 23.9	18 44.8	5 54.1	18 36.7	5 41.2	19 14.2	6 14.6	19 15.6
31	5 08.0	18 17.8	5 24.9	18 43.7	5 54.5	18 36.1	5 42.3	19 12.9	6 15.3	19 14.7
Aug. 2	5 08.8	18 16.8	5 25.8	18 42.4	5 54.9	18 35.5	5 43.4	19 11.5	6 15.9	19 13.8
4	5 09.7	18 15.6	5 26.8	18 41.1	5 55.3	18 34.7	5 44.5	19 10.0	6 16.6	19 12.8
6	5 10.5	18 14.4	5 27.7	18 39.8	5 55.7	18 34.0	5 45.7	19 08.5	6 17.2	19 11.7
8	5 11.3	18 13.2	5 28.7	18 38.3	5 56.0	18 33.1	5 46.8	19 06.8	6 17.8	19 10.6
10	5 12.1	18 11.8	5 29.6	18 36.8	5 56.3	18 32.3	5 47.9	19 05.1	6 18.4	19 09.5
12	5 12.8	18 10.4	5 30.5	18 35.3	5 56.6	18 31.3	5 49.0	19 03.4	6 18.9	19 08.2
14	5 13.6	18 09.0	5 31.4	18 33.7	5 56.9	18 30.3	5 50.1	19 01.5	6 19.5	19 06.9
16	5 14.3	18 07.5	5 32.3	18 32.0	5 57.1	18 29.3	5 51.1	18 59.6	6 20.0	19 05.6
18	5 15.0	18 05.9	5 33.2	18 30.2	5 57.3	18 28.2	5 52.2	18 57.7	6 20.5	19 04.2
20	5 15.7	18 04.4	5 34.0	18 28.4	5 57.5	18 27.1	5 53.2	18 55.6	6 21.0	19 02.8
22	5 16.4	18 02.7	5 34.9	18 26.6	5 57.7	18 26.0	5 54.3	18 53.6	6 21.5	19 01.3
24	5 17.1	18 01.0	5 35.7	18 24.7	5 57.8	18 24.8	5 55.3	18 51.5	6 22.0	18 59.8
26	5 17.7	17 59.3	5 36.5	18 22.8	5 57.9	18 23.6	5 56.3	18 49.3	6 22.4	18 58.2
28	5 18.4	17 57.6	5 37.3	18 20.8	5 58.0	18 22.3	5 57.3	18 47.1	6 22.9	18 56.6
30	5 19.0	17 55.8	5 38.1	18 18.9	5 58.1	18 21.0	5 58.3	18 44.9	6 23.3	18 54.9
Sept. 1	5 19.6	17 53.9	5 38.9	18 16.8	5 58.2	18 19.7	5 59.3	18 42.6	6 23.7	18 53.3
3	5 20.2	17 52.1	5 39.7	18 14.8	5 58.2	18 18.4	6 00.3	18 40.3	6 24.1	18 51.6
5	5 20.8	17 50.2	5 40.4	18 12.7	5 58.3	18 17.0	6 01.2	18 38.0	6 24.4	18 49.9
7	5 21.4	17 48.3	5 41.2	18 10.6	5 58.3	18 15.6	6 02.2	18 35.6	6 24.8	18 48.1
9	5 22.0	17 46.3	5 42.0	18 08.5	5 58.3	18 14.2	6 03.2	18 33.2	6 25.2	18 46.4
11	5 22.6	17 44.4	5 42.7	18 06.4	5 58.3	18 12.8	6 04.1	18 30.9	6 25.5	18 44.6
13	5 23.2	17 42.4	5 43.4	18 04.3	5 58.3	18 11.4	6 05.1	18 28.5	6 25.9	18 42.8
15	5 23.7	17 40.4	5 44.2	18 02.1	5 58.3	18 10.0	6 06.0	18 26.1	6 26.2	18 41.0
17	5 24.3	17 38.4	5 44.9	18 00.0	5 58.4	18 08.6	6 07.0	18 23.7	6 26.6	18 39.2
19	5 24.9	17 36.4	5 45.7	17 57.9	5 58.4	18 07.2	6 08.0	18 21.3	6 26.9	18 37.4
21	5 25.5	17 34.4	5 46.4	17 55.7	5 58.4	18 05.8	6 08.9	18 18.9	6 27.3	18 35.7
23	5 26.0	17 32.4	5 47.2	17 53.6	5 58.4	18 04.4	6 09.9	18 16.5	6 27.6	18 33.9
25	5 26.6	17 30.4	5 48.0	17 51.4	5 58.4	18 03.0	6 10.9	18 14.1	6 28.0	18 32.1
27	5 27.3	17 28.5	5 48.7	17 49.3	5 58.4	18 01.6	6 11.9	18 11.7	6 28.4	18 30.3
29	5 27.9	17 26.5	5 49.5	17 47.2	5 58.5	18 00.2	6 12.9	18 09.4	6 28.8	18 28.6
Oct. 1	5 28.5	17 24.5	5 50.3	17 45.1	5 58.5	17 58.9	6 14.0	18 07.1	6 29.2	18 26.9

SUNRISE AND SUNSET, 2018

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 28.5	17 24.5	5 50.3	17 45.1	5 58.5	17 58.9	6 14.0	18 07.1	6 29.2	18 26.9
3	5 29.2	17 22.6	5 51.2	17 43.0	5 58.6	17 57.6	6 15.0	18 04.8	6 29.6	18 25.2
5	5 29.8	17 20.7	5 52.0	17 40.9	5 58.7	17 56.3	6 16.1	18 02.5	6 30.1	18 23.5
7	5 30.5	17 18.8	5 52.8	17 38.9	5 58.8	17 55.0	6 17.2	18 00.3	6 30.5	18 21.9
9	5 31.2	17 17.0	5 53.7	17 36.9	5 59.0	17 53.7	6 18.3	17 58.1	6 31.0	18 20.2
11	5 32.0	17 15.2	5 54.6	17 34.9	5 59.1	17 52.5	6 19.4	17 55.9	6 31.6	18 18.7
13	5 32.7	17 13.4	5 55.5	17 33.0	5 59.3	17 51.3	6 20.6	17 53.8	6 32.1	18 17.1
15	5 33.5	17 11.7	5 56.5	17 31.1	5 59.6	17 50.2	6 21.8	17 51.7	6 32.7	18 15.7
17	5 34.3	17 10.0	5 57.5	17 29.2	5 59.8	17 49.1	6 23.0	17 49.7	6 33.3	18 14.2
19	5 35.2	17 08.3	5 58.5	17 27.4	6 00.1	17 48.0	6 24.2	17 47.7	6 33.9	18 12.8
21	5 36.0	17 06.7	5 59.5	17 25.7	6 00.4	17 47.0	6 25.5	17 45.8	6 34.6	18 11.5
23	5 36.9	17 05.2	6 00.5	17 24.0	6 00.8	17 46.0	6 26.8	17 43.9	6 35.3	18 10.2
25	5 37.9	17 03.8	6 01.6	17 22.4	6 01.2	17 45.1	6 28.1	17 42.1	6 36.0	18 09.0
27	5 38.8	17 02.4	6 02.7	17 20.8	6 01.6	17 44.3	6 29.4	17 40.3	6 36.8	18 07.8
29	5 39.8	17 01.0	6 03.9	17 19.3	6 02.1	17 43.5	6 30.8	17 38.6	6 37.6	18 06.7
31	5 40.9	16 59.8	6 05.1	17 17.9	6 02.6	17 42.8	6 32.2	17 37.0	6 38.4	18 05.7
Nov. 2	5 41.9	16 58.6	6 06.3	17 16.6	6 03.2	17 42.1	6 33.7	17 35.5	6 39.3	18 04.7
4	5 43.0	16 57.5	6 07.5	17 15.3	6 03.7	17 41.5	6 35.1	17 34.0	6 40.2	18 03.8
6	5 44.1	16 56.4	6 08.8	17 14.1	6 04.4	17 40.9	6 36.6	17 32.6	6 41.1	18 03.0
8	5 45.3	16 55.5	6 10.1	17 13.0	6 05.1	17 40.5	6 38.2	17 31.3	6 42.1	18 02.3
10	5 46.5	16 54.6	6 11.4	17 12.0	6 05.8	17 40.1	6 39.7	17 30.1	6 43.2	18 01.6
12	5 47.7	16 53.8	6 12.8	17 11.0	6 06.5	17 39.8	6 41.3	17 29.0	6 44.2	18 01.0
14	5 48.9	16 53.1	6 14.1	17 10.2	6 07.3	17 39.5	6 42.8	17 28.0	6 45.3	18 00.5
16	5 50.2	16 52.5	6 15.5	17 09.5	6 08.2	17 39.3	6 44.4	17 27.1	6 46.4	18 00.1
18	5 51.4	16 52.0	6 16.9	17 08.8	6 09.0	17 39.2	6 46.0	17 26.3	6 47.5	17 59.8
20	5 52.7	16 51.6	6 18.4	17 08.3	6 09.9	17 39.2	6 47.6	17 25.6	6 48.7	17 59.5
22	5 54.0	16 51.3	6 19.8	17 07.9	6 10.9	17 39.3	6 49.3	17 25.0	6 49.9	17 59.3
24	5 55.4	16 51.1	6 21.2	17 07.5	6 11.9	17 39.4	6 50.9	17 24.6	6 51.1	17 59.3
26	5 56.7	16 50.9	6 22.7	17 07.3	6 12.9	17 39.6	6 52.5	17 24.2	6 52.3	17 59.3
28	5 58.0	16 50.9	6 24.1	17 07.1	6 13.9	17 39.9	6 54.1	17 23.9	6 53.6	17 59.4
30	5 59.3	16 51.0	6 25.6	17 07.1	6 14.9	17 40.2	6 55.7	17 23.8	6 54.8	17 59.5
Dec. 2	6 00.6	16 51.1	6 27.0	17 07.2	6 16.0	17 40.6	6 57.2	17 23.7	6 56.1	17 59.8
4	6 01.9	16 51.4	6 28.4	17 07.4	6 17.1	17 41.1	6 58.8	17 23.8	6 57.3	18 00.1
6	6 03.2	16 51.7	6 29.8	17 07.6	6 18.1	17 41.7	7 00.3	17 24.0	6 58.6	18 00.5
8	6 04.5	16 52.1	6 31.2	17 08.0	6 19.2	17 42.3	7 01.7	17 24.3	6 59.8	18 01.0
10	6 05.8	16 52.7	6 32.5	17 08.5	6 20.3	17 43.0	7 03.1	17 24.7	7 01.0	18 01.6
12	6 07.0	16 53.3	6 33.8	17 09.0	6 21.4	17 43.7	7 04.5	17 25.2	7 02.2	18 02.3
14	6 08.2	16 54.0	6 35.1	17 09.7	6 22.5	17 44.5	7 05.8	17 25.8	7 03.4	18 03.0
16	6 09.3	16 54.7	6 36.3	17 10.4	6 23.6	17 45.4	7 07.1	17 26.5	7 04.5	18 03.8
18	6 10.4	16 55.6	6 37.4	17 11.3	6 24.6	17 46.3	7 08.3	17 27.3	7 05.7	18 04.6
20	6 11.5	16 56.5	6 38.5	17 12.2	6 25.7	17 47.2	7 09.4	17 28.2	7 06.7	18 05.5
22	6 12.5	16 57.5	6 39.6	17 13.2	6 26.7	17 48.2	7 10.4	17 29.2	7 07.8	18 06.5
24	6 13.5	16 58.6	6 40.5	17 14.2	6 27.7	17 49.2	7 11.4	17 30.2	7 08.7	18 07.5
26	6 14.4	16 59.7	6 41.4	17 15.4	6 28.6	17 50.3	7 12.3	17 31.4	7 09.7	18 08.6
28	6 15.2	17 00.9	6 42.2	17 16.5	6 29.5	17 51.3	7 13.0	17 32.6	7 10.5	18 09.7
30	6 15.9	17 02.1	6 43.0	17 17.8	6 30.4	17 52.4	7 13.7	17 33.9	7 11.3	18 10.9
32	6 16.6	17 03.3	6 43.6	17 19.1	6 31.2	17 53.5	7 14.3	17 35.2	7 12.1	18 12.0

MOONRISE, 2018

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

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

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

MOONRISE, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

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

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

MOONRISE, 2018

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

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

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

MOONRISE, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

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

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

MOONRISE, 2018

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

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

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

MOONRISE, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONRISE (MOON'S UPPER LIMB)

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

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

MOONRISE, 2018

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

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

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

MOONRISE, 2018

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

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

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

MOONSET, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

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

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

MOONSET, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

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

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

MOONSET, 2018

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

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

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

MOONSET, 2018

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

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

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

MOONSET, 2018

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

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

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

MOONSET, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

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

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

MOONSET, 2018

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

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

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

MOONSET, 2018
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

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

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 $\times$ 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, 2018

(Time in I.S.T.)

		d	h	m			d	h	m
Full Moon	Dec, 17	03	21	17	Full Moon	Jun	28	10	23
Last Quarter	Dec, 17	10	13	21	Last Quarter	Jul	06	13	21
New Moon	Dec, 17	18	12	00	New Moon	Jul	13	08	18
First Quarter	Dec, 17	26	14	50	First Quarter	Jul	20	01	22
Full Moon	Jan, 18	02	07	54	Full Moon	Jul	28	01	50
Last Quarter	Jan	09	03	55	Last Quarter	Aug	04	23	48
New Moon	Jan	17	07	47	New Moon	Aug	11	15	28
First Quarter	Jan	25	03	50	First Quarter	Aug	18	13	19
Full Moon	Jan	31	18	57	Full Moon	Aug	26	17	26
Last Quarter	Feb	07	21	24	Last Quarter	Sep	03	08	07
New Moon	Feb	16	02	35	New Moon	Sep	09	23	31
First Quarter	Feb	23	13	39	First Quarter	Sep	17	04	45
Full Moon	Mar	02	06	21	Full Moon	Sep	25	08	22
Last Quarter	Mar	09	16	50	Last Quarter	Oct	02	15	15
New Moon	Mar	17	18	42	New Moon	Oct	09	09	17
First Quarter	Mar	24	21	05	First Quarter	Oct	16	23	32
Full Moon	Mar	31	18	07	Full Moon	Oct	24	22	15
Last Quarter	Apr	08	12	48	Last Quarter	Oct	31	22	10
New Moon	Apr	16	07	27	New Moon	Nov	07	21	32
First Quarter	Apr	23	03	16	First Quarter	Nov	15	20	24
Full Moon	Apr	30	06	28	Full Moon	Nov	23	11	09
Last Quarter	May	08	07	39	Last Quarter	Nov	30	05	49
New Moon	May	15	17	18	New Moon	Dec	07	12	50
First Quarter	May	22	09	19	First Quarter	Dec	15	17	19
Full Moon	May	29	19	50	Full Moon	Dec	22	23	19
Last Quarter	Jun	07	00	02	Last Quarter	Dec,18	29	15	04
New Moon	Jun	14	01	13	New Moon	Jan, 19	06	06	58
First Quarter	Jun	20	16	21	First Quarter	Jan, 19	14	12	15

PART - IV

ECLIPSES AND OCCULTATIONS

ECLIPSES, 2018

In the year 2018, there are three eclipses of the Sun and two eclipses of the Moon.

I	January	31	Total eclipse of the Moon	329
II	February	15	Partial eclipse of the Sun	320-322
III	July	13	Partial eclipse of the Sun	323-325
IV	July	27	Total eclipse of the Moon	332
V	August	11	Partial eclipse the Sun	326-328

II- Partial eclipse of the Sun, February 15, 2018, Thursday.

Not visible in India.

Area of Visibility

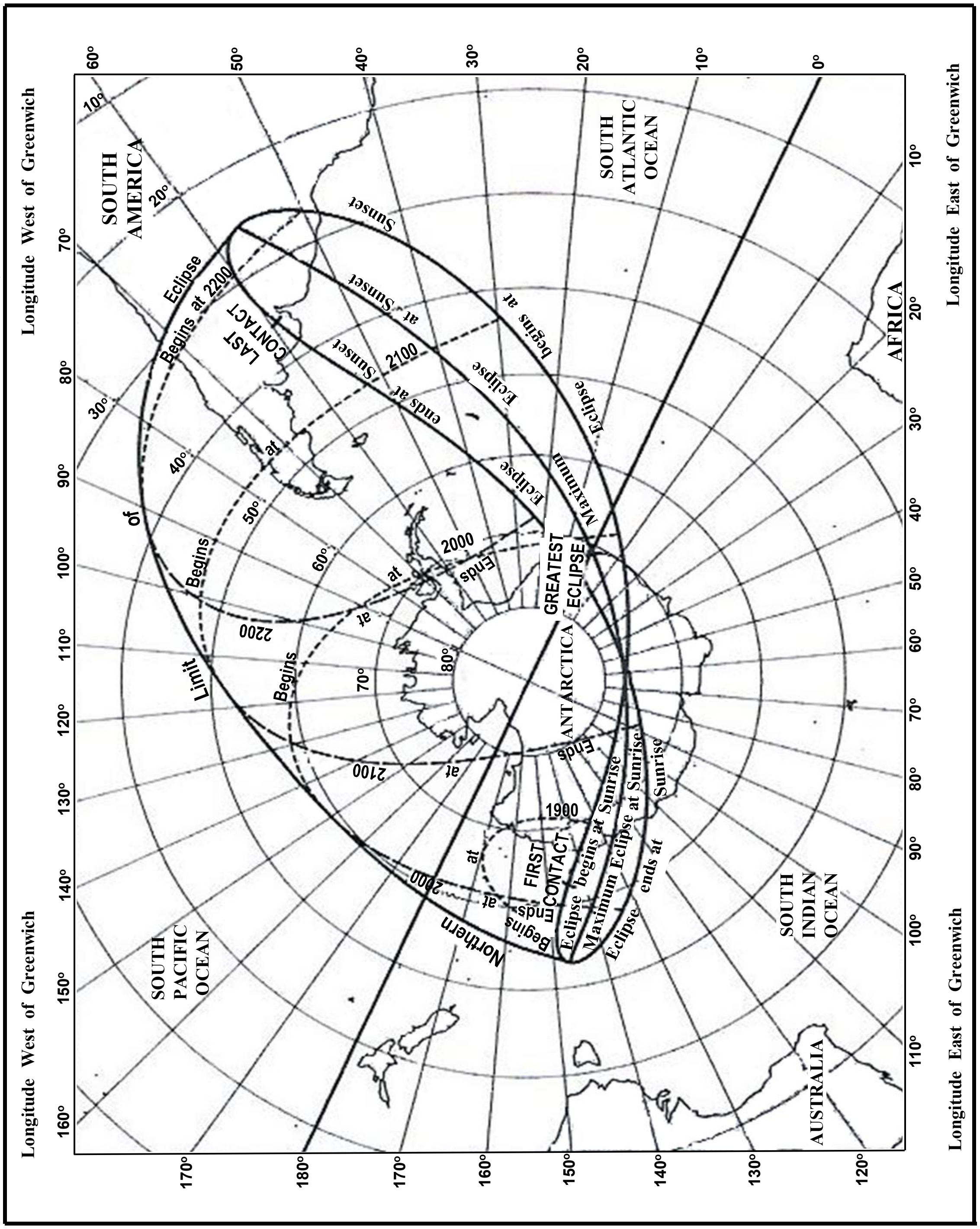
The eclipse is visible in the region covering Antarctica except Wilkes Land, southern part of South America and Falkland Islands.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : February 15^d 20^h 15^m $08^s.45$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	21	57	12.89	21	57	12.88
Hourly Motion			122.38			09.72
	°	'	"	°	'	"
Declination	-13	37	15.75	-12	28	38.63
Hourly Motion		7	53.37			51.82
Equatorial Horizontal Parallax		55	0.28			08.90
True Semi-diameter		14	58.96		16	11.42

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	15	18	56.0	16	00	26.0	-62	28.4	+144	21.2
Greatest eclipse*	15	20	51.4	16	02	21.4	-71	05.5	+0	51.4
Eclipse ends	15	22	47.0	16	04	27.0	-35	25.8	-59	12.4

*Magnitude of the eclipse =0.598

ECLIPSES, 2018



ECLIPSES, 2018

BESSELIAN ELEMENTS OF THE PARTIAL ECLIPSE OF THE SUN
FEBRUARY 15

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane
h	m	x	y	sin d	cos d	μ °	'	"	l_1
18	40	-0.800878	-1.456286	-0.216387	+0.976308	96	28	35.2	+0.567439
	50	-0.717703	-1.434997	-0.216347	+0.976317	98	58	36.3	+0.567431
19	00	-0.634527	-1.413699	-0.216307	+0.976325	101	28	37.4	+0.567423
	10	-0.551350	-1.392394	-0.216267	+0.976334	103	58	38.5	+0.567414
	20	-0.468172	-1.371081	-0.216227	+0.976343	106	28	39.6	+0.567405
	30	-0.384993	-1.349761	-0.216187	+0.976352	108	58	40.7	+0.567395
	40	-0.301814	-1.328433	-0.216147	+0.976361	111	28	41.7	+0.567384
	50	-0.218635	-1.307097	-0.216107	+0.976370	113	58	42.8	+0.567373
20	00	-0.135456	-1.285753	-0.216067	+0.976379	116	28	43.9	+0.567361
	10	-0.052277	-1.264402	-0.216027	+0.976387	118	58	45.0	+0.567348
	20	+0.030902	-1.243044	-0.215987	+0.976396	121	28	46.1	+0.567335
	30	+0.114081	-1.221678	-0.215947	+0.976405	123	58	47.2	+0.567321
	40	+0.197259	-1.200304	-0.215907	+0.976414	126	28	48.3	+0.567307
	50	+0.280436	-1.178923	-0.215867	+0.976423	128	58	49.4	+0.567292
21	00	+0.363612	-1.157534	-0.215827	+0.976432	131	28	50.5	+0.567276
	10	+0.446788	-1.136138	-0.215787	+0.976440	133	58	51.6	+0.567260
	20	+0.529962	-1.114735	-0.215747	+0.976449	136	28	52.7	+0.567243
	30	+0.613134	-1.093324	-0.215707	+0.976458	138	58	53.7	+0.567225
	40	+0.696306	-1.071906	-0.215667	+0.976467	141	28	54.8	+0.567207
	50	+0.779475	-1.050480	-0.215627	+0.976476	143	58	55.9	+0.567188
22	00	+0.862643	-1.029048	-0.215587	+0.976485	146	28	57.0	+0.567168
	10	+0.945808	-1.007608	-0.215547	+0.976493	148	58	58.1	+0.567148
	20	+1.028972	-0.986160	-0.215507	+0.976502	151	28	59.2	+0.567127
	30	+1.112133	-0.964706	-0.215467	+0.976511	153	59	00.3	+0.567105
	40	+1.195292	-0.943244	-0.215427	+0.976520	156	29	01.4	+0.567083
	50	+1.278447	-0.921775	-0.215387	+0.976529	158	59	02.5	+0.567060
23	00	+1.361601	-0.900299	-0.215347	+0.976538	161	29	03.6	+0.567037
	10	+1.444751	-0.878816	-0.215307	+0.976546	163	59	04.7	+0.567013
	20	+1.527898	-0.857326	-0.215267	+0.976555	166	29	05.8	+0.566988

$\tan f_1 = 0.004742$ $\tan f_2 = 0.004718$

TT hr	d °	'	"	Variations per minute x'	y'	μ' '	"
19	-12	29	32	+0.008 318	0.002 131	15	00
20	-12	28	41	+0.008 318	0.002 135	15	00
21	-12	27	51	+0.008 317	0.002 144	15	00
22	-12	26	60	+0.008 317	0.002 144	15	00
23	-12	26	09	+0.008 315	0.002 148	15	00

ɜ́ = 0.004364 ɟ cos ű́cos (ε +ə) η′ = 0.004364 ɜ sin d

*d stands for declination and ε stands for hour angle

ECLIPSES, 2018

III-Partial Eclipse of the Sun, July 13, 2018, Friday

Not visible in India

Area of Visibility

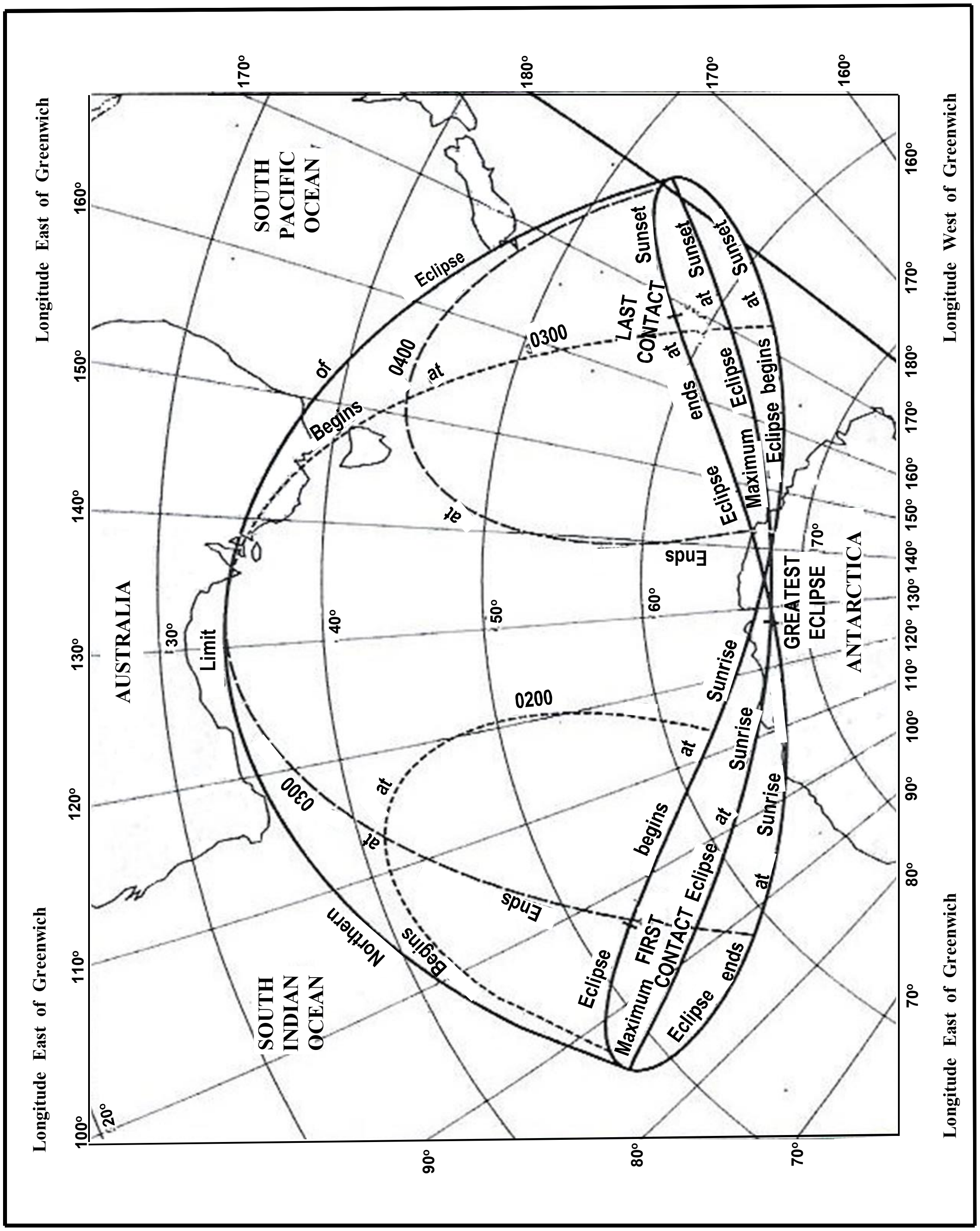
The eclipse is visible in the region covering tip of Wilkes Land in Antarctica, Tasmania, southernmost part of South Australia and Stewart Island.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : July 13^d 03^h 09^m $04^s.53$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	07	29	32.46	07	29	32.46
Hourly Motion			162.39			10.16
	°	'	"	°	'	"
Declination	20	27	26.37	21	50	27.76
Hourly Motion		-2	27.39			-21.68
Equatorial Horizontal Parallax		61	20.38			8.65
True Semi-diameter		16	42.49		15	43.99

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	13	01	48.6	13	07	18.6	-52	59.3	+ 96	25.3
Greatest eclipse*	13	03	01.1	13	08	31.1	-67	55.6	+ 127	28.3
Eclipse ends	13	04	13.6	13	09	43.6	-57	55.0	+ 168	17.8

*Magnitude of the eclipse = 0.335

ECLIPSES, 2018



ECLIPSES, 2018

BESSELIAN ELEMENTS OF THE PARTIAL ECLIPSE OF THE SUN
JULY 13

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
1	00	-1.264845	-1.284495	+0.372294	+0.928115	193	34	13.1	+0.529292
	10	-1.167728	-1.289994	+0.372278	+0.928121	196	04	13.2	+0.529298
	20	-1.070608	-1.295498	+0.372262	+0.928128	198	34	13.3	+0.529304
	30	-0.973486	-1.301005	+0.372246	+0.928134	201	04	13.5	+0.529308
	40	-0.876361	-1.306517	+0.372230	+0.928140	203	34	13.6	+0.529313
	50	-0.779234	-1.312033	+0.372214	+0.928147	206	04	13.8	+0.529316
2	00	-0.682105	-1.317554	+0.372198	+0.928153	208	34	13.9	+0.529318
	10	-0.584974	-1.323079	+0.372182	+0.928160	211	04	14.0	+0.529320
	20	-0.487841	-1.328608	+0.372166	+0.928166	213	34	14.2	+0.529321
	30	-0.390708	-1.334141	+0.372150	+0.928173	216	04	14.3	+0.529322
	40	-0.293574	-1.339678	+0.372134	+0.928179	218	34	14.5	+0.529322
	50	-0.196439	-1.345219	+0.372118	+0.928185	221	04	14.6	+0.529320
3	00	-0.099304	-1.350765	+0.372102	+0.928192	223	34	14.8	+0.529319
	10	-0.002169	-1.356315	+0.372086	+0.928198	226	04	14.9	+0.529316
	20	+0.094966	-1.361868	+0.372070	+0.928205	228	34	15.0	+0.529313
	30	+0.192100	-1.367426	+0.372054	+0.928211	231	04	15.2	+0.529309
	40	+0.289234	-1.372988	+0.372038	+0.928218	233	34	15.3	+0.529304
	50	+0.386366	-1.378554	+0.372022	+0.928224	236	04	15.5	+0.529299
4	00	+0.483498	-1.384124	+0.372006	+0.928230	238	34	15.6	+0.529292
	10	+0.580627	-1.389698	+0.371990	+0.928237	241	04	15.8	+0.529285
	20	+0.677755	-1.395275	+0.371974	+0.928243	243	34	15.9	+0.529278
	30	+0.774880	-1.400857	+0.371958	+0.928250	246	04	16.1	+0.529269
	40	+0.872003	-1.406443	+0.371941	+0.928256	248	34	16.2	+0.529260
	50	+0.969123	-1.412032	+0.371925	+0.928263	251	04	16.4	+0.529250
5	00	+1.066241	-1.417625	+0.371909	+0.928269	253	34	16.5	+0.529239
	10	+1.163354	-1.423222	+0.371893	+0.928275	256	04	16.7	+0.529227
	20	+1.260465	-1.428823	+0.371877	+0.928282	258	34	16.8	+0.529215

$\tan f_1 = 0.004606$ $\tan f_2 = 0.004583$

TT hr	d °	′	″	Variations per minute x′	y′	μ′ ′	″
1	21	51	26	+0.009 712	-0.000 550	15	00
2	21	51	04	+0.009 713	-0.000 552	15	00
3	21	50	43	+0.009 713	-0.000 557	15	00
4	21	50	22	+0.009 713	-0.000 557	15	00
5	21	50	00	+0.009 711	-0.000 560	15	00

ɜ′ = 0.004364 ɟ cos ű′cos (ε +ɚ) η′ = 0.004364 ɜ sin d

*d stands for declination and ε stands for hour angle

ECLIPSES, 2018

V-Partial Eclipse of the Sun, August 11, 2018, Saturday

Not visible in India

Area of Visibility

The eclipse is visible in the region covering northernmost Canada, Greenland, Iceland, northernmost tip of British Isles, most of Scandanavia, Svalbard, most of Russia, most of Kazakhstan, most of Kyrgyzstan, Mongolia, most of China.

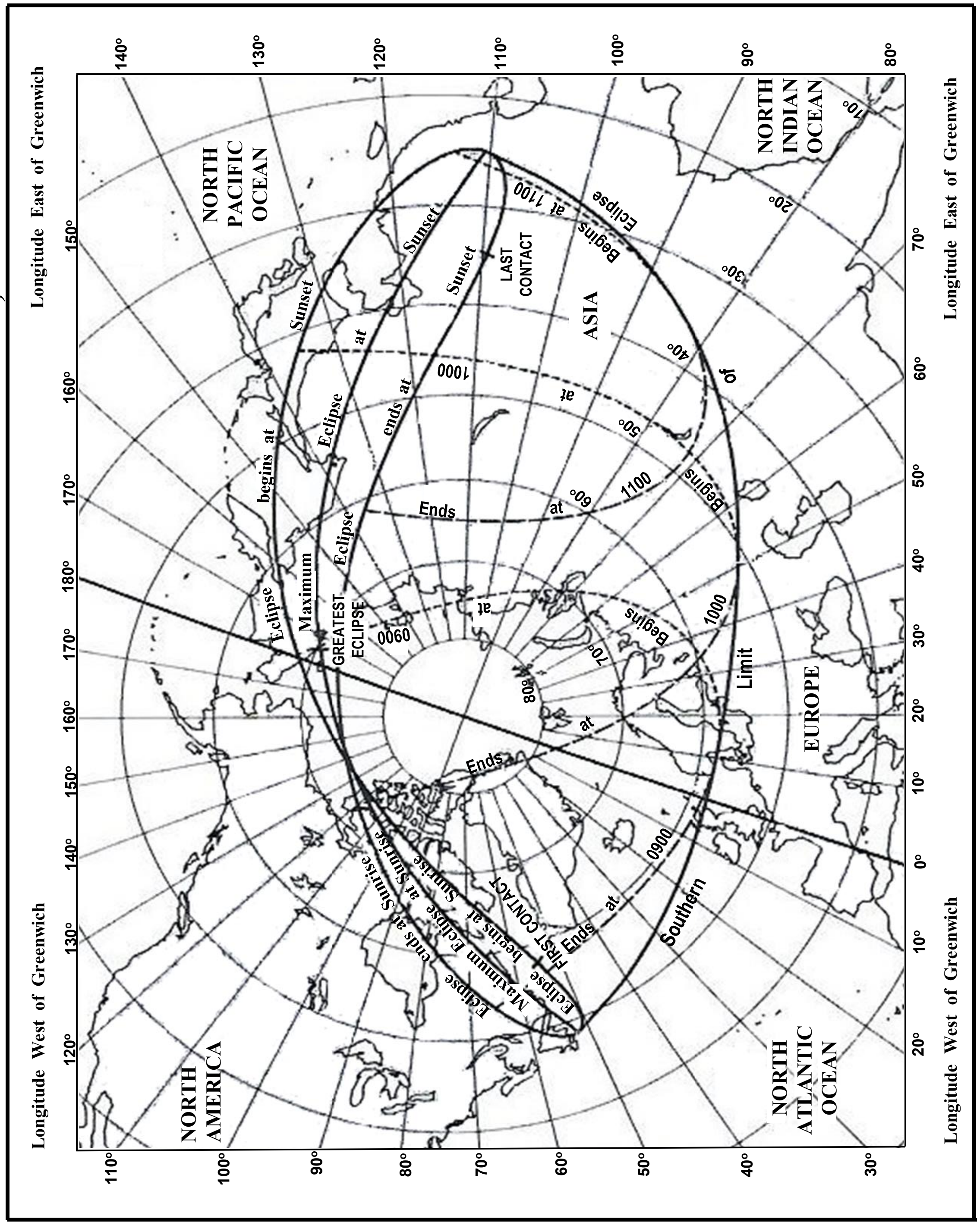
ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : August 11^d 09^h 20^m $05^s.44$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	09	24	23.96	09	24	23.93
Hourly Motion			154.10			9.46
	°	'	"	°	'	"
Declination	16	25	21.86	15	13	38.54
Hourly Motion		-8	27.91			-44.56
Equatorial Horizontal Parallax		61	10.30			8.68
True Semi-diameter		16	39.74		15	46.82

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	11	08	02.3	11	13	32.3	+ 57	79.0	- 54	54.4
Greatest eclipse*	11	09	46.3	11	15	16.3	+ 70	26.1	- 185	19.3
Eclipse ends	11	11	30.6	11	17	00.6	+ 34	46.4	+ 109	31.2

*Magnitude of the eclipse = 0.736

ECLIPSES, 2018

PARTIAL SOLAR ECLIPSE OF AUGUST 11, 2018



The timings of beginning and ending are expressed in UT

ECLIPSES, 2018

BESSELIAN ELEMENTS OF THE PARTIAL ECLIPSE OF THE SUN AUGUST 11

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
7	00	-1.338150	+1.471309	+0.263081	+0.964774	283	41	12.8	+0.530629
	10	-1.243397	+1.450425	+0.263047	+0.964783	286	11	14.6	+0.530647
	20	-1.148642	+1.429531	+0.263013	+0.964792	288	41	16.4	+0.530664
	30	-1.053885	+1.408627	+0.262979	+0.964802	291	11	18.3	+0.530680
	40	-0.959127	+1.387713	+0.262945	+0.964811	293	41	20.1	+0.530696
	50	-0.864368	+1.366790	+0.262911	+0.964820	296	11	22.0	+0.530711
8	00	-0.769608	+1.345856	+0.262878	+0.964829	298	41	23.8	+0.530726
	10	-0.674847	+1.324913	+0.262844	+0.964838	301	11	25.6	+0.530739
	20	-0.580086	+1.303961	+0.262810	+0.964848	303	41	27.5	+0.530752
	30	-0.485325	+1.282999	+0.262776	+0.964857	306	11	29.3	+0.530765
	40	-0.390564	+1.262028	+0.262742	+0.964866	308	41	31.2	+0.530776
	50	-0.295804	+1.241047	+0.262708	+0.964875	311	11	33.0	+0.530787
9	00	-0.201045	+1.220057	+0.262674	+0.964885	313	41	34.8	+0.530797
	10	-0.106287	+1.199058	+0.262641	+0.964894	316	11	36.7	+0.530807
	20	-0.011530	+1.178049	+0.262607	+0.964903	318	41	38.5	+0.530816
	30	+0.083226	+1.157032	+0.262573	+0.964912	321	11	40.4	+0.530824
	40	+0.177979	+1.136005	+0.262539	+0.964921	323	41	42.2	+0.530831
	50	+0.272731	+1.114970	+0.262505	+0.964931	326	11	44.1	+0.530838
10	00	+0.367479	+1.093925	+0.262471	+0.964940	328	41	45.9	+0.530844
	10	+0.462226	+1.072872	+0.262437	+0.964949	331	11	47.7	+0.530849
	20	+0.556969	+1.051810	+0.262403	+0.964958	333	41	49.6	+0.530853
	30	+0.651709	+1.030739	+0.262369	+0.964967	336	11	51.4	+0.530857
	40	+0.746445	+1.009660	+0.262335	+0.964977	338	41	53.3	+0.530860
	50	+0.841178	+0.988572	+0.262302	+0.964986	341	11	55.1	+0.530863
11	00	+0.935906	+0.967475	+0.262268	+0.964995	343	41	57.0	+0.530865
	10	+1.030631	+0.946370	+0.262234	+0.965004	346	11	58.8	+0.530866
	20	+1.125350	+0.925257	+0.262200	+0.965014	348	42	00.7	+0.530866
	30	+1.220065	+0.904135	+0.262166	+0.965023	351	12	02.5	+0.530866
	40	+1.314774	+0.883006	+0.262132	+0.965032	353	42	04.4	+0.530865
	50	+1.409479	+0.861868	+0.262098	+0.965041	356	12	06.2	+0.530863
	00	+1.504177	+0.840721	+0.262064	+0.965050	358	42	08.0	+0.530861

$\tan f_1 = 0.004620$ $\tan f_2 = 0.004597$

TT	d			Variations per minute			
hr	°	'	"	x'	y'	μ' '	"
7	15	15	11	+0.009 475	-0.002 088	15	00
8	15	14	27	+0.009 476	-0.002 094	15	00
9	15	13	44	+0.009 475	-0.002 105	15	00
10	15	13	00	+0.009 475	-0.002 105	15	00
11	15	12	17	+0.009 472	-0.002 110	15	00

ȝ′ = 0.004364 ȷ cos ű′cos (ε+ə) η′ = 0.004364 ȝ sin d

*d stands for declination and ε stands for hour angle

ECLIPSES, 2018

I- Total Eclipse of the Moon, January 31, 2018, Wednesday

Visible in India

Eclipse will be visible in the region covering North America except eastern part, Oceania, Russia, Asia including India, Middle East, northern Scandanavia and eastern Europe.

The places from where the beginning of the umbral phase is visible at the time of moonset are eastern part of South Pacific Ocean, eastern part of United States of America and eastern part of Canada.

The places from where the ending of the umbral phase is visible at the time of moonrise are the Indian Ocean, Somalia, Saudi Arabia , Turkey and Ukraine.

ELEMENTS OF THE ECLIPSE						
Universal Time of Opposition in Right Ascension : January 31^{d} 13^{h} 35^{m} $38^{s}33$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	08	56	19.85	20	56	19.85
Hourly Motion			154.38			10.21
	°	'	"	°	'	"
Declination	16	59	02.72	-17	17	43.74
Hourly Motion		-07	00.56			-42.12
Equatorial Horizontal Parallax		60	52.45			08.93
True Semi-diameter		16	34.88		16	14.02

CIRCUMSTANCES OF THE ECLIPSE											
	Universal Time			Indian Standard Time			Position Angle measured from the North Point of Moonôs Limb (N.E.S.W.)	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	31	10	49.7	31	16	19.7	89	17	18	-160	28
Moon enters umbra	31	11	48.2	31	17	18.2	83	17	11	-174	29
Moon enters Totality	31	12	51.4	31	18	21.4	-119	16	57	+170	59
Middle of the eclipse*	31	13	29.9	31	18	59.9	--	17	00	+161	07
Moon leaves Totality	31	14	08.3	31	19	38.3	140	16	55	+151	53
Moon leaves umbra	31	15	11.6	31	20	41.6	298	16	48	+138	43
Moon leaves penumbra	31	16	09.9	31	21	39.9	292	16	41	+122	42

*Magnitude of the eclipse =1.321 (Moonôs diam =1.0). Distance between the centers at middle 1100".9

Radius of shadow cone at Moonôs distance: Penumbra 4722".0, Umbra 2735".0

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (11h 48.2m U.T.)						Western Limit Moonrise at ending (15h 11.6m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
	ę	′	ę	ę	′	ę	ę	′	ę	ę	′
-50	-106	07	+10	-81	21	-50	+67	47	+10	+43	40
40	99	32	20	78	01	40	61	23	20	40	24
30	94	46	30	74	11	30	56	45	30	36	40
20	90	57	40	69	26	20	53	01	40	32	02
-10	87	36	50	62	51	-10	49	46	50	25	38
0	-84	29	+60	-52	05	0	+46	43	+60	+15	12

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, 2018

TOTAL ECLIPSE OF THE MOON, JANUARY 31, 2018

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA

PLACES	Moon Rise (IST)	Umbral phase begins at 17h 18m (IST)	Totality begins at 18h 21m (IST)	Greatest Phase at 19h 00m (IST)	Totality Ends at 19h 38m (IST)	Umbral phase Ends at 20h 42m (IST)
	h m	Visibility				
Agartala	17 03	Visible	Visible	Visible	Visible	Visible
Ahmedabad	18 21	*	Visible	Visible	Visible	Visible
Aijawl	16 57	Visible	Visible	Visible	Visible	Visible
Ajmer	18 08	*	Visible	Visible	Visible	Visible
Allahabad	17 40	*	Visible	Visible	Visible	Visible
Amritsar	17 58	*	Visible	Visible	Visible	Visible
Bangalore	18 15	*	Visible	Visible	Visible	Visible
Bhagalpur	17 19	*	Visible	Visible	Visible	Visible
Bhopal	18 02	*	Visible	Visible	Visible	Visible
Bhubaneswar	17 31	*	Visible	Visible	Visible	Visible
Cannanore	18 26	*	*	Visible	Visible	Visible
Chandigarh	17 48	*	Visible	Visible	Visible	Visible
Chennai	18 04	*	Visible	Visible	Visible	Visible
Cochin	18 25	*	*	Visible	Visible	Visible
Cooch Behar	17 06	Visible	Visible	Visible	Visible	Visible
Cuttack	17 30	*	Visible	Visible	Visible	Visible
Darjeeling	17 10	Visible	Visible	Visible	Visible	Visible
Dehradun	17 47	*	Visible	Visible	Visible	Visible
Delhi	17 54	*	Visible	Visible	Visible	Visible
Dibrugarh	16 41	Visible	Visible	Visible	Visible	Visible
Dwarka	18 37	*	*	Visible	Visible	Visible
Gandhinagar	18 21	*	Visible	Visible	Visible	Visible
Gangtok	17 08	Visible	Visible	Visible	Visible	Visible
Gaya	17 28	*	Visible	Visible	Visible	Visible
Guwahati	16 58	Visible	Visible	Visible	Visible	Visible
Haridwar	17 46	*	Visible	Visible	Visible	Visible
Hyderabad	18 05	*	Visible	Visible	Visible	Visible
Imphal	16 50	Visible	Visible	Visible	Visible	Visible
Itanagar	16 47	Visible	Visible	Visible	Visible	Visible
Jaipur	18 02	*	Visible	Visible	Visible	Visible
Jalandhar	17 53	*	Visible	Visible	Visible	Visible
Jammu	17 57	*	Visible	Visible	Visible	Visible
Kanyakumari	18 22	*	*	Visible	Visible	Visible
Kavalur	18 08	*	Visible	Visible	Visible	Visible
Kavaratti	18 37	*	*	Visible	Visible	Visible
Kohima	16 47	Visible	Visible	Visible	Visible	Visible
Kolkata	17 17	Visible	Visible	Visible	Visible	Visible
Kozikode	18 25	*	*	Visible	Visible	Visible
Lucknow	17 41	*	Visible	Visible	Visible	Visible

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

ECLIPSES, 2018

TOTAL ECLIPSE OF THE MOON, JANUARY 31, 2018

PHASES OF ECLIPSE VISIBLE FROM CERTAIN PLACES OF INDIA

PLACES	Moon Rise (IST)	Umbral phase begins at 17h 18m (IST)	Totality begins at 18h 21m (IST)	Greatest Phase at 19h 00m (IST)	Totality Ends at 19h 38m (IST)	Umbral phase Ends at 20h 42m (IST)
	h m	Visibility				
Madurai	18 17	*	Visible	Visible	Visible	Visible
Mangalore	18 27	*	*	Visible	Visible	Visible
Mount Abu	18 19	*	Visible	Visible	Visible	Visible
Mumbai	18 27	*	*	Visible	Visible	Visible
Murshidabad	17 14	Visible	Visible	Visible	Visible	Visible
Muzaffarpur	17 24	*	Visible	Visible	Visible	Visible
Mysore	18 20	*	Visible	Visible	Visible	Visible
Nagpur	17 58	*	Visible	Visible	Visible	Visible
Nasik	18 21	*	Visible	Visible	Visible	Visible
Panaji	18 25	*	*	Visible	Visible	Visible
Patna	17 26	*	Visible	Visible	Visible	Visible
Pondicherry	18 07	*	Visible	Visible	Visible	Visible
Port Blair	17 14	Visible	Visible	Visible	Visible	Visible
Pune	18 23	*	*	Visible	Visible	Visible
Puri	17 32	*	Visible	Visible	Visible	Visible
Raipur	17 47	*	Visible	Visible	Visible	Visible
Rajkot	18 30	*	*	Visible	Visible	Visible
Ranchi	17 28	*	Visible	Visible	Visible	Visible
Shillong	16 57	Visible	Visible	Visible	Visible	Visible
Shimla	17 50	*	Visible	Visible	Visible	Visible
Silchar	16 55	Visible	Visible	Visible	Visible	Visible
Siliguri	17 10	Visible	Visible	Visible	Visible	Visible
Silvassa	18 24	*	*	Visible	Visible	Visible
Srinagar	17 54	*	Visible	Visible	Visible	Visible
Thiruvanantapuram	18 24	*	*	Visible	Visible	Visible
Udaipur	18 15	*	Visible	Visible	Visible	Visible
Ujjain	18 08	*	Visible	Visible	Visible	Visible
Vadodara	18 20	*	Visible	Visible	Visible	Visible
Varanasi	17 35	*	Visible	Visible	Visible	Visible

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

ECLIPSES, 2018

IV- Total Eclipse of the Moon, July 27, 2018, Friday

Visible in India

Eclipse will be visible in the region covering Antarctica, Australasia, Russia except northernmost parts, Asia, Africa, Scandanavia, Europe, Central and Eastern South America.

The places from where the beginning of the umbral phase is visible at the time of moonset are New Zealand, the South Pacific Ocean , the North Pacific Ocean and eastern part of Russia. .

The places from where the ending of the umbral phase is visible at the time of moonrise are Argentina, Bolivia, Brazil and the North Atlantic Ocean.

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 : July 27^{d} 20^{h} 23^{m} $44^{s}92$

	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	20	28	22.35	20	28	22.34
Hourly Motion			123.91			09.81
	°	'	"	°	'	"
Declination	-18	58	01.20	19	04	24.74
Hourly Motion		4	25.79	-		-34.38
Equatorial Horizontal Parallax		53	59.71			08.66
True Semi-diameter		14	42.40		15	45.03

CIRCUMSTANCES OF THE ECLIPSE

	Universal Time			Indian Standard Time			Position Angle measured from the North Point of Moonôs Limb (N.E.S.W.)	The Moon being in the Zenith in Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	27	17	13.1	27	22	43.1	86	-19	12	+102	07
Moon enters umbra	27	18	24.2	27	23	54.2	89	-19	07	+84	56
Moon enters Totality	27	19	30.0	28	01	00.0	-83	-18	58	+69	31
Middle of the eclipse*	27	20	21.8	28	01	51.8	--	-18	58	+56	28
Moon leaves Totality	27	21	13.6	28	02	43.6	67	-18	54	+43	56
Moon leaves umbra	27	22	19.3	28	03	49.3	255	-18	49	+28	00
Moon leaves penumbra	27	23	30.4	28	05	00.4	258	-18	44	+10	48

*Magnitude of the eclipse =1.614 (Moonôs diam =1.0). Distance between the centers at middle 378".5

Radius of shadow cone at Moonôs distance: Penumbra 4271"8, Umbra 2343".9

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (18h 24.2m U.T.)						Western Limit Moonrise at ending (22h 19.3m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
	ę	′	ę	ę	′	ę	ę	′	ę	ę	′
-50	-160	41	+10	+171	25	-50	-85	58	+10	-58	33
40	168	10	20	167	41	40	78	37	20	54	52
30	178	32	30	163	23	30	73	21	30	50	39
20	-177	50	40	158	01	20	69	08	40	45	23
-10	+178	26	50	150	32	-10	65	27	50	38	02
0	+174	56	+60	+138	03	0	-82	00	+60	-25	49

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.

OCCULTATIONS, 2018

PLANETS BY THE MOON

Sl. No	Date and Ingress - Egress Times (U.T.)		Planet	Magnitude of Planet	Area of Visibility
		h -- h			
1.	Nov. 12	16.7-19.6	Pluto	14.3	N.E. North America, S. Greenland, Iceland, Azores, most of western Europe.
2.	Nov. 16	03.5-06.3	Mars	-0.3	Most of Antartica, Falkland Islands, S. South America
3.	Dec. 09	04.8-05.9	Saturn	14.3	South eastern Russia, northern tip of China
4.	Dec. 10	01.7-05.3	Pluto	8.0	N.E. China, E. Mongolia, Japan, E. and S. E. Russia, N. Micronesia, Aleutian Islands.

OCCULTATIONS, 2018

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.	Nov. 12	18	12.8	2	18.1	1.0005	0.5482	0.0300	19	23	09.9	-22	05	24.5
2.	Nov. 16	4	17.4	-14	12.0	-1.0932	0.5010	0.1433	22	11	21.3	-12	59	02.0
3.	Dec. 09	05	17.5	-8	07.6	1.2360	0.5514	-0.0112	18	37	51.4	-22	38	10.0
4.	Dec. 10	03	33.2	-10	36.6	0.8030	0.5502	0.0313	19	26	09.6	-22	01	52.3

OCCULTATIONS, 2018

ELEMENTS (contd.)

Sl. No.	*l*	*a*
1.	0.2725	1.00
2.	0.2733	1.00
3.	0.2726	1.00
4.	0.2725	1.00

OCCULTATIONS, 2018

BRIGHT STAR BY THE MOON

Sl. No.	Date and Ingress - Egress Time (U.T)		Star	Magnitude of Star	Area of Visibility
	h -- h				
1.	Jan. 5	06.7-09.7	Regulus	1.35	Alaska, eastern tip of Russia, Northern Canada, Greenland, Svalbard, Iceland, most of Europe, north westernmost Africa.
2.	Jan. 27	08.6- 12.2	Aldebaran	0.85	Most of India, Central Asia, most of China, Mongolia, most of Russia, Alaska, N. W. North America.
3.	Feb. 1	17.8 - 20.7	Regulus	1.35	Scandanavia, Northern Greenland, Svalbard, northern and eastern Russia, N. E. China, N. W. Alaska, most of Japan
4.	Feb. 23	15.6-19.1	Aldebaran	0.85	Bermuda, N. E. North America, Greenland, most of Europe, Svalbard, most of Russia, Kazakhstan, western Mongolia, North West China.
5.	Mar. 1	04.5 ï 07.4	Regulus	1.35	N. E. tip of Russia, N. North America, Greenland, Svalbard, W. edge of Europe, Azores.
6.	Mar.22/23	21.2 ï 00.3	Aldebaran	0.85	N. E. Russia, N. W. North America, Greenland, Svalbard, most of Scandanvia, Great Britain and Ireland.
7.	Mar. 28	13.2-15.8	Regulus	1.35	Most of Scandanvia, N. and eastern Russia, Svalbard, N. Greenland, north westernmost North America, Aleutian Islands.
8.	Apr. 19	03.7-06.7	Aldebaran	0.85	Most of Uzbekistan, Most of Kazakhstan, central and northern Russia, North and eastern Scandanavia, N. Greenland, northern most Canada.
9.	Apr. 24	19.9-21.4	Regulus	1.35	Central Russia, N. E. tip of Kazakhstan.
10.	May 16	12.3 ï 14.0	Aldebaran	0.85	Central and Northern Canada, N. W. Greenland, northernmost central Russia.
11.	Jul. 10	08.5-10.6	Aldebaran	0.85	Central and N. North America, most of Greenland, N. Central Russia.
12.	Aug. 6	17.6-19.8	Aldebaran	0.85	Mongolia, Central Russia, Svalbard, most of Greenland, northernmost Canada.
13.	Sep. 03	01.0-02.3	Aldebaran	0.85	Greenland, northernmost Canada.

OCCULTATIONS, 2018

ELEMENTS OF OCCULTATIONS OF STAR

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. 5	07	47.9	04	39.1	0.9146	0.5806	-0.1612	10	09	19.9	11	52	38.0
2.	Jan. 27	10	34.3	14	25.1	0.6823	0.5942	0.1085	04	36	57.7	16	32	31.2
3.	Feb. 1	18	48.0	17	27.5	0.9501	0.5880	-0.1628	10	09	20.5	11	52	35.0
4.	Feb. 23	17	33.4	23	49.8	0.7258	0.5843	0.1067	04	36	57.2	16	32	30.7
5.	Mar. 1	05	32.6	06	00.4	0.9469	0.5859	-0.1630	10	09	20.7	11	52	34.2
6.	Mar. 22	22	59.1	30	24.8	0.8892	0.5834	0.1070	04	36	56.7	16	32	30.2
7.	Mar. 28	14	02.2	16	17.8	1.0292	0.5771	-0.1622	10	09	20.6	11	52	35.0
8.	Apr. 19	05	10.5	14	23.7	1.0764	0.5905	0.1098	04	36	56.4	16	32	29.9
9.	Apr. 24	20	04.4	24	07.4	1.2373	0.5696	-0.1615	10	09	20.3	11	52	36.6
10.	May 16	13	28.4	24	29.5	1.1801	0.5985	0.1135	04	36	56.3	16	32	30.2
11.	Jul 10	09	54.6	24	31.9	1.1176	0.5954	0.1160	04	36	57.2	16	32	33.7
12.	Aug. 06	19	01.1	35	26.3	1.1161	0.5852	0.1142	04	36	57.9	16	32	36.4
13.	Sep. 3	02	01.4	20	14.2	1.2356	0.5766	0.1124	04	36	58.7	16	32	38.9

l = 0.2725 *   and a = 1.0027*

* Elements l and a have identical values correct upto last significant digit (as reported) in occultations of bright star above

PART - V

ASTRONOMICAL PHENOMENA
AND
MISCELLANEOUS TABLES

PHENOMENA, 2018

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. -3	W. 22	-0.3	W. 3	-4.0	July 1	E. 24	-0.1	E. 41	-4.1
2	23	-0.4	2	-4.0	6	25	+0.1	42	-4.1
7	22	-0.3	1	é	11	26	+0.3	42	-4.1
12	21	-0.3	E. 1	é	16	26	+0.6	43	-4.2
17	19	-0.3	2	-4.0	21	24	+1.0	44	-4.2
22	W. 17	-0.3	E. 3	-3.9	26	E. 21	+1.6	E. 44	-4.3
27	14	-0.4	4	-3.9	31	15	+2.6	45	-4.3
Feb. 1	12	-0.6	6	-3.9	Aug. 5	9	+4.3	45	-4.3
6	9	-0.8	7	-3.9	10	W. 5	+5.3	46	-4.4
11	5	-1.2	8	-3.9	15	10	+3.3	46	-4.4
16	W. 2	-1.6	E. 9	-3.9	20	W. 16	+1.4	E. 46	-4.5
21	E. 3	-1.6	10	-3.9	25	18	+0.1	46	-4.5
26	7	-1.4	12	-3.9	30	18	-0.6	45	-4.6
Mar. 3	12	-1.2	13	-3.9	Sept. 4	15	-1.0	45	-4.6
8	16	-1.0	14	-3.9	9	11	-1.3	44	-4.7
13	E. 18	-0.7	E. 15	-3.9	14	W. 7	-1.5	E. 42	-4.7
18	18	+0.1	16	-3.9	19	2	-1.7	40	-4.8
23	15	+1.5	18	-3.9	24	E. 3	-1.5	38	-4.8
28	9	+3.7	19	-3.9	29	6	-1.1	35	-4.8
Apr. 2	W. 3	é	20	-3.9	Oct. 4	10	-0.7	31	-4.7
7	W. 9	+4.0	E. 21	-3.9	9	E. 13	-0.5	E. 26	-4.6
12	17	+2.3	22	-3.9	14	16	-0.3	20	-4.5
17	22	+1.3	24	-3.9	19	18	-0.3	14	-4.2
22	25	+0.8	25	-3.9	24	20	-0.2	8	-4.3
27	27	+0.5	26	-3.9	29	22	-0.2	W. 7	é
May 2	W. 27	+0.2	E. 27	-3.9	Nov. 3	E. 23	-0.3	W. 13	-4.2
7	26	+0.1	29	-3.9	8	23	-0.3	19	-4.5
12	24	-0.1	30	-3.9	13	22	-0.1	25	-4.7
17	21	-0.4	31	-3.9	18	18	+0.6	30	-4.8
22	17	-0.7	32	-3.9	23	10	+2.6	35	-4.8
27	W. 12	-1.1	E. 33	-3.9	28	W. 2	é	W. 38	-4.9
June 1	6	-1.7	34	-3.9	Dec. 3	12	+1.7	41	-4.9
6	1	-2.4	36	-4.0	8	19	0.0	43	-4.8
11	E. 6	-1.7	37	-4.0	13	21	-0.4	44	-4.8
16	12	-1.1	38	-4.0	18	21	-0.5	45	-4.8
21	E. 17	-0.7	E. 39	-4.0	23	W. 20	-0.4	W. 46	-4.7
26	21	-0.4	40	-4.0	28	18	-0.4	47	-4.7
July 1	E. 24	-0.1	E. 41	-4.1	33	W. 16	-0.4	W. 47	-4.6

Conjunction-	Mercury		Venus	Mercury	Venus
	d h	d h	d h	d h	d h
Superior:	Feb. 17 12	June 6 02	Jan. 9 07	Sept. 21 02	é
Inferior:	Apr. 1 18	Aug. 9 02	Oct. 26 14	Nov. 27 09	é

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, 2018

ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h UT

Date	Mars Elong.	Mars Mag.	Jupiter Elong.	Jupiter Mag.	Saturn Elong.	Saturn Mag.	Uranus Elong.	Neptune Elong.	Pluto Elong.
	°		°		°		°	°	°
Jan. -8	W. 53	+1.5	W. 46	-1.8	W. 1	+0.4	E. 113	E. 70	E. 17
2	57	+1.5	54	-1.8	10	+0.5	103	60	7
12	61	+1.4	63	-1.9	19	+0.5	93	50	W. 3
22	65	+1.3	72	-1.9	28	+0.5	83	41	12
Feb. 1	69	+1.2	81	-2.0	37	+0.6	73	31	22
11	W. 73	+1.1	W. 90	-2.0	W. 46	+0.6	E. 63	E. 21	W. 32
21	77	+0.9	99	-2.1	56	+0.6	53	11	42
Mar. 3	81	+0.8	109	-2.2	65	+0.6	44	2	52
13	85	+0.6	119	-2.2	74	+0.5	34	W. 8	61
23	89	+0.4	129	-2.3	84	+0.5	25	18	71
Apr. 2	W. 94	+0.3	W. 140	-2.4	W. 93	+0.5	E. 15	W. 27	W. 81
12	98	+0.1	151	-2.4	103	+0.4	6	37	91
22	103	-0.2	161	-2.5	113	+0.4	W. 3	46	101
May 2	108	-0.4	172	-2.5	123	+0.3	12	56	110
12	113	-0.7	E. 177	-2.5	133	+0.3	21	65	120
22	W. 119	-0.9	E. 166	-2.5	W. 143	+0.2	W. 31	W. 75	W. 130
June 1	125	-1.2	155	-2.5	153	+0.2	40	84	140
11	132	-1.5	145	-2.4	163	+0.1	49	94	149
21	140	-1.8	134	-2.4	173	+0.1	58	103	159
July 1	150	-2.2	124	-2.3	E. 176	0.0	67	113	169
11	W. 160	-2.5	E. 115	-2.2	E. 166	+0.1	W. 76	W. 122	W. 179
21	170	-2.7	105	-2.2	156	+0.1	86	132	E. 172
31	E. 172	-2.8	96	-2.1	146	+0.2	95	142	162
Aug. 10	162	-2.6	87	-2.1	136	+0.2	105	151	152
20	151	-2.4	79	-2.0	126	+0.3	114	161	142
30	E. 142	-2.2	E. 70	-1.9	E. 116	+0.4	W. 124	W. 171	E. 132
Sept. 9	133	-1.9	62	-1.9	106	+0.4	134	E. 178	123
19	126	-1.6	54	-1.8	97	+0.4	144	169	113
29	119	-1.4	46	-1.8	87	+0.5	154	159	103
Oct. 9	114	-1.1	38	-1.8	78	+0.5	164	149	93
19	E. 109	-0.9	E. 30	-1.8	E. 68	+0.5	W. 175	E. 139	E. 83
29	104	-0.7	22	-1.7	59	+0.6	E. 175	128	73
Nov. 8	100	-0.5	14	-1.7	50	+0.6	164	118	64
18	96	-0.3	7	-1.7	41	+0.6	154	108	54
28	92	-0.1	W. 2	-1.7	32	+0.5	144	98	44
Dec. 8	E. 88	+0.1	W. 9	-1.7	E. 23	+0.5	E. 133	E. 88	E. 34
18	85	+0.2	17	-1.7	14	+0.5	123	78	24
28	81	+0.4	25	-1.8	5	+0.5	112	68	14
38	E. 78	+0.5	W. 33	-1.8	W. 4	+0.5	E. 102	E. 58	E. 4
	d h		d h		d h		d h	d h	d h
Conjunction:	é .		Nov. 26 07		é .		Apr. 18 14	Mar. 4 14	Jan. 9 09
Opposition:	July 27 05		May 9 01		June 27 13		Oct. 24 01	Sept. 7 18	July 12 10

Magnitudes at opposition: Uranus +5.7; Neptune +7.8; Pluto +14.5

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, 2018

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

UNIVERSAL TIME

MERCURY

		d	h	m			d	h	m	
Superior conjuction		é	é	é		June	6	02	02	
Heliacal rising E.		é	é	é		June	14	18	03	
Greatest elongation E.		é	é	é		July	12	05	29	(26ę.4)
Retrograde		é	é	é		July	26	04	59	
Heliacal setting E.		é	é	é		July	29	00	16	
Inferior conjunction		é	é	é		Aug.	9	02	06	
Heliacal rising W.		é	é	é		Aug.	15	17	31	
Direct		é	é	é		Aug.	19	04	18	
Greatest elongation W.	Jan.	1	19	58	(22ę.7)	Aug.	26	20	34	(18ę.3)
Heliacal setting W.	Jan.	28	09	51		Sept.	10	03	00	
Superior conjuction	Feb.	17	12	24		Sept.	21	01	53	
Heliacal rising E.	Mar.	1	02	28		Oct.	12	08	54	
Greatest elongation E.	Mar.	15	15	10	(18ę.4)	Nov.	6	15	32	(23ę.3)
Retrograde	Mar.	23	00	26		Nov.	17	01	16	
Heliacal setting E.	Mar.	26	18	46		Nov.	21	13	21	
Inferior conjunction	Apr.	1	17	52		Nov.	27	09	15	
Heliacal rising W.	Apr.	9	18	48		Dec.	1	18	22	
Direct	Apr.	15	09	23		Dec.	6	21	38	
Greatest elongation W.	Apr.	29	18	24	(27ę.0)	Dec.	15	11	30	(21ę.3)
Heliacal setting W.	May	24	12	43			é	é	é	

VENUS

		d	h	m		d	h	m
Superior conjuction	Jan.	9	07	02		é	é	é
Heliacal rising E.	Feb.	4	00	15		é	é	é
Greatest elongation E.	Aug.	17	17	30	(45ę.9)	é	é	é
Retrograde	Oct.	5	19	01		é	é	é
Heliacal setting E.	Oct.	16	11	14		é	é	é
Inferior conjunction	Oct.	26	14	16		é	é	é
Heliacal rising W.	Oct.	30	13	13		é	é	é
Direct	Nov.	16	10	52		é	é	é
Greatest elongation W.		é	é	é		é	é	é
Heliacal setting W.		é	é	é		é	é	é

EARTH

		d	h	m			d	h	m		d	h	m
Perihelion	Jan.	3	05	35	Equinoxes	Mar.	20	16	16	Sept.	23	01	54
Aphelion	July	6	16	47	Solstices	June	21	10	07	Dec.	21	22	23

SUPERIOR PLANETS

	MARS				JUPITER				SATURN			
		d	h	m		d	h	m		d	h	m
Conjunction		é	é	é	Nov.	26	06	33		é	é	é
Heliacal rising W.		é	é	é	Dec.	7	04	35	Jan.	5	05	46
Retrograde	June	26	21	03	Mar.	9	04	45	Apr.	18	01	47
Opposition	July	27	05	13	May	9	00	39	June	27	13	28
Direct	Aug.	27	14	05	July	10	17	03	Sept.	6	11	08
Heliacal setting E.		é	é	é	Nov.	13	10	23	Dec.	19	04	13

PHENOMENA, 2018

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
Conjuction	Apr.	18 14 00	Mar.	4 13 54	Jan.	9 09 30
Retrograde	Aug.	7 16 47	June	18 23 28	Apr.	22 15 24
Opposition	Oct.	24 00 46	Sept.	7 18 27	July	12 10 01
Direct	Jan.	2 14 13	Nov.	25 01 15	Oct.	1 02 03

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, 2018

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

UNIVERSAL TIME

	d h m			d h m	
Jan.	7 00 39	*Mars* conj. *Jupiter*	Apr.	17 22 05	Moon conj. Venus
	11 08 22	Moon conj. Jupiter		30 19 11	Moon conj. Jupiter
	11 12 35	Moon conj. Mars	May	4 20 02	Moon conj. Saturn
	13 07 03	*Mercury* conj. *Saturn*		6 06 21	Moon conj. Mars
	15 01 49	Moon conj. Saturn		13 18 57	Moon conj. Mercury
	15 07 03	Moon conj. Mercury		17 18 17	Moon conj. Venus
	17 06 30	Moon conj. Venus		27 19 48	Moon conj. Jupiter
Feb.	7 21 57	Moon conj. Jupiter	June	1 00 53	Moon conj. Saturn
	9 06 40	Moon conj. Mars		3 10 22	Moon conj. Mars
	11 14 17	Moon conj. Saturn		14 13 01	Moon conj. Mercury
	15 18 06	Moon conj. Mercury		16 12 14	Moon conj. Venus
	16 16 36	Moon conj. Venus		23 21 11	Moon conj. Jupiter
Mar.	4 18 04	*Mercury* conj. *Venus*		28 03 34	Moon conj. Saturn
	7 08 55	Moon conj. Jupiter		30 23 10	Moon conj. Mars
	10 00 54	Moon conj. Mars	July	14 23 11	Moon conj. Mercury
	11 02 05	Moon conj. Saturn		16 04 35	Moon conj. Venus
	18 21 58	Moon conj. Venus		21 02 29	Moon conj. Jupiter
	18 23 47	Moon conj. Mercury		25 05 46	Moon conj. Saturn
	20 04 02	*Mercury* conj. *Venus*		27 18 48	Moon conj. Mars
Apr.	2 15 45	*Mars* conj. *Saturn*	Aug.	11 03 54	Moon conj. Mercury
	3 16 06	Moon conj. Jupiter		14 18 05	Moon conj. Venus
	7 12 19	Moon conj. Saturn		17 13 06	Moon conj. Jupiter
	7 17 42	Moon conj. Mars		21 09 34	Moon conj. Saturn
	14 12 12	Moon conj. Mercury		23 14 19	Moon conj. Mars

PHENOMENA, 2018 --- *contd.*

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

UNIVERSAL TIME

	d	h	m			d	h	m	
Sept.	8	22	54	Moon conj. Mercury	Nov.	6	08	18	Moon conj. Venus
	12	22	31	Moon conj. Venus		8	19	06	Moon conj. Jupiter
	14	04	33	Moon conj. Jupiter		9	13	37	Moon conj. Mercury
	17	16	26	Moon conj. Saturn		11	15	25	Moon conj. Saturn
	20	04	23	Moon conj. Mars		16	05	03	Moon conj. Mars
Oct.	10	04	36	Moon conj. Mercury		27	22	27	*Mercury* conj. *Jupiter*
	10	22	15	Moon conj. Venus	Dec.	3	21	05	Moon conj. Venus
	11	23	12	Moon conj. Jupiter		5	21	53	Moon conj. Mercury
	15	02	41	Moon conj. Saturn		6	14	31	Moon conj. Jupiter
	15	20	21	*Mercury* conj. *Venus*		9	05	09	Moon conj. Saturn
	18	11	51	Moon conj. Mars		15	02	19	Moon conj. Mars
	29	11	05	*Mercury* conj. *Jupiter*		21	17	37	*Mercury* conj. *Jupiter*

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

	d	h	m			d	h	m	
Feb.	10	15	09	Mars 5°.17 N. of *Antares*	Sept.	5	22	45	Mercury 1°.04 N. of *Regulus*
May	3	17	24	Venus 6°.50 N. of *Aldebaran*	Oct.	5	18	28	Mercury 2°.25 N. of *Spica*
June	4	01	16	Mercury 5°.92 N. of *Aldebaran*	Nov.	9	05	56	Mercury 1°.83 N. of *Antares*
June	9	01	22	Venus 4°.76 S. of *Pollux*	Nov.	24	02	19	Mercury 4°.42 N. of *Antares*
June	25	15	58	Mercury 4°.94 S. of *Pollux*	Dec.	20	02	09	Jupiter 5°.27 N. of *Antares*
July	9	20	07	Venus 1°.07 N. of *Regulus*	Dec.	21	08	23	Mercury 6°.17 N. of *Antares*
Sept.	2	08	55	Venus 1°.43 S. of *Spica*					

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	d	h	m	
Jan.	1	19	58	Mercury greatest elong. W. (22ę.7)
	1	21	49	Moon at perigee
	2	02	24	FULL MOON
	2	20	49	Uranus stationary in RA
	3	05	35	Earth at perihelion
	4	07	48	Moon in ascending node
	7	03	40	Mars 0ę.2 S. of Jupiter
	8	22	25	LAST QUARTER
	9	05	41	Venus 1ę.2 S. of Pluto
	9	07	02	Venus in superior conjunction 0ę 46' S of Sun
	9	09	30	Pluto in conjunction with Sun
	10	12	57	Moon greatest lat. N 5ę 13'
	11	05	58	Jupiter 4ę.3 S of Moon
	11	10	03	Mars 4ę.6 S of Moon
	13	06	48	Mercury 0ę.6 S. of Saturn
	14	20	44	Uranus in square with Sun
	15	01	57	Saturn 2ę.6 S of Moon
	15	02	10	Moon at apogee
	15	02	45	Mercury in descending node
	15	07	23	Mercury 3ę.4 S of Moon
	17	02	17	NEW MOON
	17	07	39	Venus 2ę.5 S of Moon
	18	14	28	Moon in descending node
	20	19	33	Neptune 1ę.6 N of Moon
	23	13	56	Venus at aphelion
	24	01	09	Uranus 4ę.7 N of Moon
	24	17	13	Mercury 1ę.5 S. of Pluto
	24	22	20	FIRST QUARTER
	25	07	54	Moon greatest lat. S 5ę13'
	25	11	20	Mercury at aphelion
	30	09	57	Moon at perigee
	31	13	27	FULL MOON, *Lunar Eclipse*
	31	18	47	Moon in ascending node
Feb.	6	16	15	Moon greatest lat. N 5ę 14'
	7	15	54	LAST QUARTER
	7	19	46	Jupiter 4ę.3 S of Moon
	9	05	12	Mars 4ę.4 S of Moon
	10	15	09	Mars 5ę.2 N. of *Antares*
	10	23	21	Jupiter in square with Sun
	11	14	16	Moon at apogee
	11	14	30	Saturn 2ę.5 S of Moon
	14	17	22	Mercury greatest helio lat. S.
	14	20	24	Venus greatest helio lat. S.
	14	21	11	Moon in descending node
	15	18	57	Mercury 1ę.1 S of Moon
	15	21	05	NEW MOON, *Solar Eclipse*
	16	16	09	Venus 0ę.6 N of Moon
	17	03	16	Neptune 1ę.7 N of Moon
Feb.	17	12	24	Mercury in superior conjunction 1ę 58 S of Sun
	20	08	04	Uranus 4ę.7 N of Moon
	21	10	41	Moon greatest lat. S 5ę 14'
	21	14	15	Venus 0ę.6 S. of Neptune
	23	08	09	FIRST QUARTER
	25	10	03	Mercury 0ę.5 S. of Neptune
	27	14	39	Moon at perigee
	28	05	03	Moon in ascending node
Mar.	2	00	51	FULL MOON
	4	13	54	Neptune in conjunction with Sun
	5	18	28	Mercury 1ę.4 N. of Venus
	5	19	00	Mercury in ascending node
	6	08	17	Moon greatest lat. N 5ę 10'
	7	06	56	Jupiter 4ę.1 S of Moon
	9	09	43	Jupiter stationary in RA
	9	11	20	LAST QUARTER
	10	00	38	Mars 3ę.8 S of Moon
	10	10	57	Mercury at perihelion
	11	02	21	Saturn 2ę.2 S of Moon
	11	09	14	Moon at apogee
	14	03	47	Moon in descending node
	15	15	10	Mercury greatest elong. E. (18ę.4)
	16	12	29	Neptune 1ę.8 N of Moon
	16	19	02	Mars in descending node
	17	13	12	NEW MOON
	18	01	16	Mercury 3ę.9 N. of Venus
	18	18	07	Mercury 7ę.7 N of Moon
	18	19	05	Venus 3ę.7 N of Moon
	19	16	29	Uranus 4ę.6 N of Moon
	20	12	41	Moon greatest lat. S 5ę 07'
	20	16	16	*Vernal Equinox*
	20	16	18	Mercury greatest helio. lat N.
	22	17	14	Mercury stationary in RA
	24	15	35	FIRST QUARTER
	24	16	08	Mars in square with Sun
	26	17	17	Moon at perigee
	27	10	56	Moon in ascending node
	29	00	15	Venus 0ę.1 S. of Uranus
	29	14	16	Saturn in square with Sun
	31	12	37	FULL MOON
Apr.	1	17	52	Mercury in inferior conjunction 2ę 50' N of Sun
	2	11	33	Moon greatest lat. N 5ę 04'
	2	11	51	Mars 1ę.3 S. of Saturn
	3	14	14	Jupiter 3ę.9 S of Moon
	7	12	35	Saturn 1ę.9 S of Moon
	7	18	16	Mars 3ę.1 S of Moon
	8	05	31	Moon at apogee

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	d	h	m	
Apr.	8	07	18	LAST QUARTER
	10	08	09	Moon in descending node
	11	04	51	Pluto in square with Sun
	12	03	31	Venus in ascending node
	12	22	43	Neptune 1°.9 N of Moon
	13	01	53	Mercury in descending node
	14	03	54	Mercury stationary in RA
	14	09	25	Mercury 3°.9 N of Moon
	16	01	57	NEW MOON
	16	03	06	Uranus 4°.6 N of Moon
	16	14	27	Moon greatest lat. S 4° 58'
	17	13	42	Saturn at aphelion
	17	19	28	Venus 5°.4 N of Moon
	18	01	36	Saturn stationary in RA
	18	13	60	Uranus in conjunction with Sun
	20	14	41	Moon at perigee
	22	21	46	FIRST QUARTER
	23	02	07	Pluto stationary in RA
	23	10	36	Mercury at aphelion
	23	12	20	Moon in ascending node
	26	00	00	Mars 1°.4 S. of Pluto
	29	13	22	Moon greatest lat. N 4° 59'
	29	18	24	Mercury greatest elong. W. (27°.0)
	30	00	58	FULL MOON
	30	17	16	Jupiter 3°.8 S of Moon
May	3	17	24	Venus 6°.5 N. of *Aldebaran*
	4	20	16	Saturn 1°.7 S of Moon
	6	00	35	Moon at apogee
	6	07	25	Mars 2°.7 S of Moon
	7	10	23	Moon in descending node
	8	02	09	LAST QUARTER
	9	00	39	Jupiter in opposition with Sun
	10	08	49	Neptune 2°.2 N of Moon
	12	21	02	Mercury 2°.4 S. of Uranus
	13	15	12	Uranus 4°.7 N of Moon
	13	16	39	Mercury greatest helio lat. S.
	13	16	46	Moon greatest lat. S 4° 57'
	13	17	20	Mercury 2°.4 N of Moon
	15	11	48	NEW MOON
	15	23	03	Venus at perihelion
	17	18	09	Venus 4°.8 N of Moon
	17	21	05	Moon at perigee
	20	13	14	Moon in ascending node
	22	03	49	FIRST QUARTER
	26	14	21	Moon greatest lat. N 5° 01'
	27	17	40	Jupiter 4°.0 S of Moon
	29	14	20	FULL MOON
June	1	01	04	Saturn 1°.6 S of Moon
	1	18	24	Mercury in ascending node
June	2	16	35	Moon at apogee
	3	12	01	Mars 3°.2 S of Moon
	3	12	38	Moon in descending node
	4	01	16	Mercury 5°.9 N. of *Aldebaran*
	6	02	02	Mercury in superior conjunction 0° 44' N of Sun
	6	10	14	Mercury at perihelion
	6	15	25	Venus greatest helio. lat N.
	6	17	34	Neptune 2°.4 N of Moon
	6	18	32	LAST QUARTER
	7	05	58	Neptune in square with Sun
	9	01	22	Venus 4°.8 S. of *Pollux*
	10	03	15	Uranus 4°.9 N of Moon
	10	07	57	Moon greatest lat. S 5° 04'
	13	19	43	NEW MOON
	14	13	15	Mercury 4°.6 N of Moon
	14	23	53	Moon at perigee
	16	13	12	Venus 2°.3 N of Moon
	16	15	32	Mercury greatest helio. lat N.
	16	17	52	Moon in ascending node
	19	11	59	Neptune stationary in RA
	20	10	51	FIRST QUARTER
	21	10	07	*Summer solstice*
	22	15	42	Moon greatest lat. N 5° 08'
	23	18	48	Jupiter 4°.2 S of Moon
	25	15	58	Mercury 4°.9 S. of *Pollux*
	27	13	28	Saturn in opposition with Sun
	28	03	43	Saturn 1°.8 S of Moon
	28	04	53	FULL MOON
	28	13	45	Mars stationary in RA
	30	02	43	Moon at apogee
	30	16	46	Moon in descending node
July	1	01	48	Mars 4°.8 S of Moon
	4	00	20	Neptune 2°.6 N of Moon
	6	07	51	LAST QUARTER
	6	16	47	Earth at aphelion
	7	11	37	Moon greatest lat. S 5° 15'
	7	13	39	Uranus 5°.0 N of Moon
	9	20	07	Venus 1°.1 N. of *Regulus*
	10	01	07	Mercury in descending node
	11	03	50	Jupiter stationary in RA
	12	05	29	Mercury greatest elong. E. (26°.4)
	12	10	01	Pluto in opposition with Sun
	13	02	48	NEW MOON, *Solar Eclipse*
	13	08	25	Moon at perigee
	14	02	49	Moon in ascending node
	14	22	03	Mercury 2°.2 S of Moon
	16	03	31	Venus 1°.6 S of Moon
	19	19	52	FIRST QUARTER

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	d	h	m			d	h	m	
July	20	06	09	Moon greatest lat. N 5ę 14'	Sept.	6	10	27	Saturn stationary in RA
	20	09	53	Mercury at aphelion		6	22	42	Moon in ascending node
	20	23	57	Jupiter 4ę.4 S of Moon		7	18	27	Neptune in opposition with Sun
	25	05	53	Saturn 2ę.0 S of Moon		8	01	20	Moon at perigee
	25	07	20	Mercury stationary in RA		8	22	16	Mercury 0ę.9 S of Moon
	25	11	35	Uranus in square with Sun		9	18	01	NEW MOON
	27	05	13	Mars in opposition with Sun		12	13	37	Moon greatest lat. N 5ę 07'
	27	05	44	Moon at apogee		12	14	47	Mercury greatest helio. lat N.
	27	20	20	FULL MOON, *Lunar Eclipse*		12	15	45	Venus 10ę.5 S of Moon
	27	22	05	Mars 6ę.7 S of Moon		14	02	20	Jupiter 4ę.4 S of Moon
	27	22	40	Moon in descending node		16	12	49	Mars at perihelion
	31	05	31	Neptune 2ę.6 N of Moon		16	23	15	FIRST QUARTER
	31	07	50	Mars nearest to Earth		17	16	30	Saturn 2ę.1 S of Moon
Aug.	1	16	36	Venus in descending node		20	00	53	Moon at apogee
	3	15	09	Moon greatest lat. S 5ę 14'		20	06	42	Mars 4ę.8 S of Moon
	3	21	22	Uranus 5ę.0 N of Moon		20	09	31	Moon in descending node
	4	18	18	LAST QUARTER		21	01	53	Mercury in superior conjunction
	6	23	28	Jupiter in square with Sun					1ę 30' N of Sun
	7	20	29	Uranus stationary in RA		21	10	--	Venus greatest illumination
	9	02	06	Mercury in inferior conjunction		23	01	54	*Autumnal Equinox*
				4ę 48' S of Sun		23	15	33	Neptune 2ę.4 N of Moon
	9	15	56	Mercury greatest helio lat. S.		25	02	52	FULL MOON
	10	13	41	Moon in ascending node		25	23	51	Saturn in square with Sun
	10	18	07	Moon at perigee		27	07	08	Uranus 4ę.8 N of Moon
	11	01	31	Mercury 5ę.5 S of Moon		27	07	11	Moon greatest lat. S 5ę 00'
	11	09	58	NEW MOON, *Solar Eclipse*		27	13	01	Venus greatest helio lat. S.
	14	13	34	Venus 6ę.3 S of Moon		30	15	31	Pluto stationary in RA
	16	09	50	Moon greatest lat. N 5ę 14'	Oct.	2	09	45	LAST QUARTER
	17	10	38	Jupiter 4ę.5 S of Moon		4	03	09	Moon in ascending node
	17	17	30	Venus greatest elong. E. (45ę.9)		5	04	14	Venus stationary in RA
	18	07	48	FIRST QUARTER		5	18	28	Mercury 2ę.3 N. of *Spica*
	18	12	20	Mercury stationary in RA		5	22	27	Moon at perigee
	21	01	19	Mars greatest helio lat. S.		6	00	30	Mercury in descending node
	21	09	39	Saturn 2ę.1 S of Moon		9	03	47	NEW MOON
	23	11	23	Moon at apogee		9	16	36	Moon greatest lat. N 4ę 58'
	23	17	14	Mars 6ę.8 S of Moon		10	00	34	Mercury 5ę.9 S of Moon
	24	04	49	Moon in descending node		10	14	48	Venus 13ę.2 S of Moon
	26	11	56	FULL MOON		11	21	20	Jupiter 4ę.1 S of Moon
	26	20	34	Mercury greatest elong. W. (18ę.3)		12	04	08	Pluto in square with Sun
	27	10	11	Neptune 2ę.5 N of Moon		14	15	21	Mercury 6ę.8 N. of Venus
	28	10	14	Mars stationary in RA		15	02	46	Saturn 1ę.8 S of Moon
	28	17	46	Mercury in ascending node		16	09	09	Mercury at aphelion
	30	17	44	Moon greatest lat. S 5ę 08'		16	18	02	FIRST QUARTER
	31	02	42	Uranus 4ę.9 N of Moon		17	12	05	Moon in descending node
Sept.	2	08	55	Venus 1ę.4 S. of *Spica*		17	19	16	Moon at apogee
	2	09	31	Mercury at perihelion		18	13	02	Mars 1ę.9 S of Moon
	3	02	37	LAST QUARTER		20	22	14	Neptune 2ę.5 N of Moon
	5	07	40	Venus at aphelion		24	00	46	Uranus in opposition with Sun
	5	22	45	Mercury 1ę.04 N. of *Regulus*		24	08	25	Moon greatest lat. S 4ę 57'

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	d	h	m			d	h	m	
Oct.	24	12	31	Uranus 4ę.7 N of Moon	Nov.	27	09	15	Mercury in inferior conjunction
	24	16	45	FULL MOON					0ę 55' N of Sun
	24	17	52	Pluto in descending node		27	23	44	Mercury 0ę.5 N. of Jupiter
	26	14	16	Venus in inferior conjunction		29	08	46	Mercury at perihelion
				6ę 15' S of Sun		30	00	19	LAST QUARTER
	30	03	38	Mercury 3ę.3 S. of Jupiter	Dec.	2	00	--	Venus greatest illumination
	31	03	45	Moon in ascending node		3	00	34	Mars in square with Sun
	31	16	40	LAST QUARTER		3	08	05	Moon greatest lat. N 5ę 04'
	31	20	23	Moon at perigee		3	18	43	Venus 3ę.6 S of Moon
Nov.	5	15	14	Mercury greatest helio lat. S.		5	21	08	Mercury 1ę.9 S of Moon
	6	02	25	Venus 9ę.5 S of Moon		5	22	22	Neptune in square with Sun
	6	06	36	Moon greatest lat. N 4ę 57'		6	13	23	Jupiter 3ę.5 S of Moon
	6	15	32	Mercury greatest elong. E. (23ę.3)		6	20	37	Mercury stationary in RA
	7	16	02	NEW MOON		7	07	20	NEW MOON
	8	17	36	Jupiter 3ę.8 S of Moon		7	14	46	Mars 0ę.04 N. of Neptune
	9	05	56	Mercury 1ę.8 N. of Antares		9	05	17	Saturn 1ę.1 S of Moon
	9	11	34	Mercury 6ę.7 S of Moon					*Occultation*
	11	15	32	Saturn 1ę.5 S of Moon		9	14	00	Mercury greatest helio. lat N.
	13	14	04	Moon in descending node		10	17	58	Moon in descending node
	14	03	14	Venus stationary in RA		12	12	25	Moon at apogee
	14	15	56	Moon at apogee		14	14	16	Neptune 3ę.0 N of Moon
	15	14	54	FIRST QUARTER		14	23	22	Mars 3ę.6 N of Moon
	16	04	17	Mars 1ę.0 N of Moon		15	11	30	Mercury greatest elong. W. (21ę.3)
				Occultation		15	11	49	FIRST QUARTER
	16	09	09	Mercury at aphelion		17	14	02	Moon greatest lat. S 5ę 11'
	17	04	47	Mercury stationary in RA		18	04	05	Uranus 5ę.0 N of Moon
	17	06	02	Neptune 2ę.7 N of Moon		20	02	09	Jupiter 5ę.3 N. of *Antares*
	20	10	32	Moon greatest lat. S 5ę 03'		21	08	23	Mercury 6ę.2 N. of *Antares*
	20	19	42	Uranus 4ę.8 N of Moon		21	14	43	Mercury 0ę.9 N. of Jupiter
	22	20	08	Venus in ascending node		21	22	23	*Winter solstice*
	23	05	39	FULL MOON		22	17	49	FULL MOON
	24	02	19	Mercury 4ę.4 N. of Antares		24	09	49	Moon at perigee
	24	16	46	Mercury in ascending node		24	11	53	Moon in ascending node
	25	08	25	Neptune stationary in RA		26	16	54	Venus at perihelion
	26	06	33	Jupiter in conjunction with Sun		29	09	34	LAST QUARTER
	26	12	12	Moon at perigee		30	10	01	Moon greatest lat. N 5ę 14'
	27	05	17	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)
ð 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)
16)
+ reduction for longitude of place
+ given local apparent Sidereal Time ð Equation of Equinoxes
ð correction for Sidereal Time added (Table-II).

Otherwise, L.M.T. for any given Sidereal Time may be obtained as follows:-
Given Sidereal Time
ð Sidereal Time for 0^h U.T. (pages 13 to
+ 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 ð longitude of place ð 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				
55	13 45	28 45	43 45	58 45	73 45	88 45	55	13 45				
56	14 00	29 00	44 00	59 00	74 00	89 00	56	14 00				
57	14 15	29 15	44 15	59 15	74 15	89 15	57	14 15				
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				

h		°
6	=	90
12	=	180
18	=	270

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

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

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

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

TABLE - V ---- *contd.*

CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

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

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

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

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

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

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

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

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

In units of the fifth decimal of a Degree.

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.91	
	26
.95	
	27
0.98	
	28
1.00	

In critical cases ascend

TABLE - VII
INTERPOLATION COEFFICIENTS

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

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

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

N.B. ï The coefficients are all *negative*. For details about Besselôs and Everettôs 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
					À					
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

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

1 metre = 3.2808 feet

SEMI-DIURNAL AND SEMI-NOCTURNAL ARCS
(FOR TRUE ALTITUDE = 0)

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

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

AMPLITUDE OF RISING AND SETTING
(FOR TRUE ALTITUDE = 0)

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

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

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

AUGMENTATION OF MOON'S SEMI-DIAMETER
Moon 's Apparent Altitude

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

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

NATURAL TRIGONOMETRIC FUNCTIONS

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

STANDARD TIMES

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

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m
Aden	+ 3	15	00
Afghanistan	+ 4 1/2	16	30
Alaska	-9	03	00
- Day light Saving Time	- 8	04	00
Albania	+ 1	13	00
- Day light Saving Time	+ 2	14	00
Aleutian Islands	- 10	02	00
Algeria	0	12	00
Angola	+ 1	13	00
Argentina	- 3	09	00
Ascension Islands	0	12	00
Australia-			
Capital Territory (Canberra), Victoria, New South Wales, Queensland, Tasmania.	+ 10	22	00
South Australia, Northern Territory, Broken Hill Area	+ 9 1/2	21	30
- Day light Saving Time	+ 10 1/2	22	30
Western Australia	+ 8	20	00
- Day light Saving Time	+ 9	21	00
Austral Islands	- 10	02	00
Austria	+ 1	13	00
Azores	- 1	11	00
Bahrain	+ 3	15	00
Bangladesh	+ 6	18	00

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m
Belgium	+ 1	13	00
Belize	- 6Ψ	06	00Ψ
Bermuda	- 4	08	00
Bhutan	+ 6	18	00
Bolivia	- 4	08	00
Brazil-			
Eastern (including coast)	- 3*	09	00*
Western	- 3*	09	00*
Territory of Acre	- 4*	08	00*
Bulgaria	+ 2	14	00
Cambodia	+ 7	19	00
Cameroon	+ 1	13	00
Canada-			
Newfoundland	- 3 1/2*	08	30*
East of Long. 63° W N W Territories (East of Long. 68° W), New Brunswick Nova Scotia, Prince Edward Island	- 4*	08	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*
Ontario (West of Long. 90° W), Manitoba, NW Territories (Long. W 85°-102°), East Saskatchewan, Nunavut (Central)	- 6*	06	00*
Alberta	- 7*	05	00*
Yukon Time	- 8	04	00
Canary Island	+ 1	13	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, 2018 and materials up to April 20, 2019 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 2019 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 Jupiterøs 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 óPrincipal Festivals for Holidaysô. 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 Sayana Vyatipata and Sayana Vaidhriti, reported under the column ñPhenomenaò, 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 ómahapata yogaô defined in some Indian traditional texts (siddhantic treatises).

HELIACAL RISING AND SETTING OF PLANETS, 2019
(JANUARY TO APRIL)

Planet	National Date		Nirayana Date		Gregorian Date		Time (I.S.T) h	m
Mercury sets in the East	Pausha	20, 1940 Saka	Pausha	27, 5119 Kali	Jan.	10, 2019	11	27
Mercury rises in the West	Magha	23, 1940 Saka	Magha	30, 5119 Kali	Feb.	12, 2019	12	36
Mercury sets in the West	Phalguna	18, 1940 Saka	Phalguna	25, 5119 Kali	Mar.	9, 2019	16	54
Mercury rises in the East	Phalguna	30, 1940 Saka	Chaitra	7, 5119 Kali	Mar.	21, 2019	18	25
Saturn rises in the East	Pausha	27, 1940 Saka	Magha	4, 5119 Kali	Jan.	17, 2019	17	01

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, 2019
(JANUARY TO APRIL)

Planet		National Date		Nirayana Date		Gregorian Date		Time (I.S.T) h	m
Mercury	Retrograde	Phalguna	14, 1940 Saka	Phalguna	21, 5119 Kali	Mar.	5, 2019	23	53
Mercury	Direct	Chaitra	7, 1941 Saka	Chaitra	14, 5119 Kali	Mar	28, 2019	19	33
Jupiter	Retrograde	Chaitra	20, 1941 Saka	Chaitra	27, 5119 Kali	Apr.	10, 2019	22	31
Saturn	Retrograde	Vaisakha	10, 1941 Saka	Vaisakha	17, 5120 Kali	Apr.	30, 2019	6	26
Uranus	Direct	Pausha	16, 1940 Saka	Pausha	23, 5119 Kali	Jan.	6, 2019	25	56
Pluto(Dwarf)	Retrograde	Vaisakha	4, 1941 Saka	Vaisakha	11, 5120 Kali	Apr.	24, 2019	24	17

MEAN RAHU, 2019

Date		Longitude ° ′ ″	Date		Longitude ° ′ ″	Date		Longitude ° ′ ″
Jan.	-2	93 36 30	Feb.	7	91 29 20	Mar.	19	89 22 09
	8	93 04 43		17	90 57 32		29	88 50 21
	18	92 32 55		27	90 25 44	Apr.	8	88 18 33
Jan.	28	92 01 07	Mar.	9	89 53 56		18	87 46 46
							28	87 14 58

ECLIPSES, 2019
(JANUARY TO APRIL)

January 5-6, 2019 - Partial Solar Eclipse - Not visible in India.
January 21, 2019 - Total Lunar Eclipse - Not visible in India.

INDIAN CALENDAR

SAKA ERA 1939

Makara : Tapas
Winter (Sisira), 1st Month

Month of PAUSHA (30 days)

(*Nirayana*) 8 Pausha, 5118 Kali Era to (*Nirayana*) 7 Magha, 5118 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
		2017 A.D.															
1	Fri	Dec. 22	6	37.6	11	58.6	17	19.8	S 4	22	22.9	22	19	10.8	14	-	-
2	Sat	23	6	38.1	11	59.0	17	20.3	S 5	24	25.3	23	21	43.2	14	7	13.6
3	Sun	24	6	38.5	11	59.6	17	20.8	6	25	55.1	24	23	45.6	15	7	32.5
4	Mon	25	6	39.0	12	00.0	17	21.4	7	26	43.5	25	25	09.1	16	7	24.9
5	Tue	26	6	39.4	12	00.5	17	22.0	8	26	44.3	26	25	47.1	17	6	44.8
															(18	29	27.6)
6	Wed	27	6	39.8	12	01.0	17	22.5	9	25	55.1	27	25	36.6	19	27	31.3
7	Thu	28	6	40.2	12	01.5	17	23.1	S 10	24	16.9	1	24	38.2	20	24	56.6
8	Fri	29	6	40.6	12	02.0	17	23.7	11	21	54.5	2	22	56.3	21	21	46.6
9	Sat	30	6	40.9	12	02.5	17	24.3	12	18	55.3	3	20	38.2	22	18	06.8
10	Sun	31	6	41.3	12	03.0	17	25.0	13	15	28.6	4	17	53.5	23	14	04.1
		2018 A.D.															
11	Mon	Jan. 1	6	41.6	12	03.5	17	25.6	14	11	44.6	5	14	52.8	24	9	46.6
															(25	29	22.9)
12	Tue	2	6	41.9	12	03.9	17	26.3	S 15	7	54.1	6	11	47.3	26	25	01.9
									(K 1	28	08.2)						
13	Wed	3	6	42.1	12	04.6	17	26.9	2	24	37.6	7	8	48.5	27	20	52.2
14	Thu	4	6	42.4	12	04.8	17	27.6	3	21	32.1	8	6	07.3	1	17	01.6
												(9	27	53.6)			
15	Fri	5	6	42.6	12	05.3	17	28.2	4	19	00.4	10	26	15.8	2	13	37.1
16	Sat	6	6	42.8	12	05.7	17	28.9	K 5	17	09.6	11	25	20.0	3	10	44.2
17	Sun	7	6	43.0	12	06.2	17	29.6	6	16	04.3	12	25	09.8	4	8	26.8
18	Mon	8	6	43.2	12	06.6	17	30.3	7	15	46.6	13	25	45.6	5	6	46.4
															(6	5	42.5)
19	Tue	9	6	43.3	12	07.0	17	31.0	8	16	15.1	14	27	04.5	7	29	12.3
20	Wed	10	6	43.4	12	07.4	17	31.7	9	17	25.5	15	29	00.8	8	29	11.2
21	Thu	11	6	43.5	12	07.8	17	32.4	K 10	19	10.9	16	-	-	9	29	33.5
22	Fri	12	6	43.6	12	08.2	17	33.1	11	21	22.8	16	7	26.9	10	30	12.9
23	Sat	13	6	43.7	12	08.6	17	33.8	12	23	52.4	17	10	14.2	11	-	-
24	Sun	14	6	43.7	12	09.0	17	34.5	13	26	31.1	18	13	14.1	11	7	03.1
25	Mon	15	6	43.7	12	09.3	17	35.3	14	29	11.5	19	16	19.1	12	7	58.6
26	Tue	16	6	43.7	12	09.7	17	36.0	K 30	-	-	20	19	22.4	13	8	54.2
27	Wed	17	6	43.6	12	10.0	17	36.7	K 30	7	47.3	21	22	18.4	14	9	45.9
28	Thu	18	6	43.6	12	10.3	17	37.4	S 1	10	12.6	22	25	01.9	15	10	29.6
29	Fri	19	6	43.5	12	10.7	17	38.1	2	12	22.4	23	27	27.8	16	11	01.8
30	Sat	20	6	43.4	12	11.0	17	38.8	3	14	11.2	24	29	30.9	17	11	18.6

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1939

Uttarayana | Dakshina Gola | Month of PAUSHA (30 days) | Ayanamsa on 1st : 24° 06′ 18″

(*Nirayana*) 8 Pausha, 5118 Kali Era to (*Nirayana*) 7 Magha, 5118 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2017 A.D.					
1	Dec. 22	SAURA PAUSHA	CHAANDRA PAUSHA			1- Uttarayana day.
2	23					
3	24					
4	25					4- Birthday of Sadhu T. L. Vaswani (Sindhi), Guru Govind Singh's Birthday (according to tithi).
5	26					5- Jor Mela- 3 days (Punjab).
6	27					
7	28			7- Enters Purvashadha ($29^h 11^m.7$)		7- Samba Dasami (Odisha).
8	29					8- Putrada ekadasi , Vaikuntha Ekadasi (S. India).
9	30					
10	31				10- Sayana Vaidhriti ($21^h 38^m.2$)	
	2018 A.D.					
11	Jan. 1					
12	2				12- Full Moon ($7^h 54^m.1$)	12- Paushi Purnima, Pushyabhisheka Yatra, Arudra Darshanam (S. India) (Purvarunodaya).
13	3					
14	4					
15	5					15- Ganesha Sankashta Chaturthi.
16	6					
17	7					
18	8					18- Birthday of Swami Vivekananda (according to tithi).
19	9					19- Ashtaka (Mamashtaka).
20	10					
21	11			21- Enters Uttarashadha ($7^h 16^m.0$)		
22	12				22- Sayana Vyatipata ($27^h 21^m.3$)	22- Sattila Ekadasi.
23	13			23- Saura Maghadi ($17^h 37^m.0$)		23- Lohri(Punjab,J&K), Bhogi(SIndia).
24	14	SAURA MAGHA				24- Pongal (S. India), Makaradi Snana,Tila Samkranti, Tai Pongal (Kerala), Tamil New Year's Day, Magha Bihu (Assam), Makara Samkranti (Bengal), Birthday of Sant Paramanand (Sindhi), Makara Samkranti (N. India).
25	15					25- Mattu Pongal or Kanuvu(S. India), Ratanti Kalika Puja.
26	16					26- Mauni Amavasya, Tai Amavasya, Makara Vavu (Kerala).
27	17		CHAANDRA MAGHA		27- New Moon ($7^h 47^m.3$)	
28	18					28- Magha Sukladi.
29	19					
30	Jan. 20			30- Enters Tropical Aquarius ($8^h 39^m.0$)		30- Tila Chaturthi, Kunda Chaturthi.

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 2, $8^h 30^m.1$; Mina 4, $18^h 52^m.3$; Mesha 6, $25^h 36^m.6$; Vrisha 8, $28^h 24^m.9$; Mithuna 10, $28^h 24^m.5$; Karkata 12, $27^h 32^m.0$; Simha 14, $27^h 53^m.6$; Kanya 17, $7^h 13^m.0$; Tula 19, $14^h 19^m.9$; Vrischika 21, $24^h 48^m.1$; Dhanus 24, $13^h 14^m.1$; Makara 26, $26^h 07^m.3$; Kumbha 29, $14^h 17^m.4$; Sun enters :- Nirayana Makara 24, $13^h 46^m.6$.

INDIAN CALENDAR

SAKA ERA 1939

Kumbha : Tapasya

Winter (Sisira), 2nd Month

Month of MAGHA (30 days)

(*Nirayana*) 8 Magha, 5118 Kali Era to (*Nirayana)* 7 Phalguna, 5118 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
		2018 A.D.															
1	Sun	Jan. 21	6	43.2	12	11.2	17	39.6	S 4	15	33.7	25	-	-	18	11	16.2
2	Mon	22	6	43.1	12	11.5	17	40.3	S 5	16	24.9	25	7	05.9	19	10	50.9
3	Tue	23	6	42.9	12	11.8	17	41.0	6	16	40.3	26	8	08.1	20	9	59.0
4	Wed	24	6	42.7	12	12.0	17	41.7	7	16	16.9	27	8	33.8	21	8	37.8
5	Thu	25	6	42.5	12	12.3	17	42.4	8	15	13.8	1	8	21.0	22	6	45.8
															(23	28	22.7)
6	Fri	26	6	42.2	12	12.5	17	43.1	9	13	32.0	2	7	29.7	24	25	30.3
												(3	30	02.7)			
7	Sat	27	6	41.9	12	12.7	17	43.8	S 10	11	14.9	4	28	04.6	25	22	11.6
8	Sun	28	6	41.6	12	12.9	17	44.5	11	8	27.9	5	25	42.1	26	18	31.5
									(12	29	18.0)						
9	Mon	29	6	41.3	12	13.0	17	45.1	13	25	53.4	6	23	03.6	27	14	35.8
10	Tue	30	6	41.0	12	13.2	17	45.8	14	22	23.1	7	20	18.1	1	10	31.4
															(2	30	25.7)
11	Wed	31	6	40.6	12	13.4	17	46.5	S 15	18	56.8	8	17	35.6	3	26	26.2
12	Thu	Feb. 1	6	40.2	12	13.5	17	47.1	K 1	15	44.0	9	15	06.0	4	22	40.8
13	Fri	2	6	39.8	12	13.6	17	47.8	2	12	54.2	10	12	59.0	5	19	16.7
14	Sat	3	6	39.4	12	13.8	17	48.5	3	10	36.3	11	11	23.9	6	16	20.3
15	Sun	4	6	38.9	12	13.9	17	49.1	4	8	58.1	12	10	28.0	7	13	57.0
16	Mon	5	6	38.4	12	14.0	17	49.7	K 5	8	05.4	13	10	17.0	8	12	10.3
17	Tue	6	6	38.0	12	14.0	17	50.4	6	8	01.2	14	10	53.4	9	11	01.6
18	Wed	7	6	37.4	12	14.1	17	51.0	7	8	45.1	15	12	15.8	10	10	29.6
19	Thu	8	6	36.9	12	14.1	17	51.6	8	10	12.8	16	14	19.3	11	10	30.6
20	Fri	9	6	36.4	12	14.2	17	52.2	9	12	16.2	17	16	55.2	12	10	58.3
21	Sat	10	6	35.8	12	14.2	17	52.8	K 10	14	44.3	18	19	52.5	13	11	44.8
22	Sun	11	6	35.2	12	14.2	17	53.4	11	17	24.5	19	22	59.1	14	12	41.4
23	Mon	12	6	34.6	12	14.2	17	54.0	12	20	04.9	20	26	03.6	15	13	39.7
24	Tue	13	6	34.0	12	14.2	17	54.6	13	22	34.9	21	28	56.6	16	14	32.2
25	Wed	14	6	33.4	12	14.2	17	55.2	14	24	46.8	22	-	-	17	15	12.8
26	Thu	15	6	32.7	12	14.1	17	55.8	K 30	26	35.2	22	7	30.9	18	15	37.2
27	Fri	16	6	32.0	12	14.0	17	56.3	S 1	27	57.1	23	9	42.1	19	15	42.7
28	Sat	17	6	31.4	12	14.0	17	56.9	2	28	51.3	24	11	27.5	20	15	27.6
29	Sun	18	6	30.6	12	13.9	17	57.4	3	29	17.3	25	12	46.2	21	14	51.2
30	Mon	19	6	29.9	12	13.8	17	58.0	4	29	15.4	26	13	37.8	22	13	53.3

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 | SAKA ERA 1939

Dakshina Gola | Month of MAGHA (30 days) | Ayanamsa on 1st : 24° 06′ 23″

(*Nirayana*) 8 Magha, 5118 Kali Era to (*Nirayana)* 7 Phalguna, 5118 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	Jan. 21	SAURA MAGHA	CHAANDRA MAGHA			1- Martyrdom Day of Hemu Kalani (Sindhi), Varada Chaturthi, Ganesa Puja (Bengal).
2	22					2- Sri Panchami, Sarasvati Puja, Vasanta Panchami.
3	23					3- Netaji's Birthday.
4	24			4- Enters Sravana ($9^h 30^m.0$)		4- Ratha Saptami (Purvarunodaya), Vidhana Saptami, Arogya Saptami.
5	25					5- Bhismashtami.
6	26				6- Sayana Vaidhriti ($12^h 29^m.8$)	6- Republic Day.
7	27					7- Jaya Ekadasi (Smarta).
8	28					8- Bhaimi Ekadasi (Bengal), Bhishma Dvadasi, Birthday of Lala Lajpat Rai, Trispisha Mahadvadasi, Jaya Ekadasi (Vaishnava).
9	29					9- Desert Festival- 3 days(Jaisalmer).
10	30					10- Martyr's Day (Mahatma Gandhi Commemoration Day).
11	31				11- Full Moon ($18^h 56^m.8$) 11- Total Lunar Eclipse- visible in India	11- Maghi Purnima, Guru Ravi Das's Birthday (according to tithi), Floating Festival (Tai Poosam).
12	Feb. 1					
13	2					
14	3					
15	4				15- Venus rises in the west ($5^h 45^m$)	
16	5					
17	6			17- Enters Dhanishtha ($12^h 45^m.3$)		
18	7				18- Sayana Vyatipata ($7^h 45^m.3$)	18- Ashtaka (Sakashtaka), Janaki Janma.
19	8					
20	9					
21	10					21- Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj)(according to tithi).
22	11			22- Saura Phalgunadi ($30^h 28^m.0$)		22- Vijaya Ekadasi.
23	12					
24	13	SAURA PHALGUNA				24- Maha Sivaratri (Kashmir).
25	14					25- Maha Sivaratri, Sivaratri (S. India).
26	15				26- New Moon ($26^h 35^m.2$) 26- Partial Solar Eclipse- not visible in India	
27	16		CHAANDRA PHALGUNA			
28	17					28- Birthday of Sri Ramakrishna (according to tithi).
29	18			29- Enters Trop. Pisces ($22^h 48^m.0$)		
30	Feb. 19			30- Enters Satabhisaj ($17^h 12^m.8$)		30- Sivaji 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 :- Mina 1, $24^h 45^m.0$; Mesha 4, $8^h 33^m.8$; Vrisha 6, $13^h 11^m.1$; Mithuna 8, $14^h 55^m.9$; Karkata 10, $14^h 59^m.6$; Simha 12, $15^h 06^m.0$; Kanya 14, $17^h 06^m.0$; Tula 16, $22^h 29^m.3$; Vrischika 19, $7^h 45^m.0$; Dhanus 21, $19^h 52^m.5$; Makara 24, $8^h 48^m.3$; Kumbha 26, $20^h 39^m.6$; Mina 28, $30^h 29^m.0$; Sun enters :- Nirayana Kumbha 23, $26^h 48^m.2$.

INDIAN CALENDAR

SAKA ERA 1939

Mina : Madhu
Spring (Vasanta), 1st Month

Month of PHALGUNA (30 days)

(*Nirayana*) 8 Phalguna, 5118 Kali Era to (*Nirayana)* 7 Chaitra, 5118 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
		2018 A.D.																	
1	Tue	Feb.	20	6	29.2	12	13.7	17	58.5	S	5	28	46.2	27	14	02.7	23	12	34.1
2	Wed		21	6	28.5	12	13.6	17	59.0		6	27	50.4	1	14	01.2	24	10	53.8
3	Thu		22	6	27.7	12	13.5	17	59.5		7	26	29.0	2	13	34.2	25	8	52.9
4	Fri		23	6	26.9	12	13.4	18	00.0		8	24	43.5	3	12	42.6	26	6	31.9
																	(27	27	52.1)
5	Sat		24	6	26.1	12	13.2	18	00.5		9	22	36.1	4	11	28.2	1	24	55.0
6	Sun		25	6	25.3	12	13.1	18	01.0	S	10	20	09.9	5	9	53.6	2	21	43.2
7	Mon		26	6	24.5	12	13.0	18	01.5		11	17	29.2	6	8	02.5	3	18	19.9
														(7	29	59.7)			
8	Tue		27	6	23.7	12	12.7	18	02.0		12	14	39.2	8	27	51.4	4	14	49.4
9	Wed		28	6	22.9	12	12.5	18	02.5		13	11	46.3	9	25	44.5	5	11	16.5
10	Thu	Mar.	1	6	22.0	12	12.3	18	02.9		14	8	57.7	10	23	47.2	6	7	47.1
																	(7	28	27.4)
11	Fri		2	6	21.1	12	12.2	18	03.4	S	15	6	21.4	11	22	07.9	8	25	23.8
										(K	1	28	05.6)						
12	Sat		3	6	20.3	12	12.0	18	03.9		2	26	18.6	12	20	54.9	9	22	42.7
13	Sun		4	6	19.4	12	11.8	18	04.3		3	25	08.0	13	20	16.2	10	20	29.9
14	Mon		5	6	18.5	12	11.5	18	04.7		4	24	39.9	14	20	17.9	11	18	49.9
15	Tue		6	6	17.6	12	11.3	18	05.2	K	5	24	57.5	15	21	03.9	12	17	45.3
16	Wed		7	6	16.7	12	11.0	18	05.6		6	26	00.8	16	22	34.4	13	17	16.4
17	Thu		8	6	15.8	12	10.8	18	06.0		7	27	45.1	17	24	45.0	14	17	20.4
18	Fri		9	6	14.9	12	10.6	18	06.5		8	30	01.0	18	27	27.1	15	17	51.7
19	Sat		10	6	14.0	12	10.3	18	06.9		9	-	-	19	-	-	16	18	41.8
20	Sun		11	6	13.0	12	10.0	18	07.3		9	8	35.6	19	6	28.3	17	19	40.6
21	Mon		12	6	12.1	12	09.8	18	07.7	K	10	11	13.9	20	9	34.2	18	20	37.6
22	Tue		13	6	11.1	12	09.5	18	08.1		11	13	41.3	21	12	30.7	19	21	23.2
23	Wed		14	6	10.2	12	09.3	18	08.5		12	15	45.9	22	15	06.0	20	21	49.7
24	Thu		15	6	09.2	12	09.0	18	08.9		13	17	19.5	23	17	12.0	21	21	51.9
25	Fri		16	6	08.3	12	08.7	18	09.3		14	18	18.2	24	18	44.5	22	21	27.3
26	Sat		17	6	07.3	12	08.4	18	09.7	K	30	18	41.5	25	19	43.0	23	20	35.6
27	Sun		18	6	06.4	12	08.1	18	10.1	S	1	18	31.9	26	20	09.7	24	19	18.6
28	Mon		19	6	05.4	12	07.7	18	10.5		2	17	53.3	27	20	08.5	25	17	39.2
29	Tue		20	6	04.4	12	07.5	18	10.9		3	16	50.6	1	19	44.2	26	15	40.7
30	Wed		21	6	03.5	12	07.3	18	11.2		4	15	28.6	2	19	01.5	27	13	26.7

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1939

Uttarayana
Dakshina Gola

Month of PHALGUNA (30 days)

Ayanamsa on 1st : $24^0 06^{/} 26^{//}$

(*Nirayana*) 8 Phalguna, 5118 Kali Era to (*Nirayana)* 7 Chaitra, 5118 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.	SAURA PHALGUNA	CHAANDRA PHALGUNA			
1	Feb. 20				1- Sayana Vaidhriti ($21^h 07^m.9$)	
2	21					
3	22					3- Holashtaka.
4	23					
5	24					
6	25					
7	26					7- Amlaki Ekadasi.
8	27					8- Govinda Dvadasi.
9	28					
10	Mar. 1					10- Masi Magham, Holikadahana, Birthday of Sri Chaitanya (according to tithi), Dolyatra.
11	2				11- Full Moon ($6^h 21^m.4$)	11- Hola, Vasantotsava, Holi.
12	3					
13	4			13- Enters Purva Bhadrapada ($23^h 35^m.2$)	13- Sayana Vyatipata ($18^h 01^m.4$)	
14	5					
15	6					15- Ranga Panchami, Bijoy Govindji Halankar (Manipur).
16	7					
17	8					
18	9					18- Varsitaparambha (Jain), Sitalashtami, Vaikkatashtami (Kerala).
19	10					
20	11					
21	12					
22	13			22- Saura Chaitradi ($27^h 04^m.1$)		22- Papamochani Ekadasi.
23	14	SAURA CHAITRA				
24	15					24- Madhukrishna Trayodasi.
25	16					
26	17		CHAANDRA CHAITRA		26- New Moon ($18^h 41^m.5$) 26- Sayana Vaidhriti ($29^h 22^m.0$)	
27	18			27- Enters Uttara Bhadrapada ($8^h 00^m.9$)		27- Chaitra Sukladi (Gudi Padava, Ugadi), Telugu New Year's Day, Vasanta Navaratrarambha, Cheti Chand (Sindhi New Year's Day).
28	19					
29	20			29- Enters Trop. Aries ($21^h 45^m.6$)		29- Gauri Tritiya (Gangaur), Sarhul (Bihar), Andolana Tritiya, Mahavishuva day.
30	Mar. 21					30- Indian Year Ending day.
	1940 S.E.					
Chtr. 1	Mar. 22					1- Indian New Year's Day, Sri (Lakshmi) Panchami.

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 :- Mesha 1, $14^h 02^m.7$; Vrisha 3, $19^h 23^m.5$; Mithuna 5, $22^h 43^m.2$; Karkata 7, $24^h 31^m.2$; Simha 9, $25^h 44^m.5$; Kanya 11, $27^h 46^m.8$; Tula 14, $8^h 11^m.6$; Vrischika 16, $16^h 07^m.7$; Dhanus 18, $27^h 27^m.1$; Makara 21, $16^h 19^m.7$; Kumbha 23, $28^h 13^m.1$; Mina 26, $13^h 31^m.5$; Mesha 28, $20^h 08^m.5$; Vrisha 30, $24^h 48^m.5$; Sun enters: Nirayana Mina 23, $23^h 42^m.8$.

INDIAN CALENDAR

SAKA ERA 1940 — Mesha : Madhava

Month of CHAITRA (30 days) — Spring (Vasanta), 2nd Month

(*Nirayana*) 8 Chaitra, 5118 Kali Era to (*Nirayana*) 7 Vaisakha, 5119 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
		2018 A.D.																	
1	Thu	Mar.	22	6	02.5	12	07.0	18	11.6	S	5	13	51.6	3	18	04.7	1	11	00.6
2	Fri		23	6	01.5	12	06.6	18	12.0		6	12	03.3	4	16	57.3	2	8	25.1
																	(3	29	42.4)
3	Sat		24	6	00.5	12	06.3	18	12.4		7	10	06.3	5	15	41.9	4	26	54.2
4	Sun		25	5	59.6	12	06.0	18	12.7		8	8	02.7	6	14	20.5	5	24	02.0
											(9	29	54.4)						
5	Mon		26	5	58.6	12	05.7	18	13.1	S	10	27	43.4	7	12	55.1	6	21	07.1
6	Tue		27	5	57.6	12	05.4	18	13.5		11	25	32.0	8	11	27.6	7	18	11.3
7	Wed		28	5	56.6	12	05.1	18	15.8		12	23	23.6	9	10	00.9	8	15	17.2
8	Thu		29	5	55.6	12	04.8	18	14.2		13	21	22.8	10	8	38.9	9	12	27.8
9	Fri		30	5	54.7	12	04.5	18	14.6		14	19	35.1	11	7	26.7	10	9	47.1
10	Sat		31	5	53.7	12	04.2	18	15.0	S	15	18	06.9	12	6	30.3	11	7	19.9
																	(12	29	11.2)
11	Sun	Apr.	1	5	52.7	12	04.0	18	15.3	K	1	17	04.9	13	5	56.4	13	27	26.0
														(14	29	51.7)			
12	Mon		2	5	51.8	12	03.6	18	15.7		2	16	35.5	15	-	-	14	26	08.7
13	Tue		3	5	50.8	12	03.6	18	16.1		3	16	43.9	15	6	21.9	15	25	22.2
14	Wed		4	5	49.9	12	03.0	18	16.4		4	17	32.9	16	7	30.9	16	25	07.2
15	Thu		5	5	48.9	12	02.8	18	16.8	K	5	19	01.4	17	9	19.0	17	25	21.8
16	Fri		6	5	48.0	12	02.5	18	17.2		6	21	03.9	18	11	42.4	18	26	00.6
17	Sat		7	5	47.0	12	02.2	18	17.6		7	23	30.0	19	14	32.5	19	26	55.5
18	Sun		8	5	46.1	12	01.9	18	17.9		8	26	05.4	20	17	36.5	20	27	55.9
19	Mon		9	5	45.2	12	01.6	18	18.3		9	28	34.1	21	20	38.9	21	28	50.6
20	Tue		10	5	44.2	12	01.4	18	18.7	K	10	-	-	22	23	24.5	22	29	28.6
21	Wed		11	5	43.3	12	01.1	18	19.1	K	10	6	40.7	23	25	40.4	23	29	41.2
22	Thu		12	5	42.4	12	00.8	18	19.5		11	8	13.2	24	27	18.0	24	29	22.6
23	Fri		13	5	41.5	12	00.6	18	19.9		12	9	04.3	25	28	13.4	25	28	30.2
24	Sat		14	5	40.6	12	00.3	18	20.3		13	9	11.9	26	28	27.6	26	27	04.6
25	Sun		15	5	39.7	12	00.0	18	20.7		14	8	37.7	27	28	04.8	27	25	09.0
26	Mon		16	5	38.9	11	59.9	18	21.1	K	30	7	27.1	1	27	11.9	1	22	48.2
27	Tue		17	5	38.0	11	59.6	18	21.5	S	1	5	47.0	2	25	56.7	2	20	07.9
											(2	27	45.3)						
28	Wed		18	5	37.2	11	59.4	18	21.9		3	25	30.0	3	24	27.4	3	17	14.5
29	Thu		19	5	36.3	11	59.2	18	22.3		4	23	08.2	4	22	51.2	4	14	13.7
30	Fri		20	5	35.5	11	59.0	18	22.7	S	5	20	45.9	5	21	14.7	5	11	10.7

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1940

Month of CHAITRA (30 days)

Uttarayana
Uttara Gola

Ayanamsa on 1st : $24^0 06' 29''$

(*Nirayana*) 8 Chaitra, 5118 Kali Era to (*Nirayana)* 7 Vaisakha, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D					
1	Mar. 22	SAURA CHAITRA	CHAANDRA CHAITRA			1- Indian New Year's Day, Sri (Lakshmi) Panchami.
2	23					2- Skanda Shashthi, Oli begins (Jain).
3	24					3- Asokashtami, Vasanti Pujarambha.
4	25					4- Annapurna Puja, Mela Bahu Fort (J&K),Rama Navami.
5	26					
6	27					6- Kamada Ekadasi.
7	28					
8	29					8- Ananga Trayodasi, Mahavira Jayanti (Jain).
9	30				9- Sayana Vyatipata (7^h $18^m.3$)	9- Panguni Uttiram, Damanaka Chaturdasi.
10	31			10-Enters Revati (18^h $51^m.6$)	10-Full Moon (18^h $06^m.9$) 4 - Venus rises in the east (14^h $02^m.0$)	10- Chaitri Purnima, Hanumat Jayanti (S. India), Oli ends(Jain).
11	Apr. 1					11- Trivandrum Arat (Kerala).
12	2					
13	3					
14	4					
15	5					15- Birthday Anniversary of Swami Leela Shah (Sindhi).
16	6					
17	7					
18	8					
19	9					
20	10					
21	11					
22	12				22 -Sayana Vaidhriti (14^h $46^m.5$)	22- Varuthini Ekadasi, Sri Vallabhacharya Jayanti.
23	13			23- Saura Vaisakhadi (11^h $11^m.8$)		
24	14	SAURA VAISAKHA		24- Enters Asvini (8^h $13^m.0$)		24- Vaisakhi (Punjab,Haryana, H.P, Delhi and Odisha), Visu (Kerala), Mesha Samkranti (Odisha). Chadaka Puja (Bengal), Dr. B.R. Ambedkar Jayanti, Cheiraoba (Manipur), Rangali Bihu(Assam) Beginning of Nirayana 5119 KE, Mesadi (T.N.)
25	15					25- Bahag Bihu (Assam),Vaisakhadi (Bengal), Shilhenba (Manipur).
26	16		CHAANDRA VAISAKHA		26-New Moon (8^h $27^m.2$)	26- Tithi of Deva Damodara (Assam)
27	17					
28	18					28- Parasuram Jayanti,Kedar Badri Yatra, Varshitapa Samapana(Jain) Akshaya Tritiya.
29	19					
30	Apr. 20			30- Enters Trop. Taurus (8^h $42^m.5$)		30- Sri Sankaracharya 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, 28^h $20^m.5$; Karkata 5, 7^h $16^m.7$; Simha 7, 10^h $0^m.9$; Kanya 9, 13^h $10^m.9$; Tula 11, 17^h $50^m.0$; Vrischika 13, 25^h $10^m.0$; Dhanus 16, 11^h $42^m.4$; Makara 18, 24^h $22^m.8$; Kumbha 21, 12^h $36^m.8$; Mina 23, 22^h $03^m.5$; Mesha 25, 28^h $04^m.8$; Vrisha 28, 7^h $35^m.4$; Mithuna 30, 10^h $02^m.7$; Sun enters :- Nirayana Mesha 24, 8^h $13^m.0$.

SAKA ERA 1940

Vrisha : Sukra

Month of VAISAKHA (31 days)

Summer (Grishma), 1st Month

(*Nirayana*) 8 Vaisakha, 5119 Kali Era to (*Nirayana*) 7 Jyaishtha, 5119 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
		2018 A.D.																	
1	Sat	Apr.	21	5	34.7	11	59.0	18	23.1	S	6	18	27.9	6	19	42.4	6	8	09.7
																	(7	29	13.4)
2	Sun		22	5	33.8	11	58.5	18	23.5		7	16	17.4	7	18	17.9	8	26	25.1
3	Mon		23	5	33.0	11	58.4	18	23.9		8	14	16.3	8	17	02.9	9	23	44.6
4	Tue		24	5	32.3	11	58.2	18	24.3		9	12	25.8	9	15	58.7	10	21	13.1
5	Wed		25	5	31.5	11	58.0	18	24.8	S	10	10	46.7	10	15	05.9	11	18	51.2
6	Thu		26	5	30.7	11	57.8	18	25.2		11	9	20.1	11	14	25.8	12	16	39.8
7	Fri		27	5	30.0	11	57.7	18	25.6		12	8	07.7	12	14	00.3	13	14	40.7
8	Sat		28	5	29.2	11	57.5	18	26.1		13	7	12.3	13	13	52.7	14	12	56.0
9	Sun		29	5	28.5	11	57.4	18	26.5		14	6	37.7	14	14	06.6	15	11	28.8
10	Mon		30	5	27.8	11	57.2	18	26.9	S	15	6	28.2	15	14	46.6	16	10	22.2
11	Tue	May	1	5	27.1	11	57.1	18	27.4	K	1	6	47.9	16	15	56.3	17	9	39.1
12	Wed		2	5	26.4	11	57.0	18	27.8		2	7	40.0	17	17	38.2	18	9	21.6
13	Thu		3	5	25.7	11	56.9	18	28.3		3	9	05.5	18	19	51.7	19	9	29.8
14	Fri		4	5	25.1	11	56.	18	28.7		4	11	01.8	19	22	32.8	20	10	01.8
15	Sat		5	5	24.5	11	56.7	18	29.2	K	5	13	22.2	20	25	32.9	21	10	52.4
16	Sun		6	5	23.8	11	56.6	18	29.6		6	15	55.7	21	28	39.5	22	11	54.0
17	Mon		7	5	23.2	11	56.6	18	30.1		7	18	27.9	22	-	-	23	12	56.4
18	Tue		8	5	22.7	11	56.5	18	30.6		8	20	43.1	22	7	37.8	24	13	48.6
19	Wed		9	5	22.1	11	56.4	18	31.0		9	22	26.8	23	10	12.6	25	14	19.5
20	Thu		10	5	21.5	11	56.4	18	31.5	K	10	23	28.4	24	12	11.2	26	14	20.4
21	Fri		11	5	21.0	11	56.4	18	32.0		11	23	41.9	25	13	25.2	27	13	45.3
22	Sat		12	5	20.5	11	56.3	18	32.4		12	23	06.6	26	13	51.4	1	12	31.6
23	Sun		13	5	20.0	11	56.3	18	32.9		13	21	46.0	27	13	31.3	2	10	40.2
24	Mon		14	5	19.5	11	56.3	18	33.4		14	19	46.8	1	12	30.2	3	8	14.9
25	Tue		15	5	19.1	11	56.3	18	33.9	K	30	17	17.7	2	10	56.3	4	5	21.2
																	(5	26	06.2)
26	Wed		16	5	18.6	11	56.4	18	34.3	S	1	14	28.1	3	8	58.9	6	22	37.7
27	Thu		17	5	18.2	11	56.4	18	34.8		2	11	27.4	4	6	48.1	7	19	03.1
														(5	28	33.3)			
28	Fri		18	5	17.8	11	56.4	18	35.3		3	8	24.8	6	26	23.4	8	15	29.4
29	Sat		19	5	17.4	11	56.5	18	35.8		4	5	28.2	7	24	25.3	9	12	02.8
										(S	5	26	44.3)						
30	Sun		20	5	17.0	11	56.5	18	36.2		6	24	18.2	8	22	44.5	10	8	48.2
31	Mon		21	5	16.7	11	56.6	18	36.7	S	7	22	13.1	9	21	24.7	11	5	49.2
																	(12	27	08.2)

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1940

Uttarayana
Uttara Gola

Month of VAISAKHA (31 days)

Ayanamsa on 1st : $24^0 06^{/} 32^{//}$

(*Nirayana*) 8 Vaisakha, 5119 Kali Era to (*Nirayana*) 7 Jyaishtha, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018A.D.					
1	Apr. 21	SAURA VAISAKHA	CHAANDRA VAISAKHA			1- Sri Ramanujacharya Jayanti (S.India), Sri Ramanujacharya Jayanti.
2	22					2- Gangotpatti.
3	23					3- Babu Kuer Singh Day (Bihar).
4	24				4- Sayana Vyatipata ($18^h 44^m.2$)	4- Sita Navami. Ekadasi (Vaishnava & Vidhava).
5	25					5- Trichur Puram (Kerala).
6	26					6- Mohini Ekadasi.
7	27			7- Enters Bharani ($24^h 00^m.0$)		7- Minakshi Kolyanam.
8	28					8- Nrisimha Chaturdasi.
9	29					
10	30				10- Full Moon ($6^h 28^m.2$)	10- Vaisakhi Purnima, Buddha Purnima, Beginning of Buddha era.
11	May 1					11- May Day
12	2					
13	3					13- Birthday anniversary of Dada Chellaram (Sindhi).
14	4					
15	5					
16	6					
17	7				17- Sayana Vaidhriti ($22^h 28^m.7$)	
18	8					
19	9					19- Birthday of Rabindranath Tagore.
20	10					
21	11			21- Enters Krittika ($18^h 12^m.6$)		21- Apara Ekadasi, Bhadrakali Ekadasi (Punjab).
22	12					
23	13					
24	14			24- Saura Jyaishthadi ($7^h 40^m.9$)		24- Phalaharini Kalika Puja, Savitri Chaturdasi.
25	15	SAURA JYAISHTHA			25- New Moon ($17^h 17^m.7$)	25- Vata Savitri Vrata(Amavasya Paksha).
26	16		CHAANDRA JYAISHTHA MALA			
27	17					
28	18					
29	19					
30	20				30- Sayana Vyatipata ($6^h 22^m.6$)	
31	May 21			31- Enters Trop. Gemini ($7^h 44^m.6$)		

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

Moon enters :- Karkata 2, $12^h 38^m.2$; Simha 4, $15^h 58^m.7$; Kanya 6, $20^h 17^m.9$; Tula 8, $25^h 56^m.7$; Vrischika 11, $9^h 35^m.9$; Dhanus 13, $19^h 51^m.7$; Makara 16, $8^h 19^m.5$; Kumbha 18, $20^h 59^m.0$; Mina 21, $7^h 11^m.2$; Mesha 23, $13^h 31^m.3$; Vrisha 25, $16^h 28^m.7$; Mithuna 27, $17^h 40^m.7$; Karkata 29, $18^h 53^m.4$; Simha 31, $21^h 24^m.7$; Sun enters :- Nirayana Vrisha 24, $29^h 03^m.3$

SAKA ERA 1940

Month of JYAISHTHA (31 days)

Mithuna :Suchi
Summer (Grishma), 2nd Month

(*Nirayana*) 8 Jyaishtha, 5119 Kali Era to (*Nirayana*) 7 Ashadha, 5119 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
		2018 A.D.															
1	Tue	May 22	5	16.3	11	56.6	18	37.2	S 8	20	31.1	10	20	27.9	13	24	46.3
2	Wed	23	5	16.0	11	56.7	18	37.6	9	19	12.9	11	19	54.7	14	22	43.7
3	Thu	24	5	15.7	11	56.8	18	38.1	S 10	18	18.4	12	19	45.2	15	21	00.3
4	Fri	25	5	15.5	11	56.9	18	38.6	11	17	47.6	13	19	58.9	16	19	35.8
5	Sat	26	5	15.2	11	57.0	18	39.0	12	17	40.6	14	20	36.1	17	18	30.4
6	Sun	27	5	15.0	11	57.1	18	39.5	13	17	58.0	15	21	37.4	18	17	44.3
7	Mon	28	5	14.8	11	57.2	18	39.9	14	18	40.7	16	23	03.5	19	17	18.2
8	Tue	29	5	14.6	11	57.4	18	40.4	S 15	19	49.6	17	24	55.3	20	17	12.5
9	Wed	30	5	14.4	11	57.5	18	40.8	K 1	21	24.8	18	27	12.3	21	17	27.3
10	Thu	31	5	14.2	11	57.6	18	41.3	2	23	24.6	19	-	-	22	18	01.4
11	Fri	June 1	5	14.1	11	57.8	18	41.7	3	25	44.8	19	5	52.4	23	18	52.0
12	Sat	2	5	14.0	11	57.9	18	42.1	4	28	17.7	20	8	50.6	24	19	54.1
13	Sun	3	5	13.9	11	58.1	18	42.5	K 5	-	-	21	11	58.6	25	21	00.7
14	Mon	4	5	13.8	11	58.3	18	42.9	K 5	6	52.7	22	15	05.0	26	22	02.7
15	Tue	5	5	13.7	11	58.4	18	43.3	6	9	16.5	23	17	56.7	27	22	50.2
16	Wed	6	5	13.7	11	58.6	18	43.7	7	11	15.4	24	20	20.4	1	23	13.6
17	Thu	7	5	13.7	11	58.8	18	44.1	8	12	37.3	25	22	04.7	2	23	04.7
18	Fri	8	5	13.7	11	59.0	18	44.5	9	13	13.3	26	23	02.2	3	22	18.0
19	Sat	9	5	13.7	11	59.2	18	44.9	K 10	12	59.0	27	23	09.8	4	20	51.0
20	Sun	10	5	13.7	11	59.4	18	45.2	11	11	54.5	1	22	29.2	5	18	44.4
21	Mon	11	5	13.7	11	59.6	18	45.6	12	10	04.0	2	21	05.5	6	16	01.8
22	Tue	12	5	13.8	11	59.8	18	45.9	13	7	34.2	3	19	06.9	7	12	48.7
									(14	28	34.0)						
23	Wed	13	5	13.9	12	00.0	18	46.3	K 30	25	13.2	4	16	43.0	8	9	12.3
24	Thu	14	5	14.0	12	00.2	18	46.6	S 1	21	41.9	5	14	04.2	9	5	20.6
															(10	25	21.6)
25	Fri	15	5	14.1	12	00.4	18	46.9	2	18	09.8	6	11	21.0	11	21	23.5
26	Sat	16	5	14.3	12	00.6	18	47.2	3	14	46.1	7	8	43.4	12	17	33.7
27	Sun	17	5	14.4	12	00.9	18	47.4	4	11	39.1	8	6	20.2	13	13	58.6
												(9	28	19.3)			
28	Mon	18	5	14.6	12	01.1	18	47.7	S 5	8	55.5	10	26	46.3	14	10	43.7
29	Tue	19	5	14.7	12	01.3	18	48.0	6	6	40.9	11	25	45.5	15	7	53.1
									(7	28	59.0)						
30	Wed	20	5	14.9	12	01.5	18	48.2	8	27	51.5	12	25	18.9	16	5	29.5
															(17	27	33.9)
31	Thu	21	5	15.1	12	01.7	18	48.4	S 9	27	18.9	13	25	26.7	18	26	06.4

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 1940

Uttara Gola | Month of JYAISHTHA (31 days) | Ayanamsa on 1st : $24^{0} 06' 36''$

(Nirayana) 8 Jyaishtha, 5119 Kali Era to *(Nirayana)* 7 Ashadha, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D					
1	May 22	SAURA JYAISHTHA	CHAANDRA JYAISHTHA MALA			
2	23					
3	24					3- Ganga Dasahara (except Bengal & Odisha).
4	25			4- Enters Rohini ($14^h 20^m.9$)		4- Padmini Ekadasi (Purusottami).
5	26					
6	27					
7	28					
8	29				8- Full Moon ($19^h 49^m.6$)	
9	30					
10	31					
11	June 1				11- Sayana Vaidhriti ($28^h 27^m.2$)	
12	2					
13	3					
14	4					
15	5					
16	6					
17	7					
18	8			18- Enters Mrigasiras ($12^h 16^m.7$)		
19	9					
20	10					20- Kamala Ekadasi (Purusottami).
21	11					
22	12					
23	13				23- New Moon ($25^h 13^m.2$)	
24	14		CHAANDRA JYAISHTHA SUDDHA	24- Saura Ashadhadi ($13^h 59^m.4$)	24- Sayana Vyatipata ($23^h 02^m.0$)	
25	15					25- Rajas Samkranti (Odisha).
26	16	SAURA ASHADHA				26- Rambha Tritiya, Pratap Jayanti (Rajasthan).
27	17					27- Guru Arjan Dev's Martyrdom Day (Sikh).
28	18					28- Vindhyavasini Puja.
29	19					29- Aranya Shashthi, Jamatri Shashthi (Bengal).
30	20					30- Mela Kshir Bhawani (Kashmir) - 2 days.
31	June 21			31- Enters Trop. Cancer ($15^h 37^m.3$)		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:- Kanya 2, $25^h 50^m.2$; Tula 5, $8^h 14^m.6$; Vrischika 7, $16^h 39^m.6$; Dhanus 9, $27^h 12^m.3$; Makara 12, $15^h 37^m.1$; Kumbha 14, $28^h 33^m.6$; Mina 17, $15^h 42^m.8$; Mesha 19, $23^h 09^m.8$; Vrisha 21, $26^h 38^m.8$; Mithuna 23, $27^h 24^m.8$; Karkata 25, $27^h 21^m.8$; Simha 27, $28^h 19^m.3$; Kanya 30, $7^h 35^m.6$; Sun enters :-Nirayana Mithuna 25, $11^h 36^m.7$

INDIAN CALENDAR

SAKA ERA 1940

Karkata : Nabhas
Rains (Varsa), 1st Month

Month of ASHADHA (31 days)

(*Nirayana*) 8 Ashadha, 5119 Kali Era to (*Nirayana*) 7 Sravana, 5119 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi		Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
				h	m	h	m	h	m		No.	h	m		h	m		h	m
		2018 A.D.																	
1	Fri	Jun.	22	5	15.4	12	02.0	18	48.6	S	10	27	20.0	14	26	07.9	19	25	05.8
2	Sat		23	5	15.6	12	02.2	18	48.8		11	27	52.7	15	27	20.2	20	24	30.5
3	Sun		24	5	15.8	12	02.4	18	49.0		12	28	54.4	16	29	00.9	21	24	18.2
4	Mon		25	5	16.1	12	02.6	18	49.1		13	-	-	17	-	-	22	24	26.8
5	Tue		26	5	16.4	12	02.8	18	49.3		13	6	22.3	17	7	06.9	23	24	53.5
6	Wed		27	5	16.7	12	03.0	18	49.4		14	8	13.0	18	9	34.9	24	25	35.9
7	Thu		28	5	17.0	12	03.2	18	49.5	S	15	10	23.0	19	12	21.3	25	26	30.8
8	Fri		29	5	17.3	12	03.4	18	49.6	K	1	12	47.5	20	15	21.3	26	27	34.2
9	Sat		30	5	17.6	12	03.6	18	49.7		2	15	20.7	21	18	29.0	27	28	41.1
10	Sun	Jul.	1	5	17.9	12	03.8	18	49.7		3	17	55.0	22	21	36.7	1	-	-
11	Mon		2	5	18.2	12	04.0	18	49.7		4	20	20.9	23	24	35.1	1	5	45.4
12	Tue		3	5	18.6	12	04.2	18	49.8	K	5	22	28.3	24	27	14.0	2	6	40.0
13	Wed		4	5	19.0	12	04.4	18	49.8		6	24	06.7	25	-	-	3	7	17.1
14	Thu		5	5	19.3	12	04.5	18	49.7		7	25	07.0	25	5	23.1	4	7	29.4
15	Fri		6	5	19.7	12	04.7	18	49.7		8	25	22.7	26	6	53.7	5	7	10.2
16	Sat		7	5	20.1	12	04.9	18	49.6		9	24	50.5	27	7	39.6	6	6	15.0
																	(7	28	41.5)
17	Sun		8	5	20.5	12	05.0	18	49.5	K	10	23	30.8	1	7	38.2	8	26	29.8
18	Mon		9	5	20.9	12	05.2	18	49.4		11	21	27.2	2	6	50.5	9	23	42.7
														(3	29	20.6)			
19	Tue		10	5	21.3	12	05.3	18	49.3		12	18	45.7	4	27	15.2	10	20	24.9
20	Wed		11	5	21.7	12	05.5	18	49.2		13	15	34.2	5	24	43.2	11	16	42.6
21	Thu		12	5	22.1	12	05.6	18	49.0		14	12	01.7	6	21	54.2	12	12	43.1
22	Fri		13	5	22.5	12	05.7	18	48.9	K	30	8	17.9	7	18	58.6	13	8	34.2
										(S	1	28	32.5)				(14	28	24.2)
23	Sat		14	5	22.9	12	05.9	18	48.7		2	24	55.2	8	16	06.6	15	24	21.0
24	Sun		15	5	23.3	12	06.0	18	48.4		3	21	35.2	9	13	28.1	16	20	32.1
25	Mon		16	5	23.8	12	06.0	18	48.2		4	18	40.9	10	11	12.4	17	17	04.3
26	Tue		17	5	24.2	12	06.1	18	47.9	S	5	16	19.5	11	9	27.5	18	14	03.5
27	Wed		18	5	24.6	12	06.2	18	47.7		6	14	36.7	12	8	19.6	19	11	34.0
28	Thu		19	5	25.0	12	06.3	18	47.4		7	13	36.2	13	7	53.0	20	9	38.5
29	Fri		20	5	25.5	12	06.4	18	47.0		8	13	19.1	14	8	09.3	21	8	18.0
30	Sat		21	5	25.9	12	06.4	18	46.7		9	13	44.2	15	9	07.4	22	7	31.4
31	Sun		22	5	26.4	12	06.5	18	46.3	S	10	14	47.7	16	10	43.9	23	7	15.8

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 1940

Dakshinayana

Uttara Gola

Month of ASHADHA (31 days)

Ayanamsa on 1st : $24^{0} 06^{/} 41^{//}$

(*Nirayana*) 8 Ashadha, 5119 Kali Era to (*Nirayana)* 7 Sravana, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018A.D.					
1	June 22	SAURA ASHADHA	CHAANDRA JYAISHTHA SUDDHA	1- Enters Ardra ($11^h 11^m.4$)		1- Ganga Dasahara(Bengal & Odisha)
2	23					2- Nirjala Ekadasi.
3	24					3- Champaka Dvadasi.
4	25					
5	26					
6	27				6- Sayana Vaidhriti ($10^h 20^m.7$)	6- Vata Savitri Vrata (Purnima Paksha).
7	28				7- Full Moon ($10^h 23^m.0$)	7- Deva Snana Purnima.
8	29					8- Guru Hargobind's Birthday
9	30					
10	July 1					
11	2					
12	3					
13	4					
14	5					
15	6			15- Enters Punarvasu ($10^h 50^m.6$)		
16	7					
17	8					
18	9					18- Yogini Ekadasi.
19	10				19- Sayana Vyatipata ($17^h 57^m.4$)	
20	11					
21	12					
22	13		CHAANDRA ASHADHA		22- New Moon ($8^h 17^m.9$)	22- Martyr's day (Kashmir).
23	14					23- Monoratha Dvitiya Vrata (Bengal), Rathayatra.
24	15			24- Saura Sravanadi ($24^h 45^m.4$)	22- Solar Eclipse (not visible in India).	
25	16					25- Manasa Puja begins (Bengal).
26	17	SAURA SRAVANA				
27	18					27- Kumara Shashthi, Vivasvat Saptami.
28	19					
29	20			29- Enters Pushya ($10^h 17^m.0$)		29- Kharchi Puja (Tripura).
30	21					30- Mela Sharik Bhagwati (Kashmir).
31	July 22			31- EntersTrop.Leo ($26^h 30^m.3$)	31- Sayana Vaidhriti ($16^h 31^m.4$)	31- Punaryatra, Ultarath, Bahudha Yatra.

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 1, $13^h 43^m.2$; Vrischika 3, $22^h 33^m.2$; Dhanus 6, $9^h 34^m.9$; Makara 8, $22^h 07^m.7$; Kumbha 11, $11^h 07^m.7$; Mina 13, $22^h 54^m.1$; Mesha 16, $7^h 39^m.6$; Vrisha 18, $12^h 31^m.7$; Mithuna 20, $14^h 01^m.9$; Karkata 22, $13^h 42^m.5$; Simha 24, $13^h 28^m.1$; Kanya 26, $15^h 06^m.9$; Tula 28, $19^h 55^m.8$; Vrischika 30, $28^h 16^m.5$; Sun enters:-Nirayana Karkata 25, $22^h 27^m.1$

INDIAN CALENDAR

SAKA ERA 1940

Simha : Nabhasya
Rains (Varsa), 2nd Month

Month of SRAVANA (31 days)

(*Nirayana*) 8 Sravana, 5119 Kali Era to (*Nirayana*) 7 Bhadra, 5119 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
		2018 A.D.															
1	Mon	Jul. 23	5	26.8	12	06.5	18	46.0	S 11	16	23.9	17	12	53.1	24	7	27.0
2	Tue	24	5	27.2	12	06.5	18	45.6	12	18	25.8	18	15	28.0	25	8	00.0
3	Wed	25	5	27.7	12	06.5	18	45.2	13	20	45.8	19	18	21.3	26	8	49.2
4	Thu	26	5	28.1	12	06.5	18	44.7	14	23	16.5	20	21	25.3	27	9	49.0
5	Fri	27	5	28.5	12	06.5	18	44.3	S 15	25	50.3	21	24	32.8	1	10	54.1
6	Sat	28	5	29.0	12	06.5	18	43.8	K 1	28	20.6	22	27	37.2	2	11	59.2
7	Sun	29	5	29.4	12	06.5	18	43.3	2	-	-	23	-	-	3	12	59.6
8	Mon	30	5	29.8	12	06.4	18	42.8	2	6	40.5	23	6	31.8	4	13	50.4
9	Tue	31	5	30.3	12	06.4	18	42.2	3	8	43.5	24	9	10.1	5	14	26.8
10	Wed	Aug. 1	5	30.7	12	06.3	18	41.7	4	10	23.0	25	11	25.7	6	14	44.1
11	Thu	2	5	31.1	12	06.3	18	41.1	K 5	11	33.1	26	13	12.5	7	14	37.7
12	Fri	3	5	31.5	12	06.2	18	40.5	6	12	08.4	27	14	25.0	8	14	03.5
13	Sat	4	5	32.0	12	06.1	18	39.9	7	12	04.9	1	14	59.4	9	12	58.6
14	Sun	5	5	32.4	12	06.0	18	39.3	8	11	20.7	2	14	53.4	10	11	21.1
15	Mon	6	5	32.8	12	05.9	18	38.7	9	9	55.9	3	14	07.4	11	9	10.8
16	Tue	7	5	33.2	12	05.8	18	38.0	K 10	7	52.7	4	12	43.8	12	6	29.0
									(11	29	15.7)				(13	27	18.9)
17	Wed	8	5	33.6	12	05.7	18	37.4	12	26	10.6	5	10	47.4	14	23	45.1
18	Thu	9	5	34.0	12	05.5	18	36.7	13	22	45.2	6	8	24.8	15	19	53.4
19	Fri	10	5	34.4	12	05.4	18	36.0	14	19	07.9	7	5	44.0	16	15	50.6
												(8	26	54.1)			
20	Sat	11	5	34.8	12	05.2	18	35.3	K 30	15	27.8	9	24	05.0	17	11	44.1
21	Sun	12	5	35.2	12	05.1	18	34.6	S 1	11	54.3	10	21	26.7	18	7	41.7
															(19	27	51.2)
22	Mon	13	5	35.6	12	04.9	18	33.8	2	8	37.0	11	19	09.3	20	24	20.4
23	Tue	14	5	36.0	12	04.7	18	33.0	3	5	45.3	12	17	22.1	21	21	16.2
									(4	27	27.9)						
24	Wed	15	5	36.4	12	04.5	18	32.3	S 5	25	51.9	13	16	13.0	22	18	44.3
25	Thu	16	5	36.8	12	04.3	18	31.5	6	25	02.3	14	15	48.3	23	16	49.0
26	Fri	17	5	37.0	12	04.1	18	30.7	7	25	01.2	15	16	11.0	24	15	32.2
27	Sat	18	5	37.5	12	03.9	18	29.9	8	25	47.3	16	17	20.8	25	14	53.4
28	Sun	19	5	37.9	12	03.7	18	29.1	9	27	15.3	17	19	13.4	26	14	49.4
29	Mon	20	5	38.2	12	03.4	18	28.2	S 10	29	16.7	18	21	41.0	27	15	14.6
30	Tue	21	5	38.6	12	03.2	18	27.4	11	-	-	19	24	33.4	1	16	01.5
31	Wed	22	5	39.0	12	03.0	18	26.5	S 11	7	40.7	20	27	39.3	2	17	01.9

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Dakshinayana
Uttara Gola

SAKA ERA 1940
Month of SRAVANA (31 days)

Ayanamsa on 1st : $24^0 06^{/} 46^{//}$

(*Nirayana*) 8 Sravana, 5119 Kali Era to (*Nirayana*) 7 Bhadra, 5119 Kali Era

Date	Gergorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	July 23		CHAANDRA ASHADHA			1- Harisayani Ekadasi.
2	24					
3	25					
4	26					4- Mela Jwalamukhi (Kashmir).
5	27				5- Full Moon ($25^h 50^m.3$) 5- Lunar Eclipse (visible in India)	5- Guru Purnima, Vyasa Puja, Ashadhi Purnima.
6	28					
7	29					
8	30					
9	31	SAURA SRAVANA				
10	Aug. 1					10- Tilak Commemoration Day.
11	2					11- Nag Panchami (Bengal).
12	3			12- Enters Aslesha ($9^h 15^m.2$)		
13	4				13- Sayana Vyatipata ($8^h 44^m.0$)	13- Ker Puja (Tripura).
14	5					
15	6					
16	7					16- Kamika Ekadasi (Smarta).
17	8					17- Ekadasi (Vaishnava & Vidhava).
18	9					
19	10					
20	11				20- New Moon ($15^h 27^m.8$) 20- Solar Eclipse	20- Chitalagi Amavasya (Odisha), Adi Amavasya (Tamil Nadu), Karkataka Vavu (Kerala).
21	12		CHAANDRA SRAVANA			
22	13					22- Madhusrava Tritiya (Teej), Adi Puram (S. India).
23	14					
24	15					24- Naga Panchami, Independence Day.
25	16			25- Saura Bhadrapadadi ($9^h 16^m.8$)	25- Sayana Vaidhriti ($25^h 30^m.0$)	
26	17	SAURA BHADRAPADA		26- Enters Magha ($6^h 50^m.5$)		26- Manasa Puja ends (Bengal), Simhadi(Kerala), Beginning of Kollam Era, Goswami Tulasi Jayanti.
27	18					27- Durvashtami (except Bengal).
28	19					
29	20					
30	21					30- Jhulana Yatrarambha.
31	Aug. 22					31- Pabitra Ekadasi.

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 2, $15^h 28^m.0$; Makara 4, $28^h 12^m.1$; Kumbha 7, $17^h 06^m.2$; Mina 9, $28^h 54^m.3$; Mesha 12, $14^h 25^m.0$; Vrisha 14, $20^h 45^m.6$; Mithuna 16, $23^h 49^m.4$; Karkata 18, $24^h 25^m.4$; Simha 20, $24^h 05^m.0$; Kanya 22, $24^h 39^m.3$; Tula 24, $27^h 54^m.8$; Vrischika 27, $10^h 59^m.1$; Dhanus 29, $21^h 41^m.0$; Sun enters :- Nirayana Simha 26, $6^h 50^m.5$.

INDIAN CALENDAR

SAKA ERA 1940

Kanya: Isha

Month of BHADRA (31 days)

Autumn (Sarat), 1st Month

(*Nirayana*) 8 Bhadra, 5119 Kali Era to (*Nirayana*) 7 Asvina, 5119 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
		2018 A.D.															
1	Thu	Aug. 23	5	39.3	12	02.7	18	25.6	S 12	10	15.6	21	-	-	3	18	07.5
2	Fri	24	5	39.7	12	02.4	18	24.7	13	12	50.6	21	6	47.6	4	19	10.7
3	Sat	25	5	40.0	12	02.2	18	23.9	14	15	16.4	22	9	48.6	5	20	05.6
4	Sun	26	5	40.3	12	01.9	18	22.9	S 15	17	26.2	23	12	35.9	6	20	47.3
5	Mon	27	5	40.7	12	01.6	18	22.0	K 1	19	15.0	24	15	03.6	7	21	12.6
6	Tue	28	5	41.0	12	01.3	18	21.1	2	20	39.8	25	17	08.4	8	21	19.1
7	Wed	29	5	41.3	12	01.0	18	20.2	3	21	38.4	26	18	48.1	9	21	05.3
8	Thu	30	5	41.7	12	00.7	18	19.2	4	22	09.5	27	20	01.1	10	20	30.0
9	Fri	31	5	42.0	12	00.4	18	18.3	K 5	22	11.9	1	20	46.2	11	19	32.1
10	Sat	Sept. 1	5	42.3	12	00.0	18	17.3	6	21	44.7	2	21	02.2	12	18	10.8
11	Sun	2	5	42.6	11	59.8	18	16.4	7	20	47.4	3	20	48.5	13	16	25.4
12	Mon	3	5	43.0	11	59.4	18	15.4	8	19	20.0	4	20	05.0	14	14	15.7
13	Tue	4	5	43.3	11	59.1	18	14.4	9	17	23.7	5	18	52.8	15	11	42.2
14	Wed	5	5	43.6	11	58.8	18	13.4	K 10	15	00.9	6	17	14.3	16	8	46.4
															(17	29	30.8)
15	Thu	6	5	43.9	11	58.4	18	12.5	11	12	15.4	7	15	13.6	18	25	59.1
16	Fri	7	5	44.2	11	58.1	18	11.5	12	9	12.6	8	12	56.2	19	22	16.4
17	Sat	8	5	44.5	11	57.8	18	10.5	13	5	58.9	9	10	29.2	20	18	28.7
									(14	26	42.3)						
18	Sun	9	5	44.8	11	57.4	18	09.5	K 30	23	31.5	10	8	01.1	21	14	42.7
												(11	29	41.0)			
19	Mon	10	5	45.1	11	57.0	18	08.5	S 1	20	35.8	12	27	39.1	22	11	05.9
20	Tue	11	5	45.5	11	56.7	18	07.5	2	18	04.8	13	26	04.8	23	7	46.0
															(24	28	50.2)
21	Wed	12	5	45.8	11	56.4	18	06.5	3	16	07.6	14	25	07.3	25	26	25.3
22	Thu	13	5	46.1	11	56.0	18	05.4	4	14	52.0	15	24	53.4	26	24	36.1
23	Fri	14	5	46.4	11	55.7	18	04.4	S 5	14	23.8	16	25	27.4	27	23	25.6
24	Sat	15	5	46.7	11	55.3	18	03.4	6	14	45.2	17	26	49.4	1	22	53.7
25	Sun	16	5	47.0	11	54.9	18	02.4	7	15	54.4	18	28	54.8	2	22	57.4
26	Mon	17	5	47.3	11	54.6	18	01.4	8	17	44.5	19	-	-	3	23	30.1
27	Tue	18	5	47.6	11	54.2	18	00.3	9	20	04.4	19	7	34.4	4	24	23.1
28	Wed	19	5	47.9	11	53.9	17	59.3	S 10	22	39.9	20	10	35.6	5	25	25.9
29	Thu	20	5	48.2	11	53.6	17	58.3	11	25	16.5	21	13	44.0	6	26	28.3
30	Fri	21	5	48.5	11	53.2	17	57.3	12	27	41.0	22	16	45.9	7	27	21.1
31	Sat	22	5	48.8	11	52.8	17	56.3	S 13	29	43.6	23	19	30.2	8	27	57.2

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Dakshinayana | SAKA ERA 1940

Uttara Gola | Month of BHADRA (31 days) | Ayanamsa on 1st : $24^{0} 06^{\prime} 50^{\prime\prime}$

(*Nirayana*) 8 Bhadra, 5119 Kali Era to (*Nirayana)* 7 Asvina, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	Aug. 23	SAURA BHADRAPADA	CHAANDRA SRAVANA	1- Enters Trop. Virgo ($9^h 38^m.6$)		
2	24					2- Vara Mahalakshmi Vrata (S. India), First Onam Day.
3	25					3- Onam or Thiru Onam Day (Kerala), JhulanaYatra Samapana(Pradosa), Rik Upakarma.
4	26				4- Full Moon ($17^h 26^m.2$)	4- Raksha Bandhana, Jhulana Yatra Samapana, Amar Nath Yatra, Naroli Purnima(Mumbai), Balabhadra Puja(Odisha), Sravani Purnima, Solono (Rakhi Bandhan-Delhi), Avani Avittam (S. India), Yaju Upakarma.
5	27					5- Gayatri Japam, Fourth Onam Day, Sri Narayana Guru Deva's Birthday (Kerala).
6	28					
7	29					7- Teejri (Sindhi).
8	30			8- Enters PurvaPhalguni ($26^h 53^m.0$)	8- Sayana Vyatipata ($17^h 43^m.5$)	8- Bahula Chaturthi, Sankashta Chaturthi.
9	31					9- Raksha Panchami (Odisha), Tithi of Sri Madhava Deva (Assam).
10	Sept. 1					
11	2					11- Janmashtami (Smarta), Vadi Thadri (Sindhi), Sri Krishna Jayanti (T.N., Assam & Kerala), Jayanti Yoga.
12	3					12- Janmashtami(Vaishnava), Nandotsava (Gokulashtami), Sri Jayanti (Ramanuja), Gokulashtami (S. India), Coorg (Keil Muhurt).
13	4					
14	5					
15	6					15- Aja Ekadasi, Paryusana Parvarambha(Chaturthi Paksha-Jain), Paryusana Parvarambha (Panchami Paksha-Jain).
16	7					
17	8					17- Kailas Yatra- 2 days, Aghora Chaturdasi.
18	9				18- New Moon ($23^h 31^m.5$)	18- Pithori, Kusotpatini, Jain Fstival, Saptapuri Amavasya (Odisha).
19	10		CHAANDRA BHADRAPADA			
20	11				20- Sayana Vaidhriti ($15^h 51^m.3$)	20- Tithi of Sri Sankara Deva (Assam), Samaveda Upakarma.
21	12					21- Haritalika Gauri Tritiya, Haritalika Chaturthi.
22	13			22- Enters U. Phalguni ($20^h 41^m.6$)		22- Samvatsari (Chaturthi Paksha - Jain), Ganesa Chaturthi,Samvatsari (Panchami Paksha-Jain), Vinayaka Chaturthi(S.India).
23	14					23- Rishi Panchami,Mela Pat-3 days (Jammu & Kashmir).
24	15					24- Surya Shashthi.
25	16			25- Saura Asvinadi ($9^h 30^m.2$)		25- Mahalakshmi Vratarambha.
26	17	SAURA ASVINA				26- Radhashtami, Visvakarma Puja, Durvashtami(Bengal).
27	18					
28	19					
29	20					29- Dol Gyaras (MP), Heikra Hitamba (Manipur), Parsvaparivartani Ekadasi.
30	21					30- Vamana Jayanti, Sravana Dvadasi, Sakrotthana, Samadhi day of Narayana Guru (Kerala).
31	Sept. 22					

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

Moon enters : Makara 1,$10^h 26^m.5$;Kumbha 3, $23^h 14^m.5$; Mina 6, $10^h 39^m.5$; Mesha 8, $20^h 01^m.1$; Vrisha 10, $27^h 01^m.6$; Mithuna 13, $7^h 32^m.4$;Karkata 15, $9^h 45^m.6$;Simha 17, $10^h 29^m.2$;Kanya 19, $11^h 08^m.5$;Tula 21, $13^h 31^m.0$;Vrischika 23, $19^h 14^m.3$;Dhanus 25, $28^h 54^m.8$;Makara 28,$17^h 22^m.6$;Kumbha 31, $6^h 10^m.8$; Sun enters :- Nirayana Kanya 26, $6^h 46^m.8$.

INDIAN CALENDAR

SAKA ERA 1940

Tula : Urja

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

(*Nirayana*) 8 Asvina, 5119 Kali Era to (*Nirayana*) 7 Kartika, 5119 Kali Era

Date	Week Day	Gregorian Date	Sunrise h	Sunrise m	Apparent Noon h	Apparent Noon m	Sunset h	Sunset m	Tithi No.	Tithi Ending Moment h	Tithi Ending Moment m	Nakshatra No.	Nakshatra Ending Moment h	Nakshatra Ending Moment m	Yoga No.	Yoga Ending Moment h	Yoga Ending Moment m
		2018 A.D.															
1	Sun	Sep. 23	5	49.2	11	52.5	17	55.2	S 14	-	-	24	21	49.5	9	28	12.2
2	Mon	24	5	49.5	11	52.1	17	54.2	14	7	18.1	25	23	40.1	10	28	03.9
3	Tue	25	5	49.8	11	51.8	17	53.2	S 15	8	22.4	26	25	01.3	11	27	32.1
4	Wed	26	5	50.1	11	51.4	17	52.2	K 1	8	56.7	27	25	54.6	12	26	38.2
5	Thu	27	5	50.4	11	51.1	17	51.2	2	9	03.2	1	26	22.6	13	25	23.9
6	Fri	28	5	50.8	11	50.7	17	50.2	3	8	44.6	2	26	28.2	14	23	51.4
7	Sat	29	5	51.1	11	50.4	17	49.2	4	8	04.0	3	26	13.8	15	22	02.5
8	Sun	30	5	51.4	11	50.1	17	48.2	K 5	7	03.6	4	25	41.2	16	19	58.6
									(6	29	45.1)						
9	Mon	Oct. 1	5	51.8	11	49.7	17	47.2	7	28	09.4	5	24	51.4	17	17	40.6
10	Tue	2	5	52.1	11	49.4	17	46.2	8	26	17.4	6	23	45.3	18	15	08.9
11	Wed	3	5	52.5	11	49.1	17	45.3	9	24	10.1	7	22	23.7	19	12	24.4
12	Thu	4	5	52.8	11	48.8	17	44.3	K 10	21	49.2	8	20	48.5	20	9	27.8
13	Fri	5	5	53.2	11	48.5	17	43.3	11	19	17.9	9	19	02.5	21	6	21.1
															(22	27	06.9)
14	Sat	6	5	53.5	11	48.2	17	42.4	12	16	40.4	10	17	10.4	23	23	49.2
15	Sun	7	5	53.9	11	47.9	17	41.4	13	14	02.8	11	15	18.2	24	20	33.2
16	Mon	8	5	54.3	11	47.6	17	40.5	14	11	32.2	12	13	33.4	25	17	24.9
17	Tue	9	5	54.7	11	47.3	17	39.6	K 30	9	16.9	13	12	04.7	26	14	30.8
18	Wed	10	5	55.0	11	47.1	17	38.6	S 1	7	25.6	14	11	00.8	27	11	57.8
19	Thu	11	5	55.4	11	46.8	17	37.7	2	6	07.0	15	10	30.4	1	9	52.2
									(3	29	28.4)						
20	Fri	12	5	55.8	11	46.5	17	36.8	4	29	35.0	16	10	40.4	2	8	19.0
21	Sat	13	5	56.2	11	46.3	17	35.9	S 5	-	-	17	11	35.0	3	7	21.5
22	Sun	14	5	56.7	11	46.1	17	35.1	S 5	6	28.3	18	13	14.3	4	7	00.0
23	Mon	15	5	57.1	11	45.8	17	34.2	6	8	05.0	19	15	33.6	5	7	11.5
24	Tue	16	5	57.5	11	45.6	17	33.3	7	10	16.7	20	18	22.9	6	7	49.6
25	Wed	17	5	57.9	11	45.4	17	32.5	8	12	50.1	21	21	28.2	7	8	44.9
26	Thu	18	5	58.4	11	45.2	17	31.6	9	15	29.1	22	24	33.7	8	9	46.2
27	Fri	19	5	58.8	11	45.0	17	30.8	S 10	17	57.3	23	27	24.1	9	10	41.8
28	Sat	20	5	59.3	11	44.8	17	30.0	11	20	01.2	24	29	47.4	10	11	21.6
29	Sun	21	5	59.7	11	44.7	17	29.2	12	21	31.2	25	-	-	11	11	37.7
30	Mon	22	6	00.2	11	44.5	17	28.4	S 13	22	23.0	25	7	36.1	12	11	25.5

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Dakshinayana
Dakshina Gola

SAKA ERA 1940
Month of ASVINA (30 days)

Ayanamsa on 1st : $24^{0}\,06^{/}\,53^{//}$

(*Nirayana*) 8 Asvina, 5119 Kali Era to (*Nirayana*) 7 Kartika, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	Sept. 23	SAURA ASVINA	CHAANDRA BHADRAPADA	1- Enters Trop. Libra ($7^h 24^m.0$)		1- Ananta Chaturdasi, Jalavisuva Day
2	24				2- Sayana Vyatipata ($25^h 15^m.2$)	2- Indra Purnima.
3	25				3- Full Moon ($8^h 22^m.4$)	3- Pitri Paksha Tarpana begins.
4	26					
5	27			5- Enters Hasta ($12^h 14^m.5$)		
6	28					
7	29					
8	30					
9	Oct. 1					
10	2					10- Mahalakshmi Vrata Samapana, Mahatma Gandhi's Birthday.
11	3					11- Matri Navami.
12	4					
13	5					13- Indira Ekadasi.
14	6					
15	7				15- Sayana Vaidhriti ($7^h 45^m.3$)	
16	8					16- Mahalaya Amavasya, Sarvapitri Amavasya (Odisha), Gagacchaya Parva (Hasta after $13^h 33^m$).
17	9		CHAANDRA ASVINA		17- New Moon ($9^h 16^m.9$)	17- Tarpana Layba (Manipur).
18	10			18- Enters Chitra ($19^h 03^m.3$)		18- Saradiya Navaratrarambha, Maharaja Agrasen's Jayanti.
19	11				19- Jupiter enters Vrischika ($19^h 19^m.6$)	
20	12					
21	13					21- Upanga Lalita Vrata (Lalita Panchami)
22	14					22- Sarasvati Avahana.
23	15					
24	16			24- Saura Kartikadi ($21^h 48^m.5$)	24- Venus sets in the West ($16^h 44^m$)	24- Durga Puja begins (Mahasaptami), Oli begins (Jain).
25	17					25- Mahashtami, Ayudha Puja, Kaveri Samkramana Snana.
26	18	SAURA KARTIKA				26- Mahanavami, Sarasvati Visarjana, Vijaya Dasami (Dussehara) (in some opinion).
27	19					27- Vijaya Dasami (Dussehara or Dasahara), Vijaya Dasami (Bengal & Kerala), Sri Madhavacharya Jayanti, Papankusa Ekadasi (Pasankusa).
28	20				28– Sayana Vyatipata ($8^h 28^m.0$)	28- Bharat Milap.
29	21					
30	Oct. 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 :- Mina 2, $17^h 15^m.2$; Mesha 4, $25^h 54^m.6$; Vrisha 7, $8^h 26^m.4$; Mithuna 9, $13^h 18^m.4$; Karkata 11, $16^h 45^m.5$; Simha 13, $19^h 02^m.5$; Kanya 15, $20^h 51^m.0$; Tula 17, $23^h 29^m.1$; Vrischika 19, $28^h 33^m.8$; Dhanus 22, $13^h 14^m.3$; Makara 24, $25^h 08^m.3$; Kumbha 27, $14^h 01^m.6$; Mina 29, $25^h 12^m.4$; Sun enters :- Nirayana Tula 25, $18^h 44^m.5$.

INDIAN CALENDAR

SAKA ERA 1940

Vrischika : Sahas
Hemanta, 1st Month

Month of KARTIKA (30 days)

(*Nirayana*) 8 Kartika, 5119 Kali Era to (*Nirayana*) 7 Agrahayana, 5119 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
		2018 A.D.																	
1	Tue	Oct.	23	6	00.7	11	44.4	17	27.7	S	14	22	36.5	26	8	47.0	13	10	43.4
2	Wed		24	6	01.2	11	44.2	17	26.9	S	15	22	15.1	27	9	22.6	14	9	32.5
3	Thu		25	6	01.6	11	44.1	17	26.2	K	1	21	24.1	1	9	25.9	15	7	56.0
																	(16	29	58.0)
4	Fri		26	6	02.1	11	44.0	17	25.5		2	20	09.8	2	9	03.0	17	27	43.2
5	Sat		27	6	02.7	11	43.9	17	24.8		3	18	38.2	3	8	20.3	18	25	16.1
6	Sun		28	6	03.2	11	43.8	17	24.1		4	16	54.8	4	7	23.5	19	22	40.5
7	Mon		29	6	03.7	11	43.7	17	23.4	K	5	15	03.9	5	6	17.5	20	19	59.5
														(6	29	05.9)			
8	Tue		30	6	04.2	11	43.7	17	22.8		6	13	08.3	7	27	51.0	21	17	15.1
9	Wed		31	6	04.8	11	43.6	17	22.2		7	11	10.1	8	26	34.2	22	14	28.7
10	Thu	Nov.	1	6	05.3	11	43.6	17	21.5		8	9	10.3	9	25	16.4	23	11	41.0
11	Fri		2	6	05.9	11	43.6	17	20.9		9	7	09.9	10	23	58.9	24	8	52.9
										(K	10	29	10.4)				(25	30	05.5)
12	Sat		3	6	06.4	11	43.5	17	20.4		11	27	14.1	11	22	44.0	26	27	20.7
13	Sun		4	6	07.0	11	43.6	17	19.8		12	25	24.7	12	21	35.0	27	24	41.3
14	Mon		5	6	07.6	11	43.6	17	19.3		13	23	47.1	13	20	36.6	1	22	11.2
15	Tue		6	6	08.2	11	43.6	17	18.8		14	22	27.3	14	19	55.0	2	19	54.8
16	Wed		7	6	08.8	11	43.7	17	18.3	K	30	21	32.1	15	19	36.5	3	17	57.2
17	Thu		8	6	09.4	11	43.7	17	17.8	S	1	21	08.0	16	19	47.9	4	16	23.3
18	Fri		9	6	10.0	11	43.8	17	17.4		2	21	20.4	17	20	34.5	5	15	17.0
19	Sat		10	6	10.6	11	43.9	17	16.9		3	22	12.7	18	21	59.4	6	14	40.9
20	Sun		11	6	11.3	11	44.0	17	16.5		4	23	44.6	19	24	02.2	7	14	35.3
21	Mon		12	6	11.9	11	44.1	17	16.1	S	5	25	51.1	20	26	37.9	8	14	57.6
22	Tue		13	6	12.5	11	44.2	17	15.8		6	28	22.4	21	29	36.6	9	15	41.8
23	Wed		14	6	13.2	11	44.4	17	15.4		7	-	-	22	-	-	10	16	39.1
24	Thu		15	6	13.8	11	44.5	17	15.1		7	7	04.4	22	8	44.7	11	17	38.7
25	Fri		16	6	14.5	11	44.7	17	14.8		8	9	40.4	23	11	46.1	12	18	28.9
26	Sat		17	6	15.1	11	44.9	17	14.5		9	11	54.5	24	14	25.6	13	18	59.2
27	Sun		18	6	15.8	11	45.1	17	14.3	S	10	13	33.8	25	16	30.9	14	19	01.1
28	Mon		19	6	16.5	11	45.3	17	14.1		11	14	30.0	26	17	54.4	15	18	29.4
29	Tue		20	6	17.1	11	45.5	17	13.9		12	14	40.0	27	18	33.6	16	17	22.4
30	Wed		21	6	17.8	11	45.8	17	13.7	S	13	14	06.6	1	18	30.5	17	15	41.3

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

Dakshinayan | SAKA ERA 1940

Dakshina Gola | Month of KARTIKA (30 days) | Ayanamsa on 1st : $24^0 06^{/} 55^{//}$

(*Nirayana*) 8 Kartika, 5119 Kali Era to (*Nirayana*) 7 Agrahayana, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	Oct. 23	SAURA KARTIKA	CHAANDRA ASVINA	1- Enters Tropical Scorpio ($16^h 52^m.4$)		1- Kojagar (Lakshmindra Puja).
2	24			2- Enters Svati ($11^h 43^m.7$)	2- Full Moon ($22^h 15^m.1$)	2- Kojagori Lakshmi Puja (Bengal), Kumara Purnima(Odisha), Oli ends (Jain), Sarat Purnima, Maharshi Valmiki's Birthday(according to tithi)
3	25					
4	26					
5	27					5- Karaka Chaturthi (Karwa Chouth), Dasaratha Chaturthi.
6	28					
7	29					
8	30				8- Venus rises in the East ($18^h 43^m$)	
9	31					9- Ahoyi Ashtami, Karashtami, Ahoyi Ashtami (Punjab).
10	Nov. 1				10- Sayana Vaidhriti ($19^h 47^m.7$)	10- Martyrdom day of Bhagat Kanwar Ram (Sindhi).
11	2					
12	3					12- Rama Ekadasi (Smarta).
13	4					13- Govatsa Dvadasi, Ekadasi (Vaishnava & Vidhava).
14	5					14- Dhana Trayodasi.
15	6			15- Enters Visakha ($19^h 53^m.1$)		15- Kali Chaturdasi, Dipavali(S.India), Kali Puja,Hanumajjanma (N. India) (Purvarunodaya), Naraka Chaturdasi (Purvarunodaya), (Sunrise $6^h 08^m.2$).
16	7				16- New Moon ($21^h 32^m.1$)	16- Dipavali, Lakshmi Puja, Kaumudi Dipam, Lakshmi Dipam, Kedar Gauri Vrata (S. India), Mahavira Nirvana(Jain).
17	8		CHAANDRA KARTIKA			17- Kartika Sukladi, Govardhana Puja, Bali Puja, Annakuta.
18	9					18- Yama Dvitiya, Bhratri Dvitiya (Bengal), Dwat Puja (Bihar), Viswakarma Day.
19	10					
20	11					
21	12					21- Jnana Panchami (Jain).
22	13				22- Jupiter sets in the west ($15^h 33^m$)	22- Pratihara Shashthi or Surya Shashthi (Chhat -Bihar).
23	14				23- Sayana Vyatipata ($13^h 42^m.6$)	23- Trivandrum Arat (Kerala), Children's Day (Nehru's Birthday).
24	15			24- Saura Margasirshadi ($21^h 54^m.2$)		
25	16					25- Gopashtami or Goshthashtami, Kartika Puja.
26	17	SAURA MARGASIRSHA				26- Jagaddhatri Puja, Akshaya Navami Death anniversary of Lala Lajpat Rai.
27	18					
28	19			28- Enters Anuradha ($25^h 53^m.0$)		28- Utthana or Deva Prabodhani Ekadasi, Tulasi Vivaha.
29	20					29- Birthday celebration of Prof. Ram Panjwani (Sindhi).
30	Nov. 21					30- Vaikuntha Chaturdasi (Pradosa).

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, $9^h 22^m.6$; Vrisha 4, $14^h 54^m.0$; Mithuna 6, $18^h 51^m.4$; Karkata 8, $22^h 09^m.9$; Simha 10, $25^h 16^m.4$; Kanya 12, $28^h 26^m.1$; Tula 15, $8^h 13^m.3$; Vrischika 17, $13^h 41^m.9$; Dhanus 19, $21^h 59^m.4$; Makara 22, $9^h 20^m.9$; Kumbha 24, $22^h 17^m.3$; Mina 27, $10^h 03^m.3$; Mesha 29, $18^h 33^m.6$; Sun enters :- Nirayana Vrischika 25, $18^h 32^m.3$.

INDIAN CALENDAR

SAKA ERA 1940

Dhanus : Sahasya
Hemanta, 2nd Month

Month of AGRAHAYANA (30 days)

(*Nirayana*) 8 Agrahayana, 5119 Kali Era to (*Nirayana*) 7 Pausha, 5119 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi			Nakshatra			Yoga		
			h	m	h	m	h	m	No.	Ending Moment h	m	No.	Ending Moment h	m	No.	Ending Moment h	m
		2018 A.D.															
1	Thu	Nov. 22	6	18.5	11	46.0	17	13.5	S 14	12	53.8	2	17	50.4	18	13	29.7
2	Fri	23	6	19.2	11	46.3	17	13.	S 15	11	09.2	3	16	40.7	19	10	52.9
3	Sat	24	6	19.8	11	46.6	17	13.3	K 1	9	01.0	4	15	09.8	20	7	57.1
															(21	28	48.7)
4	Sun	25	6	20.5	11	46.9	17	13.2	2	6	37.6	5	13	26.0	22	25	33.6
									(3	28	06.7)						
5	Mon	26	6	21.2	11	47.2	17	13.1	4	25	35.3	6	11	37.1	23	22	17.5
6	Tue	27	6	21.9	11	47.5	17	13.1	K 5	23	08.8	7	9	49.6	24	19	04.7
7	Wed	28	6	22.6	11	47.8	17	13.1	6	20	51.5	8	8	08.7	25	15	58.6
8	Thu	29	6	23.3	11	48.2	17	13.1	7	18	46.2	9	6	38.2	26	13	01.8
												(10	29	20.6)			
9	Fri	30	6	23.9	11	48.5	17	13.1	8	16	55.1	11	28	17.7	27	10	15.9
10	Sat	Dec. 1	6	24.6	11	48.9	17	13.2	9	15	19.5	12	27	30.5	1	7	42.0
															(2	29	21.0)
11	Sun	2	6	25.3	11	49.3	17	13.3	K 10	14	00.7	13	27	00.4	3	27	13.9
12	Mon	3	6	26.0	11	49.7	17	13.4	11	13	00.2	14	26	49.3	4	25	22.1
13	Tue	4	6	26.7	11	50.0	17	13.5	12	12	20.0	15	26	59.5	5	23	47.1
14	Wed	5	6	27.3	11	50.5	17	13.7	13	12	03.0	16	27	33.9	6	22	31.2
15	Thu	6	6	28.0	11	50.9	17	13.9	14	12	12.1	17	28	35.4	7	21	36.5
16	Fri	7	6	28.7	11	51.3	17	14.1	K 30	12	50.4	18	30	06.4	8	21	04.7
17	Sat	8	6	29.3	11	51.8	17	14.3	S 1	13	59.8	19	-	-	9	20	56.7
18	Sun	9	6	30.0	11	52.2	17	14.6	2	15	40.7	19	8	07.4	10	21	11.9
19	Mon	10	6	30.6	11	52.7	17	14.8	3	17	50.2	20	10	36.9	11	21	47.7
20	Tue	11	66	31.2	11	53.1	17	15.1	4	20	22.1	21	13	29.4	12	22	39.1
21	Wed	12	6	31.8	11	53.6	17	15.4	S 5	23	06.2	22	16	36.3	13	23	38.7
22	Thu	13	6	32.5	11	54.0	17	15.8	6	25	49.2	23	19	45.2	14	24	37.2
23	Fri	14	6	33.1	11	54.5	17	16.1	7	28	16.2	24	22	42.4	15	25	24.4
24	Sat	15	6	33.7	11	55.0	17	16.5	8	30	13.2	25	25	13.7	16	25	50.4
25	Sun	16	6	34.2	11	55.5	17	16.9	9	-	-	26	27	07.8	17	25	46.7
26	Mon	17	6	34.8	11	56.0	17	17.3	9	7	29.1	27	28	16.8	18	25	07.6
27	Tue	18	6	35.4	11	56.5	17	17.7	S 10	7	57.2	1	28	37.6	19	23	50.3
28	Wed	19	6	35.9	11	56.9	17	18.2	11	7	35.4	2	28	11.8	20	21	55.0
									(12	30	26.1)						
29	Thu	20	6	36.4	11	57.4	17	18.6	13	28	34.8	3	27	04.1	21	19	24.6
30	Fri	21	6	36.9	11	57.9	17	19.1	S 14	26	09.3	4	25	22.1	22	16	24.2

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

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1940

Dakshinayana

Dakshina Gola

Month of AGRAHAYANA (30 days)

Ayanamsa on 1st : $24^{0} 06^{/} 59^{//}$

(*Nirayana*) 8 Agrahayana, 5119 Kali Era to (*Nirayana*) 7 Pausha, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	Nov. 22	SAURA MARGASIRSHA	CHAANDRA KARTIKA	1- Enters Trop. Sagittarius ($14^h 31^m.5$)		1- Rasayatra,Bharani DipamVaikuntha Chaturdasi, Tripurotsava, Krittika Dipam.
2	23				2- Full Moon ($11^h 09^m.2$)	2- Rasayatra(Vaishnava),Pushkar Fair, Kartiki Purnima,Rathayatra (Jain), Guru Nanak's Birthday (Sikh) (according to tithi), Huthri - 3 days (Coorg).
3	24					3- Guru Tegh Bahadur's Martyrdom Day.
4	25					
5	26				5- Sayana Vaidhriti ($30^h 14^m.0$)	
6	27					
7	28					
8	29					8- Kalashtami.
9	30					9- Prathamashtami (Odisha), Vaikkatashtami (Kerala).
10	Dec. 1					
11	2			11- Enters Jyeshtha ($30^h 14^m.4$)		
12	3					12- Utpanna Ekadasi.
13	4					
14	5					
15	6					
16	7		CHAANDRA MARGASIRSHA		16- Jupiter rises in the east ($10^h 05^m$) 16- New Moon ($12^h 50^m.4$)	
17	8					
18	9				18- Sayana Vyatipata ($18^h 22^m.0$)	
19	10					
20	11					
21	12					
22	13					22- Guha Shashthi, Subrahmanya Shashthi (S. India), Champa Shashthi(Maharashtra), Mulakrupini Shashthi (Bengal).
23	14					23- Mitra Saptami.
24	15			24- Saura Paushadi ($12^h 41^m.6$)		
25	16	SAURA PAUSHA		25- Enters Mula ($9^h 09^m.6$)		
26	17					
27	18					27- Mokshada Ekadasi (Smarta).
28	19					28- Mauna Ekadasi (Jain), Mokshada Ekadasi (Vaishnava), Gita Jayanti, Akhanda Dvadasi, Trisprisha Mahadvadasi,Vaikuntha Ekadasi (S India).
29	20					
30	Dec. 21			30- Enters Tropical Capricornus ($21^h 57^m.9$)		

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

Moon enters :- Vrisha 1, $23^h 35^m.4$; Mithuna 3, $26^h 19^m.0$; Karkata 5, $28^h 16^m.0$; Simha 8, $6^h 38^m.2$; Kanya 10, $10^h 04^m.3$; Tula 12, $14^h 52^m.3$; Vrischika 14, $21^h 22^m.9$; Dhanus 16, $30^h 06^m.4$; Makara 19, $17^h 18^m.1$; Kumbha 21, $30^h 11^m.3$; Mina 24, $18^h 39^m.0$; Mesha 26, $28^h 16^m.8$; Vrisha 29, $9^h 58^m.5$; Sun enters :- Nirayana Dhanus 25, $9^h 09^m.6$.

SAKA ERA 1940

Makara : Tapas
Winter (Sisira), 1st Month

Month of PAUSHA (30 days)

(*Nirayana*) 8 Pausha, 5119 Kali Era to (*Nirayana*) 7 Magha, 5119 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
		2018 A.D.															
1	Sat	Dec. 22	6	37.4	11	58.4	17	19.6	S 15	23	18.5	5	23	14.7	23	13	00.1
2	Sun	23	6	37.9	11	58.9	17	20.1	K 1	20	11.9	6	20	51.4	24	9	19.3
															(25	29	29.1)
3	Mon	24	6	38.4	11	59.4	17	20.7	2	16	58.7	7	18	21.8	26	25	36.8
4	Tue	25	6	38.8	11	59.9	17	21.2	3	13	47.7	8	15	55.0	27	21	49.1
5	Wed	26	6	39.3	12	00.4	17	21.8	4	10	46.9	9	13	39.1	1	18	12.1
6	Thu	27	6	39.7	12	00.9	17	22.4	K 5	8	03.3	10	11	41.2	2	14	50.8
7	Fri	28	6	40.1	12	01.4	17	23.0	7	27	49.7	11	10	06.9	3	11	49.3
8	Sat	29	6	40.5	12	01.9	17	23.6	8	26	26.8	12	9	00.2	4	9	10.3
9	Sun	30	6	40.8	12	02.4	17	24.2	9	25	35.6	13	8	23.7	5	6	55.8
															(6	29	06.2)
10	Mon	31	6	41.2	12	02.8	17	24.8	K 10	25	16.5	14	8	18.3	7	27	41.5
		2019 A.D.															
11	Tue	Jan. 1	6	41.5	12	03.3	17	25.4	11	25	28.6	15	8	43.9	8	26	40.9
12	Wed	2	6	41.8	12	03.8	17	26.1	12	26	10.8	16	9	39.3	9	26	03.1
13	Thu	3	6	42.1	12	04.3	17	26.7	13	27	21.2	17	11	03.0	10	25	46.7
14	Fri	4	6	42.3	12	04.7	17	27.4	14	28	57.9	18	12	53.1	11	25	50.2
15	Sat	5	6	42.6	12	05.2	17	28.1	K 30	-	-	19	15	07.4	12	26	11.6
16	Sun	6	6	42.8	12	05.6	17	28.8	K 30	6	58.2	20	17	42.9	13	26	48.5
17	Mon	7	6	43.0	12	06.1	17	29.4	S 1	9	18.7	21	20	35.7	14	27	37.7
18	Tue	8	6	43.2	12	06.5	17	30.1	2	11	54.3	22	23	40.4	15	28	34.9
19	Wed	9	6	43.3	12	06.9	17	30.8	3	14	38.5	23	26	49.6	16	29	34.3
20	Thu	10	6	43.4	12	07.3	17	31.5	4	17	22.1	24	29	54.0	17	30	29.3
21	Fri	11	6	43.5	12	07.7	17	32.2	S 5	19	54.8	25	-	-	18	-	-
22	Sat	12	6	43.6	12	08.1	17	33.0	6	22	05.1	25	8	43.0	18	7	12.1
23	Sun	13	6	43.7	12	08.5	17	33.7	7	23	42.2	26	11	05.7	19	7	34.8
24	Mon	14	6	43.7	12	08.9	17	34.4	8	24	37.5	27	12	52.4	20	7	30.0
25	Tue	15	6	43.7	12	09.2	17	35.1	9	24	45.2	1	13	55.7	21	6	52.0
															(22	29	36.9)
26	Wed	16	6	43.7	12	09.6	17	35.8	S 10	24	03.7	2	14	11.8	23	27	43.5
27	Thu	17	6	43.7	12	09.9	17	36.5	11	22	34.5	3	13	40.4	24	25	13.1
28	Fri	18	6	43.6	12	10.3	17	37.2	12	20	22.4	4	12	24.8	25	22	08.9
29	Sat	19	6	43.5	12	10.6	17	38.0	13	17	34.4	5	10	31.0	26	18	36.4
30	Sun	20	6	43.4	12	10.9	17	38.7	S 14	14	19.2	6	8	07.0	27	14	41.9
												(7	29	22.3)			

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

SAKA ERA 1940

Uttarayana
Dakshina Gola

Month of PAUSHA (30 days)

Ayanamsa on 1st : 24° 07′ 04″

(*Nirayana*) 8 Pausha, 5119 Kali Era to (*Nirayana)* 7 Magha, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2018 A.D.					
1	Dec. 22	SAURA PAUSHA	CHAANDRA MARGASHIRSHA		1- Sayana Vaidhriti ($20^h 45^m.9$)	1- Uttarayana day, Sri Datta Jayanti (Maharashtra), Margi Purnima, Dattatreya Jayanti.
2	23				1- Full Moon ($23^h 18^m.5$)	2- Arudra Darshanam (S. India) (Purvarunodaya).
3	24					
4	25					4- Birthday of Sadhu T. L. Vaswani (Sindhi).
5	26					5- Jor Mela- 3 days (Punjab).
6	27					
7	28					
8	29			8- Enters Purvashadha ($11^h 27^m.3$)		8- Ashtaka (Pupashtaka).
9	30					
10	31					10- Birthday of Parsvanatha (Jain).
	2019 A.D.					
11	Jan. 1					11- Saphala Ekadasi.
12	2					
13	3				13- Sayana Vyatipata ($23^h 00^m.2$)	
14	4					
15	5				15-16 Solar Eclipse (not visible in India)	15- Vakula Amavasya (Odisha).
16	6		CHAANDRA PAUSHA		16- New Moon ($6^h 58^m.2$)	
17	7					
18	8					
19	9					
20	10					
21	11			21- Enters Uttarashadha ($13^h 20^m.6$)		
22	12					
23	13			23- Saura Maghadi ($23^h 23^m.2$)		23- Guru Govind Singh's Birthday Lohri (Punjab, J&K).
24	14					24- Bhogi (S. India), Birthday of Sant Paramanand (Sindhi), Magha Bihu (Assam), Makara Samkranti (Bengal).
25	15	SAURA MAGHA				25- Pongal (S. India), Makaradi Snana, Tila Samkranti, Tai Pongal (Kerala), Tamil New Year's Day, Makara Snana.
26	16					26- Mattu Pongal or Kanuvu (S. India), Samba Dasami (Odisha).
27	17				27- Sayana Vaidhriti ($11^h 56^m.9$)	27- Putrada ekadasi.
28	18					
29	19					
30	Jan. 20			30- Enters Tropical Aquarius ($14^h 29^m.5$)		

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

Moon enters :- Mithuna 1, $12^h 21^m.0$; Karkata 3, $12^h 59^m.3$; Simha 5, $13^h 39^m.1$; Kanya 7, $15^h 47^m.5$; Tula 9, $20^h 17^m.1$; Vrischika 11, $27^h 22^m.7$; Dhanus 14, $12^h 53^m.1$; Makara 16, $24^h 24^m.6$; Kumbha 19, $13^h 15^m.0$; Mina 21, $26^h 02^m.8$; Mesha 24, $12^h 52^m.4$; Vrisha 26, $20^h 08^m.3$; Mithuna 28, $23^h 32^m.2$; Karkata 30, $24^h 04^m.9$; Sun enters :- Nirayana Makara 24, $19^h 51^m.5$.

SAKA ERA 1940

Kumbha : Tapasya

Winter (Sisira), 2nd Month

Month of MAGHA (30 days)

(*Nirayana*) 8 Magha, 5119 Kali Era to (*Nirayana*) 7 Phalguna, 5119 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
		2019 A.D.																	
1	Mon	Jan.	21	6	43.3	12	11.2	17	39.4	S	15	10	46.1	8	26	27.0	1	10	33.0
																	(2	30	17.4)
2	Tue		22	6	43.1	12	11.4	17	40.1	K	1	7	05.0	9	23	31.7	3	26	03.4
											(2	27	26.2)						
3	Wed		23	6	42.9	12	11.7	17	40.8		3	23	59.4	10	20	46.6	4	21	58.8
4	Thu		24	6	42.7	12	12.0	17	41.5		4	20	54.1	11	18	21.4	5	18	11.1
5	Fri		25	6	42.5	12	12.2	17	42.2	K	5	18	18.4	12	16	24.9	6	14	46.7
6	Sat		26	6	42.3	12	12.4	17	42.9		6	16	19.5	13	15	04.3	7	11	51.1
7	Sun		27	6	42.0	12	12.6	17	43.6		7	15	02.4	14	14	24.4	8	9	28.3
8	Mon		28	6	41.7	12	12.8	17	44.3		8	14	29.6	15	14	27.9	9	7	40.1
																	(10	30	26.6)
9	Tue		29	6	41.4	12	13.0	17	45.0		9	14	40.9	16	15	14.2	11	29	45.7
10	Wed		30	6	41.0	12	13.2	17	45.6	K	10	15	33.5	17	16	40.0	12	29	34.0
11	Thu		31	6	40.7	12	13.4	17	46.3		11	17	02.1	18	18	40.0	13	29	46.6
12	Fri	Feb.	1	6	40.3	12	13.5	17	47.0		12	18	59.7	19	21	07.3	14	30	18.2
13	Sat		2	6	39.9	12	13.6	17	47.7		13	21	19.0	20	23	54.5	15	-	-
14	Sun		3	6	39.5	12	13.8	17	48.3		14	23	52.6	21	26	54.7	15	7	03.6
15	Mon		4	6	39.0	12	13.9	17	49.0	K	30	26	33.6	22	30	01.1	16	7	57.6
16	Tue		5	6	38.6	12	13.9	17	49.6	S	1	29	15.6	23	-	-	17	8	55.7
17	Wed		6	6	38.1	12	14.0	17	50.2		2	-	-	23	9	07.8	18	9	53.6
18	Thu		7	6	37.6	12	14.1	17	50.9		2	7	52.5	24	12	08.9	19	10	47.0
19	Fri		8	6	37.1	12	14.1	17	51.5		3	10	18.2	25	14	58.5	20	11	31.7
20	Sat		9	6	36.5	12	14.2	17	52.1		4	12	26.1	26	17	30.1	21	12	03.0
21	Sun		10	6	36.0	12	14.2	17	52.7	S	5	14	09.2	27	19	37.0	22	12	16.0
22	Mon		11	6	35.4	12	14.2	17	53.3		6	15	20.8	1	21	12.4	23	12	05.7
23	Tue		12	6	34.8	12	14.2	17	53.9		7	15	54.8	2	22	10.6	24	11	27.5
24	Wed		13	6	34.2	12	14.2	17	54.5		8	15	46.7	3	22	27.4	25	10	17.5
25	Thu		14	6	33.5	12	14.2	17	55.1		9	14	54.5	4	22	01.0	26	8	33.5
																	(27	30	14.7)
26	Fri		15	6	32.9	12	14.1	17	55.7	S	10	13	18.6	5	20	52.4	1	27	22.5
27	Sat		16	6	32.2	12	14.1	17	56.2		11	11	02.0	6	19	05.2	2	24	00.1
28	Sun		17	6	31.5	12	14.0	17	56.8		12	8	10.2	7	16	45.6	3	20	12.4
											(13	28	50.5)						
29	Mon		18	6	30.8	12	13.9	17	57.3		14	25	11.6	8	14	01.6	4	16	06.0
30	Tue		19	6	30.1	12	13.9	17	57.9	S	15	21	23.6	9	11	02.8	5	11	48.3

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 — SAKA ERA 1940

Dakshina Gola — Month of MAGHA (30 days) — Ayanamsa on 1st : 24° 07′ 10″

(*Nirayana*) 8 Magha, 5119 Kali Era to (*Nirayana)* 7 Phalguna, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2019 A.D.					
1	Jan. 21	SAURA MAGHA	CHHANDRA PAUSHA		1- Full Moon ($10^h 46^m.1$) 1- LunarEclipse not visible in India	1- Martyrdom Day of Hemu Kalani (Sindhi), Floating Festival (Tai Poosam), Pushyabhisheka Yatra, Paushi Purnima.
2	22					
3	23					3- Netaji's Birthday.
4	24			4- Enters Sravana nak. ($15^h 41^m.6$)		4- Ganesha Sankashta Chaturthi.
5	25					
6	26					6- Republic Day.
7	27					7- Birthday of Swami Vivekananda (according to tithi).
8	28				8- Sayana Vyatipata ($27^h 45^m.2$)	8- Ashtaka (Mamashtaka), Birthday of Lala Lajpat Rai.
9	29					
10	30					10- Martyr's Day (Mahatma Gandhi Commemoration Day).
11	31					11- Sattila Ekadasi.
12	Feb. 1					
13	2					13- Meru Trayodasi (Jain), Ratanti Kalika Puja.
14	3					
15	4				15- New Moon ($26^h 33^m.6$)	15- Mauni Amavasya (Monday), Mahodaya Yoga (after $7^h 58^m$), Tai Amavasya, Makara Vavu (Kerala), Ardra Kumbha Parva at Allahabad.
16	5		CHHANDRA MAGHA			16- Magha Sukladi.
17	6			17- Enters Dhanishtha ($18^h 47^m.4$)		
18	7					
19	8					19- Tila Chaturthi, Kunda Chaturthi.
20	9					20- Varada Chaturthi, Ganesa Puja (Bengal).
21	10					21- Sri Panchami, Sarasvati Puja, Vasanta Panchami.
22	11				22- Sayana Vaidhriti ($21^h 00^m.6$)	
23	12			23- Saura Phalgunadi ($12^h 09^m.7$)		23- Ratha Saptami (Purvarunodaya), Vidhana Saptami, Arogya Saptami.
24	13	SAURA PHALGUNA				24- Bhismashtami.
25	14					
26	15					
27	16					27- Jaya Ekadasi, Bhaimi Ekadasi (Bengal), Bhishma Dvadasi.
28	17					28- Desert Festival- 3 days(Jaisalmer).
29	18			29- Enters Trop. Pisces ($28^h 33^m.9$)		
30	Feb. 19			30- Enters Satabhisaj ($23^h 18^m.1$)	30- Full Moon ($21^h 23^m.6$)	30- Maghi Purnima, Guru Ravi Das's Birthday (according to tithi), Masi Magham, Sivaji 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 :- Simha 2, $23^h 31^m.7$; Kanya 4, $23^h 49^m.3$; Tula 6, $26^h 39^m.0$; Vrischika 9, $8^h 58^m.7$; Dhanus 11, $18^h 40^m.0$; Makara 13, $30^h 38^m.6$; Kumbha 16, $19^h 34^m.8$; Mina 19, $8^h 17^m.5$; Mesha 21, $19^h 37^m.0$; Vrisha 23, $28^h 18^m.8$; Mithuna 26, $9^h 31^m.9$; Karkata 28, $11^h 23^m.1$; Simha 30, $11^h 02^m.8$; Sun enters :- Nirayana Kumbha 24, $8^h 48^m.7$.

INDIAN CALENDAR

SAKA ERA 1940

Mina : Madhu

Month of PHALGUNA (30 days)

Spring (Vasanta), 1st Month

(*Nirayana*) 8 Phalguna, 5119 Kali Era to (*Nirayana*) 7 Chaitra, 5119 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
		2019 A.D.																
1	Wed	Feb.	20	6	29.4	12	13.8	17	58.4	K 1	17	36.8	10	7	59.8	6	7	27.5
													(11	29	03.8)	(7	27	12.2)
2	Thu		21	6	28.6	12	13.7	17	58.9	2	14	02.1	12	26	26.1	8	23	11.2
3	Fri		22	6	27.9	12	13.5	17	59.4	3	10	50.2	13	24	17.4	9	19	32.8
4	Sat		23	6	27.1	12	13.4	17	59.9	4	8	11.1	14	22	47.1	10	16	24.2
										(K 5	30	13.7)						
5	Sun		24	6	26.3	12	13.3	18	00.4	6	29	04.5	15	22	02.5	11	13	51.4
6	Mon		25	6	25.5	12	13.1	18	00.9	7	28	47.1	16	22	07.8	12	11	58.2
7	Tue		26	6	24.7	12	13.0	18	01.4	8	29	20.8	17	23	03.4	13	10	45.7
8	Wed		27	6	23.9	12	12.8	18	01.9	9	-	-	18	24	45.3	14	10	12.3
9	Thu		28	6	23.1	12	12.6	18	02.4	9	6	41.1	19	27	05.9	15	10	13.3
10	Fri	Mar.	1	6	22.2	12	12.4	18	02.8	K 10	8	39.4	20	29	54.5	16	10	42.0
11	Sat		2	6	21.4	12	12.2	18	03.3	11	11	04.6	21	-	-	17	11	30.2
12	Sun		3	6	20.5	12	12.0	18	03.8	12	13	44.8	21	8	59.5	18	12	29.5
13	Mon		4	6	19.6	12	11.8	18	04.2	13	16	28.7	22	12	09.9	19	13	32.0
14	Tue		5	6	18.7	12	11.6	18	04.7	14	19	07.3	23	15	16.5	20	14	31.3
15	Wed		6	6	17.9	12	11.4	18	05.1	K 30	21	34.0	24	18	12.7	21	15	22.5
16	Thu		7	6	17.0	12	11.1	18	05.5	S 1	23	44.0	25	20	53.7	22	16	02.2
17	Fri		8	6	16.0	12	10.9	18	06.0	2	25	34.5	26	23	16.4	23	16	27.9
18	Sat		9	6	15.1	12	10.7	18	06.4	3	27	02.9	27	25	18.3	24	16	37.7
19	Sun		10	6	14.2	12	10.4	18	06.8	4	28	06.8	1	26	57.0	25	16	29.9
20	Mon		11	6	13.3	12	10.2	18	07.2	S 5	28	43.5	2	28	09.7	26	16	02.5
21	Tue		12	6	12.3	12	09.9	18	07.6	6	28	50.0	3	28	53.2	27	15	13.2
22	Wed		13	6	11.4	12	09.6	18	08.0	7	28	23.4	4	29	04.7	1	13	59.5
23	Thu		14	6	10.4	12	09.3	18	08.4	8	27	21.8	5	28	41.9	2	12	19.3
24	Fri		15	6	09.5	12	09.1	18	08.8	9	25	44.6	6	27	44.1	3	10	11.1
25	Sat		16	6	08.5	12	08.8	18	09.2	S 10	23	33.0	7	26	12.7	4	7	34.7
																(5	28	31.3)
26	Sun		17	6	07.6	12	08.5	18	09.6	11	20	50.8	8	24	11.3	6	25	03.8
27	Mon		18	6	06.6	12	08.2	18	10.0	12	17	43.5	9	21	46.0	7	21	16.9
28	Tue		19	6	05.6	12	07.9	18	10.4	13	14	18.6	10	19	04.7	8	17	16.7
29	Wed		20	6	04.7	12	07.6	18	11.2	14	10	45.0	11	16	17.1	9	13	10.6
30	Thu		21	6	03.7	12	07.3	18	11.2	S 15	7	12.9	12	13	33.8	10	9	06.8
										(K 1	27	52.8)				(11	29	13.9)

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 1940

Uttarayana

Dakshina Gola

Month of PHALGUNA (30 days)

Ayanamsa on 1st : $24^{0} 07^{/} 14^{//}$

(*Nirayana*) 8 Phalguna, 5119 Kali Era to (*Nirayana*) 7 Chaitra, 5119 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2019 A.D.					
1	Feb. 20	SAURA PHALGUNA	CHAANDRA MAGHA			
2	21					
3	22					
4	23				4- Sayana Vyatipata ($13^h 59^m.5$)	
5	24					
6	25					
7	26					7- Ashtaka (Sakashtaka), Janaki Janma, Vaikkatashtami (Kerala).
8	27					
9	28					
10	Mar. 1					10- Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj)(according to tithi).
11	2					11- Vijaya Ekadasi.
12	3					12- Maha Sivaratri (Kashmir).
13	4			13- Enters Purva Bhadrapada ($29^h 36^m.6$)		13- Maha Sivaratri, Sivaratri (S. India).
14	5					
15	6				15- New Moon ($21^h 34^m.0$)	
16	7		CHAANDRA PHALGUNA			
17	8				17- Sayana Vaidhriti ($25^h 42^m.5$)	17- Birthday of Sri Ramakrishna (according to tithi).
18	9					
19	10					
20	11					
21	12					
22	13					22- Holashtaka.
23	14			23- Saura Chaitradi ($8^h 42^m.1$)		
24	15	SAURA CHAITRA				
25	16					
26	17					26- Amlaki Ekadasi.
27	18			27- Enters Uttara Bhadrapada ($14^h 00^m.5$)		
28	19					
29	20			29- Enters Trop. Aries ($27^h 28^m.4$)		29- Holikadahana.
30	Mar. 21				30- Full Moon ($7^h 12^m.9$) 30- Sayana Vyatipata ($6^h 45^m.5$)	30- Birthday of Sri Chaitanya, Holi, Dolyatra, Hola, Vasantotsava, Panguni Uttiram, Maha Vishuva Day, Indian Year Ending day.
	1941 S.E.					
Chtr. 1	Mar. 22					1- Indian New Year's 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 :- Kanya 2, $10^h 22^m.3$; Tula 4, $11^h 26^m.9$; Vrischika 6, $16^h 01^m.6$; Dhanus 8, $24^h 45^m.3$; Makara 11, $12^h 39^m.6$; Kumbha 13, $25^h 44^m.2$; Mina 16, $14^h 15^m.1$; Mesha 18, $25^h 18^m.3$; Vrisha 21, $10^h 23^m.4$; Mithuna 23, $16^h 57^m.6$; Karkata 25, $20^h 38^m.5$; Simha 27, $21^h 46^m.0$; Kanya 29, $21^h 35^m.4$; Sun enters: Nirayana Mina 23, $29^h 40^m.0$.

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS

Festivals	Criterion	Date
		National / Nirayana / Gregorian 1939 S.E / Kali 5118 / 2018 A.D
75. Bhogi (S.India)	Day before Pongal	Pausha 23 / Pausha 30 / Jan.13
76. Makara Samkranti (Bengal)	Saura Maghadi (Midnight Rule)	Pausha 24 / Magha 1 / Jan 14
Magha Bihu (Assam)	-do-	Pausha 24 / Magha 1 / Jan. 14
Makaradi Snana, Tila Samkranti	Ditto (Sunset rule)	Pausha 24 / Magha 1 / Jan. 14
Pongal (S.India)	Ditto (Sunset rule)	Pausha 24 / Magha 1 / Jan. 14
Tai Pongal (Kerala)	Ditto (18 Ghatika Rule)	Pausha 24 / Magha 1 / Jan. 14
77. Mattu Pongal or kanuvu (S I)	Day after Pongal	Pausha 25 / Magha 2 / Jan. 15
78. Sri Panchami, Vasant Panchami	Magha S 5	Magha 2 / Magha 9 / Jan 22
79. Netajiôs Birthday	Fixed	Magha 3 / Magha 10 / Jan. 23
80. Republic Day	Fixed	Magha 6 / Magha 13 / Jan. 26
81. Guru Ravidasôs Birthday	Magha S 15	Magha 11 / Magha 18 / Jan 31
82. Birth Day of Swami Dayananda Saraswati (Founder of ñArya Samajò)	Phalguna K 10 (Purnimanta)	Magha 21 / Magha 28 / Feb 10
83. Maha Sivaratri (Kashmir)	Magha K 13	Magha 24 / Phalguna 1 / Feb 13
84. Maha Sivaratri	Magha K 14	Magha 25 / Phalguna 2 / Feb 14
85. Sivaji Jayanti	Fixed	Magha 30 / Phalguna 7 / Feb 19
86. Holikadahana	Phalguna S 15 (night)	Phalguna 10/Phalguna 17/March 1
87. Dolyatra	Phalguna S 15	Phalguna 10/Phalguna 17/March 1
88. Holi	Day after Holikadahana	Phalguna 11/Phalguna 18/March 2
89. Hola,Vasantatsava,	Phalguna K 1	Phalguna 11/Phalguna 18/March 2
90. Maha Vishuva day	Day of Sunôs entry into Trop. Aries (Midnight rule)	Phalguna 29/ Chaitra 6 /March 20
		Saka 1940/Kali 5118 /2018 A.D.
1. Indian New Yearôs Day	Fixed	Chaitra 1 / Chaitra 8/ Mar. 22
2. Oli begins (Jain)	8 days before Oli ends	Chaitra 2 / Chaitra 9/ Mar. 23
3. Rama Navami	Chaitra S 9	Chaitra 4 / Chaitra 11/ Mar. 25
4. Mahavira Jayanti	Chaitra S 13	Chaitra 8 / Chaitra 15/ Mar. 29
5. Oli ends (Jain)	Chaitra S 15(Udayvyapini)	Chaitra 10/ Chaitra 17 / Mar. 31
		Saka 1940/Kali 5119 /2018 A.D.
6. Vaisakhi (Punjab,Haryana, H.P,Delhi & Orissa),Visu (Kerala)	Saura Vaisakhadi (Sunrise Rule)	Chaitra 24/ Vaisakha 1/Apr. 14
7. Chadaka Puja (Bengal), Ceiraoba (Manipur),	Saura Vaisakhadi (Midnight Rule)	Chaitra 24 / Vaisakha 1/ Apr. 14
Mesadi (Tamil Nadu)	Saura Vaisakhadi (Sunset Rule)	Chaitra 24 / Vaisakha 1/ Apr. 14
8. Vaisakhadi (Bengal) , Bahag Bihu (Assam), Shilhenba (Manipur)	Day Following Saura Vaisakhadi (Midnight Rule)	Chaitra 25/ Vaisakha 2 / Apr. 15
9. Tithi of Deva Damodara(Assam)	S1 of Saura Vaisakha	Chaitra 26/ Vaisakha 3 / Apr. 16
10. Aksaya Tritiya	Vaisakha S 3	Chaitra 28/ Vaisakha 5 / Apr. 18
11. Babu Kuer Singh Day (Bihar)	Fixed	Vaisakha 3 / Vaisakha 10 /Apr. 23
12. Buddha Purnima	Vaisakha S 15	Vaisakha 10 / Vaisakha 17/ Apr. 30
13. May day	Fixed	Vaisakha 11 / Vaisakha 18 / May 1
14. Birthday of Rabindranath	25 Vaisakha of Beng. Calendar	Vaisakha 19/ Vaisakha 26 / May 9
15. Rajas Samkranti (Odisha)	Saura Ashadhadi (Sunrise Rule)	Jyaishtha 25 / Ashadha 1 / June 15
16. Pratap Jayanti	Jyaishtha S 3	Jyaishtha 26 / Ashadha 2 / June 16
17. Guru Arjan Devôs Martyrdom Day (Sikh)	Jyaishtha S 4	Jyaishtha 27/ Ashadha 3 / June 17
18. Rathayatra	Ashadha S 2	Ashadha 23 / Ashadha 30 / July 14
19. Kharchi Puja (Tripura)	Ashadha S 8	Ashadha 29/ Sravana 5/ July 20
20. Punaryatra	Ashadha S 10	Ashadha 31/Sravana 7/ July 22
21. Ultarath, Bahudha Yatra	9th day from Rathayatra	Ashadha 31/Sravana 7/ July 22
22.Tilak Commemoration Day	Fixed	Sravana 10 / Sravana 17 / Aug. 1
23. Ker Puja (Tripura)	First Tues. or Sat.day after 14 days from Kharci Puja not falling on K10	Sravana 13 / Sravana 20 / Aug. 4
24. Karkataka Vavu (Kerala)	K 30 of Saura Sravana	Sravana 20 / Sravana 27 / Aug. 11
25. Independence Day	Fixed	Sravana 24 /Sravana 31/Aug.15

Festivals numbered 75 to 90 are repetition of the same for Pausha to Phalguna, 1939 S.E., published in the previous year.

Festivals	Criterion	Date
		National / Nirayana / Gregorian Saka 1940/Kali 5119/2018 A.D.
26. Jhulana Yatrarambha	Sravana S 11 (Ratri)	Sravana 30 / Bhadra 6 / Aug. 21
27. First Onam Day	Day before Thiru Onam Day	Bhadra 2 / Bhadra 9 / Aug. 24
28. Onam or Thiru Onam Day	Sravana nak.of Saura Bhadra	Bhadra 3 / Bhadra 10 / Aug. 25
29. Rik Upakarma	Sravana nak.of ChandraSravana	Bhadra 3 / Bhadra 10 / Aug. 25
30. Jhulana Yatrasamapana	Sravana S 15	Bhadra 4 / Bhadra 11 / Aug. 26
31. Avani Avittam (S.India)	Sravana S 15	Bhadra 4 / Bhadra 11 / Aug. 26
Raksha Bandhana, Amar nath yatra, Solono (Rakhi Bandhan)	Sravana S 15(Udayvyapini)	Bhadra 4 / Bhadra 11 / Aug. 26
Jhulana Purnima, Naroli urnima	Sravana S 15	Bhadra 4 / Bhadra 11 / Aug. 26
32. Third Onam day	Day after Thiru Onam day	Bhadra 4 / Bhadra 11/ Aug. 26
33. Fourth Onam day	2 days after Thiru Onam day	Bhadra 5 / Bhadra 12 / Aug. 27
34. Tithi of Sri Madhava Deva Assam),	K 5 of Saura Bhadra	Bhadra 9 / Bhadra 16/ Aug. 31
Raksha Panchami(Odisha)	Sravana K 5	Bhadra 9 / Bhadra 16/ Aug. 31
35. Janmashtami (Smarta)	Sravana K 8(Nishitha)	Bhadra 11/ Bhadra 18/ Sept 2
Sri Krishna Jayanti (T.N.Kerala,	K8 of Saura Bhadra	Bhadra 11/ Bhadra 18/ Sept 2
Assam), Jayanti Joga		Bhadra 11/ Bhadra 18/ Sept 2
36. Sri Jayanti (Ramanuja)	Rohini nakshatra of Saura Bhadra	Bhadra 12/ Bhadra 19/ Sept 3
Janmashtami (Vaishnava)	Sravana K 8	Bhadra 12/ Bhadra 19/ Sept 3
Gokulashtami (Nandotsava)	Day after Janmashtami	Bhadra 12/ Bhadra 19/ Sept 3
37. Paryusana Parvarambha (Chaturthi Pakshaï Jain)	7 days before Samvatsari (Chaturthi paksha)	Bhadra 15/ Bhadra 22/ Sept 6
38. Paryusana Parvarambha (Panchami Paksha ï Jain)	7 days before Samvatsari (Panchami paksha)	Bhadra 15 /Bhadra 22 /Sept 6
39. Samvatsari(Chaturthi Paksha-Jain)	Bhadra S 4 (Udayavyapini)	Bhadra 22 / Bhadra 29 /Sept 13
Vinayak Chaturthi (T.N), Ganesh Chaturthi	S4 of Saura Bhadra	Bhadra 22 / Bhadra 29 /Sept 13
40. Samvatsari(Panchami Paksha-Jain)	Bhadra S 5 current at sunrise	Bhadra 22 / Bhadra 29 /Sept 13
41. Radhashtami	Bhadra S 8	Bhadra 26 / Asvina 2 / Sept 17
42. Ananta Chaturdasi	Bhadra S 14	Asvina 1/ Asvina 8 / Sept 23
43. Mahatma Gandhi's Birthday	Fixed	Asvina 10/ Asvina 17 / Oct 2
44. Mahalaya Amavasya ,Sarvapitri Amavasya (Odisha)	Bhadra K 30	Asvina 16 / Asvina 23 / Oct 8
45. Sthapana Navaratrarambha (Saradia)	Asvina S1	Asvina 18 / Asvina 25 / Oct 10
46. Oli begins (Jain)	8 days before Oli ends (i.e. 9th day)	Asvina 23/ Asvina 30 / Oct 15
47. Durga Puja (Maha Saptami),	Asvina S 7	Asvina 24 / Kartika 1 / Oct 16
Oli begins	8 days before Oli ends	Asvina 24 / Kartika 1 / Oct 16
48. Durga Puja (Maha Astami)	Asvina S 8	Asvina 25 / Kartika 2 / Oct 17
Ayudha Puja	Day before Dassahara	Asvina 25 / Kartika 2 / Oct 17
49. Durga Puja (Maha Navami)	Asvina S 9	Asvina 26 / Kartika 3 / Oct 18
50. Vijaya Dasami (Dussehra or Dasahara) (in some opinion).	Asvina S 10 (Aparahna) with Sravana nak.	Asvina 26 / Kartika 3 / Oct 18
51. Vijaya Dasami (Dussehra or Dasahara)	Asvina S 10 (Aparahna)	Asvina 27 / Kartika 4 / Oct 19
52. Vijaya Dasami (Bengal & Kerala)	Asvina S 10 (Purvahna)	Asvina 27 / Kartika 4 / Oct 19
53. Kojagori Lakhmi Puja (Bengal)	Asvina S 15 (Pradosa)	Kartika 2/ Kartika 9 /Oct 24
54. Kumara Purnima (Odisha)	Asvina S 15	Kartika 2/ Kartika 9 /Oct 24
55. Maharsi Valmiki's Birthday (according to tithi)	Asvina S 15	Kartika 2/ Kartika 9 /Oct 24
56. Oli ends (Jain)	Asvina S 15 (Udayvyapini)	Kartika 2/ Kartika 9 /Oct 24
57. Naraka Chaturdasi (S.India)	Asvina K 14 (Purvarunodaya)	Kartika 15/ Kartika 22 /Nov. 6
58. Dipavali (S.India)	Asvina K 14	Kartika 15/ Kartika 22 /Nov. 6
59. Kali Puja	Asvina K 30 (Nishithvyapini)	Kartika 15/ Kartika 22 /Nov. 6
60. Dipavali	Asvina K 30	Kartika 16/ Kartika 23 /Nov. 7
61. Govardhan Puja	Kartika S 1	Kartika 17/ Kartika 24 /Nov.8
Kartika Sukladi	Kartika S 1	Kartika 17/ Kartika 24 /Nov.8
Bali Puja	Kartika S 1	Kartika 17/ Kartika 24 /Nov.8
Annakuta	Kartika S 1	Kartika 17/ Kartika 24 /Nov.8
62. Bhratri Dvitiya, Dwat Puja, Tikka Ceremony, Bhai Duj	Kartika S 2 (Aparahna)	Kartika 18/ Kartika 25 /Nov 9

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS

Festivals	Criterion	Date
		National / Nirayana / Gregorian Saka 1940/Kali 5119/2018 A.D.
Bhratri Dvitiya (Bengal)	Kartika S 2 (Madhyahna)	Kartika 18/ Kartika 25 /Nov 9
63. Pratihar Shashthi or Surya Shashthi, Chhat- Bihar	Kartika S 6	Kartika 22/ Kartika 29 /Nov 13
64. Goshtashtami or Gopashtami	Kartika S 8	Kartika 25/ Agrahayana 2 /Nov 16
65. Rasayatra (Smarta)	Kartika S 15 (Nisithavyapini)	Agrahayana 1 / Agrahn.8/ Nov. 22
66. Rasayatra (Vaishnava)	Kartika S 15 (Udayavyapini)	Agrahayana 2 / Agrahn. 9 / Nov 23
Guru Nanakôs Birthday	Kartika S 15 (Udayavyapini)	Agrahayana 2 / Agrahn. 9 / Nov23
Ratha Yatra (Jain)	Kartika S 15 (Udayavyapini)	Agrahayana 2 / Agrahn. 9 / Nov23
Kartiki Purnima,	Kartika S15	Agrahayana 2 / Agrahn. 9 / Nov23
Pushkar Fair	Kartika S 15	Agrahayana 2 / Agrahn. 9 / Nov23
67. Huthri ï 3 days(Coorg.)	S15 to K 2 of Saura Margasirsha	Agrahayana 2 / Agrahn. 9 / Nov23
68. Guru Teg Bahadurôs Martyrdom Day	Fixed	Agrahayana 3 / Agrahn.10 / Nov 24
69. Prathamastami (Odisha)	Kartika K 8	Agrahayana 9 / Agrahn.16 / Nov 30
70. Vaikuntha Ekadasi (S.India)	S 11 of Saura Pausha	Agrahayana 28 / Pausha 5 / Dec 19
71. Jor Mela (Punjab)	Fixed	Pausha 5 / Pausha 12 /Dec 26
		1940 S.E/ 5119 K.E./2019 A.D.
72. Guru Gobind Singhôs Birthday	Pausha S 7	Pausha 23 / Pausha 30 / Jan 13
73. Bhogi (S.India)	Day before Pongal	Pausha 24 / Magha 1 / Jan.14
74. Makara Samkranti (Bengal)	Saura Maghadi (MidnightRule)	Pausha 24 / Magha 1 / Jan 14
Magha Bihu (Assam)	-do-	Pausha 24 / Magha 1 / Jan. 14
75. Pongal (S.India),Tai Pongal(Kerala)	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Tamil New Yearôs day ,Tila Samkranti, Makara Sankranti (N.India), Makaradi Snana		Pausha 25 / Magha 2 / Jan. 15
76. Mattu Pongal or Kanuvu	Day after Pongal	Pausha 26 / Magha 3 / Jan. 16
77. Netajiôs Birthday	Fixed	Magha 3 / Magha 10 / Jan. 23
78. Republic Day	Fixed	Magha 6 / Magha 13 / Jan. 26
79. Sri Panchami, Vasanta Panchami	Magha S 5	Magha 21 / Magha 28 / Feb 10
80. Sivaji Jayanti	Fixed	Magha 30 / Phalguna 7 / Feb 19
81. Guru Ravidasôs Birthday	Magha S 15	Magha 30 / Phalguna 7 / Feb 19
82. Birth Day of Swami Dayananda Saraswati (Founder of Arya Samaj)	Phalguna K 10 (Purnimanta)	Phalguna 10/ Phalguna 17/ March 1
83. Maha Sivaratri (Kashmir)	Magha K 13	Phalguna 12/ Phalguna 19/ March 3
84. Maha Sivaratri	Magha K 14(Prodosa & Nishithavyapini)	Phalguna 13/ Phalguna 20/ March 4
85. Holikadahana	Phalguna S 15 (night)	Phalguna 29 / Chaitra 6 / March 20
86. Dolyatra	Phalguna S 15	Phalguna 30 / Chaitra 7 / March 21
87. Holi	Day after Holikadahana	Phalguna 30 / Chaitra 7 / March 21
88. Hola,Vasantatsava	Phalguna K 1	Phalguna 30 / Chaitra 7 / March 21
89. MahaVishuva day	Day of Sunôs entry into Trop . Aries (Midnight rule)	Phalguna 30 / Chaitra 7 / March 21
Special Festivals for Jammu and Kashmir		
		National / Nirayana / Gregorian Saka 1939/ Kali 5118/ 2018 A.D.
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausha 23/ Pausha 30/ Jan. 13
		Saka 1940/ Kali 5118/ 2018 A.D.
1. Mela Bahu Fort	Chaitra S 8	Chaitra 4 / Chaitra 11 / March 25
		Saka 1940 / Kali 5119 / 2018 A.D
2. Mela Kshir Bhawani (2 days)	Jyaishtha S 8	Jyaishtha 30 / Ashadha 6 / June 20
3. Guru Hargobind's Birthday	Jyaishtha K 1	Ashadha 8 / Ashadha 15 / June 29
4. Martyr's Day	Fixed	Asadha 22 / Asadha 29 / July 13
5. Kailas Yatra	Sravana K 13, K 14	Bhadra 17 / Bhadra 24 / Sept 8
6. Mela Pat	Bhadra S 5 to S 7	Bhadra 23 / Bhadra 30 / Sept 14
		Saka 1940/ Kali 5119/ 2019 A D.
7. Lohri	Day before Saura Maghadi	Pausha 23 / Pausha 30 / Jan. 13

Festivals	Criterion	Date
		National / Nirayana / Gregorian
		Saka 1940 / Kali 5118 / 2018 A.D
1. Hazrat aliôs Birthday	13 Rajab	Chaitra 11 / Chaitra 18 / April 1
		Saka 1940 / Kali 5119 / 2018 A.D
2. Sab-e-Miraj *	27 Rajab	Chaitra 25 / Vaisakha 2 / /April 15
3. Sab-e-Barat*	15 Shaban	Vaisakha 12 / Vaisakha 19 / May 2
4. First day of Ramadan	1 Ramadan	Vaisakha 27 / Jyaishtha 3 / May 17
5. Shahadat-e-Hazrat Ali	21 Ramadan	Jyaishtha 16 / Jyaishtha 23/ June 6
6. Sab ï e- Qadr *	27 Ramadan	Jyaishtha 22/ Jyaishtha 29/ June 12
7. Jumat ul Vida	Last Friday of Ramadan	Jyaishtha 25/ Ashadha 1/ June 15
8. Id-ul -Fitr	1 Shawwal	Jyaishtha 26 /Ashadha 2/June 16
9. Id-uz -Zuha (Bakrid)	10 Zulhijja	Sravana 31 / Bhadra 7/ Aug 22
10. Muharram	10 Muharram	Bhadra 30 /Asvina 6 / Sept. 21
11. Chelhum	Fortieth day from (39 days after) 10 Muharram	Kartika 8 / Kartika 15 / Oct 30
12. Akheri Chahar Shumba	Last Wednesday of Safar	Kartika 16 / Kartika 23 / Nov.7
13. Shahadat ï e- Iman Hasan	28 Safar	Kartika 16 / Kartika 23 / Nov.7
14. Milad-un Nabi or Id-e-Milad(Birth Day of the Prophet), Fateha Dwaz Daham or Bara Wafat	12 Rabiuô awwal	Kartika 30 / Agrahn. 7 / Nov.21
15. Id-e-Maulad	17 Rabiuô awwal	Agrahn. 5/ Agrahn. 12/Nov 26
16. Fateha Yazdadham (Giarhween Sharif)	11 Rabius Sani	Agrahn. 28/ Pausha 5 /Dec. 19
		Saka 1940 / Kali 5119 / 2019 A.D
1. Hazrat aliôs Birthday	13 Rajab	Phalguna 30 / Chaitra 7 / March 21
		Saka 1941 / Kali 5119 / 2019 A.D
2. Sab-e-Miraj *	27 Rajab	Chaitra 14/ Chaitra 21 /April 4

* The festival is observed in the preceding night

THE ISLAMIC CALENDAR 2018-2019 A.D. (Hejira : 1439-1440 A. H.)

The beginning dates of the different months of the Islamic Calendar for the year 2018-2019 A.D. determined on the basis of the first visibility of the lunar crescent after the New-Moon day culculated for the Central Station of India are as follows:-

Jumadu'l awwal	1439	Jan. 19	2018	(30)	MUHARRAM	1440	Sept. 12	2018	(29)
Jumadu's sani	"	Feb. 18	"	(30)	Safar	"	Oct. 11	"	(30)
Rajab	"	Mar. 20	"	(29)	Rabiu'l awwal	"	Nov. 10	"	(29)
Shaban	"	Apr. 18	"	(29)	Rabiu's sani	"	Dec. 9	"	(30)
Ramadan	"	May 17	"	(30)	Jumadu'l awwal	"	Jan. 8	2019	(30)
Shawwal	"	Jun. 16	"	(29)	Jumadu's sani	"	Feb. 7	"	(30)
Zu'lqada	"	Jul. 15	"	(29)	Rajab	"	Mar. 9	"	(29)
Zulhijja	"	Aug. 13	"	(30)	Shaban	"	Apr. 7	"	

N.B.-Actually the months begin from sunset of the preceding day when the Moon becomes first visible.
The moon may be visible on 19.11.17 in western part of India.

Fixed Calendar

According to the Fixed Calendar the beginning dates of different months are as follows : 2018 - Jan. 18, Feb. 19, Mar. 19, Apr. 17, May 16, June 15, July 14, Aug. 12, Sept. 12, Oct. 9, Nov. 10, Dec. 7 2019 - Jan. 7, Feb. 8, Mar. 8, Apr. 6.

THE PARSI (SHAHENSHAHI) CALENDAR, 2018 - 2019 A.D.

(As used by the Indian Parsis)

Yazdejardi Era : 1387 - 1388

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	1387	Jan. 14	2018	(30)	Ardibehesht	1388	Sept. 16	2018	(30)
Meher	"	Feb. 13	"	(30)	Khordad	"	Oct. 16	"	(30)
Avan	"	Mar. 15	"	(30)	Tir	"	Nov. 15	"	(30)
Adar	"	Apr. 14	"	(30)	Amardad	"	Dec. 15	"	(30)
Dei	"	May 14	"	(30)	Shahrivar	"	Jan. 14	2019	(30)
Bahman	"	June 13	"	(30)	Meher	"	Feb. 13	"	(30)
Aspandad	"	July 13	"	(30)	Avan	"	Mar. 15	"	(30)
Gathas(I-V)	"	Aug. 12	"	(5)	Adar	"	Apr. 14	"	(30)
FARVARDIN	1388	Aug. 17	"	(30)	Dei	"	May 14	"	(30)

PARSI FESTIVALS 2018-2019 A.D.

Festivals	Criterion	Shahenshahi	Kadmi
		National / Nirayana / Gregorian **Saka 1940/ Kali 5119/ 2018 A.D.**	**National / Nirayana / Gregorian** **Saka 1940/ Kali 5119/ 2018 A.D.**
Zarthost-no-Diso	11 Dei	Jyaishtha 3/ Jyaishtha 10/ May 24	Vaisakha 4/ Vaisakha 11/ Apr. 24
Gatha Gahambar	Gatha III	Sravana 23/ Sravana 30/ Aug. 14	Ashadha 24/ Ashadha 31/ July 15
Parsi New Year Eve	Gatha V	Sravana 25/ Bhadra 1/ Aug. 16	Ashadha 26/ Sravana 2/ July 17
Parsi New Year's Day	1 Farvardin	Sravana 26/ Bhadra 2/ Aug. 17	Ashadha 27/ Sravana 3/ July 18
Khordad Sal (Birthday of Prophet Zarthost)	6 Farvardin	Shravana 31/ Bhadra 7/ Aug. 22	Sravana 1/ Sravana 8/ July 23

N.B.- Jamshedi Naoroj falls on March 21 every year

THE JEWISH CALENDAR, 2018 - 2019 A.D.

Jewish Era : 5778 - 79 A.M.

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

Shebat	5778	Jan.	17	2018	(30)	TISHRI	5779	Sept.	10	2018	(30)
Veadar	"	-----	-----		-----	Heshvan	"	Oct.	10	"	(30)
Adar	"	Feb.	16	"	(29)	Kislev	"	Nov.	9	"	(30)
Nisan	"	Mar.	17	"	(30)	Tebeth	"	Dec.	9	"	(29)
Iyar	"	Apr.	16	"	(29)	Shebat	"	Jan.	7	2019	(30)
Sivan	"	May	15	"	(30)	Veadar		Feb.	6	"	(30)
Tammuz	"	June	14	"	(29)	Adar	"	Mar.	8	"	(29)
Ab	"	July	13	"	(30)	Nisan	"	Apr.	6	"	(30)
Ellul	"	Aug.	12	"	(29)	Iyar	"	May	6	"	(29)

JEWISH FESTIVALS 2018-2019 A.D.

Festivals	Criterion	Date
		National / Nirayana / Gregorian **Saka 1939 / Kali 5118 / 2018 AD**
Purim	14 Adar	Phalguna 10 / Phalguna 17 / March 1
		Saka 1940 / Kali 5118 / 2018 AD
First day of Passover (Pesach)	15 Nisan	Chaitra 10 / Chaitra 17 / March 31
		Saka 1940 / Kali 5119 / 2018 AD
Feast of Weeks (Shebuoth)	6 Sivan	Vaisakha 30 / Jyaishtha 6 / May 20
Tishabeab	9 Ab	Ashadha 30 / Sravana 6 / July 21
Jewish New Year (Rosh Hashanah)	1 Tishri	Bhadra 19 / Bhadra 26 /Sept. 10
Day of Atonement (Yom Kippur)	10 Tishri	Bhadra 28 /Asvina 4 / Sept. 19
First day of Tabernacles (Succoth)	15 Tishri	Asvina 2/ Asvina 9 / Sept. 24
Last day of Succoth (SimhathTorah)	23 Tishri	Asvina 10 / Asvina 17 / Oct. 2
Hanukah	25 Kislev	Agrahn. 12/ Agrahn. 19/Dec. 3
		Saka 1940/Kali 5119 / 2019 A.D.
Purim	14 Adar	Phalguna 30/ Chaitra 7 / March 21

CHRISTIAN FESTIVALS, 2018-2019 A.D.

Festivals	Criterion	Date
		National / Nirayana / Gregorian
		Saka 1939 / Kali 5118/ 2018 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
6. Palm Sunday	7 days before Easter Sunday	Chaitra 4/ Chaitra 11 / March 25
		Saka 1940/ Kali 5118 / 2018 A.D.
7. Good Friday	2 days before Easter Sunday	Chaitra 9 / Chaitra 16 / March 30
8. Easter (Holy) Saturday	Day before Easter Sunday	Chaitra 10 / Chaitra 17 / March 31
9. Easter Sunday	First Sunday after the 14^{th} day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Chaitra 11 / Chaitra 18 / April 1
10. Low Sunday	7 days after Easter Sunday	Chaitra 18 / Chaitra 25 / April 8
		Saka 1940/ Kali 5119 /2018 A.D.
11. Rogation Sunday	35 days after Easter Sunday	Vaisakha 16/ Vaisakha 23 / May 6
12. Ascension Day-Holy Thursday	39 days after Easter Sunday	Vaisakha 20/ Vaisakha 27 / May 10
13. Ascension Sunday	3 days after Ascension day	Vaisakha 23 / Vaisakha 30 / May 13
14. Whit Sunday-Pentecost	49 days after Easter Sunday	Vaisakha 30 // Jyaishtha 6 /May 20
15. Trinity Sunday	56 days after Easter Sunday	Jyaishtha 6 / Jyaishtha 13 /May 27
16. Corpus Christi (Thursday)	60 days after Easter Sunday	Jyaishtha 10 / Jyaishtha 17/May
17. First Sunday in Advent	Fourth Sunday before Christmas,	31
18. Christmas Eve	i.e.,Sunday nearest to Nov.,30.	Agrahn. 11 /Agrahn. 18 / Dec 2
19. Christmas Day	Day before Christmas	Pausha 03 / Pausha 10 / Dec. 24
20. New Year Eve	Fixed	Pausha 04 / Pausha 11 / Dec. 25
		Pausha 10 / Pausha 17 / Dec. 31
1. Christian (English) New Yearôs Day	Fixed	**Saka 1940/ Kali 5119 / 2019 A.D.**
2 Epiphany	Fixed	Pausha 11 / Pausha 18 / Jan. 01
3. Septuagesima Sunday	Fixed	Pausha 16 / Pausha 23 / Jan. 06
4. Quinquagesima (Shrove) Sunday	63 days before Easter Sunday	Magha 28 / Phalguna 5 / Feb 17
5. Ash Wednesday	49 days before Easter Sunday	Phalguna 12/Phalguna 19 /March 3
		Phalguna 15/ Phalguna 22/March 6
6. Palm Sunday	46 days before Easter Sunday	**Saka 1941 / Kali 5120/ 2019 A.D.**
7. Good Friday	7 days before Easter Sunday	Chaitra 24/Vaisakha 1 / April 14
8. Easter (Holy) Saturday	2 days before Easter Sunday	Chaitra 29/ Vaisakha 6 / April 19
9. Easter Sunday	Day before Easter Sunday	Chaitra 30/ Vaisakha 7 / April 20
	First Sunday after the 14^{th} day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Vaisakha 1/Vaisakha 8/April 21

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

	2000 (1921 - 22 S.E.)	d	h	m	2003 (1924 - 25 S.E.)	d	h	m	2006 (1927 - 28 S.E.)	d	h	m
Pausha	Jan.	6	23	44	Jan.	2	25	53			---	
Magha	Feb.	5	18	33	Feb.	1	16	19	Jan.	29	19	45
Phalguna	Mar.	6	10	47	Mar.	3	08	05	Feb.	27	30	01
Chaitra	Apr.	4	23	42	Apr.	1	24	48	Mar.	29	15	45
Vaisakha	May	4	09	42	May	1	17	44	Apr.	27	25	14
Jyaishtha	June	2	17	44	May	31	09	49	May	27	10	56
Ashadha	July	1	24	50	June	29	24	07	June	25	21	35
Sravana	July	31	07	55	July	29	12	21	July	25	10	01
Bhadra	Aug.	29	15	49	Aug.	27	22	54	Aug.	23	24	40
Asvina	Sept.	27	25	23	Sept	26	08	37	Sept.	22	17	15
Kartika	Oct.	27	13	28	Oct.	25	18	19	Oct.	22	10	44
Margasirsha	Nov.	25	28	41	Nov.	23	28	28	Nov.	20	27	48
Pausha	Dec.	25	22	52	Dec.	23	15	13	Dec.	20	19	31

	2001 (1922 - 23 S.E.)	d	h	m	2004 (1925 - 26 S.E.)	d	h	m	2007 (1928 - 29 S.E.)	d	h	m
Pausha			---				---				---	
Magha	Jan.	24	18	37	Jan.	21	26	35	Jan.	19	09	31
Phalguna	Feb.	23	13	51	Feb.	20	14	48	Feb.	17	21	44
Chaitra	Mar.	25	06	51	Mar.	20	28	11	Mar.	19	08	13
Vaisakha	Apr.	23	20	56	Apr.	19	18	51	Apr.	17	17	06
Jyaishtha	May	23	08	16	May	19	10	22	*May*	*16*	*24*	*57*
									June	15	08	43
Ashadha	June	21	17	28	June	17	29	57	July	14	17	34
Sravana	July	20	25	14	*July*	*17*	*16*	*54*	Aug.	12	28	33
					Aug.	16	06	54				
Bhadra	Aug.	19	08	25	Sept.	14	19	59	Sept.	11	18	14
Asvina	*Sept.*	*17*	*15*	*57*	Oct.	14	08	18	Oct.	11	10	31
	Oct.	16	24	53								
Kartika	Nov.	15	12	10	Nov.	12	19	57	Nov.	9	28	33
Margasirsha	Dec	14	26	17	Dec	12	06	59	Dec.	9	23	10
Pausha			---				---				---	

	2002 (1923 - 24 S.E.)	d	h	m	2005 (1926 - 27 S.E.)	d	h	m	2008 (1929 - 30 S.E.)	d	h	m
Pausha	Jan.	13	18	59	Jan.	10	17	33	Jan.	8	17	17
Magha	Feb.	12	13	11	Feb.	8	27	58	Feb.	7	09	14
Phalguna	Mar.	14	07	33	Mar.	10	14	40	Mar.	7	22	44
Chaitra	Apr.	12	24	51	Apr.	8	26	02	Apr.	6	09	25
Vaisakha	May	12	16	15	May	8	14	15	May	5	17	48
Jyaishtha	June	11	05	17	June	6	27	25	June	3	24	53
Ashadha	July	10	15	56	July	6	17	33	July	3	07	49
Sravana	Aug.	8	24	45	Aug.	5	08	35	Aug.	1	15	43
Bhadra	Sept	7	08	40	Sept	3	24	15	Aug.	30	25	28
Asvina	Oct	6	16	48	Oct.	3	15	58	Sept.	29	13	42
Kartika	Nov.	4	26	04	Nov.	2	06	55	Oct.	28	28	44
Margasirsha	Dec.	4	13	04	Dec.	1	20	31	Nov.	27	22	25
Pausha			---		Dec.	31	08	42	Dec.	27	17	52

N.B.- The figures 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

	2009 (1930 - 31 S.E.)	d	h	m	2012 (1933 - 34 S.E.)	d	h	m	2015 (1936 - 37 S.E.)	d	h	m	2018 (1939 - 40 S.E)	d	h	m
			---				---				---				---	
Pausha	Jan.	26	13	25	Jan.	23	13	09	Jan.	20	18	44	Jan.	17	07	47
Magha	Feb.	25	07	05	Feb.	21	28	05	Feb.	18	29	17	Feb.	15	26	35
Phalguna	Mar.	26	21	36	Mar.	22	20	07	Mar.	20	15	06	Mar.	17	18	42
Chaitra	Apr.	25	08	53	Apr.	21	12	48	Apr.	18	24	27	Apr.	16	07	27
Vaisakha																
Jyaishtha	May	24	17	41	May	20	05	17	May	18	09	43	*May*	*15*	*17*	*18*
													June	13	25	13
Ashadha	June	22	25	05	June	19	20	32	*June*	*16*	*19*	*35*	July	13	08	18
									July	16	06	54				
Sravana	July	22	08	05	July	19	09	54	Aug.	14	20	23	Aug.	11	15	28
Bhadra	Aug.	20	15	32	*Aug.*	*17*	*21*	*24*	Sept	13	12	11	Sept.	09	23	32
					Sept.	16	07	41								
Asvina	Sept.	18	24	14	Oct.	15	17	33	Oct.	12	29	36	Oct.	09	09	17
Kartika	Oct.	18	11	03	Nov.	13	27	38	Nov.	11	23	17	Nov.	07	21	32
Margasirsha	Nov.	16	24	44	Dec.	13	14	12	Dec.	11	15	59	Dec.	07	12	50
Pausha	Dec.	17	17	32			---								---	

	2010 (1931 - 32 S.E.)	d	h	m	2013 (1934 - 35 S.E.)	d	h	m	2016 (1937 - 38 S.E.)	d	h	m	2019 (1940 - 41 S.E.)	d	h	m
Pausha			---		Jan.	11	25	14	Jan.	10	07	01	Jan.	6	06	58
Magha	Jan.	15	12	41	Feb.	10	12	50	Feb.	8	20	09	Feb.	4	26	34
Phalguna	Feb.	14	08	21	Mar.	11	25	21	Mar.	9	07	25	Mar.	6	21	34
Chaitra	Mar.	15	26	31	Apr.	10	15	05	Apr.	7	16	54	Apr.	5	14	21
Vaisakha	*Apr.*	*14*	*17*	*59*	May	10	05	58	May	6	25	00	May	4	28	16
	May	14	06	34												
Jyaishtha	June	12	16	45	June	8	21	26	June	5	08	30	June	3	15	32
Ashadha	July	11	25	10	July	8	12	44	July	4	16	31	July	2	24	46
Sravana	Aug.	10	08	38	Aug.	6	27	21	Aug.	2	26	15	Aug.	1	08	42
Bhadra	Sept.	8	16	00	Sept.	5	17	06	Sept.	1	14	33	Aug.	30	16	07
Asvina	Oct.	7	24	15	Oct.	5	06	05	Sept.	30	29	41	Sept.	28	23	56
Kartika	Nov.	6	10	22	Nov.	3	18	20	Oct.	30	23	08	Oct.	28	09	09
Margasirsha	Dec.	5	23	06	Dec.	2	29	52	Nov.	29	17	48	Nov.	26	20	36
Pausha			---				---		Dec.	29	12	23	Dec.	26	10	43

	2011 (1932 - 33 S.E.)	d	h	m	2014 (1935 - 36 S.E.)	d	h	m	2017 (1938 - 39 S.E.)	d	h	m	2020 (1941 - 42 S.E.)	d	h	m
Pausha	Jan.	4	14	33	Jan.	1	16	44			---				---	
Magha	Feb.	3	08	01	Jan..	30	27	09	Jan.	27	29	37	Jan.	24	27	12
Phalguna	Mar.	4	26	16	Mar.	1	13	30	Feb.	26	20	28	Feb.	23	21	02
Chaitra	Apr.	3	20	02	Mar.	30	24	15	Mar.	28	08	27	Mar.	24	14	58
Vaisakha	May	3	12	21	Apr.	29	11	44	Apr.	26	17	46	Apr.	23	07	56
Jyaishtha	June	1	26	33	May	28	24	10	May	25	25	14	May	22	23	09
Ashadha	July	1	14	24	June	27	13	39	June	24	08	01	June	21	12	11
Sravana	July	30	24	10	July	26	28	12	July	23	15	16	July	20	23	03
Bhadra	Aug.	29	08	34	Aug.	25	19	43	Aug.	21	24	00	Aug.	19	08	12
Asvina	Sept.	27	16	39	Sept.	24	11	44	Sept.	20	11	00	*Sept.*	*17*	*16*	*30*
													Oct.	16	25	01
Kartika	Oct.	26	25	26	Oct.	23	27	27	Oct.	19	24	42	Nov.	15	10	37
Margasirsha	Nov.	25	11	40	Nov.	22	18	02	Nov.	18	17	12	Dec.	14	21	47
Pausha	Dec.	24	23	36	Dec.	22	07	06	Dec.	18	12	00			---	

N.B.- The figures 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 1941

Mesha : Madhava
Spring (Vasanta), 2nd Month
Ayanamsa on 1st : $24^0 07^{/} 16^{//}$

Month of CHAITRA (30 days)

(*Nirayana*) 8 Chaitra, 5119 Kali Era to (*Nirayana)* 7 Vaisakha, 5120 Kali Era

Date	Week Day	Gregorian Date	Tithi No.	Tithi Ending Moment h	Tithi Ending Moment m	Nakshatra No.	Nakshatra Ending Moment h	Nakshatra Ending Moment m	Yoga No.	Yoga Ending Moment h	Yoga Ending Moment m
		2019 A.D.									
1	Fri	Mar. 22	K 2	24	55.9	13	11	06.1	12	25	40.7
2	Sat	23	3	22	32.5	14	9	05.2	13	22	35.2
3	Sun	24	4	20	51.6	15	7	41.3	14	20	04.3
4	Mon	25	K 5	20	00.3	16	7	02.9	15	18	12.9
5	Tue	26	6	20	01.9	17	7	15.0	16	17	03.2
6	Wed	27	7	20	55.3	18	8	18.8	17	16	34.1
7	Thu	28	8	22	34.4	19	10	10.3	18	16	41.2
8	Fri	29	9	24	48.3	20	12	40.7	19	17	16.9
9	Sat	30	K 10	27	23.2	21	15	37.5	20	18	11.6
10	Sun	31	11	-	-	22	18	46.4	21	19	14.8
11	Mon	Apr. 1	11	6	04.4	23	21	54.0	22	20	16.9
12	Tue	2	12	8	38.8	24	24	49.2	23	21	09.6
13	Wed	3	13	10	56.5	25	27	24.5	24	21	47.4
14	Thu	4	14	12	51.3	26	29	35.9	25	22	06.8
15	Fri	5	K 30	14	20.5	27	-	-	26	22	06.5
16	Sat	6	S 1	15	23.5	27	7	22.3	27	21	46.5
17	Sun	7	2	16	01.6	1	8	44.2	1	21	07.5
18	Mon	8	3	16	15.9	2	9	42.8	2	20	10.3
19	Tue	9	4	16	07.3	3	10	19.1	3	18	55.5
20	Wed	10	S 5	15	36.2	4	10	33.4	4	17	22.9
21	Thu	11	6	14	42.0	5	10	25.2	5	15	32.0
22	Fri	12	7	13	24.0	6	9	53.8	6	13	22.3
23	Sat	13	8	11	41.7	7	8	58.5	7	10	53.1
24	Sun	14	9	9	35.8	8	7	39.7	8	8	04.8
									(9	28	58.9)
25	Mon	15	S 10	7	08.4	9	5	59.3	10	25	38.1
			(11	28	23.2)	(10	28	00.9)			
26	Tue	16	12	25	26.1	11	25	50.4	11	22	06.8
27	Wed	17	13	22	24.3	12	23	35.6	12	18	30.7
28	Thu	18	14	19	26.5	13	21	25.3	13	14	56.6
29	Fri	19	S 15	16	42.2	14	19	29.4	14	11	32.0
30	Sat	20	K 1	14	21.2	15	17	58.2	15	08	24.6

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 1, $22^h 01^m.7$; Vrischika 3, $25^h 08^m.0$; Dhanus 6, $8^h 18^m.8$; Makara 8, $19^h 23^m.0$; Kumbha 11, $8^h 21^m.2$; Mina 13, $20^h 47^m.8$; Mesha 16, $7^h 22^m.3$; Vrisha 18, $15^h 54^m.0$; Mithuna 20, $22^h 32^m.2$; Mithuna 22, $27^h 14^m.6$; Simha 25, $5^h 59^m.3$; Kanya 27, $7^h 16^m.8$; Tula 29, $8^h 24^m.9$; Sun enters :- Nirayana Mesha 24, $14^h 09^m.1$.

AYANAMSA, 2018-2019

TRUE AYANAMSA FOR $5^h\ 29^m.0$ I.S.T.

Date 2018	Ayanamsa			Date 2018	Ayanamsa			Date 2018	Ayanamsa			Date 2018-19	Ayanamsa		
	°	′	″		°	′	″		°	′	″		°	′	″
Jan. 1	24	06	19.3	May 1	24	06	32.7	Aug. 29	24	06	50.2	Dec. 27	24	07	05.5
4	24	06	20.1	4	24	06	33.2	Sept. 1	24	06	50.3	30	24	07	05.8
7	24	06	20.5	7	24	06	33.8	4	24	06	50.7	Jan. 2	24	07	06.2
10	24	06	20.8	10	24	06	34.1	7	24	06	51.3	5	24	07	06.8
13	24	06	21.3	13	24	06	34.3	10	24	06	51.5	8	24	07	07.5
16	24	06	21.9	16	24	06	34.6	13	24	06	51.6	11	24	07	08.0
19	24	06	22.5	19	24	06	35.4	16	24	06	51.8	14	24	07	08.2
22	24	06	22.7	22	24	06	36.0	19	24	06	52.3	17	24	07	08.6
25	24	06	23.0	25	24	06	36.2	22	24	06	52.6	20	24	07	09.4
28	24	06	23.5	28	24	06	36.5	25	24	06	52.7	23	24	07	10.1
31	24	06	24.3	31	24	06	37.1	28	24	06	52.7	26	24	07	10.3
Feb. 3	24	06	24.6	June 3	24	06	37.7	Oct. 1	24	06	53.0	29	24	07	10.6
6	24	06	24.8	6	24	06	38.2	4	24	06	53.6	Feb. 1	24	07	11.1
9	24	06	25.1	9	24	06	38.4	7	24	06	53.9	4	24	07	11.7
12	24	06	25.6	12	24	06	38.8	10	24	06	53.9	7	24	07	12.0
15	24	06	26.0	15	24	06	39.6	13	24	06	54.1	10	24	07	12.1
18	24	06	26.2	18	24	06	40.4	16	24	06	54.6	13	24	07	12.4
21	24	06	26.3	21	24	06	40.7	19	24	06	55.0	16	24	07	12.9
24	24	06	26.6	24	24	06	41.0	22	24	06	55.2	19	24	07	13.6
27	24	06	27.3	27	24	06	41.6	25	24	06	55.2	22	24	07	13.7
Mar. 2	24	06	27.6	30	24	06	42.2	28	24	06	55.6	25	24	07	13.8
5	24	06	27.6	July 3	24	06	42.7	31	24	06	56.3	28	24	07	14.3
8	24	06	27.8	6	24	06	43.0	Nov. 3	24	06	56.7	Mar. 3	24	07	14.7
11	24	06	28.2	9	24	06	43.3	6	24	06	56.8	6	24	07	15.0
14	24	06	28.6	12	24	06	44.0	9	24	06	57.1	9	24	07	15.0
17	24	06	28.7	15	24	06	44.8	12	24	06	57.8	12	24	07	15.1
20	24	06	28.7	18	24	06	45.1	15	24	06	58.3	15	24	07	15.5
23	24	06	28.9	21	24	06	45.4	18	24	06	58.6	18	24	07	16.1
26	24	06	29.5	24	24	06	45.9	21	24	06	58.8	21	24	07	16.2
29	24	06	29.8	27	24	06	46.5	24	24	06	59.3	24	24	07	16.3
Apr. 1	24	06	29.8	30	24	06	46.9	27	24	07	00.1	27	24	07	16.6
4	24	06	30.0	Aug. 2	24	06	47.1	30	24	07	00.7	30	24	07	17.1
7	24	06	30.4	5	24	06	47.3	Dec. 3	24	07	00.9	Apr. 2	24	07	17.4
10	24	06	30.8	8	24	06	47.9	6	24	07	01.3	5	24	07	17.4
13	24	06	31.0	11	24	06	48.6	9	24	07	02.0	8	24	07	17.5
16	24	06	31.1	14	24	06	48.8	12	24	07	02.7	11	24	07	17.9
19	24	06	31.3	17	24	06	48.9	15	24	07	03.1	14	24	07	18.5
22	24	06	32.0	20	24	06	49.3	18	24	07	03.4	17	24	07	18.8
25	24	06	32.4	23	24	06	49.8	21	24	07	03.9	20	24	07	18.8
28	24	06	32.5	26	24	06	50.2	24	24	07	04.8	23	24	07	19.2
May 1	24	06	32.7	Aug. 29	24	06	50.2	Dec. 27	24	07	05.5	Apr. 26	24	07	19.8

Mean Ayanamsa = True Ayanamsa − Nutation in longitude

LONGITUDE OF SUN, MOON AND PLANETS, 2019

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

Date		Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
		°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Jan.	0	279	14	11	209	13	29	262	23	49	232	31	00	359	15	46	251	33	31	281	15	30
	1	280	15	21	222	21	35	263	51	12	233	29	38	359	56	03	251	46	09	281	22	36
	2	281	16	31	235	14	11	265	19	10	234	28	45	0	36	23	251	58	44	281	29	42
	3	282	17	42	247	52	52	266	47	40	235	28	20	1	16	44	252	11	16	281	36	46
	4	283	18	52	260	19	08	268	16	42	236	28	21	1	57	07	252	23	45	281	43	52
	5	284	20	03	272	34	27	269	46	13	237	28	49	2	37	32	252	36	10	281	50	58
	6	285	21	14	284	40	17	271	16	13	238	29	42	3	17	58	252	48	33	281	58	03
	7	286	22	25	296	38	13	272	46	40	239	30	58	3	58	26	253	00	52	282	05	09
	8	287	23	36	308	30	08	274	17	34	240	32	38	4	38	55	253	13	08	282	12	13
	9	288	24	46	320	18	17	275	48	55	241	34	39	5	19	25	253	25	20	282	19	18
	10	289	25	56	332	05	23	277	20	42	242	37	02	5	59	57	253	37	28	282	26	22
	11	290	27	06	343	54	43	278	52	56	243	39	46	6	40	30	253	49	33	282	33	25
	12	291	28	15	355	50	00	280	25	36	244	42	49	7	21	03	254	01	34	282	40	27
	13	292	29	23	7	55	28	281	58	43	245	46	12	8	01	38	254	13	31	282	47	29
	14	293	30	31	20	15	31	283	32	18	246	49	53	8	42	13	254	25	23	282	54	30
	15	294	31	39	32	54	37	285	06	21	247	53	52	9	22	49	254	37	12	283	01	31
	16	295	32	45	45	56	44	286	40	52	248	58	09	10	03	26	254	48	57	283	08	30
	17	296	33	51	59	24	55	288	15	53	250	02	42	10	44	03	255	00	37	283	15	29
	18	297	34	56	73	20	37	289	51	24	251	07	32	11	24	41	255	12	13	283	22	26
	19	298	36	01	87	43	02	291	27	26	252	12	38	12	05	19	255	23	45	283	29	23
	20	299	37	05	102	28	41	293	03	59	253	17	59	12	45	57	255	35	12	283	36	18
	21	300	38	08	117	31	16	294	41	06	254	23	36	13	26	35	255	46	34	283	43	12
	22	301	39	10	132	42	19	296	18	46	255	29	27	14	07	13	255	57	52	283	50	05
	23	302	40	12	147	52	14	297	57	01	256	35	32	14	47	52	256	09	05	283	56	56
	24	303	41	13	162	51	42	299	35	51	257	41	50	15	28	30	256	20	13	284	03	46
	25	304	42	13	177	33	07	301	15	18	258	48	22	16	09	08	256	31	16	284	10	34
	26	305	43	13	191	51	22	302	55	22	259	55	07	16	49	46	256	42	14	284	17	21
	27	306	44	12	205	44	03	304	36	04	261	02	04	17	30	25	256	53	07	284	24	06
	28	307	45	11	219	11	14	306	17	25	262	09	13	18	11	03	257	03	54	284	30	50
	29	308	46	10	232	14	47	307	59	25	263	16	34	18	51	42	257	14	36	284	37	32
	30	309	47	07	244	57	41	309	42	04	264	24	05	19	32	20	257	25	13	284	44	12
	31	310	48	04	257	23	26	311	25	24	265	31	48	20	12	59	257	35	44	284	50	50

LONGITUDE OF SUN, MOON AND PLANETS, 2019

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

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Feb. 1	311	49	01	269	35	40	313	09	22	266	39	40	20	53	38	257	46	09	284	57	26
2	312	49	56	281	37	44	314	54	00	267	47	43	21	34	16	257	56	29	285	04	01
3	313	50	51	293	32	41	316	39	16	268	55	55	22	14	55	258	06	43	285	10	33
4	314	51	44	305	23	07	318	25	08	270	04	15	22	55	33	258	16	50	285	17	03
5	315	52	37	317	11	21	320	11	36	271	12	45	23	36	11	258	26	52	285	23	30
6	316	53	28	328	59	26	321	58	37	272	21	23	24	16	49	258	36	47	285	29	55
7	317	54	18	340	49	22	323	46	07	273	30	09	24	57	27	258	46	35	285	36	18
8	318	55	06	352	43	13	325	34	03	274	39	03	25	38	04	258	56	18	285	42	39
9	319	55	54	4	43	20	327	22	20	275	48	05	26	18	41	259	05	53	285	48	56
10	320	56	39	16	52	23	329	10	51	276	57	14	26	59	18	259	15	22	285	55	11
11	321	57	24	29	13	28	330	59	28	278	06	29	27	39	53	259	24	44	286	01	24
12	322	58	06	41	49	57	332	48	03	279	15	52	28	20	29	259	34	00	286	07	34
13	323	58	47	54	45	24	334	36	24	280	25	22	29	01	04	259	43	08	286	13	41
14	324	59	27	68	03	08	336	24	19	281	34	58	29	41	38	259	52	09	286	19	45
15	326	00	04	81	45	47	338	11	31	282	44	40	30	22	11	260	01	04	286	25	46
16	327	00	41	95	54	34	339	57	43	283	54	29	31	02	43	260	09	51	286	31	45
17	328	01	15	110	28	36	341	42	35	285	04	23	31	43	15	260	18	30	286	37	40
18	329	01	48	125	24	14	343	25	43	286	14	24	32	23	46	260	27	03	286	43	32
19	330	02	18	140	34	51	345	06	41	287	24	30	33	04	15	260	35	27	286	49	21
20	331	02	48	155	51	15	346	44	59	288	34	42	33	44	44	260	43	44	286	55	07
21	332	03	15	171	02	58	348	20	06	289	44	59	34	25	11	260	51	54	287	00	49
22	333	03	42	185	59	57	349	51	28	290	55	22	35	05	38	260	59	55	287	06	28
23	334	04	06	200	34	06	351	18	29	292	05	50	35	46	03	261	07	49	287	12	04
24	335	04	30	214	40	29	352	40	30	293	16	24	36	26	28	261	15	35	287	17	36
25	336	04	52	228	17	24	353	56	54	294	27	02	37	06	51	261	23	12	287	23	05
26	337	05	12	241	25	58	355	07	01	295	37	45	37	47	14	261	30	41	287	28	30
27	338	05	32	254	09	24	356	10	15	296	48	33	38	27	36	261	38	03	287	33	51
28	339	05	50	266	32	03	357	05	59	297	59	26	39	07	57	261	45	15	287	39	09

LONGITUDE OF SUN, MOON AND PLANETS, 2019

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

Date		Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
		°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Mar	1	340	06	06	278	38	49	357	53	42	299	10	22	39	48	18	261	52	19	287	44	24
	2	341	06	21	290	34	34	358	32	55	300	21	23	40	28	37	261	59	15	287	49	34
	3	342	06	34	302	23	48	359	03	15	301	32	28	41	08	55	262	06	01	287	54	40
	4	343	06	46	314	10	27	359	24	25	302	43	36	41	49	13	262	12	39	287	59	42
	5	344	06	56	325	57	46	359	36	15	303	54	48	42	29	30	262	19	08	288	04	41
	6	345	07	04	337	48	18	359	38	42	305	06	03	43	09	45	262	25	27	288	09	35
	7	346	07	10	349	44	04	359	31	56	306	17	22	43	50	00	262	31	37	288	14	25
	8	347	07	14	1	46	33	359	16	12	307	28	44	44	30	13	262	37	38	288	19	10
	9	348	07	17	13	57	00	358	52	00	308	40	08	45	10	26	262	43	30	288	23	52
	10	349	07	17	26	16	39	358	19	57	309	51	36	45	50	37	262	49	12	288	28	29
	11	350	07	16	38	46	55	357	40	53	311	03	07	46	30	48	262	54	45	288	33	02
	12	351	07	12	51	29	33	356	55	45	312	14	40	47	10	57	263	00	08	288	37	30
	13	352	07	06	64	26	40	356	05	41	313	26	16	47	51	05	263	05	21	288	41	54
	14	353	06	58	77	40	43	355	11	53	314	37	55	48	31	12	263	10	25	288	46	13
	15	354	06	48	91	14	06	354	15	37	315	49	36	49	11	18	263	15	18	288	50	28
	16	355	06	35	105	08	42	353	18	12	317	01	19	49	51	22	263	20	02	288	54	38
	17	356	06	21	119	25	11	352	20	54	318	13	05	50	31	25	263	24	36	288	58	43
	18	357	06	04	134	02	14	351	24	54	319	24	53	51	11	27	263	28	59	289	02	44
	19	358	05	44	148	55	56	350	31	19	320	36	43	51	51	27	263	33	13	289	06	40
	20	359	05	23	163	59	35	349	41	06	321	48	36	52	31	25	263	37	16	289	10	31
	21	0	04	59	179	04	11	348	55	03	323	00	31	53	11	22	263	41	08	289	14	17
	22	1	04	33	193	59	51	348	13	51	324	12	28	53	51	18	263	44	51	289	17	58
	23	2	04	06	208	37	28	347	38	00	325	24	28	54	31	12	263	48	23	289	21	34
	24	3	03	36	222	50	14	347	07	49	326	36	30	55	11	05	263	51	44	289	25	06
	25	4	03	05	236	34	28	346	43	32	327	48	34	55	50	57	263	54	55	289	28	32
	26	5	02	32	249	49	44	346	25	17	329	00	40	56	30	48	263	57	56	289	31	53
	27	6	01	57	262	38	10	346	13	02	330	12	48	57	10	37	264	00	45	289	35	09
	28	7	01	21	275	03	46	346	06	44	331	24	59	57	50	25	264	03	24	289	38	20
	29	8	00	42	287	11	38	346	06	15	332	37	11	58	30	12	264	05	52	289	41	26
	30	9	00	02	299	07	12	346	11	24	333	49	25	59	09	58	264	08	09	289	44	26
	31	9	59	21	310	55	53	346	22	00	335	01	40	59	49	42	264	10	15	289	47	21

LONGITUDE OF SUN, MOON AND PLANETS, 2019

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

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Apr 1	10	58	37	322	42	37	346	37	48	336	13	57	60	29	25	264	12	10	289	50	11
2	11	57	51	334	31	45	346	58	34	337	26	16	61	09	07	264	13	54	289	52	55
3	12	57	04	346	26	44	347	24	05	338	38	36	61	48	48	264	15	26	289	55	34
4	13	56	14	358	30	08	347	54	05	339	50	58	62	28	28	264	16	47	289	58	07
5	14	55	23	10	43	39	348	28	21	341	03	20	63	08	06	264	17	57	290	00	35
6	15	54	29	23	08	08	349	06	39	342	15	44	63	47	43	264	18	56	290	02	57
7	16	53	34	35	43	53	349	48	46	343	28	09	64	27	19	264	19	43	290	05	13
8	17	52	36	48	30	52	350	34	30	344	40	36	65	06	54	264	20	20	290	07	24
9	18	51	36	61	29	04	351	23	39	345	53	03	65	46	28	264	20	44	290	09	30
10	19	50	34	74	38	46	352	16	04	347	05	31	66	26	00	264	20	58	290	11	29
11	20	49	30	88	00	39	353	11	34	348	18	00	67	05	31	264	21	00	290	13	23
12	21	48	24	101	35	46	354	10	00	349	30	30	67	45	00	264	20	52	290	15	12
13	22	47	15	115	25	15	355	11	13	350	43	01	68	24	29	264	20	31	290	16	54
14	23	46	04	129	29	47	356	15	07	351	55	33	69	03	55	264	20	00	290	18	31
15	24	44	51	143	49	00	357	21	34	353	08	05	69	43	20	264	19	17	290	20	02
16	25	43	35	158	20	51	358	30	29	354	20	38	70	22	44	264	18	23	290	21	27
17	26	42	17	173	01	07	359	41	44	355	33	12	71	02	06	264	17	18	290	22	47
18	27	40	57	187	43	38	0	55	16	356	45	47	71	41	27	264	16	02	290	24	00
19	28	39	35	202	20	50	2	11	00	357	58	23	72	20	46	264	14	34	290	25	08
20	29	38	11	216	45	03	3	28	52	359	11	00	73	00	04	264	12	56	290	26	10

SUN AND MOON, 2019

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

Date	Declination of Sun		Latitude of Moon		Declination of Moon		Date	Declination of Sun		Latitude of Moon		Declination of Moon	
	°	'	°	'	°	'		°	'	°	'	°	'
Jan. 0	-23	06.8	+5	15.9	-6	16.1	Feb. 1	-17	14.5	+2	25.3	-21	00.8
1	23	02.3	5	04.8	10	42.1	2	16	57.5	1	23.2	21	32.7
2	22	57.4	4	38.4	14	33.8	3	16	40.1	+0	18.1	21	05.2
3	22	52.0	3	58.8	17	41.4	4	16	22.4	-0	47.3	19	41.1
4	22	46.2	3	08.4	19	57.0	5	16	04.5	1	50.4	17	26.0
5	22	39.9	2	10.0	21	14.6	6	15	46.3	2	48.6	14	27.3
6	22	33.1	1	06.4	21	31.7	7	15	27.8	3	39.6	10	53.5
7	22	25.9	+0	00.4	20	49.0	8	15	09.0	4	21.4	6	53.3
8	22	18.3	-1	05.0	19	10.8	9	14	50.0	4	52.0	-2	35.5
9	22	10.2	2	07.4	16	43.8	10	14	30.8	5	10.0	+1	51.2
10	22	01.7	3	04.3	13	35.7	11	14	11.3	5	14.0	6	17.8
11	21	52.7	3	53.5	9	55.1	12	13	51.5	5	03.2	10	34.2
12	21	43.4	4	33.1	5	49.9	13	13	31.6	4	36.9	14	28.5
13	21	33.6	5	01.1	-1	28.2	14	13	11.4	3	55.3	17	46.5
14	21	23.4	5	16.1	+3	01.9	15	12	51.0	2	59.2	20	12.0
15	21	12.8	5	16.3	7	31.2	16	12	30.4	1	50.5	21	27.8
16	21	01.7	5	00.6	11	48.4	17	12	09.6	-0	32.9	21	20.0
17	20	50.3	4	28.1	15	39.4	18	11	48.6	+0	48.7	19	42.1
18	20	38.5	3	39.0	18	46.5	19	11	27.4	2	08.0	16	39.0
19	20	26.3	2	34.8	20	50.1	20	11	06.0	3	18.6	12	26.3
20	20	13.7	-1	18.8	21	32.6	21	10	44.5	4	14.6	7	26.8
21	20	00.7	+0	04.1	20	43.2	22	10	22.8	4	52.2	+2	05.5
22	19	47.3	1	27.5	18	23.5	23	10	00.9	5	09.8	-3	14.7
23	19	33.6	2	44.5	14	47.0	24	9	38.9	5	07.7	8	14.5
24	19	19.5	3	49.3	10	15.5	25	9	16.8	4	48.2	12	39.2
25	19	05.1	4	37.5	5	13.0	26	8	54.5	4	13.9	16	18.0
26	18	50.3	5	07.1	+0	01.6	27	8	32.0	3	27.9	19	03.2
27	18	35.1	5	17.6	-5	00.5	28	-8	09.5	+2	33.4	-20	50.1
28	18	19.7	5	10.2	9	38.9							
29	18	03.9	4	46.8	13	42.3							
30	17	47.7	4	09.8	17	01.5							
31	-17	31.3	+3	21.7	-19	29.5							

SUN AND MOON, 2019

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

Date		Declination of Sun		Latitude of Moon		Declination of Moon		Date		Declination of Sun		Latitude of Moon		Declination of Moon	
		°	'	°	'	°	'			°	'	°	'	°	'
Mar.	1	-7	46.8	+1	33.0	-21	36.4	Apr	1	+4	20.6	-2	27.2	-16	15.6
	2	7	24.0	+0	29.6	21	22.4		2	4	43.8	3	18.2	12	55.3
	3	7	01.1	-0	34.4	20	10.9		3	5	06.8	4	00.8	9	02.7
	4	6	38.1	1	36.6	18	06.9		4	5	29.8	4	33.1	4	46.3
	5	6	15.0	2	34.5	15	17.1		5	5	52.7	4	53.3	-0	15.2
	6	5	51.8	3	25.8	11	49.3		6	6	15.5	5	00.0	+4	20.5
	7	5	28.5	4	08.4	7	52.2		7	6	38.2	4	52.3	8	49.8
	8	5	05.2	4	40.3	-3	34.8		8	7	00.8	4	29.9	13	00.4
	9	4	41.8	4	59.8	+0	53.7		9	7	23.2	3	53.3	16	38.8
	10	4	18.3	5	05.6	5	23.3		10	7	45.5	3	03.7	19	30.6
	11	3	54.8	4	57.1	9	43.8		11	8	07.7	2	03.3	21	21.9
	12	3	31.2	4	33.8	13	43.4		12	8	29.8	-0	54.9	22	01.1
	13	3	07.6	3	56.3	17	09.3		13	8	51.7	+0	17.9	21	20.7
	14	2	43.9	3	05.4	19	47.3		14	9	13.4	1	30.9	19	20.0
	15	2	20.3	2	02.9	21	22.9		15	9	35.1	2	39.5	16	05.2
	16	1	56.6	-0	51.7	21	43.1		16	9	56.5	3	38.6	11	49.0
	17	1	32.9	+0	24.4	20	40.0		17	10	17.8	4	23.9	6	48.6
	18	1	09.1	1	40.6	18	13.1		18	10	38.9	4	51.9	+1	24.3
	19	0	45.4	2	51.3	14	31.1		19	10	59.8	5	00.5	-4	02.7
	20	-0	21.7	3	50.7	9	50.6		20	+11	20.6	+4	49.8	-9	12.0
	21	+0	02.0	4	34.0	+4	33.6								
	22	0	25.7	4	58.1	-0	56.3								
	23	0	49.4	5	02.0	6	16.5								
	24	1	13.0	4	47.0	11	07.6								
	25	1	36.6	4	15.6	15	14.4								
	26	2	00.2	3	31.2	18	26.3								
	27	2	23.7	2	37.5	20	36.6								
	28	2	47.2	1	37.7	21	42.7								
	29	3	10.7	+0	34.8	21	45.3								
	30	3	34.0	-0	28.5	20	47.8								
	31	+3	57.4	-1	29.9	-18	55.6								

PLANETS, 2019

GEOCENTRIC LATITUDE AND DECLINATION FOR 5^{h} $29^{m}.0$ I.S.T.

Date	Mercury		Venus		Mars		Jupiter		Saturn	
	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination
	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '
Jan. 0	+0 15.0	-22 58.0	+3 25.9	-15 04.7	-0 19.3	-0 35.3	+0 37.7	-21 32.6	+0 29.1	-22 28.5
2	-0 00.1	23 21.2	3 26.8	15 32.6	0 16.5	-0 00.7	0 37.7	21 36.0	0 28.9	22 27.5
4	0 14.7	23 40.1	3 27.0	16 00.4	0 13.8	+0 33.9	0 37.6	21 39.3	0 28.8	22 26.4
6	0 28.7	23 54.4	3 26.5	16 27.8	0 11.2	1 08.4	0 37.6	21 42.6	0 28.6	22 25.3
8	0 42.0	24 03.9	3 25.5	16 54.6	0 08.7	1 42.9	0 37.5	21 45.7	0 28.5	22 24.1
10	0 54.6	24 08.5	3 23.8	17 20.9	0 06.2	2 17.2	0 37.5	21 48.7	0 28.4	22 23.0
12	1 06.5	24 07.8	3 21.6	17 46.3	0 03.8	2 51.5	0 37.4	21 51.6	0 28.3	22 21.8
14	1 17.4	24 01.9	3 18.8	18 10.8	-0 01.4	3 25.7	0 37.4	21 54.4	0 28.1	22 20.6
16	1 27.5	23 50.4	3 15.6	18 34.2	+0 00.9	3 59.8	0 37.4	21 57.2	0 28.0	22 19.3
18	1 36.5	23 33.5	3 11.8	18 56.4	0 03.2	4 33.7	0 37.3	21 59.8	0 27.9	22 18.1
20	1 44.4	23 10.8	3 07.7	19 17.3	0 05.4	5 07.5	0 37.3	22 02.3	0 27.8	22 16.8
22	1 51.2	22 42.4	3 03.1	19 36.7	0 07.5	5 41.0	0 37.3	22 04.7	0 27.6	22 15.5
24	1 56.8	22 08.1	2 58.1	19 54.7	0 09.6	6 14.4	0 37.3	22 07.0	0 27.5	22 14.2
26	2 01.0	21 27.9	2 52.7	20 10.9	0 11.7	6 47.5	0 37.3	22 09.2	0 27.4	22 12.9
28	2 03.8	20 41.7	2 47.0	20 25.5	0 13.7	7 20.4	0 37.2	22 11.3	0 27.3	22 11.6
30	2 05.0	19 49.5	2 41.0	20 38.2	0 15.6	7 53.1	0 37.2	22 13.4	0 27.2	22 10.2
Feb. 1	2 04.5	18 51.3	2 34.7	20 48.9	0 17.5	8 25.5	0 37.2	22 15.3	0 27.1	22 08.9
3	2 02.2	17 47.0	2 28.2	20 57.7	0 19.3	8 57.6	0 37.2	22 17.2	0 27.0	22 07.5
5	1 57.9	16 36.9	2 21.4	21 04.4	0 21.1	9 29.4	0 37.2	22 18.9	0 26.9	22 06.2
7	1 51.5	15 21.0	2 14.4	21 09.0	0 22.9	10 00.9	0 37.2	22 20.6	0 26.8	22 04.8
9	1 42.8	13 59.5	2 07.2	21 11.4	0 24.6	10 32.1	0 37.2	22 22.2	0 26.7	22 03.4
11	1 31.7	12 32.9	1 59.9	21 11.6	0 26.2	11 03.0	0 37.2	22 23.7	0 26.6	22 02.0
13	1 18.0	11 01.8	1 52.4	21 09.5	0 27.8	11 33.4	0 37.3	22 25.1	0 26.5	22 00.7
15	1 01.5	9 26.8	1 44.8	21 05.2	0 29.4	12 03.5	0 37.3	22 26.4	0 26.4	21 59.3
17	0 42.3	7 49.3	1 37.1	20 58.5	0 30.9	12 33.2	0 37.3	22 27.7	0 26.3	21 57.9
19	-0 20.3	6 10.7	1 29.4	20 49.6	0 32.4	13 02.5	0 37.3	22 28.9	0 26.2	21 56.6
21	+0 04.2	4 32.9	1 21.5	20 38.3	0 33.9	13 31.4	0 37.3	22 30.0	0 26.1	21 55.3
23	0 30.9	2 58.3	1 13.7	20 24.7	0 35.3	13 59.8	0 37.4	22 31.1	0 26.1	21 53.9
25	0 59.3	1 29.7	1 05.9	20 08.8	0 36.6	14 27.8	0 37.4	22 32.1	0 26.0	21 52.6
27	+1 28.7	-0 09.9	+0 58.0	-19 50.6	+0 38.0	+14 55.3	+0 37.4	-22 33.0	+0 25.9	-21 51.3

PLANETS, 2019

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
	° '	°	° '	° '	° '	° '	° '	° '	° '	° '
Mar. 1	+1 58.0	+0 58.0	+0 50.2	-19 30.1	+0 39.3	+15 22.3	+0 37.4	-22 33.8	+0 25.8	-21 50.0
3	2 26.0	1 51.4	0 42.4	19 07.4	0 40.5	15 48.8	0 37.5	22 34.6	0 25.7	21 48.7
5	2 51.3	2 27.7	0 34.7	18 42.6	0 41.7	16 14.8	0 37.5	22 35.3	0 25.6	21 47.5
7	3 12.5	2 45.4	0 27.1	18 15.6	0 42.9	16 40.3	0 37.5	22 36.0	0 25.6	21 46.3
9	3 28.0	2 43.8	0 19.6	17 46.5	0 44.1	17 05.2	0 37.6	22 36.7	0 25.5	21 45.1
11	3 36.6	2 23.4	0 12.2	17 15.4	0 45.2	17 29.6	0 37.6	22 37.2	0 25.4	21 43.9
13	3 37.4	1 46.4	+0 05.0	16 42.4	0 46.3	17 53.4	0 37.6	22 37.7	0 25.3	21 42.8
15	3 30.1	+0 56.2	-0 02.1	16 07.4	0 47.4	18 16.7	0 37.7	22 38.2	0 25.3	21 41.7
17	3 15.3	-0 02.6	0 09.0	15 30.6	0 48.4	18 39.3	0 37.7	22 38.6	0 25.2	21 40.6
19	2 54.1	1 05.2	0 15.8	14 52.1	0 49.4	19 01.4	0 37.8	22 39.0	0 25.1	21 39.6
21	2 28.2	2 06.7	0 22.3	14 11.9	0 50.3	19 22.8	0 37.8	22 39.4	0 25.0	21 38.6
23	1 59.1	3 03.5	0 28.7	13 30.0	0 51.3	19 43.6	0 37.8	22 39.7	0 25.0	21 37.6
25	1 28.5	3 52.8	0 34.8	12 46.7	0 52.2	20 03.7	0 37.9	22 40.0	0 24.9	21 36.7
27	0 57.8	4 33.0	0 40.7	12 01.8	0 53.1	20 23.2	0 37.9	22 40.2	0 24.8	21 35.8
29	+0 27.8	5 03.2	0 46.4	11 15.7	0 53.9	20 42.0	0 37.9	22 40.4	0 24.7	21 35.0
31	-0 00.6	5 23.3	0 51.8	10 28.2	0 54.7	21 00.1	0 37.9	22 40.5	0 24.7	21 34.2
Apr. 2	0 27.1	5 33.5	0 57.0	9 39.6	0 55.5	21 17.6	0 38.0	22 40.7	0 24.6	21 33.5
4	0 51.5	5 34.3	1 01.9	8 49.8	0 56.3	21 34.4	0 38.0	22 40.8	0 24.5	21 32.8
6	1 13.4	5 26.1	1 06.5	7 59.0	0 57.0	21 50.4	0 38.0	22 40.9	0 24.4	21 32.2
8	1 33.0	5 09.5	1 10.9	7 07.3	0 57.8	22 05.8	0 38.0	22 40.9	0 24.4	21 31.6
10	1 50.1	4 45.2	1 14.9	6 14.8	0 58.5	22 20.4	0 38.0	22 40.9	0 24.3	21 31.1
12	2 04.8	4 13.6	1 18.7	5 21.5	0 59.1	22 34.3	0 38.1	22 40.9	0 24.2	21 30.6
14	2 17.1	3 35.2	1 22.1	4 27.6	0 59.8	22 47.5	0 38.1	22 40.8	0 24.2	21 30.2
16	2 27.0	2 50.5	1 25.3	3 33.1	1 00.4	22 59.9	0 38.1	22 40.8	0 24.1	21 29.8
18	2 34.6	1 59.9	1 28.1	2 38.1	1 01.0	23 11.5	0 38.1	22 40.7	0 24.0	21 29.5
20	-2 39.9	-1 03.8	-1 30.7	-1 42.7	+1 01.6	+23 22.4	+0 38.1	-22 40.5	+0 23.9	-21 29.3

URANUS, NEPTUNE AND PLUTO, 2018

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

Date	Uranus			Neptune			Pluto			Date	Uranus			Neptune			Pluto		
	°	'	"	°	'	"	°	'	"		°	'	"	°	'	"	°	'	"
Jan. 0	28	37	14	344	03	38	290	33	36	Feb. 25	29	36	32	345	46	54	292	20	13
2	28	36	37	344	06	05	290	37	36	27	29	41	17	345	51	25	292	23	19
4	28	36	13	344	08	40	290	41	38	Mar. 1	29	46	12	345	55	57	292	26	20
6	28	36	01	344	11	22	290	45	41	3	29	51	14	346	00	30	292	29	16
8	28	36	02	344	14	11	290	49	44	5	29	56	25	346	05	04	292	32	07
10	28	36	16	344	17	06	290	53	48	7	30	01	44	346	09	37	292	34	52
12	28	36	42	344	20	07	290	57	50	9	30	07	10	346	14	10	292	37	32
14	28	37	20	344	23	15	291	01	54	11	30	12	44	346	18	43	292	40	05
16	28	38	11	344	26	28	291	05	57	13	30	18	25	346	23	16	292	42	34
18	28	39	15	344	29	48	291	10	00	15	30	24	13	346	27	48	292	44	56
20	28	40	32	344	33	14	291	14	02	17	30	30	07	346	32	20	292	47	12
22	28	42	01	344	36	45	291	18	03	19	30	36	07	346	36	49	292	49	22
24	28	43	41	344	40	21	291	22	03	21	30	42	12	346	41	18	292	51	26
26	28	45	34	344	44	02	291	26	01	23	30	48	23	346	45	44	292	53	23
28	28	47	39	344	47	48	291	29	58	25	30	54	39	346	50	09	292	55	13
30	28	49	56	344	51	39	291	33	52	27	31	01	01	346	54	31	292	56	57
Feb. 1	28	52	25	344	55	34	291	37	45	29	31	07	26	346	58	52	292	58	35
3	28	55	06	344	59	34	291	41	36	31	31	13	56	347	03	09	293	00	06
5	28	57	59	345	03	37	291	45	23	Apr. 2	31	20	30	347	07	24	293	01	30
7	29	01	02	345	07	44	291	49	08	4	31	27	06	347	11	36	293	02	46
9	29	04	17	345	11	54	291	52	50	6	31	33	47	347	15	44	293	03	56
11	29	07	43	345	16	08	291	56	29	8	31	40	30	347	19	49	293	04	59
13	29	11	19	345	20	25	292	00	04	10	31	47	15	347	23	50	293	05	54
15	29	15	07	345	24	44	292	03	36	12	31	54	03	347	27	47	293	06	43
17	29	19	05	345	29	07	292	07	04	14	32	00	53	347	31	40	293	07	25
19	29	23	12	345	33	31	292	10	27	16	32	07	44	347	35	29	293	07	59
21	29	27	29	345	37	57	292	13	47	18	32	14	36	347	39	13	293	08	27
23	29	31	56	345	42	25	292	17	02	20	32	21	28	347	42	52	293	08	47
25	29	36	32	345	46	54	292	20	13	22	32	28	22	347	46	26	293	09	00

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 ± 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 Earthôs 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 observerôs geographic location because of polar motion. When UT_o is corrected for Earthôs polar motion, it is called UT1. When UT1 is further corrected for seasonal variation in the Earthôs 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 Earthôs rotation. These scales are so defined that the difference between them is purely periodic. Their difference is given by:-

$TDB = TT + 0^s.001\,657 \sin g + 0^s.000\,022 \sin (L - L_J)$, where higher order terms have been neglected. Here g is the mean anomaly of the Earth in its orbit around the Sun and is given by:-

$$g = 357^\circ.53 + 0^\circ.985\,600\,28\,(JD - 245\,1545.0)$$
$$L - L_J = 246^\circ.11 + 0.902\,517\,92\,(JD - 245\,1545.0)$$

Where $L - L_J$ is the difference in the mean longitude of the Sun and Jupiter.

Relationship Between universal time and sidereal time

Universal time is defined in terms of Greenwich mean sidereal time by:

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

where T_u is the number of Julian centuries of 36525 days of universal time elapsed since 1 January, 2000,12^h UT (JD 245 154 5.0). In other words,

$$T_u = (JD - 245\,1545.0)/\,36525$$

The above expression implies that the ratio of UT1 to GMST at the epoch J2000.0 is 0.997 269 566 329 084 and its inverse is 1.002 737 909 350 795.

The following relationship holds during 2018:

On day of year d at t^h UT1 GMST $= 6^h.640\,9056 + 0^h.065\,709\,8245\,d + 1^h.002\,737\,91\,t$

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

In 2018 :

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 2018 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, 2018 (Page 13).	6	42	23.815
		h	m	s
3.	Add equivalent mean sidereal time for 10 45 50 (UT × 1.002 737 9093).	10	47	36.094
		ð ð ð	ð ð ð	ð ð ð ð
4.	Greenwich mean sidereal time at desired L.M.T.	17	29	59.909
5.	Add equation of equinoxes at UT=0^d. 45 (second order interpolation may be used).			-0.703
		ð ð ð	ð ð ð	ð ð ð ð
6.	Greenwich apparent sidereal time	17	29	59.206
7.	Add longitude (east positive)	5	08	52.000
		ð ð ð	ð ð ð	ð ð ð ð
8.	Local apparent sidereal time	22	38	51.206

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 $22^h\ 38^m\ 51^s.206$ local apparent sidereal time on 2018 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	51.206
2.	Subtract longitude (east positive)	5	08	52.000
		ð ð ð	ð ð ð	ð ð ð ð
3.	Greenwich apparent sidereal time	17	29	59.206
4.	Subtract equation of equinox at 0^h U.T.			-0.707
		ð ð ð	ð ð ð	ð ð ð ð
5.	Greenwich mean sidereal time (provisional)	17	29	59.913
6.	Subtract Greenwich mean sidereal time at 0^h U.T.	6	42	23.815
		ð ð ð	ð ð ð	ð ð ð ð
7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.098

7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.098
8.	Mean time interval in days corresponding to (7) above = (M.S.T. (P) $\times$ 0.997 269 566) = $0^d.45$ (UT). Subtract the increment to equation of equinoxes for $0^d.45$ UT (using second order interpolation)	(-)		00.005
		ð ð ð ð	ð ð ð	ð ð
9.	Mean sidereal time	10	47	36.093
10.	Equivalent UT (MST $\times$ 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 Earthôs 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 Earthôs 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 λ + y cosλ) tanϕ/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 + ε_γ/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 ï 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 ï 0.000 091 ($\dot{n}'$ + 26) (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	1860.0	+ 7.88	1900.0	− 2.72	1940.0	+ 24.33	1980.0	+ 50.54
1821	11.7	1861	7.82	1901	1.54	1941	24.83	1981	51.38
1822	11.4	1862	7.54	1902	− 0.02	1942	25.30	1982	52.17
1823	11.1	1863	6.97	1903	+ 1.24	1943	25.70	1983	52.96
1824	10.6	1864	6.40	1904	2.64	1944	26.24	1984	53.79
1825.0	+ 10.2	1865.0	+ 6.02	1905.0	+ 3.86	1945.0	+ 26.77	1985.0	+ 54.34
1826	9.6	1866	5.41	1906	5.37	1946	27.28	1986	54.87
1827	9.1	1867	4.10	1907	6.14	1947	27.78	1987	55.32
1828	8.6	1868	2.92	1908	7.75	1948	28.25	1988	55.82
1829	8.0	1869	1.82	1909	9.13	1949	28.71	1989	56.30
1830.0	+ 7.5	1870.0	+ 1.61	1910.0	+ 10.46	1950.0	+ 29.15	1990.0	+ 56.86
1831	7.0	1871	+ 0.10	1911	11.53	1951	29.57	1991	57.57
1832	6.6	1872	− 1.02	1912	13.36	1952	29.97	1992	58.31
1833	6.3	1873	1.28	1913	14.65	1953	30.36	1993	58.12
1834	6.0	1874	2.69	1914	16.01	1954	30.72	1994	59.98
1835.0	+ 5.8	1875.0	− 3.24	1915.0	+ 17.20	1955.0	+ 31.07	1995.0	+ 60.78
1836	5.7	1876	3.64	1916	18.24	1956	31.35	1996	61.63
1837	5.6	1877	4.54	1917	19.06	1957	31.68	1997	62.29
1838	5.6	1878	4.71	1918	20.25	1958	32.18	1998	62.97
1839	5.6	1879	5.11	1919	20.95	1959	32.68	1999	63.47
1840.0	+ 5.7	1880.0	− 5.40	1920.0	+ 21.16	1960.0	+ 33.15	2000.0	+ 63.83
1841	5.8	1881	5.42	1921	22.25	1961	33.59	2001	64.09
1842	5.9	1882	5.20	1922	22.41	1962	34.00	2002	64.30
1843	6.1	1883	5.46	1923	23.03	1963	34.47	2003	64.47
1844	6.2	1884	5.46	1924	23.49	1964	35.03	2004	64.57
								2005	+ 64.69
1845.0	+ 6.3	1885.0	− 5.79	1925.0	+ 23.62	1965.0	+ 35.73	2006	+ 64.85
1846	6.5	1886	5.63	1926	23.86	1966	36.54	2007	+ 65.15
1847	6.6	1887	5.64	1927	24.49	1967	37.43	2008	+ 65.46
1848	6.8	1888	5.80	1928	24.34	1968	38.29	2009	+ 65.78
1849	6.9	1889	5.66	1929	24.08	1969	39.20	2010	+ 66.07
								2011	+ 66.32
1850.0	+ 7.1	1890.0	− 5.87	1930.0	+ 24.02	1970.0	+ 40.18	2012	+ 66.60
1851	7.2	1891	6.01	1931	24.00	1971	41.17	2013	+ 66.91
1852	7.3	1892	6.19	1932	23.87	1972	42.23	2014	+ 67.28
1853	7.4	1893	6.64	1933	23.95	1973	43.37	2015	+ 67.64
1854	7.5	1894	6.44	1934	23.86	1974	44.49	2016	+ 68.10
								Extrapolated Values	
1855.0	+ 7.6	1895.0	− 6.47	1935.0	+ 23.93	1975.0	+ 45.48	2017	+ 68.5
1856	7.7	1896	6.09	1936	23.73	1976	46.46	2018	+ 69
1857	7.7	1897	5.76	1937	23.92	1977	47.52	2019	+ 69
1858	7.8	1898	4.66	1938	23.96	1978	48.53	2020	+ 70
1859	7.8	1899	3.74	1939	24.02	1979	49.59	2021	+ 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 Earthôs 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 Sunôs apparent yearly motion lies in the ecliptic, the plane of the Earthôs 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 ñthe equator and equinox of (some date)ò.

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 Earthôs 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 ñJ2000.0ò, which is 12h TT on January 2000). Each objectôs instantaneous position, expressed as right ascension and declination, indicates the objectôs angular distance from the catalogôs 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 starǿs 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 ñrealizationò 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 ñbetweenò 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 ñbetweenò (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 poleôs 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

$$\psi_A = 5038''.481\,507\,T - 1''.079\,0069\,T^2 - 0''.001\,140\,45\,T^3 + 0''.000\,132\,851\,T^4 - 9''.51 \times 10^{-8}\,T^5$$

$$\omega_A = \varepsilon_0 - 0''.025\,754\,T + 0''.051\,2623\,T^2 - 0''.007\,725\,03\,T^3 - 0''.000\,000\,467\,T^4 + 33''.37 \times 10^{-8}\,T^5$$

$$\chi_A = 10''.556\,403\,T - 2''.381\,4292\,T^2 - 0''.001\,211\,97\,T^3 + 0''.000\,170\,663\,T^4 - 5''.60 \text{ X } 10\text{-}8\,T^5$$

The mean obliquity of the ecliptic at J2000.0 (or the equivalent TDB date) is $\varepsilon_0 = 84381''.406$

(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 ζ_A, Z_A and θ_A with the following:

$$\zeta_A = 2''.650545 + 2306''.083227\,T + 0''.2988499\,T^2 + 0''.01801828\,T^3 - 0''.000005971\,T^4 - 0''.0000003173\,T^5$$

$$Z_A = -2''.650545 + 2306''.077181\,T + 1''.0927348\,T^2 + 0''.01826837\,T^3 - 0''.000028596\,T^4 - 0''.0000002904\,T^5$$

$$\theta_A = 2004''.191903\,T - 0''.4294934\,T^2 - 0''.04182264\,T^3 - 0''.000007089\,T^4 - 0''.0000001274\,T^5$$

The centennial (per Julian century) rates of general precession in right ascension and declination are given by :

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

$$n = 2004''.191\,903 - 0''.858\,986\,8\,T - 0''.125\,467\,92\,T^2 - 0''.000\,028\,356\,T^3$$

The elements of the matrix **P** given in terms of ζ_A, Z_A, θ_A are as follows:

$$\mathbf{P} = \begin{bmatrix} \cos\zeta_A \cos\theta_A \cos Z_A - \sin\zeta_A \sin Z_A & -\sin\zeta_A \cos\theta_A \cos Z_A - \cos\zeta_A \sin Z_A & -\sin\theta_A \cos Z_A \\ \cos\zeta_A \cos\theta_A \sin Z_A + \sin\zeta_A \cos Z_A & -\sin\zeta_A \cos\theta_A \sin Z_A + \cos\zeta_A \cos Z_A & -\sin\theta_A \sin Z_A \\ \cos\zeta_A \sin\theta_A & -\sin\zeta_A \sin\theta_A & \cos\theta_A \end{bmatrix}$$

The formula for reduction of precession in right ascension and declination are as follows :

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

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

EXPLANATION

Values of the angles ζ_A, Z_A, θ_A and of the elements of the matrix P for reduction from the standard epoch J 2000.0 to epoch of year are as follows:

Epoch J 2018.5 — Rotation matrix P for reduction to epoch J 2018.5

$$\begin{aligned}\zeta_A &= +429''.286 = +0^\circ.119\,246\\ Z_A &= +424''.011 = +0^\circ.117\,781\\ \theta_A &= +370''.761 = +0^\circ.102\,989\end{aligned}\qquad \mathbf{P} = \begin{bmatrix} +0.999\,989\,83 & -0.004\,136\,89 & -0.001\,797\,49\\ +0.004\,136\,89 & +0.999\,991\,44 & -0.000\,003\,70\\ +0.001\,797\,49 & -0.000\,003\,74 & +0.999\,998\,38\end{bmatrix}$$

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:

$$\begin{aligned}\sin\pi_A \sin\Pi_A &= +4''.199\,094\,T + 0''.193\,987\,T^2 - 0''.000\,224\,66\,T^3\\ \sin\pi_A \cos\Pi_A &= -46''.811\,015\,T + 0''.051\,028\,T^2 + 0''.000\,524\,13\,T^3\end{aligned}$$

For epoch J 2018.5

$$\begin{aligned}\varepsilon &= 23^\circ\,26'\,12''.74 &&= 23^\circ.436\,873\\ \pi_A &= +8''.694 &&= 0^\circ.002\,414\,9\\ \Pi_A &= 174^\circ\,49'.8 &&= 174^\circ.830\end{aligned}$$

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

The precessional constants M, N etc. are given by :

$$\begin{aligned}M &= 1^\circ.281\,155\,668\,9\,T + 0^\circ.000\,386\,551\,31\,T^2 + 0^\circ.000\,010\,079\,T^3\\ N &= 0^\circ.556\,719\,973\,1\,T - 0^\circ.000\,119\,303\,72\,T^2 - 0^\circ.000\,011\,617\,4\,T^3\\ a &= 1^\circ.396\,887\,83\,T + 0^\circ.000\,307\,065\,22\,T^2\\ b &= 0^\circ.013\,055\,270\,3\,T - 0^\circ.000\,009\,303\,50\,T^2\\ c &= 5^\circ.125\,890\,67 + 0^\circ.818\,993\,58\,T + 0^\circ.000\,104\,256\,09\,T^2 - 0^\circ.000\,104\,155\,607\,T^3\\ c' &= 5^\circ.125\,890\,67 - 0^\circ.577\,894\,252\,T - 0^\circ.000\,164\,504\,28\,T^2 - 0^\circ.000\,104\,177\,728\,T^3\end{aligned}$$

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 :

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

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

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

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

where $\tau = t - t_1$ and π is the annual rate of rotation of the ecliptic. The precessional constants p, m, etc. are as follows :

		Epoch J 2018.5
Annual general precession	p =	$+ 0^\circ.013\,970\,9$
Annual precession in R.A.	m =	$+ 0^\circ.012\,813\,76$
Annual precession in Dec.	n =	$+ 0^\circ.005\,567\,1$
Annual rate of rotation	π =	$+ 0^\circ.000\,130\,5$
Longitude of axis	Π =	$+ 174^\circ.8295$

$$\gamma = 180^\circ - \Pi = +5^\circ.1705$$

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 ñtransfer functionò 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 Moonôs 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.

$$l = 485\,868''.249\,036 + (1325^{r} + 715\,923''.2178)\,T + 31''.8792\,T^2 + 0''.051\,635\,T^3 - 0''.000\,244\,70\,T^4$$

$$l' = 128\,7104''.793\,04 + (99^{r} + 129\,2581''.048)\,T - 0''.5532\,T^2 - 0''.000\,136\,T^3 - 0''.000\,011\,49\,T^4$$

$$F = 335\,779''.526\,232 + (1342^{r} + 295\,262''.8478)\,T - 12''.7512\,T^2 - 0''.001\,037\,T^3 + 0''.000\,004\,17\,T^4$$

$$D = 107\,2260''.703\,69 + (1236^{r} + 110\,5601''.209)\,T - 6''.3706\,T^2 + 0''.006\,593\,T^3 - 0''.000\,031\,69\,T^4$$

$$\Omega = 450\,160''.398\,036 - (5^{r} + 482\,890''.5431)\,T + 7''.722\,T^2 + 0''.007\,702\,T^3 - 0''.000\,059\,39\,T^4$$

where $1^{r} = 360^{o} = 129\,6000''$

Reduction for nutation - rigorous formulae

Nutation in longitude ($\Delta\psi$) and obliquity ($\Delta\varepsilon$) have been calculated using IAU 2000A series definitions (order of 1 μas) with the following adjustments which are required for use at the highest precession with the IAU 2006 precession, viz:

$$\Delta\psi = \Delta\psi_{2000A} + (0.4697 \times 10^{-6} - 2.7774 \times 10^{-6} T)\,\Delta\psi_{2000A}$$

$$\Delta\varepsilon = \Delta\varepsilon_{2000A} - 2.7774 \times 10^{-6}\,T\,\Delta\varepsilon_{2000A}$$

where T is measured in Julian centuries from 245 1545.0 TT. $\Delta\psi$ and $\Delta\varepsilon$ together with the true obliquity of the ecliptic (ε') are tabulated daily at 0^h TT, on page 18 to 32.

Once the nutation series has been evaluated and the values of $\Delta\psi$ and $\Delta\varepsilon$ are available, the nutation matrix can be constructed.

A mean place ($\mathbf{r}_m$) may be transformed to a true place ($\mathbf{r}_t$) and vice versa, as follows:

$$\mathbf{r}_t = \mathbf{N}\,\mathbf{r}_m \qquad \mathbf{r}_m = N^{-1}\,\mathbf{r}_t$$

where $\mathbf{N} = \mathbf{R}_1(-\varepsilon')\,\mathbf{R}_3(-\Delta\psi)\,\mathbf{R}_1(+\varepsilon)$

$$\varepsilon' = \varepsilon + \Delta\varepsilon$$

$\mathbf{R}_1$ and $\mathbf{R}_3$ are the standard rotations about the x and z axes respectively.

(i) A rotation from the mean equator and equinox of t to the mean ecliptic and equinox of t. This is simply a rotation around the x - axis (the direction toward the mean equinox of t) by the angle ε, the mean obliquity of t.

(ii) A rotation around the new z-axis (the direction toward the ecliptic pole of t) by the angle - $\Delta\psi$, the amount of nutation in longitude at t. After the rotation, the new x- axis is in the direction of true equinox of t.

(iii) A rotation around the new x-axis (the direction toward true equinox of t by the angle $-\varepsilon'$, the true oliquity of t. After the rotation, the fundamental plane is the true equator of t, orthogonal to the computed position of the CIP at t.

The nutation matrix can be written:

$$\mathbf{N} = \begin{bmatrix} C_2 & S_2C_1 & S_2S_1 \\ -S_2C_3 & C_3C_2C_1 - S_1S_3 & C_3C_2S_1 + C_1S_3 \\ S_2S_3 & -S_3C_2C_1 - S_1C_3 & -S_3C_2S_1 + C_3C_1 \end{bmatrix}$$

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

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

Approximate reduction for nutation for converting mean place to true place can be done with the help of the following formualae :

$$\Delta\alpha = (\cos\varepsilon + \sin\varepsilon \sin\alpha \tan\delta)\,\Delta\psi - \cos\alpha \tan\delta\,\Delta\varepsilon$$

$$\Delta\delta = \sin\varepsilon \cos\alpha\,\Delta\psi + \sin\alpha\,\Delta\varepsilon$$

$$\Delta\lambda = \Delta\psi; \qquad \Delta\beta = 0$$

where $\Delta\psi$ and $\Delta\varepsilon$ are nutations in longitude and obliquity respectively. Mean rectangular coordinates (x, y, z) can be converted to true rectangular co-ordinates with the help of the following :

$$\Delta x = ï\ (y \cos \varepsilon + z \sin \varepsilon)\ \Delta\psi$$
$$\Delta y = +\ x\ \Delta\psi \cos \varepsilon\ ï\ z\ \Delta\varepsilon$$
$$\Delta z = +\ x\ \Delta\psi \sin \varepsilon + y\ \Delta\varepsilon$$

where both $\Delta\psi$ and $\Delta\varepsilon$ are in radians.

The elements of the corresponding rotation matrix are:

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

Daily values of $\Delta\psi$ and $\Delta\varepsilon$ during 2018 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 2018 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 2018		*f* s	*g* s	,*g* ′	*G* h m	Date 2018		*f* s	*g* s	*g* ′	*G* h m
Jan.	**- 8**	+54.6	23.7	5.93	00 05	**July**	**1**	+56.1	24.4	6.09	00 04
	2 *	+54.7	23.8	5.94	00 05		**11**	+56.1	24.4	6.10	00 04
	12	+54.8	23.8	5.96	00 05		**21 ***	+56.2	24.4	6.11	00 04
	22	+54.9	23.8	5.96	00 05		**31**	+56.3	24.5	6.12	00 04
Feb.	**1**	+55.0	23.9	5.98	00 05	**Aug.**	**10**	+56.4	24.5	6.13	00 04
	11 *	+55.0	23.9	5.98	00 05		**20**	+56.5	24.5	6.14	00 04
	21	+55.1	23.9	5.98	00 04		**30 ***	+56.5	24.6	6.14	00 03
Mar.	**3**	+55.2	24.0	5.99	00 04	**Sept.**	**9**	+56.6	24.6	6.15	00 03
	13	+55.2	24.0	6.00	00 04		**19**	+56.7	24.6	6.16	00 03
	23 *	+55.2	24.0	6.00	00 04		**29**	+56.7	24.6	6.16	00 03
Apr.	**2**	+55.3	24.0	6.01	00 04	**Oct.**	**9 * À**	+56.8	24.7	6.17	00 03
	12	+55.4	24.1	6.01	00 04		**19**	+56.8	24.7	6.17	00 03
	22	+55.4	24.1	6.02	00 04		**29**	+56.9	24.7	6.18	00 03
May	**2 ***	+55.5	24.1	6.03	00 04	**Nov.**	**8**	+56.9	24.7	6.19	00 03
	12	+55.6	24.1	6.04	00 04		**18 ***	+57.0	24.8	6.20	00 03
	22	+55.7	24.2	6.05	00 04		**28**	+57.2	24.8	6.21	00 03
June	**1**	+55.7	24.2	6.06	00 04	**Dec.**	**8**	+57.2	24.9	6.22	00 04
	11 *	+55.8	24.3	6.07	00 04		**18**	+57.3	24.9	6.23	00 03
	21	+56.0	24.3	6.08	00 04		**28 ***	+57.5	25.0	6.24	00 03
July	**1**	+56.1	24.4	6.09	00 04		**38**	+57.6	25.0	6.26	00 03

* 40 - day date À400 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 2018.5

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:

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

Annual aberration for reduction from a geometric place (α_0, δ_o) to an apparent geocentric place (α, δ) is given by :

$$\alpha = \alpha_0 + (-\dot{X} \sin \alpha_0 + \dot{Y} \cos \alpha_0) / (c \cos \delta_0)$$

$\delta = \delta_0 + (-\dot{X} \cos \alpha_0 \sin \delta_0 - \dot{Y} \sin \alpha_0 \sin \delta_0 + \dot{Z} \cos \delta_0)/ c$, where c = 173.14 a.u./day and $\dot{X}, \dot{Y}, \dot{Z}$ are the velocity components of the Earth (pages 256 to 270).

The reduction of observations of the radial velocity to a common origin at the barycentre is given by adding the component of the Earth's velocity in the direction (α_0, δ_0) of the object :

$$\dot{X} \cos \alpha_0 \cos \delta_0 + \dot{Y} \sin \alpha_0 \cos \delta_0 + \dot{Z} \sin \delta_0$$

Differential annual aberration corrections to be added to the observed differences of right ascension and declination (in the sense moving object minus star) to give true differences are:

(R.A.) a $\Delta\alpha + b\,\Delta\delta$ (in units of $0^s.001$) ; (declination) c $\Delta\alpha + d\,\Delta\delta$ (in units of $0''.01$)

Here $\Delta\alpha$ is to be taken in units of 1^m and $\Delta\delta$ in units of 1'. The coefficients a, b, c and d are defined by:

$a = -5.701 \cos (H+\alpha) \sec \delta$

$b = -0.380 \sin (H+\alpha) \sec \delta \tan \delta$

$c = +8.552 \sin (H+\alpha) \sin \delta$

$d = -0.570 \cos (H+\alpha) \cos \delta$

$H^h = 23.4 - (\text{day of year}/15.2)$

(The day of year is tabulated on pages 4 to 12)

Annual parallax correction can be calculated approximately for reduction from the catalogue place (α_0,δ_0) to the geocentric place (α,δ) using the following formulae;

$\alpha = \alpha_0 + (\pi / 15 \cos \delta_0)(X \sin \alpha_0 - Y \cos \alpha_0)$ 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 2018 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 359. 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 Sunôs 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 7837é é é ..s
Geocentric gravitational constant, GE	3.986 004 418 x $10^{14} m^3 s^{-2}$	3.986 004 48é é x $10^{14} m^3 s^{-2}$
Heliocentric gravitational constant, GS	1.327 124 42 099 x $10^{20} m^3 s^{-2}$	1.327 124 40é é x $10^{20} m^3 s^{-2}$
Ratio of mass of Sun to that of Earth, (GS)/ (GE)	332 946.0 487	332 946.038é é é .
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″.4119é .
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 2018 only :

Geometric mean longitude	:	$L = 279^\circ.619\,367 + 0.985\,647\,36\ d$
Mean longitude of perigee	:	$\Gamma = 283^\circ.246\,811 + 0.000\,047\,08\ d$
Mean anomaly	:	$g = 356^\circ.372\,556 + 0.985\,600\,28\ d$
Eccentricity	:	$e = 0^\circ.016\,701\,06 - 0.\,000\,000\,0012\ d$
Obliquity of the ecliptic w.r.t. mean equator of date	:	$\varepsilon = 23^\circ.436\,938 - 0.000\,000\,36\ d$

where d is the interval in days from 2018 January 0 at 0^h TT and is given by

d = JD − 245 7387.5 = 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 2018.0 as derived from the Sunȇs 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 2018.5. Revised value of the annual general precession p = $0^\circ.\,013\,9709$ (for J 2018.5) 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 447.

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 Sunôs surface, as seen from the Earth, can be converted into its heliocentric angular distance ρ from the centreof the Sunôs 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 Sunôs disc can be converted into heliographic co-ordinates (L, B) as follows :

$$\sin B = \sin B_o \cos \rho + \cos B_o \sin \rho \cos (P - \theta)$$
$$\cos B \sin (L - L_o) = \sin \rho \sin (P - \theta)$$
$$\cos B \cos (L - L_o) = \cos \rho \cos B_o \text{ ï } \sin B_o \sin \rho \cos (P - \theta)$$

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. Carringtonôs 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, 2018

Number	Date of Commencement			Number	Date of Commencement			Number	Date of Commencement		
2199	2017	Dec.	30.94	2204	2018	May	16.45	2209	2018	Sept.	29.58
2200	2018	Jan.	27.27	2205		June	12.66	2210		Oct.	26.87
2201		Feb.	23.61	2206		July	9.86	2211		Nov.	23.17
2202		Mar.	22.93	2207		Aug.	6.07	2212	2018	Dec.	20.49
2203		Apr.	19.22	2208		Sept.	2.31	2213	2019	Jan.	16.83

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 2018 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 2018 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 :

$$i = 24^\circ.584 - 0.000\,939\,d - 0.000\,000\,408\,d^2$$

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 :

$$\Delta = 319^\circ.262\,2 - 0.050\,554\,d - 0.000\,001\,014\,d^2$$

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 :

$$\Omega' = -2^\circ.531 - 0.002\,623\,d + 0.000\,001\,127\,d^2$$

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°.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 :

$$L' = 73^\circ.358\,817 + 13.176\,396\,46\,d$$

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

$$\Gamma' = 95^\circ.663\,96 + 0.111\,403\,42\,d$$

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

$$\Omega = 136^\circ.953\,049 - 0.052\,953\,74\,d$$

Mean elongation of the Moon from the Sun :

$$D = L' - L = 153^\circ.739\,449 + 12.190\,749\,1\,d$$

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

The above expressions are valid for use in 2018 only.

In all the above expressions, the time argument d is the interval in days since 0^h TT January 0, 2018 and is given by $d = \mathrm{JD} - 245\,8118.5$

The length of the principal mean months at 2018.0 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.

The position angle of the bright limb is the position angle of the mid point of the illuminated limb, reckoned eastward from the north point of the disc. The position angle of the two cusps may be obtained by adding $\pm 90°$ to that of the bright limb.

The expression for calculating the selenographic altitude (a) of the Sun (above the lunar horizon) at a point at selenographic longitude *l* and latitude *b* is as follows :

$\sin a = \sin b_\circ \sin b + \cos b_\circ \cos b \sin (c_\circ + l)$, where $(c_\circ, b_\circ)$ are the Sun's co-longitude and latitude at the time.

The following expressions can be used to compute the differential corrections to be applied to the tabular geocentric librations to form the topocentric librations :

$$\Delta l = - \pi' \sin (Q - C) \sec b$$
$$\Delta b = + \pi' \cos (Q - C)$$
$\Delta C = + \sin (b + \Delta b) \Delta l - \pi' \sin Q \tan \delta$, where Q is the geocentric parallactic angle of the Moon and π' is the topocentric horizontal parallax. The latter is obtained from the geocentric horizontal parallax (π) (pages 64 to 79) by using :

$$\pi' = \pi (\sin z + 0.0084 \sin 2 z)$$
where z is the geocentric zenith distance of the Moon. The values of z and Q may be calculated from the geocentric R.A. (α) and declination (δ) of the Moon by using :

$$\sin z \sin Q = \cos \phi \sin h$$
$$\sin z \cos Q = \cos \delta \sin \phi - \sin \delta \cos \phi \cos h$$
$$\cos z = \sin \delta \sin \phi + \cos \delta \cos \phi \cos h$$
where ϕ is the geocentric latitude of the observer and h is the local hour angle of the Moon given by :
h = local apparent sidereal time $- \alpha$

Second differences in the tabular values of the geocentric librations must be taken into account in interpolation for the time of observation.

Major Planets

The heliocentric and geocentric positions of the major planets given on pages 96 to 197 have been derived directly from the numerical integration mentioned on page 446.

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

planetős 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 Earthős 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 Earthős centre is given by :

Earthős Centre $=$ (Earth / Moon barycentre) $-$ (0.000 0312 cos L, 0.000 2865 sin L, 0.0000124 sinL,
-0.00000718 sinL,0.00000657 cosL, 0.00000285 cosL)

where $L = 218^\circ + 481\ 268^\circ\ T$, 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 451 important stars have been computed using the conversion from equatorial mean positions to ecliptic co-ordinates. Similarly, annual variations in longitude and latitude, etc., are the differentials of the conversion formulae. All quantities relate to the middle of the current Julian year.

Apparent Places of Stars (pages 227 to 243)

The apparent places of 68 selected stars are reported under this section. These positions are completely based on the FK5 beginning with the issue for 1988.

Smaller aberration has been computed from the total velocity of the Earth referred to the barycentre of the solar system. The E-terms of aberration are no longer included in the mean places in the FK5, but rather in the reduction from mean to apparent places.

Reductions to apparent places have been computed rigorously and directly without the intermediary of the mean place for the begining of the year. The rigorous computation also includes effects of relativistic light deflection. Because of this, the apparent places of a star when approaching very closely the Sun cannot be interpolated by the user, but these cases are of no practical interest in normal applications.

Apparent places of 68 bright stars with annual variation and annual proper motion at 10-day interval have been given on pages 227 to 243. The number, name, are taken generally from the FK5, magnitude and spectrum are taken from SIMBAD data base. Corrections for parallax have been applied where appreciable.

The right ascension and declination are referred to the true equator and equinox of date but with the omission of the short period terms of nutation. After interpolating the given apparent places to date and longitude of the station, the following corrections for the effect of short period terms of nutation are to be applied :

$$\Delta\alpha = a\,d\psi + b\,d\varepsilon \quad \text{seconds of time}$$
$$\Delta\delta = a'\,d\psi + b'\,d\varepsilon \quad \text{seconds of arc}$$

where $d\psi$ and $d\varepsilon$ are short period terms of nutation as tabulated on pages 244 to 251. The values of a, b, a' and b' are given for each star under the apparent place.

The Apparent places of Polaris for each day of the year (pages 272 to 274) have been computed rigorously.

Besselian Day Numbers (pages 244 to 251)

All stellar data tabulations are now for the standard epoch at the middle of the current Julian year rather than the beginning of the Besselian year and accordingly the Besselian Day Numbers and second order day numbers are referred to the mean equator and equinox of the epoch, J 2018.5. 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 2018.5 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:

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

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 :-

$$\mathbf{q} = (\cos\alpha_0 \cos\delta_0 , \quad \sin\alpha_0 \cos\delta_0 , \quad \sin\delta_0)$$

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

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

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:

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

Where $\mu/c^2 = 9.87 \text{ X } 10^{-9}$ a.u and $E = |\mathbf{E}|$, the vector $\mathbf{p}_1$ is a unit vector to the order of μ/c^2 and dot (**.**) indicates scalar product.

The proper direction $\mathbf{p}_2$ in the geocentric inertial frame, that is moving with the instantaneous velocity **V** of the Earth relative to the natural frame, is given by:

$$\mathbf{p}_2 = (\beta^{-1}\mathbf{p}_1 + (1 + \mathbf{p}_1.\mathbf{V})/(1+\beta^{-1}))\mathbf{V})/(1+\mathbf{p}_1.\mathbf{V}) \text{é é é é é} \quad (4)$$

Where $\mathbf{V} = \dot{\mathbf{E}}_{\mathbf{B}}/c = 0.0057755\, \dot{\mathbf{E}}_{\mathbf{B}}$ and $\beta = (1 - V^2)^{-1/2}$; the velocity **V** expressed in units of velocity of light and is equal to the Earthôs 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:

$$\mathbf{p}_3 = M\,\mathbf{p}_2 \quad \text{é é é é é é é ..} \quad (5)$$

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 :

$$\alpha = \tan^{-1}(\eta/\xi) \quad \text{and} \quad \delta = \tan^{-1}(\zeta/\beta) \text{ é é é é é é} \quad (6)$$

Where $\beta = (\xi^2 + \eta^2)^{1/2}$

where the quadrant of α can be determined by the signs of ξ and η.

Correction for polar motion :

The apparent geocentric direction $\mathbf{p}_3$, given by equation (5) above, is for the true equator and equinox with the z axis pointing towards the celestial ephemeris pole. A further correction for polar motion may be applied to $\mathbf{p}_3$ to obtain $\mathbf{p}_4$ i.e. the direction relative to the conventional terrestrial reference system in which the z-axis is in the direction of the adopted mean position of the pole, as follows :

$$\mathbf{p}_4 = \mathbf{R}_2(-x)\,\mathbf{R}_1(-y)\,\mathbf{R}_3(\text{GAST})\,\mathbf{p}_3$$

where GAST is the Greenwich apparent sidereal time at the corresponding instant of UT and

$$\mathbf{R}_1(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & \sin\theta \\ 0 & -\sin\theta & \cos\theta \end{bmatrix} \qquad \mathbf{R}_2(\theta) = \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix}$$

$$\mathbf{R}_3(\theta) = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

are the standard matrices that produce rotations through an angle θ about the x, y and z - axes respectively.

Polar motion is described by x and y, the co- ordinates of the celestial ephemeris pole with respect to the adopted origin; x and y are measured in seconds of arc from the origin along the meridians at longitudes 0° and 270°. Current values for the reduction of observations are published by the International Polar Motion Service and the Bureau International de lôHeure.

Example of stellar reduction :

Calculation of apparent position of a fictitious star on 2018, 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:

$\alpha_0 = 14^h\ 39^m\ 36^s.087$ $\qquad$ $\mu_\alpha = -49.486$ s/ century
$\qquad\qquad\qquad\qquad\qquad\qquad = -0.000\,239\,915$ rad/century

$\delta_0 = -60°\ 50'\ 07''.14$ $\qquad$ $\mu_\delta = +69''.60$ s/ century
$\qquad\qquad\qquad\qquad\qquad\qquad = +0.000\,337\,430$ rad/ century

$\pi = 0''.752$ $\qquad$ $\nu = -22.2$ km/ s
$= 3.6458 \times 10^{-6}$ rad $\qquad$ $\nu\pi = -0.001\,707\,360$ rad/ century

The barycentric position vector of the Sun and the position and velocity vectors of the Earth referred to J2000.0 on 2018 January 1, 0^h TDB (pages 202, 256 to 270) are :

Vector	Julian date	Barycentric Rectangular Components x	y	z
$\mathbf{E}_B$	245 8119.5	$-0.173\,417\,352$	$+0.893\,409\,498$	$+0.387\,167\,975$
$\dot{\mathbf{E}}_\mathbf{B}$	245 8119.5	$-0.017\,207\,098$	$-0.002\,867\,324$	$-0.001\,243\,260$
$\mathbf{S}_\mathbf{B}$	245 8119.5	$+0.001\,802\,712$	$+0.005\,672\,380$	$+0.002\,328\,253$

In order to calculate the geocentric vector **P** of the star at J 2000.0, using equation (1), the vectors **q** and **m** may be computed using positional data of the star.

$\mathbf{q} = (-0.373\,854\,098,\quad -0.312\,594\,565,\quad -0.873\,222\,624)$
$\mathbf{m} = (+0.000\,258\,364,\quad +0.000\,528\,759,\quad +0.001\,655\,343)$
$\mathbf{T} = (245\,8119.5 - 245\,1545.0)/\,36525 \;=\; +0.180\,000\,000$

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

$\mathbf{P} \;= (-0.373\,806\,960,\quad -0.312\,502\,645,\quad -0.872\,926\,074)$ and $|\mathbf{P}| = 0.999\,694\,692$

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

$\mathbf{E} \;= (-0.175\,220\,064,\quad +0.887\,737\,118,\quad +0.384\,839\,722)$ and $|\mathbf{E}| = 0.983\,301\,008$

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

$\mathbf{p} \;= (-0.373\,921\,121,\quad -0.312\,598\,084,\quad -0.873\,192\,667)$

$\mathbf{e} \;= (-0.178\,195\,753,\quad +0.902\,813\,188,\quad +0.391\,375\,295)$

The scalar product $\mathbf{p.\,e} = -0.557\,332\,554$ and $2\mu/c^2 = 1.974 \times 10^{-8}$ a. u. The second term in the equation (3) represents the correction for the light deflection in the natural frame, and is given by the following vector :

$(2\mu/c^2\mathbf{E})\,(\mathbf{e} - (\mathbf{p.\,e})\,\mathbf{p})/\,(1 + \mathbf{p.\,e}) = (-0.000\,000\,017,\quad +0.000\,000\,032,\quad -0.000\,000\,004)$

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

$\mathbf{p_1}$ = ($-$0.373 921 139, $-$0.312 598 051, $-$0.873 192 671)

The velocity vector $\mathbf{V} = 0.005\,7755\,\dot{\mathbf{E}}_\mathbf{B}$ and $\beta^{-1} = (1 - V^2)^{1/2}$ are as follows:

V = ($-$0.000 099 380, $-$0.000 016 560, $-$0.000 007 180)

$\beta^{-1} = 0.999\,999\,995$

The scalar product $\mathbf{p_1}.\,\mathbf{V} = +\,0.000\,048\,607$

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

$\mathbf{p_2}$ = ($-$0.374 002 340, $-$0.312 599 416, $-$0.873 157 406)

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

$$\mathbf{M} = \begin{bmatrix} +0.999\,990\,61 & -0.003\,973\,71 & -0.001\,726\,54 \\ +0.003\,973\,77 & +0.999\,992\,10 & +0.000\,032\,32 \\ +0.001\,726\,39 & -0.000\,039\,18 & +0.999\,998\,51 \end{bmatrix}$$

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 $\mathbf{p_3}$ = ($-$ 0.371 249 114, $-$ 0.314 111 363, $-$ 0.873 789 532) and the apparent right ascension and declination:

$\alpha = \tan^{-1}(\eta/\xi) = 14^{h}\ 40^{m}\ 56^{s}.240$; $\delta = \tan^{-1}(\zeta/\beta) = -60^{\circ}\ 54''\ 07'.3415$

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 369.

PART IV — ECLIPSES AND OCCULTATIONS

Eclipses and Occultations have been calculated on the basis of the tabulated positions of the Sun and the Moon. The semi-diameters of the Sun and the Moon used in these calculations exclude irradiation. The Sun's tabular semi-diameter which includes irradiation is diminished by 1."55 for this purpose.

The semi-diameter of the Moon given by $\sin s = k \sin \pi$, where π is the Moon's horizontal parallax is based on the adopted constant $k = 0.272\ 5076$ to account for the irregularities of the lunar limb. It corresponds to the mean radius of Watt's datum as determined by observations of occultations and to the adopted radius of the Earth, introduced in 1982 and is consistent with the IAU system of Astronomical constants (1976) . It is used with effect from 1986 in this publication. Refraction is neglected in calculation of eclipses of both the Sun and the Moon.

EXPLANATION

The circumstances of the phenomena are given provisionally in Universal Time, using $\Delta T\ (A) = +\ 69^s.0$ 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 ɣ is given by :

sin ɣ = { 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 ɣ).

The value of ɣ should be so taken that cos ɣ may be negative for the beginning and positive for the ending of the phase. In other words, when sin ɣ is positive, i.e., when $(M - N)$ falls in the 1st or the 2nd quadrant, ɣ would be in the second quadrant for the beginning and in the first quadrant for the ending; and when sin ɣ is negative, i.e., when $(M - N)$ is in the 3rd or the 4th quadrant, ɣ 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 Moonôs diameter being unity, is (L_1 ï Δ)/ 2 s,

where Δ = 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 Moonôs limb, measured from the north point in the direction N.E.S.W. is 180Ǔ+ N + ɣ for the first and last contacts both with umbra and penumbra as the case may be, and is N + ɣ 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 + ɣ = M, i.e., $P = M$ + 180Ǔor $P = M$ 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 Earthôs equatorial radius. The quantities d and ε 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, ε, 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, $\xi,\ \eta,\ \zeta$ 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 :

$$\xi' = \varepsilon' \rho \cos \phi' \cos H$$

$$\eta' = \varepsilon' \xi \sin d - \zeta d'$$

where $H = \varepsilon + \lambda$ and ε' 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 observerôs latitude ϕ using Table ï 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 0º to 180º, 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 Sunôs 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 $y - \eta$ 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 é é é	0°	10°	20°	30°	40°	50°	60°
η é é é	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 observerôs 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 Moonôs 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 óphenomenaô 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 467.

Interpolation

Interpolation Coefficients have been given on pages 355 to 358 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 :

$f_n = f_0 + n\,\Delta'_{½} + B''(\Delta''_0 + \Delta''_1) \ldots\ldots$ Bessel

$f_n = f_0 + n\,\Delta'_{½} + E_0''\Delta''_0 + E_1''\Delta''_1 \ldots\ldots$ Everett

in which $f_0 + n\Delta'_{½}$ may be replaced by $(1-n) f_0 + nf_1$, if necessary, and where

$$B'' = n(n-1)/4, \quad E_0'' = -n(n-1)(n-2)/6 \quad \text{and} \quad E_1'' = n(n+1)(n-1)/6$$

It will be noted that in Besselôs 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 355 to 358 for the given value of n.

EXPLANATION

Besselôs method of interpolation is more simple, but greater accuracy is yielded by Everettôs formula on account of the fact that it includes the effect of third differences also.

The more complete formula of Bessel is as follows :

$$f_n = f_0 + n\Delta'_{½} + \{n(n \text{ ï } 1)\,(\Delta''_0 + \Delta''_1)\}/4 + \{\,n(n-1)(n-½)\,\Delta'''_{½}\,\}/6 + \cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

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 $f_0' = \{(\Delta'_{-½} + \Delta'_{½})/2\} \text{ ï } (\Delta_1'' - \Delta_0'')/6$,
when $n = ½$, $f'_{½} = \Delta'_{½} \text{ ï } \{(\Delta_1'' - \Delta_0'')/24\}$ and when $n = 1$, $f_1' = \{(\Delta'_{½} + \Delta'_{1½})/2\} \text{ ï } (\Delta_1'' - \Delta_0'')/6$

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 363 and 364 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 $\rho \sin \varphi'$ and $\rho \cos \varphi'$ 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 ï 0.001 6708 cos 2 φ + 0.000 0021 cos 4 φ

C = 1.001 6799 ï 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

$\varphi' = \varphi - 11'\ 32''.726 \sin 2\varphi + 1''.163 \sin 4\varphi - 0''.003 \sin 6\varphi$

One degree of longitude (in km.) = 111.4133 cos φ - 0.0935 cos 3 φ

One degree of latitude (in km.) = 111.1334 ï 0.5598 cos 2 φ + 0.0012 cos 4 φ

g (cm/sec²) = 978.031 + 5.1859 $\sin^2 \varphi$ - 0.0057 $\sin^2 2\varphi$ - 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 Earthôs center measured in units of 6378140 m (Earthôs equatorial radius).

Invariable plane of the solar system; $\Omega = 106°35'\ 01'' + 3452''T$, $I = 1°\ 34'\ 59'' - 18''T$

Pole of galactic plane (1950); $\alpha = 12^h\ 49^m.0$, $\delta = +27°\ 24'$

Solar apex (1950).. $\alpha = 18^h\ 06^m$, $\delta = +30°$

Solar motion = 20.0 km. or 12.4 miles per sec.

Speed of the Earth moving around the Sun = 29.79 km. or 18.51 miles per sec.

EXPLANATION

Heliacal Rising and Setting of Planets

The planets Mercury to Saturn (as well as the Moon) remain invisible to the naked eyes for some days at the time of conjunction with the Sun. This phenomenon of planet's invisibility due to its proximity to the Sun is known as combust or heliacal setting of the planets, and it plays an important part in Indian Calendar. The dates of heliacal setting and rising of the planets marking the period or invisibility have been calculated assuming that the phenomenon occurs when, at the given station, the Sun attains a Zenith distance of $90°+h$ at the time when the zenith distance of the planet is 90°. The values of h for different planets adopted for the purpose are as follows :

Mercury 10° (Direct) and 11° (Retrograde)
Venus 6°, Mars 14,° Jupiter 8°.5 , and Saturn 12°

The day of the first visibility of the lunar crescent after a new-moon day has also been determined in a somewhat similar way on the basis of the following values of the limiting altitude of the Moon above the horizon corresponding to its azimuth difference from the Sun, when the zenith distance of the Sun is 90°.

Azimuth difference	0°	5°	10°	15°	20°
Altitude	10°.4	10°.0	9°.3	8°.0	6°.2

When the altitude of the Moon at sunset exceeds the above limit, the Moon is likely to be visible in that evening and when the excess is more than a degree, the Moon is sure to be visible. The beginning dates of the months of the Islamic Calendar have been determined on the basis of the above calculations and indicated on the date following that of the first visibility of the Moon.

In the above calculations, the atmospheric refraction and the horizontal parallax of the Moon are neglected.

The computations of heliacal rising and setting of planets and determination of the dates of first visibility of the Moon have been done for the central station of India.

ASTRONOMICAL CONSTANTS*

Units : The units meter (m), kilogram (kg.) and second (s) are the units of length, mass and time in the International System of Unit (SI).

The astronomical unit of time is a time interval of one (*D*) of 86400 seconds. An interval of 36525 days is one Julian century.

The astronomical unit of mass is the mass of the Sun (*S*).

The astronomical unit of length is that length (*A*) for which the Gaussian gravitational constant (*k*) takes the value of 0.01720209895 when the units of measurement are the astronomical unit of length, mass and time. The dimensions of k^2 are those of the constant of gravitational (*G*), i.e. $L^3M^{-1}T^{-2}$. The term "unit distance" is also used for the length *A*.

Defining Constants :

1. Gaussian gravitational constant $k = 0.017\ 202\ 098\ 95$
2. Speed of light $c = 299\ 792\ 458\ ms^{-1}$

EXPLANATION

Primary Constants :

3. Light-time for unit distance — τ_A = 499.004 78384 s
4. Equatorial radius for Earth — a_e = 637 8136.6 m
   [IUGG value — a_e = 637 8137 m]
5. Dynamical form-factor for Earth — J_2 = 0.001 082 6359
6. Geocentric gravitational constant — GE = 3.986 004 418 X 10^{14} $m^3 s^{-2}$
7. Constant of Gravitation — G = 6.674 28 X 10^{-11} $m^3 kg^{-1} s^{-2}$
8. Ratio of mass of Moon to that of Earth — μ = 0.012 300 0371
9. General precession in longitude,
   per Julian century, at standard epoch J 2000.0 — P = 5028".796195
10. Obliquity of the ecliptic, at standard
    epoch J2000.0 — ε = 23º 26' 21".406

Derived Constants

11. Constant of nutation at standard
    epoch J2000.0 — N = 9".2052 331
12. Unit distance — $c\tau_A = A$ =1.495 978 707 x 10^{11}m
13. Solar parallax — arc sin (a_e/A) = $\pi\odot$ = 8".794143
14. Constant of aberration for standard
    Epoch J2000.0 — k = 20".49551
15. Flattening factor for the Earth — f = 0.003 352 82 = 1/298.25642
16. Heliocentric gravitational constant — $A^3 k^2/D^2 = GS$ = 1.327 124 42099 x 10^{20} $m^3 s^{-2}$
17. Ratio of mass of Sun to that of the Earth — $(GS)/(GE) = S/E$ = 332 946.0487
18. Ratio of mass of Sun to that of Earth + Moon — (S/E)/(1+μ) = 328 900.5596
19. Mass of the Sun — (GS)/G = S = 1.9884 x 10^{30} kg
20. System of planetary masses :
    (Ratios of mass of Sun to those of the planets etc.)

Mercury	6023600	Jupiter	1047.348644
Venus	408523.719	Saturn	3497.9018
Earth + Moon	328900.5596	Uranus	22902.98
Mars	3098703.59	Neptune	19412.26
		Pluto	136566000

Other quantities for use in the preparation of ephemerides :

It is recommended that the values given in the following list should normally be used in the preparation of new ephemerides.

21. Masses of minor planets in unit of the solar mass :

(1) Ceres	4.72 x 10^{-10}
(2) Pallas	1.03 x 10^{-10}
(3) Vesta	1.35 x 10^{-10}

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*See page 446 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.

$\gamma = (B-A)/C = 0.000\ 2278$

$\beta = (C-B)/B = 0.000\ 6313$

$C_{20} = -0.000\ 2027$

$C_{22} = +0.000\ 0223$

$C_{30} = -0.000\ 006$

$C_{31} = +0.000\ 029$

$S_{31} = +0.000\ 004$

$C/MR^2 = 0''.392$

$I = 5552''.7 = 1^\circ\ 32'\ 32.7''$

$C_{32} = +0.000\ 0048$

$S_{32} = +0.000\ 0017$

$C_{33} = +0.000\ 0018$

$S_{33} = -0.000\ 001$

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