

THE NAUTICAL ALMANAC

2025

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Information in the data page footers

Information pertaining to the IERS EOP data has been added to the odd data page footers if using MiKTeX or TeX Live (2020 or later). The International Earth Rotation Service (IERS) provides accurate data (updated weekly) on the Earth Orientation Parameters (EOP).

Earth's speed of rotation is not constant, i.e. the day length fluctuates.¹ This is due to *internal torques* caused by relative movements and mass redistribution of Earth's core, mantle, oceans, atmosphere, and cryosphere. This has an immediate impact on the GHA values of all celestial objects.

The IERS monitors and measures several parameters taking the actual speed of Earth's rotation into account. Their measured data begins on 2nd January 1973. Predictive data begins following the last day of (obtained) data and extends about 360 days into the future. (The IERS results are published with a delay of about 18-hours between the date of publication and the last available date with measured EOP.²) These Nautical Almanac daily pages take the (measured or predicted) UT1-UTC values into account providing highly accurate navigational data especially if the predictions are fairly recent.

As long as either measured or predicted data is available the footer will show:

[IERS Earth Orientation data as of dd-mmm-yyyy](#)

This indicates that IERS EOP data is in use - older dates are measured; newer dates are predictions.

If the final date of IERS prediction data is on the current data page, the footer shows:

[IERS Earth Orientation predictions end dd-mmm-yyyy](#)

Pages with dates beyond the final date of IERS prediction data have the following footer:

[No IERS EOP prediction data available](#)

Skyfield then defaults to using the ΔT and leap second files that ship with Skyfield internally.

The footers mentioned are only displayed as long as `'useIERS = True'` is set in `config.py` to enable use of IERS EOP data.

Brief historical overview

The story begins with the XEphem astronomical library, which is declared 'end of life' by its author, Elwood Charles Downey, as no further updates are planned. He generously gave permission for use of XEphem code in Ephem (also known as Pyephem), an astronomical library authored by Brandon Rhodes. Enno Rodegerdts (<https://sv-inua.net/>) created the original Nautical Almanac 'daily pages' in Pyalmanac using Python 2 and LaTeX. After contacting him I obtained permission for its future enhancement and maintenance. Pyalmanac uses Ephem.

Meanwhile Brandon Rhodes was working on a far more sophisticated astronomical library, Skyfield. This was 'state of the art' and clearly surpassed the 'Jean Meeus'-based Pyephem/Ephem. Skyfield uses NASA's NAIF (Navigation and Ancillary Information Facility) SPICE algorithms. The results agree with those from the HORIZONS System (*operated by NASA JPL (Jet Propulsion Laboratory) SSD (Solar System Dynamics) group, not by NAIF*). This in turn implies that celestial positions calculated by Skyfield agree with those generated by the United States Naval Observatory and their *Astronomical Almanac* to within 0.0005 arcseconds (half a milliarcsecond).

Pyephem was then in 'maintenance mode'. Clearly Pyalmanac needed adaptation to use Skyfield, and thus SFalmanac was born. However its performance was poor regarding the calculation of 'events' such as: sunrise, sunset, moonrise, moonset, civil twilight start/end and nautical twilight start/end. An interim (faster) solution was required.

A hybrid application, originally named Skyalmanac, was developed using Ephem to calculate 'events' and Skyfield for the rest. This was indeed much faster at the cost of poorer 'event time' data. It took a while to find a better solution: multiprocessing, which was built into SFalmanac. This now could compare to the execution times in Pyalmanac but with improved data.

New functionality was added to SFalmanac, e.g. lunar phase as a graphic; Lunar Distance tables and charts. The original Skyalmanac is deprecated and has now been replaced with the latest SFalmanac code, so Skyalmanac and SFalmanac are now identical apart from the name. Since April 2019 <http://thenauticalalmanac.com> has been publishing Celestial Navigation related material with software provided here.

¹https://en.wikipedia.org/wiki/Day_length_fluctuations

²<https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html>

January 01, 02, 03 UT (Wed., Thu., Fri.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Wed	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec		SHA	Dec	
0	100°53.98	130°30.29	S13°35.18	335°46.43	N23°32.71		29°1.04	N21°47.24		114°22.99	S07°55.01					Alpheratz	357°34.85 29°13.85	
1	115°56.44	145°30.22	34.09	350°49.74	32.99		44°3.79	47.22		129°25.28	54.93					Ankaa	353°7.17 -42°10.45	
2	130°58.90	160°30.16	33.00	5°53.05	33.26		59°6.54	47.19		144°27.57	54.85					Schedar	349°31.08 56°40.74	
3	146°1.37	175°30.10	•• 31.91	20°56.37	•• 33.54		74°9.29	•• 47.17		159°29.86	•• 54.77					Diphda	348°47.30 -17°51.09	
4	161°3.83	190°30.04	30.82	35°59.68	33.81		89°12.04	47.14		174°32.15	54.69					Achernar	335°20.02 -57°6.86	
5	176°6.30	205°29.98	29.73	51°3.00	34.09		104°14.79	47.12		189°34.44	54.61					Hamal	327°51.08 23°34.95	
6	191°8.76	220°29.92	S13°28.63	66°6.31	N23°34.36		119°17.54	N21°47.09		204°36.73	S07°54.53					Polaris	313°44.00 89°22.44	
7	206°11.23	235°29.86	27.54	81°9.63	34.64		134°20.28	47.07		219°39.02	54.46					Acamar	315°11.52 -40°12.44	
8	221°13.69	250°29.80	26.45	96°12.95	34.91		149°23.03	47.05		234°41.31	54.38					Menkar	314°5.96 4°11.28	
9	236°16.15	265°29.74	•• 25.35	111°16.27	•• 35.19		164°25.78	•• 47.02		249°43.60	•• 54.30					Mirfak	308°27.93 49°57.18	
10	251°18.62	280°29.69	24.26	126°19.59	35.46		179°28.53	47.00		264°45.89	54.22					Aldebaran	290°39.33 16°33.61	
11	266°21.08	295°29.63	23.16	141°22.92	35.74		194°31.27	46.97		279°48.18	54.14					Rigel	281°3.56 -8°10.38	
12	281°23.55	310°29.58	S13°22.07	156°26.24	N23°36.01		209°34.02	N21°46.95		294°50.47	S07°54.06					Capella	280°21.45 46°1.45	
13	296°26.01	325°29.53	20.97	171°29.56	36.29		224°36.77	46.92		309°52.76	53.98					Bellatrix	278°22.56 6°22.34	
14	311°28.48	340°29.48	19.88	186°32.89	36.57		239°39.51	46.90		324°55.05	53.90					Elnath	278°1.51 28°37.74	
15	326°30.94	355°29.43	•• 18.78	201°36.22	•• 36.84		254°42.26	•• 46.87		339°57.33	•• 53.83					Alnilam	275°37.41 -1°11.16	
16	341°33.40	10°29.38	17.68	216°39.55	37.12		269°45.00	46.85		354°59.62	53.75					Betelgeuse	270°51.76 7°24.70	
17	356°35.87	25°29.33	16.58	231°42.88	37.39		284°47.75	46.83		10°1.91	53.67					Canopus	263°51.84 -52°42.51	
18	11°38.33	40°29.28	S13°15.49	246°46.21	N23°37.67		299°50.49	N21°46.80		25°4.20	S07°53.59					Sirius	258°25.89 -16°45.02	
19	26°40.80	55°29.23	14.39	261°49.54	37.94		314°53.24	46.78		40°6.49	53.51					Adhara	255°5.49 -29°0.33	
20	41°43.26	70°29.19	13.29	276°52.87	38.22		329°55.98	46.75		55°8.78	53.43					Procyon	244°50.51 5°9.63	
21	56°45.72	85°29.14	•• 12.19	291°56.21	•• 38.49		344°58.73	•• 46.73		70°11.06	•• 53.35					Pollux	243°16.95 27°57.88	
22	71°48.19	100°29.10	11.09	306°59.54	38.77		0°1.47	46.70		85°13.35	53.27					Avior	234°14.15 -59°35.21	
23	86°50.65	115°29.06	9.99	322°2.88	39.05		15°4.22	46.68		100°15.64	53.19					Suhail	222°45.95 -43°31.85	
Mer.pass. 17:14			ν-0.1' d-1.1' m-4.45			ν3.3' d0.3' m-1.21			ν2.7' d-0.0' m-2.74			ν2.3' d-0.1' m1.05						
Thu	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	101°53.12	130°29.01	S13°8.89	337°6.21	N23°39.32		30°6.96	N21°46.66		115°17.93	S07°53.11					Miaplacidus	221°37.53 -69°48.95	
1	116°55.58	145°28.97	7.79	352°9.55	39.60		45°9.70	46.63		130°20.21	53.03					Alphard	217°47.51 -8°46.00	
2	131°58.05	160°28.93	6.69	7°12.89	39.87		60°12.45	46.61		145°22.50	52.95					Regulus	207°34.24 11°50.62	
3	147°0.51	175°28.89	•• 5.59	22°16.23	•• 40.15		75°15.19	•• 46.58		160°24.79	•• 52.87					Dubhe	193°40.70 61°36.68	
4	162°2.97	190°28.85	4.48	37°19.58	40.43		90°17.93	46.56		175°27.07	52.79					Denebola	182°24.88 14°25.83	
5	177°5.44	205°28.82	3.38	52°22.92	40.70		105°20.67	46.54		190°29.36	52.71					Gienah	175°43.56 -17°40.77	
6	192°7.90	220°28.78	S13°2.28	67°26.26	N23°40.98		120°23.41	N21°46.51		205°31.65	S07°52.63					Acrux	173°0.10 -63°13.97	
7	207°10.37	235°28.74	1.18	82°29.61	41.25		135°26.16	46.49		220°33.93	52.55					Gacrux	171°51.65 -57°14.92	
8	222°12.83	250°28.71	13°0.07	97°32.95	41.53		150°28.90	46.46		235°36.22	52.47					Alioth	166°12.99 55°49.13	
9	237°15.29	265°28.68	12°58.97	112°36.30	•• 41.80		165°31.64	•• 46.44		250°38.51	•• 52.39					Spica	158°22.38 -11°17.48	
10	252°17.76	280°28.64	57.86	127°39.65	42.08		180°34.38	46.42		265°40.79	52.31					Alkaid	152°52.14 49°11.01	
11	267°20.22	295°28.61	56.76	142°43.00	42.36		195°37.12	46.39		280°43.08	52.23					Hadar	148°36.29 -60°29.35	
12	282°22.69	310°28.58	S12°55.65	157°46.35	N23°42.63		210°39.86	N21°46.37		295°45.37	S07°52.15					Menkent	147°57.79 -36°29.41	
13	297°25.15	325°28.55	54.55	172°49.70	42.91		225°42.60	46.35		310°47.65	52.07					Arcturus	145°48.06 19°2.98	
14	312°27.62	340°28.52	53.44	187°53.06	43.19		240°45.34	46.32		325°49.94	51.99					Rigil Kent.	139°40.66 -60°56.07	
15	327°30.08	355°28.50	•• 52.33	202°56.41	•• 43.46		255°48.08	•• 46.30		340°52.22	•• 51.91					Kochab	137°20.42 74°2.81	
16	342°32.54	10°28.47	51.23	217°59.76	43.74		270°50.82	46.27		355°54.51	51.83					Zuben'ubi	136°56.22 -16°8.70	
17	357°35.01	25°28.44	50.12	233°3.12	44.01		285°53.56	46.25		10°56.79	51.75					Alphecca	126°4.01 26°37.66	
18	12°37.47	40°28.42	S12°49.01	248°6.48	N23°44.29		300°56.30	N21°46.23		25°59.08	S07°51.67					Antares	112°16.17 -26°29.19	
19	27°39.94	55°28.39	47.90	263°9.84	44.57		315°59.03	46.20		41°1.36	51.59					Atria	107°10.94 -69°4.18	
20	42°42.40	70°28.37	46.80	278°13.20	44.84		331°1.77	46.18		56°3.65	51.51					Sabik	102°3.12 -15°45.35	
21	57°44.86	85°28.35	•• 45.69	293°16.56	•• 45.12		346°4.51	•• 46.16		71°5.93	•• 51.43					Shaula	96°10.79 -37°7.27	
22	72°47.33	100°28.33	44.58	308°19.92	45.39		1°7.25	46.13		86°8.22	51.35					Rasalhague	95°58.89 12°32.43	
23	87°49.79	115°28.31	43.47	323°23.28	45.67		16°9.99	46.11		101°10.50	51.27					Eltanin	90°42.72 51°29.00	
Mer.pass. 17:10			ν-0.0' d-1.1' m-4.46			ν3.3' d0.3' m-1.24			ν2.7' d-0.0' m-2.74			ν2.3' d-0.1' m1.06						
Fri	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	102°52.26	130°28.29	S12°42.36	338°26.64	N23°45.95		31°12.72	N21°46.09		116°12.79	S07°51.19					Jan 01 Wed	SHA	Mer.pass
1	117°54.72	145°28.27	41.25	353°30.01	46.22		46°15.46	46.06		131°15.07	51.11					Venus	29°36.31 15:18	
2	132°57.19	160°28.25	40.14	8°33.37	46.50		61°18.20	46.04		146°17.35	51.03					Mars	234°52.45 01:37	
3	147°59.65	175°28.24	•• 39.02	23°36.74	•• 46.77		76°20.93	•• 46.02		161°19.64	•• 50.95					Jupiter	288°7.07 22:00	
4	163°2.11	190°28.22	37.91	3														

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Wed							
0	179°8.37	S22°59.89	164°13.16	7.1'	S25°51.63	-7.2'	57.4'
1	194°8.07	59.69	178°39.25	7.1'	25°44.42	-7.4'	57.4'
2	209°7.78	59.48	193°5.38	7.2'	25°37.06	-7.5'	57.4'
3	224°7.48	59.27	207°31.57	7.2'	25°29.54	-7.7'	57.4'
4	239°7.19	59.06	221°57.81	7.3'	25°21.87	-7.8'	57.5'
5	254°6.89	58.85	236°24.10	7.3'	25°14.04	-8.0'	57.5'
6	269°6.60	S22°58.64	250°50.45	7.4'	S25°6.06	-8.1'	57.5'
7	284°6.30	58.43	265°16.85	7.5'	24°57.93	-8.3'	57.5'
8	299°6.01	58.21	279°43.31	7.5'	24°49.65	-8.4'	57.5'
9	314°5.71	58.00	294°9.82	7.6'	24°41.22	-8.6'	57.6'
10	329°5.42	57.79	308°36.39	7.6'	24°32.64	-8.7'	57.6'
11	344°5.12	57.57	323°3.02	7.7'	24°23.92	-8.9'	57.6'
12	359°4.83	S22°57.36	337°29.71	7.8'	S24°15.05	-9.0'	57.6'
13	14°4.54	57.14	351°56.46	7.8'	24°6.03	-9.2'	57.6'
14	29°4.24	56.92	6°23.27	7.9'	23°56.87	-9.3'	57.7'
15	44°3.95	56.70	20°50.15	7.9'	23°47.56	-9.4'	57.7'
16	59°3.65	56.48	35°17.09	8.0'	23°38.11	-9.6'	57.7'
17	74°3.36	56.26	49°44.09	8.1'	23°28.52	-9.7'	57.7'
18	89°3.07	S22°56.04	64°11.16	8.1'	S23°18.80	-9.9'	57.7'
19	104°2.77	55.82	78°38.29	8.2'	23°8.93	-10.0'	57.8'
20	119°2.48	55.60	93°5.49	8.3'	22°58.93	-10.1'	57.8'
21	134°2.19	55.38	107°32.75	8.3'	22°48.78	-10.3'	57.8'
22	149°1.90	55.15	122°0.09	8.4'	22°38.51	-10.4'	57.8'
23	164°1.60	54.93	136°27.49	8.5'	22°28.10	-10.5'	57.8'
SD = 16.3' $d = -0.2'$			SD = 15.6'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°1.31	S22°54.70	150°54.95	8.5'	S22°17.56	-10.7'	57.8'
1	194°1.02	54.48	165°22.49	8.6'	22°6.88	-10.8'	57.9'
2	209°0.73	54.25	179°50.09	8.7'	21°56.08	-10.9'	57.9'
3	224°0.43	54.02	194°17.77	8.7'	21°45.15	-11.1'	57.9'
4	239°0.14	53.79	208°45.51	8.8'	21°34.09	-11.2'	57.9'
5	253°59.85	53.56	223°13.32	8.9'	21°22.90	-11.3'	57.9'
6	268°59.56	S22°53.33	237°41.20	9.0'	S21°11.59	-11.4'	58.0'
7	283°59.27	53.10	252°9.16	9.0'	21°0.16	-11.6'	58.0'
8	298°58.98	52.87	266°37.18	9.1'	20°48.60	-11.7'	58.0'
9	313°58.69	52.64	281°5.27	9.2'	20°36.92	-11.8'	58.0'
10	328°58.39	52.41	295°33.43	9.2'	20°25.12	-11.9'	58.0'
11	343°58.10	52.17	310°1.67	9.3'	20°13.21	-12.0'	58.0'
12	358°57.81	S22°51.94	324°29.97	9.4'	S20°1.18	-12.1'	58.1'
13	13°57.52	51.70	338°58.34	9.4'	19°49.03	-12.3'	58.1'
14	28°57.23	51.47	353°26.79	9.5'	19°36.77	-12.4'	58.1'
15	43°56.94	51.23	7°55.30	9.6'	19°24.39	-12.5'	58.1'
16	58°56.65	50.99	22°23.88	9.7'	19°11.90	-12.6'	58.1'
17	73°56.36	50.75	36°52.53	9.7'	18°59.31	-12.7'	58.1'
18	88°56.07	S22°50.51	51°21.26	9.8'	S18°46.60	-12.8'	58.2'
19	103°55.78	50.27	65°50.05	9.9'	18°33.79	-12.9'	58.2'
20	118°55.50	50.03	80°18.91	9.9'	18°20.87	-13.0'	58.2'
21	133°55.21	49.79	94°47.83	10.0'	18°7.85	-13.1'	58.2'
22	148°54.92	49.55	109°16.83	10.1'	17°54.72	-13.2'	58.2'
23	163°54.63	49.30	123°45.89	10.1'	17°41.50	-13.3'	58.2'
SD = 16.3' $d = -0.2'$			SD = 15.8'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.34	S22°49.06	138°15.02	10.2'	S17°28.17	-13.4'	58.3'
1	193°54.05	48.81	152°44.22	10.3'	17°14.74	-13.5'	58.3'
2	208°53.76	48.57	167°13.49	10.3'	17°1.22	-13.6'	58.3'
3	223°53.48	48.32	181°42.81	10.4'	16°47.60	-13.7'	58.3'
4	238°53.19	48.07	196°12.21	10.5'	16°33.89	-13.8'	58.3'
5	253°52.90	47.82	210°41.67	10.5'	16°20.08	-13.9'	58.3'
6	268°52.61	S22°47.58	225°11.19	10.6'	S16°6.18	-14.0'	58.3'
7	283°52.33	47.33	239°40.78	10.7'	15°52.19	-14.1'	58.4'
8	298°52.04	47.07	254°10.43	10.7'	15°38.12	-14.2'	58.4'
9	313°51.75	46.82	268°40.14	10.8'	15°23.95	-14.2'	58.4'
10	328°51.46	46.57	283°9.92	10.8'	15°9.70	-14.3'	58.4'
11	343°51.18	46.32	297°39.75	10.9'	14°55.37	-14.4'	58.4'
12	358°50.89	S22°46.06	312°9.65	11.0'	S14°40.95	-14.5'	58.4'
13	13°50.61	45.81	326°39.60	11.0'	14°26.45	-14.6'	58.4'
14	28°50.32	45.55	341°9.61	11.1'	14°11.88	-14.7'	58.5'
15	43°50.03	45.30	355°39.68	11.1'	13°57.22	-14.7'	58.5'
16	58°49.75	45.04	10°9.81	11.2'	13°42.49	-14.8'	58.5'
17	73°49.46	44.78	24°39.99	11.2'	13°27.68	-14.9'	58.5'
18	88°49.18	S22°44.53	39°10.23	11.3'	S13°12.79	-15.0'	58.5'
19	103°48.89	44.27	53°40.52	11.3'	12°57.84	-15.0'	58.5'
20	118°48.61	44.01	68°10.87	11.4'	12°42.81	-15.1'	58.5'
21	133°48.32	43.75	82°41.26	11.4'	12°27.71	-15.2'	58.5'
22	148°48.04	43.48	97°11.71	11.5'	12°12.54	-15.2'	58.6'
23	163°47.75	43.22	111°42.21	11.5'	11°57.31	-15.3'	58.6'
SD = 16.3' $d = -0.2'$			SD = 15.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:23	10:39	■	■	13:30	15:46
N 70°	08:04	09:47	■	■	14:21	16:05
68°	07:49	09:16	■	■	14:53	16:20
66°	07:37	08:52	10:25	13:43	15:17	16:32
64°	07:26	08:33	09:48	14:20	15:35	16:42
62°	07:17	08:18	09:22	14:47	15:50	16:52
60°	07:09	08:05	09:02	15:07	16:03	17:00
N 58°	07:02	07:54	08:45	15:24	16:15	17:07
56°	06:55	07:44	08:31	15:38	16:24	17:13
54°	06:50	07:35	08:19	15:50	16:33	17:19
52°	06:44	07:27	08:08	16:01	16:41	17:24
50°	06:39	07:20	07:58	16:10	16:48	17:29
48°	06:28	07:05	07:38	16:30	17:04	17:41
N 40°	06:18	06:52	07:22	16:46	17:17	17:51
38°	06:09	06:40	07:08	17:00	17:28	18:00
36°	06:00	06:30	06:56	17:12	17:38	18:08
34°	05:44	06:12	06:36	17:33	17:57	18:24
N 10°	05:28	05:55	06:17	17:51	18:14	18:40
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:25	18:43	19:08	19:37
30°	04:03	04:36	05:03	19:05	19:32	20:05
35°	03:45	04:21	04:51	19:18	19:47	20:23
40°	03:22	04:03	04:36	19:32	20:05	20:46
45°	02:53	03:41	04:18	19:50	20:26	21:15
S 50°	02:09	03:13	03:57	20:11	20:55	21:58
52°	01:43	02:58	03:46	20:22	21:10	22:24
54°	01:04	02:41	03:34	20:34	21:27	23:02
56°	////	02:20	03:20	20:47	21:47	////
58°	////	01:52	03:04	21:03	22:15	////
S 60°	////	01:10	02:45	21:22	22:56	////

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	■	■	12:47	■	■	18:17
N 70°	■	13:51	12:17	■	15:25	18:45
68°	■	12:41	11:55	■	16:33	19:05
66°	■	12:04	11:38	■	17:09	19:21
64°	12:03	11:38	11:23	15:16	17:34	19:34
62°	11:24	11:17	11:11	15:55	17:54	19:44
60°	10:57	11:00	11:01	16:21	18:09	19:54
N 58°	10:35	10:46	10:52	16:42	18:23	20:02
56°	10:18	10:33	10:43	16:59	18:34	20:09
54°	10:03	10:22	10:36	17:14	18:45	20:15
52°	09:50	10:13	10:30	17:26	18:53	20:20
50°	09:38	10:04	10:24	17:37	19:01	20:25
45°	09:14	09:46	10:11	18:00	19:18	20:36
N 40°	08:55	09:31	10:01	18:19	19:32	20:45
38°	08:39	09:18	09:52	18:34	19:44	20:53
36°	08:25	09:07	09:44	18:47	19:54	20:59
34°	08:01	08:47	09:30	19:09	20:11	21:11
N 10°	07:40	08:30	09:18	19:29	20:26	21:20
0°	07:20	08:15	09:06	19:47	20:40	21:30
S 10°	07:01	07:59	08:55	20:04	20:53	21:39
20°	06:40	07:42	08:42	20:23	21:08	21:48
30°	06:15	07:22	08:28	20:45	21:24	21:59
35°	06:01	07:10	08:20	20:58	21:34	22:05
40°	05:44	06:57	08:10	21:12	21:45	22:13
45°	05:24	06:41	07:59	21:29	21:57	22:21
S 50°	04:59	06:21	07:46	21:50	22:13	22:30
52°	04:46	06:12	07:39	22:00	22:20	22:35
54°	04:32	06:01	07:32	22:11	22:28	22:40
56°	04:16	05:50	07:24	22:24	22:36	22:45
58°	03:56	05:36	07:15	22:38	22:46	22:51
S 60°	03:31	05:19	07:05	22:56	22:58	22:58

Day	Sun		Mer. Pass	Moon		Age 2-4 1-11%
	Eqn. of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
01	03:27	03:41	12:04	13:33	01:06	
02	03:55	04:09	12:04	14:27	02:01	
03	04:23	04:36	12:05	15:18	02:53	

January 04, 05, 06 UT (Sat., Sun., Mon.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	103°51.40	130°28.11	S12°15.60	339°47.68	N23°52.57	32°18.33	N21°45.53	117°7.57	S07°49.24			Alpheratz	357°34.86 29°13.85
1	118°53.86	145°28.12	14.48	354°51.07	52.85	47°21.06	45.51	132°9.85	49.16			Ankaa	353°7.19 -42°10.45
2	133°56.32	160°28.12	13.36	9°54.46	53.12	62°23.79	45.49	147°12.13	49.07			Schedar	349°31.10 56°40.74
3	148°58.79	175°28.13	•• 12.24	24°57.85	•• 53.40	77°26.51	•• 45.46	162°14.42	•• 48.99			Diphda	348°47.31 -17°51.09
4	164°1.25	190°28.14	11.12	40°1.25	53.67	92°29.24	45.44	177°16.70	48.91			Achernar	335°20.04 -57°6.86
5	179°3.72	205°28.15	10.00	55°4.64	53.95	107°31.97	45.42	192°18.98	48.83			Hamal	327°51.09 23°34.95
6	194°6.18	220°28.16	S12°8.88	70°8.03	N23°54.22	122°34.70	N21°45.39	207°21.26	S07°48.75			Polaris	313°45.29 89°22.46
7	209°8.64	235°28.17	7.75	85°11.43	54.50	137°37.43	45.37	222°23.54	48.66			Acamar	315°11.53 -40°12.44
8	224°11.11	250°28.18	6.63	100°14.82	54.77	152°40.16	45.35	237°25.82	48.58			Menkar	314°5.97 4°11.27
9	239°13.57	265°28.19	•• 5.51	115°18.22	•• 55.05	167°42.88	•• 45.33	252°28.10	•• 48.50			Mirfak	308°27.94 49°57.18
10	254°16.04	280°28.21	4.39	130°21.62	55.33	182°45.61	45.30	267°30.38	48.42			Aldebaran	290°39.33 16°33.61
11	269°18.50	295°28.22	3.26	145°25.02	55.60	197°48.34	45.28	282°32.66	48.33			Rigel	281°3.56 -8°10.39
12	284°20.97	310°28.24	S12°2.14	160°28.42	N23°55.88	212°51.07	N21°45.26	297°34.94	S07°48.25			Capella	280°21.45 46°1.46
13	299°23.43	325°28.25	12°1.01	175°31.82	56.15	227°53.79	45.24	312°37.22	48.17			Bellatrix	278°22.56 6°22.34
14	314°25.89	340°28.27	11°59.89	190°35.22	56.43	242°56.52	45.21	327°39.50	48.09			Elnath	278°1.51 28°37.74
15	329°28.36	355°28.29	•• 58.77	205°38.62	•• 56.70	257°59.24	•• 45.19	342°41.78	•• 48.00			Alnilam	275°37.41 -1°11.17
16	344°30.82	10°28.31	57.64	220°42.03	56.98	273°1.97	45.17	357°44.06	47.92			Betelgeuse	270°51.76 7°24.70
17	359°33.29	25°28.33	56.52	235°45.43	57.25	288°4.70	45.15	12°46.34	47.84			Canopus	263°51.84 -52°42.53
18	14°35.75	40°28.35	S11°55.39	250°48.84	N23°57.53	303°7.42	N21°45.13	27°48.61	S07°47.76			Sirius	258°25.89 -16°45.03
19	29°38.21	55°28.37	54.26	265°52.24	57.80	318°10.15	45.10	42°50.89	47.67			Adhara	255°5.48 -29°0.34
20	44°40.68	70°28.39	53.14	280°55.65	58.08	333°12.87	45.08	57°53.17	47.59			Procyon	244°50.50 5°9.63
21	59°43.14	85°28.42	•• 52.01	295°59.06	•• 58.35	348°15.59	•• 45.06	72°55.45	•• 47.51			Pollux	243°16.93 27°57.88
22	74°45.61	100°28.44	50.88	311°2.47	58.63	3°18.32	45.04	87°57.73	47.42			Avior	234°14.14 -59°35.22
23	89°48.07	115°28.47	49.76	326°5.88	58.90	18°21.04	45.01	103°0.01	47.34			Suhail	222°45.94 -43°31.87
Mer.pass. 17:02		ν0.0' d-1.1' m-4.48		ν3.4' d0.3' m-1.28		ν2.7' d-0.0' m-2.72		ν2.3' d-0.1' m1.06					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	104°50.53	130°28.50	S11°48.63	341°9.29	N23°59.18	33°23.77	N21°44.99	118°2.29	S07°47.26			Miaplacidus	221°37.51 -69°48.96
1	119°53.00	145°28.53	47.50	356°12.70	59.45	48°26.49	44.97	133°4.56	47.17			Alphard	217°47.49 -8°46.01
2	134°55.46	160°28.55	46.37	11°16.12	23°59.73	63°29.21	44.95	148°6.84	47.09			Regulus	207°34.21 11°50.62
3	149°57.93	175°28.58	•• 45.24	26°19.53	24°0.00	78°31.93	•• 44.93	163°9.12	•• 47.01			Dubhe	193°40.65 61°36.68
4	165°0.39	190°28.62	44.11	41°22.94	0.28	93°34.66	44.90	178°11.40	46.92			Denebola	182°24.85 14°25.82
5	180°2.85	205°28.65	42.98	56°26.36	0.55	108°37.38	44.88	193°13.68	46.84			Gienah	175°43.54 -17°40.78
6	195°5.32	220°28.68	S11°41.85	71°29.78	N24°0.82	123°40.10	N21°44.86	208°15.95	S07°46.76			Acrux	173°0.06 -63°13.98
7	210°7.78	235°28.71	40.72	86°33.19	1.10	138°42.82	44.84	223°18.23	46.67			Gacrux	171°51.62 -57°14.93
8	225°10.25	250°28.75	39.59	101°36.61	1.37	153°45.54	44.82	238°20.51	46.59			Alioth	166°12.95 55°49.12
9	240°12.71	265°28.78	•• 38.46	116°40.03	•• 1.65	168°48.26	•• 44.79	253°22.79	•• 46.51			Spica	158°22.36 -11°17.49
10	255°15.18	280°28.82	37.33	131°43.45	1.92	183°50.98	44.77	268°25.06	46.42			Alkaid	152°52.11 49°11.00
11	270°17.64	295°28.86	36.20	146°46.87	2.19	198°53.70	44.75	283°27.34	46.34			Hadar	148°36.25 -60°29.35
12	285°20.10	310°28.90	S11°35.07	161°50.30	N24°2.47	213°56.42	N21°44.73	298°29.62	S07°46.26			Menkent	147°57.77 -36°29.42
13	300°22.57	325°28.94	33.94	176°53.72	2.74	228°59.14	44.71	313°31.89	46.17			Arcturus	145°48.04 19°2.97
14	315°25.03	340°28.98	32.80	191°57.14	3.02	244°1.86	44.69	328°34.17	46.09			Rigel Kent.	139°40.62 -60°56.07
15	330°27.50	355°29.02	•• 31.67	207°0.57	•• 3.29	259°4.58	•• 44.66	343°36.45	•• 46.01			Kochab	137°20.36 74°2.79
16	345°29.96	10°29.06	30.54	222°3.99	3.56	274°7.30	44.64	358°38.72	45.92			Zuben'ubi	136°56.20 -16°8.71
17	0°32.42	25°29.11	29.40	237°7.42	3.84	289°10.02	44.62	13°41.00	45.84			Alphecca	126°3.99 26°37.64
18	15°34.89	40°29.15	S11°28.27	252°10.85	N24°4.11	304°12.73	N21°44.60	28°43.27	S07°45.75			Antares	112°16.15 -26°29.20
19	30°37.35	55°29.20	27.14	267°14.27	4.38	319°15.45	44.58	43°45.55	45.67			Atria	107°10.90 -69°4.18
20	45°39.82	70°29.24	26.00	282°17.70	4.66	334°18.17	44.56	58°47.83	45.59			Sabik	102°3.11 -15°45.36
21	60°42.28	85°29.29	•• 24.87	297°21.13	•• 4.93	349°20.89	•• 44.53	73°50.10	•• 45.50			Shaula	96°10.78 -37°7.27
22	75°44.74	100°29.34	23.73	312°24.56	5.20	4°23.60	44.51	88°52.38	45.42			Rasalhague	95°58.88 12°32.41
23	90°47.21	115°29.39	22.60	327°28.00	5.48	19°26.32	44.49	103°54.65	45.33			Eltanin	90°42.71 51°28.98
Mer.pass. 16:58		ν0.0' d-1.1' m-4.48		ν3.4' d0.3' m-1.30		ν2.7' d-0.0' m-2.72		ν2.3' d-0.1' m1.06					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	105°49.67	130°29.44	S11°21.46	342°31.43	N24°5.75	34°29.04	N21°44.47	118°56.93	S07°45.25			Kaus Aust.	83°32.93 -34°22.37
1	120°52.14	145°29.49	20.33	357°34.86	6.02	49°31.75	44.45	133°59.20	45.16			Vega	80°33.66 38°48.31
2	135°54.60	160°29.54	19.19	12°38.29	6.30	64°34.47	44.43	149°1.48	45.08			Nunki	75°48.14 -26°15.98
3	150°57.06	175°29.60	•• 18.05	27°41.73	•• 6.57	79°37.18	•• 44.41	164°3.75	•• 45.00			Altair	62°0.30 8°56.01
4	165°59.53	190°29.65	16.92	42°45.17	6.84	94°39.90	44.38	179°6.03	44.91			Peacock	53°6.29 -56°39.40
5	181°1.99	205°29.71	15.78	57°48.60	7.11	109°42.61	44.36	194°8.30	44.83			Deneb	49°26.25 45°22.22
6	196°4.46	220°29.77	S11°14.64	72°52.04	N24°7.39	124°45.33	N21°44.34	209°10.58	S07°44.74			Enif	33°39.06 9°59.37
7	211°6.92	235°29.82	13.50	87°55.48	7.66	139°48.04	44.32	224°12.85	44.66			Al Na'ir	27°33.23 -46°50.61
8	226°9.38	250°29.88	12.37	102°58.92	7.93	154°50.76	44.30	239°15.13	44.57</				


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.47	S22°42.96	126°12.76	11.6'	S11°42.01	-15.4'	58.6'
1	193°47.18	42.69	140°43.36	11.6'	11°26.65	-15.4'	58.6'
2	208°46.90	42.43	155°14.00	11.7'	11°11.22	-15.5'	58.6'
3	223°46.62	· · 42.16	169°44.69	11.7'	10°55.74	-15.5'	58.6'
4	238°46.33	41.90	184°15.43	11.8'	10°40.19	-15.6'	58.6'
5	253°46.05	41.63	198°46.21	11.8'	10°24.59	-15.7'	58.6'
6	268°45.77	S22°41.36	213°17.04	11.9'	S10°8.92	-15.7'	58.7'
7	283°45.48	41.09	227°47.90	11.9'	09°53.21	-15.8'	58.7'
8	298°45.20	40.82	242°18.81	11.9'	09°37.43	-15.8'	58.7'
9	313°44.92	· · 40.55	256°49.76	12.0'	09°21.61	-15.9'	58.7'
10	328°44.64	40.28	271°20.74	12.0'	09°5.74	-15.9'	58.7'
11	343°44.35	40.01	285°51.76	12.1'	08°49.81	-16.0'	58.7'
12	358°44.07	S22°39.74	300°22.82	12.1'	S08°33.84	-16.0'	58.7'
13	13°43.79	39.47	314°53.92	12.1'	08°17.82	-16.1'	58.7'
14	28°43.51	39.19	329°25.05	12.2'	08°1.75	-16.1'	58.7'
15	43°43.23	· · 38.92	343°56.21	12.2'	07°45.64	-16.2'	58.7'
16	58°42.95	38.64	358°27.40	12.2'	07°29.49	-16.2'	58.8'
17	73°42.66	38.36	12°58.63	12.3'	07°13.29	-16.2'	58.8'
18	88°42.38	S22°38.09	27°29.88	12.3'	S06°57.06	-16.3'	58.8'
19	103°42.10	37.81	42°1.16	12.3'	06°40.79	-16.3'	58.8'
20	118°41.82	37.53	56°32.47	12.3'	06°24.48	-16.3'	58.8'
21	133°41.54	· · 37.25	71°3.80	12.4'	06°8.13	-16.4'	58.8'
22	148°41.26	36.97	85°35.16	12.4'	05°51.75	-16.4'	58.8'
23	163°40.98	36.69	100°6.54	12.4'	05°35.34	-16.4'	58.8'
SD = 16.3' $d = -0.3'$			SD = 16.0'				

Sun	GHA		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.70	S22°36.41	114°37.94	12.4'	S05°18.90	-16.5'	58.8'
1	193°40.42	36.13	129°9.36	12.4'	05°2.42	-16.5'	58.8'
2	208°40.14	35.84	143°40.80	12.5'	04°45.92	-16.5'	58.8'
3	223°39.87	· · 35.56	158°12.26	12.5'	04°29.39	-16.6'	58.9'
4	238°39.59	35.27	172°43.73	12.5'	04°12.84	-16.6'	58.9'
5	253°39.31	34.99	187°15.22	12.5'	03°56.26	-16.6'	58.9'
6	268°39.03	S22°34.70	201°46.73	12.5'	S03°39.66	-16.6'	58.9'
7	283°38.75	34.41	216°18.24	12.5'	03°23.03	-16.6'	58.9'
8	298°38.47	34.13	230°49.77	12.5'	03°6.39	-16.7'	58.9'
9	313°38.20	· · 33.84	245°21.31	12.5'	02°49.72	-16.7'	58.9'
10	328°37.92	33.55	259°52.85	12.6'	02°33.04	-16.7'	58.9'
11	343°37.64	33.26	274°24.40	12.6'	02°16.35	-16.7'	58.9'
12	358°37.36	S22°32.97	288°55.96	12.6'	S01°59.64	-16.7'	58.9'
13	13°37.09	32.67	303°27.52	12.6'	01°42.91	-16.7'	58.9'
14	28°36.81	32.38	317°59.09	12.6'	01°26.18	-16.7'	58.9'
15	43°36.53	· · 32.09	332°30.66	12.6'	01°9.43	-16.8'	58.9'
16	58°36.26	31.79	347°2.22	12.6'	00°52.67	-16.8'	59.0'
17	73°35.98	31.50	1°33.79	12.6'	00°35.91	-16.8'	59.0'
18	88°35.70	S22°31.20	16°5.35	12.6'	S00°19.14	-16.8'	59.0'
19	103°35.43	30.91	30°36.91	12.6'	S00°2.37	-16.8'	59.0'
20	118°35.15	30.61	45°8.46	12.5'	N00°14.41	16.8'	59.0'
21	133°34.88	· · 30.31	59°40.01	12.5'	00°31.19	16.8'	59.0'
22	148°34.60	30.01	74°11.55	12.5'	00°47.97	16.8'	59.0'
23	163°34.33	29.71	88°43.08	12.5'	01°4.75	16.8'	59.0'
SD = 16.3' $d = -0.3'$			SD = 16.0'				

Mon	GHA		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.05	S22°29.41	103°14.60	12.5'	N01°21.52	16.8'	59.0'
1	193°33.78	29.11	117°46.10	12.5'	01°38.30	16.8'	59.0'
2	208°33.50	28.81	132°17.60	12.5'	01°55.06	16.8'	59.0'
3	223°33.23	· · 28.50	146°49.07	12.5'	02°11.82	16.8'	59.0'
4	238°32.96	28.20	161°20.53	12.4'	02°28.58	16.7'	59.0'
5	253°32.68	27.90	175°51.98	12.4'	02°45.32	16.7'	59.0'
6	268°32.41	S22°27.59	190°23.40	12.4'	N03°2.05	16.7'	59.0'
7	283°32.14	27.29	204°54.80	12.4'	03°18.78	16.7'	59.0'
8	298°31.86	26.98	219°26.18	12.4'	03°35.48	16.7'	59.1'
9	313°31.59	· · 26.67	233°57.54	12.3'	03°52.17	16.7'	59.1'
10	328°31.32	26.36	248°28.87	12.3'	04°8.85	16.7'	59.1'
11	343°31.04	26.05	263°0.18	12.3'	04°25.51	16.6'	59.1'
12	358°30.77	S22°25.75	277°31.46	12.2'	N04°42.15	16.6'	59.1'
13	13°30.50	25.43	292°2.71	12.2'	04°58.76	16.6'	59.1'
14	28°30.23	25.12	306°33.92	12.2'	05°15.36	16.6'	59.1'
15	43°29.96	· · 24.81	321°5.11	12.2'	05°31.93	16.5'	59.1'
16	58°29.69	24.50	335°36.27	12.1'	05°48.48	16.5'	59.1'
17	73°29.41	24.19	350°7.38	12.1'	06°5.00	16.5'	59.1'
18	88°29.14	S22°23.87	4°38.47	12.0'	N06°21.49	16.5'	59.1'
19	103°28.87	23.56	19°9.51	12.0'	06°37.95	16.4'	59.1'
20	118°28.60	23.24	33°40.52	12.0'	06°54.38	16.4'	59.1'
21	133°28.33	· · 22.92	48°11.49	11.9'	07°10.78	16.4'	59.1'
22	148°28.06	22.61	62°42.41	11.9'	07°27.15	16.3'	59.1'
23	163°27.79	22.29	77°13.30	11.8'	07°43.47	16.3'	59.1'
SD = 16.3' $d = -0.3'$			SD = 16.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:19	10:29	■	■	13:43	15:53
N 70°	08:01	09:42	■	■	14:29	16:10
68°	07:47	09:12	11:27	12:44	15:00	16:25
66°	07:35	08:49	10:19	13:52	15:22	16:37
64°	07:25	08:31	09:44	14:27	15:40	16:47
62°	07:16	08:16	09:19	14:52	15:55	16:56
60°	07:08	08:04	08:59	15:12	16:08	17:03
N 58°	07:01	07:53	08:43	15:28	16:19	17:10
56°	06:55	07:43	08:30	15:42	16:28	17:17
54°	06:49	07:35	08:18	15:54	16:37	17:22
52°	06:44	07:27	08:07	16:04	16:44	17:28
50°	06:39	07:20	07:58	16:13	16:51	17:32
45°	06:28	07:05	07:38	16:33	17:07	17:43
N 40°	06:18	06:52	07:22	16:49	17:19	17:53
35°	06:09	06:41	07:09	17:03	17:31	18:02
30°	06:01	06:31	06:57	17:14	17:41	18:10
20°	05:45	06:12	06:36	17:35	17:59	18:26
N 10°	05:30	05:56	06:19	17:53	18:15	18:41
0°	05:13	05:39	06:02	18:09	18:32	18:58
S 10°	04:55	05:22	05:45	18:26	18:49	19:16
20°	04:33	05:02	05:27	18:44	19:09	19:38
30°	04:05	04:38	05:06	19:05	19:32	20:05
35°	03:47	04:24	04:53	19:18	19:47	20:23
40°	03:25	04:06	04:39	19:32	20:04	20:45
45°	02:56	03:45	04:21	19:49	20:26	21:14
S 50°	02:14	03:16	04:00	20:11	20:54	21:56
52°	01:49	03:02	03:50	20:21	21:08	22:20
54°	01:14	02:46	03:38	20:32	21:24	22:55
56°	////	02:25	03:25	20:46	21:45	////
58°	////	01:59	03:09	21:01	22:10	////
S 60°	////	01:20	02:50	21:20	22:48	////

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	11:51	11:12	10:36	20:56	23:18	· ·
N 70°	11:39	11:09	10:41	21:06	23:17	· ·
68°	11:28	11:06	10:46	21:13	23:15	· ·
66°	11:20	11:04	10:50	21:20	23:14	· ·
64°	11:12	11:02	10:53	21:25	23:14	· ·
62°	11:06	11:01	10:56	21:30	23:13	· ·
60°	11:00	10:59	10:58	21:34	23:12	· ·
N 58°	10:55	10:58	11:01	21:37	23:12	· ·
56°	10:51	10:57	11:03	21:40	23:11	· ·
54°	10:47	10:56	11:05	21:43	23:11	· ·
52°	10:43	10:55	11:06	21:46	23:10	· ·
50°	10:40	10:54	11:08	21:48	23:10	· ·
45°	10:33	10:52	11:11	21:53	23:09	· ·
N 40°	10:27	10:51	11:14	21:57	23:08	· ·
35°	10:22	10:49	11:17	22:00	23:08	· ·
30°	10:17	10:48	11:19	22:04	23:07	· ·
20°	10:09	10:46	11:23	22:09	23:06	· ·
N 10°	10:02	10:44	11:26	22:13	23:05	23:58
0°	09:55	10:42	11:30	22:18	23:05	23:52
S 10°	09:48	10:41	11:33	22:22	23:04	23:46
20°	09:41	10:39	11:36	22:26	23:03	23:40
30°	09:33	10:37	11:41	22:31	23:02	23:33
35°	09:28	10:36	11:43	22:34	23:01	23:29
40°	09:23	10:34	11:46	22:37	23:01	23:25
45°	09:16	10:33	11:49	22:41	23:00	23:19
S 50°	09:09	10:31	11:53	22:45	22:59	23:13
52°	09:05	10:30	11:55	22:47	22:59	23:10
54°	09:01	10:29	11:57	22:49	22:58	23:07
56°	08:57	10:28	11:59	22:52	22:58	23:04
58°	08:52	10:27	12:01	22:54	22:57	23:00
S 60°	08:47	10:26	12:04	22:57	22:56	22:56

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 5-7 19-39%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
04	04:50	05:04	12:05	16:06	03:42	
05	05:17	05:31	12:06	16:54	04:30	
06	05:44	05:57	12:06	17:41	05:17	

h		Sun		Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.52	S22°21.97	91°44.14	11.8'	N07°59.77	16.3'	59.1'
1	193°27.25	21.65	106°14.93	11.7'	08°16.02	16.2'	59.1'
2	208°26.99	21.33	120°45.68	11.7'	08°32.23	16.2'	59.1'
3	223°26.72	· · 21.01	135°16.37	11.6'	08°48.41	16.1'	59.1'
4	238°26.45	20.69	149°47.02	11.6'	09°4.54	16.1'	59.1'
5	253°26.18	20.36	164°17.62	11.5'	09°20.62	16.0'	59.1'
6	268°25.91	S22°20.04	178°48.17	11.5'	N09°36.66	16.0'	59.1'
7	283°25.64	19.72	193°18.66	11.4'	09°52.65	15.9'	59.1'
8	298°25.38	19.39	207°49.10	11.4'	10°8.60	15.9'	59.1'
9	313°25.11	· · 19.07	222°19.48	11.3'	10°24.49	15.8'	59.1'
10	328°24.84	18.74	236°49.81	11.3'	10°40.33	15.8'	59.1'
11	343°24.57	18.41	251°20.08	11.2'	10°56.12	15.7'	59.1'
12	358°24.31	S22°18.08	265°50.29	11.1'	N11°11.85	15.7'	59.1'
13	13°24.04	17.75	280°20.43	11.1'	11°27.52	15.6'	59.1'
14	28°23.77	17.42	294°50.52	11.0'	11°43.14	15.6'	59.1'
15	43°23.51	· · 17.09	309°20.54	11.0'	11°58.69	15.5'	59.1'
16	58°23.24	16.76	323°50.50	10.9'	12°14.19	15.4'	59.2'
17	73°22.98	16.43	338°20.39	10.8'	12°29.62	15.4'	59.2'
18	88°22.71	S22°16.10	352°50.22	10.8'	N12°44.99	15.3'	59.2'
19	103°22.45	15.77	7°19.98	10.7'	13°0.29	15.2'	59.2'
20	118°22.18	15.43	21°49.67	10.6'	13°15.53	15.2'	59.2'
21	133°21.92	· · 15.10	36°19.29	10.5'	13°30.69	15.1'	59.2'
22	148°21.65	14.76	50°48.83	10.5'	13°45.79	15.0'	59.2'
23	163°21.39	14.43	65°18.31	10.4'	14°0.81	14.9'	59.2'
SD = 16.3'		$d = -0.3'$	SD = 16.1'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.12	S22°14.09	79°47.71	10.3'	N14°15.76	14.9'	59.2'
1	193°20.86	13.75	94°17.04	10.3'	14°30.63	14.8'	59.2'
2	208°20.60	13.41	108°46.30	10.2'	14°45.42	14.7'	59.2'
3	223°20.33	· · 13.07	123°15.47	10.1'	15°0.14	14.6'	59.2'
4	238°20.07	12.73	137°44.57	10.0'	15°14.77	14.6'	59.2'
5	253°19.81	12.39	152°13.60	9.9'	15°29.33	14.5'	59.2'
6	268°19.54	S22°12.05	166°42.54	9.9'	N15°43.80	14.4'	59.2'
7	283°19.28	11.71	181°11.40	9.8'	15°58.18	14.3'	59.2'
8	298°19.02	11.36	195°40.19	9.7'	16°12.48	14.2'	59.2'
9	313°18.76	· · 11.02	210°8.89	9.6'	16°26.69	14.1'	59.1'
10	328°18.50	10.68	224°37.51	9.5'	16°40.80	14.0'	59.1'
11	343°18.23	10.33	239°6.04	9.5'	16°54.83	13.9'	59.1'
12	358°17.97	S22°9.98	253°34.49	9.4'	N17°8.76	13.8'	59.1'
13	13°17.71	9.64	268°2.86	9.3'	17°22.60	13.7'	59.1'
14	28°17.45	9.29	282°31.14	9.2'	17°36.34	13.6'	59.1'
15	43°17.19	· · 8.94	296°59.34	9.1'	17°49.98	13.5'	59.1'
16	58°16.93	8.59	311°27.45	9.0'	18°3.52	13.4'	59.1'
17	73°16.67	8.24	325°55.47	8.9'	18°16.96	13.3'	59.1'
18	88°16.41	S22°7.89	340°23.40	8.8'	N18°30.30	13.2'	59.1'
19	103°16.15	7.54	354°51.25	8.8'	18°43.53	13.1'	59.1'
20	118°15.89	7.19	9°19.00	8.7'	18°56.65	13.0'	59.1'
21	133°15.63	· · 6.83	23°46.67	8.6'	19°9.66	12.9'	59.1'
22	148°15.37	6.48	38°14.25	8.5'	19°22.57	12.8'	59.1'
23	163°15.12	6.13	52°41.74	8.4'	19°35.36	12.7'	59.1'
SD = 16.3'		$d = -0.3'$	SD = 16.1'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°14.86	S22°5.77	67°9.13	8.3'	N19°48.04	12.6'	59.1'
1	193°14.60	5.41	81°36.44	8.2'	20°0.61	12.4'	59.1'
2	208°14.34	5.06	96°3.65	8.1'	20°13.05	12.3'	59.1'
3	223°14.08	· · 4.70	110°30.78	8.0'	20°25.38	12.2'	59.1'
4	238°13.83	4.34	124°57.81	7.9'	20°37.59	12.1'	59.1'
5	253°13.57	3.98	139°24.75	7.8'	20°49.68	12.0'	59.1'
6	268°13.31	S22°3.62	153°51.60	7.8'	N21°1.64	11.8'	59.1'
7	283°13.06	3.26	168°18.36	7.7'	21°13.48	11.7'	59.1'
8	298°12.80	2.90	182°45.02	7.6'	21°25.19	11.6'	59.1'
9	313°12.54	· · 2.54	197°11.59	7.5'	21°36.77	11.5'	59.1'
10	328°12.29	2.18	211°38.07	7.4'	21°48.22	11.3'	59.1'
11	343°12.03	1.81	226°4.46	7.3'	21°59.54	11.2'	59.1'
12	358°11.78	S22°1.45	240°30.76	7.2'	N22°10.73	11.1'	59.1'
13	13°11.52	1.09	254°56.97	7.1'	22°21.78	10.9'	59.1'
14	28°11.27	0.72	269°23.08	7.0'	22°32.70	10.8'	59.0'
15	43°11.01	· · 0.35	283°49.11	6.9'	22°43.48	10.6'	59.0'
16	58°10.76	21°59.99	298°15.04	6.8'	22°54.12	10.5'	59.0'
17	73°10.50	21°59.62	312°40.89	6.8'	23°4.61	10.4'	59.0'
18	88°10.25	S21°59.25	327°6.64	6.7'	N23°14.97	10.2'	59.0'
19	103°10.00	58.88	341°32.31	6.6'	23°25.18	10.1'	59.0'
20	118°9.74	58.51	355°57.88	6.5'	23°35.24	9.9'	59.0'
21	133°9.49	· · 58.14	10°23.37	6.4'	23°45.16	9.8'	59.0'
22	148°9.24	57.77	24°48.77	6.3'	23°54.93	9.6'	59.0'
23	163°8.98	57.40	39°14.09	6.2'	24°4.54	9.5'	59.0'
SD = 16.3'		$d = -0.4'$	SD = 16.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:14	10:18	■	■	13:56	16:00
N 70°	07:57	09:36	■	■	14:39	16:17
68°	07:44	09:07	11:08	13:07	15:07	16:31
66°	07:32	08:45	10:12	14:02	15:29	16:42
64°	07:22	08:28	09:39	14:35	15:46	16:52
62°	07:14	08:14	09:15	14:59	16:00	17:00
60°	07:06	08:02	08:57	15:17	16:12	17:08
N 58°	07:00	07:51	08:41	15:33	16:23	17:14
56°	06:54	07:42	08:28	15:46	16:32	17:20
54°	06:48	07:33	08:16	15:58	16:40	17:26
52°	06:43	07:26	08:06	16:08	16:48	17:31
50°	06:38	07:19	07:57	16:17	16:55	17:36
45°	06:27	07:04	07:37	16:36	17:10	17:46
N 40°	06:18	06:52	07:22	16:52	17:22	17:56
35°	06:09	06:41	07:09	17:05	17:33	18:04
30°	06:01	06:31	06:57	17:17	17:43	18:12
20°	05:46	06:13	06:37	17:37	18:00	18:28
N 10°	05:31	05:57	06:20	17:54	18:17	18:43
0°	05:15	05:41	06:03	18:10	18:33	18:59
S 10°	04:57	05:24	05:47	18:27	18:50	19:17
20°	04:35	05:04	05:29	18:45	19:09	19:38
30°	04:08	04:41	05:08	19:05	19:33	20:05
35°	03:50	04:26	04:56	19:18	19:47	20:23
40°	03:29	04:09	04:42	19:32	20:04	20:44
45°	03:00	03:48	04:25	19:48	20:25	21:12
S 50°	02:20	03:21	04:04	20:09	20:52	21:53
52°	01:56	03:07	03:54	20:19	21:06	22:16
54°	01:23	02:51	03:42	20:30	21:22	22:48
56°	////	02:31	03:29	20:43	21:41	////
58°	////	02:06	03:14	20:58	22:06	////
S 60°	////	01:31	02:56	21:16	22:40	////

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	09:54	08:44	□	01:43	04:39	□
N 70°	10:10	09:25	□	01:30	04:00	□
68°	10:23	09:53	08:46	01:19	03:34	06:33
66°	10:34	10:14	09:42	01:10	03:14	05:38
64°	10:43	10:31	10:15	01:03	02:58	05:06
62°	10:51	10:46	10:40	00:57	02:45	04:42
60°	10:58	10:58	11:00	00:52	02:34	04:23
N 58°	11:04	11:08	11:16	00:47	02:25	04:07
56°	11:09	11:18	11:30	00:43	02:17	03:54
54°	11:14	11:26	11:42	00:39	02:09	03:43
52°	11:19	11:33	11:53	00:35	02:03	03:33
50°	11:23	11:40	12:03	00:32	01:57	03:24
45°	11:31	11:55	12:23	00:26	01:44	03:05
N 40°	11:39	12:07	12:40	00:20	01:34	02:49
35°	11:45	12:17	12:54	00:16	01:25	02:36
30°	11:51	12:26	13:06	00:11	01:17	02:25
20°	12:01	12:42	13:27	00:04	01:04	02:06
N 10°	12:10	12:56	13:46	· ·	00:52	01:50
0°	12:18	13:09	14:03	· ·	00:42	01:34
S 10°	12:26	13:22	14:21	· ·	00:31	01:19
20°	12:35	13:36	14:40	· ·	00:19	01:02
30°	12:46	13:53	15:02	· ·	00:06	00:44
35°	12:52	14:02	15:14	23:59	· ·	00:33
40°	12:59	14:13	15:29	23:51	· ·	00:21
45°	13:07	14:26	15:47	23:41	· ·	00:06
S 50°	13:16	14:42	16:10	23:29	23:48	· ·
52°	13:21	14:50	16:20	23:23	23:40	· ·
54°	13:26	14:58	16:33	23:17	23:31	23:51
56°	13:32	15:08	16:47	23:11	23:21	23:36
58°	13:38	15:19	17:03	23:03	23:09	23:19
S 60°	13:45	15:31	17:23	22:55	22:55	22:58

Day	Sun		Mer. Pass hh:mm	Moon		Age 8-10 50-72%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
07	06:10	06:23	12:06	18:30	06:05	
08	06:36	06:48	12:07	19:21	06:55	
09	07:01	07:13	12:07	20:17	07:49	

h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d HP
Fri 0	178°8.73	S21°57.02		53°39.32	6.1'	N24°14.01	9.3' 59.0'
1	193°8.48	56.65		68°4.47	6.1'	24°23.32	9.2' 59.0'
2	208°8.23	56.27		82°29.53	6.0'	24°32.48	9.0' 59.0'
3	223°7.98	55.90		96°54.50	5.9'	24°41.48	8.8' 59.0'
4	238°7.72	55.52		111°19.40	5.8'	24°50.33	8.7' 58.9'
5	253°7.47	55.15		125°44.22	5.7'	24°59.01	8.5' 58.9'
6	268°7.22	S21°54.77		140°8.95	5.7'	N25°7.54	8.4' 58.9'
7	283°6.97	54.39		154°33.61	5.6'	25°15.90	8.2' 58.9'
8	298°6.72	54.01		168°58.19	5.5'	25°24.10	8.0' 58.9'
9	313°6.47	53.63		183°22.69	5.4'	25°32.13	7.9' 58.9'
10	328°6.22	53.25		197°47.12	5.4'	25°40.00	7.7' 58.9'
11	343°5.97	52.87		212°11.47	5.3'	25°47.71	7.5' 58.9'
12	358°5.72	S21°52.49		226°35.75	5.2'	N25°55.24	7.4' 58.9'
13	13°5.47	52.11		240°59.97	5.1'	26°2.61	7.2' 58.9'
14	28°5.23	51.72		255°24.11	5.1'	26°9.80	7.0' 58.9'
15	43°4.98	51.34		269°48.18	5.0'	26°16.83	6.9' 58.8'
16	58°4.73	50.95		284°12.19	4.9'	26°23.68	6.7' 58.8'
17	73°4.48	50.57		298°36.14	4.9'	26°30.36	6.5' 58.8'
18	88°4.23	S21°50.18		313°0.02	4.8'	N26°36.86	6.3' 58.8'
19	103°3.99	49.79		327°23.84	4.8'	26°43.18	6.1' 58.8'
20	118°3.74	49.41		341°47.61	4.7'	26°49.33	6.0' 58.8'
21	133°3.49	49.02		356°11.31	4.7'	26°55.31	5.8' 58.8'
22	148°3.24	48.63		10°34.96	4.6'	27°1.10	5.6' 58.8'
23	163°3.00	48.24		24°58.56	4.5'	27°6.71	5.4' 58.8'
SD = 16.3'			$d = -0.4'$	SD = 16.1'			

Sat	GHA	Dec		GHA	ν	Dec	d HP
0	178°2.75	S21°47.85		39°22.11	4.5'	N27°12.14	5.3' 58.7'
1	193°2.51	47.46		53°45.61	4.5'	27°17.39	5.1' 58.7'
2	208°2.26	47.06		68°9.06	4.4'	27°22.46	4.9' 58.7'
3	223°2.01	46.67		82°32.47	4.4'	27°27.35	4.7' 58.7'
4	238°1.77	46.28		96°55.83	4.3'	27°32.05	4.5' 58.7'
5	253°1.52	45.88		111°19.16	4.3'	27°36.56	4.3' 58.7'
6	268°1.28	S21°45.49		125°42.45	4.3'	N27°40.89	4.1' 58.7'
7	283°1.04	45.09		140°5.70	4.2'	27°45.04	4.0' 58.7'
8	298°0.79	44.69		154°28.92	4.2'	27°49.00	3.8' 58.6'
9	313°0.55	44.30		168°52.10	4.2'	27°52.77	3.6' 58.6'
10	328°0.30	43.90		183°15.26	4.1'	27°56.36	3.4' 58.6'
11	343°0.06	43.50		197°38.39	4.1'	27°59.75	3.2' 58.6'
12	357°59.82	S21°43.10		212°1.50	4.1'	N28°2.96	3.0' 58.6'
13	12°59.57	42.70		226°24.59	4.1'	28°5.98	2.8' 58.6'
14	27°59.33	42.30		240°47.66	4.1'	28°8.81	2.6' 58.6'
15	42°59.09	41.90		255°10.72	4.0'	28°11.45	2.5' 58.5'
16	57°58.85	41.50		269°33.76	4.0'	28°13.90	2.3' 58.5'
17	72°58.61	41.09		283°56.79	4.0'	28°16.16	2.1' 58.5'
18	87°58.36	S21°40.69		298°19.81	4.0'	N28°18.23	1.9' 58.5'
19	102°58.12	40.28		312°42.82	4.0'	28°20.11	1.7' 58.5'
20	117°57.88	39.88		327°5.84	4.0'	28°21.80	1.5' 58.5'
21	132°57.64	39.47		341°28.85	4.0'	28°23.30	1.3' 58.4'
22	147°57.40	39.07		355°51.86	4.0'	28°24.61	1.1' 58.4'
23	162°57.16	38.66		10°14.88	4.0'	28°25.73	0.9' 58.4'
SD = 16.3'			$d = -0.4'$	SD = 16.0'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	177°56.92	S21°38.25		24°37.91	4.0'	N28°26.66	0.7' 58.4'
1	192°56.68	37.84		39°0.95	4.1'	28°27.40	0.5' 58.4'
2	207°56.44	37.43		53°24.00	4.1'	28°27.95	0.4' 58.4'
3	222°56.20	37.02		67°47.06	4.1'	28°28.30	0.2' 58.3'
4	237°55.97	36.61		82°10.15	4.1'	28°28.47	-0.0' 58.3'
5	252°55.73	36.20		96°33.25	4.1'	28°28.45	-0.2' 58.3'
6	267°55.49	S21°35.79		110°56.38	4.2'	N28°28.24	-0.4' 58.3'
7	282°55.25	35.37		125°19.54	4.2'	28°27.84	-0.6' 58.3'
8	297°55.01	34.96		139°42.72	4.2'	28°27.26	-0.8' 58.2'
9	312°54.78	34.54		154°5.94	4.2'	28°26.48	-1.0' 58.2'
10	327°54.54	34.13		168°29.19	4.3'	28°25.52	-1.1' 58.2'
11	342°54.30	33.71		182°52.47	4.3'	28°24.37	-1.3' 58.2'
12	357°54.06	S21°33.29		197°15.80	4.4'	N28°23.03	-1.5' 58.2'
13	12°53.83	32.88		211°39.16	4.4'	28°21.51	-1.7' 58.2'
14	27°53.59	32.46		226°2.57	4.5'	28°19.81	-1.9' 58.1'
15	42°53.36	32.04		240°26.03	4.5'	28°17.92	-2.1' 58.1'
16	57°53.12	31.62		254°49.54	4.6'	28°15.84	-2.3' 58.1'
17	72°52.89	31.20		269°13.09	4.6'	28°13.58	-2.4' 58.1'
18	87°52.65	S21°30.78		283°36.70	4.7'	N28°11.14	-2.6' 58.1'
19	102°52.42	30.36		298°0.37	4.7'	28°8.52	-2.8' 58.0'
20	117°52.18	29.93		312°24.10	4.8'	28°5.72	-3.0' 58.0'
21	132°51.95	29.51		326°47.89	4.9'	28°2.74	-3.2' 58.0'
22	147°51.71	29.09		341°11.74	4.9'	27°59.58	-3.3' 58.0'
23	162°51.48	28.66		355°35.65	5.0'	27°56.24	-3.5' 58.0'
SD = 16.3'			$d = -0.4'$	SD = 15.9'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:09	10:06	██	██	14:10	16:08
N 70°	07:53	09:28	██	██	14:49	16:24
68°	07:40	09:01	10:51	13:25	15:15	16:37
66°	07:29	08:41	10:04	14:13	15:36	16:48
64°	07:20	08:24	09:34	14:43	15:52	16:57
62°	07:11	08:11	09:11	15:05	16:06	17:05
60°	07:04	07:59	08:53	15:24	16:17	17:12
N 58°	06:58	07:49	08:38	15:39	16:28	17:19
56°	06:52	07:40	08:25	15:51	16:37	17:24
54°	06:47	07:32	08:14	16:02	16:45	17:30
52°	06:42	07:25	08:04	16:12	16:52	17:35
50°	06:37	07:18	07:55	16:21	16:59	17:39
45°	06:27	07:03	07:36	16:40	17:13	17:49
N 40°	06:18	06:51	07:21	16:55	17:25	17:59
35°	06:09	06:41	07:08	17:08	17:36	18:07
30°	06:01	06:31	06:57	17:19	17:45	18:15
20°	05:47	06:14	06:37	17:39	18:02	18:30
N 10°	05:32	05:58	06:20	17:56	18:18	18:44
0°	05:16	05:42	06:04	18:12	18:34	19:00
S 10°	04:59	05:25	05:48	18:28	18:51	19:17
20°	04:38	05:06	05:31	18:45	19:09	19:38
30°	04:11	04:43	05:10	19:05	19:32	20:05
35°	03:54	04:29	04:58	19:17	19:46	20:22
40°	03:32	04:13	04:45	19:31	20:03	20:43
45°	03:05	03:52	04:28	19:47	20:23	21:10
S 50°	02:26	03:25	04:08	20:08	20:50	21:49
52°	02:04	03:12	03:58	20:17	21:03	22:11
54°	01:33	02:56	03:47	20:28	21:18	22:40
56°	00:35	02:38	03:35	20:40	21:37	23:33
58°	///	02:14	03:20	20:55	22:00	///
S 60°	///	01:42	03:03	21:12	22:31	///

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	□	□	□	□	□	□
64°	09:38	□	□	07:43	□	□
62°	10:33	10:16	□	06:48	09:12	□
60°	11:06	11:25	12:18	06:16	08:03	09:20
N 58°	11:31	12:00	12:57	05:52	07:28	08:41
56°	11:51	12:26	13:24	05:32	07:03	08:14
54°	12:07	12:46	13:45	05:16	06:43	07:52
52°	12:22	13:03	14:03	05:02	06:26	07:34
50°	12:34	13:18	14:18	04:50	06:11	07:19
45°	13:00	13:48	14:49	04:25	05:42	06:48
N 40°	13:21	14:11	15:12	04:05	05:19	06:25
35°	13:38	14:31	15:32	03:49	05:00	06:05
30°	13:53	14:47	15:49	03:35	04:43	05:48
20°	14:19	15:16	16:17	03:11	04:16	05:19
N 10°	14:41	15:40	16:41	02:50	03:52	04:55
0°	15:02	16:03	17:04	02:31	03:30	04:32
S 10°	15:22	16:25	17:27	02:11	03:08	04:09
20°	15:45	16:50	17:51	01:51	02:45	03:44
30°	16:11	17:18	18:19	01:27	02:18	03:16
35°	16:27	17:35	18:36	01:13	02:02	02:59
40°	16:45	17:55	18:55	00:57	01:43	02:39
45°	17:07	18:19	19:19	00:38	01:20	02:15
S 50°	17:35	18:50	19:49	00:15	00:52	01:43
52°	17:48	19:05	20:04	00:03	00:38	01:28
54°	18:04	19:24	20:22	00:21	01:10
56°	18:23	19:46	20:43	00:02	00:48
58°	18:46	20:14	21:09	23:39	00:19
S 60°	19:17	20:55	21:46	23:07	23:38

Day	Sun			Moon		
	Eqn. of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	Age 11-13 82-95%
10	07:25	07:37	12:08	21:16	08:46	
11	07:49	08:01	12:08	22:17	09:46	
12	08:12	08:24	12:08	23:18	10:48	

January 13, 14, 15 UT (Mon., Tue., Wed.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	112°43.65	130°52.22	S08°7.04	352°17.44	N24°49.56	42°0.93	N21°41.35	125°17.53	S07°30.43			Alpheratz	357°34.89 29°13.84
1	127°46.12	145°52.44	5.87	7°20.97	49.80	57°3.59	41.34	140°19.78	30.33			Ankaa	353°7.23 -42°10.44
2	142°48.58	160°52.66	4.70	22°24.49	50.05	72°6.26	41.32	155°22.04	30.24			Schedar	349°31.16 56°40.74
3	157°51.05	175°52.89	· · 3.52	37°28.02	· · 50.29	87°8.92	· · 41.31	170°24.29	· · 30.15			Diphda	348°47.33 -17°51.10
4	172°53.51	190°53.11	2.35	52°31.55	50.53	102°11.58	41.29	185°26.55	30.06			Achernar	335°20.12 -57°6.87
5	187°55.97	205°53.34	1.17	67°35.08	50.77	117°14.24	41.27	200°28.81	29.97			Hamal	327°51.11 23°34.94
6	202°58.44	220°53.57	S08°0.00	82°38.61	N24°51.02	132°16.90	N21°41.26	215°31.06	S07°29.87			Polaris	313°48.53 89°22.49
7	218°0.90	235°53.80	07°58.83	97°42.14	51.26	147°19.56	41.24	230°33.32	29.78			Acamar	315°11.57 -40°12.46
8	233°3.37	250°54.03	57.65	112°45.67	51.50	162°22.22	41.23	245°35.57	29.69			Menkar	314°5.98 4°11.26
9	248°5.83	265°54.26	· · 56.48	127°49.20	· · 51.74	177°24.88	· · 41.21	260°37.83	· · 29.60			Mirfak	308°27.97 49°57.20
10	263°8.30	280°54.49	55.30	142°52.73	51.98	192°27.54	41.20	275°40.08	29.50			Aldebaran	290°39.33 16°33.60
11	278°10.76	295°54.72	54.13	157°56.26	52.22	207°30.20	41.18	290°42.34	29.41			Rigel	281°3.56 -8°10.41
12	293°13.22	310°54.96	S07°52.95	172°59.79	N24°52.47	222°32.86	N21°41.17	305°44.59	S07°29.32			Capella	280°21.44 46°1.48
13	308°15.69	325°55.19	51.78	188°3.32	52.71	237°35.52	41.15	320°46.85	29.23			Bellatrix	278°22.56 6°22.33
14	323°18.15	340°55.43	50.60	203°6.85	52.95	252°38.18	41.14	335°49.10	29.13			Elnath	278°1.50 28°37.75
15	338°20.62	355°55.66	· · 49.43	218°10.38	· · 53.19	267°40.83	· · 41.12	350°51.35	· · 29.04			Alnilam	275°37.40 -1°11.19
16	353°23.08	10°55.90	48.25	233°13.91	53.43	282°43.49	41.11	5°53.61	28.95			Betelgeuse	270°51.74 7°24.69
17	8°25.54	25°56.14	47.07	248°17.44	53.67	297°46.15	41.09	20°55.86	28.86			Canopus	263°51.85 -52°42.58
18	23°28.01	40°56.38	S07°45.90	263°20.97	N24°53.90	312°48.80	N21°41.08	35°58.12	S07°28.76			Sirius	258°25.87 -16°45.07
19	38°30.47	55°56.62	44.72	278°24.51	54.14	327°51.46	41.06	51°0.37	28.67			Adhara	255°5.46 -29°0.39
20	53°32.94	70°56.87	43.55	293°28.04	54.38	342°54.12	41.05	66°2.62	28.58			Procyon	244°50.47 5°9.60
21	68°35.40	85°57.11	· · 42.37	308°31.57	· · 54.62	357°56.77	· · 41.03	81°4.88	· · 28.48			Pollux	243°16.89 27°57.88
22	83°37.87	100°57.35	41.19	323°35.10	54.86	12°59.43	41.02	96°7.13	28.39			Avior	234°14.10 -59°35.28
23	98°40.33	115°57.60	40.02	338°38.63	55.10	28°2.08	41.01	111°9.39	28.30			Suhail	222°45.89 -43°31.92
Mer.pass. 16:26		ν0.2' d-1.2' m-4.56		ν3.5' d0.2' m-1.43		ν2.7' d-0.0' m-2.67		ν2.3' d-0.1' m1.08					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	113°42.79	130°57.85	S07°38.84	353°42.17	N24°55.33	43°4.74	N21°40.99	126°11.64	S07°28.21			Regulus	207°34.15 11°50.59
1	128°45.26	145°58.10	37.66	8°45.70	55.57	58°7.39	40.98	141°13.89	28.11			Dubhe	193°40.53 61°36.69
2	143°47.72	160°58.34	36.49	23°49.23	55.81	73°10.05	40.96	156°16.15	28.02			Denebola	182°24.78 14°25.79
3	158°50.19	175°58.59	· · 35.31	38°52.77	· · 56.05	88°12.70	· · 40.95	171°18.40	· · 27.93			Gienah	175°43.46 -17°40.82
4	173°52.65	190°58.85	34.13	53°56.30	56.28	103°15.35	40.93	186°20.65	27.83			Acrux	172°59.91 -63°14.01
5	188°55.12	205°59.10	32.96	68°59.83	56.52	118°18.01	40.92	201°22.90	27.74			Gacrux	171°51.49 -57°14.96
6	203°57.58	220°59.35	S07°31.78	84°3.37	N24°56.75	133°20.66	N21°40.90	216°25.16	S07°27.65			Alioth	166°12.84 55°49.11
7	219°0.04	235°59.61	30.60	99°6.90	56.99	148°23.31	40.89	231°27.41	27.55			Spica	158°22.28 -11°17.52
8	234°2.51	250°59.86	29.42	114°10.44	57.22	163°25.96	40.88	246°29.66	27.46			Alkaid	152°52.01 49°10.97
9	249°4.97	266°0.12	· · 28.25	129°13.97	· · 57.46	178°28.61	· · 40.86	261°31.92	· · 27.37			Hadar	148°36.11 -60°29.36
10	264°7.44	281°0.38	27.07	144°17.51	57.69	193°31.27	40.85	276°34.17	27.27			Menkent	147°57.67 -36°29.44
11	279°9.90	296°0.63	25.89	159°21.04	57.93	208°33.92	40.83	291°36.42	27.18			Arcturus	145°47.96 19°2.93
12	294°12.36	311°0.89	S07°24.71	174°24.58	N24°58.16	223°36.57	N21°40.82	306°38.67	S07°27.09			Rigel Kent.	139°40.48 -60°56.07
13	309°14.83	326°1.15	23.53	189°28.11	58.40	238°39.22	40.81	321°40.92	26.99			Kochab	137°20.19 74°2.76
14	324°17.29	341°1.42	22.36	204°31.65	58.63	253°41.87	40.79	336°43.18	26.90			Zuben'ubi	136°56.12 -16°8.73
15	339°19.76	356°1.68	· · 21.18	219°35.18	· · 58.86	268°44.52	· · 40.78	351°45.43	· · 26.81			Alphecca	126°3.92 26°37.60
16	354°22.22	11°1.94	20.00	234°38.72	59.10	283°47.17	40.76	6°47.68	26.71			Antares	112°16.08 -26°29.20
17	9°24.69	26°2.21	18.82	249°42.25	59.33	298°49.82	40.75	21°49.93	26.62			Atria	107°10.75 -69°4.15
18	24°27.15	41°2.47	S07°17.64	264°45.79	N24°59.56	313°52.46	N21°40.74	36°52.18	S07°26.52			Sabik	102°3.04 -15°45.37
19	39°29.61	56°2.74	16.47	279°49.32	24°59.80	328°55.11	40.72	51°54.43	26.43			Shaula	96°10.71 -37°7.26
20	54°32.08	71°3.01	15.29	294°52.86	25°0.03	343°57.76	40.71	66°56.69	26.34			Rasalhague	95°58.83 12°32.38
21	69°34.54	86°3.28	· · 14.11	309°56.39	· · 0.26	359°0.41	· · 40.69	81°58.94	· · 26.24			Eltanin	90°42.67 51°28.93
22	84°37.01	101°3.55	12.93	324°59.93	0.49	14°3.06	40.68	97°1.19	26.15			Kaus Aust.	83°32.87 -34°22.35
23	99°39.47	116°3.82	11.75	340°3.47	0.72	29°5.70	40.67	112°3.44	26.05			Vega	80°33.63 38°48.27
Mer.pass. 16:22		ν0.2' d-1.2' m-4.57		ν3.5' d0.2' m-1.44		ν2.7' d-0.0' m-2.66		ν2.3' d-0.1' m1.09					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	114°41.93	131°4.09	S07°10.57	355°7.00	N25°0.95	44°8.35	N21°40.65	127°5.69	S07°25.96			Nunki	75°48.10 -26°15.97
1	129°44.40	146°4.37	9.39	10°10.54	1.18	59°10.99	40.64	142°7.94	25.87			Altair	62°0.28 8°55.99
2	144°46.86	161°4.64	8.21	25°14.08	1.41	74°13.64	40.63	157°10.19	25.77			Peacock	53°6.27 -56°39.36
3	159°49.33	176°4.92	· · 7.03	40°17.61	· · 1.64	89°16.29	· · 40.61	172°12.44	· · 25.68			Deneb	49°26.25 45°22.18
4	174°51.79	191°5.19	5.85	55°21.15	1.87	104°18.93	40.60	187°14.69	25.58			Enif	33°39.06 9°59.35
5	189°54.26	206°5.47	4.68	70°24.69	2.10	119°21.58	40.59	202°16.94	25.49			Al Na'ir	27°33.24 -46°50.58
6	204°56.72	221°5.75	S07°3.50	85°28.22	N25°2.33	134°24.22	N21°40.57	217°19.19	S07°25.40			Fomalhaut	15°14.72 -29°29.56
7	219°59.18	236°6.03	2.32	100°31.76	2.56	149°26.86	40.56	232°21.44	25.30			Scheat	13°45.41 28°13.20
8	235°1.65	251°6.31	1.14	115°35.30	2.79	164°29.51	40.55	247°23.69	25.21			Markab	13°30.08 15°20.42
9	250°4.11	266°6.60	06°59.96	130°38.83	· · 3.02	179°32.15	· · 40.53</						

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.25	S21°28.23	9°59.63	5.1'	N27°52.73	-3.7'	57.9'
1	192°51.01	27.81	24°23.69	5.1'	27°49.04	-3.9'	57.9'
2	207°50.78	27.38	38°47.81	5.2'	27°45.18	-4.0'	57.9'
3	222°50.55	· · 26.95	53°12.01	5.3'	27°41.14	-4.2'	57.9'
4	237°50.32	26.53	67°36.28	5.4'	27°36.93	-4.4'	57.8'
5	252°50.08	26.10	82°0.64	5.4'	27°32.55	-4.6'	57.8'
6	267°49.85	S21°25.67	96°25.07	5.5'	N27°28.00	-4.7'	57.8'
7	282°49.62	25.24	110°49.58	5.6'	27°23.28	-4.9'	57.8'
8	297°49.39	24.80	125°14.18	5.7'	27°18.39	-5.1'	57.8'
9	312°49.16	· · 24.37	139°38.86	5.8'	27°13.34	-5.2'	57.7'
10	327°48.93	23.94	154°3.63	5.9'	27°8.12	-5.4'	57.7'
11	342°48.70	23.51	168°28.49	5.9'	27°2.74	-5.5'	57.7'
12	357°48.47	S21°23.07	182°53.43	6.0'	N26°57.19	-5.7'	57.7'
13	12°48.24	22.64	197°18.47	6.1'	26°51.49	-5.9'	57.6'
14	27°48.01	22.20	211°43.61	6.2'	26°45.62	-6.0'	57.6'
15	42°47.78	· · 21.77	226°8.83	6.3'	26°39.60	-6.2'	57.6'
16	57°47.55	21.33	240°34.16	6.4'	26°33.42	-6.3'	57.6'
17	72°47.32	20.89	254°59.58	6.5'	26°27.08	-6.5'	57.5'
18	87°47.09	S21°20.45	269°25.10	6.6'	N26°20.59	-6.6'	57.5'
19	102°46.87	20.01	283°50.72	6.7'	26°13.95	-6.8'	57.5'
20	117°46.64	19.57	298°16.44	6.8'	26°7.15	-6.9'	57.5'
21	132°46.41	· · 19.13	312°42.27	6.9'	26°0.21	-7.1'	57.5'
22	147°46.18	18.69	327°8.20	7.0'	25°53.12	-7.2'	57.4'
23	162°45.96	18.25	341°34.23	7.1'	25°45.88	-7.4'	57.4'
SD = 16.3' $d = -0.4'$			SD = 15.8'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°45.73	S21°17.81	356°0.37	7.2'	N25°38.50	-7.5'	57.4'
1	192°45.50	17.36	10°26.61	7.4'	25°30.97	-7.7'	57.4'
2	207°45.28	16.92	24°52.96	7.5'	25°23.31	-7.8'	57.3'
3	222°45.05	· · 16.47	39°19.43	7.6'	25°15.50	-7.9'	57.3'
4	237°44.83	16.03	53°46.00	7.7'	25°7.55	-8.1'	57.3'
5	252°44.60	15.58	68°12.68	7.8'	24°59.47	-8.2'	57.3'
6	267°44.38	S21°15.14	82°39.47	7.9'	N24°51.25	-8.4'	57.2'
7	282°44.15	14.69	97°6.37	8.0'	24°42.90	-8.5'	57.2'
8	297°43.93	14.24	111°33.38	8.1'	24°34.41	-8.6'	57.2'
9	312°43.70	· · 13.79	126°0.51	8.2'	24°25.80	-8.7'	57.2'
10	327°43.48	13.34	140°27.75	8.4'	24°17.05	-8.9'	57.1'
11	342°43.26	12.89	154°55.10	8.5'	24°8.18	-9.0'	57.1'
12	357°43.03	S21°12.44	169°22.57	8.6'	N23°59.18	-9.1'	57.1'
13	12°42.81	11.99	183°50.15	8.7'	23°50.06	-9.2'	57.1'
14	27°42.59	11.53	198°17.84	8.8'	23°40.82	-9.4'	57.0'
15	42°42.37	· · 11.08	212°45.65	8.9'	23°31.45	-9.5'	57.0'
16	57°42.14	10.63	227°13.57	9.0'	23°21.97	-9.6'	57.0'
17	72°41.92	10.17	241°41.61	9.2'	23°12.37	-9.7'	57.0'
18	87°41.70	S21°9.72	256°9.77	9.3'	N23°2.65	-9.8'	56.9'
19	102°41.48	9.26	270°38.04	9.4'	22°52.82	-9.9'	56.9'
20	117°41.26	8.80	285°6.42	9.5'	22°42.88	-10.1'	56.9'
21	132°41.04	· · 8.35	299°34.92	9.6'	22°32.82	-10.2'	56.8'
22	147°40.82	7.89	314°3.53	9.7'	22°22.66	-10.3'	56.8'
23	162°40.60	7.43	328°32.26	9.8'	22°12.39	-10.4'	56.8'
SD = 16.3' $d = -0.4'$			SD = 15.6'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°40.38	S21°6.97	343°1.11	10.0'	N22°2.01	-10.5'	56.8'
1	192°40.16	6.51	357°30.07	10.1'	21°51.53	-10.6'	56.7'
2	207°39.94	6.05	11°59.14	10.2'	21°40.95	-10.7'	56.7'
3	222°39.72	· · 5.59	26°28.33	10.3'	21°30.26	-10.8'	56.7'
4	237°39.50	5.12	40°57.63	10.4'	21°19.47	-10.9'	56.7'
5	252°39.28	4.66	55°27.05	10.5'	21°8.59	-11.0'	56.6'
6	267°39.07	S21°4.20	69°56.58	10.6'	N20°57.61	-11.1'	56.6'
7	282°38.85	3.73	84°26.22	10.8'	20°46.54	-11.2'	56.6'
8	297°38.63	3.27	98°55.97	10.9'	20°35.37	-11.3'	56.6'
9	312°38.41	· · 2.80	113°25.84	11.0'	20°24.11	-11.3'	56.5'
10	327°38.20	2.33	127°55.82	11.1'	20°12.76	-11.4'	56.5'
11	342°37.98	1.87	142°25.91	11.2'	20°1.33	-11.5'	56.5'
12	357°37.76	S21°1.40	156°56.11	11.3'	N19°49.80	-11.6'	56.5'
13	12°37.55	0.93	171°26.42	11.4'	19°38.19	-11.7'	56.4'
14	27°37.33	0.46	185°56.84	11.5'	19°26.50	-11.8'	56.4'
15	42°37.12	20°59.99	200°27.36	11.6'	19°14.73	-11.9'	56.4'
16	57°36.90	20°59.52	214°58.00	11.7'	19°2.87	-11.9'	56.3'
17	72°36.69	59.05	229°28.75	11.9'	18°50.94	-12.0'	56.3'
18	87°36.47	S20°58.58	243°59.60	12.0'	N18°38.92	-12.1'	56.3'
19	102°36.26	58.10	258°30.55	12.1'	18°26.83	-12.2'	56.3'
20	117°36.04	57.63	273°1.62	12.2'	18°14.67	-12.2'	56.2'
21	132°35.83	· · 57.16	287°32.78	12.3'	18°2.43	-12.3'	56.2'
22	147°35.62	56.68	302°4.05	12.4'	17°50.13	-12.4'	56.2'
23	162°35.40	56.21	316°35.43	12.5'	17°37.75	-12.4'	56.2'
SD = 16.3' $d = -0.5'$			SD = 15.5'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:02	09:55	■	■	14:25	16:17
N 70°	07:47	09:20	■	■	14:59	16:32
68°	07:35	08:55	10:36	13:42	15:24	16:44
66°	07:25	08:36	09:55	14:24	15:43	16:54
64°	07:16	08:20	09:27	14:52	15:59	17:03
62°	07:08	08:07	09:06	15:13	16:12	17:10
60°	07:02	07:56	08:49	15:30	16:23	17:17
N 58°	06:56	07:46	08:34	15:44	16:33	17:23
56°	06:50	07:37	08:22	15:57	16:41	17:29
54°	06:45	07:30	08:11	16:07	16:49	17:34
52°	06:40	07:23	08:02	16:17	16:56	17:39
50°	06:36	07:16	07:53	16:25	17:02	17:43
45°	06:26	07:02	07:35	16:43	17:16	17:53
N 40°	06:17	06:51	07:20	16:58	17:28	18:01
35°	06:09	06:40	07:08	17:11	17:38	18:09
30°	06:01	06:31	06:57	17:22	17:48	18:17
20°	05:47	06:14	06:38	17:41	18:04	18:31
N 10°	05:33	05:59	06:21	17:57	18:20	18:46
0°	05:17	05:43	06:05	18:13	18:35	19:01
S 10°	05:00	05:27	05:50	18:29	18:51	19:18
20°	04:40	05:09	05:33	18:45	19:10	19:38
30°	04:14	04:46	05:13	19:05	19:32	20:04
35°	03:57	04:32	05:01	19:17	19:45	20:21
40°	03:36	04:16	04:48	19:30	20:02	20:41
45°	03:10	03:56	04:32	19:46	20:21	21:08
S 50°	02:32	03:30	04:12	20:05	20:47	21:45
52°	02:11	03:17	04:03	20:15	21:00	22:05
54°	01:44	03:03	03:52	20:25	21:14	22:32
56°	00:59	02:45	03:40	20:37	21:32	23:14
58°	////	02:23	03:26	20:51	21:54	////
S 60°	////	01:53	03:10	21:07	22:22	////

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	□	□	□	□	□	□
N 70°	□	□	14:46	□	□	12:44
68°	□	□	15:46	□	□	11:43
66°	□	13:28	16:20	□	12:14	11:08
64°	□	14:37	16:45	□	11:04	10:42
62°	13:06	15:12	17:04	10:37	10:28	10:22
60°	13:51	15:37	17:20	09:51	10:02	10:05
N 58°	14:21	15:57	17:33	09:22	09:41	09:51
56°	14:44	16:14	17:44	08:59	09:24	09:39
54°	15:02	16:28	17:54	08:40	09:10	09:29
52°	15:18	16:40	18:03	08:24	08:57	09:19
50°	15:31	16:51	18:11	08:10	08:46	09:11
45°	15:59	17:13	18:27	07:42	08:22	08:53
N 40°	16:20	17:31	18:41	07:20	08:03	08:38
35°	16:38	17:46	18:52	07:01	07:47	08:25
30°	16:54	17:59	19:02	06:45	07:34	08:14
20°	17:20	18:21	19:19	06:18	07:10	07:55
N 10°	17:42	18:40	19:34	05:55	06:49	07:38
0°	18:03	18:58	19:48	05:33	06:30	07:22
S 10°	18:24	19:16	20:02	05:11	06:10	07:07
20°	18:46	19:34	20:16	04:47	05:50	06:50
30°	19:12	19:56	20:33	04:19	05:25	06:30
35°	19:27	20:09	20:43	04:03	05:11	06:18
40°	19:44	20:23	20:54	03:44	04:54	06:05
45°	20:05	20:40	21:07	03:21	04:34	05:49
S 50°	20:32	21:01	21:22	02:51	04:08	05:29
52°	20:45	21:11	21:30	02:36	03:56	05:20
54°	20:59	21:22	21:38	02:19	03:42	05:09
56°	21:16	21:35	21:47	01:58	03:25	04:57
58°	21:37	21:50	21:57	01:32	03:05	04:43
S 60°	22:02	22:07	22:08	00:55	02:40	04:26

Day	Sun		Mer. Pass	Moon		Age 14-16 99-99%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm Lower hh:mm		
13	08:35	08:46	12:09	—:—	11:48	
14	08:57	09:08	12:09	00:17	12:44	
15	09:18	09:29	12:09	01:10	13:35	

January 16, 17, 18 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	115°41.07		131°10.96	S06°42.25	356°31.89	N25°6.40	45°11.76	N21°40.34	127°59.68	S07°23.69	Alpheratz	357°34.90 29°13.83	
1	130°43.54		146°11.26	41.07	11°35.43	6.63	60°14.40	40.33	143°1.93	23.60	Ankaa	353°7.24 -42°10.44	
2	145°46.00		161°11.56	39.89	26°38.97	6.85	75°17.04	40.31	158°4.18	23.50	Schedar	349°31.18 56°40.73	
3	160°48.47		176°11.86	· · 38.71	41°42.51	· · 7.07	90°19.68	· · 40.30	173°6.42	· · 23.41	Diphda	348°47.34 -17°51.10	
4	175°50.93		191°12.16	37.53	56°46.04	7.29	105°22.31	40.29	188°8.67	23.31	Achernar	335°20.14 -57°6.86	
5	190°53.39		206°12.47	36.35	71°49.58	7.52	120°24.95	40.28	203°10.92	23.22	Hamal	327°51.12 23°34.94	
6	205°55.86		221°12.77	S06°35.17	86°53.12	N25°7.74	135°27.59	N21°40.26	218°13.17	S07°23.12	Polaris	313°49.96 89°22.50	
7	220°58.32		236°13.08	33.99	101°56.66	7.96	150°30.22	40.25	233°15.42	23.03	Acamar	315°11.58 -40°12.47	
8	236°0.79		251°13.39	32.80	117°0.20	8.18	165°32.86	40.24	248°17.66	22.93	Menkar	314°5.99 4°11.26	
9	251°3.25		266°13.70	· · 31.62	132°3.73	· · 8.40	180°35.49	· · 40.23	263°19.91	· · 22.84	Mirfak	308°27.98 49°57.20	
10	266°5.72		281°14.01	30.44	147°7.27	8.62	195°38.13	40.21	278°22.16	22.74	Aldebaran	290°39.34 16°33.61	
11	281°8.18		296°14.32	29.26	162°10.81	8.84	210°40.76	40.20	293°24.40	22.65	Rigel	281°3.56 -8°10.42	
12	296°10.64		311°14.63	S06°28.08	177°14.35	N25°9.06	225°43.40	N21°40.19	308°26.65	S07°22.55	Capella	280°21.45 46°1.48	
13	311°13.11		326°14.94	26.90	192°17.88	9.28	240°46.03	40.18	323°28.90	22.45	Bellatrix	278°22.56 6°22.33	
14	326°15.57		341°15.25	25.72	207°21.42	9.50	255°48.66	40.17	338°31.15	22.36	Elath	278°1.50 28°37.75	
15	341°18.04		356°15.57	· · 24.53	222°24.96	· · 9.72	270°51.30	· · 40.15	353°33.39	· · 22.26	Alnilam	275°37.40 -1°11.19	
16	356°20.50		11°15.89	23.35	237°28.49	9.94	285°53.93	40.14	8°35.64	22.17	Betelgeuse	270°51.74 7°24.68	
17	11°22.96		26°16.20	22.17	252°32.03	10.15	300°56.56	40.13	23°37.89	22.07	Canopus	263°51.86 -52°42.59	
18	26°25.43		41°16.52	S06°20.99	267°35.57	N25°10.37	315°59.19	N21°40.12	38°40.13	S07°21.98	Sirius	258°25.87 -16°45.08	
19	41°27.89		56°16.84	19.81	282°39.11	10.59	331°1.82	40.11	53°42.38	21.88	Adhara	255°5.46 -29°0.40	
20	56°30.36		71°17.16	18.62	297°42.64	10.81	346°4.46	40.09	68°44.63	21.78	Procyon	244°50.46 5°9.60	
21	71°32.82		86°17.48	· · 17.44	312°46.18	· · 11.02	1°7.09	· · 40.08	83°46.87	· · 21.69	Pollux	243°16.88 27°57.89	
22	86°35.28		101°17.81	16.26	327°49.72	11.24	16°9.72	40.07	98°49.12	21.59	Avior	234°14.09 -59°35.30	
23	101°37.75		116°18.13	15.08	342°53.25	11.46	31°12.35	40.06	113°51.36	21.50	Suhail	222°45.87 -43°31.94	
Mer.pass. 16:15		ν0.3' d-1.2' m-4.59		ν3.5' d0.2' m-1.45		ν2.6' d-0.0' m-2.65		ν2.2' d-0.1' m1.09					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	116°40.21		131°18.45	S06°13.90	357°56.79	N25°11.67	46°14.98	N21°40.05	128°53.61	S07°21.40	Miaplacidus	221°37.42 -69°49.04	
1	131°42.68		146°18.78	12.71	13°0.33	11.89	61°17.61	40.04	143°55.86	21.31	Alphard	217°47.42 -8°46.05	
2	146°45.14		161°19.11	11.53	28°3.86	12.10	76°20.24	40.02	158°58.10	21.21	Regulus	207°34.13 11°50.59	
3	161°47.61		176°19.44	· · 10.35	43°7.40	· · 12.32	91°22.86	· · 40.01	174°0.35	· · 21.11	Dubhe	193°40.49 61°36.69	
4	176°50.07		191°19.76	9.17	58°10.94	12.53	106°25.49	40.00	189°2.59	21.02	Denebola	182°24.75 14°25.78	
5	191°52.53		206°20.09	7.99	73°14.47	12.75	121°28.12	39.99	204°4.84	20.92	Gienah	175°43.44 -17°40.83	
6	206°55.00		221°20.43	S06°6.80	88°18.01	N25°12.96	136°30.75	N21°39.98	219°7.08	S07°20.82	Acrux	172°59.88 -63°14.02	
7	221°57.46		236°20.76	5.62	103°21.55	13.18	151°33.38	39.97	234°9.33	20.73	Gacrux	171°51.46 -57°14.98	
8	236°59.93		251°21.09	4.44	118°25.08	13.39	166°36.00	39.95	249°11.57	20.63	Alioth	166°12.79 55°49.10	
9	252°2.39		266°21.43	· · 3.26	133°28.62	· · 13.60	181°38.63	· · 39.94	264°13.82	· · 20.54	Spica	158°22.25 -11°17.53	
10	267°4.85		281°21.76	2.07	148°32.15	13.81	196°41.26	39.93	279°16.06	20.44	Alkaid	152°51.98 49°10.96	
11	282°7.32		296°22.10	06°0.89	163°35.69	14.03	211°43.88	39.92	294°18.31	20.34	Hadar	148°36.06 -60°29.37	
12	297°9.78		311°22.44	S05°59.71	178°39.22	N25°14.24	226°46.51	N21°39.91	309°20.55	S07°20.25	Menkent	147°57.64 -36°29.45	
13	312°12.25		326°22.78	58.53	193°42.76	14.45	241°49.13	39.90	324°22.80	20.15	Arcturus	145°47.93 19°2.92	
14	327°14.71		341°23.12	57.35	208°46.30	14.66	256°51.76	39.89	339°25.04	20.05	Rigel Kent.	139°40.44 -60°56.08	
15	342°17.17		356°23.46	· · 56.16	223°49.83	· · 14.87	271°54.38	· · 39.88	354°27.29	· · 19.96	Kochab	137°20.12 74°2.75	
16	357°19.64		11°23.80	54.98	238°53.37	15.08	286°57.01	39.87	9°29.53	19.86	Zuben'ubi	136°56.09 -16°8.74	
17	12°22.10		26°24.15	53.80	253°56.90	15.29	301°59.63	39.85	24°31.77	19.76	Alphecca	126°3.89 26°37.59	
18	27°24.57		41°24.49	S05°52.62	269°0.43	N25°15.50	317°2.26	N21°39.84	39°34.02	S07°19.67	Antares	112°16.05 -26°29.21	
19	42°27.03		56°24.84	51.43	284°3.97	15.71	332°4.88	39.83	54°36.26	19.57	Atria	107°10.70 -69°4.14	
20	57°29.49		71°25.18	50.25	299°7.50	15.92	347°7.50	39.82	69°38.51	19.47	Sabik	102°3.02 -15°45.38	
21	72°31.96		86°25.53	· · 49.07	314°11.04	· · 16.13	2°10.12	· · 39.81	84°40.75	· · 19.38	Shaula	96°10.69 -37°7.26	
22	87°34.42		101°25.88	47.88	329°14.57	16.34	17°12.75	39.80	99°42.99	19.28	Rasalhague	95°58.81 12°32.37	
23	102°36.89		116°26.23	46.70	344°18.11	16.55	32°15.37	39.79	114°45.24	19.18	Eltanin	90°42.65 51°28.91	
Mer.pass. 16:11		ν0.3' d-1.2' m-4.60		ν3.5' d0.2' m-1.44		ν2.6' d-0.0' m-2.64		ν2.2' d-0.1' m1.09					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	117°39.35		131°26.58	S05°45.52	359°21.64	N25°16.76	47°17.99	N21°39.78	129°47.48	S07°19.09	Jan 16 Thu	SHA Mer.pass	
1	132°41.82		146°26.94	44.34	14°25.17	16.96	62°20.61	39.77	144°49.72	18.99	Venus	15°29.89 15:15	
2	147°44.28		161°27.29	43.15	29°28.71	17.17	77°23.23	39.76	159°51.97	18.89	Mars	240°50.82 00:14	
3	162°46.74		176°27.65	· · 41.97	44°32.24	· · 17.38	92°25.85	· · 39.75	174°54.21	· · 18.80	Jupiter	289°30.69 20:56	
4	177°49.21		191°28.00	40.79	59°35.77	17.59	107°28.47	39.74	189°56.45	18.70	Saturn	12°18.61 15:26	
5	192°51.67		206°28.36	39.61	74°39.31	17.79	122°31.09	39.73	204°58.70	18.60			
6	207°54.14		221°28.72	S05°38.42	89°42.84	N25°18.00	137°33.71	N21°39.72	220°0.94	S07°18.50	Jan 17 Fri	SHA Mer.pass	
7	222°56.60		236°29.08	37.24	104°46.37	18.20	152°36.33	39.71	235°3.18	18.41	Venus	14°38.24 15:14	
8	237°59.06		251°29.44	36.06	119°49.90	18.41	167°38.95	39.70	250°5.42	18.31	Mars	241°16.58 00:08	
9	253°1.53		266°29.80	· · 34.88	134°53.44	· · 18.61	182°41.57	· · 39.68	265°7.67	· · 18.21	Jupiter	289°34.76 20:51	
10	268°3.99		281°30.16	33.69	149°56.97	18.82	197°44.19	39.67	280°9.91	18.12	Saturn	12°13.40 15:22	
11	283°6.46		296°30.53	32.51	165°0.50	19.02	212°46.80	39.66	295°12.15	18.02			
12	298°8.92		311°30.89	S05°31.33	180°4.03	N25°19.23	227°49.42						


h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°35.19	S20°55.73	331°6.90	12.6'	N17°25.30	-12.5'	56.1'
1	192°34.98	55.25	345°38.48	12.7'	17°12.78	-12.6'	56.1'
2	207°34.77	54.77	0°10.16	12.8'	17°0.20	-12.6'	56.1'
3	222°34.55	54.30	14°41.94	12.9'	16°47.55	-12.7'	56.1'
4	237°34.34	53.82	29°13.81	13.0'	16°34.85	-12.8'	56.0'
5	252°34.13	53.34	43°45.79	13.1'	16°22.07	-12.8'	56.0'
6	267°33.92	S20°52.86	58°17.86	13.2'	N16°9.24	-12.9'	56.0'
7	282°33.71	52.38	72°50.02	13.3'	15°56.35	-12.9'	56.0'
8	297°33.50	51.89	87°22.29	13.4'	15°43.40	-13.0'	55.9'
9	312°33.29	51.41	101°54.64	13.4'	15°30.40	-13.1'	55.9'
10	327°33.08	50.93	116°27.09	13.5'	15°17.33	-13.1'	55.9'
11	342°32.87	50.44	130°59.63	13.6'	15°4.22	-13.2'	55.9'
12	357°32.66	S20°49.96	145°32.26	13.7'	N14°51.05	-13.2'	55.8'
13	12°32.45	49.47	160°4.99	13.8'	14°37.83	-13.3'	55.8'
14	27°32.24	48.99	174°37.80	13.9'	14°24.56	-13.3'	55.8'
15	42°32.03	48.50	189°10.70	14.0'	14°11.25	-13.4'	55.8'
16	57°31.83	48.01	203°43.68	14.1'	13°57.88	-13.4'	55.7'
17	72°31.62	47.53	218°16.75	14.2'	13°44.47	-13.5'	55.7'
18	87°31.41	S20°47.04	232°49.91	14.2'	N13°31.01	-13.5'	55.7'
19	102°31.20	46.55	247°23.15	14.3'	13°17.51	-13.5'	55.7'
20	117°31.00	46.06	261°56.47	14.4'	13°3.97	-13.6'	55.6'
21	132°30.79	45.57	276°29.87	14.5'	12°50.38	-13.6'	55.6'
22	147°30.58	45.07	291°3.36	14.6'	12°36.76	-13.7'	55.6'
23	162°30.38	44.58	305°36.92	14.6'	12°23.09	-13.7'	55.6'
SD = 16.3' d = -0.5'			SD = 15.3'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°30.17	S20°44.09	320°10.56	14.7'	N12°9.39	-13.7'	55.5'
1	192°29.97	43.60	334°44.28	14.8'	11°55.65	-13.8'	55.5'
2	207°29.76	43.10	349°18.08	14.9'	11°41.88	-13.8'	55.5'
3	222°29.56	42.61	3°51.94	14.9'	11°28.07	-13.8'	55.5'
4	237°29.35	42.11	18°25.89	15.0'	11°14.22	-13.9'	55.4'
5	252°29.15	41.61	32°59.90	15.1'	11°0.35	-13.9'	55.4'
6	267°28.95	S20°41.12	47°33.99	15.2'	N10°46.44	-13.9'	55.4'
7	282°28.74	40.62	62°8.14	15.2'	10°32.50	-14.0'	55.4'
8	297°28.54	40.12	76°42.37	15.3'	10°18.53	-14.0'	55.4'
9	312°28.34	39.62	91°16.66	15.4'	10°4.54	-14.0'	55.3'
10	327°28.13	39.12	105°51.02	15.4'	09°50.52	-14.0'	55.3'
11	342°27.93	38.62	120°25.44	15.5'	09°36.47	-14.1'	55.3'
12	357°27.73	S20°38.12	134°59.93	15.6'	N09°22.39	-14.1'	55.3'
13	12°27.53	37.62	149°34.48	15.6'	09°8.29	-14.1'	55.2'
14	27°27.33	37.12	164°9.09	15.7'	08°54.17	-14.1'	55.2'
15	42°27.13	36.61	178°43.77	15.7'	08°40.03	-14.2'	55.2'
16	57°26.92	36.11	193°18.50	15.8'	08°25.86	-14.2'	55.2'
17	72°26.72	35.61	207°53.29	15.8'	08°11.68	-14.2'	55.2'
18	87°26.52	S20°35.10	222°28.14	15.9'	N07°57.47	-14.2'	55.1'
19	102°26.32	34.59	237°3.04	16.0'	07°43.25	-14.2'	55.1'
20	117°26.12	34.09	251°38.00	16.0'	07°29.01	-14.3'	55.1'
21	132°25.93	33.58	266°13.01	16.1'	07°14.76	-14.3'	55.1'
22	147°25.73	33.07	280°48.08	16.1'	07°0.48	-14.3'	55.0'
23	162°25.53	32.56	295°23.19	16.2'	06°46.20	-14.3'	55.0'
SD = 16.3' d = -0.5'			SD = 15.1'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.33	S20°32.06	309°58.36	16.2'	N06°31.89	-14.3'	55.0'
1	192°25.13	31.55	324°33.57	16.3'	06°17.58	-14.3'	55.0'
2	207°24.93	31.04	339°8.83	16.3'	06°3.26	-14.3'	55.0'
3	222°24.74	30.52	353°44.14	16.4'	05°48.92	-14.3'	54.9'
4	237°24.54	30.01	8°19.49	16.4'	05°34.57	-14.4'	54.9'
5	252°24.34	29.50	22°54.89	16.4'	05°20.21	-14.4'	54.9'
6	267°24.15	S20°28.99	37°30.33	16.5'	N05°5.85	-14.4'	54.9'
7	282°23.95	28.47	52°5.81	16.5'	04°51.48	-14.4'	54.9'
8	297°23.75	27.96	66°41.33	16.6'	04°37.10	-14.4'	54.9'
9	312°23.56	27.44	81°16.89	16.6'	04°22.71	-14.4'	54.8'
10	327°23.36	26.93	95°52.48	16.6'	04°8.32	-14.4'	54.8'
11	342°23.17	26.41	110°28.12	16.7'	03°53.92	-14.4'	54.8'
12	357°22.97	S20°25.89	125°3.78	16.7'	N03°39.52	-14.4'	54.8'
13	12°22.78	25.37	139°39.49	16.7'	03°25.12	-14.4'	54.8'
14	27°22.58	24.86	154°15.22	16.8'	03°10.71	-14.4'	54.7'
15	42°22.39	24.34	168°50.99	16.8'	02°56.31	-14.4'	54.7'
16	57°22.20	23.82	183°26.79	16.8'	02°41.90	-14.4'	54.7'
17	72°22.00	23.30	198°2.62	16.9'	02°27.49	-14.4'	54.7'
18	87°21.81	S20°22.77	212°38.47	16.9'	N02°13.09	-14.4'	54.7'
19	102°21.62	22.25	227°14.35	16.9'	01°58.68	-14.4'	54.7'
20	117°21.43	21.73	241°50.26	16.9'	01°44.28	-14.4'	54.6'
21	132°21.24	21.21	256°26.19	17.0'	01°29.88	-14.4'	54.6'
22	147°21.04	20.68	271°2.15	17.0'	01°15.49	-14.4'	54.6'
23	162°20.85	20.16	285°38.13	17.0'	01°1.10	-14.4'	54.6'
SD = 16.2' d = -0.5'			SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:55	09:42	■	■	14:39	16:26
N 70°	07:41	09:11	11:37	12:44	15:10	16:40
68°	07:30	08:48	10:22	13:59	15:33	16:51
66°	07:20	08:30	09:46	14:35	15:51	17:01
64°	07:12	08:15	09:20	15:01	16:06	17:09
62°	07:05	08:03	09:00	15:21	16:18	17:16
60°	06:58	07:52	08:44	15:37	16:29	17:23
N 58°	06:53	07:43	08:30	15:51	16:38	17:28
56°	06:47	07:34	08:19	16:02	16:46	17:33
54°	06:43	07:27	08:08	16:13	16:54	17:38
52°	06:38	07:20	07:59	16:22	17:00	17:43
50°	06:34	07:14	07:51	16:30	17:07	17:47
45°	06:25	07:01	07:33	16:47	17:20	17:56
N 40°	06:16	06:49	07:19	17:02	17:31	18:04
35°	06:08	06:39	07:07	17:14	17:41	18:12
30°	06:01	06:30	06:56	17:24	17:50	18:19
20°	05:47	06:14	06:38	17:43	18:06	18:33
N 10°	05:33	05:59	06:22	17:59	18:21	18:47
0°	05:19	05:44	06:07	18:14	18:36	19:02
S 10°	05:02	05:29	05:51	18:29	18:52	19:18
20°	04:42	05:11	05:35	18:45	19:09	19:38
30°	04:17	04:49	05:15	19:05	19:31	20:03
35°	04:00	04:36	05:04	19:16	19:44	20:19
40°	03:40	04:20	04:51	19:29	20:00	20:39
45°	03:15	04:00	04:36	19:44	20:19	21:04
S 50°	02:39	03:36	04:17	20:03	20:44	21:40
52°	02:19	03:23	04:08	20:12	20:56	21:59
54°	01:54	03:09	03:58	20:22	21:10	22:24
56°	01:16	02:52	03:46	20:33	21:27	22:59
58°	////	02:31	03:33	20:46	21:47	////
S 60°	////	02:04	03:17	21:02	22:13	////

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	17:15	19:38	21:40	11:54	11:02	10:26
N 70°	17:44	19:49	21:42	11:24	10:48	10:21
68°	18:04	19:59	21:43	11:02	10:37	10:17
66°	18:21	20:06	21:44	10:44	10:27	10:13
64°	18:34	20:13	21:46	10:29	10:19	10:10
62°	18:45	20:18	21:46	10:17	10:12	10:07
60°	18:54	20:23	21:47	10:06	10:06	10:05
N 58°	19:03	20:27	21:48	09:57	10:00	10:02
56°	19:10	20:31	21:48	09:49	09:55	10:00
54°	19:16	20:34	21:49	09:42	09:51	09:59
52°	19:22	20:37	21:50	09:35	09:47	09:57
50°	19:27	20:40	21:50	09:29	09:44	09:56
45°	19:38	20:46	21:51	09:16	09:36	09:52
N 40°	19:47	20:51	21:52	09:06	09:29	09:50
35°	19:55	20:55	21:53	08:57	09:23	09:47
30°	20:02	20:59	21:53	08:48	09:18	09:45
20°	20:14	21:05	21:54	08:34	09:09	09:42
N 10°	20:24	21:11	21:55	08:22	09:02	09:39
0°	20:34	21:16	21:56	08:10	08:54	09:35
S 10°	20:43	21:21	21:57	07:59	08:47	09:32
20°	20:53	21:27	21:58	07:46	08:39	09:29
30°	21:05	21:33	21:59	07:31	08:30	09:25
35°	21:11	21:37	22:00	07:23	08:24	09:23
40°	21:19	21:41	22:01	07:13	08:18	09:20
45°	21:28	21:45	22:01	07:02	08:11	09:18
S 50°	21:38	21:51	22:02	06:48	08:03	09:14
52°	21:43	21:54	22:03	06:41	07:59	09:12
54°	21:48	21:56	22:03	06:34	07:54	09:11
56°	21:54	22:00	22:04	06:26	07:49	09:09
58°	22:01	22:03	22:05	06:16	07:44	09:06
S 60°	22:08	22:07	22:05	06:06	07:38	09:04

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-84%
16	09:39	09:49	12:10	01:59	14:22	
17	09:59	10:09	12:10	02:44	15:05	
18	10:19	10:28	12:10	03:26	15:46	

January 19, 20, 21 UT (Sun., Mon., Tue.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	118°38.49	131°35.36	S05°17.13	0°46.39	N25°21.64	48°20.80	N21°39.54	130°41.29	S07°16.75	Alpheratz	357°34.91 29°13.82
1	133°40.95	146°35.74	15.95	15°49.92	21.84	63°23.41	39.53	145°43.54	16.65	Ankaa	353°7.25 -42°10.44
2	148°43.42	161°36.12	14.77	30°53.45	22.04	78°26.02	39.52	160°45.78	16.55	Schedar	349°31.21 56°40.73
3	163°45.88	176°36.50	•• 13.59	45°56.98	•• 22.24	93°28.64	•• 39.51	175°48.02	•• 16.46	Diphda	348°47.36 -17°51.10
4	178°48.34	191°36.89	12.40	61°05.00	22.44	108°31.25	39.50	190°50.26	16.36	Achernar	335°20.16 -57°6.87
5	193°50.81	206°37.27	11.22	76°4.03	22.64	123°33.86	39.49	205°52.50	16.26	Hamal	327°51.13 23°34.94
6	208°53.27	221°37.66	S05°10.04	91°7.56	N25°22.83	138°36.47	N21°39.48	220°54.74	S07°16.16	Polaris	313°51.46 89°22.50
7	223°55.74	236°38.04	8.86	106°11.08	23.03	153°39.08	39.47	235°56.98	16.06	Acamar	315°11.60 -40°12.47
8	238°58.20	251°38.43	7.67	121°14.61	23.23	168°41.69	39.46	250°59.22	15.97	Menkar	314°6.01 4°11.26
9	254°0.67	266°38.82	•• 6.49	136°18.14	•• 23.42	183°44.30	•• 39.45	266°1.46	•• 15.87	Mirfak	308°28.00 49°57.21
10	269°3.13	281°39.21	5.31	151°21.66	23.62	198°46.91	39.44	281°3.70	15.77	Aldebaran	290°39.35 16°33.60
11	284°5.59	296°39.60	4.13	166°25.19	23.82	213°49.52	39.43	296°5.94	15.67	Rigel	281°3.57 -8°10.42
12	299°8.06	311°39.99	S05°2.94	181°28.71	N25°24.01	228°52.13	N21°39.42	311°8.18	S07°15.57	Capella	280°21.46 46°1.49
13	314°10.52	326°40.39	1.76	196°32.24	24.21	243°54.73	39.41	326°10.42	15.47	Bellatrix	278°22.57 6°22.32
14	329°12.99	341°40.78	05°05.58	211°35.76	24.40	258°57.34	39.40	341°12.66	15.38	Elnath	278°1.51 28°37.76
15	344°15.45	356°41.18	04°59.40	226°39.29	•• 24.60	273°59.95	•• 39.40	356°14.90	•• 15.28	Alnilam	275°37.41 -1°11.20
16	359°17.91	11°41.58	58.21	241°42.81	24.79	289°2.56	39.39	11°17.14	15.18	Betelgeuse	270°51.75 7°24.68
17	14°20.38	26°41.97	57.03	256°46.34	24.98	304°5.16	39.38	26°19.38	15.08	Canopus	263°51.87 -52°42.61
18	29°22.84	41°42.37	S04°55.85	271°49.86	N25°25.18	319°7.77	N21°39.37	41°21.62	S07°14.98	Sirius	258°25.87 -16°45.09
19	44°25.31	56°42.77	54.67	286°53.38	25.37	334°10.38	39.36	56°23.86	14.88	Adhara	255°5.47 -29°0.41
20	59°27.77	71°43.17	53.48	301°56.90	25.56	349°12.98	39.35	71°26.10	14.78	Procyon	244°50.46 5°9.60
21	74°30.23	86°43.58	•• 52.30	317°0.43	•• 25.75	4°15.59	•• 39.34	86°28.33	•• 14.69	Pollux	243°16.88 27°57.89
22	89°32.70	101°43.98	51.12	332°3.95	25.95	19°18.19	39.33	101°30.57	14.59	Avior	234°14.09 -59°35.32
23	104°35.16	116°44.39	49.94	347°7.47	26.14	34°20.80	39.33	116°32.81	14.49	Suhail	222°45.87 -43°31.96
Mer.pass. 16:03		ν0.4' d-1.2' m-4.62		ν3.5' d0.2' m-1.41		ν2.6' d-0.0' m-2.62		ν2.2' d-0.1' m1.09		Miaplacidus 221°37.41 -69°49.06	
										Alphard 217°47.41 -8°46.06	
										Regulus 207°34.12 11°50.58	
										Dubhe 193°40.46 61°36.70	
										Denebola 182°24.73 14°25.78	
										Gienah 175°43.42 -17°40.84	
										Acrux 172°59.84 -63°14.03	
										Gacrux 171°51.43 -57°14.99	
										Alioth 166°12.76 55°49.10	
										Spica 158°22.23 -11°17.54	
										Alkaid 152°51.95 49°10.96	
										Hadar 148°36.03 -60°29.37	
										Menkent 147°57.62 -36°29.46	
										Arcturus 145°47.91 19°2.91	
										Rigil Kent. 139°40.40 -60°56.08	
										Kochab 137°20.06 74°2.74	
										Zuben'ubi 136°56.07 -16°8.75	
										Alphecca 126°3.87 26°37.58	
										Antares 112°16.03 -26°29.21	
										Atria 107°10.66 -69°4.14	
										Sabik 102°3.01 -15°45.38	
										Shaula 96°10.67 -37°7.26	
										Rasalhague 95°58.80 12°32.36	
										Eltanin 90°42.64 51°28.89	
										Kaus Aust. 83°32.84 -34°22.35	
										Vega 80°33.61 38°48.23	
										Nunki 75°48.08 -26°15.97	
										Altair 62°0.26 8°55.97	
										Peacock 53°6.26 -56°39.34	
										Deneb 49°26.26 45°22.15	
										Enif 33°39.06 9°59.34	
										Al Na'ir 27°33.25 -46°50.57	
										Fomalhaut 15°14.73 -29°29.55	
										Scheat 13°45.43 28°13.18	
										Markab 13°30.10 15°20.40	
Jan 19 Sun			SHA		Mer.pass						
Venus			12°56.87		15:13						
Mars			242°7.90		23:51						
Jupiter			289°42.31		20:43						
Saturn			12°2.81		15:15						
Jan 20 Mon			SHA		Mer.pass						
Venus			12°7.17		15:13						
Mars			242°33.37		23:46						
Jupiter			289°45.78		20:39						
Saturn			11°57.42		15:11						
Jan 21 Tue			SHA		Mer.pass						
Venus			11°18.13		15:12						
Mars			242°58.63		23:40						
Jupiter			289°49.03		20:35						
Saturn			11°51.99		15:08						
Horizontal parallax											
Venus: 0.2											
Mars: 0.2											



h	Sun			Moon				
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	177°20.66	S20°19.63		300°14.13	17.0'	N00°46.71	-14.4'	54.6'
1	192°20.47	19.11		314°50.14	17.0'	00°32.33	-14.4'	54.6'
2	207°20.28	18.58		329°26.18	17.1'	00°17.96	-14.4'	54.6'
3	222°20.09	· · 18.05		344°2.24	17.1'	N00°3.60	-14.4'	54.5'
4	237°19.90	17.52		358°38.31	17.1'	S00°10.76	14.3'	54.5'
5	252°19.71	17.00		13°14.39	17.1'	00°25.11	14.3'	54.5'
6	267°19.52	S20°16.47		27°50.49	17.1'	S00°39.44	14.3'	54.5'
7	282°19.33	15.94		42°26.60	17.1'	00°53.77	14.3'	54.5'
8	297°19.15	15.41		57°2.73	17.1'	01°8.09	14.3'	54.5'
9	312°18.96	· · 14.88		71°38.86	17.1'	01°22.39	14.3'	54.5'
10	327°18.77	14.34		86°15.00	17.2'	01°36.68	14.3'	54.4'
11	342°18.58	13.81		100°51.15	17.2'	01°50.96	14.3'	54.4'
12	357°18.39	S20°13.28		115°27.31	17.2'	S02°5.23	14.3'	54.4'
13	12°18.21	12.74		130°3.47	17.2'	02°19.48	14.2'	54.4'
14	27°18.02	12.21		144°39.64	17.2'	02°33.72	14.2'	54.4'
15	42°17.83	· · 11.67		159°15.81	17.2'	02°47.94	14.2'	54.4'
16	57°17.65	11.14		173°51.98	17.2'	03°2.14	14.2'	54.4'
17	72°17.46	10.60		188°28.15	17.2'	03°16.33	14.2'	54.4'
18	87°17.28	S20°10.06		203°4.33	17.2'	S03°30.50	14.2'	54.4'
19	102°17.09	9.53		217°40.50	17.2'	03°44.65	14.1'	54.3'
20	117°16.91	8.99		232°16.67	17.2'	03°58.78	14.1'	54.3'
21	132°16.72	· · 8.45		246°52.83	17.2'	04°12.89	14.1'	54.3'
22	147°16.54	7.91		261°28.99	17.2'	04°26.98	14.1'	54.3'
23	162°16.36	7.37		276°5.14	17.1'	04°41.05	14.0'	54.3'
SD = 16.2' $d = -0.5'$			SD = 14.9'					

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°16.17	S20°6.83	290°41.29	17.1'	S04°55.10	14.0'	54.3'
1	192°15.99	6.28	305°17.42	17.1'	05°9.13	14.0'	54.3'
2	207°15.81	5.74	319°53.55	17.1'	05°23.13	14.0'	54.3'
3	222°15.62	· · 5.20	334°29.67	17.1'	05°37.11	14.0'	54.3'
4	237°15.44	4.66	349°5.77	17.1'	05°51.06	13.9'	54.3'
5	252°15.26	4.11	3°41.86	17.1'	06°5.00	13.9'	54.3'
6	267°15.08	S20°3.57	18°17.94	17.1'	S06°18.90	13.9'	54.3'
7	282°14.90	3.02	32°54.00	17.0'	06°32.78	13.9'	54.2'
8	297°14.72	2.47	47°30.05	17.0'	06°46.63	13.8'	54.2'
9	312°14.54	· · 1.93	62°6.07	17.0'	07°0.45	13.8'	54.2'
10	327°14.36	1.38	76°42.08	17.0'	07°14.25	13.8'	54.2'
11	342°14.18	0.83	91°18.07	17.0'	07°28.02	13.7'	54.2'
12	357°14.00	S20°0.28	105°54.04	16.9'	S07°41.75	13.7'	54.2'
13	12°13.82	19°59.73	120°29.98	16.9'	07°55.46	13.7'	54.2'
14	27°13.64	59.18	135°5.90	16.9'	08°9.14	13.6'	54.2'
15	42°13.46	· · 58.63	149°41.80	16.9'	08°22.78	13.6'	54.2'
16	57°13.28	58.08	164°17.67	16.8'	08°36.39	13.6'	54.2'
17	72°13.10	57.53	178°53.51	16.8'	08°49.97	13.5'	54.2'
18	87°12.93	S19°56.97	193°29.33	16.8'	S09°3.52	13.5'	54.2'
19	102°12.75	56.42	208°5.12	16.8'	09°17.03	13.5'	54.2'
20	117°12.57	55.87	222°40.87	16.7'	09°30.51	13.4'	54.2'
21	132°12.40	· · 55.31	237°16.60	16.7'	09°43.95	13.4'	54.2'
22	147°12.22	54.75	251°52.29	16.7'	09°57.35	13.4'	54.2'
23	162°12.04	54.20	266°27.95	16.6'	10°10.72	13.3'	54.2'
SD = 16.2' $d = -0.5'$			SD = 14.8'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°11.87	S19°53.64	281°3.57	16.6'	S10°24.05	13.3'	54.2'
1	192°11.69	53.08	295°39.16	16.6'	10°37.34	13.3'	54.2'
2	207°11.52	52.53	310°14.71	16.5'	10°50.59	13.2'	54.2'
3	222°11.34	· · 51.97	324°50.23	16.5'	11°3.81	13.2'	54.2'
4	237°11.17	51.41	339°25.70	16.4'	11°16.98	13.1'	54.2'
5	252°10.99	50.85	354°1.13	16.4'	11°30.11	13.1'	54.2'
6	267°10.82	S19°50.29	8°36.53	16.3'	S11°43.20	13.0'	54.2'
7	282°10.65	49.73	23°11.88	16.3'	11°56.25	13.0'	54.2'
8	297°10.47	49.16	37°47.18	16.3'	12°9.25	13.0'	54.2'
9	312°10.30	· · 48.60	52°22.44	16.2'	12°22.21	12.9'	54.2'
10	327°10.13	48.04	66°57.66	16.2'	12°35.13	12.9'	54.2'
11	342°9.96	47.47	81°32.83	16.1'	12°48.00	12.8'	54.2'
12	357°9.78	S19°46.91	96°7.95	16.1'	S13°0.82	12.8'	54.2'
13	12°9.61	46.34	110°43.02	16.0'	13°13.60	12.7'	54.2'
14	27°9.44	45.78	125°18.04	16.0'	13°26.32	12.7'	54.2'
15	42°9.27	· · 45.21	139°53.02	15.9'	13°39.01	12.6'	54.2'
16	57°9.10	44.64	154°27.93	15.9'	13°51.64	12.6'	54.2'
17	72°8.93	44.08	169°2.80	15.8'	14°4.22	12.5'	54.2'
18	87°8.76	S19°43.51	183°37.61	15.8'	S14°16.75	12.5'	54.2'
19	102°8.59	42.94	198°12.37	15.7'	14°29.23	12.4'	54.2'
20	117°8.42	42.37	212°47.07	15.6'	14°41.66	12.4'	54.2'
21	132°8.25	· · 41.80	227°21.71	15.6'	14°54.03	12.3'	54.2'
22	147°8.08	41.23	241°56.30	15.5'	15°6.35	12.3'	54.2'
23	162°7.91	40.66	256°30.82	15.5'	15°18.62	12.2'	54.2'
SD = 16.2' $d = -0.6'$			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:47	09:30	■	■	14:54	16:36
N 70°	07:34	09:01	11:03	13:21	15:22	16:49
68°	07:24	08:40	10:09	14:14	15:43	16:59
66°	07:15	08:23	09:36	14:47	16:00	17:08
64°	07:07	08:09	09:13	15:10	16:13	17:16
62°	07:01	07:58	08:54	15:29	16:25	17:22
60°	06:55	07:48	08:39	15:44	16:35	17:28
N 58°	06:49	07:39	08:26	15:57	16:44	17:33
56°	06:44	07:31	08:15	16:08	16:52	17:38
54°	06:40	07:24	08:05	16:18	16:59	17:43
52°	06:36	07:18	07:56	16:27	17:05	17:47
50°	06:32	07:12	07:48	16:35	17:11	17:51
45°	06:23	06:59	07:31	16:51	17:24	18:00
N 40°	06:15	06:48	07:17	17:05	17:34	18:08
35°	06:08	06:39	07:06	17:17	17:44	18:15
30°	06:01	06:30	06:55	17:27	17:53	18:22
20°	05:47	06:14	06:38	17:45	18:08	18:35
N 10°	05:34	06:00	06:22	18:00	18:22	18:48
0°	05:20	05:45	06:07	18:15	18:37	19:02
S 10°	05:04	05:30	05:53	18:29	18:52	19:18
20°	04:44	05:13	05:37	18:45	19:09	19:37
30°	04:20	04:52	05:18	19:04	19:30	20:02
35°	04:04	04:39	05:07	19:14	19:43	20:18
40°	03:45	04:24	04:55	19:27	19:58	20:37
45°	03:20	04:05	04:40	19:42	20:16	21:01
S 50°	02:46	03:41	04:22	20:00	20:40	21:35
52°	02:28	03:29	04:13	20:08	20:52	21:53
54°	02:04	03:16	04:03	20:18	21:05	22:15
56°	01:32	03:00	03:52	20:29	21:21	22:46
58°	///	02:40	03:39	20:41	21:40	23:52
S 60°	///	02:15	03:24	20:56	22:04	///

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	23:38	· · ·	01:44	09:54	09:21	08:40
N 70°	23:31	· · ·	01:25	09:56	09:31	09:01
68°	23:25	· · ·	01:10	09:58	09:39	09:18
66°	23:20	· · ·	00:58	10:00	09:46	09:31
64°	23:16	· · ·	00:48	10:01	09:52	09:42
62°	23:13	· · ·	00:40	10:02	09:57	09:52
60°	23:10	· · ·	00:32	10:03	10:02	10:00
N 58°	23:07	· · ·	00:26	10:04	10:06	10:08
56°	23:04	· · ·	00:21	10:05	10:09	10:14
54°	23:02	· · ·	00:16	10:06	10:12	10:20
52°	23:00	· · ·	00:11	10:06	10:15	10:25
50°	22:59	· · ·	00:07	10:07	10:18	10:30
45°	22:55	23:59	· · ·	10:08	10:24	10:41
N 40°	22:52	23:51	· · ·	10:09	10:29	10:49
35°	22:49	23:45	· · ·	10:10	10:33	10:57
30°	22:46	23:40	· · ·	10:11	10:37	11:03
20°	22:42	23:31	· · ·	10:13	10:43	11:15
N 10°	22:39	23:22	· · ·	10:14	10:49	11:25
0°	22:35	23:15	23:56	10:15	10:54	11:34
S 10°	22:32	23:07	23:44	10:16	11:00	11:44
20°	22:29	23:00	23:32	10:18	11:06	11:54
30°	22:25	22:51	23:18	10:19	11:12	12:06
35°	22:22	22:45	23:10	10:20	11:16	12:13
40°	22:20	22:40	23:01	10:21	11:20	12:21
45°	22:17	22:33	22:51	10:22	11:25	12:30
S 50°	22:13	22:25	22:38	10:23	11:32	12:41
52°	22:12	22:21	22:32	10:24	11:34	12:46
54°	22:10	22:17	22:26	10:24	11:38	12:52
56°	22:08	22:13	22:19	10:25	11:41	12:58
58°	22:06	22:08	22:11	10:26	11:45	13:05
S 60°	22:04	22:02	22:02	10:27	11:49	13:13

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		76-58%
19	10:37	10:46	12:11	04:06	16:25		
20	10:55	11:04	12:11	04:45	17:05		
21	11:13	11:21	12:11	05:25	17:45		

January 22, 23, 24 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	121°35.90		132°5.67	S03°52.07	4°59.54	N25°35.06	51°27.98	N21°38.95	133°22.40	S07°9.60	Alpheratz	357°34.92	29°13.81
1	136°38.37		147°6.13	50.89	20°3.04	35.23	66°30.57	38.95	148°24.63	9.50	Ankaa	353°7.27	-42°10.43
2	151°40.83		162°6.60	49.71	35°6.54	35.41	81°33.16	38.94	163°26.87	9.40	Schedar	349°31.23	56°40.72
3	166°43.29		177°7.06	· · 48.53	50°10.04	· · 35.58	96°35.74	· · 38.94	178°29.10	· · 9.30	Diphda	348°47.37	-17°51.10
4	181°45.76		192°7.53	47.36	65°13.54	35.75	111°38.33	38.93	193°31.33	9.20	Achernar	335°20.19	-57°6.86
5	196°48.22		207°8.00	46.18	80°17.03	35.92	126°40.91	38.92	208°33.57	9.10	Hamal	327°51.15	23°34.94
6	211°50.69		222°8.47	S03°45.00	95°20.53	N25°36.09	141°43.50	N21°38.92	223°35.80	S07°9.00	Polaris	313°52.79	89°22.51
7	226°53.15		237°8.94	43.82	110°24.03	36.26	156°46.08	38.91	238°38.03	8.90	Acamar	315°11.62	-40°12.48
8	241°55.62		252°9.41	42.64	125°27.52	36.43	171°48.67	38.90	253°40.27	8.80	Menkar	314°6.02	4°11.25
9	256°58.08		267°9.89	· · 41.46	140°31.02	· · 36.60	186°51.25	· · 38.90	268°42.50	· · 8.70	Mirfak	308°28.02	49°57.21
10	272°0.54		282°10.36	40.28	155°34.51	36.77	201°53.83	38.89	283°44.73	8.60	Aldebaran	290°39.36	16°33.60
11	287°3.01		297°10.84	39.11	170°38.01	36.94	216°56.42	38.89	298°46.97	8.49	Rigel	281°3.57	-8°10.43
12	302°5.47		312°11.32	S03°37.93	185°41.50	N25°37.11	231°59.00	N21°38.88	313°49.20	S07°8.39	Capella	280°21.47	46°1.50
13	317°7.94		327°11.79	36.75	200°45.00	37.28	247°1.58	38.87	328°51.43	8.29	Bellatrix	278°22.57	6°22.32
14	332°10.40		342°12.27	35.57	215°48.49	37.44	262°4.16	38.87	343°53.67	8.19	Elnath	278°1.52	28°37.76
15	347°12.86		357°12.76	· · 34.39	230°51.98	· · 37.61	277°6.74	· · 38.86	358°55.90	· · 8.09	Alnilam	275°37.42	-1°11.20
16	2°15.33		12°13.24	33.22	245°55.47	37.78	292°9.32	38.86	13°58.13	7.99	Betelgeuse	270°51.75	7°24.68
17	17°17.79		27°13.72	32.04	260°58.96	37.94	307°11.91	38.85	29°0.36	7.89	Canopus	263°51.88	-52°42.62
18	32°20.26		42°14.21	S03°30.86	276°2.45	N25°38.11	322°14.49	N21°38.85	44°2.60	S07°7.79	Sirius	258°25.88	-16°45.10
19	47°22.72		57°14.69	29.68	291°5.94	38.28	337°17.07	38.84	59°4.83	7.69	Adhara	255°5.47	-29°0.43
20	62°25.18		72°15.18	28.51	306°9.43	38.44	352°19.65	38.83	74°7.06	7.58	Procyon	244°50.46	5°9.59
21	77°27.65		87°15.67	· · 27.33	321°12.92	· · 38.61	7°22.22	· · 38.83	89°9.29	· · 7.48	Pollux	243°16.88	27°57.89
22	92°30.11		102°16.16	26.15	336°16.41	38.77	22°24.80	38.82	104°11.53	7.38	Avior	234°14.09	-59°35.34
23	107°32.58		117°16.65	24.97	351°19.90	38.94	37°27.38	38.82	119°13.76	7.28	Suhail	222°45.86	-43°31.97
Mer.pass. 15:51		ν0.5' d-1.2' m-4.65		ν3.5' d0.2' m-1.34		ν2.6' d-0.0' m-2.60		ν2.2' d-0.1' m1.10					
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	122°35.04		132°17.14	S03°23.80	6°23.38	N25°39.10	52°29.96	N21°38.81	134°15.99	S07°7.18	Miaplacidus	221°37.39	-69°49.08
1	137°37.51		147°17.63	22.62	21°26.87	39.26	67°32.54	38.81	149°18.22	7.08	Alphard	217°47.40	-8°46.07
2	152°39.97		162°18.13	21.44	36°30.36	39.43	82°35.11	38.80	164°20.45	6.98	Regulus	207°34.11	11°50.58
3	167°42.43		177°18.62	· · 20.27	51°33.84	· · 39.59	97°37.69	· · 38.80	179°22.68	· · 6.87	Dubhe	193°40.43	61°36.70
4	182°44.90		192°19.12	19.09	66°37.33	39.75	112°40.27	38.79	194°24.92	6.77	Denebola	182°24.71	14°25.77
5	197°47.36		207°19.62	17.91	81°40.81	39.91	127°42.84	38.79	209°27.15	6.67	Gienah	175°43.40	-17°40.85
6	212°49.83		222°20.12	S03°16.74	96°44.29	N25°40.07	142°45.42	N21°38.78	224°29.38	S07°6.57	Acrux	172°59.80	-63°14.04
7	227°52.29		237°20.62	15.56	111°47.77	40.24	157°48.00	38.78	239°31.61	6.47	Gacrux	171°51.40	-57°15.00
8	242°54.75		252°21.12	14.39	126°51.26	40.40	172°50.57	38.77	254°33.84	6.37	Alioth	166°12.73	55°49.10
9	257°57.22		267°21.62	· · 13.21	141°54.74	· · 40.56	187°53.15	· · 38.77	269°36.07	· · 6.26	Spica	158°22.21	-11°17.55
10	272°59.68		282°22.12	12.03	156°58.22	40.72	202°55.72	38.76	284°38.30	6.16	Alkaid	152°51.92	49°10.95
11	288°2.15		297°22.63	10.86	172°1.70	40.88	217°58.29	38.76	299°40.53	6.06	Hadar	148°35.99	-60°29.38
12	303°4.61		312°23.14	S03°9.68	187°5.18	N25°41.04	233°0.87	N21°38.75	314°42.77	S07°5.96	Menkent	147°57.59	-36°29.47
13	318°7.08		327°23.64	8.51	202°8.66	41.19	248°3.44	38.75	329°45.00	5.86	Arcturus	145°47.89	19°2.90
14	333°9.54		342°24.15	7.33	217°12.13	41.35	263°6.01	38.74	344°47.23	5.75	Rigel Kent.	139°40.36	-60°56.09
15	348°12.00		357°24.66	· · 6.16	232°15.61	· · 41.51	278°8.59	· · 38.74	359°49.46	· · 5.65	Kochab	137°20.00	74°2.74
16	3°14.47		12°25.18	4.98	247°19.09	41.67	293°11.16	38.73	14°51.69	5.55	Zuben'ubi	136°56.05	-16°8.75
17	18°16.93		27°25.69	3.81	262°22.56	41.83	308°13.73	38.73	29°53.92	5.45	Alphecca	126°3.85	26°37.57
18	33°19.40		42°26.20	S03°2.63	277°26.04	N25°41.98	323°16.30	N21°38.72	44°56.15	S07°5.35	Antares	112°16.01	-26°29.21
19	48°21.86		57°26.72	1.46	292°29.51	42.14	338°18.87	38.72	59°58.38	5.24	Atria	107°10.61	-69°4.13
20	63°24.32		72°27.23	03°0.28	307°32.99	42.29	353°21.44	38.71	75°0.61	5.14	Sabik	102°2.99	-15°45.38
21	78°26.79		87°27.75	02°59.11	322°36.46	· · 42.45	8°24.01	· · 38.71	90°2.84	· · 5.04	Shaula	96°10.65	-37°7.26
22	93°29.25		102°28.27	57.94	337°39.94	42.61	23°26.58	38.70	105°5.07	4.94	Rasalhague	95°58.78	12°32.35
23	108°31.72		117°28.79	56.76	352°43.41	42.76	38°29.15	38.70	120°7.30	4.83	Eltanin	90°42.62	51°28.88
Mer.pass. 15:47		ν0.5' d-1.2' m-4.66		ν3.5' d0.2' m-1.32		ν2.6' d-0.0' m-2.59		ν2.2' d-0.1' m1.10					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	123°34.18		132°29.31	S02°55.59	7°46.88	N25°42.91	53°31.72	N21°38.70	135°9.53	S07°4.73	Jan 22 Wed	SHA	Mer.pass
1	138°36.65		147°29.84	54.41	22°50.35	43.07	68°34.29	38.69	150°11.76	4.63	Venus	10°29.77	15:11
2	153°39.11		162°30.36	53.24	37°53.82	43.22	83°36.86	38.69	165°13.99	4.53	Mars	243°23.64	23:35
3	168°41.57		177°30.89	· · 52.07	52°57.29	· · 43.38	98°39.43	· · 38.68	180°16.22	· · 4.42	Jupiter	289°52.08	20:31
4	183°44.04		192°31.41	50.89	68°0.76	43.53	113°42.00	38.68	195°18.45	4.32	Saturn	11°46.49	15:04
5	198°46.50		207°31.94	49.72	83°4.22	43.68	128°44.56	38.68	210°20.68	4.22			
6	213°48.97		222°32.47	S02°48.55	98°7.69	N25°43.83	143°47.13	N21°38.67	225°22.91	S07°4.12	Jan 23 Thu	SHA	Mer.pass
7	228°51.43		237°33.00	47.37	113°11.16	43.99	158°49.70	38.67	240°25.13	4.01	Venus	9°42.10	15:10
8	243°53.89		252°33.53	46.20	128°14.62	44.14	173°52.26	38.66	255°27.36	3.91	Mars	243°48.34	23:29
9	258°56.36		267°34.06	· · 45.03	143°18.09	· · 44.29	188°54.83	· · 38.66	270°29.59	· · 3.81	Jupiter	289°54.92	20:26
10	273°58.82		282°34.60	43.86	158°21.55	44.44	203°57.39	38.66	285°31.82	3.71	Saturn	11°40.95	15:01
11	289°1.29												


h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°7.75	S19°40.08	271°5.29	15.4'	S15°30.83	12.2'	54.2'
1	192°7.58	39.51	285°39.69	15.3'	15°42.98	12.1'	54.2'
2	207°7.41	38.94	300°14.03	15.3'	15°55.08	12.0'	54.2'
3	222°7.24	· · 38.36	314°48.31	15.2'	16°7.12	12.0'	54.2'
4	237°7.08	37.79	329°22.52	15.1'	16°19.10	11.9'	54.3'
5	252°6.91	37.21	343°56.67	15.1'	16°31.02	11.9'	54.3'
6	267°6.75	S19°36.64	358°30.75	15.0'	S16°42.88	11.8'	54.3'
7	282°6.58	36.06	13°4.77	14.9'	16°54.68	11.7'	54.3'
8	297°6.41	35.48	27°38.71	14.9'	17°6.42	11.7'	54.3'
9	312°6.25	· · 34.91	42°12.59	14.8'	17°18.09	11.6'	54.3'
10	327°6.08	34.33	56°46.40	14.7'	17°29.70	11.5'	54.3'
11	342°5.92	33.75	71°20.14	14.7'	17°41.25	11.5'	54.3'
12	357°5.76	S19°33.17	85°53.80	14.6'	S17°52.73	11.4'	54.3'
13	12°5.59	32.59	100°27.39	14.5'	18°4.14	11.3'	54.3'
14	27°5.43	32.01	115°0.91	14.4'	18°15.49	11.3'	54.3'
15	42°5.27	· · 31.42	129°34.36	14.4'	18°26.77	11.2'	54.4'
16	57°5.10	30.84	144°7.73	14.3'	18°37.98	11.1'	54.4'
17	72°4.94	30.26	158°41.02	14.2'	18°49.11	11.1'	54.4'
18	87°4.78	S19°29.68	173°14.23	14.1'	S19°0.18	11.0'	54.4'
19	102°4.62	29.09	187°47.37	14.1'	19°11.18	10.9'	54.4'
20	117°4.46	28.51	202°20.43	14.0'	19°22.10	10.8'	54.4'
21	132°4.29	· · 27.92	216°53.41	13.9'	19°32.95	10.8'	54.4'
22	147°4.13	27.33	231°26.31	13.8'	19°43.73	10.7'	54.4'
23	162°3.97	26.75	245°59.13	13.7'	19°54.42	10.6'	54.4'
SD = 16.2'		$d = -0.6'$	SD = 14.8'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°3.81	S19°26.16	260°31.86	13.7'	S20°5.05	10.5'	54.5'
1	192°3.65	25.57	275°4.52	13.6'	20°15.59	10.5'	54.5'
2	207°3.49	24.98	289°37.09	13.5'	20°26.06	10.4'	54.5'
3	222°3.33	· · 24.39	304°9.58	13.4'	20°36.44	10.3'	54.5'
4	237°3.18	23.80	318°41.98	13.3'	20°46.75	10.2'	54.5'
5	252°3.02	23.21	333°14.30	13.2'	20°56.97	10.1'	54.5'
6	267°2.86	S19°22.62	347°46.53	13.1'	S21°7.11	10.1'	54.5'
7	282°2.70	22.03	2°18.67	13.1'	21°17.17	10.0'	54.6'
8	297°2.54	21.44	16°50.73	13.0'	21°27.14	9.9'	54.6'
9	312°2.39	· · 20.85	31°22.70	12.9'	21°37.03	9.8'	54.6'
10	327°2.23	20.25	45°54.58	12.8'	21°46.83	9.7'	54.6'
11	342°2.07	19.66	60°26.37	12.7'	21°56.54	9.6'	54.6'
12	357°1.92	S19°19.06	74°58.07	12.6'	S22°6.16	9.5'	54.6'
13	12°1.76	18.47	89°29.69	12.5'	22°15.69	9.4'	54.7'
14	27°1.61	17.87	104°1.21	12.4'	22°25.13	9.3'	54.7'
15	42°1.45	· · 17.27	118°32.64	12.3'	22°34.48	9.3'	54.7'
16	57°1.30	16.68	133°3.98	12.2'	22°43.74	9.2'	54.7'
17	72°1.14	16.08	147°35.23	12.2'	22°52.90	9.1'	54.7'
18	87°0.99	S19°15.48	162°6.38	12.1'	S23°1.97	9.0'	54.7'
19	102°0.83	14.88	176°37.45	12.0'	23°10.94	8.9'	54.8'
20	117°0.68	14.28	191°8.42	11.9'	23°19.81	8.8'	54.8'
21	132°0.53	· · 13.68	205°39.29	11.8'	23°28.58	8.7'	54.8'
22	147°0.38	13.08	220°10.08	11.7'	23°37.25	8.6'	54.8'
23	162°0.22	12.48	234°40.77	11.6'	23°45.83	8.5'	54.8'
SD = 16.2'		$d = -0.6'$	SD = 14.9'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°0.07	S19°11.88	249°11.36	11.5'	S23°54.30	8.4'	54.9'
1	191°59.92	11.27	263°41.86	11.4'	24°2.66	8.3'	54.9'
2	206°59.77	10.67	278°12.27	11.3'	24°10.92	8.2'	54.9'
3	221°59.62	· · 10.06	292°42.58	11.2'	24°19.08	8.0'	54.9'
4	236°59.47	9.46	307°12.80	11.1'	24°27.13	7.9'	54.9'
5	251°59.32	8.85	321°42.92	11.0'	24°35.07	7.8'	55.0'
6	266°59.16	S19°8.25	336°12.95	10.9'	S24°42.90	7.7'	55.0'
7	281°59.02	7.64	350°42.88	10.8'	24°50.63	7.6'	55.0'
8	296°58.87	7.03	5°12.71	10.7'	24°58.24	7.5'	55.0'
9	311°58.72	· · 6.43	19°42.46	10.6'	25°5.73	7.4'	55.0'
10	326°58.57	5.82	34°12.10	10.6'	25°13.12	7.3'	55.1'
11	341°58.42	5.21	48°41.65	10.5'	25°20.39	7.2'	55.1'
12	356°58.27	S19°4.60	63°11.11	10.4'	S25°27.54	7.0'	55.1'
13	11°58.12	3.99	77°40.47	10.3'	25°34.58	6.9'	55.1'
14	26°57.98	3.38	92°9.74	10.2'	25°41.50	6.8'	55.2'
15	41°57.83	· · 2.77	106°38.92	10.1'	25°48.30	6.7'	55.2'
16	56°57.68	2.15	121°8.00	10.0'	25°54.97	6.6'	55.2'
17	71°57.54	1.54	135°36.98	9.9'	26°1.53	6.4'	55.2'
18	86°57.39	S19°0.93	150°5.87	9.8'	S26°7.96	6.3'	55.2'
19	101°57.24	19°0.31	164°34.67	9.7'	26°14.27	6.2'	55.3'
20	116°57.10	18°59.70	179°3.38	9.6'	26°20.46	6.1'	55.3'
21	131°56.95	· · 59.09	193°32.00	9.5'	26°26.51	5.9'	55.3'
22	146°56.81	58.47	208°0.52	9.4'	26°32.44	5.8'	55.3'
23	161°56.66	57.85	222°28.95	9.3'	26°38.24	5.7'	55.4'
SD = 16.2'		$d = -0.6'$	SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:38	09:17	■	■	15:08	16:47
N 70°	07:27	08:51	10:39	13:46	15:33	16:58
68°	07:17	08:32	09:55	14:29	15:53	17:08
66°	07:09	08:16	09:26	14:58	16:08	17:16
64°	07:02	08:03	09:05	15:20	16:21	17:22
62°	06:56	07:52	08:47	15:37	16:32	17:29
60°	06:51	07:43	08:33	15:51	16:42	17:34
N 58°	06:46	07:35	08:21	16:04	16:50	17:39
56°	06:41	07:27	08:10	16:14	16:57	17:43
54°	06:37	07:21	08:01	16:24	17:04	17:48
52°	06:33	07:14	07:52	16:32	17:10	17:51
50°	06:29	07:09	07:45	16:39	17:15	17:55
45°	06:21	06:57	07:29	16:55	17:27	18:03
N 40°	06:14	06:46	07:16	17:08	17:38	18:11
35°	06:07	06:37	07:04	17:20	17:47	18:17
30°	06:00	06:29	06:55	17:30	17:55	18:24
20°	05:47	06:14	06:37	17:46	18:10	18:37
N 10°	05:35	06:00	06:22	18:01	18:24	18:49
0°	05:21	05:46	06:08	18:15	18:37	19:03
S 10°	05:05	05:32	05:54	18:30	18:52	19:18
20°	04:47	05:15	05:39	18:45	19:09	19:37
30°	04:23	04:54	05:21	19:03	19:29	20:00
35°	04:08	04:42	05:10	19:13	19:41	20:15
40°	03:49	04:27	04:58	19:25	19:56	20:34
45°	03:25	04:09	04:44	19:39	20:13	20:57
S 50°	02:53	03:47	04:27	19:56	20:36	21:29
52°	02:36	03:35	04:18	20:05	20:47	21:46
54°	02:14	03:23	04:09	20:14	21:00	22:07
56°	01:46	03:07	03:58	20:24	21:15	22:34
58°	00:57	02:49	03:46	20:36	21:32	23:18
S 60°	////	02:27	03:32	20:50	21:54	////

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	04:26	■	■	07:24	■	■
N 70°	03:36	■	■	08:16	■	■
68°	03:05	05:42	■	08:48	07:44	■
66°	02:43	04:45	■	09:12	08:41	■
64°	02:25	04:12	06:23	09:31	09:15	08:43
62°	02:10	03:48	05:35	09:47	09:40	09:32
60°	01:58	03:29	05:04	10:00	10:00	10:03
N 58°	01:48	03:13	04:42	10:11	10:16	10:27
56°	01:39	03:00	04:23	10:21	10:30	10:46
54°	01:31	02:48	04:07	10:30	10:43	11:02
52°	01:24	02:38	03:54	10:37	10:53	11:15
50°	01:17	02:29	03:42	10:44	11:03	11:27
45°	01:03	02:10	03:18	11:00	11:23	11:53
N 40°	00:52	01:55	02:59	11:12	11:39	12:13
35°	00:43	01:42	02:43	11:23	11:53	12:30
30°	00:34	01:31	02:29	11:32	12:06	12:44
20°	00:20	01:11	02:05	11:49	12:26	13:09
N 10°	00:07	00:55	01:45	12:03	12:45	13:30
0°	· · ·	00:39	01:27	12:17	13:02	13:51
S 10°	· · ·	00:24	01:08	12:30	13:19	14:11
20°	· · ·	00:08	00:48	12:45	13:37	14:32
30°	23:49	· · ·	00:25	13:01	13:58	14:58
35°	23:39	· · ·	00:12	13:11	14:11	15:12
40°	23:26	23:56	· · ·	13:22	14:25	15:30
45°	23:12	23:38	· · ·	13:35	14:43	15:51
S 50°	22:54	23:16	23:45	13:51	15:04	16:17
52°	22:46	23:05	23:32	13:59	15:14	16:30
54°	22:37	22:53	23:17	14:08	15:26	16:45
56°	22:27	22:39	22:59	14:17	15:39	17:02
58°	22:15	22:23	22:38	14:28	15:55	17:23
S 60°	22:02	22:04	22:10	14:41	16:13	17:50

Day	Sun		Mer. Pass hh:mm	Moon		Age 23-25 49-30%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
22	11:29	11:37	12:12	06:06	18:28	
23	11:45	11:52	12:12	06:50	19:14	
24	12:00	12:07	12:12	07:38	20:04	

January 25, 26, 27 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	124°33.32	132°42.21	S02°27.46	9°9.97	N25°46.50	54°33.27	N21°38.61	136°3.02	S07°2.26	Alpheratz	357°34.93	29°13.81
1	139°35.79	147°42.76	26.29	24°13.43	46.65	69°35.83	38.60	151°5.24	2.16	Ankaa	353°7.28	-42°10.43
2	154°38.25	162°43.32	25.12	39°16.88	46.79	84°38.39	38.60	166°7.47	2.06	Schedar	349°31.25	56°40.71
3	169°40.71	177°43.87	· · 23.95	54°20.33	· · 46.94	99°40.95	· · 38.60	181°9.70	· · 1.95	Diphda	348°47.37	-17°51.10
4	184°43.18	192°44.43	22.78	69°23.78	47.08	114°43.51	38.60	196°11.93	1.85	Achernar	335°20.22	-57°6.86
5	199°45.64	207°44.99	21.61	84°27.23	47.22	129°46.07	38.59	211°14.15	1.75	Hamal	327°51.15	23°34.93
6	214°48.11	222°45.55	S02°20.44	99°30.68	N25°47.37	144°48.63	N21°38.59	226°16.38	S07°1.64	Polaris	313°53.98	89°22.51
7	229°50.57	237°46.11	19.27	114°34.13	47.51	159°51.18	38.59	241°18.61	1.54	Acamar	315°11.64	-40°12.48
8	244°53.03	252°46.67	18.10	129°37.58	47.65	174°53.74	38.58	256°20.83	1.44	Menkar	314°6.02	4°11.25
9	259°55.50	267°47.24	· · 16.93	144°41.02	· · 47.79	189°56.30	· · 38.58	271°23.06	· · 1.33	Mirfak	308°28.03	49°57.21
10	274°57.96	282°47.80	15.77	159°44.47	47.93	204°58.85	38.58	286°25.29	1.23	Aldebaran	290°39.36	16°33.60
11	290°0.43	297°48.37	14.60	174°47.91	48.07	220°1.41	38.58	301°27.51	1.13	Rigel	281°3.58	-8°10.44
12	305°2.89	312°48.93	S02°13.43	189°51.36	N25°48.21	235°3.97	N21°38.57	316°29.74	S07°1.02	Capella	280°21.47	46°1.50
13	320°5.36	327°49.50	12.26	204°54.80	48.35	250°6.52	38.57	331°31.97	0.92	Bellatrix	278°22.57	6°22.31
14	335°7.82	342°50.07	11.09	219°58.24	48.49	265°9.08	38.57	346°34.19	0.82	Elnath	278°1.52	28°37.76
15	350°10.28	357°50.64	· · 9.93	235°1.69	· · 48.63	280°11.63	· · 38.57	1°36.42	· · 0.71	Alnilam	275°37.42	-1°11.21
16	5°12.75	12°51.22	8.76	250°5.13	48.77	295°14.19	38.56	16°38.65	0.61	Betelgeuse	270°51.75	7°24.67
17	20°15.21	27°51.79	7.59	265°8.57	48.91	310°16.74	38.56	31°40.87	0.50	Canopus	263°51.89	-52°42.64
18	35°17.68	42°52.37	S02°6.42	280°12.01	N25°49.05	325°19.29	N21°38.56	46°43.10	S07°0.40	Sirius	258°25.87	-16°45.11
19	50°20.14	57°52.94	5.26	295°15.44	49.18	340°21.85	38.56	61°45.32	0.30	Adhara	255°5.47	-29°0.44
20	65°22.61	72°53.52	4.09	310°18.88	49.32	355°24.40	38.55	76°47.55	0.19	Procyon	244°50.45	5°9.58
21	80°25.07	87°54.10	· · 2.92	325°22.32	· · 49.46	10°26.95	· · 38.55	91°49.78	· · 0.09	Pollux	243°16.87	27°57.89
22	95°27.53	102°54.68	1.76	340°25.75	49.59	25°29.50	38.55	106°52.00	06°59.99	Avior	234°14.08	-59°35.36
23	110°30.00	117°55.26	0.59	355°29.19	49.73	40°32.06	38.55	121°54.23	06°59.88	Suhail	222°45.84	-43°31.99
Mer.pass. 15:39		ν0.6' d-1.2' m-4.68		ν3.5' d0.1' m-1.27		ν2.6' d-0.0' m-2.58		ν2.2' d-0.1' m1.10		Miaplacidus	221°37.38	-69°49.10
										Alphard	217°47.39	-8°46.08
										Regulus	207°34.09	11°50.57
										Dubhe	193°40.40	61°36.71
										Denebola	182°24.69	14°25.76
										Gienah	175°43.37	-17°40.86
										Acrux	172°59.75	-63°14.06
										Gacrux	171°51.35	-57°15.01
										Alioth	166°12.69	55°49.10
										Spica	158°22.18	-11°17.56
										Alkaid	152°51.89	49°10.95
										Hadar	148°35.93	-60°29.39
										Menkent	147°57.56	-36°29.48
										Arcturus	145°47.86	19°2.90
										Rigil Kent.	139°40.31	-60°56.09
										Kochab	137°19.94	74°2.73
										Zuben'ubi	136°56.02	-16°8.76
										Alphecca	126°3.82	26°37.56
										Antares	112°15.98	-26°29.22
										Atria	107°10.55	-69°4.12
										Sabik	102°2.97	-15°45.38
										Shaula	96°10.62	-37°7.25
										Rasalhague	95°58.76	12°32.34
										Eltanin	90°42.60	51°28.86
										Kaus Aust.	83°32.80	-34°22.34
										Vega	80°33.58	38°48.21
										Nunki	75°48.04	-26°15.96
										Altair	62°0.24	8°55.96
										Peacock	53°6.24	-56°39.32
										Deneb	49°26.25	45°22.12
										Enif	33°39.06	9°59.33
										Al Na'ir	27°33.26	-46°50.55
										Fomalhaut	15°14.74	-29°29.54
										Scheat	13°45.44	28°13.16
										Markab	13°30.11	15°20.39
										Jan 25 Sat	SHA	Mer.pass
										Venus	8°8.89	15:09
										Mars	244°36.65	23:18
										Jupiter	289°59.95	20:18
										Saturn	11°29.69	14:54
										Jan 26 Sun	SHA	Mer.pass
										Venus	7°23.38	15:08
										Mars	245°0.16	23:13
										Jupiter	290°2.14	20:14
										Saturn	11°23.99	14:50
										Jan 27 Mon	SHA	Mer.pass
										Venus	6°38.63	15:07
										Mars	245°23.18	23:07
										Jupiter	290°4.12	20:10
										Saturn	11°18.24	14:46
										Horizontal parallax		
										Venus: 0.3		
										Mars: 0.2		
Mer.pass. 15:31		ν0.6' d-1.2' m-4.70		ν3.4' d0.1' m-1.21		ν2.5' d-0.0' m-2.56		ν2.2' d-0.1' m1.11				

h		Sun			Moon			
Sat		GHA	Dec		GHA	ν	Dec	d HP
0		176°56.52	S18°57.24		236°57.29	9.3'	S26°43.92	5.5' 55.4'
1		191°56.38	56.62		251°25.54	9.2'	26°49.46	5.4' 55.4'
2		206°56.23	56.00		265°53.71	9.1'	26°54.86	5.3' 55.4'
3		221°56.09	· · 55.38		280°21.78	9.0'	27°0.14	5.1' 55.5'
4		236°55.95	54.76		294°49.76	8.9'	27°5.28	5.0' 55.5'
5		251°55.81	54.14		309°17.66	8.8'	27°10.28	4.9' 55.5'
6		266°55.66	S18°53.52		323°45.47	8.7'	S27°15.15	4.7' 55.5'
7		281°55.52	52.90		338°13.20	8.6'	27°19.88	4.6' 55.6'
8		296°55.38	52.28		352°40.84	8.6'	27°24.47	4.5' 55.6'
9		311°55.24	· · 51.66		7°8.40	8.5'	27°28.92	4.3' 55.6'
10		326°55.10	51.03		21°35.87	8.4'	27°33.23	4.2' 55.7'
11		341°54.96	50.41		36°3.26	8.3'	27°37.40	4.0' 55.7'
12		356°54.82	S18°49.79		50°30.57	8.2'	S27°41.42	3.9' 55.7'
13		11°54.68	49.16		64°57.80	8.2'	27°45.30	3.7' 55.7'
14		26°54.54	48.54		79°24.95	8.1'	27°49.03	3.6' 55.8'
15		41°54.40	· · 47.91		93°52.03	8.0'	27°52.62	3.4' 55.8'
16		56°54.26	47.28		108°19.02	7.9'	27°56.06	3.3' 55.8'
17		71°54.12	46.66		122°45.94	7.8'	27°59.35	3.1' 55.8'
18		86°53.99	S18°46.03		137°12.79	7.8'	S28°2.50	3.0' 55.9'
19		101°53.85	45.40		151°39.56	7.7'	28°5.49	2.8' 55.9'
20		116°53.71	44.77		166°6.27	7.6'	28°8.33	2.7' 55.9'
21		131°53.57	· · 44.14		180°32.90	7.6'	28°11.02	2.5' 56.0'
22		146°53.44	43.51		194°59.46	7.5'	28°13.56	2.4' 56.0'
23		161°53.30	42.88		209°25.95	7.4'	28°15.94	2.2' 56.0'
		SD = 16.2' $d = -0.6'$			SD = 15.1'			
Sun		GHA	Dec		GHA	ν	Dec	d HP
0		176°53.17	S18°42.25		223°52.38	7.4'	S28°18.16	2.1' 56.0'
1		191°53.03	41.62		238°18.75	7.3'	28°20.24	1.9' 56.1'
2		206°52.90	40.98		252°45.05	7.2'	28°22.15	1.8' 56.1'
3		221°52.76	· · 40.35		267°11.29	7.2'	28°23.91	1.6' 56.1'
4		236°52.63	39.72		281°37.46	7.1'	28°25.51	1.4' 56.2'
5		251°52.49	39.08		296°3.58	7.1'	28°26.94	1.3' 56.2'
6		266°52.36	S18°38.45		310°29.65	7.0'	S28°28.22	1.1' 56.2'
7		281°52.22	37.81		324°55.65	7.0'	28°29.34	1.0' 56.3'
8		296°52.09	37.18		339°21.61	6.9'	28°30.30	0.8' 56.3'
9		311°51.96	· · 36.54		353°47.51	6.9'	28°31.09	0.6' 56.3'
10		326°51.83	35.90		8°13.36	6.8'	28°31.73	0.5' 56.3'
11		341°51.69	35.26		22°39.17	6.8'	28°32.20	0.3' 56.4'
12		356°51.56	S18°34.63		37°4.92	6.7'	S28°32.50	0.1' 56.4'
13		11°51.43	33.99		51°30.63	6.7'	28°32.64	-0.0' 56.4'
14		26°51.30	33.35		65°56.30	6.6'	28°32.61	-0.2' 56.5'
15		41°51.17	· · 32.71		80°21.93	6.6'	28°32.42	-0.4' 56.5'
16		56°51.04	32.07		94°47.52	6.5'	28°32.07	-0.5' 56.5'
17		71°50.91	31.43		109°13.07	6.5'	28°31.54	-0.7' 56.6'
18		86°50.78	S18°30.78		123°38.58	6.5'	S28°30.85	-0.9' 56.6'
19		101°50.65	30.14		138°4.06	6.4'	28°29.99	-1.0' 56.6'
20		116°50.52	29.50		152°29.51	6.4'	28°28.96	-1.2' 56.6'
21		131°50.39	· · 28.85		166°54.93	6.4'	28°27.76	-1.4' 56.7'
22		146°50.26	28.21		181°20.32	6.4'	28°26.39	-1.5' 56.7'
23		161°50.14	27.57		195°45.68	6.3'	28°24.86	-1.7' 56.7'
		SD = 16.2' $d = -0.6'$			SD = 15.3'			
Mon		GHA	Dec		GHA	ν	Dec	d HP
0		176°50.01	S18°26.92		210°11.02	6.3'	S28°23.15	-1.9' 56.8'
1		191°49.88	26.27		224°36.34	6.3'	28°21.27	-2.0' 56.8'
2		206°49.75	25.63		239°1.64	6.3'	28°19.23	-2.2' 56.8'
3		221°49.63	· · 24.98		253°26.92	6.3'	28°17.01	-2.4' 56.9'
4		236°49.50	24.33		267°52.18	6.2'	28°14.62	-2.6' 56.9'
5		251°49.38	23.68		282°17.43	6.2'	28°12.06	-2.7' 56.9'
6		266°49.25	S18°23.03		296°42.67	6.2'	S28°9.33	-2.9' 57.0'
7		281°49.12	22.39		311°7.90	6.2'	28°6.43	-3.1' 57.0'
8		296°49.00	21.74		325°33.12	6.2'	28°3.36	-3.2' 57.0'
9		311°48.88	· · 21.08		339°58.33	6.2'	28°0.11	-3.4' 57.0'
10		326°48.75	20.43		354°23.54	6.2'	27°56.69	-3.6' 57.1'
11		341°48.63	19.78		8°48.74	6.2'	27°53.11	-3.8' 57.1'
12		356°48.50	S18°19.13		23°13.95	6.2'	S27°49.35	-3.9' 57.1'
13		11°48.38	18.48		37°39.15	6.2'	27°45.42	-4.1' 57.2'
14		26°48.26	17.82		52°4.36	6.2'	27°41.31	-4.3' 57.2'
15		41°48.14	· · 17.17		66°29.58	6.2'	27°37.04	-4.4' 57.2'
16		56°48.01	16.51		80°54.80	6.2'	27°32.59	-4.6' 57.3'
17		71°47.89	15.86		95°20.03	6.2'	27°27.98	-4.8' 57.3'
18		86°47.77	S18°15.20		109°45.27	6.3'	S27°23.19	-5.0' 57.3'
19		101°47.65	14.55		124°10.53	6.3'	27°18.24	-5.1' 57.3'
20		116°47.53	13.89		138°35.80	6.3'	27°13.11	-5.3' 57.4'
21		131°47.41	· · 13.23		153°1.09	6.3'	27°7.81	-5.5' 57.4'
22		146°47.29	12.57		167°26.39	6.3'	27°2.35	-5.6' 57.4'
23		161°47.17	11.91		181°51.72	6.3'	26°56.71	-5.8' 57.5'
		SD = 16.2' $d = -0.6'$			SD = 15.5'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:29	09:04	11:33	12:53	15:23	16:58
N 70°	07:19	08:41	10:19	14:07	15:45	17:08
68°	07:10	08:23	09:42	14:44	16:03	17:16
66°	07:03	08:09	09:16	15:10	16:17	17:23
64°	06:57	07:57	08:56	15:30	16:29	17:30
62°	06:51	07:47	08:40	15:46	16:39	17:35
60°	06:46	07:38	08:27	15:59	16:48	17:40
N 58°	06:41	07:30	08:15	16:11	16:56	17:45
56°	06:37	07:23	08:05	16:21	17:03	17:49
54°	06:33	07:17	07:56	16:29	17:09	17:52
52°	06:30	07:11	07:48	16:37	17:15	17:56
50°	06:26	07:06	07:41	16:44	17:20	17:59
45°	06:19	06:54	07:26	17:00	17:31	18:07
N 40°	06:12	06:44	07:13	17:12	17:41	18:14
35°	06:05	06:36	07:03	17:23	17:50	18:20
30°	05:59	06:28	06:53	17:32	17:57	18:26
20°	05:47	06:14	06:37	17:48	18:12	18:38
N 10°	05:35	06:00	06:23	18:03	18:25	18:50
0°	05:22	05:47	06:09	18:16	18:38	19:03
S 10°	05:07	05:33	05:55	18:30	18:52	19:18
20°	04:49	05:17	05:41	18:44	19:08	19:36
30°	04:26	04:57	05:23	19:01	19:27	19:59
35°	04:11	04:45	05:13	19:11	19:39	20:13
40°	03:54	04:31	05:02	19:23	19:53	20:31
45°	03:31	04:14	04:48	19:36	20:10	20:53
S 50°	03:00	03:52	04:32	19:53	20:32	21:23
52°	02:44	03:42	04:24	20:00	20:42	21:39
54°	02:24	03:30	04:15	20:09	20:54	21:58
56°	01:59	03:15	04:05	20:19	21:08	22:23
58°	01:21	02:58	03:54	20:30	21:24	22:58
S 60°	////	02:38	03:40	20:43	21:45	////

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	██	██	██	██
62°	07:41	██	██	09:14	██	██
60°	06:42	08:07	08:51	10:13	10:44	12:00
N 58°	06:09	07:24	08:14	10:46	11:26	12:37
56°	05:45	06:56	07:48	11:11	11:55	13:03
54°	05:25	06:34	07:27	11:31	12:17	13:24
52°	05:09	06:16	07:10	11:48	12:35	13:41
50°	04:54	06:00	06:55	12:02	12:51	13:56
45°	04:26	05:29	06:24	12:31	13:22	14:25
N 40°	04:03	05:05	06:01	12:54	13:46	14:49
35°	03:45	04:45	05:41	13:13	14:06	15:08
30°	03:29	04:28	05:25	13:30	14:23	15:24
20°	03:02	03:59	04:56	13:57	14:52	15:52
N 10°	02:39	03:35	04:32	14:21	15:17	16:15
0°	02:18	03:12	04:09	14:43	15:40	16:37
S 10°	01:56	02:50	03:47	15:06	16:02	16:59
20°	01:33	02:25	03:23	15:30	16:27	17:22
30°	01:07	01:57	02:54	15:57	16:55	17:50
35°	00:52	01:40	02:37	16:14	17:12	18:05
40°	00:34	01:21	02:18	16:33	17:32	18:24
45°	00:12	00:57	01:54	16:56	17:56	18:46
S 50°	· · ·	00:27	01:24	17:26	18:27	19:14
52°	· · ·	00:12	01:08	17:41	18:42	19:28
54°	23:54	· · ·	00:51	17:58	19:00	19:44
56°	23:33	· · ·	00:29	18:19	19:21	20:03
58°	23:07	· · ·	00:02	18:46	19:49	20:26
S 60°	22:30	23:23	· · ·	19:22	20:28	20:56

Day	Sun		Mer. Pass	Moon		Age 26-28 22-8%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
25	12:14	12:21	12:12	08:30	20:58	

January 28, 29, 30 UT (Tue., Wed., Thu.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Tue	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec		SHA	Dec	
0	127°30.74	133°25.40	S01°3.71	13°16.41	N25°55.90		57°36.63	N21°38.51		138°43.18	S06°54.74					Alpheratz	357°34.93 29°13.80	
1	142°33.21	148°26.05	2.55	28°19.80	56.02		72°39.16	38.51		153°45.40	54.64					Ankaa	353°7.29 -42°10.42	
2	157°35.67	163°26.70	1.40	43°23.19	56.13		87°41.69	38.51		168°47.62	54.53					Schedar	349°31.27 56°40.71	
3	172°38.14	178°27.35	01°0.24	58°26.58	•• 56.25		102°44.22	•• 38.51		183°49.84	•• 54.43					Diphda	348°47.38 -17°51.10	
4	187°40.60	193°28.01	00°59.09	73°29.96	56.36		117°46.76	38.51		198°52.06	54.32					Achernar	335°20.24 -57°6.85	
5	202°43.07	208°28.66	57.94	88°33.35	56.48		132°49.29	38.51		213°54.28	54.22					Hamal	327°51.16 23°34.93	
6	217°45.53	223°29.32	S00°56.78	103°36.73	N25°56.59		147°51.82	N21°38.51		228°56.51	S06°54.11					Polaris	313°55.33 89°22.52	
7	232°47.99	238°29.98	55.63	118°40.11	56.71		162°54.35	38.51		243°58.73	54.00					Acamar	315°11.65 -40°12.48	
8	247°50.46	253°30.63	54.48	133°43.50	56.82		177°56.88	38.51		259°0.95	53.90					Menkar	314°6.03 4°11.25	
9	262°52.92	268°31.29	•• 53.32	148°46.88	•• 56.93		192°59.41	•• 38.51		274°3.17	•• 53.79					Mirfak	308°28.04 49°57.21	
10	277°55.39	283°31.96	52.17	163°50.26	57.04		208°1.94	38.51		289°5.39	53.69					Aldebaran	290°39.36 16°33.60	
11	292°57.85	298°32.62	51.02	178°53.63	57.16		223°4.47	38.51		304°7.61	53.58					Rigel	281°3.58 -8°10.44	
12	308°0.31	313°33.28	S00°49.87	193°57.01	N25°57.27		238°7.00	N21°38.51		319°9.83	S06°53.47					Capella	280°21.47 46°1.51	
13	323°2.78	328°33.95	48.71	209°0.39	57.38		253°9.52	38.51		334°12.05	53.37					Bellatrix	278°22.57 6°22.31	
14	338°5.24	343°34.62	47.56	224°3.77	57.49		268°12.05	38.51		349°14.27	53.26					Elnath	278°1.52 28°37.76	
15	353°7.71	358°35.29	•• 46.41	239°7.14	•• 57.60		283°14.58	•• 38.52		4°16.49	•• 53.16					Alnilam	275°37.42 -1°11.21	
16	8°10.17	13°35.96	45.26	254°10.51	57.71		298°17.11	38.52		19°18.71	53.05					Betelgeuse	270°51.75 7°24.67	
17	23°12.64	28°36.63	44.11	269°13.89	57.82		313°19.63	38.52		34°20.93	52.94					Canopus	263°51.90 -52°42.65	
18	38°15.10	43°37.30	S00°42.96	284°17.26	N25°57.93		328°22.16	N21°38.52		49°23.15	S06°52.84					Sirius	258°25.87 -16°45.12	
19	53°17.56	58°37.97	41.81	299°20.63	58.04		343°24.69	38.52		64°25.37	52.73					Adhara	255°5.47 -29°0.46	
20	68°20.03	73°38.65	40.66	314°24.00	58.15		358°27.21	38.52		79°27.59	52.63					Procyon	244°50.44 5°9.58	
21	83°22.49	88°39.33	•• 39.51	329°27.37	•• 58.26		13°29.74	•• 38.52		94°29.81	•• 52.52					Pollux	243°16.86 27°57.89	
22	98°24.96	103°40.01	38.36	344°30.73	58.36		28°32.26	38.52		109°32.03	52.41					Avior	234°14.08 -59°35.38	
23	113°27.42	118°40.69	37.21	359°34.10	58.47		43°34.79	38.53		124°34.25	52.31					Suhail	222°45.83 -43°32.01	
Mer.pass. 15:27			ν0.6' d-1.2' m-4.71			ν3.4' d0.1' m-1.19			ν2.5' d0.0' m-2.55			ν2.2' d-0.1' m1.11						
Wed	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	128°29.88	133°41.37	S00°36.06	14°37.46	N25°58.58		58°37.31	N21°38.53		139°36.47	S06°52.20					Dubhe	193°40.36 61°36.71	
1	143°32.35	148°42.05	34.91	29°40.83	58.68		73°39.83	38.53		154°38.69	52.09					Denebola	182°24.66 14°25.76	
2	158°34.81	163°42.73	33.76	44°44.19	58.79		88°42.36	38.53		169°40.91	51.99					Gienah	175°43.34 -17°40.88	
3	173°37.28	178°43.42	•• 32.61	59°47.55	•• 58.90		103°44.88	•• 38.53		184°43.13	•• 51.88					Acrux	172°59.71 -63°14.07	
4	188°39.74	193°44.11	31.47	74°50.92	59.00		118°47.40	38.53		199°45.35	51.77					Gacrux	171°51.32 -57°15.03	
5	203°42.21	208°44.80	30.32	89°54.28	59.11		133°49.92	38.54		214°47.57	51.67					Alioth	166°12.65 55°49.10	
6	218°44.67	223°45.49	S00°29.17	104°57.63	N25°59.21		148°52.45	N21°38.54		229°49.78	S06°51.56					Spica	158°22.15 -11°17.57	
7	233°47.13	238°46.18	28.03	120°0.99	59.31		163°54.97	38.54		244°52.00	51.46					Alkaid	152°51.85 49°10.94	
8	248°49.60	253°46.87	26.88	135°4.35	59.42		178°57.49	38.54		259°54.22	51.35					Hadar	148°35.89 -60°29.40	
9	263°52.06	268°47.56	•• 25.73	150°7.70	•• 59.52		194°0.01	•• 38.54		274°56.44	•• 51.24					Menkent	147°57.52 -36°29.49	
10	278°54.53	283°48.26	24.59	165°11.06	59.62		209°2.53	38.54		289°58.66	51.14					Arcturus	145°47.83 19°2.89	
11	293°56.99	298°48.96	23.44	180°14.41	59.73		224°5.05	38.55		305°0.88	51.03					Rigel Kent.	139°40.26 -60°56.10	
12	308°59.45	313°49.66	S00°22.30	195°17.76	N25°59.83		239°7.57	N21°38.55		320°3.10	S06°50.92					Kochab	137°19.87 74°2.72	
13	324°1.92	328°50.36	21.15	210°21.12	25°59.93		254°10.09	38.55		335°5.32	50.82					Zuben'ubi	136°55.99 -16°8.77	
14	339°4.38	343°51.06	20.01	225°24.47	26°0.03		269°12.61	38.55		350°7.53	50.71					Alphecca	126°3.79 26°37.55	
15	354°6.85	358°51.76	•• 18.86	240°27.81	•• 0.13		284°15.13	•• 38.55		5°9.75	•• 50.60					Antares	112°15.95 -26°29.22	
16	9°9.31	13°52.47	17.72	255°31.16	0.23		299°17.64	38.56		20°11.97	50.49					Atria	107°10.49 -69°4.12	
17	24°11.78	28°53.17	16.57	270°34.51	0.33		314°20.16	38.56		35°14.19	50.39					Sabik	102°2.94 -15°45.39	
18	39°14.24	43°53.88	S00°15.43	285°37.85	N26°0.43		329°22.68	N21°38.56		50°16.41	S06°50.28					Shaula	96°10.59 -37°7.25	
19	54°16.70	58°54.59	14.29	300°41.20	0.53		344°25.20	38.56		65°18.62	50.17					Rasalhague	95°58.74 12°32.33	
20	69°19.17	73°55.30	13.14	315°44.54	0.63		359°27.71	38.57		80°20.84	50.07					Eltanin	90°42.57 51°28.85	
21	84°21.63	88°56.01	•• 12.00	330°47.88	•• 0.73		14°30.23	•• 38.57		95°23.06	•• 49.96					Kaus Aust.	83°32.78 -34°22.34	
22	99°24.10	103°56.72	10.86	345°51.23	0.83		29°32.74	38.57		110°25.28	49.85					Vega	80°33.56 38°48.19	
23	114°26.56	118°57.44	9.72	0°54.57	0.93		44°35.26	38.57		125°27.50	49.75					Nunki	75°48.02 -26°15.96	
Mer.pass. 15:23			ν0.7' d-1.1' m-4.72			ν3.4' d0.1' m-1.16			ν2.5' d0.0' m-2.54			ν2.2' d-0.1' m1.11						
Thu	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	129°29.02	133°58.15	S00°8.57	15°57.91	N26°1.03		59°37.77	N21°38.58		140°29.71	S06°49.64					Jan 28 Tue	SHA Mer.pass	
1	144°31.49	148°58.87	7.43	31°1.24	1.12		74°40.29	38.58		155°31.93	49.53					Venus	5°54.66 15:06	
2	159°33.95	163°59.59	6.29	46°4.58	1.22		89°42.80	38.58		170°34.15	49.42					Mars	245°45.67 23:02	
3	174°36.42	179°0.31	•• 5.15	61°7.92	•• 1.32		104°45.32	•• 38.58		185°36.37	•• 49.32					Jupiter	290°5.88 20:06	
4	189°38.88	194°1.03	4.01	76°11.25	1.41		119°47.83	38.59		200°38.58	49.21					Saturn	11°12.43 14:43	
5	204°41.35</																	

h		Sun		Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.05	S18°11.26	196°17.06	6.4'	S26°50.91	-6.0'	57.5'
1	191°46.93	10.60	210°42.43	6.4'	26°44.94	-6.1'	57.5'
2	206°46.81	9.94	225°7.83	6.4'	26°38.80	-6.3'	57.6'
3	221°46.69	· · 9.27	239°33.25	6.5'	26°32.49	-6.5'	57.6'
4	236°46.58	8.61	253°58.70	6.5'	26°26.02	-6.6'	57.6'
5	251°46.46	7.95	268°24.18	6.5'	26°19.38	-6.8'	57.6'
6	266°46.34	S18°7.29	282°49.70	6.5'	S26°12.57	-7.0'	57.7'
7	281°46.22	6.62	297°15.24	6.6'	26°5.60	-7.1'	57.7'
8	296°46.11	5.96	311°40.83	6.6'	25°58.47	-7.3'	57.7'
9	311°45.99	· · 5.30	326°6.44	6.7'	25°51.17	-7.5'	57.8'
10	326°45.88	4.63	340°32.10	6.7'	25°43.71	-7.6'	57.8'
11	341°45.76	3.97	354°57.80	6.7'	25°36.09	-7.8'	57.8'
12	356°45.65	S18°3.30	9°23.53	6.8'	S25°28.30	-7.9'	57.9'
13	11°45.53	2.63	23°49.31	6.8'	25°20.36	-8.1'	57.9'
14	26°45.42	1.97	38°15.13	6.9'	25°12.25	-8.3'	57.9'
15	41°45.30	· · 1.30	52°41.00	6.9'	25°3.99	-8.4'	57.9'
16	56°45.19	0.63	67°6.91	7.0'	24°55.57	-8.6'	58.0'
17	71°45.08	17°59.96	81°32.87	7.0'	24°46.99	-8.7'	58.0'
18	86°44.96	S17°59.29	95°58.88	7.1'	S24°38.25	-8.9'	58.0'
19	101°44.85	58.62	110°24.94	7.1'	24°29.36	-9.0'	58.1'
20	116°44.74	57.95	124°51.04	7.2'	24°20.31	-9.2'	58.1'
21	131°44.63	· · 57.28	139°17.20	7.2'	24°11.11	-9.4'	58.1'
22	146°44.51	56.61	153°43.42	7.3'	24°1.76	-9.5'	58.1'
23	161°44.40	55.94	168°9.68	7.3'	23°52.26	-9.7'	58.2'
SD = 16.2' d = -0.7'			SD = 15.7'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°44.29	S17°55.26	182°36.00	7.4'	S23°42.61	-9.8'	58.2'
1	191°44.18	54.59	197°2.38	7.4'	23°32.80	-10.0'	58.2'
2	206°44.07	53.92	211°28.82	7.5'	23°22.85	-10.1'	58.2'
3	221°43.96	· · 53.24	225°55.31	7.5'	23°12.75	-10.2'	58.3'
4	236°43.85	52.57	240°21.85	7.6'	23°2.51	-10.4'	58.3'
5	251°43.74	51.89	254°48.46	7.7'	22°52.12	-10.5'	58.3'
6	266°43.64	S17°51.21	269°15.13	7.7'	S22°41.59	-10.7'	58.3'
7	281°43.53	50.54	283°41.86	7.8'	22°30.91	-10.8'	58.4'
8	296°43.42	49.86	298°8.65	7.8'	22°20.10	-11.0'	58.4'
9	311°43.31	· · 49.18	312°35.50	7.9'	22°9.14	-11.1'	58.4'
10	326°43.20	48.50	327°2.41	8.0'	21°58.05	-11.2'	58.4'
11	341°43.10	47.83	341°29.38	8.0'	21°46.82	-11.4'	58.5'
12	356°42.99	S17°47.15	355°56.42	8.1'	S21°35.45	-11.5'	58.5'
13	11°42.88	46.47	10°23.52	8.2'	21°23.95	-11.6'	58.5'
14	26°42.78	45.79	24°50.69	8.2'	21°12.31	-11.8'	58.5'
15	41°42.67	· · 45.10	39°17.91	8.3'	21°0.55	-11.9'	58.6'
16	56°42.57	44.42	53°45.21	8.4'	20°48.65	-12.0'	58.6'
17	71°42.46	43.74	68°12.57	8.4'	20°36.62	-12.2'	58.6'
18	86°42.36	S17°43.06	82°39.99	8.5'	S20°24.47	-12.3'	58.6'
19	101°42.25	42.37	97°7.48	8.6'	20°12.18	-12.4'	58.7'
20	116°42.15	41.69	111°35.03	8.6'	19°59.78	-12.5'	58.7'
21	131°42.05	· · 41.01	126°2.65	8.7'	19°47.25	-12.7'	58.7'
22	146°41.94	40.32	140°30.33	8.8'	19°34.59	-12.8'	58.7'
23	161°41.84	39.64	154°58.09	8.8'	19°21.82	-12.9'	58.8'
SD = 16.2' d = -0.7'			SD = 15.9'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.74	S17°38.95	169°25.90	8.9'	S19°8.93	-13.0'	58.8'
1	191°41.64	38.26	183°53.78	8.9'	18°55.92	-13.1'	58.8'
2	206°41.54	37.58	198°21.73	9.0'	18°42.79	-13.2'	58.8'
3	221°41.43	· · 36.89	212°49.74	9.1'	18°29.55	-13.4'	58.8'
4	236°41.33	36.20	227°17.82	9.1'	18°16.20	-13.5'	58.9'
5	251°41.23	35.51	241°45.96	9.2'	18°2.73	-13.6'	58.9'
6	266°41.13	S17°34.82	256°14.17	9.3'	S17°49.15	-13.7'	58.9'
7	281°41.03	34.13	270°42.44	9.3'	17°35.47	-13.8'	58.9'
8	296°40.93	33.44	285°10.78	9.4'	17°21.68	-13.9'	58.9'
9	311°40.83	· · 32.75	299°39.18	9.5'	17°7.78	-14.0'	59.0'
10	326°40.73	32.06	314°7.65	9.5'	16°53.78	-14.1'	59.0'
11	341°40.64	31.37	328°36.18	9.6'	16°39.68	-14.2'	59.0'
12	356°40.54	S17°30.67	343°4.77	9.7'	S16°25.47	-14.3'	59.0'
13	11°40.44	29.98	357°33.42	9.7'	16°11.17	-14.4'	59.0'
14	26°40.34	29.29	12°2.14	9.8'	15°56.77	-14.5'	59.1'
15	41°40.25	· · 28.59	26°30.92	9.8'	15°42.27	-14.6'	59.1'
16	56°40.15	27.90	40°59.76	9.9'	15°27.68	-14.7'	59.1'
17	71°40.05	27.20	55°28.66	10.0'	15°12.99	-14.8'	59.1'
18	86°39.96	S17°26.51	69°57.62	10.0'	S14°58.22	-14.9'	59.1'
19	101°39.86	25.81	84°26.64	10.1'	14°43.35	-15.0'	59.1'
20	116°39.77	25.11	98°55.72	10.1'	14°28.40	-15.0'	59.2'
21	131°39.67	· · 24.42	113°24.86	10.2'	14°13.36	-15.1'	59.2'
22	146°39.58	23.72	127°54.06	10.3'	13°58.24	-15.2'	59.2'
23	161°39.48	23.02	142°23.31	10.3'	13°43.03	-15.3'	59.2'
SD = 16.2' d = -0.7'			SD = 16.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:19	08:51	10:53	13:35	15:37	17:09
N 70°	07:10	08:30	10:01	14:27	15:57	17:18
68°	07:02	08:14	09:29	14:58	16:13	17:25
66°	06:56	08:01	09:06	15:21	16:27	17:31
64°	06:50	07:50	08:48	15:40	16:37	17:37
62°	06:45	07:40	08:33	15:54	16:47	17:42
60°	06:41	07:32	08:20	16:07	16:55	17:46
N 58°	06:37	07:25	08:09	16:18	17:02	17:50
56°	06:33	07:18	08:00	16:27	17:09	17:54
54°	06:30	07:12	07:52	16:35	17:14	17:57
52°	06:26	07:07	07:44	16:43	17:20	18:01
50°	06:23	07:02	07:37	16:49	17:25	18:04
48°	06:16	06:51	07:23	17:04	17:35	18:11
N 40°	06:10	06:42	07:11	17:16	17:44	18:17
38°	06:04	06:34	07:01	17:26	17:53	18:23
36°	05:58	06:27	06:52	17:35	18:00	18:29
34°	05:47	06:13	06:36	17:50	18:13	18:40
N 10°	05:35	06:01	06:23	18:04	18:26	18:51
0°	05:23	05:48	06:10	18:17	18:38	19:04
S 10°	05:08	05:34	05:57	18:30	18:52	19:18
20°	04:51	05:19	05:42	18:44	19:07	19:35
30°	04:29	05:00	05:26	19:00	19:26	19:57
35°	04:15	04:49	05:17	19:09	19:37	20:10
40°	03:58	04:35	05:06	19:20	19:50	20:27
45°	03:36	04:19	04:53	19:33	20:06	20:49
S 50°	03:07	03:58	04:37	19:48	20:27	21:17
52°	02:52	03:48	04:29	19:56	20:37	21:32
54°	02:34	03:37	04:21	20:04	20:48	21:49
56°	02:12	03:23	04:12	20:13	21:01	22:12
58°	01:40	03:08	04:01	20:24	21:16	22:42
S 60°	00:31	02:49	03:49	20:36	21:35	23:37

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	■	■	11:35	■	■	15:12
N 70°	■	■	10:50	■	■	15:55
68°	■	11:42	10:20	■	13:10	16:23
66°	■	10:34	09:58	■	14:17	16:44
64°	10:46	09:58	09:40	12:06	14:52	17:01
62°	09:41	09:31	09:25	13:11	15:17	17:15
60°	09:06	09:11	09:12	13:45	15:37	17:26
N 58°	08:40	08:54	09:01	14:10	15:53	17:36
56°	08:20	08:39	08:51	14:30	16:07	17:45
54°	08:03	08:27	08:43	14:47	16:19	17:52
52°	07:49	08:16	08:35	15:01	16:29	17:59
50°	07:36	08:06	08:28	15:13	16:38	18:05
48°	07:09	07:45	08:13	15:39	16:58	18:18
N 40°	06:49	07:28	08:01	15:59	17:13	18:29
38°	06:31	07:14	07:50	16:16	17:27	18:38
36°	06:16	07:01	07:41	16:30	17:38	18:46
34°	05:50	06:40	07:25	16:54	17:57	19:00
N 10°	05:28	06:21	07:11	17:15	18:14	19:11
0°	05:07	06:04	06:58	17:35	18:30	19:22
S 10°	04:46	05:46	06:44	17:54	18:45	19:33
20°	04:24	05:27	06:30	18:14	19:02	19:45
30°	03:58	05:05	06:14	18:38	19:20	19:58
35°	03:43	04:52	06:04	18:52	19:31	20:05
40°	03:25	04:38	05:53	19:08	19:44	20:14
45°	03:03	04:20	05:40	19:26	19:58	20:24
S 50°	02:36	03:58	05:24	19:50	20:16	20:35
52°	02:22	03:47	05:16	20:01	20:24	20:41
54°	02:06	03:35	05:08	20:14	20:33	20:47
56°	01:48	03:21	04:59	20:28	20:43	20:53
58°	01:25	03:05	04:48	20:45	20:55	21:01
S 60°	00:56	02:45	04:35	21:05	21:08	21:09

Day	Sun		Mer. Pass	Moon		Age 29-1 3-0%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
28	12:52	12:57	12:13	11:21	23:49	
29	13:03	13:08	12:13	12:17	--:--	
30	13:13	13:18	12:13	13:10	00:44	

January 31, 01, 02 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	130°28.16		134°15.78	N00°18.73	17°17.70	N26°3.25	60°38.02	N21°38.65	141°22.91	S06°47.06		Alpheratz	357°34.94 29°13.80
1	145°30.63		149°16.54	19.87	32°21.01	3.34	75°40.53	38.66	156°25.13	46.95		Ankaa	353°7.30 -42°10.41
2	160°33.09		164°17.29	21.00	47°24.31	3.42	90°43.03	38.66	171°27.34	46.84		Schedar	349°31.29 56°40.70
3	175°35.56		179°18.05	•• 22.13	62°27.62	•• 3.51	105°45.54	•• 38.67	186°29.56	•• 46.74		Diphda	348°47.38 -17°51.10
4	190°38.02		194°18.81	23.26	77°30.93	3.60	120°48.04	38.67	201°31.78	46.63		Achernar	335°20.26 -57°6.85
5	205°40.48		209°19.57	24.40	92°34.23	3.68	135°50.54	38.67	216°33.99	46.52		Hamal	327°51.17 23°34.93
6	220°42.95		224°20.33	N00°25.53	107°37.54	N26°3.77	150°53.05	N21°38.68	231°36.21	S06°46.41		Polaris	313°56.97 89°22.53
7	235°45.41		239°21.09	26.66	122°40.84	3.85	165°55.55	38.68	246°38.42	46.30		Acamar	315°11.67 -40°12.48
8	250°47.88		254°21.85	27.79	137°44.14	3.94	180°58.05	38.69	261°40.64	46.20		Menkar	314°6.04 4°11.25
9	265°50.34		269°22.62	•• 28.92	152°47.44	•• 4.02	196°0.56	•• 38.69	276°42.85	•• 46.09		Mirfak	308°28.06 49°57.21
10	280°52.80		284°23.39	30.05	167°50.74	4.11	211°3.06	38.69	291°45.07	45.98		Aldebaran	290°39.37 16°33.60
11	295°55.27		299°24.16	31.18	182°54.04	4.19	226°5.56	38.70	306°47.28	45.87		Rigel	281°3.59 -8°10.45
12	310°57.73		314°24.93	N00°32.31	197°57.34	N26°4.28	241°8.06	N21°38.70	321°49.50	S06°45.76		Capella	280°21.48 46°1.51
13	326°0.20		329°25.70	33.44	213°0.63	4.36	256°10.56	38.71	336°51.71	45.66		Bellatrix	278°22.58 6°22.31
14	341°2.66		344°26.47	34.57	228°3.93	4.44	271°13.06	38.71	351°53.93	45.55		Elnath	278°1.53 28°37.76
15	356°5.12		359°27.25	•• 35.70	243°7.22	•• 4.52	286°15.56	•• 38.72	6°56.14	•• 45.44		Alnilam	275°37.43 -1°11.21
16	11°7.59		14°28.02	36.83	258°10.51	4.61	301°18.06	38.72	21°58.36	45.33		Betelgeuse	270°51.76 7°24.67
17	26°10.05		29°28.80	37.96	273°13.80	4.69	316°20.56	38.73	37°0.57	45.22		Canopus	263°51.91 -52°42.67
18	41°12.52		44°29.58	N00°39.08	288°17.09	N26°4.77	331°23.06	N21°38.73	52°2.78	S06°45.11		Sirius	258°25.88 -16°45.13
19	56°14.98		59°30.36	40.21	303°20.38	4.85	346°25.56	38.73	67°5.00	45.01		Adhara	255°5.47 -29°0.46
20	71°17.44		74°31.14	41.34	318°23.67	4.93	1°28.06	38.74	82°7.21	44.90		Procyon	244°50.44 5°9.58
21	86°19.91		89°31.93	•• 42.46	333°26.95	•• 5.01	16°30.56	•• 38.74	97°9.43	•• 44.79		Pollux	243°16.85 27°57.90
22	101°22.37		104°32.71	43.59	348°30.24	5.09	31°33.05	38.75	112°11.64	44.68		Avior	234°14.09 -59°35.40
23	116°24.84		119°33.50	44.71	3°33.52	5.17	46°35.55	38.75	127°13.86	44.57		Suhail	222°45.83 -43°32.03
Mer.pass. 15:16		ν0.8' d1.1' m-4.74		ν3.3' d0.1' m-1.10		ν2.5' d0.0' m-2.53		ν2.2' d-0.1' m1.11		Miaplacidus 221°37.37 -69°49.14			
										Alphard 217°47.37 -8°46.10			
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		Regulus	207°34.05 11°50.56
0	131°27.30		134°34.29	N00°45.84	18°36.80	N26°5.25	61°38.05	N21°38.76	142°16.07	S06°44.46		Dubhe	193°40.32 61°36.72
1	146°29.77		149°35.08	46.96	33°40.08	5.33	76°40.54	38.76	157°18.28	44.36		Denebola	182°24.64 14°25.75
2	161°32.23		164°35.87	48.09	48°43.36	5.41	91°43.04	38.77	172°20.50	44.25		Gienah	175°43.32 -17°40.89
3	176°34.69		179°36.67	•• 49.21	63°46.64	•• 5.48	106°45.54	•• 38.77	187°22.71	•• 44.14		Acrux	172°59.68 -63°14.09
4	191°37.16		194°37.46	50.34	78°49.92	5.56	121°48.03	38.78	202°24.92	44.03		Gacrux	171°51.29 -57°15.04
5	206°39.62		209°38.26	51.46	93°53.19	5.64	136°50.53	38.78	217°27.14	43.92		Alioth	166°12.62 55°49.10
6	221°42.09		224°39.06	N00°52.58	108°56.47	N26°5.71	151°53.02	N21°38.79	232°29.35	S06°43.81		Spica	158°22.13 -11°17.58
7	236°44.55		239°39.86	53.71	123°59.74	5.79	166°55.51	38.79	247°31.56	43.70		Alkaid	152°51.81 49°10.94
8	251°47.01		254°40.66	54.83	139°3.01	5.87	181°58.01	38.80	262°33.78	43.60		Hadar	148°35.85 -60°29.41
9	266°49.48		269°41.46	•• 55.95	154°6.28	•• 5.94	197°0.50	•• 38.80	277°35.99	•• 43.49		Menkent	147°57.50 -36°29.50
10	281°51.94		284°42.26	57.07	169°9.55	6.02	212°2.99	38.81	292°38.20	43.38		Arcturus	145°47.81 19°2.88
11	296°54.41		299°43.07	58.19	184°12.82	6.09	227°5.49	38.82	307°40.42	43.27		Rigel Kent.	139°40.22 -60°56.11
12	311°56.87		314°43.88	N00°59.31	199°16.09	N26°6.17	242°7.98	N21°38.82	322°42.63	S06°43.16		Kochab	137°19.80 74°2.72
13	326°59.33		329°44.69	01°0.43	214°19.35	6.24	257°10.47	38.83	337°44.84	43.05		Zuben'ubi	136°55.96 -16°8.78
14	342°1.80		344°45.50	1.55	229°22.62	6.31	272°12.96	38.83	352°47.06	42.94		Alphecca	126°3.77 26°37.54
15	357°4.26		359°46.31	•• 2.67	244°25.88	•• 6.39	287°15.45	•• 38.84	7°49.27	•• 42.83		Antares	112°15.93 -26°29.23
16	12°6.73		14°47.13	3.79	259°29.14	6.46	302°17.94	38.84	22°51.48	42.72		Atria	107°10.43 -69°4.12
17	27°9.19		29°47.94	4.91	274°32.40	6.53	317°20.43	38.85	37°53.70	42.62		Sabik	102°2.92 -15°45.40
18	42°11.65		44°48.76	N01°6.03	289°35.66	N26°6.60	332°22.92	N21°38.86	52°55.91	S06°42.51		Shaula	96°10.56 -37°7.26
19	57°14.12		59°49.58	7.15	304°38.92	6.68	347°25.41	38.86	67°58.12	42.40		Rasalhague	95°58.72 12°32.32
20	72°16.58		74°50.40	8.26	319°42.18	6.75	2°27.90	38.87	83°0.33	42.29		Eltanin	90°42.55 51°28.83
21	87°19.05		89°51.22	•• 9.38	334°45.43	•• 6.82	17°30.39	•• 38.87	98°2.55	•• 42.18		Kaus Aust.	83°32.75 -34°22.34
22	102°21.51		104°52.05	10.50	349°48.69	6.89	32°32.88	38.88	113°4.76	42.07		Vega	80°33.54 38°48.17
23	117°23.97		119°52.87	11.61	4°51.94	6.96	47°35.37	38.88	128°6.97	41.96		Nunki	75°48.00 -26°15.96
Mer.pass. 15:12		ν0.8' d1.1' m-4.75		ν3.3' d0.1' m-1.07		ν2.5' d0.0' m-2.52		ν2.2' d-0.1' m1.11		Altair 62°0.22 8°55.94			
										Peacock 53°6.20 -56°39.29			
										Deneb 49°26.24 45°22.09			
										Enif 33°39.05 9°59.31			
										Al Na'ir 27°33.25 -46°50.52			
										Fomalhaut 15°14.74 -29°29.53			
										Scheat 13°45.45 28°13.14			
										Markab 13°30.11 15°20.38			
Jan 31 Fri			SHA		Mer.pass								
Venus			3°47.62		15:02								
Mars			246°49.53		22:46								
Jupiter			290°9.86		19:54								
Saturn			10°54.75		14:32								
Feb 01 Sat			SHA		Mer.pass								
Venus			3°6.99		15:01								
Mars			247°9.50		22:41								
Jupiter			290°10.75		19:50								
Saturn			10°48.77		14:29								
Feb 02 Sun			SHA		Mer.pass								
Venus			2°27.26		15:00								
Mars			247°28.75		22:35								
Jupiter			290°11.42		19:46								
Saturn			10°42.74		14:25								
Horizontal parallax													
Venus:												0.3	
Mars:												0.2	
Mer.pass. 15:08		ν0.8' d1.1' m-4.76		ν3.3' d0.1' m-1.05		ν2.5' d0.0' m-2.51		ν2.2' d-0.1' m1.11					


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	176°39.39	S17°22.32	156°52.62	10.4'	S13°27.75	-15.4'	59.2'
1	191°39.30	21.62	171°21.98	10.4'	13°12.38	-15.4'	59.2'
2	206°39.20	20.92	185°51.40	10.5'	12°56.93	-15.5'	59.3'
3	221°39.11	· · 20.22	200°20.88	10.5'	12°41.41	-15.6'	59.3'
4	236°39.02	19.52	214°50.40	10.6'	12°25.82	-15.7'	59.3'
5	251°38.93	18.82	229°19.98	10.6'	12°10.15	-15.7'	59.3'
6	266°38.83	S17°18.12	243°49.61	10.7'	S11°54.41	-15.8'	59.3'
7	281°38.74	17.41	258°19.30	10.7'	11°38.60	-15.9'	59.3'
8	296°38.65	16.71	272°49.03	10.8'	11°22.72	-15.9'	59.3'
9	311°38.56	· · 16.01	287°18.81	10.8'	11°6.77	-16.0'	59.3'
10	326°38.47	15.30	301°48.64	10.9'	10°50.76	-16.1'	59.4'
11	341°38.38	14.60	316°18.51	10.9'	10°34.69	-16.1'	59.4'
12	356°38.29	S17°13.89	330°48.44	11.0'	S10°18.56	-16.2'	59.4'
13	11°38.20	13.19	345°18.40	11.0'	10°2.36	-16.3'	59.4'
14	26°38.11	12.48	359°48.42	11.1'	09°46.11	-16.3'	59.4'
15	41°38.03	· · 11.77	14°18.47	11.1'	09°29.80	-16.4'	59.4'
16	56°37.94	11.07	28°48.57	11.1'	09°13.44	-16.4'	59.4'
17	71°37.85	10.36	43°18.71	11.2'	08°57.03	-16.5'	59.4'
18	86°37.76	S17°9.65	57°48.89	11.2'	S08°40.56	-16.5'	59.4'
19	101°37.68	8.94	72°19.10	11.3'	08°24.04	-16.6'	59.5'
20	116°37.59	8.23	86°49.36	11.3'	08°7.48	-16.6'	59.5'
21	131°37.50	· · 7.52	101°19.65	11.3'	07°50.87	-16.7'	59.5'
22	146°37.42	6.81	115°49.98	11.4'	07°34.21	-16.7'	59.5'
23	161°37.33	6.10	130°20.34	11.4'	07°17.51	-16.7'	59.5'
SD = 16.2' $d = -0.7'$			SD = 16.2'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.25	S17°5.39	144°50.74	11.4'	S07°0.77	-16.8'	59.5'
1	191°37.16	4.67	159°21.17	11.5'	06°43.99	-16.8'	59.5'
2	206°37.08	3.96	173°51.63	11.5'	06°27.18	-16.9'	59.5'
3	221°36.99	· · 3.25	188°22.12	11.5'	06°10.32	-16.9'	59.5'
4	236°36.91	2.53	202°52.64	11.5'	05°53.43	-16.9'	59.5'
5	251°36.83	1.82	217°23.19	11.6'	05°36.51	-17.0'	59.5'
6	266°36.74	S17°1.11	231°53.76	11.6'	S05°19.56	-17.0'	59.5'
7	281°36.66	17°0.39	246°24.36	11.6'	05°2.58	-17.0'	59.5'
8	296°36.58	16°59.67	260°54.99	11.6'	04°45.57	-17.0'	59.5'
9	311°36.50	· · 58.96	275°25.63	11.7'	04°28.53	-17.1'	59.6'
10	326°36.42	58.24	289°56.30	11.7'	04°11.47	-17.1'	59.6'
11	341°36.33	57.52	304°26.99	11.7'	03°54.38	-17.1'	59.6'
12	356°36.25	S16°56.81	318°57.70	11.7'	S03°37.27	-17.1'	59.6'
13	11°36.17	56.09	333°28.43	11.7'	03°20.15	-17.1'	59.6'
14	26°36.09	55.37	347°59.17	11.8'	03°3.00	-17.2'	59.6'
15	41°36.01	· · 54.65	2°29.93	11.8'	02°45.84	-17.2'	59.6'
16	56°35.93	53.93	17°0.71	11.8'	02°28.67	-17.2'	59.6'
17	71°35.85	53.21	31°31.49	11.8'	02°11.48	-17.2'	59.6'
18	86°35.78	S16°52.49	46°2.29	11.8'	S01°54.28	-17.2'	59.6'
19	101°35.70	51.77	60°33.10	11.8'	01°37.07	-17.2'	59.6'
20	116°35.62	51.04	75°3.92	11.8'	01°19.85	-17.2'	59.6'
21	131°35.54	· · 50.32	89°34.74	11.8'	01°2.62	-17.2'	59.6'
22	146°35.46	49.60	104°5.58	11.8'	00°45.39	-17.2'	59.6'
23	161°35.39	48.87	118°36.41	11.8'	00°28.15	-17.2'	59.6'
SD = 16.2' $d = -0.7'$			SD = 16.2'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.31	S16°48.15	133°7.26	11.8'	S00°10.92	-17.2'	59.6'
1	191°35.24	47.43	147°38.10	11.8'	N00°6.32	17.2'	59.6'
2	206°35.16	46.70	162°8.95	11.8'	00°23.55	17.2'	59.6'
3	221°35.08	· · 45.98	176°39.79	11.8'	00°40.79	17.2'	59.6'
4	236°35.01	45.25	191°10.64	11.8'	00°58.01	17.2'	59.6'
5	251°34.93	44.52	205°41.48	11.8'	01°15.24	17.2'	59.6'
6	266°34.86	S16°43.80	220°12.32	11.8'	N01°32.45	17.2'	59.6'
7	281°34.79	43.07	234°43.16	11.8'	01°49.65	17.2'	59.6'
8	296°34.71	42.34	249°13.98	11.8'	02°6.85	17.2'	59.6'
9	311°34.64	· · 41.61	263°44.80	11.8'	02°24.03	17.2'	59.6'
10	326°34.57	40.88	278°15.61	11.8'	02°41.19	17.2'	59.6'
11	341°34.49	40.15	292°46.42	11.8'	02°58.34	17.1'	59.6'
12	356°34.42	S16°39.42	307°17.20	11.8'	N03°15.48	17.1'	59.6'
13	11°34.35	38.69	321°47.98	11.8'	03°32.59	17.1'	59.6'
14	26°34.28	37.96	336°18.74	11.7'	03°49.69	17.1'	59.6'
15	41°34.21	· · 37.23	350°49.49	11.7'	04°6.76	17.0'	59.6'
16	56°34.14	36.50	5°20.22	11.7'	04°23.80	17.0'	59.6'
17	71°34.07	35.76	19°50.93	11.7'	04°40.83	17.0'	59.6'
18	86°34.00	S16°35.03	34°21.62	11.7'	N04°57.82	17.0'	59.6'
19	101°33.93	34.30	48°52.29	11.6'	05°14.79	16.9'	59.6'
20	116°33.86	33.56	63°22.94	11.6'	05°31.72	16.9'	59.6'
21	131°33.79	· · 32.83	77°53.56	11.6'	05°48.63	16.9'	59.6'
22	146°33.72	32.09	92°24.16	11.6'	06°5.50	16.8'	59.5'
23	161°33.65	31.36	106°54.74	11.5'	06°22.34	16.8'	59.5'
SD = 16.2' $d = -0.7'$			SD = 16.3'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:09	08:37	10:25	14:03	15:51	17:20
N 70°	07:01	08:19	09:44	14:44	16:10	17:28
68°	06:54	08:04	09:16	15:12	16:24	17:34
66°	06:49	07:52	08:55	15:33	16:36	17:40
64°	06:44	07:42	08:39	15:49	16:46	17:45
62°	06:39	07:34	08:25	16:03	16:54	17:49
60°	06:35	07:26	08:13	16:15	17:02	17:53
N 58°	06:32	07:19	08:03	16:25	17:09	17:56
56°	06:28	07:13	07:54	16:33	17:15	18:00
54°	06:25	07:08	07:47	16:41	17:20	18:03
52°	06:22	07:03	07:40	16:48	17:25	18:05
50°	06:20	06:58	07:33	16:55	17:29	18:08
45°	06:13	06:48	07:20	17:08	17:39	18:15
N 40°	06:07	06:40	07:08	17:19	17:48	18:20
35°	06:02	06:32	06:59	17:29	17:55	18:26
30°	05:57	06:25	06:50	17:37	18:02	18:31
20°	05:46	06:12	06:35	17:52	18:15	18:41
N 10°	05:35	06:00	06:22	18:05	18:27	18:52
0°	05:23	05:48	06:10	18:17	18:39	19:04
S 10°	05:10	05:36	05:58	18:29	18:51	19:17
20°	04:53	05:21	05:44	18:43	19:06	19:33
30°	04:32	05:03	05:29	18:58	19:24	19:54
35°	04:19	04:52	05:20	19:07	19:34	20:08
40°	04:03	04:39	05:09	19:17	19:47	20:24
45°	03:42	04:24	04:57	19:29	20:02	20:44
S 50°	03:15	04:04	04:42	19:44	20:22	21:11
52°	03:01	03:55	04:35	19:51	20:31	21:25
54°	02:44	03:44	04:27	19:59	20:42	21:41
56°	02:23	03:31	04:18	20:07	20:54	22:01
58°	01:56	03:17	04:08	20:17	21:08	22:27
S 60°	01:13	02:59	03:57	20:28	21:25	23:07

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	10:19	09:35	08:57	18:16	20:46	23:12
N 70°	10:02	09:29	09:00	18:30	20:47	23:02
68°	09:48	09:24	09:03	18:42	20:49	22:54
66°	09:37	09:20	09:05	18:51	20:50	22:48
64°	09:27	09:17	09:07	18:59	20:51	22:43
62°	09:19	09:13	09:08	19:05	20:52	22:38
60°	09:12	09:11	09:10	19:11	20:53	22:34
N 58°	09:05	09:08	09:11	19:16	20:53	22:30
56°	09:00	09:06	09:12	19:20	20:54	22:27
54°	08:55	09:04	09:13	19:24	20:55	22:25
52°	08:50	09:02	09:14	19:28	20:55	22:22
50°	08:46	09:01	09:15	19:31	20:55	22:20
45°	08:37	08:57	09:17	19:38	20:56	22:15
N 40°	08:29	08:54	09:18	19:44	20:57	22:11
35°	08:22	08:51	09:19	19:48	20:58	22:07
30°	08:17	08:49	09:21	19:53	20:58	22:04
20°	08:06	08:45	09:23	20:00	20:59	21:59
N 10°	07:57	08:42	09:25	20:07	21:00	21:54
0°	07:49	08:38	09:27	20:12	21:01	21:49
S 10°	07:41	08:35	09:28	20:18	21:02	21:45
20°	07:31	08:31	09:30	20:25	21:03	21:40
30°	07:21	08:27	09:33	20:32	21:03	21:35
35°	07:15	08:25	09:34	20:36	21:04	21:32
40°	07:08	08:22	09:36	20:40	21:04	21:28
45°	07:00	08:19	09:37	20:45	21:05	21:25
S 50°	06:50	08:15	09:40	20:51	21:06	21:20
52°	06:46	08:14	09:41	20:54	21:06	21:18
54°	06:41	08:12	09:42	20:57	21:06	21:15
56°	06:35	08:10	09:43	21:01	21:07	21:13
58°	06:29	08:07	09:44	21:04	21:07	21:10
S 60°	06:22	08:05	09:46	21:09	21:08	21:07

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	2-4
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-15%
31	13:22	13:27	12:13	14:01	01:36	
01	13:31	13:35	12:14	14:50	02:25	
02	13:39	13:42	12:14	15:38	03:14	

February 03, 04, 05 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	133°25.58		135°14.04	N01°39.38	21°12.84	N26°8.59	63°37.44	N21°39.05	144°2.25	S06°39.22
1	148°28.04		150°14.91	40.48	36°16.06	8.65	78°39.92	39.06	159°4.46	39.11
2	163°30.50		165°15.78	41.59	51°19.28	8.71	93°42.40	39.06	174°6.67	39.00
3	178°32.97		180°16.65	· · 42.69	66°22.49	· · 8.77	108°44.88	· · 39.07	189°8.89	· · 38.89
4	193°35.43		195°17.52	43.80	81°25.71	8.83	123°47.35	39.08	204°11.10	38.78
5	208°37.90		210°18.40	44.90	96°28.92	8.89	138°49.83	39.09	219°13.31	38.67
6	223°40.36		225°19.27	N01°46.00	111°32.13	N26°8.95	153°52.30	N21°39.09	234°15.52	S06°38.56
7	238°42.82		240°20.15	47.10	126°35.34	9.01	168°54.78	39.10	249°17.73	38.45
8	253°45.29		255°21.03	48.21	141°38.55	9.07	183°57.26	39.11	264°19.94	38.34
9	268°47.75		270°21.91	· · 49.31	156°41.76	· · 9.13	198°59.73	· · 39.12	279°22.15	· · 38.23
10	283°50.22		285°22.80	50.41	171°44.97	9.18	214°2.21	39.12	294°24.36	38.12
11	298°52.68		300°23.68	51.51	186°48.17	9.24	229°4.68	39.13	309°26.57	38.01
12	313°55.14		315°24.57	N01°52.61	201°51.38	N26°9.30	244°7.15	N21°39.14	324°28.77	S06°37.90
13	328°57.61		330°25.46	53.71	216°54.58	9.35	259°9.63	39.15	339°30.98	37.79
14	344°0.07		345°26.35	54.81	231°57.78	9.41	274°12.10	39.16	354°33.19	37.68
15	359°2.54		0°27.24	· · 55.91	247°0.98	· · 9.46	289°14.57	· · 39.16	9°35.40	· · 37.57
16	14°5.00		15°28.14	57.00	262°4.18	9.52	304°17.05	39.17	24°37.61	37.46
17	29°7.46		30°29.03	58.10	277°7.38	9.57	319°19.52	39.18	39°39.82	37.35
18	44°9.93		45°29.93	N01°59.20	292°10.57	N26°9.63	334°21.99	N21°39.19	54°42.03	S06°37.24
19	59°12.39		60°30.83	02°0.30	307°13.77	9.68	349°24.46	39.20	69°44.24	37.13
20	74°14.86		75°31.73	1.39	322°16.96	9.74	4°26.93	39.20	84°46.45	37.02
21	89°17.32		90°32.63	· · 2.49	337°20.15	· · 9.79	19°29.40	· · 39.21	99°48.66	· · 36.91
22	104°19.79		105°33.53	3.58	352°23.34	9.84	34°31.87	39.22	114°50.87	36.80
23	119°22.25		120°34.44	4.68	7°26.53	9.89	49°34.34	39.23	129°53.08	36.69
Mer.pass. 15:04			ν0.9' d1.1' m-4.77		ν3.2' d0.1' m-1.02		ν2.5' d0.0' m-2.50		ν2.2' d-0.1' m1.11	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	134°24.71		135°35.35	N02°5.77	22°29.72	N26°9.95	64°36.81	N21°39.24	144°55.29	S06°36.58
1	149°27.18		150°36.26	6.87	37°32.91	10.00	79°39.28	39.25	159°57.49	36.47
2	164°29.64		165°37.17	7.96	52°36.09	10.05	94°41.75	39.25	174°59.70	36.36
3	179°32.11		180°38.08	· · 9.05	67°39.28	· · 10.10	109°44.22	· · 39.26	190°1.91	· · 36.25
4	194°34.57		195°39.00	10.14	82°42.46	10.15	124°46.68	39.27	205°4.12	36.14
5	209°37.03		210°39.91	11.24	97°45.64	10.20	139°49.15	39.28	220°6.33	36.03
6	224°39.50		225°40.83	N02°12.33	112°48.82	N26°10.25	154°51.62	N21°39.29	235°8.54	S06°35.92
7	239°41.96		240°41.75	13.42	127°52.00	10.30	169°54.08	39.30	250°10.75	35.81
8	254°44.43		255°42.67	14.51	142°55.17	10.35	184°56.55	39.31	265°12.95	35.69
9	269°46.89		270°43.59	· · 15.60	157°58.35	· · 10.40	199°59.02	· · 39.31	280°15.16	· · 35.58
10	284°49.35		285°44.52	16.69	173°1.52	10.45	215°1.48	39.32	295°17.37	35.47
11	299°51.82		300°45.45	17.78	188°4.69	10.50	230°3.95	39.33	310°19.58	35.36
12	314°54.28		315°46.37	N02°18.86	203°7.87	N26°10.55	245°6.41	N21°39.34	325°21.79	S06°35.25
13	329°56.75		330°47.31	19.95	218°11.03	10.59	260°8.88	39.35	340°23.99	35.14
14	344°59.21		345°48.24	21.04	233°14.20	10.64	275°11.34	39.36	355°26.20	35.03
15	0°1.68		0°49.17	· · 22.13	248°17.37	· · 10.69	290°13.80	· · 39.37	10°28.41	· · 34.92
16	15°4.14		15°50.11	23.21	263°20.54	10.73	305°16.27	39.38	25°30.62	34.81
17	30°6.60		30°51.04	24.30	278°23.70	10.78	320°18.73	39.39	40°32.83	34.70
18	45°9.07		45°51.98	N02°25.38	293°26.86	N26°10.83	335°21.19	N21°39.39	55°35.03	S06°34.59
19	60°11.53		60°52.92	26.47	308°30.02	10.87	350°23.65	39.40	70°37.24	34.48
20	75°14.00		75°53.87	27.55	323°33.18	10.92	5°26.12	39.41	85°39.45	34.36
21	90°16.46		90°54.81	· · 28.64	338°36.34	· · 10.96	20°28.58	· · 39.42	100°41.66	· · 34.25
22	105°18.92		105°55.76	29.72	353°39.50	11.01	35°31.04	39.43	115°43.86	34.14
23	120°21.39		120°56.71	30.80	8°42.66	11.05	50°33.50	39.44	130°46.07	34.03
Mer.pass. 15:00			ν0.9' d1.1' m-4.78		ν3.2' d0.1' m-0.99		ν2.5' d0.0' m-2.50		ν2.2' d-0.1' m1.11	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	135°23.85		135°57.66	N02°31.88	23°45.81	N26°11.09	65°35.96	N21°39.45	145°48.28	S06°33.92
1	150°26.32		150°58.61	32.97	38°48.96	11.14	80°38.42	39.46	160°50.49	33.81
2	165°28.78		165°59.56	34.05	53°52.11	11.18	95°40.88	39.47	175°52.69	33.70
3	180°31.24		181°0.52	· · 35.13	68°55.26	· · 11.22	110°43.34	· · 39.48	190°54.90	· · 33.59
4	195°33.71		196°1.48	36.21	83°58.41	11.26	125°45.80	39.49	205°57.11	33.48
5	210°36.17		211°2.43	37.29	99°1.56	11.31	140°48.25	39.50	220°59.31	33.36
6	225°38.64		226°3.40	N02°38.37	114°4.71	N26°11.35	155°50.71	N21°39.51	236°1.52	S06°33.25
7	240°41.10		241°4.36	39.44	129°7.85	11.39	170°53.17	39.52	251°3.73	33.14
8	255°43.57		256°5.32	40.52	144°10.99	11.43	185°55.63	39.53	266°5.93	33.03
9	270°46.03		271°6.29	· · 41.60	159°14.14	· · 11.47	200°58.08	· · 39.54	281°8.14	· · 32.92
10	285°48.49		286°7.26	42.68	174°17.28	11.51	216°0.54	39.55	296°10.35	32.81
11	300°50.96		301°8.23	43.75	189°20.41	11.55	231°3.00	39.56	311°12.55	32.70
12	315°53.42		316°9.20	N02°44.83	204°23.55	N26°11.59	246°5.45	N21°39.57	326°14.76	S06°32.59
13	330°55.89		331°10.17	45.90	219°26.69	11.63	261°7.91	39.58	341°16.97	32.47
14	345°58.35		346°11.15	46.98	234°29.82	11.67	276°10.36	39.59	356°19.17	32.36
15	1°0.81		1°12.13	· · 48.05	249°32.96	· · 11.71	291°12.82	· · 39.60	11°21.38	· · 32.25
16	16°3.28		16°13.10	49.13	264°36.09	11.74	306°15.27	39.61	26°23.59	32.14
17	31°5.74		31°14.09	50.20	279°39.22	11.78	321°17.72	39.62	41°25.79	32.03
18	46°8.21		46°15.07	N02°51.27	294°42.35	N26°11.82	336°20.18	N21°39.63	56°28.00	S06°31.92
19	61°10.67		61°16.05	52.34	309°45.47	11.86	351°22.63	39.64	71°30.20	31.80
20	76°13.13		76°17.04	53.42	324°48.60	11.89	6°25.08	39.65	86°32.41	31.69
21	91°15.60		91°18.03	· · 54.49	339°51.72	· · 11.93	21°27.53	· · 39.66	101°34.62	· · 31.58
22	106°18.06		106°19.02	55.56	354°54.85	11.97	36°29.99	39.67	116°36.82	31.47
23	121°20.53		121°20.01	56.63	9°57.97	12.00	51°32.44	39.68	131°39.03	31.36
Mer.pass. 14:56			ν1.0' d1.1' m-4.79		ν3.2' d0.0' m-0.96		ν2.5' d0.0' m-2.49		ν2.2' d-0.1' m1.11	

Stars		
	SHA	Dec
Alpheratz	357° 34.96	29° 13.79
Ankaa	353° 7.31	-42° 10.41
Schedar	349° 31.31	56° 40.69
Diphda	348° 47.40	-17° 51.10
Achernar	335° 20.28	-57° 6.85
Hamal	327° 51.19	23° 34.92
Polaris	313° 58.52	89° 22.53
Acamar	315° 11.69	-40° 12.49
Menkar	314° 6.05	4° 11.24
Mirfak	308° 28.09	49° 57.21
Aldebaran	290° 39.38	16° 33.60
Rigel	281° 3.60	-8° 10.45
Capella	280° 21.50	46° 1.52
Bellatrix	278° 22.59	6° 22.31
Elnath	278° 1.54	28° 37.76
Alnilam	275° 37.44	-1° 11.22
Betelgeuse	270° 51.77	7° 24.67
Canopus	263° 51.93	-52° 42.68
Sirius	258° 25.89	-16° 45.14
Adhara	255° 5.48	-29° 0.48
Procyon	244° 50.45	5° 9.57
Pollux	243° 16.86	27° 57.90
Avior	234° 14.09	-59° 35.41
Suhail	222° 45.83	-43° 32.04
Miaplacidus	221° 37.37	-69° 49.15
Alphard	217° 47.36	-8° 46.11
Regulus	207° 34.05	11° 50.56
Dubhe	193° 40.30	61° 36.73
Denebola	182° 24.63	14° 25.75
Gienah	175° 43.31	-17° 40.90
Acrux	172° 59.65	-63° 14.10
Gacrux	171° 51.26	-57° 15.06
Alioth	166° 12.59	55° 49.10
Spica	158° 22.11	-11° 17.59
Alkaid	152° 51.79	49° 10.94
Hadar	148° 35.81	-60° 29.41
Menkent	147° 57.47	-36° 29.51
Arcturus	145° 47.79	19° 2.87
Rigel Kent.	139° 40.18	-60° 56.11
Kochab	137° 19.73	74° 2.72
Zuben'ubi	136° 55.94	-16° 8.79
Alphecca	126° 3.74	26° 37.53
Antares	112° 15.91	-26° 29.23
Atria	107° 10.38	-69° 4.11
Sabik	102° 2.90	-15° 45.40
Shaula	96° 10.54	-37° 7.25
Rasalhague	95° 58.70	12° 32.31
Eltanin	90° 42.53	51° 28.82
Kaus Aust.	83° 32.74	-34° 22.34
Vega	80° 33.53	38° 48.16
Nunki	75° 47.99	-26° 15.96
Altair	62° 0.21	8° 55.93
Peacock	53° 6.19	-56° 39.28
Deneb	49° 26.24	45° 22.07
Enif	33° 39.05	9° 59.31
Al Na'ir	27° 33.25	-46° 50.52
Fomalhaut	15° 14.74	-29° 29.53
Scheat	13° 45.46	28° 13.13
Markab	13° 30.12	15° 20.37
<hr/>		
Feb 03 Mon	SHA	Mer.pass
Venus	1° 48.46	14:58
Mars	247° 47.27	22:30
Jupiter	290° 11.87	19:42
Saturn	10° 36.68	14:22
<hr/>		
Feb 04 Tue	SHA	Mer.pass
Venus	1° 10.63	14:57
Mars	248° 5.01	22:25
Jupiter	290° 12.10	19:38
Saturn	10° 30.57	14:18
<hr/>		
Feb 05 Wed	SHA	Mer.pass
Venus	0° 33.80	14:55
Mars	248° 21.96	22:20
Jupiter	290° 12.11	19:34
Saturn	10° 24.43	14:15
<hr/>		
Horizontal parallax		
	Venus:	0.3
	Mars:	0.2


h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		176°33.58	S16°30.62	121°25.28	11.5'	N06°39.14	16.8' 59.5'
1		191°33.52	29.89	135°55.80	11.5'	06°55.90	16.7' 59.5'
2		206°33.45	29.15	150°26.29	11.5'	07°12.62	16.7' 59.5'
3		221°33.38	· · 28.41	164°56.75	11.4'	07°29.30	16.6' 59.5'
4		236°33.32	27.67	179°27.17	11.4'	07°45.94	16.6' 59.5'
5		251°33.25	26.93	193°57.57	11.4'	08°2.54	16.5' 59.5'
6		266°33.18	S16°26.19	208°27.92	11.3'	N08°19.08	16.5' 59.5'
7		281°33.12	25.45	222°58.24	11.3'	08°35.59	16.5' 59.5'
8		296°33.05	24.71	237°28.53	11.2'	08°52.04	16.4' 59.5'
9		311°32.99	· · 23.97	251°58.77	11.2'	09°8.44	16.3' 59.5'
10		326°32.93	23.23	266°28.98	11.2'	09°24.79	16.3' 59.5'
11		341°32.86	22.49	280°59.14	11.1'	09°41.08	16.2' 59.5'
12		356°32.80	S16°21.75	295°29.27	11.1'	N09°57.32	16.2' 59.5'
13		11°32.74	21.01	309°59.35	11.0'	10°13.50	16.1' 59.4'
14		26°32.67	20.26	324°29.38	11.0'	10°29.63	16.1' 59.4'
15		41°32.61	· · 19.52	338°59.37	10.9'	10°45.69	16.0' 59.4'
16		56°32.55	18.78	353°29.31	10.9'	11°1.70	15.9' 59.4'
17		71°32.49	18.03	7°59.21	10.8'	11°17.64	15.9' 59.4'
18		86°32.43	S16°17.29	22°29.05	10.8'	N11°33.51	15.8' 59.4'
19		101°32.36	16.54	36°58.85	10.7'	11°49.32	15.7' 59.4'
20		116°32.30	15.80	51°28.59	10.7'	12°5.06	15.7' 59.4'
21		131°32.24	· · 15.05	65°58.28	10.6'	12°20.73	15.6' 59.4'
22		146°32.18	14.30	80°27.92	10.6'	12°36.33	15.5' 59.4'
23		161°32.12	13.55	94°57.51	10.5'	12°51.86	15.5' 59.4'
		SD = 16.2' $d = -0.7'$		SD = 16.2'			

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		176°32.06	S16°12.81	109°27.03	10.5'	N13°7.32	15.4' 59.4'
1		191°32.01	12.06	123°56.51	10.4'	13°22.70	15.3' 59.3'
2		206°31.95	11.31	138°25.92	10.4'	13°38.00	15.2' 59.3'
3		221°31.89	· · 10.56	152°55.28	10.3'	13°53.22	15.1' 59.3'
4		236°31.83	9.81	167°24.57	10.2'	14°8.36	15.1' 59.3'
5		251°31.77	9.06	181°53.81	10.2'	14°23.42	15.0' 59.3'
6		266°31.72	S16°8.31	196°22.98	10.1'	N14°38.40	14.9' 59.3'
7		281°31.66	7.56	210°52.10	10.0'	14°53.29	14.8' 59.3'
8		296°31.60	6.81	225°21.15	10.0'	15°8.10	14.7' 59.3'
9		311°31.55	· · 6.05	239°50.13	9.9'	15°22.82	14.6' 59.3'
10		326°31.49	5.30	254°19.05	9.9'	15°37.45	14.5' 59.2'
11		341°31.44	4.55	268°47.91	9.8'	15°51.98	14.4' 59.2'
12		356°31.38	S16°3.79	283°16.69	9.7'	N16°6.43	14.4' 59.2'
13		11°31.33	3.04	297°45.42	9.7'	16°20.78	14.3' 59.2'
14		26°31.27	2.28	312°14.07	9.6'	16°35.04	14.2' 59.2'
15		41°31.22	· · 1.53	326°42.65	9.5'	16°49.20	14.1' 59.2'
16		56°31.17	0.77	341°11.17	9.4'	17°3.25	14.0' 59.2'
17		71°31.11	16°0.02	355°39.61	9.4'	17°17.21	13.9' 59.2'
18		86°31.06	S15°59.26	10°7.98	9.3'	N17°31.07	13.8' 59.2'
19		101°31.01	58.50	24°36.28	9.2'	17°44.83	13.6' 59.1'
20		116°30.96	57.75	39°4.51	9.2'	17°58.48	13.5' 59.1'
21		131°30.91	· · 56.99	53°32.67	9.1'	18°12.02	13.4' 59.1'
22		146°30.85	56.23	68°0.75	9.0'	18°25.46	13.3' 59.1'
23		161°30.80	55.47	82°28.76	8.9'	18°38.78	13.2' 59.1'
		SD = 16.2' $d = -0.7'$		SD = 16.2'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		176°30.75	S15°54.71	96°56.70	8.9'	N18°52.00	13.1' 59.1'
1		191°30.70	53.95	111°24.56	8.8'	19°5.10	13.0' 59.1'
2		206°30.65	53.19	125°52.35	8.7'	19°18.09	12.9' 59.0'
3		221°30.60	· · 52.43	140°20.06	8.6'	19°30.96	12.8' 59.0'
4		236°30.56	51.67	154°47.69	8.6'	19°43.72	12.6' 59.0'
5		251°30.51	50.91	169°15.25	8.5'	19°56.36	12.5' 59.0'
6		266°30.46	S15°50.15	183°42.73	8.4'	N20°8.88	12.4' 59.0'
7		281°30.41	49.38	198°10.13	8.3'	20°21.28	12.3' 59.0'
8		296°30.36	48.62	212°37.46	8.3'	20°33.55	12.2' 59.0'
9		311°30.32	· · 47.86	227°4.71	8.2'	20°45.70	12.0' 59.0'
10		326°30.27	47.09	241°31.89	8.1'	20°57.73	11.9' 58.9'
11		341°30.22	46.33	255°58.98	8.0'	21°9.63	11.8' 58.9'
12		356°30.18	S15°45.56	270°26.00	7.9'	N21°21.40	11.6' 58.9'
13		11°30.13	44.80	284°52.94	7.9'	21°33.04	11.5' 58.9'
14		26°30.08	44.03	299°19.81	7.8'	21°44.55	11.4' 58.9'
15		41°30.04	· · 43.26	313°46.59	7.7'	21°55.93	11.2' 58.9'
16		56°29.99	42.50	328°13.30	7.6'	22°7.17	11.1' 58.9'
17		71°29.95	41.73	342°39.93	7.6'	22°18.28	11.0' 58.8'
18		86°29.91	S15°40.96	357°6.49	7.5'	N22°29.25	10.8' 58.8'
19		101°29.86	40.19	11°32.96	7.4'	22°40.08	10.7' 58.8'
20		116°29.82	39.43	25°59.36	7.3'	22°50.77	10.6' 58.8'
21		131°29.78	· · 38.66	40°25.69	7.2'	23°1.32	10.4' 58.8'
22		146°29.73	37.89	54°51.94	7.2'	23°11.73	10.3' 58.8'
23		161°29.69	37.12	69°18.11	7.1'	23°22.00	10.1' 58.7'
		SD = 16.2' $d = -0.8'$		SD = 16.1'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:58	08:24	10:02	14:27	16:06	17:32
N 70°	06:51	08:07	09:28	15:01	16:22	17:38
68°	06:46	07:54	09:03	15:26	16:35	17:44
66°	06:41	07:44	08:45	15:44	16:45	17:48
64°	06:37	07:34	08:29	15:59	16:54	17:52
62°	06:33	07:27	08:17	16:12	17:02	17:56
60°	06:30	07:20	08:06	16:23	17:09	17:59
N 58°	06:26	07:14	07:57	16:32	17:15	18:02
56°	06:23	07:08	07:49	16:40	17:21	18:05
54°	06:21	07:03	07:41	16:47	17:26	18:08
52°	06:18	06:58	07:35	16:54	17:30	18:10
50°	06:16	06:54	07:29	17:00	17:34	18:13
45°	06:10	06:45	07:16	17:12	17:43	18:18
N 40°	06:05	06:37	07:05	17:23	17:51	18:24
35°	06:00	06:30	06:56	17:32	17:58	18:28
30°	05:55	06:23	06:48	17:40	18:05	18:33
20°	05:45	06:11	06:34	17:54	18:17	18:43
N 10°	05:35	06:00	06:22	18:06	18:28	18:53
0°	05:24	05:49	06:10	18:17	18:39	19:04
S 10°	05:11	05:37	05:59	18:29	18:51	19:17
20°	04:55	05:23	05:46	18:42	19:05	19:32
30°	04:35	05:06	05:31	18:56	19:22	19:52
35°	04:22	04:55	05:23	19:04	19:32	20:05
40°	04:07	04:43	05:13	19:14	19:44	20:20
45°	03:48	04:29	05:01	19:26	19:58	20:39
S 50°	03:22	04:10	04:47	19:39	20:17	21:04
52°	03:09	04:01	04:41	19:46	20:25	21:17
54°	02:53	03:51	04:33	19:53	20:35	21:32
56°	02:35	03:39	04:25	20:01	20:47	21:50
58°	02:11	03:26	04:16	20:10	21:00	22:13
S 60°	01:36	03:10	04:05	20:21	21:16	22:46

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	08:17	07:19	□	· ·	01:56	□
N 70°	08:30	07:50	05:55	· ·	01:28	05:13
68°	08:40	08:12	07:23	· ·	01:07	03:46
66°	08:49	08:30	08:03	· ·	00:51	03:08
64°	08:57	08:45	08:30	· ·	00:38	02:41
62°	09:03	08:58	08:52	· ·	00:27	02:21
60°	09:09	09:08	09:09	· ·	00:17	02:05
N 58°	09:14	09:18	09:24	· ·	00:09	01:51
56°	09:18	09:26	09:37	· ·	00:02	01:39
54°	09:22	09:33	09:48	23:56	· ·	01:29
52°	09:26	09:40	09:58	23:50	· ·	01:20
50°	09:29	09:46	10:06	23:45	· ·	01:11
45°	09:36	09:59	10:25	23:34	· ·	00:54
N 40°	09:43	10:09	10:41	23:25	· ·	00:40
35°	09:48	10:19	10:54	23:17	· ·	00:28
30°	09:53	10:27	11:05	23:10	· ·	00:18
20°	10:01	10:41	11:25	22:59	· ·	00:00
N 10°	10:08	10:54	11:43	22:48	23:45	· ·
0°	10:15	11:06	11:59	22:39	23:31	· ·
S 10°	10:22	11:18	12:15	22:29	23:16	· ·
20°	10:30	11:30	12:33	22:19	23:01	23:47
30°	10:38	11:45	12:54	22:08	22:44	23:25
35°	10:44	11:54	13:06	22:01	22:34	23:12
40°	10:49	12:04	13:20	21:54	22:23	22:57
45°	10:56	12:16	13:36	21:45	22:09	22:39
S 50°	11:04	12:30	13:57	21:35	21:53	22:17
52°	11:08	12:37	14:07	21:30	21:46	22:06
54°	11:12	12:44	14:18	21:25	21:37	21:55
56°	11:17	12:53	14:31	21:19	21:28	21:41
58°	11:22	13:02	14:46	21:13	21:18	21:25
S 60°	11:28	13:13	15:04	21:06	21:05	21:07

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		5-7
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		25-46%
03	13:46	13:49	12:14	16:27	04:02		
04	13:52	13:54	12:14	17:18	04:52		
05	13:57	13:59	12:14	18:12	05:45		

February 06, 07, 08 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars			
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	136°22.99	136°21.00	N02°57.70	25°1.09	N26°12.04	66°34.89	N21°39.69	146°41.23	S06°31.25			Alpheratz	357°34.96 29°13.78	
1	151°25.46	151°22.00		58.76	40°4.21	12.07	81°37.34	39.70	161°43.44	31.13		Ankaa	353°7.32 -42°10.40	
2	166°27.92	166°23.00	02°59.83	55°7.33	12.11		96°39.79	39.71	176°45.64	31.02		Schedar	349°31.33 56°40.68	
3	181°30.38	181°24.00	03°0.90	70°10.44	•• 12.14	111°42.24	•• 39.72	191°47.85	•• 30.91			Diphda	348°47.40 -17°51.10	
4	196°32.85	196°25.00		1.97	85°13.56	12.18	126°44.69	39.74	206°50.06	30.80		Achernar	335°20.31 -57°6.84	
5	211°35.31	211°26.00		3.03	100°16.67	12.21	141°47.14	39.75	221°52.26	30.69		Hamal	327°51.20 23°34.92	
6	226°37.78	226°27.01	N03°4.10	115°19.78	N26°12.24	156°49.59	N21°39.76	236°54.47	S06°30.58			Polaris	313°59.76 89°22.53	
7	241°40.24	241°28.01		5.16	130°22.89	12.28	171°52.04	39.77	251°56.67	30.46		Acamar	315°11.70 -40°12.49	
8	256°42.71	256°29.02		6.23	145°26.00	12.31	186°54.48	39.78	266°58.88	30.35		Menkar	314°6.06 4°11.24	
9	271°45.17	271°30.03	•• 7.29	160°29.11	•• 12.34	201°56.93	•• 39.79	282°1.08	•• 30.24			Mirfak	308°28.10 49°57.21	
10	286°47.63	286°31.05		8.36	175°32.21	12.37	216°59.38	39.80	297°3.29	30.13		Aldebaran	290°39.39 16°33.59	
11	301°50.10	301°32.06		9.42	190°35.32	12.41	232°1.83	39.81	312°5.49	30.02		Rigel	281°3.61 -8°10.46	
12	316°52.56	316°33.08	N03°10.48	205°38.42	N26°12.44	247°4.27	N21°39.82	327°7.70	S06°29.90			Capella	280°21.51 46°1.52	
13	331°55.03	331°34.10		11.54	220°41.52	12.47	262°6.72	39.84	342°9.90	29.79		Bellatrix	278°22.60 6°22.30	
14	346°57.49	346°35.12		12.61	235°44.62	12.50	277°9.16	39.85	357°12.11	29.68		Elnath	278°1.55 28°37.76	
15	1°59.95	1°36.14	•• 13.67	250°47.72	•• 12.53	292°11.61	•• 39.86	12°14.31	•• 29.57			Alnilam	275°37.44 -1°11.23	
16	17°2.42	16°37.16		14.73	265°50.82	12.56	307°14.06	39.87	27°16.52	29.46		Betelgeuse	270°51.77 7°24.66	
17	32°4.88	31°38.19		15.79	280°53.92	12.59	322°16.50	39.88	42°18.72	29.34		Canopus	263°51.95 -52°42.69	
18	47°7.35	46°39.22	N03°16.84	295°57.01	N26°12.62	337°18.94	N21°39.89	57°20.92	S06°29.23			Sirius	258°25.89 -16°45.15	
19	62°9.81	61°40.25		17.90	311°0.10	12.65	352°21.39	39.90	72°23.13	29.12		Adhara	255°5.49 -29°0.49	
20	77°12.28	76°41.28		18.96	326°3.19	12.68	7°23.83	39.92	87°25.33	29.01		Procyon	244°50.45 5°9.57	
21	92°14.74	91°42.31	•• 20.02	341°6.28	•• 12.70	22°26.27	•• 39.93	102°27.54	•• 28.89			Pollux	243°16.86 27°57.90	
22	107°17.20	106°43.35		21.07	356°9.37	12.73	37°28.72	39.94	117°29.74	28.78		Avior	234°14.10 -59°35.43	
23	122°19.67	121°44.39		22.13	11°12.46	12.76	52°31.16	39.95	132°31.95	28.67		Suhail	222°45.82 -43°32.06	
Mer.pass. 14:52		ν1.0' d1.1' m-4.79		ν3.1' d0.0' m-0.93		ν2.5' d0.0' m-2.48		ν2.2' d-0.1' m1.11					Miaplacidus	221°37.37 -69°49.18
													Alphard	217°47.35 -8°46.12
													Regulus	207°34.03 11°50.56
													Dubhe	193°40.28 61°36.74
													Denebola	182°24.61 14°25.74
													Gienah	175°43.29 -17°40.91
													Acrux	172°59.61 -63°14.12
													Gacrux	171°51.23 -57°15.07
													Alioth	166°12.56 55°49.10
													Spica	158°22.09 -11°17.60
													Alkaid	152°51.76 49°10.94
													Hadar	148°35.76 -60°29.42
													Menkent	147°57.44 -36°29.51
													Arcturus	145°47.76 19°2.87
													Rigil Kent.	139°40.13 -60°56.12
													Kochab	137°19.68 74°2.72
													Zuben'ubi	136°55.92 -16°8.79
													Alphecca	126°3.72 26°37.53
													Antares	112°15.88 -26°29.23
													Atria	107°10.32 -69°4.11
													Sabik	102°2.87 -15°45.40
													Shaula	96°10.51 -37°7.25
													Rasalhague	95°58.68 12°32.31
													Eltanin	90°42.51 51°28.81
													Kaus Aust.	83°32.71 -34°22.33
													Vega	80°33.51 38°48.15
													Nunki	75°47.97 -26°15.96
													Altair	62°0.20 8°55.93
													Peacock	53°6.17 -56°39.27
													Deneb	49°26.23 45°22.06
													Enif	33°39.05 9°59.30
													Al Na'ir	27°33.25 -46°50.50
													Fomalhaut	15°14.75 -29°29.52
													Scheat	13°45.46 28°13.13
													Markab	13°30.12 15°20.37
													Feb 06 Thu	
													Venus	359°58.01 14:54
													Mars	248°38.10 22:15
													Jupiter	290°11.90 19:30
													Saturn	10°18.24 14:11
													Feb 07 Fri	
													Venus	359°23.29 14:52
													Mars	248°53.41 22:10
													Jupiter	290°11.47 19:27
													Saturn	10°12.02 14:08
													Feb 08 Sat	
													Venus	358°49.69 14:50
													Mars	249°7.89 22:06
													Jupiter	290°10.83 19:23
													Saturn	10°5.76 14:04
													Horizontal parallax	
													Venus:	0.3
													Mars:	0.2
Mer.pass. 14:44		ν1.1' d1.0' m-4.81		ν3.0' d0.0' m-0.87		ν2.4' d0.0' m-2.46		ν2.2' d-0.1' m1.12						

h		Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°29.65	S15°36.35	83°44.21	7.0'	N23°32.12	10.0'	58.7'	
1	191°29.61	35.57	98°10.23	6.9'	23°42.09	9.8'	58.7'	
2	206°29.57	34.80	112°36.18	6.9'	23°51.92	9.7'	58.7'	
3	221°29.53	· · 34.03	127°2.06	6.8'	24°1.60	9.5'	58.7'	
4	236°29.48	33.26	141°27.86	6.7'	24°11.13	9.4'	58.7'	
5	251°29.44	32.49	155°53.59	6.7'	24°20.51	9.2'	58.7'	
6	266°29.40	S15°31.71	170°19.25	6.6'	N24°29.73	9.1'	58.6'	
7	281°29.37	30.94	184°44.84	6.5'	24°38.80	8.9'	58.6'	
8	296°29.33	30.16	199°10.36	6.4'	24°47.72	8.8'	58.6'	
9	311°29.29	· · 29.39	213°35.80	6.4'	24°56.48	8.6'	58.6'	
10	326°29.25	28.61	228°1.19	6.3'	25°5.08	8.4'	58.6'	
11	341°29.21	27.84	242°26.50	6.2'	25°13.53	8.3'	58.6'	
12	356°29.17	S15°27.06	256°51.75	6.2'	N25°21.82	8.1'	58.5'	
13	11°29.14	26.29	271°16.93	6.1'	25°29.94	8.0'	58.5'	
14	26°29.10	25.51	285°42.04	6.1'	25°37.90	7.8'	58.5'	
15	41°29.06	· · 24.73	300°7.10	6.0'	25°45.71	7.6'	58.5'	
16	56°29.03	23.95	314°32.09	5.9'	25°53.34	7.5'	58.5'	
17	71°28.99	23.18	328°57.02	5.9'	26°0.82	7.3'	58.5'	
18	86°28.96	S15°22.40	343°21.89	5.8'	N26°8.12	7.1'	58.4'	
19	101°28.92	21.62	357°46.71	5.8'	26°15.26	7.0'	58.4'	
20	116°28.89	20.84	12°11.46	5.7'	26°22.24	6.8'	58.4'	
21	131°28.85	· · 20.06	26°36.16	5.6'	26°29.04	6.6'	58.4'	
22	146°28.82	19.28	41°0.81	5.6'	26°35.68	6.5'	58.4'	
23	161°28.78	18.50	55°25.41	5.5'	26°42.14	6.3'	58.4'	
SD = 16.2' $d = -0.8'$			SD = 16.0'					
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°28.75	S15°17.71	69°49.95	5.5'	N26°48.44	6.1'	58.3'	
1	191°28.72	16.93	84°14.44	5.4'	26°54.56	5.9'	58.3'	
2	206°28.68	16.15	98°38.89	5.4'	27°0.51	5.8'	58.3'	
3	221°28.65	· · 15.37	113°3.29	5.4'	27°6.28	5.6'	58.3'	
4	236°28.62	14.58	127°27.64	5.3'	27°11.88	5.4'	58.3'	
5	251°28.59	13.80	141°51.95	5.3'	27°17.31	5.3'	58.3'	
6	266°28.56	S15°13.02	156°16.22	5.2'	N27°22.56	5.1'	58.2'	
7	281°28.53	12.23	170°40.46	5.2'	27°27.64	4.9'	58.2'	
8	296°28.49	11.45	185°4.65	5.2'	27°32.53	4.7'	58.2'	
9	311°28.46	· · 10.66	199°28.81	5.1'	27°37.25	4.5'	58.2'	
10	326°28.43	9.88	213°52.93	5.1'	27°41.80	4.4'	58.2'	
11	341°28.41	9.09	228°17.02	5.1'	27°46.16	4.2'	58.2'	
12	356°28.38	S15°8.30	242°41.09	5.0'	N27°50.34	4.0'	58.1'	
13	11°28.35	7.52	257°5.12	5.0'	27°54.35	3.8'	58.1'	
14	26°28.32	6.73	271°29.13	5.0'	27°58.17	3.6'	58.1'	
15	41°28.29	· · 5.94	285°53.11	5.0'	28°1.82	3.5'	58.1'	
16	56°28.26	5.15	300°17.08	4.9'	28°5.28	3.3'	58.1'	
17	71°28.24	4.36	314°41.02	4.9'	28°8.56	3.1'	58.1'	
18	86°28.21	S15°3.57	329°4.94	4.9'	N28°11.66	2.9'	58.0'	
19	101°28.18	2.78	343°28.85	4.9'	28°14.58	2.7'	58.0'	
20	116°28.16	1.99	357°52.75	4.9'	28°17.32	2.6'	58.0'	
21	131°28.13	· · 1.20	12°16.63	4.9'	28°19.87	2.4'	58.0'	
22	146°28.10	15°0.41	26°40.51	4.9'	28°22.25	2.2'	58.0'	
23	161°28.08	14°59.62	41°4.38	4.9'	28°24.44	2.0'	58.0'	
SD = 16.2' $d = -0.8'$			SD = 15.9'					
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°28.05	S14°58.83	55°28.24	4.9'	N28°26.44	1.8'	57.9'	
1	191°28.03	58.03	69°52.11	4.9'	28°28.27	1.6'	57.9'	
2	206°28.00	57.24	84°15.97	4.9'	28°29.91	1.5'	57.9'	
3	221°27.98	· · 56.45	98°39.83	4.9'	28°31.37	1.3'	57.9'	
4	236°27.96	55.65	113°3.70	4.9'	28°32.65	1.1'	57.9'	
5	251°27.93	54.86	127°27.58	4.9'	28°33.74	0.9'	57.8'	
6	266°27.91	S14°54.06	141°51.46	4.9'	N28°34.65	0.7'	57.8'	
7	281°27.89	53.27	156°15.35	4.9'	28°35.38	0.5'	57.8'	
8	296°27.87	52.47	170°39.26	4.9'	28°35.93	0.4'	57.8'	
9	311°27.84	· · 51.68	185°3.19	4.9'	28°36.29	0.2'	57.8'	
10	326°27.82	50.88	199°27.13	5.0'	28°36.47	0.0'	57.8'	
11	341°27.80	50.09	213°51.09	5.0'	28°36.47	-0.2'	57.7'	
12	356°27.78	S14°49.29	228°15.08	5.0'	N28°36.29	-0.4'	57.7'	
13	11°27.76	48.49	242°39.09	5.0'	28°35.93	-0.5'	57.7'	
14	26°27.74	47.69	257°3.12	5.1'	28°35.39	-0.7'	57.7'	
15	41°27.72	· · 46.89	271°27.19	5.1'	28°34.67	-0.9'	57.7'	
16	56°27.70	46.09	285°51.29	5.1'	28°33.76	-1.1'	57.6'	
17	71°27.68	45.30	300°15.42	5.2'	28°32.68	-1.3'	57.6'	
18	86°27.66	S14°44.50	314°39.58	5.2'	N28°31.42	-1.4'	57.6'	
19	101°27.65	43.69	329°3.79	5.2'	28°29.98	-1.6'	57.6'	
20	116°27.63	42.89	343°28.03	5.3'	28°28.37	-1.8'	57.6'	
21	131°27.61	· · 42.09	357°52.32	5.3'	28°26.57	-2.0'	57.5'	
22	146°27.59	41.29	12°16.65	5.4'	28°24.60	-2.1'	57.5'	
23	161°27.58	40.49	26°41.03	5.4'	28°22.46	-2.3'	57.5'	
SD = 16.2' $d = -0.8'$			SD = 15.8'					

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:46	08:10	09:41	14:48	16:20	17:44
N 70°	06:41	07:56	09:12	15:17	16:34	17:49
68°	06:37	07:44	08:51	15:39	16:45	17:53
66°	06:33	07:35	08:34	15:56	16:55	17:57
64°	06:29	07:26	08:20	16:09	17:03	18:00
62°	06:26	07:19	08:08	16:21	17:10	18:03
60°	06:23	07:13	07:59	16:31	17:16	18:06
N 58°	06:21	07:07	07:50	16:39	17:22	18:09
56°	06:18	07:02	07:42	16:47	17:27	18:11
54°	06:16	06:58	07:36	16:53	17:31	18:13
52°	06:14	06:54	07:30	16:59	17:35	18:15
50°	06:12	06:50	07:24	17:05	17:39	18:17
45°	06:07	06:41	07:12	17:17	17:47	18:22
N 40°	06:02	06:34	07:02	17:26	17:55	18:27
35°	05:57	06:27	06:54	17:35	18:01	18:31
30°	05:53	06:21	06:46	17:42	18:07	18:36
20°	05:44	06:10	06:33	17:55	18:18	18:44
N 10°	05:35	06:00	06:22	18:07	18:28	18:54
0°	05:24	05:49	06:11	18:18	18:39	19:04
S 10°	05:12	05:38	06:00	18:28	18:50	19:16
20°	04:57	05:25	05:48	18:40	19:03	19:30
30°	04:38	05:09	05:34	18:54	19:19	19:49
35°	04:26	04:59	05:26	19:02	19:29	20:01
40°	04:11	04:47	05:17	19:11	19:40	20:16
45°	03:53	04:33	05:06	19:22	19:54	20:34
S 50°	03:29	04:16	04:53	19:34	20:11	20:58
52°	03:17	04:08	04:47	19:41	20:19	21:10
54°	03:02	03:58	04:40	19:47	20:29	21:23
56°	02:45	03:47	04:32	19:55	20:39	21:40
58°	02:24	03:35	04:23	20:03	20:51	22:01
S 60°	01:55	03:20	04:14	20:13	21:06	22:28

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	08:02	☐	☐	05:05	☐	☐
62°	08:44	08:30	☐	04:24	06:41	☐
60°	09:13	09:25	10:02	03:56	05:46	07:15
N 58°	09:35	09:58	10:43	03:35	05:14	06:34
56°	09:54	10:22	11:11	03:17	04:50	06:06
54°	10:09	10:42	11:33	03:02	04:30	05:45
52°	10:22	10:59	11:51	02:49	04:14	05:27
50°	10:34	11:13	12:06	02:38	04:00	05:11
45°	10:59	11:42	12:37	02:14	03:31	04:40
N 40°	11:19	12:05	13:01	01:56	03:09	04:16
35°	11:35	12:24	13:21	01:40	02:51	03:56
30°	11:49	12:40	13:38	01:26	02:35	03:39
20°	12:14	13:08	14:07	01:04	02:08	03:11
N 10°	12:35	13:32	14:32	00:44	01:45	02:46
0°	12:55	13:54	14:55	00:25	01:23	02:23
S 10°	13:15	14:17	15:18	00:07	01:02	02:00
20°	13:37	14:41	15:42	· · ·	00:39	01:36
30°	14:02	15:09	16:11	· · ·	00:12	01:07
35°	14:17	15:26	16:28	23:57	· · ·	00:50
40°	14:35	15:46	16:48	23:39	· · ·	00:30
45°	14:56	16:09	17:12	23:17	· · ·	00:06
S 50°	15:22	16:40	17:43	22:49	23:35	· · ·
52°	15:35	16:55	17:59	22:36	23:20	· · ·
54°	15:50	17:13	18:17	22:21	23:02	· · ·
56°	16:08	17:35	18:39	22:03	22:40	23:41
58°	16:30	18:02	19:08	21:41	22:12	23:12
S 60°	16:57	18:42	19:49	21:13	21:32	22:31

Day	Sun			Moon		
	Eqn.of	Time	Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	8-10
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-78%
06	14:01	14:03	12:14	19:09	06:40	
07	14:05	14:06	12:14	20:09	07:39	
08	14:08	14:09	12:14	21:09	08:39	

Aries			Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	139°20.41	137°37.66	N04°13.10	28°41.93	N26°13.73	69°30.38	N21°40.58	149°19.88	S06°23.14	
1	154°22.88	152°38.79	14.12	43°44.94	13.74	84°32.80	40.60	164°22.08	23.03	
2	169°25.34	167°39.93	15.15	58°47.96	13.75	99°35.23	40.61	179°24.28	22.91	
3	184°27.81	182°41.07	•• 16.17	73°50.97	•• 13.76	114°37.65	•• 40.63	194°26.48	•• 22.80	
4	199°30.27	197°42.22	17.19	88°53.98	13.77	129°40.07	40.64	209°28.69	22.69	
5	214°32.73	212°43.37	18.21	103°56.98	13.78	144°42.49	40.65	224°30.89	22.57	
6	229°35.20	227°44.51	N04°19.23	118°59.99	N26°13.79	159°44.91	N21°40.67	239°33.09	S06°22.46	
7	244°37.66	242°45.66	20.25	134°2.99	13.80	174°47.34	40.68	254°35.29	22.35	
8	259°40.13	257°46.82	21.27	149°6.00	13.81	189°49.76	40.70	269°37.49	22.23	
9	274°42.59	272°47.97	•• 22.29	164°9.00	•• 13.82	204°52.18	•• 40.71	284°39.69	•• 22.12	
10	289°45.06	287°49.13	23.31	179°12.00	13.83	219°54.60	40.73	299°41.89	22.01	
11	304°47.52	302°50.29	24.32	194°15.00	13.84	234°57.02	40.74	314°44.09	21.89	
12	319°49.98	317°51.45	N04°25.34	209°17.99	N26°13.85	249°59.44	N21°40.76	329°46.29	S06°21.78	
13	334°52.45	332°52.61	26.35	224°20.99	13.86	265°1.86	40.77	344°48.49	21.66	
14	349°54.91	347°53.78	27.37	239°23.98	13.86	280°4.28	40.78	359°50.69	21.55	
15	4°57.38	2°54.94	•• 28.38	254°26.98	•• 13.87	295°6.69	•• 40.80	14°52.89	•• 21.44	
16	19°59.84	17°56.11	29.40	269°29.97	13.88	310°9.11	40.81	29°55.09	21.32	
17	35°2.31	32°57.28	30.41	284°32.96	13.89	325°11.53	40.83	44°57.29	21.21	
18	50°4.77	47°58.46	N04°31.42	299°35.95	N26°13.89	340°13.95	N21°40.84	59°59.50	S06°21.10	
19	65°7.23	62°59.63	32.43	314°38.93	13.90	355°16.36	40.86	75°1.70	20.98	
20	80°9.70	78°0.81	33.44	329°41.92	13.91	10°18.78	40.87	90°3.90	20.87	
21	95°12.16	93°1.99	•• 34.45	344°44.90	•• 13.91	25°21.20	•• 40.89	105°6.10	•• 20.75	
22	110°14.63	108°3.17	35.46	359°47.88	13.92	40°23.61	40.90	120°8.30	20.64	
23	125°17.09	123°4.36	36.47	14°50.86	13.92	55°26.03	40.92	135°10.50	20.53	
Mer.pass. 14:40		ν1.1' d1.0' m-4.82		ν3.0' d0.0' m-0.84		ν2.4' d0.0' m-2.46		ν2.2' d-0.1' m1.12		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	140°19.55	138°5.54	N04°37.48	29°53.84	N26°13.93	70°28.44	N21°40.93	150°12.70	S06°20.41	
1	155°22.02	153°6.73	38.48	44°56.82	13.93	85°30.86	40.95	165°14.90	20.30	
2	170°24.48	168°7.92	39.49	59°59.80	13.94	100°33.27	40.96	180°17.10	20.19	
3	185°26.95	183°9.12	•• 40.50	75°2.77	•• 13.94	115°35.69	•• 40.98	195°19.30	•• 20.07	
4	200°29.41	198°10.31	41.50	90°5.74	13.94	130°38.10	41.00	210°21.50	19.96	
5	215°31.88	213°11.51	42.50	105°8.72	13.95	145°40.51	41.01	225°23.69	19.84	
6	230°34.34	228°12.71	N04°43.51	120°11.69	N26°13.95	160°42.93	N21°41.03	240°25.89	S06°19.73	

Feb 09 Sun	SHA	Mer.pass
Venus	358° 17.24	14:48
Mars	249° 21.52	22:01
Jupiter	290° 9.96	19:19
Saturn	9° 59.47	14:01

Feb 10 Mon	SHA	Mer.pass
Venus	357° 45.99	14:46
Mars	249° 34.29	21:56
Jupiter	290° 8.89	19:15
Saturn	9° 53.14	13:57

Feb 11 Tue	SHA	Mer.pass
Venus	357° 15.98	14:44
Mars	249° 46.20	21:51
Jupiter	290° 7.60	19:11
Saturn	9° 46.78	13:54


h	Sun			Moon				
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	176°27.56	S14°39.69		41°5.46	5.5'	N28°20.14	-2.5'	57.5'
1	191°27.54	38.88		55°29.93	5.5'	28°17.64	-2.7'	57.5'
2	206°27.53	38.08		69°54.46	5.6'	28°14.97	-2.8'	57.5'
3	221°27.51	· · 37.28		84°19.05	5.6'	28°12.13	-3.0'	57.4'
4	236°27.50	36.47		98°43.69	5.7'	28°9.12	-3.2'	57.4'
5	251°27.48	35.67		113°8.39	5.8'	28°5.93	-3.4'	57.4'
6	266°27.47	S14°34.86		127°33.15	5.8'	N28°2.58	-3.5'	57.4'
7	281°27.45	34.06		141°57.97	5.9'	27°59.05	-3.7'	57.4'
8	296°27.44	33.25		156°22.85	6.0'	27°55.36	-3.9'	57.3'
9	311°27.42	· · 32.45		170°47.81	6.0'	27°51.50	-4.0'	57.3'
10	326°27.41	31.64		185°12.82	6.1'	27°47.47	-4.2'	57.3'
11	341°27.40	30.83		199°37.91	6.2'	27°43.27	-4.4'	57.3'
12	356°27.39	S14°30.03		214°3.07	6.2'	N27°38.92	-4.5'	57.3'
13	11°27.37	29.22		228°28.31	6.3'	27°34.39	-4.7'	57.2'
14	26°27.36	28.41		242°53.61	6.4'	27°29.71	-4.8'	57.2'
15	41°27.35	· · 27.60		257°18.99	6.5'	27°24.86	-5.0'	57.2'
16	56°27.34	26.79		271°44.45	6.5'	27°19.85	-5.2'	57.2'
17	71°27.33	25.98		286°9.99	6.6'	27°14.69	-5.3'	57.2'
18	86°27.32	S14°25.17		300°35.61	6.7'	N27°9.36	-5.5'	57.1'
19	101°27.31	24.36		315°1.31	6.8'	27°3.88	-5.6'	57.1'
20	116°27.30	23.55		329°27.10	6.9'	26°58.25	-5.8'	57.1'
21	131°27.29	· · 22.74		343°52.96	7.0'	26°52.45	-5.9'	57.1'
22	146°27.28	21.93		358°18.92	7.0'	26°46.51	-6.1'	57.1'
23	161°27.27	21.12		12°44.96	7.1'	26°40.41	-6.2'	57.0'
SD = 16.2' $d = -0.8'$			SD = 15.7'					

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	176°27.26	S14°20.30		27°11.09	7.2'	N26°34.16	-6.4'	57.0'
1	191°27.25	19.49		41°37.31	7.3'	26°27.77	-6.5'	57.0'
2	206°27.25	18.68		56°3.61	7.4'	26°21.22	-6.7'	57.0'
3	221°27.24	· · 17.86		70°30.01	7.5'	26°14.53	-6.8'	57.0'
4	236°27.23	17.05		84°56.51	7.6'	26°7.69	-7.0'	57.0'
5	251°27.23	16.24		99°23.09	7.7'	26°0.71	-7.1'	56.9'
6	266°27.22	S14°15.42		113°49.77	7.8'	N25°53.58	-7.3'	56.9'
7	281°27.21	14.61		128°16.55	7.9'	25°46.31	-7.4'	56.9'
8	296°27.21	13.79		142°43.42	8.0'	25°38.91	-7.5'	56.9'
9	311°27.20	· · 12.97		157°10.39	8.1'	25°31.36	-7.7'	56.9'
10	326°27.20	12.16		171°37.45	8.2'	25°23.67	-7.8'	56.8'
11	341°27.19	11.34		186°4.62	8.3'	25°15.85	-8.0'	56.8'
12	356°27.19	S14°10.52		200°31.88	8.4'	N25°7.90	-8.1'	56.8'
13	11°27.18	9.71		214°59.24	8.5'	24°59.81	-8.2'	56.8'
14	26°27.18	8.89		229°26.71	8.6'	24°51.59	-8.4'	56.8'
15	41°27.18	· · 8.07		243°54.27	8.7'	24°43.24	-8.5'	56.7'
16	56°27.17	7.25		258°21.94	8.8'	24°34.76	-8.6'	56.7'
17	71°27.17	6.43		272°49.70	8.9'	24°26.15	-8.7'	56.7'
18	86°27.17	S14°5.61		287°17.57	9.0'	N24°17.42	-8.9'	56.7'
19	101°27.17	4.79		301°45.54	9.1'	24°8.56	-9.0'	56.7'
20	116°27.17	3.97		316°13.62	9.2'	23°59.58	-9.1'	56.6'
21	131°27.16	· · 3.15		330°41.80	9.3'	23°50.48	-9.2'	56.6'
22	146°27.16	2.33		345°10.08	9.4'	23°41.26	-9.3'	56.6'
23	161°27.16	1.51		359°38.46	9.5'	23°31.91	-9.5'	56.6'
SD = 16.2'			$d = -0.8'$	SD = 15.6'				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	176°27.16	S14°0.68		14°6.95	9.6'	N23°22.45	-9.6'	56.5'
1	191°27.16	13°59.86		28°35.54	9.7'	23°12.88	-9.7'	56.5'
2	206°27.16	59.04		43°4.24	9.8'	23°3.19	-9.8'	56.5'
3	221°27.16	· · 58.22		57°33.04	9.9'	22°53.39	-9.9'	56.5'
4	236°27.16	57.39		72°1.94	10.0'	22°43.47	-10.0'	56.5'
5	251°27.17	56.57		86°30.95	10.1'	22°33.45	-10.1'	56.4'
6	266°27.17	S13°55.74		101°0.06	10.2'	N22°23.32	-10.2'	56.4'
7	281°27.17	54.92		115°29.28	10.3'	22°13.08	-10.3'	56.4'
8	296°27.17	54.09		129°58.60	10.4'	22°2.74	-10.4'	56.4'
9	311°27.17	· · 53.27		144°28.02	10.5'	21°52.29	-10.6'	56.4'
10	326°27.18	52.44		158°57.55	10.6'	21°41.74	-10.7'	56.3'
11	341°27.18	51.61		173°27.18	10.7'	21°31.09	-10.8'	56.3'
12	356°27.18	S13°50.79		187°56.92	10.8'	N21°20.33	-10.8'	56.3'
13	11°27.19	49.96		202°26.76	10.9'	21°9.49	-10.9'	56.3'
14	26°27.19	49.13		216°56.70	11.0'	20°58.54	-11.0'	56.3'
15	41°27.20	· · 48.30		231°26.74	11.1'	20°47.50	-11.1'	56.2'
16	56°27.20	47.48		245°56.88	11.2'	20°36.36	-11.2'	56.2'
17	71°27.21	46.65		260°27.13	11.3'	20°25.14	-11.3'	56.2'
18	86°27.21	S13°45.82		274°57.47	11.4'	N20°13.82	-11.4'	56.2'
19	101°27.22	44.99		289°27.92	11.5'	20°2.41	-11.5'	56.2'
20	116°27.23	44.16		303°58.47	11.6'	19°50.92	-11.6'	56.1'
21	131°27.23	· · 43.33		318°29.12	11.7'	19°39.33	-11.7'	56.1'
22	146°27.24	42.50		332°59.86	11.8'	19°27.67	-11.8'	56.1'
23	161°27.25	41.67		347°30.71	11.9'	19°15.92	-11.8'	56.1'
SD = 16.2'			$d = -0.8'$	SD = 15.4'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:34	07:56	09:22	15:08	16:34	17:56
N 70°	06:30	07:44	08:57	15:33	16:46	18:00
68°	06:27	07:34	08:38	15:52	16:56	18:03
66°	06:24	07:25	08:23	16:07	17:04	18:06
64°	06:21	07:18	08:10	16:19	17:12	18:08
62°	06:19	07:12	08:00	16:30	17:18	18:11
60°	06:17	07:06	07:51	16:38	17:23	18:13
N 58°	06:15	07:01	07:43	16:46	17:28	18:15
56°	06:13	06:57	07:36	16:53	17:33	18:17
54°	06:11	06:52	07:30	16:59	17:37	18:19
52°	06:09	06:49	07:24	17:05	17:40	18:20
50°	06:07	06:45	07:19	17:10	17:44	18:22
45°	06:03	06:37	07:08	17:21	17:52	18:26
N 40°	05:59	06:31	06:59	17:30	17:58	18:30
35°	05:55	06:25	06:51	17:38	18:04	18:34
30°	05:51	06:19	06:44	17:45	18:09	18:38
20°	05:43	06:09	06:32	17:57	18:20	18:46
N 10°	05:34	05:59	06:21	18:08	18:29	18:54
0°	05:25	05:49	06:11	18:18	18:39	19:04
S 10°	05:13	05:39	06:00	18:28	18:50	19:15
20°	04:59	05:26	05:49	18:39	19:02	19:29
30°	04:41	05:11	05:36	18:52	19:17	19:47
35°	04:30	05:02	05:29	18:59	19:26	19:58
40°	04:16	04:51	05:20	19:07	19:36	20:12
45°	03:59	04:38	05:10	19:17	19:49	20:29
S 50°	03:36	04:22	04:58	19:29	20:05	20:51
52°	03:25	04:14	04:52	19:35	20:13	21:02
54°	03:11	04:05	04:46	19:41	20:22	21:15
56°	02:56	03:55	04:39	19:48	20:31	21:30
58°	02:37	03:44	04:31	19:56	20:43	21:48
S 60°	02:12	03:30	04:22	20:05	20:56	22:12

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	12:38	<input type="checkbox"/>	<input type="checkbox"/>	10:33
66°	<input type="checkbox"/>	<input type="checkbox"/>	13:34	<input type="checkbox"/>	<input type="checkbox"/>	09:36
64°	<input type="checkbox"/>	11:44	14:07	<input type="checkbox"/>	09:37	09:02
62°	10:20	12:35	14:31	09:02	08:44	08:37
60°	11:24	13:07	14:50	07:58	08:12	08:17
N 58°	11:58	13:30	15:06	07:24	07:48	08:00
56°	12:23	13:49	15:19	06:58	07:29	07:46
54°	12:43	14:05	15:31	06:38	07:12	07:34
52°	13:00	14:19	15:41	06:21	06:58	07:24
50°	13:14	14:31	15:50	06:06	06:46	07:14
45°	13:43	14:55	16:09	05:37	06:20	06:54
N 40°	14:06	15:15	16:24	05:14	06:00	06:37
35°	14:25	15:31	16:37	04:54	05:43	06:23
30°	14:41	15:45	16:49	04:38	05:28	06:11
20°	15:08	16:09	17:08	04:10	05:03	05:50
N 10°	15:32	16:30	17:25	03:46	04:41	05:31
0°	15:53	16:49	17:40	03:23	04:20	05:14
S 10°	16:15	17:08	17:55	03:00	04:00	04:56
20°	16:38	17:28	18:12	02:36	03:38	04:38
30°	17:05	17:52	18:31	02:08	03:12	04:16
35°	17:21	18:05	18:42	01:51	02:56	04:03
40°	17:40	18:21	18:54	01:31	02:38	03:48
45°	18:02	18:40	19:09	01:07	02:17	03:31
S 50°	18:30	19:03	19:26	00:36	01:49	03:08
52°	18:44	19:14	19:35	00:21	01:36	02:58
54°	19:00	19:27	19:44	00:03	01:20	02:46
56°	19:19	19:41	19:54	· · ·	01:02	02:32
58°	19:42	19:58	20:06	· · ·	00:39	02:16
S 60°	20:12	20:19	20:20	· · ·	00:10	01:56

Day	Sun			Moon			
	Eqn.of Time		Mer. Pass	Mer.Pass.			Age 11-13 86-97%
	00 ^h	12 ^h		Upper	Lower		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		
09	14:10	14:10	12:14	22:07	09:38		
10	14:11	14:11	12:14	23:01	10:35		
11	14:11	14:11	12:14	23:52	11:27		

February 12, 13, 14 UT (Wed., Thu., Fri.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	142°17.83	139°5.08	N05°24.95	32°15.07	N26°13.82	72°23.93	N21°41.72	151°58.23	S06°14.92	Alpheratz	357°34.97 29°13.77
1	157°20.30	154°6.38	25.92	47°17.98	13.81	87°26.33	41.73	167°0.43	14.81	Ankaa	353°7.33 -42°10.38
2	172°22.76	169°7.68	26.89	62°20.88	13.80	102°28.73	41.75	182°2.62	14.69	Schedar	349°31.36 56°40.67
3	187°25.23	184°8.98	•• 27.86	77°23.78	•• 13.79	117°31.12	•• 41.77	197°4.82	•• 14.58	Diphda	348°47.41 -17°51.09
4	202°27.69	199°10.28	28.83	92°26.68	13.78	132°33.52	41.79	212°7.02	14.46	Achernar	335°20.35 -57°6.82
5	217°30.15	214°11.59	29.79	107°29.58	13.77	147°35.92	41.80	227°9.21	14.35	Hamal	327°51.21 23°34.92
6	232°32.62	229°12.89	N05°30.76	122°32.48	N26°13.76	162°38.31	N21°41.82	242°11.41	S06°14.23	Polaris	314°2.64 89°22.53
7	247°35.08	244°14.20	31.72	137°35.38	13.75	177°40.71	41.84	257°13.61	14.12	Acamar	315°11.73 -40°12.48
8	262°37.55	259°15.52	32.69	152°38.27	13.74	192°43.10	41.86	272°15.81	14.00	Menkar	314°6.08 4°11.24
9	277°40.01	274°16.83	•• 33.65	167°41.17	•• 13.73	207°45.49	•• 41.87	287°18.00	•• 13.89	Mirfak	308°28.13 49°57.21
10	292°42.47	289°18.15	34.61	182°44.06	13.72	222°47.89	41.89	302°20.20	13.77	Aldebaran	290°39.41 16°33.60
11	307°44.94	304°19.47	35.58	197°46.95	13.71	237°50.28	41.91	317°22.40	13.66	Rigel	281°3.62 -8°10.46
12	322°47.40	319°20.79	N05°36.54	212°49.84	N26°13.69	252°52.67	N21°41.93	332°24.59	S06°13.54	Capella	280°21.53 46°1.53
13	337°49.87	334°22.11	37.50	227°52.72	13.68	267°55.07	41.95	347°26.79	13.43	Bellatrix	278°22.61 6°22.30
14	352°52.33	349°23.44	38.45	242°55.61	13.67	282°57.46	41.96	2°28.99	13.31	Elnath	278°1.56 28°37.77
15	7°54.80	4°24.77	•• 39.41	257°58.49	•• 13.65	297°59.85	•• 41.98	17°31.18	•• 13.20	Alnilam	275°37.45 -1°11.23
16	22°57.26	19°26.10	40.37	273°1.38	13.64	313°2.24	42.00	32°33.38	13.08	Betelgeuse	270°51.78 7°24.66
17	37°59.72	34°27.43	41.33	288°4.26	13.63	328°4.63	42.02	47°35.58	12.97	Canopus	263°51.98 -52°42.71
18	53°2.19	49°28.76	N05°42.28	303°7.14	N26°13.61	343°7.02	N21°42.04	62°37.77	S06°12.85	Sirius	258°25.90 -16°45.16
19	68°4.65	64°30.10	43.24	318°10.01	13.60	358°9.41	42.05	77°39.97	12.74	Adhara	255°5.50 -29°0.51
20	83°7.12	79°31.44	44.19	333°12.89	13.59	13°11.80	42.07	92°42.16	12.62	Procyon	244°50.44 5°9.56
21	98°9.58	94°32.79	•• 45.14	348°15.77	•• 13.57	28°14.19	•• 42.09	107°44.36	•• 12.51	Pollux	243°16.85 27°57.91
22	113°12.04	109°34.13	46.10	3°18.64	13.56	43°16.58	42.11	122°46.56	12.39	Avior	234°14.11 -59°35.47
23	128°14.51	124°35.48	47.05	18°21.51	13.54	58°18.97	42.13	137°48.75	12.28	Suhail	222°45.82 -43°32.10
Mer.pass. 14:28		ν1.3' d1.0' m-4.84		ν2.9' d-0.0' m-0.76		ν2.4' d0.0' m-2.43		ν2.2' d-0.1' m1.12		Miaplacidus	221°37.38 -69°49.22
										Alphard	217°47.34 -8°46.14
										Regulus	207°34.01 11°50.55
										Dubhe	193°40.22 61°36.75
										Denebola	182°24.57 14°25.73
										Gienah	175°43.24 -17°40.94
										Acrux	172°59.54 -63°14.15
										Gacrux	171°51.17 -57°15.11
										Alioth	166°12.49 55°49.11
										Spica	158°22.04 -11°17.62
										Alkaid	152°51.69 49°10.93
										Hadar	148°35.68 -60°29.45
										Menkent	147°57.38 -36°29.54
										Arcturus	145°47.71 19°2.85
										Rigel Kent.	139°40.04 -60°56.14
										Kochab	137°19.54 74°2.71
										Zuben'ubi	136°55.86 -16°8.81
										Alphecca	126°3.66 26°37.51
										Antares	112°15.82 -26°29.24
										Atria	107°10.19 -69°4.11
										Sabik	102°2.82 -15°45.41
										Shaula	96°10.45 -37°7.25
										Rasalhague	95°58.63 12°32.29
										Eltanin	90°42.45 51°28.78
										Kaus Aust.	83°32.66 -34°22.33
										Vega	80°33.46 38°48.13
										Nunki	75°47.92 -26°15.95
										Altair	62°0.16 8°55.92
										Peacock	53°6.12 -56°39.24
										Deneb	49°26.21 45°22.03
										Enif	33°39.03 9°59.29
										Al Na'ir	27°33.23 -46°50.48
										Fomalhaut	15°14.74 -29°29.50
										Scheat	13°45.46 28°13.11
										Markab	13°30.11 15°20.36
Feb 12 Wed			SHA		Mer.pass						
Venus			356°47.25		14:42						
Mars			249°57.24		21:47						
Jupiter			290°6.10		19:07						
Saturn			9°40.39		13:50						
Feb 13 Thu			SHA		Mer.pass						
Venus			356°19.86		14:40						
Mars			250°7.41		21:42						
Jupiter			290°4.39		19:04						
Saturn			9°33.98		13:47						
Feb 14 Fri			SHA		Mer.pass						
Venus			355°53.84		14:38						
Mars			250°16.71		21:38						
Jupiter			290°2.47		19:00						
Saturn			9°27.53		13:43						
Horizontal parallax											
Venus: 0.3											
Mars: 0.2											


h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.26	S13°40.83	2°1.65	12.0'	N19°4.08	-11.9'	56.1'
1	191°27.26	40.00	16°32.69	12.1'	18°52.17	-12.0'	56.0'
2	206°27.27	39.17	31°3.83	12.2'	18°40.18	-12.1'	56.0'
3	221°27.28	· · 38.34	45°35.06	12.3'	18°28.11	-12.1'	56.0'
4	236°27.29	37.50	60°6.39	12.4'	18°15.96	-12.2'	56.0'
5	251°27.30	36.67	74°37.82	12.5'	18°3.74	-12.3'	56.0'
6	266°27.31	S13°35.84	89°9.34	12.6'	N17°51.44	-12.4'	55.9'
7	281°27.32	35.00	103°40.95	12.7'	17°39.07	-12.4'	55.9'
8	296°27.33	34.17	118°12.66	12.8'	17°26.63	-12.5'	55.9'
9	311°27.34	· · 33.33	132°44.46	12.9'	17°14.12	-12.6'	55.9'
10	326°27.35	32.50	147°16.35	13.0'	17°1.55	-12.6'	55.9'
11	341°27.36	31.66	161°48.33	13.1'	16°48.90	-12.7'	55.8'
12	356°27.37	S13°30.82	176°20.40	13.2'	N16°36.19	-12.8'	55.8'
13	11°27.38	29.99	190°52.56	13.2'	16°23.41	-12.8'	55.8'
14	26°27.40	29.15	205°24.80	13.3'	16°10.58	-12.9'	55.8'
15	41°27.41	· · 28.31	219°57.14	13.4'	15°57.68	-13.0'	55.8'
16	56°27.42	27.48	234°29.56	13.5'	15°44.72	-13.0'	55.7'
17	71°27.44	26.64	249°2.07	13.6'	15°31.70	-13.1'	55.7'
18	86°27.45	S13°25.80	263°34.66	13.7'	N15°18.62	-13.1'	55.7'
19	101°27.46	24.96	278°7.34	13.8'	15°5.48	-13.2'	55.7'
20	116°27.48	24.12	292°40.10	13.8'	14°52.29	-13.2'	55.7'
21	131°27.49	· · 23.28	307°12.94	13.9'	14°39.05	-13.3'	55.6'
22	146°27.51	22.44	321°45.87	14.0'	14°25.75	-13.3'	55.6'
23	161°27.52	21.60	336°18.87	14.1'	14°12.40	-13.4'	55.6'
SD = 16.2'		$d = -0.8'$	SD = 15.3'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.54	S13°20.76	350°51.95	14.2'	N13°59.01	-13.4'	55.6'
1	191°27.55	19.92	5°25.11	14.2'	13°45.56	-13.5'	55.6'
2	206°27.57	19.08	19°58.35	14.3'	13°32.06	-13.5'	55.5'
3	221°27.59	· · 18.24	34°31.67	14.4'	13°18.52	-13.6'	55.5'
4	236°27.60	17.39	49°5.06	14.5'	13°4.93	-13.6'	55.5'
5	251°27.62	16.55	63°38.53	14.5'	12°51.30	-13.7'	55.5'
6	266°27.64	S13°15.71	78°12.07	14.6'	N12°37.62	-13.7'	55.5'
7	281°27.65	14.86	92°45.68	14.7'	12°23.90	-13.8'	55.4'
8	296°27.67	14.02	107°19.37	14.8'	12°10.14	-13.8'	55.4'
9	311°27.69	· · 13.18	121°53.12	14.8'	11°56.35	-13.8'	55.4'
10	326°27.71	12.33	136°26.95	14.9'	11°42.51	-13.9'	55.4'
11	341°27.73	11.49	151°0.84	15.0'	11°28.63	-13.9'	55.4'
12	356°27.75	S13°10.64	165°34.80	15.0'	N11°14.72	-13.9'	55.3'
13	11°27.77	9.79	180°8.83	15.1'	11°0.78	-14.0'	55.3'
14	26°27.79	8.95	194°42.92	15.2'	10°46.79	-14.0'	55.3'
15	41°27.81	· · 8.10	209°17.08	15.2'	10°32.78	-14.0'	55.3'
16	56°27.83	7.26	223°51.30	15.3'	10°18.74	-14.1'	55.3'
17	71°27.85	6.41	238°25.58	15.3'	10°4.66	-14.1'	55.2'
18	86°27.87	S13°5.56	252°59.93	15.4'	N09°50.55	-14.1'	55.2'
19	101°27.89	4.71	267°34.33	15.5'	09°36.42	-14.2'	55.2'
20	116°27.91	3.86	282°8.80	15.5'	09°22.25	-14.2'	55.2'
21	131°27.94	· · 3.02	296°43.32	15.6'	09°8.06	-14.2'	55.2'
22	146°27.96	2.17	311°17.90	15.6'	08°53.85	-14.2'	55.2'
23	161°27.98	1.32	325°52.53	15.7'	08°39.61	-14.3'	55.1'
SD = 16.2'		$d = -0.8'$	SD = 15.2'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.00	S13°0.47	340°27.23	15.7'	N08°25.35	-14.3'	55.1'
1	191°28.03	12°59.62	355°1.97	15.8'	08°11.06	-14.3'	55.1'
2	206°28.05	58.77	9°36.77	15.8'	07°56.75	-14.3'	55.1'
3	221°28.08	· · 57.92	24°11.62	15.9'	07°42.42	-14.3'	55.1'
4	236°28.10	57.06	38°46.52	15.9'	07°28.08	-14.4'	55.0'
5	251°28.12	56.21	53°21.46	16.0'	07°13.71	-14.4'	55.0'
6	266°28.15	S12°55.36	67°56.46	16.0'	N06°59.33	-14.4'	55.0'
7	281°28.18	54.51	82°31.51	16.1'	06°44.92	-14.4'	55.0'
8	296°28.20	53.66	97°6.60	16.1'	06°30.51	-14.4'	55.0'
9	311°28.23	· · 52.80	111°41.73	16.2'	06°16.08	-14.4'	55.0'
10	326°28.25	51.95	126°16.91	16.2'	06°1.63	-14.5'	54.9'
11	341°28.28	51.10	140°52.14	16.3'	05°47.17	-14.5'	54.9'
12	356°28.31	S12°50.24	155°27.40	16.3'	N05°32.70	-14.5'	54.9'
13	11°28.33	49.39	170°2.71	16.3'	05°18.22	-14.5'	54.9'
14	26°28.36	48.53	184°38.05	16.4'	05°3.73	-14.5'	54.9'
15	41°28.39	· · 47.68	199°13.44	16.4'	04°49.23	-14.5'	54.9'
16	56°28.42	46.82	213°48.86	16.5'	04°34.72	-14.5'	54.8'
17	71°28.45	45.97	228°24.32	16.5'	04°20.21	-14.5'	54.8'
18	86°28.47	S12°45.11	242°59.81	16.5'	N04°5.68	-14.5'	54.8'
19	101°28.50	44.25	257°35.34	16.6'	03°51.16	-14.5'	54.8'
20	116°28.53	43.40	272°10.90	16.6'	03°36.62	-14.5'	54.8'
21	131°28.56	· · 42.54	286°46.49	16.6'	03°22.09	-14.5'	54.8'
22	146°28.59	41.68	301°22.12	16.7'	03°7.55	-14.5'	54.7'
23	161°28.62	40.82	315°57.77	16.7'	02°53.00	-14.5'	54.7'
SD = 16.2'		$d = -0.9'$	SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:22	07:43	09:04	15:26	16:47	18:08
N 70°	06:19	07:32	08:42	15:48	16:58	18:11
68°	06:17	07:23	08:25	16:04	17:07	18:13
66°	06:15	07:16	08:12	16:18	17:14	18:15
64°	06:13	07:09	08:01	16:29	17:20	18:16
62°	06:11	07:04	07:51	16:38	17:26	18:18
60°	06:10	06:59	07:43	16:46	17:31	18:20
N 58°	06:08	06:54	07:36	16:54	17:35	18:21
56°	06:07	06:50	07:29	17:00	17:39	18:23
54°	06:05	06:47	07:24	17:05	17:42	18:24
52°	06:04	06:43	07:18	17:11	17:46	18:25
50°	06:02	06:40	07:14	17:15	17:49	18:27
45°	05:59	06:33	07:04	17:25	17:56	18:30
N 40°	05:56	06:27	06:55	17:34	18:02	18:33
35°	05:52	06:22	06:48	17:41	18:07	18:37
30°	05:49	06:17	06:41	17:47	18:12	18:40
20°	05:42	06:08	06:30	17:58	18:21	18:47
N 10°	05:34	05:59	06:20	18:08	18:30	18:55
0°	05:25	05:50	06:11	18:18	18:39	19:03
S 10°	05:14	05:40	06:01	18:27	18:49	19:14
20°	05:01	05:28	05:51	18:37	19:00	19:27
30°	04:44	05:14	05:39	18:49	19:14	19:44
35°	04:33	05:05	05:32	18:56	19:22	19:54
40°	04:20	04:55	05:24	19:04	19:32	20:07
45°	04:04	04:43	05:15	19:13	19:44	20:23
S 50°	03:43	04:28	05:03	19:24	19:59	20:44
52°	03:32	04:20	04:58	19:29	20:07	20:54
54°	03:20	04:12	04:52	19:35	20:15	21:06
56°	03:06	04:03	04:46	19:41	20:24	21:20
58°	02:49	03:52	04:38	19:48	20:34	21:37
S 60°	02:27	03:40	04:30	19:56	20:46	21:58

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	14:10	16:55	19:03	10:44	09:32	08:51
N 70°	14:55	17:12	19:09	09:58	09:13	08:43
68°	15:24	17:25	19:13	09:27	08:57	08:36
66°	15:45	17:36	19:17	09:04	08:45	08:30
64°	16:02	17:45	19:20	08:46	08:34	08:25
62°	16:16	17:52	19:23	08:31	08:25	08:20
60°	16:28	17:59	19:25	08:18	08:18	08:16
N 58°	16:38	18:05	19:27	08:07	08:11	08:13
56°	16:47	18:10	19:29	07:57	08:05	08:10
54°	16:54	18:14	19:31	07:49	07:59	08:07
52°	17:01	18:18	19:32	07:41	07:54	08:05
50°	17:08	18:22	19:33	07:34	07:49	08:02
45°	17:21	18:30	19:36	07:19	07:40	07:57
N 40°	17:32	18:37	19:39	07:07	07:31	07:53
35°	17:41	18:42	19:41	06:56	07:24	07:49
30°	17:49	18:47	19:43	06:47	07:18	07:46
20°	18:03	18:56	19:46	06:31	07:07	07:40
N 10°	18:16	19:03	19:49	06:16	06:57	07:35
0°	18:27	19:10	19:51	06:03	06:48	07:30
S 10°	18:38	19:17	19:54	05:50	06:39	07:25
20°	18:50	19:25	19:57	05:35	06:29	07:20
30°	19:04	19:33	20:00	05:18	06:18	07:14
35°	19:12	19:38	20:02	05:08	06:11	07:11
40°	19:21	19:44	20:04	04:57	06:03	07:07
45°	19:31	19:50	20:06	04:44	05:55	07:02
S 50°	19:44	19:57	20:09	04:28	05:44	06:57
52°	19:49	20:01	20:10	04:20	05:39	06:54
54°	19:56	20:05	20:12	04:11	05:33	06:51
56°	20:03	20:09	20:13	04:02	05:27	06:48
58°	20:11	20:13	20:15	03:50	05:20	06:45
S 60°	20:20	20:19	20:17	03:38	05:12	06:41

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	14-16
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-98%
12	14:11	14:11	12:14	—:—	12:15	
13	14:10	14:09	12:14	00:38	12:59	
14	14:08	14:07	12:14	01:20	13:41	

February 15, 16, 17 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	145°15.25	140°44.50	N06°32.57	35°40.39	N26°12.48	75°15.58	N21°43.08	154°36.30	S06°6.61	
1	160°17.71	155°45.97	33.47	50°43.18	12.45	90°17.96	43.10	169°38.50	6.49	
2	175°20.17	170°47.44	34.38	65°45.98	12.42	105°20.33	43.12	184°40.69	6.37	
3	190°22.64	185°48.92	· · 35.28	80°48.77	· · 12.40	120°22.70	· · 43.14	199°42.88	· · 6.26	
4	205°25.10	200°50.39	36.18	95°51.56	12.37	135°25.07	43.16	214°45.08	6.14	
5	220°27.57	215°51.88	37.09	110°54.35	12.34	150°27.43	43.18	229°47.27	6.03	
6	235°30.03	230°53.36	N06°37.99	125°57.14	N26°12.31	165°29.80	N21°43.21	244°49.46	S06°5.91	
7	250°32.49	245°54.85	38.89	140°59.93	12.28	180°32.17	43.23	259°51.66	5.79	
8	265°34.96	260°56.34	39.79	156°2.71	12.25	195°34.54	43.25	274°53.85	5.68	
9	280°37.42	275°57.83	· · 40.68	171°5.50	· · 12.22	210°36.91	· · 43.27	289°56.04	· · 5.56	
10	295°39.89	290°59.32	41.58	186°8.28	12.19	225°39.28	43.29	304°58.24	5.44	
11	310°42.35	306°0.82	42.48	201°11.06	12.16	240°41.64	43.31	320°0.43	5.33	
12	325°44.82	321°2.32	N06°43.37	216°13.84	N26°12.13	255°44.01	N21°43.33	335°2.62	S06°5.21	
13	340°47.28	336°3.82	44.27	231°16.62	12.10	270°46.38	43.35	350°4.82	5.10	
14	355°49.74	351°5.33	45.16	246°19.40	12.07	285°48.74	43.37	5°7.01	4.98	
15	10°52.21	6°6.83	· · 46.05	261°22.17	· · 12.03	300°51.11	· · 43.39	20°9.20	· · 4.86	
16	25°54.67	21°8.34	46.94	276°24.94	12.00	315°53.47	43.42	35°11.40	4.75	
17	40°57.14	36°9.86	47.83	291°27.72	11.97	330°55.84	43.44	50°13.59	4.63	
18	55°59.60	51°11.37	N06°48.72	306°30.49	N26°11.94	345°58.20	N21°43.46	65°15.78	S06°4.51	
19	71°2.06	66°12.89	49.61	321°33.26	11.91	1°0.57	43.48	80°17.97	4.40	
20	86°4.53	81°14.41	50.50	336°36.02	11.87	16°2.93	43.50	95°20.17	4.28	
21	101°6.99	96°15.93	· · 51.38	351°38.79	· · 11.84	31°5.29	· · 43.52	110°22.36	· · 4.16	
22	116°9.46	111°17.46	52.27	6°41.55	11.81	46°7.66	43.54	125°24.55	4.05	
23	131°11.92	126°18.99	53.15	21°44.32	11.77	61°10.02	43.57	140°26.75	3.93	
Mer.pass. 14:17			ν1.5' d0.9' m-4.85		ν2.8' d-0.0' m-0.67		ν2.4' d0.0' m-2.41		ν2.2' d-0.1' m1.12	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	146°14.38	141°20.52	N06°54.03	36°47.08	N26°11.74	76°12.38	N21°43.59	155°28.94	S06°3.81	
1	161°16.85	156°22.05	54.92	51°49.84	11.71	91°14.74	43.61	170°31.13	3.70	
2	176°19.31	171°23.59	55.80	66°52.60	11.67	106°17.11	43.63	185°33.32	3.58	
3	191°21.78	186°25.13	· · 56.68	81°55.35	· · 11.64	121°19.47	· · 43.65	200°35.52	· · 3.46	
4	206°24.24	201°26.67	57.56	96°58.11	11.60	136°21.83	43.67	215°37.71	3.35	
5	221°26.70	216°28.21	58.43	112°0.86	11.57	151°24.19	43.70	230°39.90	3.23	
6	236°29.17	231°29.76	N06°59.31	127°3.62	N26°11.53	166°26.55	N21°43.72	245°42.09	S06°3.12	
7	251°31.63	246°31.31	07°0.19	142°6.37	11.50	181°28.91	43.74	260°44.28	3.00	
8	266°34.10	261°32.86	1.06	157°9.12	11.46	196°31.27	43.76	275°46.48	2.88	
9	281°36.56	276°34.42	· · 1.94	172°11.87	· · 11.43	211°33.63	· · 43.78	290°48.67	· · 2.76	
10	296°39.02	291°35.97	2.81	187°14.61	11.39	226°35.99	43.80	305°50.86	2.65	
11	311°41.49	306°37.54	3.68	202°17.36	11.35	241°38.35	43.83	320°53.05	2.53	
12	326°43.95	321°39.10	N07°4.55	217°20.10	N26°11.32	256°40.70	N21°43.85	335°55.25	S06°2.41	
13	341°46.42	336°40.66	5.42	232°22.84	11.28	271°43.06	43.87	350°57.44	2.30	
14	356°48.88	351°42.23	6.29	247°25.58	11.24	286°45.42	43.89	5°59.63	2.18	
15	11°51.34	6°43.80	· · 7.16	262°28.32	· · 11.21	301°47.78	· · 43.92	21°1.82	· · 2.06	
16	26°53.81	21°45.38	8.02	277°31.06	11.17	316°50.13	43.94	36°4.01	1.95	
17	41°56.27	36°46.95	8.89	292°33.79	11.13	331°52.49	43.96	51°6.21	1.83	
18	56°58.74	51°48.53	N07°9.75	307°36.53	N26°11.09	346°54.84	N21°43.98	66°8.40	S06°1.71	
19	72°1.20	66°50.12	10.62	322°39.26	11.06	1°57.20	44.00	81°10.59	1.60	
20	87°3.66	81°51.70	11.48	337°41.99	11.02	16°59.56	44.03	96°12.78	1.48	
21	102°6.13	96°53.29	· · 12.34	352°44.72	· · 10.98	32°1.91	· · 44.05	111°14.97	· · 1.36	
22	117°8.59	111°54.88	13.20	7°47.45	10.94	47°4.26	44.07	126°17.16	1.25	
23	132°11.06	126°56.47	14.06	22°50.18	10.90	62°6.62	44.09	141°19.36	1.13	
Mer.pass. 14:13			ν1.5' d0.9' m-4.85		ν2.8' d-0.0' m-0.64		ν2.4' d0.0' m-2.40		ν2.2' d-0.1' m1.12	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	147°13.52	141°58.07	N07°14.92	37°52.90	N26°10.86	77°8.97	N21°44.12	156°21.55	S06°1.01	
1	162°15.98	156°59.67	15.77	52°55.63	10.82	92°11.33	44.14	171°23.74	0.90	
2	177°18.45	172°1.27	16.63	67°58.35	10.78	107°13.68	44.16	186°25.93	0.78	
3	192°20.91	187°2.87	· · 17.48	83°1.07	· · 10.74	122°16.03	· · 44.18	201°28.12	· · 0.66	
4	207°23.38	202°4.48	18.34	98°3.79	10.70	137°18.38	44.21	216°30.31	0.54	
5	222°25.84	217°6.09	19.19	113°6.51	10.66	152°20.74	44.23	231°32.50	0.43	
6	237°28.31	232°7.70	N07°20.04	128°9.22	N26°10.62	167°23.09	N21°44.25	246°34.69	S06°0.31	
7	252°30.77	247°9.31	20.89	143°11.94	10.58	182°25.44	44.28	261°36.89	0.19	
8	267°33.23	262°10.93	21.74	158°14.65	10.54	197°27.79	44.30	276°39.08	0.08	
9	282°35.70	277°12.55	· · 22.59	173°17.36	· · 10.50	212°30.14	· · 44.32	291°41.27	05°59.96	
10	297°38.16	292°14.18	23.44	188°20.08	10.46	227°32.49	44.34	306°43.46	05°59.84	
11	312°40.63	307°15.80	24.28	203°22.78	10.41	242°34.84	44.37	321°45.65	59.72	
12	327°43.09	322°17.43	N07°25.13	218°25.49	N26°10.37	257°37.19	N21°44.39	336°47.84	S05°59.61	
13	342°45.55	337°19.06	25.97	233°28.20	10.33	272°39.54	44.41	351°50.03	59.49	
14	357°48.02	352°20.70	26.81	248°30.90	10.29	287°41.89	44.44	6°52.22	59.37	
15	12°50.48	7°22.33	· · 27.66	263°33.60	· · 10.25	302°44.24	· · 44.46	21°54.41	· · 59.26	
16	27°52.95	22°23.97	28.50	278°36.31	10.20	317°46.58	44.48	36°56.61	59.14	
17	42°55.41	37°25.62	29.34	293°39.01	10.16	332°48.93	44.51	51°58.80	59.02	
18	57°57.87	52°27.26	N07°30.17	308°41.70	N26°10.12	347°51.28	N21°44.53	67°0.99	S05°58.90	
19	73°0.34	67°28.91	31.01	323°44.40	10.07	2°53.63	44.55	82°3.18	58.79	
20	88°2.80	82°30.56	31.85	338°47.10	10.03	17°55.97	44.58	97°5.37	58.67	
21	103°5.27	97°32.22	· · 32.68	353°49.79	· · 9.98	32°58.32	· · 44.60	112°7.56	· · 58.55	
22	118°7.73	112°33.87	33.52	8°52.48	9.94	48°0.67	44.62	127°9.75	58.44	
23	133°10.19	127°35.53	34.35	23°55.17	9.90	63°3.01	44.65	142°11.94	58.32	
Mer.pass. 14:09			ν1.6' d0.9' m-4.86		ν2.7' d-0.0' m-0.61		ν2.4' d0.0' m-2.39		ν2.2' d-0.1' m1.12	

Stars		
	SHA	Dec
Alpheratz	357° 34.98	29° 13.76
Ankaa	353° 7.34	-42° 10.38
Schedar	349° 31.38	56° 40.65
Diphda	348° 47.42	-17° 51.09
Achernar	335° 20.37	-57° 6.81
Hamal	327° 51.23	23° 34.91
Polaris	314° 4.28	89° 22.53
Acamar	315° 11.75	-40° 12.48
Menkar	314° 6.09	4° 11.24
Mirfak	308° 28.16	49° 57.21
Aldebaran	290° 39.42	16° 33.59
Rigel	281° 3.64	-8° 10.47
Capella	280° 21.55	46° 1.53
Bellatrix	278° 22.63	6° 22.30
Elnath	278° 1.58	28° 37.77
Alnilam	275° 37.47	-1° 11.23
Betelgeuse	270° 51.79	7° 24.66
Canopus	263° 52.00	-52° 42.72
Sirius	258° 25.91	-16° 45.17
Adhara	255° 5.51	-29° 0.52
Procyon	244° 50.45	5° 9.56
Pollux	243° 16.86	27° 57.91
Avior	234° 14.13	-59° 35.48
Suhail	222° 45.82	-43° 32.11
Miaplacidus	221° 37.40	-69° 49.23
Alphard	217° 47.34	-8° 46.15
Regulus	207° 34.01	11° 50.55
Dubhe	193° 40.20	61° 36.77
Denebola	182° 24.56	14° 25.73
Gienah	175° 43.23	-17° 40.95
Acrux	172° 59.52	-63° 14.17
Gacrux	171° 51.15	-57° 15.12
Alioth	166° 12.46	55° 49.11
Spica	158° 22.02	-11° 17.63
Alkaid	152° 51.66	49° 10.94
Hadar	148° 35.65	-60° 29.46
Menkent	147° 57.36	-36° 29.55
Arcturus	145° 47.69	19° 2.85
Rigel Kent.	139° 40.01	-60° 56.15
Kochab	137° 19.47	74° 2.71
Zuben'ubi	136° 55.84	-16° 8.82
Alphecca	126° 3.64	26° 37.51
Antares	112° 15.80	-26° 29.25
Atria	107° 10.14	-69° 4.11
Sabik	102° 2.80	-15° 45.42
Shaula	96° 10.43	-37° 7.25
Rasalhague	95° 58.61	12° 32.28
Eltanin	90° 42.43	51° 28.77
Kaus Aust.	83° 32.64	-34° 22.33
Vega	80° 33.45	38° 48.11
Nunki	75° 47.90	-26° 15.95
Altair	62° 0.15	8° 55.91
Peacock	53° 6.10	-56° 39.23
Deneb	49° 26.20	45° 22.02
Enif	33° 39.03	9° 59.29
Al Na'ir	27° 33.23	-46° 50.47
Fomalhaut	15° 14.74	-29° 29.50
Scheat	13° 45.46	28° 13.10
Markab	13° 30.12	15° 20.35
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Feb 15 Sat	SHA	Mer.pass
Venus	355° 29.25	14:36
Mars	250° 25.14	21:33
Jupiter	290° 0.34	18:56
Saturn	9° 21.06	13:40
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Feb 16 Sun	SHA	Mer.pass
Venus	355° 6.13	14:33
Mars	250° 32.70	21:29
Jupiter	289° 58.00	18:52
Saturn	9° 14.55	13:36
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Feb 17 Mon	SHA	Mer.pass
Venus	354° 44.55	14:31
Mars	250° 39.38	21:25
Jupiter	289° 55.45	18:48
Saturn	9° 8.03	13:33
<hr/>		
Horizontal parallax		
	Venus:	0.4
	Mars:	0.2


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.65	S12°39.96	330°33.45	16.7'	N02°38.46	-14.5'	54.7'
1	191°28.68	39.11	345°9.16	16.7'	02°23.91	-14.5'	54.7'
2	206°28.72	38.25	359°44.90	16.8'	02°9.37	-14.5'	54.7'
3	221°28.75	· · 37.39	14°20.66	16.8'	01°54.83	-14.5'	54.7'
4	236°28.78	36.53	28°56.44	16.8'	01°40.29	-14.5'	54.7'
5	251°28.81	35.67	43°32.25	16.8'	01°25.75	-14.5'	54.6'
6	266°28.84	S12°34.81	58°8.08	16.9'	N01°11.21	-14.5'	54.6'
7	281°28.88	33.95	72°43.94	16.9'	00°56.68	-14.5'	54.6'
8	296°28.91	33.08	87°19.81	16.9'	00°42.16	-14.5'	54.6'
9	311°28.94	· · 32.22	101°55.70	16.9'	00°27.64	-14.5'	54.6'
10	326°28.98	31.36	116°31.61	16.9'	N00°13.13	-14.5'	54.6'
11	341°29.01	30.50	131°7.53	16.9'	S00°1.38	14.5'	54.6'
12	356°29.05	S12°29.64	145°43.47	17.0'	S00°15.87	14.5'	54.5'
13	11°29.08	28.77	160°19.43	17.0'	00°30.36	14.5'	54.5'
14	26°29.12	27.91	174°55.40	17.0'	00°44.84	14.5'	54.5'
15	41°29.15	· · 27.05	189°31.38	17.0'	00°59.30	14.5'	54.5'
16	56°29.19	26.18	204°7.37	17.0'	01°13.76	14.4'	54.5'
17	71°29.22	25.32	218°43.37	17.0'	01°28.20	14.4'	54.5'
18	86°29.26	S12°24.45	233°19.38	17.0'	S01°42.63	14.4'	54.5'
19	101°29.30	23.59	247°55.40	17.0'	01°57.05	14.4'	54.5'
20	116°29.33	22.72	262°31.43	17.0'	02°11.45	14.4'	54.4'
21	131°29.37	· · 21.86	277°7.46	17.0'	02°25.83	14.4'	54.4'
22	146°29.41	20.99	291°43.50	17.0'	02°40.20	14.4'	54.4'
23	161°29.44	20.12	306°19.54	17.0'	02°54.56	14.3'	54.4'
SD = 16.2' $d = -0.9'$			SD = 14.9'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.48	S12°19.26	320°55.58	17.0'	S03°8.89	14.3'	54.4'
1	191°29.52	18.39	335°31.62	17.0'	03°23.21	14.3'	54.4'
2	206°29.56	17.52	350°7.67	17.0'	03°37.51	14.3'	54.4'
3	221°29.60	· · 16.65	4°43.71	17.0'	03°51.79	14.3'	54.4'
4	236°29.64	15.79	19°19.75	17.0'	04°6.05	14.2'	54.3'
5	251°29.68	14.92	33°55.79	17.0'	04°20.28	14.2'	54.3'
6	266°29.72	S12°14.05	48°31.83	17.0'	S04°34.50	14.2'	54.3'
7	281°29.76	13.18	63°7.86	17.0'	04°48.69	14.2'	54.3'
8	296°29.80	12.31	77°43.88	17.0'	05°2.86	14.1'	54.3'
9	311°29.84	· · 11.44	92°19.90	17.0'	05°17.00	14.1'	54.3'
10	326°29.88	10.57	106°55.91	17.0'	05°31.12	14.1'	54.3'
11	341°29.92	9.70	121°31.90	17.0'	05°45.22	14.1'	54.3'
12	356°29.96	S12°8.83	136°7.89	17.0'	S05°59.29	14.0'	54.3'
13	11°30.00	7.96	150°43.87	17.0'	06°13.33	14.0'	54.3'
14	26°30.05	7.08	165°19.84	17.0'	06°27.34	14.0'	54.3'
15	41°30.09	· · 6.21	179°55.79	16.9'	06°41.33	14.0'	54.2'
16	56°30.13	5.34	194°31.72	16.9'	06°55.28	13.9'	54.2'
17	71°30.18	4.47	209°7.65	16.9'	07°9.21	13.9'	54.2'
18	86°30.22	S12°3.59	223°43.55	16.9'	S07°23.11	13.9'	54.2'
19	101°30.26	2.72	238°19.44	16.9'	07°36.97	13.8'	54.2'
20	116°30.31	1.85	252°55.31	16.8'	07°50.80	13.8'	54.2'
21	131°30.35	· · 0.97	267°31.15	16.8'	08°4.60	13.8'	54.2'
22	146°30.40	12°0.10	282°6.98	16.8'	08°18.37	13.7'	54.2'
23	161°30.44	11°59.22	296°42.79	16.8'	08°32.10	13.7'	54.2'
SD = 16.2' $d = -0.9'$			SD = 14.8'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.49	S11°58.35	311°18.57	16.8'	S08°45.80	13.7'	54.2'
1	191°30.53	57.47	325°54.33	16.7'	08°59.46	13.6'	54.2'
2	206°30.58	56.60	340°30.06	16.7'	09°13.09	13.6'	54.2'
3	221°30.62	· · 55.72	355°5.77	16.7'	09°26.68	13.6'	54.2'
4	236°30.67	54.85	9°41.45	16.7'	09°40.23	13.5'	54.2'
5	251°30.72	53.97	24°17.10	16.6'	09°53.74	13.5'	54.1'
6	266°30.76	S11°53.09	38°52.73	16.6'	S10°7.22	13.4'	54.1'
7	281°30.81	52.22	53°28.32	16.6'	10°20.65	13.4'	54.1'
8	296°30.86	51.34	68°3.88	16.5'	10°34.04	13.4'	54.1'
9	311°30.91	· · 50.46	82°39.41	16.5'	10°47.40	13.3'	54.1'
10	326°30.95	49.58	97°14.91	16.5'	11°0.71	13.3'	54.1'
11	341°31.00	48.70	111°50.37	16.4'	11°13.97	13.2'	54.1'
12	356°31.05	S11°47.82	126°25.80	16.4'	S11°27.20	13.2'	54.1'
13	11°31.10	46.94	141°1.19	16.4'	11°40.38	13.1'	54.1'
14	26°31.15	46.07	155°36.54	16.3'	11°53.51	13.1'	54.1'
15	41°31.20	· · 45.19	170°11.85	16.3'	12°6.60	13.0'	54.1'
16	56°31.25	44.31	184°47.13	16.2'	12°19.65	13.0'	54.1'
17	71°31.30	43.42	199°22.37	16.2'	12°32.64	12.9'	54.1'
18	86°31.35	S11°42.54	213°57.56	16.2'	S12°45.59	12.9'	54.1'
19	101°31.40	41.66	228°32.71	16.1'	12°58.49	12.9'	54.1'
20	116°31.45	40.78	243°7.82	16.1'	13°11.34	12.8'	54.1'
21	131°31.50	· · 39.90	257°42.89	16.0'	13°24.14	12.7'	54.1'
22	146°31.56	39.02	272°17.91	16.0'	13°36.89	12.7'	54.1'
23	161°31.61	38.13	286°52.88	15.9'	13°49.59	12.6'	54.1'
SD = 16.2' $d = -0.9'$			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:09	07:29	08:46	15:43	17:01	18:21
N 70°	06:08	07:20	08:28	16:02	17:10	18:22
68°	06:07	07:12	08:13	16:17	17:17	18:23
66°	06:06	07:06	08:01	16:28	17:24	18:24
64°	06:05	07:00	07:51	16:38	17:29	18:25
62°	06:04	06:55	07:42	16:47	17:34	18:26
60°	06:03	06:51	07:35	16:54	17:38	18:27
N 58°	06:02	06:47	07:28	17:01	17:42	18:28
56°	06:01	06:44	07:23	17:06	17:45	18:29
54°	05:59	06:41	07:17	17:12	17:48	18:30
52°	05:58	06:38	07:13	17:16	17:51	18:30
50°	05:57	06:35	07:08	17:20	17:54	18:31
45°	05:55	06:29	06:59	17:30	18:00	18:34
N 40°	05:52	06:24	06:51	17:37	18:05	18:37
35°	05:49	06:19	06:45	17:44	18:10	18:39
30°	05:46	06:14	06:39	17:50	18:14	18:42
20°	05:40	06:06	06:28	18:00	18:22	18:48
N 10°	05:33	05:58	06:19	18:09	18:30	18:55
0°	05:25	05:49	06:11	18:17	18:39	19:03
S 10°	05:15	05:40	06:02	18:26	18:48	19:13
20°	05:03	05:30	05:52	18:35	18:58	19:25
30°	04:47	05:16	05:41	18:46	19:11	19:40
35°	04:37	05:08	05:35	18:53	19:19	19:50
40°	04:24	04:59	05:28	19:00	19:28	20:03
45°	04:09	04:48	05:19	19:08	19:39	20:18
S 50°	03:49	04:33	05:09	19:18	19:53	20:37
52°	03:40	04:27	05:04	19:23	20:00	20:47
54°	03:28	04:19	04:58	19:28	20:07	20:58
56°	03:15	04:10	04:52	19:34	20:16	21:10
58°	03:00	04:01	04:46	19:41	20:25	21:25
S 60°	02:41	03:49	04:38	19:48	20:36	21:44

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	21:03	23:05	· · ·	08:18	07:45	07:08
N 70°	20:59	22:51	· · ·	08:17	07:52	07:24
68°	20:56	22:40	· · ·	08:16	07:58	07:37
66°	20:54	22:31	· · ·	08:16	08:02	07:48
64°	20:52	22:23	23:58	08:15	08:06	07:57
62°	20:50	22:17	23:46	08:15	08:10	08:05
60°	20:48	22:11	23:36	08:15	08:13	08:12
N 58°	20:47	22:07	23:27	08:14	08:16	08:18
56°	20:46	22:02	23:20	08:14	08:18	08:23
54°	20:45	21:58	23:13	08:14	08:21	08:28
52°	20:44	21:55	23:07	08:14	08:23	08:32
50°	20:43	21:52	23:01	08:14	08:25	08:36
45°	20:41	21:45	22:50	08:13	08:29	08:45
N 40°	20:39	21:39	22:40	08:13	08:32	08:52
35°	20:38	21:34	22:32	08:12	08:35	08:58
30°	20:37	21:30	22:24	08:12	08:38	09:04
20°	20:35	21:23	22:12	08:12	08:42	09:13
N 10°	20:33	21:17	22:01	08:11	08:46	09:22
0°	20:31	21:11	21:51	08:11	08:50	09:30
S 10°	20:29	21:05	21:41	08:10	08:54	09:38
20°	20:28	20:58	21:30	08:10	08:58	09:46
30°	20:26	20:51	21:18	08:09	09:03	09:56
35°	20:25	20:47	21:11	08:09	09:05	10:02
40°	20:23	20:43	21:04	08:08	09:08	10:08
45°	20:22	20:38	20:54	08:08	09:12	10:16
S 50°	20:20	20:31	20:44	08:07	09:16	10:25
52°	20:19	20:28	20:39	08:07	09:18	10:29
54°	20:19	20:25	20:33	08:06	09:20	10:34
56°	20:18	20:22	20:27	08:06	09:23	10:39
58°	20:17	20:18	20:20	08:06	09:25	10:45
S 60°	20:15	20:14	20:12	08:05	09:28	10:52

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		94-83%
15	14:05	14:04	12:14	02:01	14:21		
16	14:02	14:00	12:14	02:41	15:00		
17	13:58	13:56	12:14	03:20	15:40		

February 18, 19, 20 UT (Tue., Wed., Thu.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	148°12.66	142°37.20	N07°35.18	38°57.86	N26°9.85	78°5.36	N21°44.67	157°14.13	S05°58.20						
1	163°15.12	157°38.86	36.01	54°0.55	9.81	93°7.70	44.69	172°16.32	58.08						
2	178°17.59	172°40.53	36.84	69°3.24	9.76	108°10.05	44.72	187°18.51	57.97						
3	193°20.05	187°42.20	•• 37.67	84°5.92	•• 9.72	123°12.39	•• 44.74	202°20.70	•• 57.85						
4	208°22.51	202°43.87	38.50	99°8.60	9.67	138°14.73	44.77	217°22.89	57.73						
5	223°24.98	217°45.55	39.32	114°11.29	9.62	153°17.08	44.79	232°25.08	57.61						
6	238°27.44	232°47.23	N07°40.15	129°13.97	N26°9.58	168°19.42	N21°44.81	247°27.27	S05°57.50						
7	253°29.91	247°48.91	40.97	144°16.65	9.53	183°21.76	44.84	262°29.46	57.38						
8	268°32.37	262°50.60	41.79	159°19.32	9.49	198°24.11	44.86	277°31.65	57.26						
9	283°34.83	277°52.29	•• 42.61	174°22.00	•• 9.44	213°26.45	•• 44.88	292°33.84	•• 57.14						
10	298°37.30	292°53.98	43.43	189°24.67	9.39	228°28.79	44.91	307°36.03	57.03						
11	313°39.76	307°55.67	44.25	204°27.35	9.34	243°31.13	44.93	322°38.22	56.91						
12	328°42.23	322°57.37	N07°45.07	219°30.02	N26°9.30	258°33.47	N21°44.96	337°40.41	S05°56.79						
13	343°44.69	337°59.07	45.89	234°32.69	9.25	273°35.81	44.98	352°42.60	56.67						
14	358°47.16	353°0.77	46.70	249°35.36	9.20	288°38.15	45.01	7°44.79	56.56						
15	13°49.62	8°2.48	•• 47.52	264°38.02	•• 9.15	303°40.49	•• 45.03	22°46.98	•• 56.44						
16	28°52.08	23°4.18	48.33	279°40.69	9.11	318°42.83	45.05	37°49.17	56.32						
17	43°54.55	38°5.90	49.14	294°43.35	9.06	333°45.17	45.08	52°51.36	56.20						
18	58°57.01	53°7.61	N07°49.95	309°46.02	N26°9.01	348°47.51	N21°45.10	67°53.55	S05°56.09						
19	73°59.48	68°9.33	50.76	324°48.68	8.96	3°49.85	45.13	82°55.74	55.97						
20	89°1.94	83°11.05	51.57	339°51.34	8.91	18°52.19	45.15	97°57.93	55.85						
21	104°4.40	98°12.77	•• 52.38	354°53.99	•• 8.86	33°54.52	•• 45.18	113°0.12	•• 55.73						
22	119°6.87	113°14.49	53.19	9°56.65	8.81	48°56.86	45.20	128°2.31	55.62						
23	134°9.33	128°16.22	53.99	24°59.31	8.76	63°59.20	45.22	143°4.50	55.50						
Mer.pass. 14:05		ν1.7' d0.8' m-4.86			ν2.7' d-0.0' m-0.58			ν2.3' d0.0' m-2.38			ν2.2' d-0.1' m1.12				
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	149°11.80	143°17.96	N07°54.79	40°1.96	N26°8.71	79°1.53	N21°45.25	158°6.69	S05°55.38						
1	164°14.26	158°19.69	55.60	55°4.61	8.66	94°3.87	45.27	173°8.88	55.26						
2	179°16.72	173°21.43	56.40	70°7.26	8.61	109°6.21	45.30	188°11.07	55.14						
3	194°19.19	188°23.17	•• 57.20	85°9.91	•• 8.56	124°8.54	•• 45.32	203°13.26	•• 55.03						
4	209°21.65	203°24.91	58.00	100°12.56	8.51	139°10.88	45.35	218°15.45	54.91						
5	224°24.12	218°26.66	58.80	115°15.20	8.46	154°13.21	45.37	233°17.64	54.79						
6	239°26.58	233°28.41	N07°59.59	130°17.85	N26°8.41	169°15.55	N21°45.40	248°19.83	S05°54.67						
7	254°29.04	248°30.16	08°0.39	145°20.49	8.36	184°17.88	45.42	263°22.01	54.56						
8	269°31.51	263°31.91	1.18	160°23.13	8.30	199°20.22	45.45	278°24.20	54.44						
9	284°33.97	278°33.67	•• 1.98	175°25.77	•• 8.25	214°22.55	•• 45.47	293°26.39	•• 54.32						
10	299°36.44	293°35.43	2.77	190°28.41	8.20	229°24.88	45.50	308°28.58	54.20						
11	314°38.90	308°37.20	3.56	205°31.05	8.15	244°27.21	45.52	323°30.77	54.08						
12	329°41.37	323°38.96	N08°4.35	220°33.69	N26°8.10	259°29.55	N21°45.55	338°32.96	S05°53.97						
13	344°43.83	338°40.73	5.14	235°36.32	8.04	274°31.88	45.57	353°35.15	53.85						
14	359°46.29	353°42.51	5.92	250°38.95	7.99	289°34.21	45.60	8°37.34	53.73						
15	14°48.76	8°44.28	•• 6.71	265°41.58	•• 7.94	304°36.54	•• 45.62	23°39.53	•• 53.61						
16	29°51.22	23°46.06	7.49	280°44.21	7.88	319°38.87	45.65	38°41.72	53.49						
17	44°53.69	38°47.84	8.28	295°46.84	7.83	334°41.20	45.67	53°43.90	53.38						
18	59°56.15	53°49.63	N08°9.06	310°49.47	N26°7.78	349°43.53	N21°45.70	68°46.09	S05°53.26						
19	74°58.61	68°51.42	9.84	325°52.09	7.72	4°45.86	45.72	83°48.28	53.14						
20	90°1.08	83°53.21	10.62	340°54.72	7.67	19°48.19	45.75	98°50.47	53.02						
21	105°3.54	98°55.00	•• 11.40	355°57.34	•• 7.61	34°50.52	•• 45.77	113°52.66	•• 52.90						
22	120°6.01	113°56.80	12.17	10°59.96	7.56	49°52.85	45.80	128°54.85	52.79						
23	135°8.47	128°58.60	12.95	26°2.58	7.50	64°55.18	45.83	143°57.04	52.67						
Mer.pass. 14:01		ν1.7' d0.8' m-4.86			ν2.7' d-0.1' m-0.56			ν2.3' d0.0' m-2.38			ν2.2' d-0.1' m1.12				
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	150°10.93	144°0.40	N08°13.72	41°5.20	N26°7.45	79°57.51	N21°45.85	158°59.23	S05°52.55						
1	165°13.40	159°2.21	14.50	56°7.81	7.39	94°59.84	45.88	174°1.41	52.43						
2	180°15.86	174°4.01	15.27	71°10.43	7.34	110°2.16	45.90	189°3.60	52.31						
3	195°18.33	189°5.83	•• 16.04	86°13.04	•• 7.28	125°4.49	•• 45.93	204°5.79	•• 52.20						
4	210°20.79	204°7.64	16.81	101°15.66	7.23	140°6.82	45.95	219°7.98	52.08						
5	225°23.26	219°9.46	17.58	116°18.27	7.17	155°9.14	45.98	234°10.17	51.96						
6	240°25.72	234°11.28	N08°18.34	131°20.87	N26°7.11	170°11.47	N21°46.01	249°12.36	S05°51.84						
7	255°28.18	249°13.10	19.11	146°23.48	7.06	185°13.80	46.03	264°14.54	51.72						
8	270°30.65	264°14.93	19.87	161°26.09	7.00	200°16.12	46.06	279°16.73	51.61						
9	285°33.11	279°16.76	•• 20.64	176°28.69	•• 6.94	215°18.45	•• 46.08	294°18.92	•• 51.49						
10	300°35.58	294°18.59	21.40	191°31.30	6.89	230°20.77	46.11	309°21.11	51.37						
11	315°38.04	309°20.43	22.16	206°33.90	6.83	245°23.10	46.14	324°23.30	51.25						
12	330°40.50	324°22.27	N08°22.92	221°36.50	N26°6.77	260°25.42	N21°46.16	339°25.48	S05°51.13						
13	345°42.97	339°24.11	23.68	236°39.10	6.71	275°27.74	46.19	354°27.67	51.01						
14	0°45.43	354°25.96	24.43	251°41.69	6.66	290°30.07	46.21	9°29.86	50.90						
15	15°47.90	9°27.81	•• 25.19	266°44.29	•• 6.60	305°32.39	•• 46.24	24°32.05	•• 50.78						
16	30°50.36	24°29.66	25.94	281°46.88	6.54	320°34.71	46.27	39°34.24	50.66						
17	45°52.83	39°31.51	26.70	296°49.48	6.48	335°37.03	46.29	54°36.42	50.54						
18	60°55.29	54°33.37	N08°27.45	311°52.07	N26°6.42	350°39.36	N21°46.32	69°38.61	S05°50.42						
19	75°57.75	69°35.23	28.20	326°54.66	6.36	5°41.68	46.34	84°40.80	50.31						
20	91°0.22	84°37.10	28.95	341°57.25	6.31	20°44.00	46.37	99°42.99	50.19						
21	106°2.68	99°38.96	•• 29.69	356°59.83	•• 6.25	35°46.32	•• 46.40	114°45.18	•• 50.07						
22	121°5.15	114°40.83	30.44	12°2.42	6.19	50°48.64	46.42	129°47.36	49.95						
23	136°7.61	129°42.71	31.19	27°5.00	6.13	65°50.96	46.45	144°49.55	49.83						
Mer.pass. 13:57		ν1.8' d0.8' m-4.86			ν2.6' d-0.1' m-0.53			ν2.3' d0.0' m-2.37			ν2.2' d-0.1' m1.12				

Stars		
	SHA	Dec
Alpheratz	357°34.99	29°13.75
Ankaa	353°7.36	-42°10.37
Schedar	349°31.40	56°40.64
Diphda	348°47.43	-17°51.09
Achernar	335°20.39	-57°6.81
Hamal	327°51.24	23°34.90
Polaris	314°5.73	89°22.52
Acamar	315°11.77	-40°12.48
Menkar	314°6.11	4°11.23
Mirfak	308°28.18	49°57.21
Aldebaran	290°39.44	-16°33.59
Rigel	281°3.65	-8°10.47
Capella	280°21.57	46°1.53
Bellatrix	278°22.64	6°22.30
Elnath	278°1.59	28°37.77
Alnilam	275°37.48	-1°11.24
Betelgeuse	270°51.81	7°24.66
Canopus	263°52.03	-52°42.73
Sirius	258°25.92	-16°45.17
Adhara	255°5.52	-29°0.53
Procyon	244°50.46	5°9.56
Pollux	243°16.87	27°57.91
Avior	234°14.14	-59°35.50
Suhail	222°45.82	-43°32.13
Miaplacidus	221°37.41	-69°49.25
Alphard	217°47.34	-8°46.16
Regulus	207°34.00	11°50.55
Dubhe	193°40.19	61°36.78
Denebola	182°24.55	14°25.73
Gienah	175°43.22	-17°40.95
Acrux	172°59.49	-63°14.19
Gacrux	171°51.12	-57°15.14
Alioth	166°12.44	55°49.12
Spica	158°22.00	-11°17.64
Alkaid	152°51.64	49°10.94
Hadar	148°35.61	-60°29.47
Menkent	147°57.34	-36°29.56
Arcturus	145°47.67	19°2.85
Rigel Kent.	139°39.97	-60°56.16
Kochab	137°19.42	74°2.72
Zuben'ubi	136°55.82	-16°8.83
Alphecca	126°3.62	26°37.50
Antares	112°15.77	-26°29.25
Atria	107°10.09	-69°4.10
Sabik	102°2.78	-15°45.42
Shaula	96°10.41	-37°7.25
Rasalhague	95°58.60	12°32.28
Eltanin	90°42.40	51°28.76
Kaus Aust.	83°32.62	-34°22.32
Vega	80°33.43	38°48.11
Nunki	75°47.89	-26°15.95
Altair	62°0.14	8°55.90
Peacock	53°6.08	-56°39.22
Deneb	49°26.19	45°22.00
Enif	33°39.03	9°59.28
Al Na'ir	27°33.23	-46°50.46
Fomalhaut	15°14.74	-29°29.49
Scheat	13°45.47	28°13.09
Markab	13°30.12	15°20.34

Feb 18 Tue	SHA	Mer.pass
Venus	354°24.54	14:28
Mars	250°45.20	21:20
Jupiter	289°52.70	18:45
Saturn	9°1.47	13:29

Feb 19 Wed	SHA	Mer.pass
Venus	354°6.16	14:25
Mars	250°50.16	21:16
Jupiter	289°49.74	18:41
Saturn	8°54.89	13:26

Feb 20 Thu	SHA	Mer.pass
Venus	353°49.46	14:22
Mars	250°54.26	21:12
Jupiter	289°46.57	18:37
Saturn	8°48.29	13:22

Horizontal parallax	
Venus:	0.4
Mars:	0.2


h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		176°31.66	S11°37.25	301°27.81	15.9'	S14°2.24	12.6' 54.1'
1		191°31.71	36.37	316°2.69	15.8'	14°14.83	12.5' 54.1'
2		206°31.77	35.48	330°37.52	15.8'	14°27.37	12.5' 54.1'
3		221°31.82	· · 34.60	345°12.29	15.7'	14°39.85	12.4' 54.1'
4		236°31.87	33.72	359°47.02	15.7'	14°52.28	12.4' 54.1'
5		251°31.93	32.83	14°21.70	15.6'	15°4.65	12.3' 54.1'
6		266°31.98	S11°31.95	28°56.33	15.6'	S15°16.97	12.3' 54.1'
7		281°32.03	31.06	43°30.90	15.5'	15°29.23	12.2' 54.1'
8		296°32.09	30.18	58°5.41	15.5'	15°41.43	12.1' 54.1'
9		311°32.14	· · 29.29	72°39.87	15.4'	15°53.57	12.1' 54.1'
10		326°32.20	28.41	87°14.28	15.3'	16°5.65	12.0' 54.1'
11		341°32.26	27.52	101°48.62	15.3'	16°17.67	12.0' 54.1'
12		356°32.31	S11°26.63	116°22.91	15.2'	S16°29.63	11.9' 54.1'
13		11°32.37	25.75	130°57.14	15.2'	16°41.53	11.8' 54.1'
14		26°32.42	24.86	145°31.31	15.1'	16°53.36	11.8' 54.1'
15		41°32.48	· · 23.97	160°5.42	15.0'	17°5.13	11.7' 54.1'
16		56°32.54	23.08	174°39.47	15.0'	17°16.83	11.6' 54.1'
17		71°32.59	22.19	189°13.45	14.9'	17°28.47	11.6' 54.1'
18		86°32.65	S11°21.31	203°47.37	14.9'	S17°40.04	11.5' 54.1'
19		101°32.71	20.42	218°21.23	14.8'	17°51.54	11.4' 54.1'
20		116°32.77	19.53	232°55.02	14.7'	18°2.98	11.4' 54.1'
21		131°32.83	· · 18.64	247°28.75	14.7'	18°14.35	11.3' 54.1'
22		146°32.88	17.75	262°2.41	14.6'	18°25.65	11.2' 54.2'
23		161°32.94	16.86	276°36.00	14.5'	18°36.87	11.2' 54.2'
SD = 16.2' $d = -0.9'$				SD = 14.8'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		176°33.00	S11°15.97	291°9.53	14.5'	S18°48.03	11.1' 54.2'
1		191°33.06	15.08	305°42.98	14.4'	18°59.11	11.0' 54.2'
2		206°33.12	14.19	320°16.37	14.3'	19°10.12	10.9' 54.2'
3		221°33.18	· · 13.29	334°49.68	14.2'	19°21.05	10.9' 54.2'
4		236°33.24	12.40	349°22.92	14.2'	19°31.91	10.8' 54.2'
5		251°33.30	11.51	3°56.10	14.1'	19°42.70	10.7' 54.2'
6		266°33.36	S11°10.62	18°29.19	14.0'	S19°53.41	10.6' 54.2'
7		281°33.43	9.73	33°2.22	14.0'	20°4.03	10.6' 54.2'
8		296°33.49	8.83	47°35.17	13.9'	20°14.59	10.5' 54.2'
9		311°33.55	· · 7.94	62°8.05	13.8'	20°25.06	10.4' 54.2'
10		326°33.61	7.05	76°40.85	13.7'	20°35.45	10.3' 54.2'
11		341°33.67	6.15	91°13.57	13.6'	20°45.76	10.2' 54.3'
12		356°33.74	S11°5.26	105°46.22	13.6'	S20°55.99	10.1' 54.3'
13		11°33.80	4.36	120°18.79	13.5'	21°6.13	10.1' 54.3'
14		26°33.86	3.47	134°51.29	13.4'	21°16.19	10.0' 54.3'
15		41°33.92	· · 2.57	149°23.70	13.3'	21°26.17	9.9' 54.3'
16		56°33.99	1.68	163°56.03	13.3'	21°36.06	9.8' 54.3'
17		71°34.05	11°0.78	178°28.29	13.2'	21°45.86	9.7' 54.3'
18		86°34.12	S10°59.89	193°0.47	13.1'	S21°55.57	9.6' 54.3'
19		101°34.18	58.99	207°32.56	13.0'	22°5.20	9.5' 54.3'
20		116°34.25	58.09	222°4.57	12.9'	22°14.73	9.4' 54.4'
21		131°34.31	· · 57.20	236°36.50	12.8'	22°24.18	9.4' 54.4'
22		146°34.38	56.30	251°8.35	12.8'	22°33.53	9.3' 54.4'
23		161°34.44	55.40	265°40.12	12.7'	22°42.80	9.2' 54.4'
SD = 16.2' $d = -0.9'$				SD = 14.8'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		176°34.51	S10°54.51	280°11.80	12.6'	S22°51.96	9.1' 54.4'
1		191°34.57	53.61	294°43.40	12.5'	23°1.04	9.0' 54.4'
2		206°34.64	52.71	309°14.92	12.4'	23°10.01	8.9' 54.4'
3		221°34.71	· · 51.81	323°46.35	12.3'	23°18.89	8.8' 54.4'
4		236°34.78	50.91	338°17.70	12.3'	23°27.68	8.7' 54.5'
5		251°34.84	50.01	352°48.96	12.2'	23°36.36	8.6' 54.5'
6		266°34.91	S10°49.11	7°20.14	12.1'	S23°44.95	8.5' 54.5'
7		281°34.98	48.21	21°51.23	12.0'	23°53.43	8.4' 54.5'
8		296°35.05	47.31	36°22.23	11.9'	24°1.81	8.3' 54.5'
9		311°35.11	· · 46.41	50°53.15	11.8'	24°10.09	8.2' 54.5'
10		326°35.18	45.51	65°23.99	11.7'	24°18.27	8.1' 54.6'
11		341°35.25	44.61	79°54.73	11.7'	24°26.34	8.0' 54.6'
12		356°35.32	S10°43.71	94°25.39	11.6'	S24°34.31	7.9' 54.6'
13		11°35.39	42.81	108°55.97	11.5'	24°42.17	7.8' 54.6'
14		26°35.46	41.91	123°26.45	11.4'	24°49.92	7.6' 54.6'
15		41°35.53	· · 41.00	137°56.85	11.3'	24°57.56	7.5' 54.6'
16		56°35.60	40.10	152°27.17	11.2'	25°5.10	7.4' 54.7'
17		71°35.67	39.20	166°57.39	11.1'	25°12.52	7.3' 54.7'
18		86°35.74	S10°38.30	181°27.53	11.1'	S25°19.83	7.2' 54.7'
19		101°35.81	37.39	195°57.58	11.0'	25°27.03	7.1' 54.7'
20		116°35.89	36.49	210°27.55	10.9'	25°34.11	7.0' 54.7'
21		131°35.96	· · 35.59	224°57.42	10.8'	25°41.08	6.9' 54.8'
22		146°36.03	34.68	239°27.22	10.7'	25°47.93	6.7' 54.8'
23		161°36.10	33.78	253°56.92	10.6'	25°54.67	6.6' 54.8'
SD = 16.2' $d = -0.9'$				SD = 14.8'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:56	07:15	08:29	16:00	17:15	18:34
N 70°	05:56	07:07	08:13	16:16	17:22	18:33
68°	05:56	07:01	08:00	16:29	17:28	18:33
66°	05:56	06:56	07:50	16:39	17:33	18:33
64°	05:56	06:51	07:41	16:48	17:38	18:33
62°	05:55	06:47	07:33	16:56	17:42	18:33
60°	05:55	06:43	07:26	17:02	17:45	18:34
N 58°	05:55	06:40	07:21	17:08	17:48	18:34
56°	05:54	06:37	07:15	17:13	17:51	18:35
54°	05:53	06:35	07:11	17:18	17:54	18:35
52°	05:53	06:32	07:07	17:22	17:56	18:36
50°	05:52	06:30	07:03	17:26	17:59	18:36
45°	05:50	06:25	06:54	17:34	18:04	18:38
N 40°	05:48	06:20	06:47	17:41	18:08	18:40
35°	05:46	06:16	06:41	17:47	18:12	18:42
30°	05:44	06:12	06:36	17:52	18:16	18:44
20°	05:38	06:04	06:27	18:01	18:23	18:49
N 10°	05:32	05:57	06:18	18:09	18:31	18:55
0°	05:25	05:49	06:10	18:17	18:38	19:03
S 10°	05:16	05:41	06:02	18:25	18:46	19:11
20°	05:05	05:31	05:54	18:34	18:56	19:23
30°	04:50	05:19	05:44	18:43	19:08	19:37
35°	04:40	05:11	05:38	18:49	19:15	19:47
40°	04:29	05:03	05:31	18:56	19:24	19:58
45°	04:14	04:52	05:23	19:03	19:34	20:12
S 50°	03:56	04:39	05:14	19:13	19:47	20:30
52°	03:47	04:33	05:09	19:17	19:53	20:39
54°	03:37	04:26	05:05	19:22	20:00	20:49
56°	03:25	04:18	04:59	19:27	20:08	21:01
58°	03:10	04:09	04:53	19:33	20:17	21:14
S 60°	02:53	03:59	04:46	19:39	20:27	21:31

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	01:26	■	■	06:12	■	■
N 70°	00:54	03:55	■	06:46	05:15	■
68°	00:31	02:42	■	07:11	06:28	■
66°	00:13	02:06	04:48	07:30	07:06	05:59
64°	· · ·	01:41	03:38	07:46	07:32	07:09
62°	· · ·	01:21	03:03	07:59	07:53	07:45
60°	· · ·	01:05	02:38	08:10	08:10	08:11
N 58°	· · ·	00:51	02:18	08:20	08:24	08:32
56°	· · ·	00:39	02:02	08:29	08:37	08:49
54°	· · ·	00:29	01:48	08:36	08:47	09:03
52°	· · ·	00:20	01:35	08:43	08:57	09:16
50°	· · ·	00:12	01:25	08:49	09:06	09:27
45°	23:55	· · ·	01:02	09:03	09:24	09:50
N 40°	23:42	· · ·	00:45	09:14	09:39	10:09
35°	23:30	· · ·	00:30	09:23	09:52	10:25
30°	23:20	· · ·	00:17	09:32	10:03	10:38
20°	23:02	23:55	· · ·	09:46	10:22	11:02
N 10°	22:47	23:36	· · ·	09:59	10:39	11:22
0°	22:33	23:18	· · ·	10:11	10:55	11:41
S 10°	22:19	23:01	23:46	10:23	11:10	12:00
20°	22:04	22:42	23:25	10:36	11:27	12:21
30°	21:48	22:21	23:00	10:51	11:47	12:45
35°	21:38	22:09	22:45	11:00	11:59	12:59
40°	21:27	21:54	22:28	11:09	12:12	13:15
45°	21:14	21:37	22:07	11:21	12:28	13:35
S 50°	20:58	21:17	21:42	11:35	12:47	13:59
52°	20:51	21:07	21:30	11:42	12:56	14:11
54°	20:43	20:56	21:16	11:49	13:07	14:25
56°	20:34	20:44	20:59	11:58	13:18	14:41
58°	20:23	20:29	20:40	12:07	13:32	15:00
S 60°	20:12	20:12	20:16	12:18	13:48	15:23

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		75-57%
18	13:53	13:51	12:14	04:01	16:22		
19	13:48	13:45	12:14	04:44	17:06		
20	13:42	13:39	12:14	05:30	17:54		

February 21, 22, 23 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	151°10.07	144°44.58	N08°31.93	42°7.59	N26°6.07	80°53.28	N21°46.48	159°51.74	S05°49.71			Alpheratz	357°34.99 29°13.74
1	166°12.54	159°46.46	32.67	57°10.17	6.01	95°55.60	46.50	174°53.93	49.59			Ankaa	353°7.36 -42°10.36
2	181°15.00	174°48.34	33.41	72°12.75	5.95	110°57.92	46.53	189°56.11	49.48			Schedar	349°31.41 56°40.63
3	196°17.47	189°50.23	· · 34.15	87°15.33	· · 5.89	126°0.24	· · 46.56	204°58.30	· · 49.36			Diphda	348°47.44 -17°51.08
4	211°19.93	204°52.12	34.89	102°17.90	5.83	141°2.56	46.58	220°0.49	49.24			Achernar	335°20.42 -57°6.80
5	226°22.39	219°54.01	35.63	117°20.48	5.76	156°4.87	46.61	235°2.68	49.12			Hamal	327°51.25 23°34.90
6	241°24.86	234°55.91	N08°36.36	132°23.05	N26°5.70	171°7.19	N21°46.64	250°4.86	S05°49.00			Polaris	314°6.97 89°22.52
7	256°27.32	249°57.80	37.10	147°25.62	5.64	186°9.51	46.66	265°7.05	48.88			Acamar	315°11.79 -40°12.48
8	271°29.79	264°59.71	37.83	162°28.19	5.58	201°11.82	46.69	280°9.24	48.77			Menkar	314°6.12 4°11.23
9	286°32.25	280°1.61	· · 38.56	177°30.76	· · 5.52	216°14.14	· · 46.72	295°11.43	· · 48.65			Mirfak	308°28.19 49°57.20
10	301°34.72	295°3.52	39.29	192°33.33	5.46	231°16.46	46.74	310°13.61	48.53			Aldebaran	290°39.45 16°33.59
11	316°37.18	310°5.43	40.02	207°35.90	5.39	246°18.77	46.77	325°15.80	48.41			Rigel	281°3.66 -8°10.48
12	331°39.64	325°7.34	N08°40.75	222°38.46	N26°5.33	261°21.09	N21°46.80	340°17.99	S05°48.29			Capella	280°21.59 46°1.53
13	346°42.11	340°9.26	41.48	237°41.03	5.27	276°23.40	46.83	355°20.17	48.17			Bellatrix	278°22.65 6°22.29
14	1°44.57	355°11.18	42.20	252°43.59	5.21	291°25.72	46.85	10°22.36	48.05			Elnath	278°1.60 28°37.77
15	16°47.04	10°13.10	· · 42.92	267°46.15	· · 5.14	306°28.03	· · 46.88	25°24.55	· · 47.94			Alnilam	275°37.49 -1°11.24
16	31°49.50	25°15.03	43.65	282°48.71	5.08	321°30.35	46.91	40°26.74	47.82			Betelgeuse	270°51.82 7°24.65
17	46°51.96	40°16.96	44.37	297°51.27	5.02	336°32.66	46.93	55°28.92	47.70			Canopus	263°52.05 -52°42.75
18	61°54.43	55°18.89	N08°45.09	312°53.82	N26°4.95	351°34.98	N21°46.96	70°31.11	S05°47.58			Sirius	258°25.93 -16°45.18
19	76°56.89	70°20.83	45.81	327°56.38	4.89	6°37.29	46.99	85°33.30	47.46			Adhara	255°5.53 -29°0.54
20	91°59.36	85°22.77	46.52	342°58.93	4.83	21°39.60	47.02	100°35.48	47.34			Procyon	244°50.46 5°9.55
21	107°1.82	100°24.71	· · 47.24	358°1.48	· · 4.76	36°41.91	· · 47.04	115°37.67	· · 47.22			Pollux	243°16.87 27°57.92
22	122°4.29	115°26.66	47.95	13°4.03	4.70	51°44.23	47.07	130°39.86	47.11			Avior	234°14.15 -59°35.52
23	137°6.75	130°28.60	48.66	28°6.58	4.63	66°46.54	47.10	145°42.04	46.99			Suhail	222°45.83 -43°32.14
Mer.pass. 13:53		ν1.9' d0.7' m-4.85		ν2.6' d-0.1' m-0.50		ν2.3' d0.0' m-2.36		ν2.2' d-0.1' m1.12					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	152°9.21	145°30.56	N08°49.38	43°9.13	N26°4.57	81°48.85	N21°47.13	160°44.23	S05°46.87				
1	167°11.68	160°32.51	50.09	58°11.68	4.50	96°51.16	47.15	175°46.42	46.75				
2	182°14.14	175°34.47	50.79	73°14.22	4.44	111°53.47	47.18	190°48.60	46.63				
3	197°16.61	190°36.43	· · 51.50	88°16.76	· · 4.37	126°55.78	· · 47.21	205°50.79	· · 46.51				
4	212°19.07	205°38.40	52.21	103°19.31	4.31	141°58.09	47.24	220°52.98	46.39				
5	227°21.53	220°40.37	52.91	118°21.85	4.24	157°0.40	47.26	235°55.16	46.27				
6	242°24.00	235°42.34	N08°53.61	133°24.39	N26°4.18	172°2.71	N21°47.29	250°57.35	S05°46.16				
7	257°26.46	250°44.31	54.32	148°26.92	4.11	187°5.02	47.32	265°59.54	46.04				
8	272°28.93	265°46.29	55.02	163°29.46	4.05	202°7.33	47.35	281°1.72	45.92				
9	287°31.39	280°48.27	· · 55.71	178°31.99	· · 3.98	217°9.64	· · 47.38	296°3.91	· · 45.80				
10	302°33.86	295°50.25	56.41	193°34.53	3.91	232°11.94	47.40	311°6.10	45.68				
11	317°36.32	310°52.24	57.11	208°37.06	3.85	247°14.25	47.43	326°8.28	45.56				
12	332°38.78	325°54.23	N08°57.80	223°39.59	N26°3.78	262°16.56	N21°47.46	341°10.47	S05°45.44				
13	347°41.25	340°56.23	58.49	238°42.12	3.71	277°18.86	47.49	356°12.66	45.32				
14	2°43.71	355°58.22	59.19	253°44.64	3.64	292°21.17	47.52	11°14.84	45.21				
15	17°46.18	11°0.22	08°59.88	268°47.17	· · 3.58	307°23.48	· · 47.54	26°17.03	· · 45.09				
16	32°48.64	26°2.23	09°0.56	283°49.69	3.51	322°25.78	47.57	41°19.21	44.97				
17	47°51.10	41°4.24	1.25	298°52.22	3.44	337°28.09	47.60	56°21.40	44.85				
18	62°53.57	56°6.25	N09°1.94	313°54.74	N26°3.37	352°30.39	N21°47.63	71°23.59	S05°44.73				
19	77°56.03	71°8.26	2.62	328°57.26	3.30	7°32.70	47.66	86°25.77	44.61				
20	92°58.50	86°10.28	3.31	343°59.78	3.24	22°35.00	47.69	101°27.96	44.49				
21	108°0.96	101°12.30	· · 3.99	359°2.30	· · 3.17	37°37.31	· · 47.71	116°30.15	· · 44.37				
22	123°3.43	116°14.32	4.67	14°4.81	3.10	52°39.61	47.74	131°32.33	44.25				
23	138°5.89	131°16.35	5.35	29°7.33	3.03	67°41.91	47.77	146°34.52	44.13				
Mer.pass. 13:49		ν2.0' d0.7' m-4.85		ν2.5' d-0.1' m-0.47		ν2.3' d0.0' m-2.35		ν2.2' d-0.1' m1.12					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	153°8.35	146°18.38	N09°6.02	44°9.84	N26°2.96	82°44.22	N21°47.80	161°36.70	S05°44.02				
1	168°10.82	161°20.41	6.70	59°12.35	2.89	97°46.52	47.83	176°38.89	43.90				
2	183°13.28	176°22.45	7.37	74°14.86	2.82	112°48.82	47.86	191°41.07	43.78				
3	198°15.75	191°24.49	· · 8.05	89°17.37	· · 2.75	127°51.12	· · 47.88	206°43.26	· · 43.66				
4	213°18.21	206°26.53	8.72	104°19.88	2.68	142°53.43	47.91	221°45.45	43.54				
5	228°20.68	221°28.57	9.39	119°22.38	2.61	157°55.73	47.94	236°47.63	43.42				
6	243°23.14	236°30.62	N09°10.05	134°24.88	N26°2.54	172°58.03	N21°47.97	251°49.82	S05°43.30				
7	258°25.60	251°32.68	10.72	149°27.39	2.47	188°0.33	48.00	266°52.00	43.18				
8	273°28.07	266°34.73	11.39	164°29.89	2.40	203°2.63	48.03	281°54.19	43.06				
9	288°30.53	281°36.79	· · 12.05	179°32.39	· · 2.33	218°4.93	· · 48.06	296°56.38	· · 42.94				
10	303°33.00	296°38.86	12.71	194°34.89	2.26	233°7.23	48.09	311°58.56	42.83				
11	318°35.46	311°40.92	13.37	209°37.38	2.19	248°9.53	48.11	327°0.75	42.71				
12	333°37.92	326°42.99	N09°14.03	224°39.88	N26°2.11	263°11.83	N21°48.14	342°2.93	S05°42.59				
13	348°40.39	341°45.07	14.69	239°42.37	2.04	278°14.12	48.17	357°5.12	42.47				
14	3°42.85	356°47.14	15.35	254°44.87	1.97	293°16.42	48.20	12°7.30	42.35				
15	18°45.32	11°49.22	· · 16.00	269°47.36	· · 1.90	308°18.72	· · 48.23	27°9.49	· · 42.23				
16	33°47.78	26°51.31	16.66	284°49.85	1.83	323°21.02	48.26	42°11.67	42.11				
17	48°50.25	41°53.39	17.31	299°52.34	1.75	338°23.32	48.29	57°13.86	41.99				
18	63°52.71	56°55.48	N09°17.96	314°54.82	N26°1.68	353°25.61	N21°48.32	72°16.04	S05°41.87				
19	78°55.17	71°57.57	18.61	329°57.31	1.61	8°27.91	48.35	87°18.23	41.75				
20	93°57.64	86°59.67	19.25	344°59.79	1.54	23°30.20	48.38	102°20.42	41.63				
21	109°0.10	102°1.77	· · 19.90	0°2.28	· · 1.46	38°32.50	· · 48.41	117°22.60	· · 41.51				
22	124°2.57	117°3.87	20.54	15°4.76	1.39	53°34.80	48.44	132°24.79	41.40				
23	139°5.03	132°5.98	21.19	30°7.24	1.32	68°37.09	48.46	147°26.97	41.28				
Mer.pass. 13:45		ν2.0' d0.7' m-4.85		ν2.5' d-0.1' m-0.44		ν2.3' d0.0' m-2.34		ν2.2' d-0.1' m1.12					
											Feb 21 Fri	SHA	Mer.pass
											Venus	353°34.51	14:19
											Mars	250°57.51	21:08
											Jupiter	289°43.21	18:34
											Saturn	8°41.66	13:19
											Feb 22 Sat	SHA	Mer.pass
											Venus	353°21.34	14:16
											Mars	250°59.92	21:04
											Jupiter	289°39.63	18:30
											Saturn	8°35.02	13:15
											Feb 23 Sun	SHA	Mer.pass
											Venus	353°10.02	14:13
											Mars	251°1.48	21:00
											Jupiter	289°35.86	18:26
											Saturn	8°28.35	13:12
											Horizontal parallax		
											Venus:	0.4	
											Mars:	0.2	

h		Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°36.17	S10°32.87	268°26.54	10.5'	S26°1.29	6.5'	54.8'	
1	191°36.25	31.97	282°56.07	10.4'	26°7.79	6.4'	54.8'	
2	206°36.32	31.06	297°25.51	10.4'	26°14.17	6.3'	54.9'	
3	221°36.39	· · 30.16	311°54.87	10.3'	26°20.43	6.1'	54.9'	
4	236°36.47	29.25	326°24.15	10.2'	26°26.56	6.0'	54.9'	
5	251°36.54	28.34	340°53.34	10.1'	26°32.57	5.9'	54.9'	
6	266°36.62	S10°27.44	355°22.44	10.0'	S26°38.46	5.8'	54.9'	
7	281°36.69	26.53	9°51.46	9.9'	26°44.22	5.6'	55.0'	
8	296°36.76	25.62	24°20.39	9.9'	26°49.86	5.5'	55.0'	
9	311°36.84	· · 24.72	38°49.25	9.8'	26°55.37	5.4'	55.0'	
10	326°36.91	23.81	53°18.01	9.7'	27°0.75	5.3'	55.0'	
11	341°36.99	22.90	67°46.70	9.6'	27°6.00	5.1'	55.1'	
12	356°37.07	S10°21.99	82°15.30	9.5'	S27°11.13	5.0'	55.1'	
13	11°37.14	21.08	96°43.82	9.4'	27°16.12	4.9'	55.1'	
14	26°37.22	20.18	111°12.26	9.4'	27°20.97	4.7'	55.1'	
15	41°37.30	· · 19.27	125°40.62	9.3'	27°25.70	4.6'	55.2'	
16	56°37.37	18.36	140°8.90	9.2'	27°30.29	4.5'	55.2'	
17	71°37.45	17.45	154°37.11	9.1'	27°34.74	4.3'	55.2'	
18	86°37.53	S10°16.54	169°5.23	9.0'	S27°39.06	4.2'	55.2'	
19	101°37.60	15.63	183°33.27	9.0'	27°43.24	4.0'	55.3'	
20	116°37.68	14.72	198°1.24	8.9'	27°47.28	3.9'	55.3'	
21	131°37.76	· · 13.81	212°29.14	8.8'	27°51.19	3.8'	55.3'	
22	146°37.84	12.90	226°56.95	8.7'	27°54.95	3.6'	55.3'	
23	161°37.92	11.98	241°24.70	8.7'	27°58.57	3.5'	55.4'	
SD = 16.2'		$d = -0.9'$	SD = 15.0'					
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°38.00	S10°11.07	255°52.37	8.6'	S28°2.05	3.3'	55.4'	
1	191°38.08	10.16	270°19.96	8.5'	28°5.39	3.2'	55.4'	
2	206°38.16	9.25	284°47.49	8.5'	28°8.58	3.0'	55.4'	
3	221°38.23	· · 8.34	299°14.95	8.4'	28°11.63	2.9'	55.5'	
4	236°38.31	7.42	313°42.33	8.3'	28°14.54	2.8'	55.5'	
5	251°38.40	6.51	328°9.65	8.3'	28°17.29	2.6'	55.5'	
6	266°38.48	S10°5.60	342°36.90	8.2'	S28°19.90	2.5'	55.6'	
7	281°38.56	4.68	357°4.09	8.1'	28°22.36	2.3'	55.6'	
8	296°38.64	3.77	11°31.21	8.1'	28°24.67	2.2'	55.6'	
9	311°38.72	· · 2.86	25°58.26	8.0'	28°26.84	2.0'	55.6'	
10	326°38.80	1.94	40°25.26	7.9'	28°28.85	1.9'	55.7'	
11	341°38.88	1.03	54°52.19	7.9'	28°30.71	1.7'	55.7'	
12	356°38.96	S10°0.11	69°19.06	7.8'	S28°32.41	1.6'	55.7'	
13	11°39.05	09°59.20	83°45.87	7.8'	28°33.97	1.4'	55.8'	
14	26°39.13	58.28	98°12.63	7.7'	28°35.37	1.2'	55.8'	
15	41°39.21	· · 57.37	112°39.33	7.6'	28°36.61	1.1'	55.8'	
16	56°39.30	56.45	127°5.97	7.6'	28°37.70	0.9'	55.9'	
17	71°39.38	55.54	141°32.57	7.5'	28°38.64	0.8'	55.9'	
18	86°39.46	S09°54.62	155°59.11	7.5'	S28°39.41	0.6'	55.9'	
19	101°39.55	53.70	170°25.60	7.4'	28°40.03	0.5'	56.0'	
20	116°39.63	52.79	184°52.04	7.4'	28°40.49	0.3'	56.0'	
21	131°39.72	· · 51.87	199°18.43	7.3'	28°40.80	0.1'	56.0'	
22	146°39.80	50.95	213°44.78	7.3'	28°40.94	-0.0'	56.0'	
23	161°39.89	50.03	228°11.08	7.3'	28°40.92	-0.2'	56.1'	
SD = 16.2'		$d = -0.9'$	SD = 15.1'					
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°39.97	S09°49.12	242°37.34	7.2'	S28°40.75	-0.3'	56.1'	
1	191°40.06	48.20	257°3.56	7.2'	28°40.41	-0.5'	56.1'	
2	206°40.14	47.28	271°29.74	7.1'	28°39.91	-0.7'	56.2'	
3	221°40.23	· · 46.36	285°55.88	7.1'	28°39.24	-0.8'	56.2'	
4	236°40.31	45.44	300°21.98	7.1'	28°38.42	-1.0'	56.2'	
5	251°40.40	44.52	314°48.05	7.0'	28°37.43	-1.2'	56.3'	
6	266°40.49	S09°43.60	329°14.08	7.0'	S28°36.28	-1.3'	56.3'	
7	281°40.57	42.68	343°40.09	7.0'	28°34.96	-1.5'	56.3'	
8	296°40.66	41.76	358°6.06	6.9'	28°33.48	-1.6'	56.4'	
9	311°40.75	· · 40.84	12°32.00	6.9'	28°31.84	-1.8'	56.4'	
10	326°40.84	39.92	26°57.92	6.9'	28°30.03	-2.0'	56.4'	
11	341°40.93	39.00	41°23.81	6.9'	28°28.05	-2.1'	56.5'	
12	356°41.01	S09°38.08	55°49.68	6.8'	S28°25.91	-2.3'	56.5'	
13	11°41.10	37.16	70°15.53	6.8'	28°23.60	-2.5'	56.5'	
14	26°41.19	36.24	84°41.36	6.8'	28°21.13	-2.6'	56.6'	
15	41°41.28	· · 35.32	99°7.17	6.8'	28°18.49	-2.8'	56.6'	
16	56°41.37	34.39	113°32.96	6.8'	28°15.68	-3.0'	56.7'	
17	71°41.46	33.47	127°58.73	6.8'	28°12.71	-3.1'	56.7'	
18	86°41.55	S09°32.55	142°24.50	6.8'	S28°9.56	-3.3'	56.7'	
19	101°41.64	31.63	156°50.25	6.7'	28°6.25	-3.5'	56.8'	
20	116°41.73	30.70	171°15.99	6.7'	28°2.78	-3.6'	56.8'	
21	131°41.82	· · 29.78	185°41.72	6.7'	27°59.13	-3.8'	56.8'	
22	146°41.91	28.86	200°7.45	6.7'	27°55.32	-4.0'	56.9'	
23	161°42.00	27.93	214°33.17	6.7'	27°51.34	-4.1'	56.9'	
SD = 16.2'		$d = -0.9'$	SD = 15.3'					

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:42	07:00	08:13	16:16	17:28	18:47
N 70°	05:44	06:54	07:59	16:29	17:34	18:45
68°	05:45	06:49	07:48	16:41	17:39	18:44
66°	05:46	06:45	07:38	16:50	17:43	18:43
64°	05:47	06:42	07:31	16:57	17:47	18:42
62°	05:47	06:38	07:24	17:04	17:50	18:41
60°	05:47	06:35	07:18	17:10	17:53	18:41
N 58°	05:47	06:33	07:13	17:15	17:55	18:41
56°	05:47	06:30	07:08	17:19	17:57	18:41
54°	05:47	06:28	07:04	17:24	18:00	18:41
52°	05:47	06:26	07:00	17:27	18:02	18:41
50°	05:47	06:24	06:57	17:31	18:03	18:41
45°	05:46	06:20	06:50	17:38	18:08	18:42
N 40°	05:44	06:16	06:43	17:44	18:12	18:43
35°	05:43	06:12	06:38	17:49	18:15	18:44
30°	05:41	06:09	06:33	17:54	18:18	18:46
20°	05:37	06:02	06:25	18:02	18:25	18:50
N 10°	05:31	05:56	06:17	18:10	18:31	18:56
0°	05:25	05:49	06:10	18:17	18:38	19:02
S 10°	05:17	05:41	06:03	18:24	18:45	19:10
20°	05:06	05:32	05:55	18:32	18:54	19:20
30°	04:52	05:21	05:46	18:40	19:05	19:34
35°	04:43	05:14	05:41	18:46	19:12	19:43
40°	04:33	05:06	05:35	18:51	19:20	19:53
45°	04:19	04:57	05:28	18:58	19:29	20:06
S 50°	04:02	04:45	05:19	19:07	19:41	20:23
52°	03:54	04:39	05:15	19:11	19:46	20:31
54°	03:45	04:33	05:11	19:15	19:53	20:40
56°	03:34	04:25	05:06	19:20	20:00	20:51
58°	03:21	04:17	05:00	19:25	20:08	21:04
S 60°	03:05	04:08	04:54	19:31	20:17	21:19

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	██	██	██	██
62°	04:59	██	██	07:32	██	██
60°	04:15	05:48	06:51	08:16	08:34	09:27
N 58°	03:46	05:07	06:08	08:46	09:14	10:09
56°	03:24	04:40	05:40	09:08	09:42	10:38
54°	03:05	04:18	05:18	09:27	10:04	11:00
52°	02:50	04:00	04:59	09:43	10:22	11:18
50°	02:37	03:45	04:44	09:56	10:37	11:34
45°	02:10	03:14	04:12	10:24	11:08	12:05
N 40°	01:48	02:50	03:48	10:46	11:32	12:29
35°	01:30	02:31	03:28	11:04	11:52	12:49
30°	01:15	02:14	03:11	11:20	12:09	13:06
20°	00:49	01:46	02:42	11:47	12:38	13:34
N 10°	00:27	01:22	02:17	12:10	13:02	13:59
0°	00:07	00:59	01:54	12:32	13:25	14:22
S 10°	· · ·	00:37	01:31	12:53	13:48	14:44
20°	· · ·	00:13	01:07	13:16	14:13	15:08
30°	23:45	· · ·	00:38	13:43	14:41	15:37
35°	23:29	· · ·	00:21	13:59	14:58	15:53
40°	23:09	· · ·	00:01	14:18	15:18	16:13
45°	22:46	23:37	· · ·	14:41	15:42	16:36
S 50°	22:17	23:06	· · ·	15:10	16:13	17:06
52°	22:03	22:50	23:55	15:24	16:29	17:21
54°	21:46	22:32	23:38	15:40	16:47	17:38
56°	21:26	22:10	23:18	16:00	17:09	17:59
58°	21:01	21:42	22:52	16:25	17:37	18:25
S 60°	20:27	21:01	22:17	16:58	18:19	19:00

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 23-25 48-28%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
21	13:35	13:32	12:14	06:19	18:45	
22	13:28	13:24	12:13	07:12	19:40	
23	13:20	13:16	12:13	08:08	20:36	

February 24, 25, 26 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	154°7.49		147°8.09	N09°21.83	45°9.72	N26°1.24	83°39.39	N21°48.49	162°29.16	S05°41.16
1	169°9.96		162°10.20	22.47	60°12.19	1.17	98°41.68	48.52	177°31.34	41.04
2	184°12.42		177°12.32	23.11	75°14.67	1.09	113°43.97	48.55	192°33.53	40.92
3	199°14.89		192°14.44	•• 23.74	90°17.14	•• 1.02	128°46.27	•• 48.58	207°35.71	•• 40.80
4	214°17.35		207°16.56	24.38	105°19.62	0.95	143°48.56	48.61	222°37.90	40.68
5	229°19.82		222°18.69	25.01	120°22.09	0.87	158°50.85	48.64	237°40.08	40.56
6	244°22.28		237°20.82	N09°25.64	135°24.56	N26°0.80	173°53.15	N21°48.67	252°42.27	S05°40.44
7	259°24.74		252°22.96	26.27	150°27.03	0.72	188°55.44	48.70	267°44.45	40.32
8	274°27.21		267°25.09	26.90	165°29.49	0.65	203°57.73	48.73	282°46.64	40.20
9	289°29.67		282°27.23	•• 27.53	180°31.96	•• 0.57	219°0.02	•• 48.76	297°48.82	•• 40.08
10	304°32.14		297°29.38	28.16	195°34.42	0.50	234°2.31	48.79	312°51.01	39.96
11	319°34.60		312°31.52	28.78	210°36.89	0.42	249°4.61	48.82	327°53.19	39.84
12	334°37.06		327°33.67	N09°29.40	225°39.35	N26°0.34	264°6.90	N21°48.85	342°55.38	S05°39.73
13	349°39.53		342°35.83	30.02	240°41.81	0.27	279°9.19	48.88	357°57.56	39.61
14	4°41.99		357°37.99	30.64	255°44.27	0.19	294°11.48	48.91	12°59.74	39.49
15	19°44.46		12°40.15	•• 31.26	270°46.72	•• 0.12	309°13.77	•• 48.94	28°1.93	•• 39.37
16	34°46.92		27°42.31	31.88	285°49.18	0.04	324°16.06	48.97	43°4.11	39.25
17	49°49.39		42°44.48	32.49	300°51.63	25°59.96	339°18.34	49.00	58°6.30	39.13
18	64°51.85		57°46.65	N09°33.11	315°54.09	N25°59.89	354°20.63	N21°49.03	73°8.48	S05°39.01
19	79°54.31		72°48.83	33.72	330°56.54	59.81	9°22.92	49.06	88°10.67	38.89
20	94°56.78		87°51.00	34.33	345°58.99	59.73	24°25.21	49.09	103°12.85	38.77
21	109°59.24		102°53.19	•• 34.93	1°1.44	•• 59.65	39°27.50	•• 49.12	118°15.04	•• 38.65
22	125°1.71		117°55.37	35.54	16°3.88	59.58	54°29.78	49.15	133°17.22	38.53
23	140°4.17		132°57.56	36.15	31°6.33	59.50	69°32.07	49.18	148°19.41	38.41
Mer.pass. 13:41										
v2.1' d0.6' m-4.84										
v2.5' d-0.1' m-0.42										
v2.3' d0.0' m-2.34										
v2.2' d-0.1' m1.12										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	155°6.63		147°59.75	N09°36.75	46°8.78	N25°59.42	84°34.36	N21°49.21	163°21.59	S05°38.29
1	170°9.10		163°1.95	37.35	61°11.22	59.34	99°36.64	49.24	178°23.77	38.17
2	185°11.56		178°4.15	37.95	76°13.66	59.26	114°38.93	49.27	193°25.96	38.05
3	200°14.03		193°6.35	•• 38.55	91°16.10	•• 59.19	129°41.21	•• 49.30	208°28.14	•• 37.93
4	215°16.49		208°8.55	39.15	106°18.54	59.11	144°43.50	49.33	223°30.33	37.81
5	230°18.96		223°10.76	39.74	121°20.98	59.03	159°45.78	49.36	238°32.51	37.69
6	245°21.42		238°12.98	N09°40.34	136°23.41	N25°58.95	174°48.07	N21°49.39	253°34.70	S05°37.58
7	260°23.88		253°15.19	40.93	151°25.85	58.87	189°50.35	49.42	268°36.88	37.46
8	275°26.35		268°17.41	41.52	166°28.28	58.79	204°52.64	49.46	283°39.06	37.34
9	290°28.81		283°19.64	•• 42.11	181°30.71	•• 58.71	219°54.92	•• 49.49	298°41.25	•• 37.22
10	305°31.28		298°21.86	42.70	196°33.14	58.63	234°57.20	49.52	313°43.43	37.10
11	320°33.74		313°24.09	43.28	211°35.57	58.55	249°59.49	49.55	328°45.62	36.98
12	335°36.20		328°26.33	N09°43.87	226°38.00	N25°58.47	265°1.77	N21°49.58	343°47.80	S05°36.86
13	350°38.67		343°28.56	44.45	241°40.43	58.39	280°4.05	49.61	358°49.99	36.74
14	5°41.13		358°30.81	45.03	256°42.85	58.31	295°6.33	49.64	13°52.17	36.62
15	20°43.60		13°33.05	•• 45.61	271°45.27	•• 58.23	310°8.61	•• 49.67	28°54.35	•• 36.50
16	35°46.06		28°35.30	46.19	286°47.70	58.15	325°10.90	49.70	43°56.54	36.38
17	50°48.53		43°37.55	46.76	301°50.12	58.07	340°13.18	49.73	58°58.72	36.26
18	65°50.99		58°39.80	N09°47.34	316°52.54	N25°57.99	355°15.46	N21°49.76	74°0.91	S05°36.14
19	80°53.45		73°42.06	47.91	331°54.95	57.91	10°17.74	49.79	89°3.09	36.02
20	95°55.92		88°44.32	48.48	346°57.37	57.82	25°20.02	49.83	104°5.27	35.90
21	110°58.38		103°46.59	•• 49.05	1°59.79	•• 57.74	40°22.30	•• 49.86	119°7.46	•• 35.78
22	126°0.85		118°48.86	49.61	17°2.20	57.66	55°24.58	49.89	134°9.64	35.66
23	141°3.31		133°51.13	50.18	32°4.61	57.58	70°26.85	49.92	149°11.82	35.54
Mer.pass. 13:37										
v2.2' d0.6' m-4.83										
v2.4' d-0.1' m-0.39										
v2.3' d0.0' m-2.33										
v2.2' d-0.1' m1.11										
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	156°5.77		148°53.41	N09°50.74	47°7.02	N25°57.50	85°29.13	N21°49.95	164°14.01	S05°35.42
1	171°8.24		163°55.69	51.31	62°9.43	57.41	100°31.41	49.98	179°16.19	35.30
2	186°10.70		178°57.97	51.87	77°11.84	57.33	115°33.69	50.01	194°18.38	35.18
3	201°13.17		194°0.26	•• 52.43	92°14.25	•• 57.25	130°35.97	•• 50.04	209°20.56	•• 35.06
4	216°15.63		209°2.55	52.98	107°16.65	57.17	145°38.24	50.08	224°22.74	34.94
5	231°18.09		224°4.84	53.54	122°19.06	57.08	160°40.52	50.11	239°24.93	34.82
6	246°20.56		239°7.14	N09°54.09	137°21.46	N25°57.00	175°42.80	N21°50.14	254°27.11	S05°34.70
7	261°23.02		254°9.44	54.64	152°23.86	56.92	190°45.07	50.17	269°29.29	34.58
8	276°25.49		269°11.74	55.19	167°26.26	56.83	205°47.35	50.20	284°31.48	34.46
9	291°27.95		284°14.05	•• 55.74	182°28.66	•• 56.75	220°49.62	•• 50.23	299°33.66	•• 34.34
10	306°30.42		299°16.36	56.29	197°31.06	56.66	235°51.90	50.26	314°35.84	34.23
11	321°32.88		314°18.68	56.83	212°33.45	56.58	250°54.17	50.30	329°38.03	34.11
12	336°35.34		329°21.00	N09°57.38	227°35.85	N25°56.50	265°56.45	N21°50.33	344°40.21	S05°33.99
13	351°37.81		344°23.32	57.92	242°38.24	56.41	280°58.72	50.36	359°42.39	33.87
14	6°40.27		359°25.65	58.46	257°40.63	56.33	296°0.99	50.39	14°44.58	33.75
15	21°42.74		14°27.97	•• 59.00	272°43.02	•• 56.24	311°3.27	•• 50.42	29°46.76	•• 33.63
16	36°45.20		29°30.31	09°59.53	287°45.41	56.16	326°5.54	50.45	44°48.94	33.51
17	51°47.66		44°32.64	10°0.07	302°47.80	56.07	341°7.81	50.49	59°51.13	33.39
18	66°50.13		59°34.98	N10°0.60	317°50.18	N25°55.99	356°10.09	N21°50.52	74°53.31	S05°33.27
19	81°52.59		74°37.33	1.13	332°52.57	55.90	11°12.36	50.55	89°55.49	33.15
20	96°55.06		89°39.68	1.66	347°54.95	55.82	26°14.63	50.58	104°57.68	33.03
21	111°57.52		104°42.03	•• 2.19	2°57.33	•• 55.73	41°16.90	•• 50.61	119°59.86	•• 32.91
22	126°59.98		119°44.38	2.72	17°59.71	55.64	56°19.17	50.65	135°2.04	32.79
23	142°2.45		134°46.74	3.24	33°2.09	55.56	71°21.44	50.68	150°4.23	32.67
Mer.pass. 13:33										
v2.3' d0.6' m-4.82										
v2.4' d-0.1' m-0.36										
v2.3' d0.0' m-2.32										
v2.2' d-0.1' m1.11										

	SHA	Dec
Alpheratz	357°34.99	29°13.73
Ankaa	353°7.36	-42°10.34
Schedar	349°31.41	56°40.62
Diphda	348°47.44	-17°51.08
Achernar	335°20.43	-57°6.78
Hamal	327°51.26	23°34.90
Polaris	314°8.27	89°22.52
Acamar	315°11.80	-40°12.47
Menkar	314°6.12	4°11.23
Mirfak	308°28.21	49°57.20
Aldebaran	290°39.45	-16°33.59
Rigel	281°3.67	-8°10.48
Capella	280°21.60	46°1.54
Bellatrix	278°22.66	6°22.29
Elnath	278°1.61	28°37.77
Alnilam	275°37.50	-1°11.24
Betelgeuse	270°51.82	7°24.65
Canopus	263°52.07	-52°42.75
Sirius	258°25.94	-16°45.19
Adhara	255°5.54	-29°0.55
Procyon	244°50.46	5°9.55
Pollux	243°16.87	27°57.92
Avior	234°14.17	-59°35.53
Suhail	222°45.83	-43°32.16
Miaplacidus	221°37.43	-69°49.29
Alphard	217°47.33	-8°46.17


h		Sun		Moon				
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		176°42.09	S09°27.01	228°58.89	6.7'	S27°47.19	-4.3'	56.9'
1		191°42.19	26.08	243°24.61	6.7'	27°42.87	-4.5'	57.0'
2		206°42.28	25.16	257°50.32	6.7'	27°38.39	-4.7'	57.0'
3		221°42.37	· · 24.23	272°16.04	6.7'	27°33.74	-4.8'	57.0'
4		236°42.46	23.31	286°41.76	6.7'	27°28.92	-5.0'	57.1'
5		251°42.55	22.38	301°7.49	6.7'	27°23.93	-5.2'	57.1'
6		266°42.65	S09°21.46	315°33.22	6.7'	S27°18.78	-5.3'	57.2'
7		281°42.74	20.53	329°58.96	6.8'	27°13.46	-5.5'	57.2'
8		296°42.83	19.61	344°24.71	6.8'	27°7.97	-5.7'	57.2'
9		311°42.93	· · 18.68	358°50.47	6.8'	27°2.31	-5.8'	57.3'
10		326°43.02	17.75	13°16.25	6.8'	26°56.49	-6.0'	57.3'
11		341°43.12	16.83	27°42.03	6.8'	26°50.50	-6.2'	57.3'
12		356°43.21	S09°15.90	42°7.84	6.8'	S26°44.35	-6.3'	57.4'
13		11°43.30	14.97	56°33.66	6.8'	26°38.03	-6.5'	57.4'
14		26°43.40	14.04	70°59.50	6.9'	26°31.54	-6.6'	57.4'
15		41°43.49	· · 13.12	85°25.36	6.9'	26°24.89	-6.8'	57.5'
16		56°43.59	12.19	99°51.24	6.9'	26°18.08	-7.0'	57.5'
17		71°43.69	11.26	114°17.14	6.9'	26°11.10	-7.1'	57.6'
18		86°43.78	S09°10.33	128°43.07	7.0'	S26°3.96	-7.3'	57.6'
19		101°43.88	9.40	143°9.02	7.0'	25°56.65	-7.5'	57.6'
20		116°43.97	8.47	157°35.00	7.0'	25°49.19	-7.6'	57.7'
21		131°44.07	· · 7.54	172°1.01	7.0'	25°41.56	-7.8'	57.7'
22		146°44.17	6.61	186°27.04	7.1'	25°33.77	-8.0'	57.7'
23		161°44.26	5.68	200°53.11	7.1'	25°25.81	-8.1'	57.8'
		SD = 16.2' d = -0.9'		SD = 15.5'				

Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		176°44.36	S09°4.75	215°19.21	7.1'	S25°17.70	-8.3'	57.8'
1		191°44.46	3.82	229°45.34	7.2'	25°9.43	-8.4'	57.9'
2		206°44.56	2.89	244°11.50	7.2'	25°1.00	-8.6'	57.9'
3		221°44.65	· · 1.96	258°37.70	7.2'	24°52.41	-8.7'	57.9'
4		236°44.75	1.03	273°3.94	7.3'	24°43.66	-8.9'	58.0'
5		251°44.85	09°0.10	287°30.21	7.3'	24°34.75	-9.1'	58.0'
6		266°44.95	S08°59.17	301°56.52	7.3'	S24°25.69	-9.2'	58.0'
7		281°45.05	58.24	316°22.87	7.4'	24°16.48	-9.4'	58.1'
8		296°45.15	57.31	330°49.26	7.4'	24°7.11	-9.5'	58.1'
9		311°45.25	· · 56.37	345°15.69	7.5'	23°57.58	-9.7'	58.1'
10		326°45.35	55.44	359°42.16	7.5'	23°47.91	-9.8'	58.2'
11		341°45.45	54.51	14°8.68	7.6'	23°38.08	-10.0'	58.2'
12		356°45.55	S08°53.58	28°35.23	7.6'	S23°28.10	-10.1'	58.3'
13		11°45.65	52.64	43°1.84	7.6'	23°17.97	-10.3'	58.3'
14		26°45.75	51.71	57°28.48	7.7'	23°7.69	-10.4'	58.3'
15		41°45.85	· · 50.78	71°55.18	7.7'	22°57.26	-10.6'	58.4'
16		56°45.95	49.84	86°21.91	7.8'	22°46.69	-10.7'	58.4'
17		71°46.05	48.91	100°48.70	7.8'	22°35.97	-10.9'	58.4'
18		86°46.16	S08°47.97	115°15.53	7.9'	S22°25.10	-11.0'	58.5'
19		101°46.26	47.04	129°42.41	7.9'	22°14.09	-11.2'	58.5'
20		116°46.36	46.11	144°9.34	8.0'	22°2.93	-11.3'	58.5'
21		131°46.46	· · 45.17	158°36.32	8.0'	21°51.64	-11.4'	58.6'
22		146°46.56	44.24	173°3.35	8.1'	21°40.20	-11.6'	58.6'
23		161°46.67	43.30	187°30.42	8.1'	21°28.63	-11.7'	58.6'
		SD = 16.2' d = -0.9'		SD = 15.8'				

Wed		GHA	Dec	GHA	ν	Dec	d	HP
0		176°46.77	S08°42.36	201°57.55	8.2'	S21°16.91	-11.9'	58.7'
1		191°46.87	41.43	216°24.73	8.2'	21°5.06	-12.0'	58.7'
2		206°46.98	40.49	230°51.96	8.3'	20°53.07	-12.1'	58.7'
3		221°47.08	· · 39.56	245°19.24	8.3'	20°40.95	-12.3'	58.8'
4		236°47.19	38.62	259°46.57	8.4'	20°28.69	-12.4'	58.8'
5		251°47.29	37.68	274°13.95	8.4'	20°16.30	-12.5'	58.8'
6		266°47.39	S08°36.75	288°41.39	8.5'	S20°3.78	-12.7'	58.9'
7		281°47.50	35.81	303°8.88	8.5'	19°51.13	-12.8'	58.9'
8		296°47.60	34.87	317°36.41	8.6'	19°38.35	-12.9'	58.9'
9		311°47.71	· · 33.93	332°4.00	8.6'	19°25.44	-13.0'	59.0'
10		326°47.82	33.00	346°31.65	8.7'	19°12.41	-13.2'	59.0'
11		341°47.92	32.06	0°59.34	8.7'	18°59.25	-13.3'	59.0'
12		356°48.03	S08°31.12	15°27.09	8.8'	S18°45.97	-13.4'	59.1'
13		11°48.13	30.18	29°54.89	8.9'	18°32.56	-13.5'	59.1'
14		26°48.24	29.24	44°22.74	8.9'	18°19.04	-13.6'	59.1'
15		41°48.35	· · 28.30	58°50.64	9.0'	18°5.40	-13.8'	59.2'
16		56°48.45	27.37	73°18.60	9.0'	17°51.64	-13.9'	59.2'
17		71°48.56	26.43	87°46.60	9.1'	17°37.76	-14.0'	59.2'
18		86°48.67	S08°25.49	102°14.66	9.1'	S17°23.77	-14.1'	59.3'
19		101°48.78	24.55	116°42.77	9.2'	17°9.66	-14.2'	59.3'
20		116°48.88	23.61	131°10.93	9.2'	16°55.44	-14.3'	59.3'
21		131°48.99	· · 22.67	145°39.14	9.3'	16°41.12	-14.4'	59.4'
22		146°49.10	21.73	160°7.40	9.3'	16°26.68	-14.5'	59.4'
23		161°49.21	20.79	174°35.71	9.4'	16°12.14	-14.6'	59.4'
		SD = 16.1' d = -0.9'		SD = 16.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:28	06:46	07:57	16:31	17:42	19:00
N 70°	05:31	06:42	07:45	16:43	17:46	18:57
68°	05:34	06:38	07:35	16:52	17:50	18:54
66°	05:36	06:35	07:27	17:00	17:53	18:52
64°	05:37	06:32	07:20	17:07	17:55	18:50
62°	05:38	06:29	07:15	17:13	17:58	18:49
60°	05:39	06:27	07:09	17:18	18:00	18:48
N 58°	05:40	06:25	07:05	17:22	18:02	18:47
56°	05:40	06:23	07:01	17:26	18:04	18:47
54°	05:41	06:22	06:57	17:30	18:05	18:46
52°	05:41	06:20	06:54	17:33	18:07	18:46
50°	05:41	06:18	06:51	17:36	18:08	18:46
45°	05:41	06:15	06:45	17:42	18:12	18:46
N 40°	05:40	06:12	06:39	17:47	18:15	18:46
35°	05:39	06:09	06:34	17:52	18:18	18:47
30°	05:38	06:06	06:30	17:56	18:20	18:48
20°	05:35	06:00	06:23	18:04	18:26	18:52
N 10°	05:30	05:55	06:16	18:10	18:31	18:56
0°	05:24	05:49	06:10	18:16	18:37	19:01
S 10°	05:17	05:42	06:03	18:23	18:44	19:09
20°	05:08	05:34	05:56	18:29	18:52	19:18
30°	04:55	05:24	05:48	18:37	19:02	19:30
35°	04:47	05:17	05:43	18:42	19:08	19:39
40°	04:37	05:10	05:38	18:47	19:15	19:48
45°	04:24	05:01	05:32	18:53	19:24	20:00
S 50°	04:09	04:50	05:24	19:01	19:34	20:16
52°	04:01	04:45	05:21	19:04	19:40	20:23
54°	03:52	04:39	05:17	19:08	19:45	20:32
56°	03:42	04:33	05:12	19:12	19:52	20:42
58°	03:30	04:25	05:08	19:17	19:59	20:53
S 60°	03:17	04:17	05:02	19:22	20:07	21:07

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	■	■	■	■	■	■
N 70°	■	■	09:54	■	■	12:20
68°	■	■	08:58	■	■	13:14
66°	■	09:48	08:25	■	10:29	13:47
64°	■	08:26	08:00	■	11:50	14:10
62°	08:05	07:49	07:40	10:12	12:27	14:29
60°	07:15	07:22	07:24	11:02	12:53	14:44
N 58°	06:43	07:01	07:10	11:33	13:13	14:57
56°	06:20	06:44	06:58	11:56	13:30	15:08
54°	06:00	06:29	06:48	12:15	13:44	15:18
52°	05:44	06:16	06:38	12:31	13:56	15:26
50°	05:30	06:05	06:30	12:45	14:07	15:34
45°	05:01	05:41	06:12	13:13	14:30	15:50
N 40°	04:39	05:22	05:57	13:35	14:48	16:03
35°	04:20	05:06	05:45	13:53	15:03	16:14
30°	04:04	04:52	05:34	14:09	15:16	16:24
20°	03:37	04:28	05:15	14:35	15:38	16:41
N 10°	03:13	04:07	04:59	14:58	15:57	16:55
0°	02:51	03:48	04:43	15:18	16:14	17:09
S 10°	02:29	03:28	04:28	15:39	16:32	17:22
20°	02:06	03:08	04:11	16:01	16:51	17:36
30°	01:38	02:43	03:51	16:27	17:12	17:52
35°	01:22	02:29	03:40	16:42	17:24	18:01
40°	01:03	02:12	03:27	16:59	17:39	18:11
45°	00:40	01:53	03:12	17:20	17:55	18:24
S 50°	00:10	01:27	02:52	17:46	18:16	18:38
52°	· · ·	01:15	02:43	17:59	18:26	18:45
54°	· · ·	01:01	02:33	18:13	18:37	18:52
56°	· · ·	00:45	02:21	18:30	18:49	19:01
58°	· · ·	00:25	02:08	18:50	19:03	19:10
S 60°	· · ·	00:01	01:52	19:15	19:20	19:21

Day	Sun			Moon		Age
	Eqn. of Time		Mer.	Mer.Pass.		26-28
	00 ^h	12 ^h	Pass	Upper	Lower	20-6%
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
24	13:12	13:07	12:13	09:05	21:33	
25	13:03	12:58	12:13	10:01	22:29	
26	12:53	12:48	12:13	10:56	23:22	

February 27, 28, 01 UT (Thu., Fri., Sat.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	157°4.91	149°49.10	N10°3.76	48°4.47	N25°55.47	86°23.71	N21°50.71	165°6.41	S05°32.55	Alpheratz	357°34.99	29°13.73						
1	172°7.38	164°51.47	4.28	63°6.85	55.39	101°25.98	50.74	180°8.59	32.43	Ankaa	353°7.37	-42°10.33						
2	187°9.84	179°53.84	4.80	78°9.22	55.30	116°28.25	50.77	195°10.78	32.31	Schedar	349°31.43	56°40.61						
3	202°12.31	194°56.21	· · 5.32	93°11.59	· · 55.21	131°30.52	· · 50.81	210°12.96	· · 32.19	Diphda	348°47.44	-17°51.07						
4	217°14.77	209°58.59	5.83	108°13.97	55.12	146°32.79	50.84	225°15.14	32.07	Achernar	335°20.45	-57°6.77						
5	232°17.23	225°0.97	6.35	123°16.34	55.04	161°35.06	50.87	240°17.33	31.95	Hamal	327°51.27	23°34.89						
6	247°19.70	240°3.35	N10°6.86	138°18.71	N25°54.95	176°37.33	N21°50.90	255°19.51	S05°31.83	Polaris	314°9.83	89°22.51						
7	262°22.16	255°5.74	7.37	153°21.08	54.86	191°39.59	50.94	270°21.69	31.71	Acamar	315°11.82	-40°12.46						
8	277°24.63	270°8.13	7.88	168°23.44	54.78	206°41.86	50.97	285°23.87	31.59	Menkar	314°6.13	4°11.23						
9	292°27.09	285°10.52	· · 8.38	183°25.81	· · 54.69	221°44.13	· · 51.00	300°26.06	· · 31.47	Mirfak	308°28.23	49°57.20						
10	307°29.55	300°12.92	8.89	198°28.17	54.60	236°46.40	51.03	315°28.24	31.35	Aldebaran	290°39.47	16°33.59						
11	322°32.02	315°15.32	9.39	213°30.53	54.51	251°48.66	51.07	330°30.42	31.23	Rigel	281°3.68	-8°10.48						
12	337°34.48	330°17.73	N10°9.89	228°32.90	N25°54.42	266°50.93	N21°51.10	345°32.61	S05°31.11	Capella	280°21.61	46°1.54						
13	352°36.95	345°20.14	10.39	243°35.26	54.33	281°53.20	51.13	0°34.79	30.99	Bellatrix	278°22.67	6°22.29						
14	7°39.41	0°22.55	10.89	258°37.61	54.25	296°55.46	51.16	15°36.97	30.87	Elnath	278°1.62	28°37.77						
15	22°41.87	15°24.97	· · 11.38	273°39.97	· · 54.16	311°57.73	· · 51.20	30°39.15	· · 30.75	Alnilam	275°37.51	-1°11.24						
16	37°44.34	30°27.39	11.88	288°42.33	54.07	326°59.99	51.23	45°41.34	30.63	Betelgeuse	270°51.83	7°24.65						
17	52°46.80	45°29.81	12.37	303°44.68	53.98	342°2.26	51.26	60°43.52	30.51	Canopus	263°52.09	-52°42.76						
18	67°49.27	60°32.24	N10°12.86	318°47.04	N25°53.89	357°4.52	N21°51.29	75°45.70	S05°30.39	Sirius	258°25.95	-16°45.19						
19	82°51.73	75°34.67	13.35	333°49.39	53.80	12°6.78	51.33	90°47.88	30.27	Adhara	255°5.55	-29°0.55						
20	97°54.19	90°37.10	13.83	348°51.74	53.71	27°9.05	51.36	105°50.07	30.15	Procyon	244°50.47	5°9.55						
21	112°56.66	105°39.54	· · 14.32	3°54.09	· · 53.62	42°11.31	· · 51.39	120°52.25	· · 30.03	Pollux	243°16.88	27°57.92						
22	127°59.12	120°41.98	14.80	18°56.43	53.53	57°13.57	51.42	135°54.43	29.91	Avior	234°14.19	-59°35.55						
23	143°1.59	135°44.43	15.28	33°58.78	53.44	72°15.84	51.46	150°56.61	29.79	Suhail	222°45.84	-43°32.17						
Mer.pass. 13:29			ν2.4' d0.5' m-4.81			ν2.4' d-0.1' m-0.33			ν2.3' d0.0' m-2.31			ν2.2' d-0.1' m1.11			Miaplacidus	221°37.46	-69°49.31	
															Alphard	217°47.33	-8°46.18	
															Regulus	207°33.98	11°50.54	
															Dubhe	193°40.14	61°36.81	
															Denebola	182°24.51	14°25.73	
															Gienah	175°43.17	-17°40.99	
															Acrux	172°59.41	-63°14.24	
															Gacrux	171°51.05	-57°15.19	
															Alioth	166°12.36	55°49.14	
															Spica	158°21.94	-11°17.66	
															Alkaid	152°51.56	49°10.95	
															Hadar	148°35.49	-60°29.51	
															Menkent	147°57.26	-36°29.59	
															Arcturus	145°47.60	19°2.84	
															Rigel Kent.	139°39.85	-60°56.19	
															Kochab	137°19.23	74°2.72	
															Zuben'ubi	136°55.75	-16°8.85	
															Alphecca	126°3.54	26°37.49	
															Antares	112°15.69	-26°29.26	
															Atria	107°9.89	-69°4.11	
															Sabik	102°2.70	-15°45.43	
															Shaula	96°10.31	-37°7.25	
															Rasalhague	95°58.52	12°32.26	
															Eltanin	90°42.31	51°28.74	
															Kaus Aust.	83°32.53	-34°22.32	
															Vega	80°33.35	38°48.08	
															Nunki	75°47.81	-26°15.95	
															Altair	62°0.08	8°55.89	
Mer.pass. 13:26			ν2.5' d0.5' m-4.80			ν2.3' d-0.1' m-0.31			ν2.3' d0.0' m-2.31			ν2.2' d-0.1' m1.11			Peacock	53°6.00	-56°39.18	
															Deneb	49°26.14	45°21.97	
															Enif	33°38.99	9°59.27	
															Al Na'ir	27°33.19	-46°50.42	
															Fomalhaut	15°14.72	-29°29.47	
															Scheat	13°45.45	28°13.07	
															Markab	13°30.11	15°20.33	
Feb 27 Thu			SHA			Mer.pass												
			Venus			352°44.19			13:59									
			Mars			250°59.56			20:44									
			Jupiter			289°18.80			18:12									
			Saturn			8°1.50			12:58									
Feb 28 Fri			SHA			Mer.pass												
			Venus			352°42.83			13:55									
			Mars			250°57.08			20:41									
			Jupiter			289°14.05			18:08									
			Saturn			7°54.75			12:54									
Mar 01 Sat			SHA			Mer.pass												
			Venus			352°43.59			13:51									
			Mars			250°53.82			20:37									
			Jupiter			289°9.11			18:04									
			Saturn			7°47.98			12:51									
Horizontal parallax																		
			Venus:			0.4												
			Mars:			0.2												
Mer.pass. 13:22			ν2.5' d0.4' m-4.78			ν2.3' d-0.1' m-0.28			ν2.3' d0.0' m-2.30			ν2.2' d-0.1' m1.11						


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Thu 0	176°49.32	S08°19.84	189°4.07	9.4'	S15°57.49	-14.8'	59.4'
1	191°49.43	18.90	203°32.48	9.5'	15°42.73	-14.9'	59.5'
2	206°49.54	17.96	218°0.94	9.5'	15°27.88	-15.0'	59.5'
3	221°49.65	· · 17.02	232°29.44	9.6'	15°12.92	-15.1'	59.5'
4	236°49.76	16.08	246°58.00	9.6'	14°57.86	-15.2'	59.6'
5	251°49.87	15.14	261°26.60	9.6'	14°42.71	-15.3'	59.6'
6	266°49.98	S08°14.20	275°55.25	9.7'	S14°27.46	-15.3'	59.6'
7	281°50.09	13.25	290°23.94	9.7'	14°12.11	-15.4'	59.6'
8	296°50.20	12.31	304°52.68	9.8'	13°56.67	-15.5'	59.7'
9	311°50.31	· · 11.37	319°21.46	9.8'	13°41.14	-15.6'	59.7'
10	326°50.42	10.42	333°50.29	9.9'	13°25.52	-15.7'	59.7'
11	341°50.53	9.48	348°19.16	9.9'	13°9.81	-15.8'	59.7'
12	356°50.64	S08°8.54	2°48.08	10.0'	S12°54.01	-15.9'	59.8'
13	11°50.75	7.59	17°17.03	10.0'	12°38.13	-16.0'	59.8'
14	26°50.87	6.65	31°46.03	10.0'	12°22.17	-16.0'	59.8'
15	41°50.98	· · 5.71	46°15.07	10.1'	12°6.13	-16.1'	59.8'
16	56°51.09	4.76	60°44.15	10.1'	11°50.00	-16.2'	59.9'
17	71°51.20	3.82	75°13.27	10.2'	11°33.80	-16.3'	59.9'
18	86°51.32	S08°2.87	89°42.42	10.2'	S11°17.52	-16.4'	59.9'
19	101°51.43	1.93	104°11.62	10.2'	11°1.17	-16.4'	59.9'
20	116°51.54	0.98	118°40.85	10.3'	10°44.74	-16.5'	60.0'
21	131°51.66	08°0.04	133°10.12	10.3'	10°28.25	-16.6'	60.0'
22	146°51.77	07°59.09	147°39.42	10.3'	10°11.68	-16.6'	60.0'
23	161°51.89	58.15	162°8.76	10.4'	09°55.05	-16.7'	60.0'
SD = 16.1' $d = -0.9'$			SD = 16.2'				

Fri	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	176°52.00	S07°57.20	176°38.12	10.4'	S09°38.35	-16.8'	60.0'
1	191°52.11	56.26	191°7.53	10.4'	09°21.58	-16.8'	60.1'
2	206°52.23	55.31	205°36.96	10.5'	09°4.76	-16.9'	60.1'
3	221°52.34	· · 54.36	220°6.42	10.5'	08°47.87	-16.9'	60.1'
4	236°52.46	53.42	234°35.92	10.5'	08°30.92	-17.0'	60.1'
5	251°52.57	52.47	249°5.44	10.5'	08°13.92	-17.1'	60.1'
6	266°52.69	S07°51.52	263°34.99	10.6'	S07°56.87	-17.1'	60.1'
7	281°52.81	50.58	278°4.56	10.6'	07°39.76	-17.2'	60.2'
8	296°52.92	49.63	292°34.17	10.6'	07°22.59	-17.2'	60.2'
9	311°53.04	· · 48.68	307°3.79	10.6'	07°5.38	-17.3'	60.2'
10	326°53.16	47.73	321°33.44	10.7'	06°48.12	-17.3'	60.2'
11	341°53.27	46.78	336°3.11	10.7'	06°30.82	-17.3'	60.2'
12	356°53.39	S07°45.84	350°32.80	10.7'	S06°13.47	-17.4'	60.2'
13	11°53.51	44.89	5°2.52	10.7'	05°56.08	-17.4'	60.3'
14	26°53.62	43.94	19°32.25	10.7'	05°38.65	-17.5'	60.3'
15	41°53.74	· · 42.99	34°2.00	10.8'	05°21.18	-17.5'	60.3'
16	56°53.86	42.04	48°31.77	10.8'	05°3.67	-17.5'	60.3'
17	71°53.98	41.09	63°1.55	10.8'	04°46.13	-17.6'	60.3'
18	86°54.10	S07°40.14	77°31.35	10.8'	S04°28.55	-17.6'	60.3'
19	101°54.22	39.19	92°1.16	10.8'	04°10.95	-17.6'	60.3'
20	116°54.33	38.24	106°30.98	10.8'	03°53.31	-17.7'	60.4'
21	131°54.45	· · 37.29	121°0.81	10.8'	03°35.65	-17.7'	60.4'
22	146°54.57	36.34	135°30.66	10.9'	03°17.96	-17.7'	60.4'
23	161°54.69	35.39	150°0.51	10.9'	03°0.25	-17.7'	60.4'
SD = 16.1' $d = -0.9'$			SD = 16.4'				

Sat	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	176°54.81	S07°34.44	164°30.37	10.9'	S02°42.52	-17.8'	60.4'
1	191°54.93	33.49	179°0.24	10.9'	02°24.76	-17.8'	60.4'
2	206°55.05	32.54	193°30.11	10.9'	02°6.99	-17.8'	60.4'
3	221°55.17	· · 31.59	207°59.99	10.9'	01°49.20	-17.8'	60.4'
4	236°55.29	30.64	222°29.87	10.9'	01°31.40	-17.8'	60.4'
5	251°55.41	29.69	236°59.75	10.9'	01°13.59	-17.8'	60.4'
6	266°55.54	S07°28.74	251°29.63	10.9'	S00°55.76	-17.8'	60.4'
7	281°55.66	27.78	265°59.51	10.9'	00°37.93	-17.8'	60.5'
8	296°55.78	26.83	280°29.39	10.9'	00°20.09	-17.8'	60.5'
9	311°55.90	· · 25.88	294°59.27	10.9'	S00°2.25	-17.8'	60.5'
10	326°56.02	24.93	309°29.14	10.9'	N00°15.60	17.8'	60.5'
11	341°56.14	23.98	323°59.01	10.9'	00°33.45	17.8'	60.5'
12	356°56.27	S07°23.02	338°28.86	10.9'	N00°51.30	17.8'	60.5'
13	11°56.39	22.07	352°58.72	10.8'	01°9.14	17.8'	60.5'
14	26°56.51	21.12	7°28.56	10.8'	01°26.98	17.8'	60.5'
15	41°56.64	· · 20.16	21°58.39	10.8'	01°44.82	17.8'	60.5'
16	56°56.76	19.21	36°28.21	10.8'	02°2.64	17.8'	60.5'
17	71°56.88	18.26	50°58.02	10.8'	02°20.45	17.8'	60.5'
18	86°57.01	S07°17.30	65°27.81	10.8'	N02°38.26	17.8'	60.5'
19	101°57.13	16.35	79°57.59	10.8'	02°56.04	17.8'	60.5'
20	116°57.25	15.39	94°27.35	10.7'	03°13.82	17.8'	60.5'
21	131°57.38	· · 14.44	108°57.09	10.7'	03°31.57	17.7'	60.5'
22	146°57.50	13.49	123°26.81	10.7'	03°49.30	17.7'	60.5'
23	161°57.63	12.53	137°56.52	10.7'	04°7.02	17.7'	60.5'
SD = 16.1' $d = -1.0'$			SD = 16.5'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:14	06:32	07:41	16:46	17:56	19:14
N 70°	05:18	06:29	07:31	16:56	17:58	19:09
68°	05:22	06:26	07:23	17:04	18:01	19:05
66°	05:25	06:24	07:16	17:10	18:02	19:02
64°	05:27	06:22	07:10	17:16	18:04	18:59
62°	05:29	06:20	07:05	17:21	18:06	18:57
60°	05:31	06:19	07:01	17:25	18:07	18:55
N 58°	05:32	06:17	06:57	17:29	18:09	18:54
56°	05:33	06:16	06:54	17:32	18:10	18:53
54°	05:34	06:15	06:50	17:35	18:11	18:52
52°	05:35	06:14	06:48	17:38	18:12	18:51
50°	05:35	06:13	06:45	17:41	18:13	18:51
48°	05:36	06:10	06:39	17:46	18:16	18:50
N 40°	05:36	06:07	06:35	17:51	18:18	18:49
38°	05:36	06:05	06:31	17:55	18:20	18:50
36°	05:35	06:03	06:27	17:58	18:22	18:50
34°	05:33	05:58	06:20	18:05	18:27	18:53
N 10°	05:29	05:53	06:15	18:10	18:32	18:56
0°	05:24	05:48	06:09	18:16	18:37	19:01
S 10°	05:18	05:42	06:04	18:21	18:42	19:07
20°	05:09	05:35	05:57	18:27	18:49	19:16
30°	04:57	05:26	05:50	18:34	18:58	19:27
35°	04:50	05:20	05:46	18:38	19:04	19:34
40°	04:41	05:14	05:41	18:43	19:10	19:43
45°	04:29	05:06	05:36	18:48	19:18	19:54
S 50°	04:15	04:56	05:29	18:55	19:28	20:09
52°	04:08	04:51	05:26	18:58	19:33	20:16
54°	04:00	04:46	05:23	19:01	19:38	20:23
56°	03:50	04:40	05:19	19:04	19:44	20:32
58°	03:40	04:33	05:15	19:09	19:50	20:43
S 60°	03:27	04:25	05:10	19:13	19:58	20:55

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	09:00	08:06	07:25	15:08	17:51	20:22
N 70°	08:34	07:55	07:24	15:31	17:58	20:17
68°	08:14	07:47	07:24	15:49	18:04	20:14
66°	07:58	07:39	07:23	16:03	18:08	20:10
64°	07:45	07:33	07:23	16:15	18:12	20:08
62°	07:33	07:28	07:22	16:25	18:16	20:06
60°	07:24	07:23	07:22	16:33	18:19	20:04
N 58°	07:15	07:19	07:21	16:40	18:21	20:02
56°	07:08	07:15	07:21	16:46	18:24	20:00
54°	07:01	07:12	07:21	16:52	18:26	19:59
52°	06:55	07:09	07:21	16:57	18:27	19:58
50°	06:50	07:06	07:20	17:02	18:29	19:56
45°	06:38	07:00	07:20	17:12	18:33	19:54
N 40°	06:28	06:54	07:19	17:20	18:36	19:52
35°	06:19	06:50	07:19	17:27	18:38	19:50
30°	06:12	06:46	07:19	17:33	18:41	19:48
20°	05:59	06:39	07:18	17:43	18:44	19:46
N 10°	05:47	06:33	07:18	17:52	18:48	19:43
0°	05:36	06:27	07:17	18:01	18:51	19:41
S 10°	05:25	06:21	07:17	18:09	18:54	19:39
20°	05:14	06:15	07:16	18:18	18:57	19:36
30°	05:00	06:08	07:16	18:28	19:01	19:33
35°	04:52	06:04	07:16	18:33	19:03	19:32
40°	04:43	06:00	07:16	18:40	19:05	19:30
45°	04:33	05:54	07:15	18:47	19:08	19:28
S 50°	04:20	05:48	07:15	18:56	19:11	19:25
52°	04:14	05:45	07:15	19:00	19:12	19:24
54°	04:07	05:41	07:15	19:04	19:14	19:23
56°	04:00	05:38	07:14	19:09	19:16	19:22
58°	03:52	05:34	07:14	19:15	19:18	19:20
S 60°	03:42	05:29	07:14	19:21	19:20	19:18

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	29-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-1%
27	12:43	12:37	12:13	11:48	—:—	
28	12:32	12:26	12:12	12:39	00:14	
01	12:21	12:15	12:12	13:29	01:04	

March 02, 03, 04 UT (Sun., Mon., Tue.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	160°2.32	152°48.83	N10°36.49	50°52.11	N25°48.82	89°6.30	N21°53.11	167°43.53	S05°23.90	Alpheratz	357°35.00	29°13.72					
1	175°4.79	167°51.46	36.87	65°54.39	48.72	104°8.54	53.14	182°45.71	23.78	Ankaa	353°7.37	-42°10.32					
2	190°7.25	182°54.10	37.26	80°56.67	48.62	119°10.79	53.18	197°47.89	23.66	Schedar	349°31.44	56°40.60					
3	205°9.72	197°56.74	•• 37.63	95°58.95	•• 48.52	134°13.04	•• 53.21	212°50.08	•• 23.54	Diphda	348°47.45	-17°51.07					
4	220°12.18	212°59.38	38.01	111°1.22	48.43	149°15.28	53.25	227°52.26	23.42	Achernar	335°20.47	-57°6.76					
5	235°14.64	228°2.03	38.39	126°3.50	48.33	164°17.53	53.28	242°54.44	23.30	Hamal	327°51.28	23°34.89					
6	250°17.11	243°4.68	N10°38.76	141°5.77	N25°48.23	179°19.77	N21°53.32	257°56.62	S05°23.18	Polaris	314°11.31	89°22.51					
7	265°19.57	258°7.34	39.13	156°8.04	48.13	194°22.01	53.35	272°58.80	23.06	Acamar	315°11.84	-40°12.46					
8	280°22.04	273°9.99	39.50	171°10.31	48.03	209°24.26	53.38	288°0.98	22.94	Menkar	314°6.15	4°11.23					
9	295°24.50	288°12.66	•• 39.87	186°12.58	•• 47.93	224°26.50	•• 53.42	303°3.16	•• 22.82	Mirfak	308°28.25	49°57.19					
10	310°26.96	303°15.32	40.23	201°14.85	47.83	239°28.74	53.45	318°5.35	22.70	Aldebaran	290°39.49	16°33.59					
11	325°29.43	318°17.99	40.60	216°17.12	47.73	254°30.99	53.49	333°7.53	22.58	Rigel	281°3.70	-8°10.48					
12	340°31.89	333°20.67	N10°40.96	231°19.38	N25°47.63	269°33.23	N21°53.52	348°9.71	S05°22.46	Capella	280°21.64	46°1.54					
13	355°34.36	348°23.35	41.32	246°21.65	47.53	284°35.47	53.56	3°11.89	22.34	Bellatrix	278°22.68	6°22.29					
14	10°36.82	3°26.03	41.67	261°23.91	47.43	299°37.71	53.59	18°14.07	22.22	Elnath	278°1.64	28°37.77					
15	25°39.28	18°28.71	•• 42.03	276°26.17	•• 47.33	314°39.95	•• 53.63	33°16.25	•• 22.09	Alnilam	275°37.53	-1°11.24					
16	40°41.75	33°31.40	42.38	291°28.43	47.23	329°42.20	53.66	48°18.43	21.97	Betelgeuse	270°51.85	7°24.65					
17	55°44.21	48°34.10	42.73	306°30.69	47.13	344°44.44	53.70	63°20.61	21.85	Canopus	263°52.12	-52°42.77					
18	70°46.68	63°36.79	N10°43.08	321°32.95	N25°47.03	359°46.68	N21°53.73	78°22.80	S05°21.73	Sirius	258°25.97	-16°45.19					
19	85°49.14	78°39.49	43.42	336°35.20	46.92	14°48.92	53.77	93°24.98	21.61	Adhara	255°5.57	-29°0.56					
20	100°51.60	93°42.20	43.77	351°37.46	46.82	29°51.16	53.80	108°27.16	21.49	Procyon	244°50.49	5°9.55					
21	115°54.07	108°44.91	•• 44.11	6°39.71	•• 46.72	44°53.40	•• 53.84	123°29.34	•• 21.37	Pollux	243°16.89	27°57.93					
22	130°56.53	123°47.62	44.45	21°41.97	46.62	59°55.64	53.87	138°31.52	21.25	Avior	234°14.21	-59°35.56					
23	145°59.00	138°50.34	44.79	36°44.22	46.52	74°57.88	53.91	153°33.70	21.13	Suhail	222°45.85	-43°32.19					
Mer.pass. 13:18			ν2.6' d0.4' m-4.76			ν2.3' d-0.1' m-0.25			ν2.2' d0.0' m-2.29			ν2.2' d-0.1' m1.11			Miaplacidus 221°37.48 -69°49.32		
															Alphard 217°47.33 -8°46.18		
															Regulus 207°33.98 11°50.54		
															Dubhe 193°40.14 61°36.83		
															Denebola 182°24.50 14°25.73		
															Gienah 175°43.16 -17°41.00		
															Acrux 172°59.40 -63°14.26		
															Gacrux 171°51.04 -57°15.21		
															Alioth 166°12.34 55°49.15		
															Spica 158°21.93 -11°17.67		
															Alkaid 152°51.54 49°10.96		
															Hadar 148°35.47 -60°29.52		
															Menkent 147°57.24 -36°29.60		
															Arcturus 145°47.59 19°2.84		
															Rigel Kent. 139°39.82 -60°56.20		
															Kochab 137°19.17 74°2.73		
															Zuben'ubi 136°55.73 -16°8.86		
															Alphecca 126°3.52 26°37.49		
															Antares 112°15.67 -26°29.27		
															Atria 107°9.84 -69°4.11		
															Sabik 102°2.68 -15°45.43		
															Shaula 96°10.29 -37°7.25		
															Rasalhague 95°58.50 12°32.26		
															Eltanin 90°42.28 51°28.73		
															Kaus Aust. 83°32.51 -34°22.32		
															Vega 80°33.33 38°48.07		
															Nunki 75°47.79 -26°15.94		
															Altair 62°0.07 8°55.89		
															Peacock 53°5.98 -56°39.17		
															Deneb 49°26.13 45°21.95		
															Enif 33°38.99 9°59.26		
															Al Na'ir 27°33.18 -46°50.41		
															Fomalhaut 15°14.72 -29°29.46		
															Scheat 13°45.46 28°13.06		
															Markab 13°30.11 15°20.32		
Mar 02 Sun			SHA			Mer.pass											
			Venus 352°46.50			13:46											
			Mars 250°49.79			20:33											
			Jupiter 289°3.97			18:01											
			Saturn 7°41.21			12:47											
Mar 03 Mon			SHA			Mer.pass											
			Venus 352°51.60			13:42											
			Mars 250°45.01			20:30											
			Jupiter 288°58.65			17:57											
			Saturn 7°34.42			12:44											
Mar 04 Tue			SHA			Mer.pass											
			Venus 352°58.88			13:37											
			Mars 250°39.48			20:26											
			Jupiter 288°53.14			17:54											
			Saturn 7°27.62			12:40											
Horizontal parallax																	
			Venus: 0.4														
			Mars: 0.2														
Mer.pass. 13:10			ν2.8' d0.3' m-4.72			ν2.2' d-0.1' m-0.20			ν2.2' d0.0' m-2.28			ν2.2' d-0.1' m1.11					

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	176°57.75	S07°11.58	152°26.20	10.7'	N04°24.70	17.7'	60.5'
1	191°57.88	10.62	166°55.86	10.6'	04°42.37	17.6'	60.5'
2	206°58.00	9.67	181°25.49	10.6'	05°0.00	17.6'	60.5'
3	221°58.13	· · 8.71	195°55.10	10.6'	05°17.61	17.6'	60.5'
4	236°58.26	7.75	210°24.69	10.6'	05°35.18	17.5'	60.5'
5	251°58.38	6.80	224°54.24	10.5'	05°52.72	17.5'	60.5'
6	266°58.51	S07°5.84	239°23.77	10.5'	N06°10.23	17.5'	60.5'
7	281°58.64	4.89	253°53.27	10.5'	06°27.70	17.4'	60.5'
8	296°58.76	3.93	268°22.73	10.4'	06°45.13	17.4'	60.5'
9	311°58.89	· · 2.97	282°52.17	10.4'	07°2.52	17.3'	60.5'
10	326°59.02	2.02	297°21.57	10.4'	07°19.86	17.3'	60.5'
11	341°59.14	1.06	311°50.93	10.3'	07°37.16	17.3'	60.5'
12	356°59.27	S07°0.10	326°20.26	10.3'	N07°54.42	17.2'	60.5'
13	11°59.40	06°59.15	340°49.56	10.3'	08°11.63	17.2'	60.4'
14	26°59.53	58.19	355°18.81	10.2'	08°28.78	17.1'	60.4'
15	41°59.66	· · 57.23	9°48.03	10.2'	08°45.89	17.1'	60.4'
16	56°59.78	56.27	24°17.21	10.1'	09°2.94	17.0'	60.4'
17	71°59.91	55.32	38°46.34	10.1'	09°19.94	16.9'	60.4'
18	87°0.04	S06°54.36	53°15.43	10.0'	N09°36.88	16.9'	60.4'
19	102°0.17	53.40	67°44.48	10.0'	09°53.75	16.8'	60.4'
20	117°0.30	52.44	82°13.49	10.0'	10°10.57	16.8'	60.4'
21	132°0.43	· · 51.48	96°42.45	9.9'	10°27.33	16.7'	60.4'
22	147°0.56	50.52	111°11.36	9.9'	10°44.01	16.6'	60.4'
23	162°0.69	49.57	125°40.22	9.8'	11°0.64	16.6'	60.4'
SD = 16.1' $d = -1.0'$			SD = 16.5'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°0.82	S06°48.61	140°9.04	9.8'	N11°17.19	16.5'	60.3'
1	192°0.95	47.65	154°37.80	9.7'	11°33.67	16.4'	60.3'
2	207°1.08	46.69	169°6.52	9.7'	11°50.08	16.3'	60.3'
3	222°1.21	· · 45.73	183°35.18	9.6'	12°6.42	16.3'	60.3'
4	237°1.34	44.77	198°3.80	9.6'	12°22.68	16.2'	60.3'
5	252°1.47	43.81	212°32.35	9.5'	12°38.86	16.1'	60.3'
6	267°1.60	S06°42.85	227°0.86	9.4'	N12°54.97	16.0'	60.3'
7	282°1.74	41.89	241°29.31	9.4'	13°10.99	15.9'	60.3'
8	297°1.87	40.93	255°57.70	9.3'	13°26.93	15.9'	60.2'
9	312°2.00	· · 39.97	270°26.03	9.3'	13°42.78	15.8'	60.2'
10	327°2.13	39.01	284°54.31	9.2'	13°58.55	15.7'	60.2'
11	342°2.27	38.05	299°22.53	9.2'	14°14.23	15.6'	60.2'
12	357°2.40	S06°37.09	313°50.69	9.1'	N14°29.81	15.5'	60.2'
13	12°2.53	36.12	328°18.79	9.0'	14°45.31	15.4'	60.2'
14	27°2.66	35.16	342°46.83	9.0'	15°0.71	15.3'	60.2'
15	42°2.80	· · 34.20	357°14.80	8.9'	15°16.02	15.2'	60.1'
16	57°2.93	33.24	11°42.72	8.9'	15°31.23	15.1'	60.1'
17	72°3.06	32.28	26°10.57	8.8'	15°46.34	15.0'	60.1'
18	87°3.20	S06°31.32	40°38.36	8.7'	N16°1.35	14.9'	60.1'
19	102°3.33	30.35	55°6.08	8.7'	16°16.25	14.8'	60.1'
20	117°3.47	29.39	69°33.74	8.6'	16°31.05	14.7'	60.1'
21	132°3.60	· · 28.43	84°1.33	8.5'	16°45.75	14.6'	60.0'
22	147°3.74	27.47	98°28.86	8.5'	17°0.34	14.5'	60.0'
23	162°3.87	26.51	112°56.32	8.4'	17°14.82	14.4'	60.0'
SD = 16.1' $d = -1.0'$			SD = 16.5'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°4.01	S06°25.54	127°23.71	8.3'	N17°29.19	14.3'	60.0'
1	192°4.14	24.58	141°51.04	8.3'	17°43.44	14.1'	60.0'
2	207°4.28	23.62	156°18.30	8.2'	17°57.58	14.0'	59.9'
3	222°4.41	· · 22.65	170°45.49	8.1'	18°11.61	13.9'	59.9'
4	237°4.55	21.69	185°12.61	8.1'	18°25.51	13.8'	59.9'
5	252°4.68	20.73	199°39.66	8.0'	18°39.30	13.7'	59.9'
6	267°4.82	S06°19.76	214°6.65	7.9'	N18°52.97	13.5'	59.9'
7	282°4.96	18.80	228°33.56	7.8'	19°6.51	13.4'	59.8'
8	297°5.09	17.83	243°0.41	7.8'	19°19.93	13.3'	59.8'
9	312°5.23	· · 16.87	257°27.18	7.7'	19°33.23	13.2'	59.8'
10	327°5.37	15.91	271°53.89	7.6'	19°46.40	13.0'	59.8'
11	342°5.51	14.94	286°20.52	7.6'	19°59.44	12.9'	59.8'
12	357°5.64	S06°13.98	300°47.08	7.5'	N20°12.34	12.8'	59.7'
13	12°5.78	13.01	315°13.58	7.4'	20°25.12	12.6'	59.7'
14	27°5.92	12.05	329°40.00	7.4'	20°37.76	12.5'	59.7'
15	42°6.06	· · 11.08	344°6.36	7.3'	20°50.27	12.4'	59.7'
16	57°6.20	10.12	358°32.64	7.2'	21°2.64	12.2'	59.6'
17	72°6.33	9.15	12°58.86	7.1'	21°14.88	12.1'	59.6'
18	87°6.47	S06°8.19	27°25.00	7.1'	N21°26.97	12.0'	59.6'
19	102°6.61	7.22	41°51.07	7.0'	21°38.92	11.8'	59.6'
20	117°6.75	6.26	56°17.08	6.9'	21°50.73	11.7'	59.6'
21	132°6.89	· · 5.29	70°43.02	6.9'	22°2.40	11.5'	59.5'
22	147°7.03	4.32	85°8.88	6.8'	22°13.92	11.4'	59.5'
23	162°7.17	3.36	99°34.68	6.7'	22°25.30	11.2'	59.5'
SD = 16.1' $d = -1.0'$			SD = 16.4'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:59	06:17	07:25	17:01	18:09	19:28
N 70°	05:05	06:15	07:17	17:09	18:10	19:21
68°	05:10	06:14	07:10	17:15	18:11	19:16
66°	05:14	06:13	07:05	17:21	18:12	19:12
64°	05:17	06:12	07:00	17:25	18:13	19:08
62°	05:20	06:11	06:56	17:29	18:14	19:05
60°	05:22	06:10	06:52	17:33	18:15	19:03
N 58°	05:24	06:10	06:49	17:36	18:15	19:01
56°	05:26	06:09	06:46	17:39	18:16	18:59
54°	05:27	06:08	06:43	17:41	18:17	18:58
52°	05:28	06:07	06:41	17:44	18:17	18:56
50°	05:29	06:07	06:39	17:46	18:18	18:55
45°	05:31	06:05	06:34	17:50	18:20	18:54
N 40°	05:32	06:03	06:30	17:54	18:21	18:53
35°	05:32	06:01	06:27	17:58	18:23	18:52
30°	05:32	06:00	06:24	18:01	18:25	18:52
20°	05:30	05:56	06:18	18:06	18:28	18:54
N 10°	05:28	05:52	06:13	18:11	18:32	18:56
0°	05:24	05:48	06:09	18:15	18:36	19:00
S 10°	05:18	05:43	06:04	18:20	18:41	19:06
20°	05:10	05:36	05:59	18:25	18:47	19:13
30°	05:00	05:28	05:52	18:31	18:55	19:23
35°	04:53	05:23	05:49	18:34	19:00	19:30
40°	04:44	05:17	05:45	18:38	19:06	19:38
45°	04:34	05:10	05:40	18:43	19:13	19:49
S 50°	04:21	05:01	05:34	18:48	19:21	20:02
52°	04:14	04:57	05:32	18:51	19:26	20:08
54°	04:07	04:52	05:29	18:54	19:30	20:15
56°	03:59	04:47	05:26	18:57	19:35	20:23
58°	03:49	04:41	05:22	19:00	19:41	20:33
S 60°	03:38	04:34	05:18	19:04	19:48	20:44

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	06:46	05:56	☐	23:02	☐	☐
N 70°	06:54	06:18	05:13	22:43	· · ·	01:40
68°	07:01	06:35	05:56	22:28	· · ·	00:59
66°	07:07	06:49	06:25	22:16	· · ·	00:31
64°	07:12	07:01	06:47	22:06	· · ·	00:10
62°	07:17	07:11	07:05	21:57	23:54	· · ·
60°	07:21	07:20	07:20	21:50	23:40	· · ·
N 58°	07:24	07:27	07:33	21:43	23:28	· · ·
56°	07:27	07:34	07:44	21:38	23:18	· · ·
54°	07:30	07:40	07:54	21:33	23:09	· · ·
52°	07:32	07:46	08:02	21:28	23:01	· · ·
50°	07:35	07:51	08:10	21:24	22:54	· · ·
45°	07:40	08:02	08:27	21:16	22:38	· · ·
N 40°	07:44	08:11	08:41	21:08	22:26	23:44
35°	07:48	08:19	08:53	21:02	22:15	23:29
30°	07:51	08:26	09:04	20:57	22:06	23:17
20°	07:57	08:38	09:22	20:47	21:51	22:55
N 10°	08:02	08:49	09:38	20:39	21:37	22:37
0°	08:07	08:59	09:53	20:32	21:24	22:19
S 10°	08:12	09:09	10:08	20:24	21:11	22:02
20°	08:18	09:20	10:24	20:16	20:58	21:44
30°	08:24	09:33	10:43	20:07	20:43	21:23
35°	08:28	09:40	10:54	20:01	20:34	21:11
40°	08:32	09:49	11:07	19:55	20:24	20:57
45°	08:37	09:59	11:22	19:49	20:12	20:40
S 50°	08:42	10:11	11:41	19:40	19:58	20:20
52°	08:45	10:17	11:50	19:37	19:51	20:10
54°	08:48	10:23	12:00	19:33	19:44	20:00
56°	08:51	10:30	12:11	19:28	19:36	19:47
58°	08:55	10:38	12:24	19:23	19:27	19:33
S 60°	08:59	10:47	12:40	19:17	19:17	19:17

Day	Sun		Mer. Pass hh:mm	Moon		Age 2-4 6-21%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
02	12:09	12:03	12:12	14:19	01:54	
03	11:57	11:50	12:12	15:11	02:45	
04	11:44	11:37	12:12	16:06	03:38	

March 05, 06, 07 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162°59.74		156°8.11	N10°58.68	53°32.96	N25°41.34	91°47.19	N21°55.67	170°20.55	S05°15.22
1	178°2.20		171°11.02	58.91	68°35.15	41.23	106°49.41	55.71	185°22.73	15.10
2	193°4.67		186°13.93	59.13	83°37.34	41.12	121°51.63	55.74	200°24.91	14.98
3	208°7.13		201°16.84	· · 59.36	98°39.52	· · 41.01	136°53.86	· · 55.78	215°27.09	· · 14.86
4	223°9.59		216°19.76	59.58	113°41.71	40.90	151°56.08	55.82	230°29.28	14.74
5	238°12.06		231°22.68	10°59.80	128°43.89	40.79	166°58.30	55.85	245°31.46	14.62
6	253°14.52		246°25.61	N11°0.01	143°46.07	N25°40.68	182°0.52	N21°55.89	260°33.64	S05°14.50
7	268°16.99		261°28.54	0.23	158°48.25	40.57	197°2.74	55.93	275°35.82	14.38
8	283°19.45		276°31.47	0.44	173°50.43	40.46	212°4.96	55.97	290°38.00	14.26
9	298°21.91		291°34.41	· · 0.65	188°52.61	· · 40.35	227°7.18	· · 56.00	305°40.18	· · 14.14
10	313°24.38		306°37.35	0.86	203°54.79	40.24	242°9.40	56.04	320°42.36	14.02
11	328°26.84		321°40.30	1.06	218°56.96	40.12	257°11.62	56.08	335°44.54	13.90
12	343°29.31		336°43.25	N11°1.26	233°59.14	N25°40.01	272°13.84	N21°56.11	350°46.72	S05°13.78
13	358°31.77		351°46.20	1.46	249°1.31	39.90	287°16.06	56.15	5°48.90	13.66
14	13°34.24		6°49.16	1.66	264°3.48	39.79	302°18.28	56.19	20°51.08	13.54
15	28°36.70		21°52.12	· · 1.86	279°5.65	· · 39.68	317°20.50	· · 56.22	35°53.26	· · 13.42
16	43°39.16		36°55.08	2.05	294°7.82	39.57	332°22.72	56.26	50°55.44	13.29
17	58°41.63		51°58.05	2.24	309°9.99	39.45	347°24.94	56.30	65°57.62	13.17
18	73°44.09		67°1.02	N11°2.43	324°12.16	N25°39.34	2°27.15	N21°56.34	80°59.80	S05°13.05
19	88°46.56		82°4.00	2.61	339°14.33	39.23	17°29.37	56.37	96°1.98	12.93
20	103°49.02		97°6.98	2.80	354°16.49	39.12	32°31.59	56.41	111°4.16	12.81
21	118°51.48		112°9.96	· · 2.98	9°18.65	· · 39.01	47°33.80	· · 56.45	126°6.34	· · 12.69
22	133°53.95		127°12.95	3.16	24°20.82	38.89	62°36.02	56.49	141°8.52	12.57
23	148°56.41		142°15.94	3.33	39°22.98	38.78	77°38.24	56.52	156°10.70	12.45
Mer.pass. 13:06		ν2.9' d0.2' m-4.69		ν2.2' d-0.1' m-0.17		ν2.2' d0.0' m-2.27		ν2.2' d-0.1' m1.11		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	163°58.88		157°18.93	N11°3.51	54°25.14	N25°38.67	92°40.45	N21°56.56	171°12.88	S05°12.33
1	179°1.34		172°21.93	3.68	69°27.30	38.55	107°42.67	56.60	186°15.06	12.21
2	194°3.81		187°24.94	3.85	84°29.45	38.44	122°44.88	56.63	201°17.24	12.09
3	209°6.27		202°27.94	· · 4.02	99°31.61	· · 38.33	137°47.10	· · 56.67	216°19.42	· · 11.97
4	224°8.73		217°30.95	4.18	114°33.76	38.21	152°49.31	56.71	231°21.60	11.85
5	239°11.20		232°33.97	4.34	129°35.92	38.10	167°51.53	56.75	246°23.78	11.73
6	254°13.66		247°36.98	N11°4.50	144°38.07	N25°37.99	182°53.74	N21°56.78	261°25.96	S05°11.60
7	269°16.13		262°40.00	4.66	159°40.22	37.87	197°55.95	56.82	276°28.14	11.48
8	284°18.59		277°43.03	4.82	174°42.37	37.76	212°58.17	56.86	291°30.32	11.36
9	299°21.05		292°46.06	· · 4.97	189°44.52	· · 37.64	228°0.38	· · 56.90	306°32.50	· · 11.24
10	314°23.52		307°49.09	5.12	204°46.67	37.53	243°2.59	56.94	321°34.68	11.12
11	329°25.98		322°52.13	5.27	219°48.82	37.41	258°4.80	56.97	336°36.86	11.00
12	344°28.45		337°55.17	N11°5.41	234°50.96	N25°37.30	273°7.02	N21°57.01	351°39.04	S05°10.88
13	359°30.91		352°58.21	5.56	249°53.11	37.18	288°9.23	57.05	6°41.22	10.76
14	14°33.38		8°1.26	5.70	264°55.25	37.07	303°11.44	57.09	21°43.40	10.64
15	29°35.84		23°4.31	· · 5.84	279°57.39	· · 36.95	318°13.65	· · 57.12	36°45.58	· · 10.52
16	44°38.30		38°7.37	5.97	294°59.53	36.84	333°15.86	57.16	51°47.76	10.40
17	59°40.77		53°10.42	6.11	310°1.67	36.72	348°18.07	57.20	66°49.94	10.28
18	74°43.23		68°13.49	N11°6.24	325°3.81	N25°36.61	3°20.28	N21°57.24	81°52.12	S05°10.16
19	89°45.70		83°16.55	6.37	340°5.95	36.49	18°22.49	57.28	96°54.30	10.04
20	104°48.16		98°19.62	6.49	355°8.08	36.38	33°24.70	57.31	111°56.48	9.91
21	119°50.63		113°22.70	· · 6.62	10°10.22	· · 36.26	48°26.91	· · 57.35	126°58.66	· · 9.79
22	134°53.09		128°25.78	6.74	25°12.35	36.14	63°29.12	57.39	142°0.84	9.67
23	149°55.55		143°28.86	6.86	40°14.48	36.03	78°31.33	57.43	157°3.01	9.55
Mer.pass. 13:02		ν3.0' d0.2' m-4.66		ν2.2' d-0.1' m-0.15		ν2.2' d0.0' m-2.26		ν2.2' d-0.1' m1.11		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	164°58.02		158°31.94	N11°6.97	55°16.61	N25°35.91	93°33.53	N21°57.47	172°5.19	S05°9.43
1	180°0.48		173°35.03	7.09	70°18.74	35.79	108°35.74	57.50	187°7.37	9.31
2	195°2.95		188°38.12	7.20	85°20.87	35.68	123°37.95	57.54	202°9.55	9.19
3	210°5.41		203°41.22	· · 7.31	100°23.00	· · 35.56	138°40.16	· · 57.58	217°11.73	· · 9.07
4	225°7.87		218°44.32	7.41	115°25.13	35.44	153°42.36	57.62	232°13.91	8.95
5	240°10.34		233°47.42	7.52	130°27.25	35.33	168°44.57	57.66	247°16.09	8.83
6	255°12.80		248°50.53	N11°7.62	145°29.38	N25°35.21	183°46.78	N21°57.70	262°18.27	S05°8.71
7	270°15.27		263°53.64	7.72	160°31.50	35.09	198°48.98	57.73	277°20.45	8.59
8	285°17.73		278°56.76	7.82	175°33.62	34.97	213°51.19	57.77	292°22.63	8.47
9	300°20.20		293°59.88	· · 7.91	190°35.74	· · 34.85	228°53.39	· · 57.81	307°24.81	· · 8.35
10	315°22.66		309°3.00	8.00	205°37.86	34.74	243°55.60	57.85	322°26.99	8.22
11	330°25.12		324°6.12	8.09	220°39.98	34.62	258°57.80	57.89	337°29.17	8.10
12	345°27.59		339°9.25	N11°8.18	235°42.10	N25°34.50	274°0.01	N21°57.93	352°31.35	S05°7.98
13	0°30.05		354°12.39	8.27	250°44.21	34.38	289°2.21	57.96	7°33.53	7.86
14	15°32.52		9°15.52	8.35	265°46.33	34.26	304°4.42	58.00	22°35.71	7.74
15	30°34.98		24°18.67	· · 8.43	280°48.44	· · 34.14	319°6.62	· · 58.04	37°37.89	· · 7.62
16	45°37.44		39°21.81	8.51	295°50.55	34.03	334°8.82	58.08	52°40.07	7.50
17	60°39.91		54°24.96	8.58	310°52.66	33.91	349°11.03	58.12	67°42.25	7.38
18	75°42.37		69°28.11	N11°8.65	325°54.77	N25°33.79	4°13.23	N21°58.16	82°44.43	S05°7.26
19	90°44.84		84°31.27	8.72	340°56.88	33.67	19°15.43	58.19	97°46.61	7.14
20	105°47.30		99°34.42	8.79	355°58.99	33.55	34°17.63	58.23	112°48.79	7.02
21	120°49.77		114°37.59	· · 8.85	11°1.10	· · 33.43	49°19.84	· · 58.27	127°50.97	· · 6.90
22	135°52.23		129°40.75	8.92	26°3.20	33.31	64°22.04	58.31	142°53.15	6.78
23	150°54.69		144°43.92	8.98	41°5.31	33.19	79°24.24	58.35	157°55.33	6.65
Mer.pass. 12:58		ν3.1' d0.1' m-4.63		ν2.1' d-0.1' m-0.12		ν2.2' d0.0' m-2.26		ν2.2' d-0.1' m1.11		

	Stars	
	SHA	Dec
Alpheratz	357°35.00	29°13.71
Ankaa	353°7.38	-42°10.31
Schedar	349°31.45	56°40.58
Diphda	348°47.45	-17°51.06
Achernar	335°20.49	-57°6.75
Hamal	327°51.29	23°34.88
Polaris	314°12.40	89°22.50
Acamar	315°11.86	-40°12.45
Menkar	314°6.16	4°11.23
Mirfak	308°28.27	49°57.19
Aldebaran	290°39.50	-16°33.58
Rigel	281°3.71	-8°10.48
Capella	280°21.66	46°1.54
Bellatrix	278°22.70	6°22.29
Elnath	278°1.65	28°37.77
Alnilam	275°37.54	-1°11.25
Betelgeuse	270°51.86	7°24.65
Canopus	263°52.15	-52°42.77
Sirius	258°25.98	-16°45.20
Adhara	255°5.58	-29°0.57
Procyon	244°50.49	5°9.54
Pollux	243°16.90	27°57.93
Avior	234°14.23	-59°35.58
Suhail	222°45.85	-43°32.20
Miaplacidus	221°37.50	-69°49.34
Alphard	217°47.34	-8°46.19
Regulus	207°33.98	11°50.54
Dubhe	193°40.13	61°36.84
Denebala	182°24.49	14°25.73
Gienah	175°43.15	-17°41.01
Acrux	172°59.37	-63°14.27
Gacrux	171°51.02	-57°15.22
Alioth	166°12.32	55°49.16
Spica	158°21.91	-11°17.68
Alkaid	152°51.52	49°10.97
Hadar	148°35.43	-60°29.54
Menkent	147°57.22	-36°29.61
Arcturus	145°47.57	19°2.84
Rigil Kent.	139°39.78	-60°56.22
Kochab	137°19.12	74°2.74
Zuben'ubi	136°55.71	-16°8.86
Alphecca	126°3.50	26°37.49
Antares	112°15.64	-26°29.27
Atria	107°9.78	-69°4.11
Sabik	102°2.65	-15°45.43
Shaula	96°10.26	-37°7.25
Rasalhague	95°58.48	12°32.26
Eltanin	90°42.25	51°28.73
Kaus Aust.	83°32.48	-34°22.31
Vega	80°33.31	38°48.07
Nunki	75°47.77	-26°15.94
Altair	62°0.05	8°55.89
Peacock	53°5.95	-56°39.16
Deneb	49°26.11	45°21.95
Enif	33°38.98	9°59.26
Al Na'ir	27°33.17	-46°50.39
Fomalhaut	15°14.72	-29°29.

h		Sun		Moon				
Wed		GHA	Dec	GHA	ν	Dec	d	HP
0		177° 7.31	S06° 2.39	114° 0.41	6.7'	N22° 36.53	11.1'	59.5'
1		192° 7.45	1.42	128° 26.08	6.6'	22° 47.61	10.9'	59.4'
2		207° 7.59	06° 0.46	142° 51.67	6.5'	22° 58.54	10.8'	59.4'
3		222° 7.73	05° 59.49	157° 17.20	6.5'	23° 9.31	10.6'	59.4'
4		237° 7.87	58.52	171° 42.66	6.4'	23° 19.94	10.5'	59.4'
5		252° 8.01	57.56	186° 8.06	6.3'	23° 30.40	10.3'	59.3'
6		267° 8.15	S05° 56.59	200° 33.40	6.3'	N23° 40.72	10.2'	59.3'
7		282° 8.29	55.62	214° 58.67	6.2'	23° 50.88	10.0'	59.3'
8		297° 8.44	54.65	229° 23.87	6.1'	24° 0.87	9.8'	59.3'
9		312° 8.58	· · 53.69	243° 49.02	6.1'	24° 10.71	9.7'	59.2'
10		327° 8.72	52.72	258° 14.10	6.0'	24° 20.39	9.5'	59.2'
11		342° 8.86	51.75	272° 39.12	6.0'	24° 29.91	9.4'	59.2'
12		357° 9.00	S05° 50.78	287° 4.08	5.9'	N24° 39.27	9.2'	59.2'
13		12° 9.15	49.82	301° 28.99	5.8'	24° 48.46	9.0'	59.1'
14		27° 9.29	48.85	315° 53.83	5.8'	24° 57.48	8.9'	59.1'
15		42° 9.43	· · 47.88	330° 18.62	5.7'	25° 6.34	8.7'	59.1'
16		57° 9.57	46.91	344° 43.35	5.7'	25° 15.04	8.5'	59.1'
17		72° 9.72	45.94	359° 8.03	5.6'	25° 23.56	8.4'	59.0'
18		87° 9.86	S05° 44.97	13° 32.66	5.6'	N25° 31.92	8.2'	59.0'
19		102° 10.00	44.00	27° 57.23	5.5'	25° 40.11	8.0'	59.0'
20		117° 10.15	43.04	42° 21.75	5.5'	25° 48.12	7.8'	58.9'
21		132° 10.29	· · 42.07	56° 46.23	5.4'	25° 55.97	7.7'	58.9'
22		147° 10.44	41.10	71° 10.65	5.4'	26° 3.64	7.5'	58.9'
23		162° 10.58	40.13	85° 35.03	5.3'	26° 11.14	7.3'	58.9'
		SD = 16.1'		$d = -1.0'$		SD = 16.2'		

Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		177° 10.72	S05° 39.16	99° 59.36	5.3'	N26° 18.46	7.1'	58.8'
1		192° 10.87	38.19	114° 23.65	5.2'	26° 25.61	7.0'	58.8'
2		207° 11.01	37.22	128° 47.90	5.2'	26° 32.59	6.8'	58.8'
3		222° 11.16	· · 36.25	143° 12.10	5.2'	26° 39.39	6.6'	58.8'
4		237° 11.30	35.28	157° 36.27	5.1'	26° 46.01	6.4'	58.7'
5		252° 11.45	34.31	172° 0.40	5.1'	26° 52.45	6.3'	58.7'
6		267° 11.60	S05° 33.34	186° 24.49	5.1'	N26° 58.71	6.1'	58.7'
7		282° 11.74	32.37	200° 48.55	5.0'	27° 4.80	5.9'	58.7'
8		297° 11.89	31.40	215° 12.58	5.0'	27° 10.70	5.7'	58.6'
9		312° 12.03	· · 30.43	229° 36.57	5.0'	27° 16.43	5.5'	58.6'
10		327° 12.18	29.46	244° 0.54	4.9'	27° 21.97	5.4'	58.6'
11		342° 12.33	28.48	258° 24.48	4.9'	27° 27.34	5.2'	58.5'
12		357° 12.47	S05° 27.51	272° 48.39	4.9'	N27° 32.52	5.0'	58.5'
13		12° 12.62	26.54	287° 12.28	4.9'	27° 37.52	4.8'	58.5'
14		27° 12.77	25.57	301° 36.15	4.8'	27° 42.33	4.6'	58.5'
15		42° 12.91	· · 24.60	316° 0.00	4.8'	27° 46.97	4.5'	58.4'
16		57° 13.06	23.63	330° 23.83	4.8'	27° 51.42	4.3'	58.4'
17		72° 13.21	22.66	344° 47.65	4.8'	27° 55.69	4.1'	58.4'
18		87° 13.36	S05° 21.68	359° 11.45	4.8'	N27° 59.77	3.9'	58.4'
19		102° 13.51	20.71	13° 35.24	4.8'	28° 3.67	3.7'	58.3'
20		117° 13.65	19.74	27° 59.03	4.8'	28° 7.38	3.5'	58.3'
21		132° 13.80	· · 18.77	42° 22.80	4.8'	28° 10.91	3.3'	58.3'
22		147° 13.95	17.80	56° 46.57	4.8'	28° 14.26	3.2'	58.2'
23		162° 14.10	16.82	71° 10.33	4.8'	28° 17.42	3.0'	58.2'
		SD = 16.1'		$d = -1.0'$		SD = 16.0'		

Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		177° 14.25	S05° 15.85	85° 34.10	4.8'	N28° 20.40	2.8'	58.2'
1		192° 14.40	14.88	99° 57.86	4.8'	28° 23.19	2.6'	58.2'
2		207° 14.55	13.91	114° 21.63	4.8'	28° 25.80	2.4'	58.1'
3		222° 14.70	· · 12.93	128° 45.40	4.8'	28° 28.22	2.2'	58.1'
4		237° 14.85	11.96	143° 9.18	4.8'	28° 30.46	2.1'	58.1'
5		252° 14.99	10.99	157° 32.97	4.8'	28° 32.52	1.9'	58.1'
6		267° 15.14	S05° 10.01	171° 56.77	4.8'	N28° 34.39	1.7'	58.0'
7		282° 15.30	9.04	186° 20.59	4.8'	28° 36.07	1.5'	58.0'
8		297° 15.45	8.07	200° 44.42	4.8'	28° 37.57	1.3'	58.0'
9		312° 15.60	· · 7.09	215° 8.26	4.9'	28° 38.89	1.1'	57.9'
10		327° 15.75	6.12	229° 32.13	4.9'	28° 40.02	1.0'	57.9'
11		342° 15.90	5.15	243° 56.02	4.9'	28° 40.98	0.8'	57.9'
12		357° 16.05	S05° 4.17	258° 19.94	4.9'	N28° 41.74	0.6'	57.9'
13		12° 16.20	3.20	272° 43.88	5.0'	28° 42.33	0.4'	57.8'
14		27° 16.35	2.22	287° 7.85	5.0'	28° 42.73	0.2'	57.8'
15		42° 16.50	· · 1.25	301° 31.85	5.0'	28° 42.95	0.0'	57.8'
16		57° 16.65	05° 0.28	315° 55.89	5.1'	28° 42.99	-0.1'	57.8'
17		72° 16.81	04° 59.30	330° 19.95	5.1'	28° 42.85	-0.3'	57.7'
18		87° 16.96	S04° 58.33	344° 44.06	5.1'	N28° 42.53	-0.5'	57.7'
19		102° 17.11	57.35	359° 8.21	5.2'	28° 42.03	-0.7'	57.7'
20		117° 17.26	56.38	13° 32.39	5.2'	28° 41.35	-0.9'	57.6'
21		132° 17.42	· · 55.40	27° 56.62	5.3'	28° 40.49	-1.0'	57.6'
22		147° 17.57	54.43	42° 20.90	5.3'	28° 39.46	-1.2'	57.6'
23		162° 17.72	53.45	56° 45.22	5.4'	28° 38.24	-1.4'	57.6'
		SD = 16.1'		$d = -1.0'$		SD = 15.9'		

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:43	06:02	07:09	17:15	18:23	19:42
N 70°	04:51	06:02	07:03	17:21	18:22	19:34
68°	04:58	06:02	06:58	17:26	18:22	19:27
66°	05:03	06:02	06:53	17:31	18:22	19:22
64°	05:07	06:02	06:49	17:34	18:22	19:17
62°	05:11	06:02	06:46	17:38	18:22	19:13
60°	05:14	06:02	06:43	17:40	18:22	19:10
N 58°	05:16	06:01	06:41	17:43	18:22	19:08
56°	05:18	06:01	06:38	17:45	18:22	19:05
54°	05:20	06:01	06:36	17:47	18:22	19:03
52°	05:22	06:01	06:34	17:49	18:23	19:02
50°	05:23	06:00	06:33	17:51	18:23	19:00
45°	05:26	05:59	06:29	17:54	18:24	18:58
N 40°	05:27	05:59	06:26	17:57	18:24	18:56
35°	05:28	05:57	06:23	18:00	18:25	18:55
30°	05:29	05:56	06:20	18:03	18:26	18:54
20°	05:28	05:54	06:16	18:07	18:29	18:54
N 10°	05:26	05:51	06:12	18:11	18:32	18:56
0°	05:23	05:47	06:08	18:14	18:35	18:59
S 10°	05:18	05:43	06:04	18:18	18:39	19:04
20°	05:11	05:37	06:00	18:22	18:45	19:10
30°	05:02	05:30	05:54	18:27	18:51	19:20
35°	04:56	05:26	05:52	18:30	18:56	19:26
40°	04:48	05:21	05:48	18:34	19:01	19:33
45°	04:39	05:14	05:44	18:37	19:07	19:43
S 50°	04:26	05:06	05:39	18:42	19:15	19:54
52°	04:21	05:03	05:37	18:44	19:19	20:00
54°	04:14	04:58	05:35	18:46	19:23	20:07
56°	04:06	04:54	05:32	18:49	19:27	20:14
58°	03:58	04:48	05:29	18:52	19:32	20:23
S 60°	03:47	04:42	05:26	18:55	19:38	20:33

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
68°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
66°	05:29	<div></div>	<div></div>	03:24	<div></div>	<div></div>
64°	06:24	<div></div>	<div></div>	02:30	<div></div>	<div></div>
62°	06:58	06:46	<div></div>	01:58	04:13	<div></div>
60°	07:22	07:31	07:57	01:34	03:28	05:08
N 58°	07:42	08:00	08:37	01:15	02:59	04:28
56°	07:59	08:23	09:05	00:59	02:36	04:00
54°	08:13	08:42	09:27	00:45	02:18	03:38
52°	08:25	08:58	09:45	00:34	02:03	03:20
50°	08:36	09:12	10:00	00:23	01:49	03:05
45°	08:59	09:40	10:32	00:01	01:22	02:34
N 40°	09:18	10:02	10:56	01:00	02:10
35°	09:33	10:21	11:16	00:42	01:50
30°	09:47	10:36	11:33	00:27	01:34
20°	10:10	11:04	12:01	00:01	01:05
N 10°	10:31	11:27	12:26	23:38	00:41
0°	10:50	11:49	12:49	23:18	00:18
S 10°	11:09	12:11	13:12	22:57	23:55
20°	11:30	12:35	13:37	22:35	23:31
30°	11:54	13:02	14:06	22:09	23:02
35°	12:08	13:19	14:23	21:54	22:45	23:44
40°	12:25	13:38	14:44	21:37	22:26	23:24
45°	12:44	14:01	15:08	21:16	22:02	23:00
S 50°	13:10	14:31	15:40	20:50	21:32	22:28
52°	13:22	14:46	15:56	20:37	21:16	22:12
54°	13:36	15:04	16:14	20:23	20:59	21:54
56°	13:52	15:25	16:37	20:06	20:38	21:31
58°	14:12	15:51	17:06	19:46	20:11	21:02
S 60°	14:36	16:29	17:51	19:21	19:33	20:17

March 08, 09, 10 UT (Sat., Sun., Mon.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	165°57.16	159°47.10	N11°9.03	56°7.41	N25°33.07	94°26.44	N21°58.39	172°57.51	S05°6.53					Alpheratz	357°34.99 29°13.70		
1	180°59.62	174°50.28	9.09	71°9.51	32.95	109°28.64	58.43	187°59.69	6.41					Ankaa	353°7.38 -42°10.30		
2	196°2.09	189°53.46	9.14	86°11.61	32.83	124°30.84	58.47	203°1.87	6.29					Schedar	349°31.45 56°40.57		
3	211°4.55	204°56.64	· · 9.19	101°13.71	· · 32.71	139°33.04	· · 58.50	218°4.04	· · 6.17					Diphda	348°47.45 -17°51.05		
4	226°7.01	219°59.83	9.24	116°15.81	32.59	154°35.24	58.54	233°6.22	6.05					Achernar	335°20.50 -57°6.73		
5	241°9.48	235°3.02	9.28	131°17.91	32.47	169°37.44	58.58	248°8.40	5.93					Hamal	327°51.29 23°34.88		
6	256°11.94	250°6.22	N11°9.33	146°20.00	N25°32.35	184°39.64	N21°58.62	263°10.58	S05°5.81					Polaris	314°13.46 89°22.49		
7	271°14.41	265°9.42	9.37	161°22.10	32.23	199°41.84	58.66	278°12.76	5.69					Acamar	315°11.87 -40°12.45		
8	286°16.87	280°12.62	9.40	176°24.19	32.10	214°44.04	58.70	293°14.94	5.57					Menkar	314°6.16 4°11.23		
9	301°19.34	295°15.83	· · 9.44	191°26.28	· · 31.98	229°46.23	· · 58.74	308°17.12	· · 5.45					Mirfak	308°28.28 49°57.18		
10	316°21.80	310°19.04	9.47	206°28.38	31.86	244°48.43	58.78	323°19.30	5.33					Aldebaran	290°39.50 16°33.58		
11	331°24.26	325°22.25	9.50	221°30.47	31.74	259°50.63	58.82	338°21.48	5.21					Rigel	281°3.72 -8°10.44		
12	346°26.73	340°25.47	N11°9.53	236°32.56	N25°31.62	274°52.83	N21°58.86	353°23.66	S05°5.09					Capella	280°21.67 46°1.54		
13	1°29.19	355°28.69	9.55	251°34.64	31.50	289°55.02	58.89	8°25.84	4.96					Bellatrix	278°22.70 6°22.29		
14	16°31.66	10°31.91	9.57	266°36.73	31.37	304°57.22	58.93	23°28.02	4.84					Elnath	278°1.66 28°37.77		
15	31°34.12	25°35.14	· · 9.59	281°38.82	· · 31.25	319°59.42	· · 58.97	38°30.20	· · 4.72					Alnilam	275°37.55 -1°11.25		
16	46°36.58	40°38.37	9.61	296°40.90	31.13	335°1.61	59.01	53°32.38	4.60					Betelgeuse	270°51.87 7°24.65		
17	61°39.05	55°41.61	9.63	311°42.98	31.01	350°3.81	59.05	68°34.56	4.48					Canopus	263°52.17 -52°42.78		
18	76°41.51	70°44.85	N11°9.64	326°45.07	N25°30.88	5°6.00	N21°59.09	83°36.74	S05°4.36					Sirius	258°25.99 -16°45.20		
19	91°43.98	85°48.09	9.65	341°47.15	30.76	20°8.20	59.13	98°38.92	4.24					Adhara	255°5.59 -29°0.57		
20	106°46.44	100°51.34	9.65	356°49.23	30.64	35°10.39	59.17	113°41.10	4.12					Procyon	244°50.50 5°9.54		
21	121°48.91	115°54.58	· · 9.66	11°51.31	· · 30.52	50°12.59	· · 59.21	128°43.27	· · 4.00					Pollux	243°16.90 27°57.93		
22	136°51.37	130°57.84	9.66	26°53.38	30.39	65°14.78	59.25	143°45.45	3.88					Avior	234°14.25 -59°35.59		
23	151°53.83	146°1.09	9.66	41°55.46	30.27	80°16.98	59.29	158°47.63	3.76					Suhail	222°45.86 -43°32.22		
Mer.pass. 12:54			ν3.2' d0.1' m-4.59			ν2.1' d-0.1' m-0.10			ν2.2' d0.0' m-2.25			ν2.2' d-0.1' m1.10			Miaplacidus 221°37.52 -69°49.36		
															Alphard 217°47.33 -8°46.20		
															Regulus 207°33.98 11°50.54		
															Dubhe 193°40.12 61°36.85		
															Denebola 182°24.48 14°25.73		
															Gienah 175°43.14 -17°41.02		
															Acrux 172°59.35 -63°14.30		
															Gacrux 171°50.99 -57°15.24		
															Alioth 166°12.30 55°49.17		
															Spica 158°21.89 -11°17.68		
															Alkaid 152°51.49 49°10.97		
															Hadar 148°35.39 -60°29.55		
															Menkent 147°57.19 -36°29.63		
															Arcturus 145°47.55 19°2.84		
															Rigel Kent. 139°39.73 -60°56.23		
															Kochab 137°19.07 74°2.75		
															Zuben'ubi 136°55.68 -16°8.87		
															Alphecca 126°3.47 26°37.49		
															Antares 112°15.61 -26°29.27		
															Atria 107°9.71 -69°4.11		
															Sabik 102°2.62 -15°45.43		
															Shaula 96°10.22 -37°7.25		
															Rasalhague 95°58.45 12°32.25		
															Eltanin 90°42.22 51°28.73		
															Kaus Aust. 83°32.45 -34°22.31		
															Vega 80°33.28 38°48.06		
															Nunki 75°47.74 -26°15.94		
															Altair 62°0.03 8°55.89		
															Peacock 53°5.91 -56°39.14		
															Deneb 49°26.09 45°21.94		
															Enif 33°38.96 9°59.26		
															Al Na'ir 27°33.15 -46°50.37		
															Fomalhaut 15°14.70 -29°29.44		
															Scheat 13°45.44 28°13.04		
															Markab 13°30.09 15°20.32		
Mar 08 Sat			SHA			Mer.pass											
Venus			353°49.94			13:18											
Mars			250°10.25			20:13											
Jupiter			288°29.28			17:40											
Saturn			7°0.35			12:26											
Mar 09 Sun			SHA			Mer.pass											
Venus			354°8.06			13:13											
Mars			250°1.24			20:09											
Jupiter			288°22.87			17:36											
Saturn			6°53.51			12:23											
Mar 10 Mon			SHA			Mer.pass											
Venus			354°28.21			13:07											
Mars			249°51.58			20:06											
Jupiter			288°16.29			17:33											
Saturn			6°46.68			12:19											
Horizontal parallax																	
Venus:			0.5														
Mars:			0.2														
Mer.pass. 12:46			ν3.3' d-0.1' m-4.50			ν2.0' d-0.1' m-0.05			ν2.2' d0.0' m-2.24			ν2.2' d-0.1' m1.10					

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.87	S04°52.48	71°9.59	5.4'	N28°36.85	-1.6'	57.5'
1	192°18.03	51.50	85°34.01	5.5'	28°35.28	-1.7'	57.5'
2	207°18.18	50.53	99°58.48	5.5'	28°33.54	-1.9'	57.5'
3	222°18.33	· · 49.55	114°23.01	5.6'	28°31.63	-2.1'	57.5'
4	237°18.49	48.58	128°47.60	5.6'	28°29.54	-2.3'	57.4'
5	252°18.64	47.60	143°12.25	5.7'	28°27.27	-2.4'	57.4'
6	267°18.80	S04°46.62	157°36.95	5.8'	N28°24.84	-2.6'	57.4'
7	282°18.95	45.65	172°1.72	5.8'	28°22.23	-2.8'	57.4'
8	297°19.10	44.67	186°26.55	5.9'	28°19.45	-2.9'	57.3'
9	312°19.26	· · 43.70	200°51.45	6.0'	28°16.51	-3.1'	57.3'
10	327°19.41	42.72	215°16.41	6.0'	28°13.39	-3.3'	57.3'
11	342°19.57	41.74	229°41.45	6.1'	28°10.11	-3.4'	57.3'
12	357°19.72	S04°40.77	244°6.55	6.2'	N28°6.67	-3.6'	57.2'
13	12°19.88	39.79	258°31.73	6.3'	28°3.05	-3.8'	57.2'
14	27°20.03	38.81	272°56.98	6.3'	27°59.27	-3.9'	57.2'
15	42°20.19	· · 37.84	287°22.30	6.4'	27°55.33	-4.1'	57.2'
16	57°20.35	36.86	301°47.70	6.5'	27°51.23	-4.3'	57.1'
17	72°20.50	35.88	316°13.18	6.6'	27°46.96	-4.4'	57.1'
18	87°20.66	S04°34.91	330°38.74	6.6'	N27°42.54	-4.6'	57.1'
19	102°20.81	33.93	345°4.38	6.7'	27°37.95	-4.7'	57.1'
20	117°20.97	32.95	359°30.11	6.8'	27°33.21	-4.9'	57.0'
21	132°21.13	· · 31.97	13°55.91	6.9'	27°28.31	-5.1'	57.0'
22	147°21.28	31.00	28°21.80	7.0'	27°23.26	-5.2'	57.0'
23	162°21.44	30.02	42°47.78	7.1'	27°18.05	-5.4'	57.0'
SD = 16.1'			SD = 15.7'				
d = -1.0'							

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°21.60	S04°29.04	57°13.84	7.2'	N27°12.68	-5.5'	56.9'
1	192°21.75	28.06	71°39.99	7.2'	27°7.17	-5.7'	56.9'
2	207°21.91	27.09	86°6.23	7.3'	27°1.50	-5.8'	56.9'
3	222°22.07	· · 26.11	100°32.56	7.4'	26°55.69	-6.0'	56.9'
4	237°22.23	25.13	114°58.99	7.5'	26°49.73	-6.1'	56.8'
5	252°22.38	24.15	129°25.50	7.6'	26°43.61	-6.3'	56.8'
6	267°22.54	S04°23.17	143°52.11	7.7'	N26°37.36	-6.4'	56.8'
7	282°22.70	22.20	158°18.81	7.8'	26°30.96	-6.5'	56.8'
8	297°22.86	21.22	172°45.60	7.9'	26°24.41	-6.7'	56.7'
9	312°23.02	· · 20.24	187°12.49	8.0'	26°17.73	-6.8'	56.7'
10	327°23.18	19.26	201°39.48	8.1'	26°10.90	-7.0'	56.7'
11	342°23.34	18.28	216°6.57	8.2'	26°3.93	-7.1'	56.7'
12	357°23.49	S04°17.30	230°33.75	8.3'	N25°56.83	-7.2'	56.6'
13	12°23.65	16.32	245°1.03	8.4'	25°49.59	-7.4'	56.6'
14	27°23.81	15.35	259°28.41	8.5'	25°42.21	-7.5'	56.6'
15	42°23.97	· · 14.37	273°55.88	8.6'	25°34.70	-7.6'	56.6'
16	57°24.13	13.39	288°23.46	8.7'	25°27.06	-7.8'	56.5'
17	72°24.29	12.41	302°51.14	8.8'	25°19.28	-7.9'	56.5'
18	87°24.45	S04°11.43	317°18.92	8.9'	N25°11.38	-8.0'	56.5'
19	102°24.61	10.45	331°46.80	9.0'	25°3.35	-8.2'	56.5'
20	117°24.77	9.47	346°14.78	9.1'	24°55.19	-8.3'	56.5'
21	132°24.93	· · 8.49	0°42.86	9.2'	24°46.90	-8.4'	56.4'
22	147°25.09	7.51	15°11.04	9.3'	24°38.49	-8.5'	56.4'
23	162°25.25	6.53	29°39.33	9.4'	24°29.96	-8.7'	56.4'
SD = 16.1'			SD = 15.5'				
d = -1.0'							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.41	S04°5.55	44°7.72	9.5'	N24°21.30	-8.8'	56.4'
1	192°25.57	4.57	58°36.21	9.6'	24°12.52	-8.9'	56.3'
2	207°25.73	3.59	73°4.80	9.7'	24°3.63	-9.0'	56.3'
3	222°25.90	· · 2.61	87°33.50	9.8'	23°54.62	-9.1'	56.3'
4	237°26.06	1.63	102°2.30	9.9'	23°45.49	-9.2'	56.3'
5	252°26.22	04°0.65	116°31.20	10.0'	23°36.25	-9.4'	56.3'
6	267°26.38	S03°59.67	131°0.20	10.1'	N23°26.89	-9.5'	56.2'
7	282°26.54	58.69	145°29.31	10.2'	23°17.42	-9.6'	56.2'
8	297°26.70	57.71	159°58.52	10.3'	23°7.84	-9.7'	56.2'
9	312°26.87	· · 56.73	174°27.83	10.4'	22°58.16	-9.8'	56.2'
10	327°27.03	55.75	188°57.25	10.5'	22°48.36	-9.9'	56.1'
11	342°27.19	54.77	203°26.76	10.6'	22°38.46	-10.0'	56.1'
12	357°27.35	S03°53.79	217°56.38	10.7'	N22°28.45	-10.1'	56.1'
13	12°27.52	52.81	232°26.10	10.8'	22°18.34	-10.2'	56.1'
14	27°27.68	51.83	246°55.92	10.9'	22°8.12	-10.3'	56.1'
15	42°27.84	· · 50.85	261°25.85	11.0'	21°57.81	-10.4'	56.0'
16	57°28.01	49.86	275°55.87	11.1'	21°47.39	-10.5'	56.0'
17	72°28.17	48.88	290°25.99	11.2'	21°36.88	-10.6'	56.0'
18	87°28.33	S03°47.90	304°56.22	11.3'	N21°26.27	-10.7'	56.0'
19	102°28.50	46.92	319°26.54	11.4'	21°15.57	-10.8'	56.0'
20	117°28.66	45.94	333°56.96	11.5'	21°4.77	-10.9'	55.9'
21	132°28.82	· · 44.96	348°27.49	11.6'	20°53.88	-11.0'	55.9'
22	147°28.99	43.98	2°58.11	11.7'	20°42.89	-11.1'	55.9'
23	162°29.15	42.99	17°28.82	11.8'	20°31.82	-11.2'	55.9'
SD = 16.1'			SD = 15.4'				
d = -1.0'							

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:27	05:47	06:54	17:29	18:37	19:58
N 70°	04:37	05:49	06:49	17:34	18:35	19:47
68°	04:45	05:50	06:45	17:38	18:33	19:39
66°	04:51	05:51	06:42	17:41	18:32	19:32
64°	04:56	05:52	06:39	17:43	18:31	19:26
62°	05:01	05:52	06:36	17:46	18:30	19:22
60°	05:05	05:53	06:34	17:48	18:29	19:18
N 58°	05:08	05:53	06:32	17:50	18:29	19:15
56°	05:11	05:54	06:31	17:51	18:28	19:12
54°	05:13	05:54	06:29	17:53	18:28	19:09
52°	05:15	05:54	06:28	17:54	18:28	19:07
50°	05:17	05:54	06:26	17:56	18:28	19:05
45°	05:20	05:54	06:23	17:58	18:28	19:02
N 40°	05:23	05:54	06:21	18:01	18:28	18:59
35°	05:24	05:53	06:19	18:03	18:28	18:57
30°	05:25	05:53	06:17	18:05	18:28	18:56
20°	05:26	05:51	06:13	18:08	18:30	18:55
N 10°	05:25	05:49	06:10	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:14	18:34	18:58
S 10°	05:18	05:43	06:04	18:17	18:38	19:02
20°	05:13	05:38	06:01	18:20	18:42	19:08
30°	05:04	05:32	05:56	18:24	18:48	19:16
35°	04:59	05:29	05:54	18:26	18:52	19:22
40°	04:52	05:24	05:51	18:29	18:56	19:28
45°	04:43	05:18	05:48	18:32	19:01	19:37
S 50°	04:32	05:11	05:44	18:36	19:08	19:47
52°	04:27	05:08	05:42	18:37	19:11	19:53
54°	04:21	05:04	05:41	18:39	19:15	19:59
56°	04:14	05:00	05:38	18:41	19:19	20:05
58°	04:06	04:56	05:36	18:44	19:24	20:13
S 60°	03:57	04:50	05:33	18:46	19:29	20:22

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	10:50	<input type="checkbox"/>	<input type="checkbox"/>	08:10
64°	<input type="checkbox"/>	<input type="checkbox"/>	11:36	<input type="checkbox"/>	<input type="checkbox"/>	07:23
62°	<input type="checkbox"/>	10:06	12:06	<input type="checkbox"/>	07:03	06:53
60°	09:05	10:45	12:28	06:05	06:24	06:29
N 58°	09:43	11:12	12:46	05:26	05:56	06:11
56°	10:10	11:33	13:02	04:59	05:35	05:55
54°	10:31	11:50	13:15	04:38	05:17	05:41
52°	10:49	12:05	13:26	04:20	05:02	05:29
50°	11:04	12:18	13:36	04:05	04:48	05:19
45°	11:34	12:44	13:57	03:34	04:21	04:57
N 40°	11:58	13:05	14:14	03:11	04:00	04:39
35°	12:17	13:22	14:28	02:51	03:42	04:24
30°	12:34	13:37	14:40	02:34	03:26	04:10
20°	13:02	14:02	15:01	02:05	03:00	03:48
N 10°	13:26	14:24	15:19	01:41	02:37	03:28
0°	13:48	14:44	15:36	01:18	02:16	03:10
S 10°	14:11	15:04	15:53	00:55	01:54	02:51
20°	14:35	15:26	16:11	00:30	01:31	02:31
30°	15:03	15:51	16:31	00:01	01:04	02:08
35°	15:19	16:05	16:43	· · ·	00:48	01:54
40°	15:38	16:22	16:57	· · ·	00:29	01:38
45°	16:01	16:42	17:13	· · ·	00:07	01:19
S 50°	16:31	17:07	17:32	23:38	· · ·	00:55
52°	16:46	17:19	17:42	23:23	· · ·	00:43
54°	17:03	17:33	17:52	23:07	· · ·	00:30
56°	17:23	17:49	18:04	22:47	· · ·	00:14
58°	17:48	18:08	18:17	22:22	23:56	· · ·
S 60°	18:22	18:31	18:33	21:48	23:34	· · ·

Day	Sun		Mer. Pass	Moon	
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March 11, 12, 13 UT (Tue., Wed., Thu.)



h	Aries		Venus		Mars		Jupiter		Saturn		Stars				
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	168°54.58	163°44.89	N11°6.47	58°35.86	N25°24.05	97°4.11	N22°1.24	175°34.42	S04°57.85			Alpheratz	357°34.99 29°13.70		
1	183°57.04	178°48.32	6.34	73°37.88	23.92	112°6.29	1.29	190°36.60	57.73			Ankaa	353°7.37 -42°10.28		
2	198°59.50	193°51.75	6.21	88°39.90	23.79	127°8.47	1.33	205°38.77	57.60			Schedar	349°31.46 56°40.56		
3	214°1.97	208°55.18	•• 6.07	103°41.92	•• 23.66	142°10.65	•• 1.37	220°40.95	•• 57.48			Diphda	348°47.45 -17°51.05		
4	229°4.43	223°58.62	5.93	118°43.94	23.53	157°12.83	1.41	235°43.13	57.36			Achernar	335°20.51 -57°6.72		
5	244°6.90	239°2.06	5.79	133°45.96	23.40	172°15.00	1.45	250°45.31	57.24			Hamal	327°51.30 23°34.88		
6	259°9.36	254°5.50	N11°5.65	148°47.97	N25°23.27	187°17.18	N22°1.49	265°47.49	S04°57.12			Polaris	314°14.77 89°22.48		
7	274°11.83	269°8.94	5.50	163°49.99	23.13	202°19.36	1.53	280°49.67	57.00			Acamar	315°11.88 -40°12.44		
8	289°14.29	284°12.39	5.35	178°52.00	23.00	217°21.54	1.57	295°51.85	56.88			Menkar	314°6.17 4°11.23		
9	304°16.75	299°15.84	•• 5.20	193°54.02	•• 22.87	232°23.71	•• 1.61	310°54.03	•• 56.76			Mirfak	308°28.30 49°57.18		
10	319°19.22	314°19.30	5.05	208°56.03	22.74	247°25.89	1.65	325°56.21	56.64			Aldebaran	290°39.51 16°33.59		
11	334°21.68	329°22.76	4.89	223°58.04	22.61	262°28.06	1.69	340°58.39	56.52			Rigel	281°3.73 -8°10.48		
12	349°24.15	344°26.22	N11°4.73	239°0.05	N25°22.48	277°30.24	N22°1.73	356°0.57	S04°56.40			Capella	280°21.68 46°1.54		
13	4°26.61	359°29.68	4.57	254°2.06	22.34	292°32.42	1.77	11°2.75	56.28			Bellatrix	278°22.71 6°22.29		
14	19°29.07	14°33.15	4.41	269°4.07	22.21	307°34.59	1.81	26°4.92	56.16			Elnath	278°1.67 28°37.77		
15	34°31.54	29°36.62	•• 4.24	284°6.07	•• 22.08	322°36.77	•• 1.86	41°7.10	•• 56.04			Alnilam	275°37.56 -1°11.25		
16	49°34.00	44°40.09	4.07	299°8.08	21.95	337°38.94	1.90	56°9.28	55.92			Betelgeuse	270°51.88 7°24.65		
17	64°36.47	59°43.57	3.90	314°10.08	21.81	352°41.12	1.94	71°11.46	55.80			Canopus	263°52.19 -52°42.78		
18	79°38.93	74°47.05	N11°3.72	329°12.09	N25°21.68	7°43.29	N22°1.98	86°13.64	S04°55.68			Sirius	258°26.00 -16°45.21		
19	94°41.39	89°50.53	3.55	344°14.09	21.55	22°45.46	2.02	101°15.82	55.56			Adhara	255°5.61 -29°0.57		
20	109°43.86	104°54.02	3.37	359°16.09	21.41	37°47.64	2.06	116°18.00	55.43			Procyon	244°50.50 5°9.54		
21	124°46.32	119°57.51	•• 3.18	14°18.09	•• 21.28	52°49.81	•• 2.10	131°20.18	•• 55.31			Pollux	243°16.91 27°57.94		
22	139°48.79	135°1.00	3.00	29°20.09	21.15	67°51.98	2.14	146°22.36	55.19			Avior	234°14.27 -59°35.60		
23	154°51.25	150°4.49	2.81	44°22.09	21.01	82°54.16	2.18	161°24.54	55.07			Suhail	222°45.87 -43°32.23		
Mer.pass. 12:42		ν3.4' d-0.1' m-4.45		ν2.0' d-0.1' m-0.02		ν2.2' d0.0' m-2.23		ν2.2' d-0.1' m1.10					Miaplacidus	221°37.55 -69°49.37	
													Alphard	217°47.34 -8°46.20	
													Regulus	207°33.98 11°50.54	
													Dubhe	193°40.11 61°36.86	
													Denebola	182°24.47 14°25.73	
													Gienah	175°43.13 -17°41.03	
													Acrux	172°59.34 -63°14.31	
													Gacrux	171°50.98 -57°15.26	
													Alioth	166°12.28 55°49.18	
													Spica	158°21.88 -11°17.69	
													Alkaid	152°51.47 49°10.98	
													Hadar	148°35.36 -60°29.57	
													Menkent	147°57.17 -36°29.64	
													Arcturus	145°47.53 19°2.84	
													Rigel Kent.	139°39.70 -60°56.24	
													Kochab	137°19.01 74°2.75	
													Zuben'ubi	136°55.66 -16°8.88	
													Alphecca	126°3.45 26°37.49	
													Antares	112°15.58 -26°29.28	
													Atria	107°9.65 -69°4.12	
													Sabik	102°2.60 -15°45.44	
													Shaula	96°10.19 -37°7.26	
													Rasalhague	95°58.43 12°32.25	
													Eltanin	90°42.19 51°28.72	
													Kaus Aust.	83°32.42 -34°22.31	
													Vega	80°33.25 38°48.06	
													Nunki	75°47.71 -26°15.94	
													Altair	62°0.01 8°55.88	
													Peacock	53°5.88 -56°39.13	
													Deneb	49°26.07 45°21.93	
													Enif	33°38.95 9°59.26	
													Al Na'ir	27°33.13 -46°50.36	
													Fomalhaut	15°14.69 -29°29.43	
													Scheat	13°45.43 28°13.04	
													Markab	13°30.08 15°20.31	
													Mar 11 Tue	SHA	Mer.pass
													Venus	354°50.32	13:02
													Mars	249°41.28	20:03
													Jupiter	288°9.53	17:29
													Saturn	6°39.84	12:16
													Mar 12 Wed	SHA	Mer.pass
													Venus	355°14.28	12:56
													Mars	249°30.37	20:00
													Jupiter	288°2.61	17:26
													Saturn	6°33.00	12:12
													Mar 13 Thu	SHA	Mer.pass
													Venus	355°39.97	12:51
													Mars	249°18.85	19:57
													Jupiter	287°55.52	17:22
													Saturn	6°26.16	12:09


h		Sun		Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°29.32	S03°42.01	31°59.64	11.9'	N20°20.66	-11.3'	55.9'
1	192°29.48	41.03	46°30.55	12.0'	20°9.41	-11.3'	55.8'
2	207°29.64	40.05	61°1.56	12.1'	19°58.07	-11.4'	55.8'
3	222°29.81	· · 39.07	75°32.66	12.2'	19°46.65	-11.5'	55.8'
4	237°29.97	38.09	90°3.86	12.3'	19°35.14	-11.6'	55.8'
5	252°30.14	37.10	104°35.15	12.4'	19°23.56	-11.7'	55.8'
6	267°30.30	S03°36.12	119°6.54	12.5'	N19°11.89	-11.7'	55.7'
7	282°30.47	35.14	133°38.02	12.6'	19°0.14	-11.8'	55.7'
8	297°30.63	34.16	148°9.59	12.7'	18°48.32	-11.9'	55.7'
9	312°30.80	· · 33.17	162°41.26	12.8'	18°36.41	-12.0'	55.7'
10	327°30.97	32.19	177°13.01	12.8'	18°24.43	-12.1'	55.7'
11	342°31.13	31.21	191°44.86	12.9'	18°12.38	-12.1'	55.6'
12	357°31.30	S03°30.23	206°16.79	13.0'	N18°0.25	-12.2'	55.6'
13	12°31.46	29.24	220°48.82	13.1'	17°48.06	-12.3'	55.6'
14	27°31.63	28.26	235°20.93	13.2'	17°35.79	-12.3'	55.6'
15	42°31.80	· · 27.28	249°53.13	13.3'	17°23.45	-12.4'	55.6'
16	57°31.96	26.30	264°25.42	13.4'	17°11.04	-12.5'	55.5'
17	72°32.13	25.31	278°57.79	13.5'	16°58.56	-12.5'	55.5'
18	87°32.30	S03°24.33	293°30.24	13.5'	N16°46.02	-12.6'	55.5'
19	102°32.46	23.35	308°2.78	13.6'	16°33.42	-12.7'	55.5'
20	117°32.63	22.36	322°35.41	13.7'	16°20.75	-12.7'	55.5'
21	132°32.80	· · 21.38	337°8.11	13.8'	16°8.02	-12.8'	55.4'
22	147°32.96	20.40	351°40.90	13.9'	15°55.23	-12.9'	55.4'
23	162°33.13	19.41	6°13.77	13.9'	15°42.38	-12.9'	55.4'
SD = 16.1'		$d = -1.0'$	SD = 15.2'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°33.30	S03°18.43	20°46.72	14.0'	N15°29.47	-13.0'	55.4'
1	192°33.47	17.45	35°19.74	14.1'	15°16.50	-13.0'	55.4'
2	207°33.63	16.46	49°52.85	14.2'	15°3.47	-13.1'	55.4'
3	222°33.80	· · 15.48	64°26.03	14.3'	14°50.39	-13.1'	55.3'
4	237°33.97	14.50	78°59.29	14.3'	14°37.26	-13.2'	55.3'
5	252°34.14	13.51	93°32.62	14.4'	14°24.07	-13.2'	55.3'
6	267°34.31	S03°12.53	108°6.02	14.5'	N14°10.84	-13.3'	55.3'
7	282°34.47	11.55	122°39.50	14.6'	13°57.55	-13.3'	55.3'
8	297°34.64	10.56	137°13.06	14.6'	13°44.21	-13.4'	55.3'
9	312°34.81	· · 9.58	151°46.68	14.7'	13°30.82	-13.4'	55.2'
10	327°34.98	8.59	166°20.37	14.8'	13°17.39	-13.5'	55.2'
11	342°35.15	7.61	180°54.14	14.8'	13°3.91	-13.5'	55.2'
12	357°35.32	S03°6.63	195°27.97	14.9'	N12°50.38	-13.6'	55.2'
13	12°35.49	5.64	210°1.87	15.0'	12°36.81	-13.6'	55.2'
14	27°35.66	4.66	224°35.83	15.0'	12°23.20	-13.7'	55.1'
15	42°35.83	· · 3.67	239°9.86	15.1'	12°9.55	-13.7'	55.1'
16	57°36.00	2.69	253°43.96	15.2'	11°55.85	-13.7'	55.1'
17	72°36.17	1.71	268°18.11	15.2'	11°42.12	-13.8'	55.1'
18	87°36.33	S03°0.72	282°52.34	15.3'	N11°28.35	-13.8'	55.1'
19	102°36.50	02°59.74	297°26.62	15.3'	11°14.53	-13.8'	55.1'
20	117°36.67	58.75	312°0.96	15.4'	11°0.69	-13.9'	55.1'
21	132°36.85	· · 57.77	326°35.36	15.5'	10°46.80	-13.9'	55.0'
22	147°37.02	56.78	341°9.82	15.5'	10°32.89	-14.0'	55.0'
23	162°37.19	55.80	355°44.34	15.6'	10°18.94	-14.0'	55.0'
SD = 16.1'		$d = -1.0'$	SD = 15.1'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°37.36	S02°54.81	10°18.91	15.6'	N10°4.95	-14.0'	55.0'
1	192°37.53	53.83	24°53.54	15.7'	09°50.94	-14.0'	55.0'
2	207°37.70	52.84	39°28.23	15.7'	09°36.89	-14.1'	55.0'
3	222°37.87	· · 51.86	54°2.96	15.8'	09°22.82	-14.1'	54.9'
4	237°38.04	50.87	68°37.75	15.8'	09°8.71	-14.1'	54.9'
5	252°38.21	49.89	83°12.59	15.9'	08°54.58	-14.2'	54.9'
6	267°38.38	S02°48.90	97°47.48	15.9'	N08°40.42	-14.2'	54.9'
7	282°38.55	47.92	112°22.42	16.0'	08°26.24	-14.2'	54.9'
8	297°38.72	46.93	126°57.41	16.0'	08°12.03	-14.2'	54.9'
9	312°38.90	· · 45.95	141°32.44	16.1'	07°57.80	-14.3'	54.8'
10	327°39.07	44.96	156°7.52	16.1'	07°43.55	-14.3'	54.8'
11	342°39.24	43.98	170°42.65	16.2'	07°29.27	-14.3'	54.8'
12	357°39.41	S02°42.99	185°17.81	16.2'	N07°14.98	-14.3'	54.8'
13	12°39.58	42.01	199°53.02	16.3'	07°0.66	-14.3'	54.8'
14	27°39.76	41.02	214°28.28	16.3'	06°46.33	-14.4'	54.8'
15	42°39.93	· · 40.04	229°3.57	16.3'	06°31.97	-14.4'	54.8'
16	57°40.10	39.05	243°38.90	16.4'	06°17.60	-14.4'	54.7'
17	72°40.27	38.06	258°14.28	16.4'	06°3.22	-14.4'	54.7'
18	87°40.45	S02°37.08	272°49.69	16.4'	N05°48.81	-14.4'	54.7'
19	102°40.62	36.09	287°25.13	16.5'	05°34.40	-14.4'	54.7'
20	117°40.79	35.11	302°0.61	16.5'	05°19.97	-14.4'	54.7'
21	132°40.96	· · 34.12	316°36.13	16.5'	05°5.53	-14.5'	54.7'
22	147°41.14	33.14	331°11.68	16.6'	04°51.07	-14.5'	54.7'
23	162°41.31	32.15	345°47.26	16.6'	04°36.61	-14.5'	54.6'
SD = 16.1'		$d = -1.0'$	SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:10	05:32	06:38	17:43	18:50	20:13
N 70°	04:22	05:35	06:35	17:46	18:47	20:01
68°	04:31	05:37	06:33	17:49	18:44	19:51
66°	04:39	05:40	06:30	17:51	18:42	19:43
64°	04:46	05:41	06:28	17:52	18:40	19:36
62°	04:51	05:43	06:27	17:54	18:38	19:30
60°	04:55	05:44	06:25	17:55	18:37	19:26
N 58°	04:59	05:45	06:24	17:57	18:36	19:22
56°	05:03	05:46	06:23	17:58	18:35	19:18
54°	05:05	05:47	06:22	17:59	18:34	19:15
52°	05:08	05:47	06:21	18:00	18:33	19:13
50°	05:10	05:48	06:20	18:00	18:33	19:10
45°	05:15	05:49	06:18	18:02	18:31	19:06
N 40°	05:18	05:49	06:16	18:04	18:31	19:02
35°	05:20	05:49	06:15	18:05	18:30	19:00
30°	05:22	05:49	06:13	18:06	18:30	18:58
20°	05:23	05:49	06:11	18:09	18:31	18:56
N 10°	05:23	05:48	06:09	18:11	18:32	18:56
0°	05:22	05:46	06:06	18:13	18:34	18:58
S 10°	05:19	05:43	06:04	18:15	18:36	19:01
20°	05:14	05:39	06:01	18:17	18:40	19:05
30°	05:06	05:34	05:58	18:20	18:44	19:12
35°	05:01	05:31	05:57	18:22	18:47	19:17
40°	04:55	05:27	05:55	18:24	18:51	19:23
45°	04:48	05:23	05:52	18:26	18:56	19:31
S 50°	04:38	05:17	05:49	18:29	19:02	19:40
52°	04:33	05:14	05:48	18:30	19:04	19:45
54°	04:27	05:11	05:46	18:32	19:07	19:50
56°	04:21	05:07	05:45	18:33	19:11	19:56
58°	04:14	05:03	05:43	18:35	19:15	20:03
S 60°	04:06	04:58	05:41	18:37	19:19	20:11

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	 14:15	16:30		 08:04	07:17	
N 70°	12:05	14:38	16:39	08:38	07:39	07:05
68°	12:47	14:55	16:46	07:55	07:19	06:56
66°	13:15	15:09	16:52	07:26	07:04	06:47
64°	13:36	15:21	16:58	07:04	06:51	06:41
62°	13:53	15:31	17:02	06:46	06:40	06:35
60°	14:07	15:39	17:06	06:31	06:30	06:29
N 58°	14:19	15:46	17:09	06:18	06:22	06:25
56°	14:29	15:52	17:12	06:07	06:15	06:20
54°	14:38	15:58	17:15	05:57	06:08	06:17
52°	14:46	16:03	17:17	05:48	06:02	06:13
50°	14:53	16:08	17:20	05:41	05:57	06:10
45°	15:09	16:18	17:24	05:24	05:45	06:03
N 40°	15:21	16:26	17:28	05:10	05:36	05:58
35°	15:32	16:33	17:32	04:58	05:27	05:53
30°	15:41	16:39	17:35	04:48	05:20	05:48
20°	15:57	16:50	17:40	04:30	05:07	05:41
N 10°	16:11	16:59	17:45	04:14	04:56	05:34
0°	16:23	17:07	17:49	03:59	04:45	05:28
S 10°	16:36	17:16	17:53	03:44	04:34	05:21
20°	16:50	17:25	17:58	03:28	04:23	05:14
30°	17:05	17:35	18:03	03:10	04:09	05:06
35°	17:14	17:41	18:06	02:59	04:01	05:02
40°	17:25	17:48	18:09	02:46	03:53	04:56
45°	17:36	17:56	18:13	02:31	03:42	04:50
S 50°	17:51	18:05	18:17	02:13	03:29	04:43
52°	17:57	18:09	18:19	02:04	03:23	04:39
54°	18:05	18:14	18:22	01:55	03:17	04:35
56°	18:13	18:19	18:24	01:44	03:09	04:31
58°	18:22	18:25	18:27	01:31	03:01	04:26
S 60°	18:33	18:32	18:30	01:16	02:52	04:21

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	11-13
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	90-98%
11	10:03	09:55	12:10	22:34	10:11	
12	09:47	09:39	12:10	23:18	10:56	
13	09:31	09:22	12:09	23:58	11:38	

March 14, 15, 16 UT (Fri., Sat., Sun.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	171°51.99		167°59.26	N10°50.38	60°58.74	N25°14.30	99°40.26	N22°4.22	178°11.32	S04°49.17	Alpheratz	357°34.99 29°13.69
1	186°54.45		183°2.89	50.06	76°0.68	14.16	114°42.42	4.26	193°13.50	49.05	Ankaa	353°7.38 -42°10.27
2	201°56.92		198°6.53	49.74	91°2.63	14.01	129°44.58	4.30	208°15.67	48.93	Schedar	349°31.47 56°40.55
3	216°59.38		213°10.17	· · 49.41	106°4.57	· · 13.87	144°46.73	· · 4.35	223°17.85	· · 48.81	Diphda	348°47.45 -17°51.04
4	232°1.84		228°13.81	49.09	121°6.52	13.73	159°48.89	4.39	238°20.03	48.69	Achernar	335°20.52 -57°6.70
5	247°4.31		243°17.45	48.76	136°8.46	13.59	174°51.05	4.43	253°22.21	48.57	Hamal	327°51.31 23°34.87
6	262°6.77		258°21.10	N10°48.43	151°10.40	N25°13.45	189°53.21	N22°4.47	268°24.39	S04°48.45	Polaris	314°16.13 89°22.48
7	277°9.24		273°24.75	48.09	166°12.34	13.31	204°55.36	4.51	283°26.57	48.33	Acamar	315°11.90 -40°12.43
8	292°11.70		288°28.40	47.75	181°14.28	13.17	219°57.52	4.56	298°28.75	48.21	Menkar	314°6.19 4°11.23
9	307°14.17		303°32.05	· · 47.41	196°16.22	· · 13.03	234°59.67	· · 4.60	313°30.93	· · 48.09	Mirfak	308°28.32 49°57.17
10	322°16.63		318°35.71	47.07	211°18.16	12.88	250°1.83	4.64	328°33.11	47.97	Aldebaran	290°39.53 -16°33.58
11	337°19.09		333°39.37	46.73	226°20.10	12.74	265°3.99	4.68	343°35.29	47.85	Rigel	281°3.75 -8°10.48
12	352°21.56		348°43.03	N10°46.38	241°22.03	N25°12.60	280°6.14	N22°4.73	358°37.47	S04°47.73	Capella	280°21.71 46°1.54
13	7°24.02		3°46.69	46.03	256°23.97	12.46	295°8.30	4.77	13°39.65	47.61	Bellatrix	278°22.73 6°22.29
14	22°26.49		18°50.35	45.68	271°25.90	12.31	310°10.45	4.81	28°41.83	47.49	Elnath	278°1.69 28°37.77
15	37°28.95		33°54.02	· · 45.32	286°27.84	· · 12.17	325°12.61	· · 4.85	43°44.00	· · 47.37	Alnilam	275°37.57 -1°11.25
16	52°31.41		48°57.69	44.96	301°29.77	12.03	340°14.76	4.90	58°46.18	47.25	Betelgeuse	270°51.89 7°24.65
17	67°33.88		64°1.36	44.60	316°31.70	11.89	355°16.91	4.94	73°48.36	47.12	Canopus	263°52.22 -52°42.78
18	82°36.34		79°5.04	N10°44.24	331°33.63	N25°11.74	10°19.07	N22°4.98	88°50.54	S04°47.00	Sirius	258°26.02 -17°45.21
19	97°38.81		94°8.72	43.87	346°35.56	11.60	25°21.22	5.02	103°52.72	46.88	Adhara	255°5.63 -29°0.58
20	112°41.27		109°12.40	43.51	1°37.49	11.46	40°23.37	5.07	118°54.90	46.76	Procyon	244°50.52 5°9.54
21	127°43.73		124°16.08	· · 43.14	16°39.41	· · 11.31	55°25.53	· · 5.11	133°57.08	· · 46.64	Pollux	243°16.93 27°57.94
22	142°46.20		139°19.76	42.76	31°41.34	11.17	70°27.68	5.15	148°59.26	46.52	Avior	234°14.30 -59°35.61
23	157°48.66		154°23.45	42.39	46°43.26	11.03	85°29.83	5.19	164°1.44	46.40	Suhail	222°45.88 -43°32.24
Mer.pass.	12:30		ν3.6' d-0.3' m-4.28		ν1.9' d-0.1' m0.05		ν2.2' d0.0' m-2.21		ν2.2' d-0.1' m1.11		Miaplacidus	221°37.59 -69°49.39
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Alphard	217°47.35 -8°46.20
0	172°51.13		169°27.13	N10°42.01	61°45.19	N25°10.88	100°31.98	N22°5.24	179°3.62	S04°46.28	Regulus	207°33.98 11°50.54
1	187°53.59		184°30.83	41.63	76°47.11	10.74	115°34.13	5.28	194°5.80	46.16	Dubhe	193°40.11 61°36.88
2	202°56.05		199°34.52	41.24	91°49.03	10.59	130°36.28	5.32	209°7.98	46.04	Denebola	182°24.47 14°25.73
3	217°58.52		214°38.21	· · 40.86	106°50.96	· · 10.45	145°38.43	· · 5.36	224°10.15	· · 45.92	Gienah	175°43.12 -17°41.03
4	233°0.98		229°41.91	40.47	121°52.88	10.31	160°40.59	5.41	239°12.33	45.80	Acrux	172°59.33 -63°14.33
5	248°3.45		244°45.61	40.08	136°54.80	10.16	175°42.74	5.45	254°14.51	45.68	Gacrux	171°50.97 -57°15.28
6	263°5.91		259°49.31	N10°39.68	151°56.71	N25°10.02	190°44.89	N22°5.49	269°16.69	S04°45.56	Alioth	166°12.26 55°49.19
7	278°8.37		274°53.01	39.29	166°58.63	9.87	205°47.04	5.53	284°18.87	45.44	Spica	158°21.87 -11°17.70
8	293°10.84		289°56.72	38.89	182°0.55	9.73	220°49.19	5.58	299°21.05	45.32	Alkaid	152°51.45 49°10.99
9	308°13.30		305°0.43	· · 38.49	197°2.46	· · 9.58	235°51.33	· · 5.62	314°23.23	· · 45.20	Hadar	148°35.34 -60°29.58
10	323°15.77		320°4.14	38.08	212°4.38	9.44	250°53.48	5.66	329°25.41	45.08	Menkent	147°57.16 -36°29.65
11	338°18.23		335°7.85	37.68	227°6.29	9.29	265°55.63	5.70	344°27.59	44.96	Arcturus	145°47.51 19°2.84
12	353°20.69		350°11.56	N10°37.27	242°8.20	N25°9.15	280°57.78	N22°5.75	359°29.77	S04°44.84	Rigel Kent.	139°39.68 -60°56.26
13	8°23.16		5°15.28	36.86	257°10.12	9.00	295°59.93	5.79	14°31.95	44.72	Kochab	137°18.96 74°2.76
14	23°25.62		20°19.00	36.44	272°12.03	8.85	311°2.08	5.83	29°34.13	44.60	Zuben'ubi	136°55.65 -16°8.88
15	38°28.09		35°22.72	· · 36.03	287°13.94	· · 8.71	326°4.22	· · 5.87	44°36.31	· · 44.48	Alphecca	126°3.43 26°37.49
16	53°30.55		50°26.44	35.61	302°15.84	8.56	341°6.37	5.92	59°38.49	44.36	Antares	112°15.56 -26°29.28
17	68°33.01		65°30.16	35.19	317°17.75	8.42	356°8.52	5.96	74°40.66	44.24	Atria	107°9.60 -69°4.12
18	83°35.48		80°33.89	N10°34.76	332°19.66	N25°8.27	11°10.67	N22°6.00	89°42.84	S04°44.12	Sabik	102°2.58 -15°45.44
19	98°37.94		95°37.62	34.34	347°21.56	8.12	26°12.81	6.05	104°45.02	44.00	Shaula	96°10.17 -37°7.26
20	113°40.41		110°41.35	33.91	2°23.47	7.98	41°14.96	6.09	119°47.20	43.88	Rasalhague	95°58.41 12°32.25
21	128°42.87		125°45.08	· · 33.48	17°25.37	· · 7.83	56°17.10	· · 6.13	134°49.38	· · 43.76	Eltanin	90°42.16 51°28.72
22	143°45.33		140°48.81	33.04	32°27.28	7.68	71°19.25	6.18	149°51.56	43.64	Kaus Aust.	83°32.40 -34°22.31
23	158°47.80		155°52.55	32.61	47°29.18	7.53	86°21.40	6.22	164°53.74	43.52	Vega	80°33.23 38°48.05
Mer.pass.	12:27		ν3.7' d-0.4' m-4.22		ν1.9' d-0.1' m0.07		ν2.2' d0.0' m-2.20		ν2.2' d-0.1' m1.11		Nunki	75°47.69 -26°15.94
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Altair	61°59.99 8°55.88
0	173°50.26		170°56.28	N10°32.17	62°31.08	N25°7.39	101°23.54	N22°6.26	179°55.92	S04°43.40	Peacock	53°5.85 -56°39.13
1	188°52.73		186°0.02	31.72	77°32.98	7.24	116°25.68	6.30	194°58.10	43.28	Deneb	49°26.05 45°21.92
2	203°55.19		201°3.77	31.28	92°34.88	7.09	131°27.83	6.35	210°0.28	43.16	Enif	33°38.94 9°59.25
3	218°57.65		216°7.51	· · 30.83	107°36.78	· · 6.94	146°29.97	· · 6.39	225°2.46	· · 43.04	Al Na'ir	27°33.12 -46°50.35
4	234°0.12		231°11.25	30.39	122°38.67	6.80	161°32.12	6.43	240°4.64	42.92	Fomalhaut	15°14.69 -29°29.42
5	249°2.58		246°15.00	29.93	137°40.57	6.65	176°34.26	6.48	255°6.82	42.80	Scheat	13°45.43 28°13.03
6	264°5.05		261°18.75	N10°29.48	152°42.47	N25°6.50	191°36.40	N22°6.52	270°9.00	S04°42.68	Markab	13°30.08 15°20.31
7	279°7.51		276°22.50	29.02	167°44.36	6.35	206°38.55	6.56	285°11.17	42.56	Mar 14 Fri	SHA 356°7.27 Mer.pass 12:45
8	294°9.97		291°26.25	28.57	182°46.25	6.20	221°40.69	6.61	300°13.35	42.44	Venus	249°6.75 19:54
9	309°12.44		306°30.01	· · 28.10	197°48.15	· · 6.06	236°42.83	· · 6.65	315°15.53	· · 42.32	Mars	287°48.27 17:19
10	324°14.90		321°33.76	27.64	212°50.04	5.91	251°44.98	6.69	330°17.71	42.20	Jupiter	6°19.33 12:05
11	339°17.37		336°37.52	27.17	227°51.93	5.76	266°47.12	6.73	345°19.89	42.08	Saturn	
12	354°19.83		351°41.28	N10°26.71	242°53.82	N25°5.61	281°49.26	N22°6.78	0°22.07	S04°41.96	Mar 15 Sat	SHA 356°36.01 Mer.pass 12:39
13	9°22.29		6°45.04	26.23	257°55.71	5.46	296°51.40	6.82	15°24.25	41.84	Venus	248°54.06 19:50
14	24°24.76		21°48.80	25.76	272°57.60	5.31	311°53.54	6.86	30°26.43	41.72	Jupiter	287°40.86 17:15
15	39°27.22		36°52.57	· · 25.29	287°59.48	· · 5.16	326°55.68	· · 6.91	45°28.61	· · 41.60	Saturn	6°12.49 12:02
16	54°29.69		51°56.33	24.81	303°1.37	5.01	341°57.82	6.95	60°30.79	41.48	Mar 16 Sun	SHA 357°6.02 Mer.pass 12:33
17	69°32.15		67°0.10	24.33	318°3.25	4.86	356°59.96	6.99	75°32.97	41.36	Venus	248°40.82 19:47
18	84°34.61		82°3.87	N10°23.84	333°5.14	N25°4.71	12°2.10	N22°7.04	90°35.15	S04°41.24	Mars	287°33.28 17:12
19	99°37.08		97°7.64	23.36	348°7.02	4.56	27°4.24	7.08	105°37.33	41.12	Jupiter	6°5.66 11:59
20	114°39.54		112°11.42	22.87	3°8.90	4.41	42°6.38	7.12	120°39.51	41.00	Saturn	
21	129°42.01		127°15.19	· · 22.38	18°10.78	· · 4.26	57°8.52	· · 7.17	135°41.69	· · 40.88	Horizontal parallax	
22	144°44.47		142°18.97	21.89	33°12.66	4.11	72°10.66	7.21	150°43.87	40.76	Venus:	0.5
23	159°46.93		157°22.74	21.39	48°14.54	3.96	87°12.80	7.25	165°46.05	40.64	Mars:	0.1
Mer.pass.	12:23		ν3.7' d-0.4' m-4.16		ν1.9' d-0.1' m0.10		ν2.1' d0.0' m-2.20		ν2.2' d-0.1' m1.12			


h		Sun		Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°41.48	S02°31.16	0°22.87	16.6'	N04°22.14	-14.5'	54.6'
1	192°41.66	30.18	14°58.52	16.7'	04°7.65	-14.5'	54.6'
2	207°41.83	29.19	29°34.19	16.7'	03°53.16	-14.5'	54.6'
3	222°42.00	· · 28.21	44°9.89	16.7'	03°38.66	-14.5'	54.6'
4	237°42.18	27.22	58°45.62	16.8'	03°24.16	-14.5'	54.6'
5	252°42.35	26.23	73°21.37	16.8'	03°9.65	-14.5'	54.6'
6	267°42.53	S02°25.25	87°57.15	16.8'	N02°55.13	-14.5'	54.6'
7	282°42.70	24.26	102°32.95	16.8'	02°40.62	-14.5'	54.5'
8	297°42.87	23.27	117°8.77	16.8'	02°26.09	-14.5'	54.5'
9	312°43.05	· · 22.29	131°44.62	16.9'	02°11.57	-14.5'	54.5'
10	327°43.22	21.30	146°20.49	16.9'	01°57.05	-14.5'	54.5'
11	342°43.40	20.32	160°56.38	16.9'	01°42.52	-14.5'	54.5'
12	357°43.57	S02°19.33	175°32.28	16.9'	N01°28.00	-14.5'	54.5'
13	12°43.75	18.34	190°8.21	16.9'	01°13.47	-14.5'	54.5'
14	27°43.92	17.36	204°44.15	17.0'	00°58.95	-14.5'	54.5'
15	42°44.10	· · 16.37	219°20.11	17.0'	00°44.43	-14.5'	54.4'
16	57°44.27	15.38	233°56.08	17.0'	00°29.92	-14.5'	54.4'
17	72°44.45	14.40	248°32.06	17.0'	00°15.41	-14.5'	54.4'
18	87°44.62	S02°13.41	263°8.06	17.0'	N00°0.91	-14.5'	54.4'
19	102°44.80	12.42	277°44.07	17.0'	S00°13.59	14.5'	54.4'
20	117°44.97	11.44	292°20.09	17.0'	00°28.08	14.5'	54.4'
21	132°45.15	· · 10.45	306°56.12	17.0'	00°42.57	14.5'	54.4'
22	147°45.32	9.46	321°32.16	17.0'	00°57.04	14.5'	54.4'
23	162°45.50	8.48	336°8.20	17.1'	01°11.51	14.5'	54.4'
SD = 16.1'		$d = -1.0'$	SD = 14.9'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°45.67	S02°7.49	350°44.25	17.1'	S01°25.96	14.4'	54.3'
1	192°45.85	6.50	5°20.31	17.1'	01°40.41	14.4'	54.3'
2	207°46.03	5.51	19°56.37	17.1'	01°54.84	14.4'	54.3'
3	222°46.20	· · 4.53	34°32.44	17.1'	02°9.26	14.4'	54.3'
4	237°46.38	3.54	49°8.50	17.1'	02°23.66	14.4'	54.3'
5	252°46.55	2.55	63°44.57	17.1'	02°38.06	14.4'	54.3'
6	267°46.73	S02°1.57	78°20.64	17.1'	S02°52.43	14.4'	54.3'
7	282°46.91	02°0.58	92°56.71	17.1'	03°6.79	14.3'	54.3'
8	297°47.08	01°59.59	107°32.78	17.1'	03°21.14	14.3'	54.3'
9	312°47.26	· · 58.60	122°8.84	17.1'	03°35.46	14.3'	54.3'
10	327°47.44	57.62	136°44.90	17.1'	03°49.77	14.3'	54.2'
11	342°47.61	56.63	151°20.96	17.1'	04°4.06	14.3'	54.2'
12	357°47.79	S01°55.64	165°57.01	17.0'	S04°18.33	14.2'	54.2'
13	12°47.97	54.66	180°33.05	17.0'	04°32.58	14.2'	54.2'
14	27°48.15	53.67	195°9.09	17.0'	04°46.81	14.2'	54.2'
15	42°48.32	· · 52.68	209°45.11	17.0'	05°1.02	14.2'	54.2'
16	57°48.50	51.69	224°21.13	17.0'	05°15.20	14.2'	54.2'
17	72°48.68	50.71	238°57.14	17.0'	05°29.36	14.1'	54.2'
18	87°48.86	S01°49.72	253°33.14	17.0'	S05°43.50	14.1'	54.2'
19	102°49.03	48.73	268°9.12	17.0'	05°57.61	14.1'	54.2'
20	117°49.21	47.74	282°45.09	17.0'	06°11.69	14.1'	54.2'
21	132°49.39	· · 46.76	297°21.04	16.9'	06°25.75	14.0'	54.2'
22	147°49.57	45.77	311°56.98	16.9'	06°39.78	14.0'	54.1'
23	162°49.74	44.78	326°32.91	16.9'	06°53.78	14.0'	54.1'
SD = 16.1'		$d = -1.0'$	SD = 14.8'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°49.92	S01°43.79	341°8.81	16.9'	S07°7.75	13.9'	54.1'
1	192°50.10	42.81	355°44.70	16.9'	07°21.69	13.9'	54.1'
2	207°50.28	41.82	10°20.57	16.8'	07°35.61	13.9'	54.1'
3	222°50.46	· · 40.83	24°56.42	16.8'	07°49.49	13.8'	54.1'
4	237°50.64	39.84	39°32.24	16.8'	08°3.34	13.8'	54.1'
5	252°50.81	38.85	54°8.05	16.8'	08°17.15	13.8'	54.1'
6	267°50.99	S01°37.87	68°43.83	16.8'	S08°30.94	13.7'	54.1'
7	282°51.17	36.88	83°19.59	16.7'	08°44.68	13.7'	54.1'
8	297°51.35	35.89	97°55.32	16.7'	08°58.40	13.7'	54.1'
9	312°51.53	· · 34.90	112°31.03	16.7'	09°12.07	13.6'	54.1'
10	327°51.71	33.92	127°6.71	16.7'	09°25.71	13.6'	54.1'
11	342°51.89	32.93	141°42.36	16.6'	09°39.32	13.6'	54.1'
12	357°52.07	S01°31.94	156°17.98	16.6'	S09°52.88	13.5'	54.1'
13	12°52.25	30.95	170°53.58	16.6'	10°6.40	13.5'	54.1'
14	27°52.43	29.96	185°29.14	16.5'	10°19.89	13.4'	54.0'
15	42°52.60	· · 28.98	200°4.67	16.5'	10°33.33	13.4'	54.0'
16	57°52.78	27.99	214°40.17	16.5'	10°46.74	13.4'	54.0'
17	72°52.96	27.00	229°15.63	16.4'	11°0.10	13.3'	54.0'
18	87°53.14	S01°26.01	243°51.06	16.4'	S11°13.42	13.3'	54.0'
19	102°53.32	25.02	258°26.46	16.4'	11°26.69	13.2'	54.0'
20	117°53.50	24.04	273°1.82	16.3'	11°39.92	13.2'	54.0'
21	132°53.68	· · 23.05	287°37.14	16.3'	11°53.11	13.1'	54.0'
22	147°53.86	22.06	302°12.43	16.2'	12°6.24	13.1'	54.0'
23	162°54.04	21.07	316°47.67	16.2'	12°19.34	13.0'	54.0'
SD = 16.1'		$d = -1.0'$	SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:52	05:16	06:23	17:57	19:05	20:30
N 70°	04:06	05:21	06:21	17:58	18:59	20:15
68°	04:18	05:25	06:20	18:00	18:55	20:03
66°	04:27	05:28	06:19	18:00	18:52	19:53
64°	04:34	05:31	06:18	18:01	18:49	19:46
62°	04:41	05:33	06:17	18:02	18:46	19:39
60°	04:46	05:35	06:16	18:03	18:44	19:33
N 58°	04:51	05:37	06:16	18:03	18:42	19:29
56°	04:54	05:38	06:15	18:04	18:41	19:25
54°	04:58	05:39	06:14	18:04	18:40	19:21
52°	05:01	05:40	06:14	18:05	18:38	19:18
50°	05:04	05:41	06:13	18:05	18:37	19:15
45°	05:09	05:43	06:12	18:06	18:35	19:10
N 40°	05:13	05:44	06:11	18:07	18:34	19:05
35°	05:16	05:45	06:10	18:08	18:33	19:02
30°	05:18	05:46	06:10	18:08	18:32	19:00
20°	05:21	05:46	06:08	18:10	18:32	18:57
N 10°	05:22	05:46	06:07	18:11	18:32	18:56
0°	05:21	05:45	06:06	18:12	18:33	18:57
S 10°	05:19	05:43	06:04	18:13	18:34	18:59
20°	05:15	05:40	06:02	18:15	18:37	19:03
30°	05:08	05:36	06:00	18:17	18:41	19:09
35°	05:04	05:34	05:59	18:18	18:43	19:13
40°	04:59	05:31	05:58	18:19	18:46	19:18
45°	04:52	05:27	05:56	18:21	18:50	19:25
S 50°	04:43	05:22	05:54	18:23	18:55	19:33
52°	04:39	05:19	05:53	18:23	18:57	19:38
54°	04:34	05:16	05:52	18:24	19:00	19:42
56°	04:28	05:13	05:51	18:26	19:03	19:48
58°	04:22	05:10	05:50	18:27	19:06	19:54
S 60°	04:15	05:06	05:48	18:28	19:10	20:01

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	18:31	20:31	22:42	06:42	06:10	05:35
N 70°	18:31	20:21	22:18	06:39	06:14	05:47
68°	18:30	20:13	22:01	06:36	06:17	05:57
66°	18:30	20:07	21:46	06:33	06:20	06:05
64°	18:30	20:01	21:35	06:31	06:22	06:13
62°	18:30	19:57	21:25	06:29	06:24	06:19
60°	18:30	19:53	21:17	06:28	06:26	06:24
N 58°	18:30	19:49	21:09	06:26	06:28	06:29
56°	18:30	19:46	21:03	06:25	06:29	06:33
54°	18:29	19:43	20:57	06:24	06:30	06:37
52°	18:29	19:41	20:52	06:23	06:31	06:41
50°	18:29	19:38	20:48	06:22	06:33	06:44
45°	18:29	19:33	20:38	06:20	06:35	06:51
N 40°	18:29	19:29	20:29	06:18	06:37	06:57
35°	18:29	19:26	20:22	06:16	06:39	07:02
30°	18:29	19:22	20:16	06:15	06:40	07:06
20°	18:29	19:17	20:06	06:12	06:43	07:14
N 10°	18:29	19:12	19:56	06:10	06:45	07:21
0°	18:29	19:08	19:48	06:08	06:48	07:27
S 10°	18:29	19:04	19:39	06:06	06:50	07:34
20°	18:28	18:59	19:30	06:04	06:52	07:40
30°	18:28	18:54	19:20	06:01	06:55	07:48
35°	18:28	18:51	19:14	06:00	06:56	07:53
40°	18:28	18:48	19:08	05:58	06:58	07:58
45°	18:28	18:44	19:00	05:56	07:00	08:04
S 50°	18:28	18:39	18:51	05:53	07:03	08:12
52°	18:28	18:37	18:47	05:52	07:04	08:15
54°	18:28	18:35	18:42	05:51	07:05	08:19
56°	18:28	18:32	18:37	05:50	07:06	08:23
58°	18:28	18:30	18:31	05:48	07:08	08:28
S 60°	18:28	18:26	18:25	05:46	07:10	08:33

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	14-16
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%
14	09:14	09:06	12:09	—:—	12:18	
15	08:57	08:49	12:09	00:38	12:58	
16	08:40	08:32	12:09	01:17	13:37	

March 17, 18, 19 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	174°49.40		172°26.52	N10°20.89	63°16.42	N25°3.81	102°14.94	N22°7.30	180°48.22	S04°40.52
1	189°51.86		187°30.30	20.39	78°18.30	3.66	117°17.08	7.34	195°50.40	40.40
2	204°54.33		202°34.08	19.89	93°20.18	3.51	132°19.22	7.38	210°52.58	40.28
3	219°56.79		217°37.87	•• 19.39	108°22.05	•• 3.36	147°21.35	•• 7.43	225°54.76	•• 40.16
4	234°59.26		232°41.65	18.88	123°23.93	3.21	162°23.49	7.47	240°56.94	40.04
5	250°1.72		247°45.44	18.37	138°25.80	3.06	177°25.63	7.51	255°59.12	39.92
6	265°4.18		262°49.23	N10°17.86	153°27.67	N25°2.90	192°27.76	N22°7.56	271°1.30	S04°39.80
7	280°6.65		277°53.02	17.34	168°29.54	2.75	207°29.90	7.60	286°3.48	39.68
8	295°9.11		292°56.81	16.83	183°31.42	2.60	222°32.04	7.64	301°5.66	39.56
9	310°11.58		308°0.60	•• 16.31	198°33.29	•• 2.45	237°34.17	•• 7.69	316°7.84	•• 39.44
10	325°14.04		323°4.40	15.78	213°35.16	2.30	252°36.31	7.73	331°10.02	39.32
11	340°16.50		338°8.19	15.26	228°37.02	2.14	267°38.44	7.78	346°12.20	39.20
12	355°18.97		353°11.99	N10°14.73	243°38.89	N25°1.99	282°40.58	N22°7.82	1°14.38	S04°39.08
13	10°21.43		8°15.79	14.21	258°40.76	1.84	297°42.71	7.86	16°16.56	38.96
14	25°23.90		23°19.58	13.68	273°42.62	1.69	312°44.85	7.91	31°18.74	38.84
15	40°26.36		38°23.39	•• 13.14	288°44.49	•• 1.53	327°46.98	•• 7.95	46°20.92	•• 38.72
16	55°28.82		53°27.19	12.61	303°46.35	1.38	342°49.12	7.99	61°23.10	38.60
17	70°31.29		68°30.99	12.07	318°48.21	1.23	357°51.25	8.04	76°25.28	38.48
18	85°33.75		83°34.80	N10°11.53	333°50.08	N25°1.08	12°53.39	N22°8.08	91°27.46	S04°38.36
19	100°36.22		98°38.60	10.99	348°51.94	0.92	27°55.52	8.12	106°29.64	38.24
20	115°38.68		113°42.41	10.44	3°53.80	0.77	42°57.65	8.17	121°31.82	38.12
21	130°41.14		128°46.22	•• 9.89	18°55.66	•• 0.62	57°59.78	•• 8.21	136°34.00	•• 38.00
22	145°43.61		143°50.03	9.34	33°57.51	0.46	73°1.92	8.26	151°36.17	37.88
23	160°46.07		158°53.84	8.79	48°59.37	0.31	88°4.05	8.30	166°38.35	37.76
Mer.pass. 12:19		ν3.8' d-0.5' m-4.09		ν1.9' d-0.2' m0.12		ν2.1' d0.0' m-2.19		ν2.2' d-0.1' m1.12		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	175°48.54		173°57.65	N10°8.24	64°1.23	N25°0.15	103°6.18	N22°8.34	181°40.53	S04°37.64
1	190°51.00		189°1.46	7.68	79°3.08	25°0.00	118°8.31	8.39	196°42.71	37.52
2	205°53.46		204°5.28	7.12	94°4.94	24°59.85	133°10.44	8.43	211°44.89	37.40
3	220°55.93		219°9.09	•• 6.56	109°6.79	•• 59.69	148°12.58	•• 8.47	226°47.07	•• 37.28
4	235°58.39		234°12.91	6.00	124°8.64	59.54	163°14.71	8.52	241°49.25	37.16
5	251°0.86		249°16.73	5.43	139°10.50	59.38	178°16.84	8.56	256°51.43	37.04
6	266°3.32		264°20.55	N10°4.87	154°12.35	N24°59.23	193°18.97	N22°8.61	271°53.61	S04°36.92
7	281°5.78		279°24.37	4.30	169°14.20	59.07	208°21.10	8.65	286°55.79	36.80
8	296°8.25		294°28.19	3.72	184°16.05	58.92	223°23.23	8.69	301°57.97	36.68
9	311°10.71		309°32.01	•• 3.15	199°17.89	•• 58.76	238°25.36	•• 8.74	317°0.15	•• 36.56
10	326°13.18		324°35.83	2.57	214°19.74	58.61	253°27.49	8.78	332°2.33	36.44
11	341°15.64		339°39.66	1.99	229°21.59	58.45	268°29.61	8.83	347°4.51	36.32
12	356°18.11		354°43.48	N10°1.41	244°23.43	N24°58.29	283°31.74	N22°8.87	2°6.69	S04°36.20
13	11°20.57		9°47.31	0.83	259°25.28	58.14	298°33.87	8.91	17°8.87	36.08
14	26°23.03		24°51.13	10°0.24	274°27.12	57.98	313°36.00	8.96	32°11.05	35.96
15	41°25.50		39°54.96	09°59.66	289°28.96	•• 57.83	328°38.13	•• 9.00	47°13.23	•• 35.84
16	56°27.96		54°58.79	59.07	304°30.81	57.67	343°40.26	9.05	62°15.41	35.72
17	71°30.43		70°2.62	58.47	319°32.65	57.51	358°42.38	9.09	77°17.59	35.60
18	86°32.89		85°6.45	N09°57.88	334°34.49	N24°57.36	13°44.51	N22°9.13	92°19.77	S04°35.48
19	101°35.35		100°10.28	57.28	349°36.33	57.20	28°46.64	9.18	107°21.95	35.36
20	116°37.82		115°14.12	56.68	4°38.17	57.04	43°48.76	9.22	122°24.13	35.24
21	131°40.28		130°17.95	•• 56.08	19°40.00	•• 56.89	58°50.89	•• 9.27	137°26.31	•• 35.12
22	146°42.75		145°21.78	55.48	34°41.84	56.73	73°53.02	9.31	152°28.49	35.00
23	161°45.21		160°25.62	54.87	49°43.67	56.57	88°55.14	9.35	167°30.67	34.88
Mer.pass. 12:15		ν3.8' d-0.6' m-4.04		ν1.9' d-0.2' m0.14		ν2.1' d0.0' m-2.19		ν2.2' d-0.1' m1.12		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°47.67		175°29.46	N09°54.27	64°45.51	N24°56.41	103°57.27	N22°9.40	182°32.85	S04°34.76
1	191°50.14		190°33.29	53.66	79°47.34	56.26	118°59.39	9.44	197°35.03	34.64
2	206°52.60		205°37.13	53.05	94°49.18	56.10	134°1.52	9.49	212°37.21	34.52
3	221°55.07		220°40.97	•• 52.43	109°51.01	•• 55.94	149°3.64	•• 9.53	227°39.39	•• 34.40
4	236°57.53		235°44.81	51.82	124°52.84	55.78	164°5.77	9.57	242°41.57	34.29
5	252°0.00		250°48.65	51.20	139°54.67	55.62	179°7.89	9.62	257°43.75	34.17
6	267°2.46		265°52.49	N09°50.58	154°56.50	N24°55.47	194°10.01	N22°9.66	272°45.93	S04°34.05
7	282°4.92		280°56.33	49.95	169°58.33	55.31	209°12.14	9.71	287°48.11	33.93
8	297°7.39		296°0.17	49.33	185°0.16	55.15	224°14.26	9.75	302°50.29	33.81
9	312°9.85		311°4.01	•• 48.70	200°1.98	•• 54.99	239°16.38	•• 9.80	317°52.47	•• 33.69
10	327°12.32		326°7.86	48.07	215°3.81	54.83	254°18.51	9.84	332°54.65	33.57
11	342°14.78		341°11.70	47.44	230°5.63	54.67	269°20.63	9.88	347°56.83	33.45
12	357°17.24		356°15.54	N09°46.81	245°7.46	N24°54.51	284°22.75	N22°9.93	2°59.01	S04°33.33
13	12°19.71		11°19.39	46.18	260°9.28	54.35	299°24.87	9.97	18°1.19	33.21
14	27°22.17		26°23.24	45.54	275°11.10	54.20	314°27.00	10.02	33°3.37	33.09
15	42°24.64		41°27.08	•• 44.90	290°12.93	•• 54.04	329°29.12	•• 10.06	48°5.55	•• 32.97
16	57°27.10		56°30.93	44.26	305°14.75	53.88	344°31.24	10.11	63°7.73	32.85
17	72°29.56		71°34.78	43.61	320°16.57	53.72	359°33.36	10.15	78°9.91	32.73
18	87°32.03		86°38.62	N09°42.97	335°18.39	N24°53.56	14°35.48	N22°10.19	93°12.09	S04°32.61
19	102°34.49		101°42.47	42.32	350°20.20	53.40	29°37.60	10.24	108°14.27	32.49
20	117°36.96		116°46.32	41.67	5°22.02	53.24	44°39.72	10.28	123°16.45	32.37
21	132°39.42		131°50.17	•• 41.02	20°23.84	•• 53.07	59°41.84	•• 10.33	138°18.63	•• 32.25
22	147°41.89		146°54.02	40.37	35°25.65	52.91	74°43.96	10.37	153°20.81	32.13
23	162°44.35		161°57.87	39.71	50°27.47	52.75	89°46.08	10.42	168°22.99	32.01
Mer.pass. 12:11		ν3.8' d-0.6' m-4.13		ν1.8' d-0.2' m0.17		ν2.1' d0.0' m-2.18		ν2.2' d-0.1' m1.13		

Stars		
	SHA	Dec
Alpheratz	357°34.99	29°13.68
Ankaa	353°7.38	-42°10.26
Schedar	349°31.47	56°40.53
Diphda	348°47.45	-17°51.04
Achernar	335°20.54	-57°6.69
Hamal	327°51.32	23°34.87
Polaris	314°17.25	89°22.46
Acamar	315°11.91	-40°12.42
Menkar	314°6.20	4°11.23
Mirfak	308°28.34	49°57.16
Aldebaran	290°39.55	16°33.58
Rigel	281°3.77	-8°10.48
Capella	280°21.73	46°1.54
Bellatrix	278°22.75	6°22.29
Elnath	278°1.71	28°37.77
Alnilam	275°37.59	-1°11.25
Betelgeuse	270°51.91	7°24.65
Canopus	263°52.25	-52°42.79
Sirius	258°26.03	-16°45.21
Adhara	255°5.64	-29°0.58
Procyon	244°50.53	5°9.54
Pollux	243°16.95	27°57.94
Avior	234°14.33	-59°35.62
Suhail	222°45.90	-43°32.25
Miaplacidus	221°37.61	-69°49.40
Alphard	217°47.35	-8°46.21
Regulus	207°33.99	11°50.55
Dubhe	193°40.12	61°36.89
Denebola	182°24.47	14°25.73
Gienah	175°43.12	-17°41.04
Acrux	172°59.32	-63°14.35
Gacrux	171°50.96	-57°15.29
Alioth	166°12.26	55°49.21
Spica	158°21.86	-11°17.70
Alkaid	152°51.44	49°11.00
Hadar	148°35.32	-60°29.59
Menkent	147°57.14	-36°29.66
Arcturus	145°47.50	19°2.84
Rigel Kent.	139°39.65	-60°56.27
Kochab	137°18.92	74°2.78
Zuben'ubi	136°55.63	-16°8.89
Alphecca	126°3.41	26°37.50
Antares	112°15.54	-26°29.29
Atria	107°9.55	-69°4.13
Sabik	102°2.56	-15°45.44
Shaula	96°10.14	-37°7.26
Rasalhague	95°58.39	12°32.25
Eltanin	90°42.13	51°28.72
Kaus Aust.	83°32.37	-34°22.31
Vega	80°33.21	38°48.05
Nunki	75°47.67	-26°15.93
Altair	61°59.97	8°55.88
Peacock	53°5.83	-56°39.12
Deneb	49°26.03	45°21.91
Enif	33°38.93	9°59.25
Al Na'ir	27°33.11	-46°50.34
Fomalhaut	15°14.68	-29°29.41
Scheat	13°45.42	28°13.02
Markab	13°30.08	15°20.30

Mar 17 Mon	SHA	Mer.pass
Venus	357°37.12	12:27
Mars	248°27.02	19:44
Jupiter	287°25.54	17:09
Saturn	5°58.83	11:55

Mar 18 Tue	SHA	Mer.pass
Venus	358°9.11	12:21
Mars	248°12.69	19:41
Jupiter	287°17.64	17:05
Saturn	5°52.00	11:52

Mar 19 Wed	SHA	Mer.pass
Venus	358°41.78	12:15
Mars	247°57.84	19:39
Jupiter	287°9.59	17:02
Saturn	5°45.17	11:48

Horizontal parallax	
Venus:	0.5
Mars:	0.1


h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°54.22	S01°20.08	331°22.88	16.2'	S12°32.38	13.0'	54.0'
1	192°54.40	19.10	345°58.04	16.1'	12°45.38	12.9'	54.0'
2	207°54.58	18.11	0°33.17	16.1'	12°58.32	12.9'	54.0'
3	222°54.76	· · 17.12	15°8.25	16.0'	13°11.22	12.8'	54.0'
4	237°54.94	16.13	29°43.29	16.0'	13°24.06	12.8'	54.0'
5	252°55.12	15.14	44°18.28	15.9'	13°36.86	12.7'	54.0'
6	267°55.31	S01°14.16	58°53.23	15.9'	S13°49.60	12.7'	54.0'
7	282°55.49	13.17	73°28.14	15.9'	14°2.29	12.6'	54.0'
8	297°55.67	12.18	88°3.00	15.8'	14°14.92	12.6'	54.0'
9	312°55.85	· · 11.19	102°37.81	15.8'	14°27.50	12.5'	54.0'
10	327°56.03	10.20	117°12.57	15.7'	14°40.02	12.5'	54.0'
11	342°56.21	9.21	131°47.28	15.7'	14°52.49	12.4'	54.0'
12	357°56.39	S01°8.23	146°21.95	15.6'	S15°4.90	12.4'	54.0'
13	12°56.57	7.24	160°56.56	15.6'	15°17.25	12.3'	54.0'
14	27°56.75	6.25	175°31.12	15.5'	15°29.55	12.2'	54.0'
15	42°56.93	· · 5.26	190°5.63	15.5'	15°41.78	12.2'	54.0'
16	57°57.12	4.27	204°40.08	15.4'	15°53.95	12.1'	54.0'
17	72°57.30	3.28	219°14.49	15.3'	16°6.06	12.0'	54.0'
18	87°57.48	S01°2.30	233°48.83	15.3'	S16°18.11	12.0'	54.0'
19	102°57.66	1.31	248°23.12	15.2'	16°30.10	11.9'	54.0'
20	117°57.84	01°0.32	262°57.36	15.2'	16°42.02	11.9'	54.0'
21	132°58.02	00°59.33	277°31.54	15.1'	16°53.88	11.8'	54.0'
22	147°58.20	58.34	292°5.66	15.1'	17°5.67	11.7'	54.0'
23	162°58.39	57.35	306°39.72	15.0'	17°17.40	11.7'	54.0'
SD = 16.1' $d = -1.0'$			SD = 14.7'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°58.57	S00°56.37	321°13.73	14.9'	S17°29.06	11.6'	54.0'
1	192°58.75	55.38	335°47.67	14.9'	17°40.65	11.5'	54.0'
2	207°58.93	54.39	350°21.55	14.8'	17°52.17	11.5'	54.0'
3	222°59.11	· · 53.40	4°55.38	14.8'	18°3.62	11.4'	54.0'
4	237°59.30	52.41	19°29.14	14.7'	18°15.00	11.3'	54.0'
5	252°59.48	51.42	34°2.84	14.6'	18°26.31	11.2'	54.0'
6	267°59.66	S00°50.44	48°36.47	14.6'	S18°37.55	11.2'	54.0'
7	282°59.84	49.45	63°10.04	14.5'	18°48.71	11.1'	54.0'
8	298°0.03	48.46	77°43.55	14.4'	18°59.80	11.0'	54.0'
9	313°0.21	· · 47.47	92°16.99	14.4'	19°10.82	10.9'	54.0'
10	328°0.39	46.48	106°50.36	14.3'	19°21.76	10.9'	54.0'
11	343°0.57	45.49	121°23.67	14.2'	19°32.62	10.8'	54.0'
12	358°0.76	S00°44.51	135°56.92	14.2'	S19°43.41	10.7'	54.0'
13	13°0.94	43.52	150°30.09	14.1'	19°54.12	10.6'	54.0'
14	28°1.12	42.53	165°3.20	14.0'	20°4.75	10.5'	54.0'
15	43°1.31	· · 41.54	179°36.23	14.0'	20°15.29	10.5'	54.0'
16	58°1.49	40.55	194°9.20	13.9'	20°25.76	10.4'	54.0'
17	73°1.67	39.56	208°42.10	13.8'	20°36.15	10.3'	54.0'
18	88°1.86	S00°38.58	223°14.93	13.8'	S20°46.45	10.2'	54.0'
19	103°2.04	37.59	237°47.69	13.7'	20°56.67	10.1'	54.1'
20	118°2.22	36.60	252°20.37	13.6'	21°6.80	10.0'	54.1'
21	133°2.40	· · 35.61	266°52.99	13.5'	21°16.85	10.0'	54.1'
22	148°2.59	34.62	281°25.53	13.5'	21°26.81	9.9'	54.1'
23	163°2.77	33.63	295°58.00	13.4'	21°36.69	9.8'	54.1'
SD = 16.1' $d = -1.0'$			SD = 14.7'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°2.96	S00°32.65	310°30.40	13.3'	S21°46.47	9.7'	54.1'
1	193°3.14	31.66	325°2.72	13.2'	21°56.17	9.6'	54.1'
2	208°3.32	30.67	339°34.97	13.2'	22°5.78	9.5'	54.1'
3	223°3.51	· · 29.68	354°7.15	13.1'	22°15.29	9.4'	54.1'
4	238°3.69	28.69	8°39.25	13.0'	22°24.72	9.3'	54.1'
5	253°3.87	27.70	23°11.28	13.0'	22°34.05	9.2'	54.1'
6	268°4.06	S00°26.72	37°43.23	12.9'	S22°43.29	9.1'	54.1'
7	283°4.24	25.73	52°15.10	12.8'	22°52.43	9.0'	54.1'
8	298°4.43	24.74	66°46.90	12.7'	23°1.48	9.0'	54.2'
9	313°4.61	· · 23.75	81°18.63	12.6'	23°10.43	8.9'	54.2'
10	328°4.79	22.76	95°50.27	12.6'	23°19.29	8.8'	54.2'
11	343°4.98	21.77	110°21.85	12.5'	23°28.04	8.7'	54.2'
12	358°5.16	S00°20.79	124°53.34	12.4'	S23°36.70	8.6'	54.2'
13	13°5.35	19.80	139°24.76	12.3'	23°45.26	8.5'	54.2'
14	28°5.53	18.81	153°56.10	12.3'	23°53.71	8.4'	54.2'
15	43°5.71	· · 17.82	168°27.36	12.2'	24°2.07	8.3'	54.2'
16	58°5.90	16.83	182°58.55	12.1'	24°10.32	8.1'	54.2'
17	73°6.08	15.84	197°29.65	12.0'	24°18.46	8.0'	54.2'
18	88°6.27	S00°14.86	212°0.68	12.0'	S24°26.50	7.9'	54.3'
19	103°6.45	13.87	226°31.64	11.9'	24°34.44	7.8'	54.3'
20	118°6.64	12.88	241°2.51	11.8'	24°42.27	7.7'	54.3'
21	133°6.82	· · 11.89	255°33.31	11.7'	24°49.99	7.6'	54.3'
22	148°7.01	10.90	270°4.03	11.6'	24°57.61	7.5'	54.3'
23	163°7.19	9.92	284°34.67	11.6'	25°5.11	7.4'	54.3'
SD = 16.1' $d = -1.0'$			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:33	05:00	06:08	18:11	19:19	20:47
N 70°	03:50	05:07	06:08	18:11	19:12	20:29
68°	04:03	05:12	06:07	18:10	19:06	20:16
66°	04:14	05:16	06:07	18:10	19:02	20:04
64°	04:23	05:20	06:07	18:10	18:58	19:55
62°	04:30	05:23	06:07	18:10	18:54	19:48
60°	04:36	05:26	06:07	18:10	18:52	19:41
N 58°	04:42	05:28	06:07	18:10	18:49	19:36
56°	04:46	05:30	06:07	18:10	18:47	19:31
54°	04:50	05:32	06:07	18:10	18:45	19:27
52°	04:54	05:33	06:07	18:10	18:44	19:23
50°	04:57	05:35	06:07	18:10	18:42	19:20
45°	05:03	05:37	06:07	18:10	18:39	19:14
N 40°	05:08	05:40	06:06	18:10	18:37	19:09
35°	05:12	05:41	06:06	18:10	18:35	19:05
30°	05:14	05:42	06:06	18:10	18:34	19:02
20°	05:18	05:44	06:06	18:10	18:32	18:58
N 10°	05:20	05:44	06:05	18:11	18:32	18:56
0°	05:20	05:44	06:05	18:11	18:32	18:56
S 10°	05:19	05:43	06:04	18:12	18:33	18:57
20°	05:16	05:41	06:03	18:12	18:34	19:00
30°	05:10	05:38	06:02	18:13	18:37	19:05
35°	05:07	05:36	06:02	18:14	18:39	19:08
40°	05:02	05:34	06:01	18:14	18:41	19:13
45°	04:56	05:31	06:00	18:15	18:44	19:19
S 50°	04:48	05:26	05:59	18:16	18:48	19:26
52°	04:44	05:25	05:58	18:17	18:50	19:30
54°	04:40	05:22	05:58	18:17	18:52	19:34
56°	04:35	05:20	05:57	18:18	18:55	19:39
58°	04:30	05:17	05:56	18:18	18:57	19:45
S 60°	04:23	05:14	05:56	18:19	19:01	19:51

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	■	■	■	04:49	■	■
N 70°	· ·	00:41	■	05:14	04:19	■
68°	· ·	00:02	■	05:34	05:00	■
66°	23:35	· ·	01:46	05:49	05:28	04:49
64°	23:14	· ·	01:04	06:02	05:50	05:31
62°	22:57	· ·	00:36	06:13	06:07	06:00
60°	22:44	· ·	00:15	06:23	06:22	06:22
N 58°	22:32	23:58	· ·	06:31	06:34	06:40
56°	22:22	23:43	· ·	06:38	06:45	06:55
54°	22:13	23:31	· ·	06:45	06:55	07:08
52°	22:05	23:20	· ·	06:51	07:03	07:20
50°	21:58	23:10	· ·	06:56	07:11	07:30
45°	21:43	22:50	23:56	07:08	07:28	07:52
N 40°	21:31	22:33	23:36	07:17	07:41	08:09
35°	21:20	22:19	23:20	07:26	07:53	08:24
30°	21:11	22:07	23:05	07:33	08:03	08:36
20°	20:56	21:47	22:41	07:46	08:20	08:58
N 10°	20:42	21:30	22:20	07:57	08:36	09:18
0°	20:29	21:13	22:00	08:08	08:50	09:35
S 10°	20:17	20:57	21:41	08:18	09:05	09:53
20°	20:04	20:40	21:20	08:30	09:20	10:13
30°	19:48	20:20	20:56	08:43	09:38	10:35
35°	19:40	20:09	20:42	08:50	09:49	10:48
40°	19:30	19:55	20:26	08:59	10:01	11:04
45°	19:18	19:40	20:07	09:09	10:15	11:22
S 50°	19:04	19:21	19:43	09:21	10:33	11:45
52°	18:58	19:12	19:32	09:27	10:41	11:56
54°	18:51	19:02	19:19	09:34	10:50	12:08
56°	18:43	18:51	19:04	09:41	11:01	12:22
58°	18:34	18:39	18:47	09:49	11:13	12:39
S 60°	18:24	18:24	18:26	09:58	11:27	13:00

Day	Sun		Mer. Pass hh:mm	Moon		Age 17-19 93-81%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
17	08:23	08:14	12:08	01:58	14:18	
18	08:06	07:57	12:08	02:40	15:02	
19	07:48	07:39	12:08	03:24	15:48	

March 20, 21, 22 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	177°46.81	177°1.72	N09°39.05	65°29.28	N24°52.59	104°48.20	N22°10.46	183°25.17	S04°31.89		
1	192°49.28	192°5.57	38.39	80°31.09	52.43	119°50.32	10.51	198°27.35	31.77		
2	207°51.74	207°9.42	37.73	95°32.91	52.27	134°52.44	10.55	213°29.53	31.65		
3	222°54.21	222°13.28	•• 37.07	110°34.72	•• 52.11	149°54.55	•• 10.60	228°31.71	•• 31.54		
4	237°56.67	237°17.13	36.40	125°36.53	51.95	164°56.67	10.64	243°33.89	31.42		
5	252°59.13	252°20.98	35.74	140°38.34	51.79	179°58.79	10.68	258°36.07	31.30		
6	268°1.60	267°24.83	N09°35.07	155°40.14	N24°51.62	195°0.91	N22°10.73	273°38.25	S04°31.18		
7	283°4.06	282°28.69	34.40	170°41.95	51.46	210°3.02	10.77	288°40.43	31.06		
8	298°6.53	297°32.54	33.72	185°43.76	51.30	225°5.14	10.82	303°42.61	30.94		
9	313°8.99	312°36.39	•• 33.05	200°45.57	•• 51.14	240°7.26	•• 10.86	318°44.79	•• 30.82		
10	328°11.45	327°40.25	32.37	215°47.37	50.98	255°9.37	10.91	333°46.97	30.70		
11	343°13.92	342°44.10	31.69	230°49.17	50.81	270°11.49	10.95	348°49.15	30.58		
12	358°16.38	357°47.96	N09°31.01	245°50.98	N24°50.65	285°13.61	N22°11.00	3°51.33	S04°30.46		
13	13°18.85	12°51.81	30.33	260°52.78	50.49	300°15.72	11.04	18°53.51	30.34		
14	28°21.31	27°55.67	29.64	275°54.58	50.33	315°17.84	11.09	33°55.69	30.22		
15	43°23.78	42°59.52	•• 28.95	290°56.38	•• 50.16	330°19.95	•• 11.13	48°57.87	•• 30.10		
16	58°26.24	58°3.38	28.26	305°58.18	50.00	345°22.07	11.18	64°0.05	29.98		
17	73°28.70	73°7.23	27.57	320°59.98	49.84	0°24.18	11.22	79°2.23	29.86		
18	88°31.17	88°11.09	N09°26.88	336°1.78	N24°49.67	15°26.30	N22°11.26	94°4.41	S04°29.74		
19	103°33.63	103°14.94	26.19	351°3.58	49.51	30°28.41	11.31	109°6.59	29.63		
20	118°36.10	118°18.80	25.49	6°5.37	49.35	45°30.52	11.35	124°8.77	29.51		
21	133°38.56	133°22.65	•• 24.79	21°7.17	•• 49.18	60°32.64	•• 11.40	139°10.95	•• 29.39		
22	148°41.02	148°26.51	24.09	36°8.96	49.02	75°34.75	11.44	154°13.14	29.27		
23	163°43.49	163°30.37	23.39	51°10.76	48.85	90°36.86	11.49	169°15.32	29.15		
Mer.pass. 12:07		ν3.9' d-0.7' m-4.18		ν1.8' d-0.2' m0.19		ν2.1' d0.0' m-2.17		ν2.2' d-0.1' m1.13			
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	178°45.95	178°34.22	N09°22.69	66°12.55	N24°48.69	105°38.98	N22°11.53	184°17.50	S04°29.03		
1	193°48.42	193°38.08	21.98	81°14.34	48.52	120°41.09	11.58	199°19.68	28.91		
2	208°50.88	208°41.93	21.27	96°16.14	48.36	135°43.20	11.62	214°21.86	28.79		
3	223°53.35	223°45.79	•• 20.56	111°17.93	•• 48.19	150°45.31	•• 11.67	229°24.04	•• 28.67		
4	238°55.81	238°49.65	19.85	126°19.72	48.03	165°47.43	11.71	244°26.22	28.55		
5	253°58.27	253°53.50	19.14	141°21.51	47.86	180°49.54	11.76	259°28.40	28.43		
6	269°0.74	268°57.36	N09°18.43	156°23.29	N24°47.70	195°51.65	N22°11.80	274°30.58	S04°28.31		
7	284°3.20	284°1.21	17.71	171°25.08	47.53	210°53.76	11.85	289°32.76	28.19		
8	299°5.67	299°5.07	16.99	186°26.87	47.37	225°55.87	11.89	304°34.94	28.08		
9	314°8.13	314°8.92	•• 16.27	201°28.65	•• 47.20	240°57.98	•• 11.94	319°37.12	•• 27.96		
10	329°10.59	329°12.78	15.55	216°30.44	47.04	256°0.09	11.98	334°39.30	27.84		
11	344°13.06	344°16.63	14.83	231°32.22	46.87	271°2.20	12.03	349°41.48	27.72		
12	359°15.52	359°20.49	N09°14.10	246°34.00	N24°46.71	286°4.31	N22°12.07	4°43.66	S04°27.60		
13	14°17.99	14°24.34	13.37	261°35.79	46.54	301°6.42	12.12	19°45.84	27.48		
14	29°20.45	29°28.20	12.64	276°37.57	46.37	316°8.53	12.16	34°48.02	27.36		
15	44°22.91	44°32.05	•• 11.91	291°39.35	•• 46.21	331°10.64	•• 12.21	49°50.20	•• 27.24		
16	59°25.38	59°35.91	11.18	306°41.13	46.04	346°12.75	12.25	64°52.38	27.12		
17	74°27.84	74°39.76	10.45	321°42.91	45.87	1°14.85	12.30	79°54.57	27.00		
18	89°30.31	89°43.61	N09°9.71	336°44.69	N24°45.71	16°16.96	N22°12.34	94°56.75	S04°26.88		
19	104°32.77	104°47.47	8.97	351°46.46	45.54	31°19.07	12.39	109°58.93	26.76		
20	119°35.24	119°51.32	8.24	6°48.24	45.37	46°21.18	12.43	125°1.11	26.65		
21	134°37.70	134°55.17	•• 7.49	21°50.01	•• 45.20	61°23.28	•• 12.48	140°3.29	•• 26.53		
22	149°40.16	149°59.03	6.75	36°51.79	45.04	76°25.39	12.52	155°5.47	26.41		
23	164°42.63	165°2.88	6.01	51°53.56	44.87	91°27.50	12.57	170°7.65	26.29		
Mer.pass. 12:03		ν3.9' d-0.7' m-4.20		ν1.8' d-0.2' m0.21		ν2.1' d0.0' m-2.17		ν2.2' d-0.1' m1.13			
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	179°45.09	180°6.73	N09°5.26	66°55.34	N24°44.70	106°29.60	N22°12.61	185°9.83	S04°26.17		
1	194°47.56	195°10.58	4.52	81°57.11	44.53	121°31.71	12.66	200°12.01	26.05		
2	209°50.02	210°14.43	3.77	96°58.88	44.37	136°33.82	12.70	215°14.19	25.93		
3	224°52.48	225°18.28	•• 3.02	112°0.65	•• 44.20	151°35.92	•• 12.75	230°16.37	•• 25.81		
4	239°54.95	240°22.13	2.26	127°2.42	44.03	166°38.03	12.79	245°18.55	25.69		
5	254°57.41	255°25.98	1.51	142°4.19	43.86	181°40.13	12.84	260°20.74	25.57		
6	269°59.88	270°29.83	N09°0.75	157°5.96	N24°43.69	196°42.24	N22°12.88	275°22.92	S04°25.46		
7	285°2.34	285°33.68	09°0.00	172°7.72	43.52	211°44.34	12.93	290°25.10	25.34		
8	300°4.81	300°37.53	08°59.24	187°9.49	43.35	226°46.45	12.98	305°27.28	25.22		
9	315°7.27	315°41.37	•• 58.48	202°11.26	•• 43.19	241°48.55	•• 13.02	320°29.46	•• 25.10		
10	330°9.73	330°45.22	57.72	217°13.02	43.02	256°50.66	13.07	335°31.64	24.98		
11	345°12.20	345°49.07	56.95	232°14.79	42.85	271°52.76	13.11	350°33.82	24.86		
12	0°14.66	0°52.91	N08°56.19	247°16.55	N24°42.68	286°54.86	N22°13.16	5°36.00	S04°24.74		
13	15°17.13	15°56.76	55.42	262°18.31	42.51	301°56.97	13.20	20°38.18	24.62		
14	30°19.59	31°0.60	54.65	277°20.07	42.34	316°59.07	13.25	35°40.36	24.50		
15	45°22.05	46°4.45	•• 53.88	292°21.83	•• 42.17	332°1.17	•• 13.29	50°42.54	•• 24.38		
16	60°24.52	61°8.29	53.11	307°23.59	42.00	347°3.27	13.34	65°44.73	24.27		
17	75°26.98	76°12.13	52.34	322°25.35	41.83	2°5.38	13.38	80°46.91	24.15		
18	90°29.45	91°15.98	N08°51.57	337°27.11	N24°41.66	17°7.48	N22°13.43	95°49.09	S04°24.03		
19	105°31.91	106°19.82	50.79	352°28.87	41.49	32°9.58	13.47	110°51.27	23.91		
20	120°34.38	121°23.66	50.01	7°30.63	41.32	47°11.68	13.52	125°53.45	23.79		
21	135°36.84	136°27.50	•• 49.23	22°32.38	•• 41.14	62°13.78	•• 13.56	140°55.63	•• 23.67		
22	150°39.30	151°31.34	48.45	37°34.14	40.97	77°15.88	13.61	155°57.81	23.55		
23	165°41.77	166°35.18	47.67	52°35.89	40.80	92°17.98	13.66	170°59.99	23.43		
Mer.pass. 11:59		ν3.9' d-0.7' m-4.20		ν1.8' d-0.2' m0.23		ν2.1' d0.0' m-2.16		ν2.2' d-0.1' m1.14			

h		Sun		Moon				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		178°7.38	S00°8.93	299°5.24	11.5'	S25°12.50	7.3'	54.3'
1		193°7.56	7.94	313°35.73	11.4'	25°19.79	7.2'	54.3'
2		208°7.75	6.95	328°6.14	11.3'	25°26.96	7.1'	54.4'
3		223°7.93	· · 5.96	342°36.47	11.3'	25°34.01	6.9'	54.4'
4		238°8.12	4.98	357°6.72	11.2'	25°40.96	6.8'	54.4'
5		253°8.30	3.99	11°36.90	11.1'	25°47.78	6.7'	54.4'
6		268°8.49	S00°3.00	26°7.01	11.0'	S25°54.50	6.6'	54.4'
7		283°8.67	2.01	40°37.03	10.9'	26°1.09	6.5'	54.4'
8		298°8.86	1.02	55°6.98	10.9'	26°7.57	6.4'	54.4'
9		313°9.04	S00°0.04	69°36.85	10.8'	26°13.93	6.2'	54.5'
10		328°9.23	N00°0.95	84°6.65	10.7'	26°20.17	6.1'	54.5'
11		343°9.41	1.94	98°36.38	10.6'	26°26.29	6.0'	54.5'
12		358°9.60	N00°2.93	113°6.02	10.6'	S26°32.28	5.9'	54.5'
13		13°9.78	3.92	127°35.60	10.5'	26°38.16	5.8'	54.5'
14		28°9.97	4.90	142°5.10	10.4'	26°43.91	5.6'	54.5'
15		43°10.15	· · 5.89	156°34.52	10.4'	26°49.54	5.5'	54.6'
16		58°10.34	6.88	171°3.87	10.3'	26°55.04	5.4'	54.6'
17		73°10.53	7.87	185°33.15	10.2'	27°0.42	5.3'	54.6'
18		88°10.71	N00°8.85	200°2.36	10.1'	S27°5.67	5.1'	54.6'
19		103°10.90	9.84	214°31.50	10.1'	27°10.79	5.0'	54.6'
20		118°11.08	10.83	229°0.56	10.0'	27°15.79	4.9'	54.7'
21		133°11.27	· · 11.82	243°29.55	9.9'	27°20.65	4.7'	54.7'
22		148°11.45	12.81	257°58.48	9.9'	27°25.39	4.6'	54.7'
23		163°11.64	13.79	272°27.33	9.8'	27°29.99	4.5'	54.7'
		SD = 16.1'		$d = -1.0'$		SD = 14.8'		

Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		178°11.83	N00°14.78	286°56.12	9.7'	S27°34.46	4.3'	54.7'
1		193°12.01	15.77	301°24.84	9.7'	27°38.80	4.2'	54.7'
2		208°12.20	16.76	315°53.49	9.6'	27°43.01	4.1'	54.8'
3		223°12.38	· · 17.74	330°22.07	9.5'	27°47.08	3.9'	54.8'
4		238°12.57	18.73	344°50.59	9.5'	27°51.02	3.8'	54.8'
5		253°12.76	19.72	359°19.04	9.4'	27°54.82	3.7'	54.8'
6		268°12.94	N00°20.71	13°47.43	9.3'	S27°58.48	3.5'	54.9'
7		283°13.13	21.69	28°15.76	9.3'	28°2.01	3.4'	54.9'
8		298°13.32	22.68	42°44.02	9.2'	28°5.39	3.2'	54.9'
9		313°13.50	· · 23.67	57°12.23	9.1'	28°8.64	3.1'	54.9'
10		328°13.69	24.66	71°40.37	9.1'	28°11.75	3.0'	54.9'
11		343°13.87	25.64	86°8.45	9.0'	28°14.72	2.8'	55.0'
12		358°14.06	N00°26.63	100°36.48	9.0'	S28°17.55	2.7'	55.0'
13		13°14.25	27.62	115°4.44	8.9'	28°20.23	2.5'	55.0'
14		28°14.43	28.60	129°32.35	8.9'	28°22.78	2.4'	55.0'
15		43°14.62	· · 29.59	144°0.21	8.8'	28°25.18	2.3'	55.1'
16		58°14.81	30.58	158°28.01	8.7'	28°27.43	2.1'	55.1'
17		73°14.99	31.57	172°55.75	8.7'	28°29.54	2.0'	55.1'
18		88°15.18	N00°32.55	187°23.45	8.6'	S28°31.51	1.8'	55.1'
19		103°15.37	33.54	201°51.09	8.6'	28°33.32	1.7'	55.2'
20		118°15.55	34.53	216°18.68	8.5'	28°35.00	1.5'	55.2'
21		133°15.74	· · 35.51	230°46.22	8.5'	28°36.52	1.4'	55.2'
22		148°15.93	36.50	245°13.72	8.4'	28°37.90	1.2'	55.2'
23		163°16.11	37.49	259°41.17	8.4'	28°39.12	1.1'	55.3'
		SD = 16.1'		$d = 1.0'$		SD = 14.9'		

Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		178°16.30	N00°38.47	274°8.57	8.4'	S28°40.20	0.9'	55.3'
1		193°16.49	39.46	288°35.93	8.3'	28°41.13	0.8'	55.3'
2		208°16.67	40.45	303°3.25	8.3'	28°41.91	0.6'	55.3'
3		223°16.86	· · 41.44	317°30.53	8.2'	28°42.54	0.5'	55.4'
4		238°17.05	42.42	331°57.76	8.2'	28°43.01	0.3'	55.4'
5		253°17.23	43.41	346°24.96	8.2'	28°43.34	0.2'	55.4'
6		268°17.42	N00°44.40	0°52.12	8.1'	S28°43.51	0.0'	55.4'
7		283°17.61	45.38	15°19.24	8.1'	28°43.53	-0.1'	55.5'
8		298°17.80	46.37	29°46.32	8.1'	28°43.40	-0.3'	55.5'
9		313°17.98	· · 47.36	44°13.38	8.0'	28°43.11	-0.4'	55.5'
10		328°18.17	48.34	58°40.40	8.0'	28°42.67	-0.6'	55.6'
11		343°18.36	49.33	73°7.39	8.0'	28°42.07	-0.8'	55.6'
12		358°18.54	N00°50.31	87°34.35	7.9'	S28°41.32	-0.9'	55.6'
13		13°18.73	51.30	102°1.28	7.9'	28°40.41	-1.1'	55.6'
14		28°18.92	52.29	116°28.18	7.9'	28°39.35	-1.2'	55.7'
15		43°19.11	· · 53.27	130°55.06	7.9'	28°38.13	-1.4'	55.7'
16		58°19.29	54.26	145°21.92	7.8'	28°36.75	-1.5'	55.7'
17		73°19.48	55.25	159°48.75	7.8'	28°35.22	-1.7'	55.8'
18		88°19.67	N00°56.23	174°15.56	7.8'	S28°33.53	-1.8'	55.8'
19		103°19.86	57.22	188°42.35	7.8'	28°31.68	-2.0'	55.8'
20		118°20.04	58.20	203°9.13	7.8'	28°29.68	-2.2'	55.9'
21		133°20.23	00°59.19	217°35.88	7.7'	28°27.51	-2.3'	55.9'
22		148°20.42	01°0.18	232°2.62	7.7'	28°25.19	-2.5'	55.9'
23		163°20.61	1.16	246°29.35	7.7'	28°22.72	-2.6'	56.0'
		SD = 16.0'		$d = 1.0'$		SD = 15.1'		

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:13	04:44	05:52	18:25	19:34	21:06
N 70°	03:33	04:52	05:54	18:23	19:25	20:45
68°	03:49	04:59	05:55	18:21	19:18	20:29
66°	04:01	05:05	05:56	18:20	19:12	20:16
64°	04:11	05:09	05:57	18:19	19:07	20:06
62°	04:19	05:13	05:57	18:18	19:03	19:57
60°	04:26	05:17	05:58	18:17	18:59	19:50
N 58°	04:33	05:19	05:59	18:17	18:56	19:43
56°	04:38	05:22	05:59	18:16	18:53	19:38
54°	04:42	05:24	06:00	18:16	18:51	19:33
52°	04:46	05:26	06:00	18:15	18:49	19:29
50°	04:50	05:28	06:00	18:15	18:47	19:25
45°	04:57	05:32	06:01	18:14	18:43	19:18
N 40°	05:03	05:35	06:02	18:13	18:40	19:12
35°	05:07	05:37	06:02	18:13	18:38	19:07
30°	05:11	05:39	06:03	18:12	18:36	19:04
20°	05:16	05:41	06:03	18:11	18:33	18:59
N 10°	05:18	05:43	06:04	18:11	18:32	18:56
0°	05:19	05:43	06:04	18:10	18:31	18:55
S 10°	05:19	05:43	06:04	18:10	18:31	18:55
20°	05:17	05:42	06:04	18:10	18:32	18:57
30°	05:12	05:40	06:04	18:10	18:33	19:01
35°	05:09	05:39	06:04	18:10	18:35	19:04
40°	05:05	05:37	06:04	18:09	18:36	19:08
45°	05:00	05:35	06:04	18:10	18:39	19:13
S 50°	04:53	05:31	06:04	18:10	18:42	19:20
52°	04:50	05:30	06:04	18:10	18:43	19:23
54°	04:46	05:28	06:03	18:10	18:45	19:26
56°	04:42	05:26	06:03	18:10	18:47	19:31
58°	04:37	05:24	06:03	18:10	18:49	19:35
S 60°	04:31	05:21	06:03	18:10	18:51	19:41

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	03:35	██	██	04:39	██	██
62°	02:25	██	██	05:49	██	██
60°	01:50	03:26	04:43	06:25	06:35	07:09
N 58°	01:25	02:49	03:59	06:51	07:12	07:54
56°	01:05	02:23	03:30	07:11	07:38	08:23
54°	00:49	02:03	03:07	07:28	07:59	08:46
52°	00:34	01:46	02:49	07:43	08:16	09:04
50°	00:22	01:31	02:33	07:56	08:31	09:20
45°	· · ·	01:01	02:01	08:22	09:01	09:51
N 40°	· · ·	00:38	01:37	08:43	09:25	10:16
35°	· · ·	00:19	01:17	09:00	09:44	10:36
30°	· · ·	00:03	01:00	09:15	10:01	10:53
20°	23:36	· · ·	00:31	09:41	10:29	11:22
N 10°	23:12	· · ·	00:06	10:03	10:53	11:47
0°	22:50	23:43	· · ·	10:24	11:16	12:10
S 10°	22:29	23:20	· · ·	10:45	11:38	12:33
20°	22:05	22:56	23:51	11:07	12:02	12:57
30°	21:38	22:27	23:23	11:33	12:31	13:26
35°	21:22	22:10	23:06	11:48	12:47	13:43
40°	21:04	21:50	22:46	12:06	13:07	14:03
45°	20:42	21:26	22:23	12:28	13:31	14:27
S 50°	20:14	20:56	21:52	12:55	14:01	14:58
52°	20:00	20:40	21:37	13:09	14:17	15:13
54°	19:44	20:22	21:19	13:24	14:34	15:31
56°	19:25	20:01	20:57	13:43	14:56	15:53
58°	19:02	19:33	20:29	14:05	15:23	16:20
S 60°	18:32	18:53	19:49	14:35	16:03	17:01

Day	Sun		Mer. Pass	Moon	
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March 23, 24, 25 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	180°44.23		181°39.01	N08°46.89	67°37.64	N24°40.63	107°20.08	N22°13.70	186°2.17	S04°23.32
1	195°46.70		196°42.85	46.11	82°39.40	40.46	122°22.18	13.75	201°4.36	23.20
2	210°49.16		211°46.69	45.32	97°41.15	40.29	137°24.28	13.79	216°6.54	23.08
3	225°51.62		226°50.52	· · 44.53	112°42.90	· · 40.12	152°26.38	· · 13.84	231°8.72	· · 22.96
4	240°54.09		241°54.36	43.74	127°44.65	39.94	167°28.48	13.88	246°10.90	22.84
5	255°56.55		256°58.19	42.95	142°46.40	39.77	182°30.58	13.93	261°13.08	22.72
6	270°59.02		272°2.02	N08°42.16	157°48.15	N24°39.60	197°32.68	N22°13.97	276°15.26	S04°22.60
7	286°1.48		287°5.86	41.37	172°49.90	39.43	212°34.78	14.02	291°17.44	22.48
8	301°3.95		302°9.69	40.57	187°51.64	39.26	227°36.88	14.06	306°19.62	22.37
9	316°6.41		317°13.52	· · 39.78	202°53.39	· · 39.08	242°38.98	· · 14.11	321°21.81	· · 22.25
10	331°8.87		332°17.35	38.98	217°55.13	38.91	257°41.07	14.16	336°23.99	22.13
11	346°11.34		347°21.18	38.18	232°56.88	38.74	272°43.17	14.20	351°26.17	22.01
12	1°13.80		2°25.00	N08°37.38	247°58.62	N24°38.56	287°45.27	N22°14.25	6°28.35	S04°21.89
13	16°16.27		17°28.83	36.58	263°0.37	38.39	302°47.37	14.29	21°30.53	21.77
14	31°18.73		32°32.65	35.78	278°2.11	38.22	317°49.46	14.34	36°32.71	21.65
15	46°21.19		47°36.48	· · 34.98	293°3.85	· · 38.04	332°51.56	· · 14.38	51°34.89	· · 21.53
16	61°23.66		62°40.30	34.17	308°5.59	37.87	347°53.66	14.43	66°37.08	21.42
17	76°26.12		77°44.12	33.36	323°7.33	37.70	2°55.75	14.48	81°39.26	21.30
18	91°28.59		92°47.95	N08°32.56	338°9.07	N24°37.52	17°57.85	N22°14.52	96°41.44	S04°21.18
19	106°31.05		107°51.77	31.75	353°10.81	37.35	32°59.94	14.57	111°43.62	21.06
20	121°33.52		122°55.59	30.94	8°12.54	37.17	48°2.04	14.61	126°45.80	20.94
21	136°35.98		137°59.40	· · 30.13	23°14.28	· · 37.00	63°4.13	· · 14.66	141°47.98	· · 20.82
22	151°38.44		153°3.22	29.31	38°16.02	36.83	78°6.23	14.70	156°50.17	20.70
23	166°40.91		168°7.04	28.50	53°17.75	36.65	93°8.32	14.75	171°52.35	20.59
Mer.pass. 11:55		ν3.8' d-0.8' m-4.20		ν1.8' d-0.2' m0.25		ν2.1' d0.0' m-2.16		ν2.2' d-0.1' m1.14		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	181°43.37		183°10.85	N08°27.68	68°19.49	N24°36.48	108°10.42	N22°14.80	186°54.53	S04°20.47
1	196°45.84		198°14.66	26.87	83°21.22	36.30	123°12.51	14.84	201°56.71	20.35
2	211°48.30		213°18.48	26.05	98°22.95	36.13	138°14.60	14.89	216°58.89	20.23
3	226°50.76		228°22.29	· · 25.23	113°24.69	· · 35.95	153°16.70	· · 14.93	232°1.07	· · 20.11
4	241°53.23		243°26.10	24.41	128°26.42	35.78	168°18.79	14.98	247°3.26	19.99
5	256°55.69		258°29.91	23.59	143°28.15	35.60	183°20.88	15.02	262°5.44	19.88
6	271°58.16		273°33.71	N08°22.77	158°29.88	N24°35.42	198°22.98	N22°15.07	277°7.62	S04°19.76
7	287°0.62		288°37.52	21.94	173°31.60	35.25	213°25.07	15.12	292°9.80	19.64
8	302°3.09		303°41.33	21.12	188°33.33	35.07	228°27.16	15.16	307°11.98	19.52
9	317°5.55		318°45.13	· · 20.29	203°35.06	· · 34.90	243°29.25	· · 15.21	322°14.16	· · 19.40
10	332°8.01		333°48.93	19.46	218°36.79	34.72	258°31.35	15.25	337°16.35	19.28
11	347°10.48		348°52.73	18.63	233°38.51	34.54	273°33.44	15.30	352°18.53	19.16
12	2°12.94		3°56.53	N08°17.80	248°40.24	N24°34.37	288°35.53	N22°15.34	7°20.71	S04°19.05
13	17°15.41		19°0.33	16.97	263°41.96	34.19	303°37.62	15.39	22°22.89	18.93
14	32°17.87		34°4.13	16.14	278°43.68	34.01	318°39.71	15.44	37°25.07	18.81
15	47°20.33		49°7.92	· · 15.31	293°45.41	· · 33.84	333°41.80	· · 15.48	52°27.26	· · 18.69
16	62°22.80		64°11.72	14.48	308°47.13	33.66	348°43.89	15.53	67°29.44	18.57
17	77°25.26		79°15.51	13.64	323°48.85	33.48	3°45.98	15.57	82°31.62	18.45
18	92°27.73		94°19.30	N08°12.80	338°50.57	N24°33.30	18°48.07	N22°15.62	97°33.80	S04°18.34
19	107°30.19		109°23.09	11.97	353°52.29	33.13	33°50.16	15.67	112°35.98	18.22
20	122°32.66		124°26.88	11.13	8°54.01	32.95	48°52.25	15.71	127°38.16	18.10
21	137°35.12		139°30.67	· · 10.29	23°55.73	· · 32.77	63°54.34	· · 15.76	142°40.35	· · 17.98
22	152°37.58		154°34.45	9.45	38°57.44	32.59	78°56.43	15.80	157°42.53	17.86
23	167°40.05		169°38.24	8.61	53°59.16	32.41	93°58.52	15.85	172°44.71	17.75
Mer.pass. 11:51		ν3.8' d-0.8' m-4.20		ν1.7' d-0.2' m0.28		ν2.1' d0.0' m-2.15		ν2.2' d-0.1' m1.15		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	182°42.51		184°42.02	N08°7.76	69°0.88	N24°32.24	109°0.60	N22°15.90	187°46.89	S04°17.63
1	197°44.98		199°45.80	6.92	84°2.59	32.06	124°2.69	15.94	202°49.08	17.51
2	212°47.44		214°49.58	6.08	99°4.30	31.88	139°4.78	15.99	217°51.26	17.39
3	227°49.90		229°53.36	· · 5.23	114°6.02	· · 31.70	154°6.87	· · 16.03	232°53.44	· · 17.27
4	242°52.37		244°57.14	4.38	129°7.73	31.52	169°8.95	16.08	247°55.62	17.15
5	257°54.83		260°0.91	3.54	144°9.44	31.34	184°11.04	16.12	262°57.80	17.04
6	272°57.30		275°4.68	N08°2.69	159°11.15	N24°31.16	199°13.13	N22°16.17	277°59.99	S04°16.92
7	287°59.76		290°8.46	1.84	174°12.86	30.98	214°15.22	16.22	293°2.17	16.80
8	303°2.22		305°12.23	0.99	189°14.57	30.80	229°17.30	16.26	308°4.35	16.68
9	318°4.69		320°15.99	08°0.14	204°16.28	· · 30.62	244°19.39	· · 16.31	323°6.53	· · 16.56
10	333°7.15		335°19.76	07°59.28	219°17.99	30.44	259°21.47	16.35	338°8.72	16.45
11	348°9.62		350°23.53	58.43	234°19.70	30.26	274°23.56	16.40	353°10.90	16.33
12	3°12.08		5°27.29	N07°57.58	249°21.40	N24°30.08	289°25.64	N22°16.45	8°13.08	S04°16.21
13	18°14.55		20°31.05	56.72	264°23.11	29.90	304°27.73	16.49	23°15.26	16.09
14	33°17.01		35°34.81	55.87	279°24.81	29.72	319°29.81	16.54	38°17.44	15.97
15	48°19.47		50°38.57	· · 55.01	294°26.52	· · 29.54	334°31.90	· · 16.59	53°19.63	· · 15.86
16	63°21.94		65°42.32	54.15	309°28.22	29.36	349°33.98	16.63	68°21.81	15.74
17	78°24.40		80°46.08	53.29	324°29.92	29.18	4°36.07	16.68	83°23.99	15.62
18	93°26.87		95°49.83	N07°52.43	339°31.62	N24°29.00	19°38.15	N22°16.72	98°26.17	S04°15.50
19	108°29.33		110°53.58	51.57	354°33.33	28.82	34°40.23	16.77	113°28.36	15.38
20	123°31.79		125°57.33	50.71	9°35.03	28.64	49°42.32	16.82	128°30.54	15.27
21	138°34.26		141°1.08	· · 49.85	24°36.73	· · 28.45	64°44.40	· · 16.86	143°32.72	· · 15.15
22	153°36.72		156°4.83	48.99	39°38.42	28.27	79°46.48	16.91	158°34.90	15.03
23	168°39.19		171°8.57	48.12	54°40.12	28.09	94°48.57	16.95	173°37.09	14.91
Mer.pass. 11:47		ν3.8' d-0.8' m-4.20		ν1.7' d-0.2' m0.30		ν2.1' d0.0' m-2.14		ν2.2' d-0.1' m1.15		

Stars		
	SHA	Dec
Alpheratz	357°34.98	29°13.67
Ankaa	353°7.38	-42°10.23
Schedar	349°31.46	56°40.51
Diphda	348°47.45	-17°51.02
Achernar	335°20.56	-57°6.66
Hamal	327°51.32	23°34.86
Polaris	314°18.98	89°22.44
Acamar	315°11.94	-40°12.40
Menkar	314°6.21	4°11.23
Mirfak	308°28.36	49°57.15
Aldebaran	290°39.57	16°33.58
Rigel	281°3.79	-8°10.48
Capella	280°21.76	46°1.53
Bellatrix	278°22.77	6°22.29
Elnath	278°1.73	28°37.77
Alnilam	275°37.61	-1°11.25
Betelgeuse	270°51.93	7°24.65
Canopus	263°52.30	-52°42.79
Sirius	258°26.06	-16°45.21
Adhara	255°5.67	-29°0.59
Procyon	244°50.55	5°9.54
Pollux	243°16.96	27°57.95
Avior	234°14.38	-59°35.65
Suhail	222°45.92	-43°32.27
Miaplacidus	221°37.68	-69°49.43
Alphard	217°47.36	-8°46.22
Regulus	207°33.99	11°50.55
Dubhe	193°40.12	61°36.91
Denebola	182°24.45	14°25.74
Geniah	175°43.10	-17°41.06
Acrux	172°59.29	-63°14.38
Gacrux	171°50.94	-57°15.33
Alioth	166°12.23	55°49.23
Spica	158°21.83	-11°17.71
Alkaid	152°51.40	49°11.02
Hadar	148°35.26	-60°29.63
Menkent	147°57.10	-36°29.68
Arcturus	145°47.47	19°2.85
Rigel Kent.	139°39.58	-60°56.30
Kochab	137°18.84	74°2.80
Zuben'ubi	136°55.59	-16°8.90
Alphecca	126°3.37	26°37.50
Antares	112°15.49	-26°29.29
Atria	107°9.42	-69°4.14
Sabik	102°2.51	-15°45.44
Shaula	96°10.08	-37°7.26
Rasalhague	95°58.34	12°32.25
Eltanin	90°42.07	51°28.72
Kaus Aust.	83°32.31	-34°22.30
Vega	80°33.15	38°48.05
Nunki	75°47.62	-26°15.92
Altair	61°59.93	8°55.88
Peacock	53°5.75	-56°39.09
Deneb	49°25.98	45°21.90
Enif	33°38.89	9°59.25
Al Na'ir	27°33.07	-46°50.31
Fomalhaut	15°14.66	-29°29.39
Scheat	13°45.40	28°13.01
Markab	13°30.05	15°20.30
Mar 23 Sun	SHA	Mer.pass
Venus	0°54.78	11:50
Mars	246°53.41	19:27
Jupiter	286°35.85	16:48
Saturn	5°17.94	11:34
Mar 24 Mon	SHA	Mer.pass
Venus	1°27.48	11:44
Mars	246°36.11	19:24
Jupiter	286°27.04	16:45
Saturn	5°11.16	11:31
Mar 25 Tue	SHA	Mer.pass
Venus	1°59.51	11:38
Mars	246°18.36	19:22
Jupiter	286°18.09	16:42
Saturn	5°4.38	11:27
Horizontal parallax		
	Venus:	0.5
	Mars:	0.1


h	Sun			Moon				
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	178°20.79	N01°2.15		260°56.06	7.7'	S28°20.08	-2.8'	56.0'
1	193°20.98	3.13		275°22.76	7.7'	28°17.28	-3.0'	56.0'
2	208°21.17	4.12		289°49.45	7.7'	28°14.33	-3.1'	56.1'
3	223°21.36	5.11		304°16.13	7.7'	28°11.22	-3.3'	56.1'
4	238°21.54	6.09		318°42.81	7.7'	28°7.94	-3.4'	56.1'
5	253°21.73	7.08		333°9.48	7.7'	28°4.51	-3.6'	56.2'
6	268°21.92	N01°8.06		347°36.14	7.7'	S28°0.92	-3.7'	56.2'
7	283°22.11	9.05		2°2.80	7.7'	27°57.17	-3.9'	56.2'
8	298°22.29	10.03		16°29.46	7.7'	27°53.27	-4.1'	56.3'
9	313°22.48	11.02		30°56.12	7.7'	27°49.20	-4.2'	56.3'
10	328°22.67	12.00		45°22.78	7.7'	27°44.97	-4.4'	56.3'
11	343°22.86	12.99		59°49.44	7.7'	27°40.59	-4.5'	56.4'
12	358°23.04	N01°13.98		74°16.10	7.7'	S27°36.04	-4.7'	56.4'
13	13°23.23	14.96		88°42.77	7.7'	27°31.34	-4.9'	56.4'
14	28°23.42	15.95		103°9.45	7.7'	27°26.48	-5.0'	56.5'
15	43°23.61	16.93		117°36.13	7.7'	27°21.46	-5.2'	56.5'
16	58°23.80	17.92		132°2.82	7.7'	27°16.28	-5.3'	56.5'
17	73°23.98	18.90		146°29.53	7.7'	27°10.94	-5.5'	56.6'
18	88°24.17	N01°19.89		160°56.24	7.7'	S27°5.44	-5.7'	56.6'
19	103°24.36	20.87		175°22.96	7.7'	26°59.79	-5.8'	56.6'
20	118°24.55	21.86		189°49.70	7.8'	26°53.98	-6.0'	56.7'
21	133°24.73	22.84		204°16.45	7.8'	26°48.01	-6.1'	56.7'
22	148°24.92	23.83		218°43.22	7.8'	26°41.88	-6.3'	56.8'
23	163°25.11	24.81		233°10.01	7.8'	26°35.60	-6.4'	56.8'
SD = 16.0'			$d = 1.0'$	SD = 15.3'				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	178°25.30	N01°25.79		247°36.81	7.8'	S26°29.16	-6.6'	56.8'
1	193°25.49	26.78		262°3.63	7.8'	26°22.56	-6.8'	56.9'
2	208°25.67	27.76		276°30.48	7.9'	26°15.81	-6.9'	56.9'
3	223°25.86	28.75		290°57.34	7.9'	26°8.90	-7.1'	56.9'
4	238°26.05	29.73		305°24.23	7.9'	26°1.83	-7.2'	57.0'
5	253°26.24	30.72		319°51.13	7.9'	25°54.61	-7.4'	57.0'
6	268°26.43	N01°31.70		334°18.07	8.0'	S25°47.24	-7.5'	57.1'
7	283°26.61	32.69		348°45.03	8.0'	25°39.71	-7.7'	57.1'
8	298°26.80	33.67		3°12.01	8.0'	25°32.03	-7.8'	57.1'
9	313°26.99	34.65		17°39.02	8.0'	25°24.20	-8.0'	57.2'
10	328°27.18	35.64		32°6.06	8.1'	25°16.21	-8.1'	57.2'
11	343°27.37	36.62		46°33.13	8.1'	25°8.07	-8.3'	57.2'
12	358°27.55	N01°37.61		61°0.23	8.1'	S24°59.78	-8.4'	57.3'
13	13°27.74	38.59		75°27.35	8.2'	24°51.34	-8.6'	57.3'
14	28°27.93	39.57		89°54.51	8.2'	24°42.75	-8.7'	57.4'
15	43°28.12	40.56		104°21.70	8.2'	24°34.01	-8.9'	57.4'
16	58°28.31	41.54		118°48.93	8.3'	24°25.12	-9.0'	57.4'
17	73°28.49	42.52		133°16.18	8.3'	24°16.08	-9.2'	57.5'
18	88°28.68	N01°43.51		147°43.47	8.3'	S24°6.89	-9.3'	57.5'
19	103°28.87	44.49		162°10.79	8.4'	23°57.55	-9.5'	57.6'
20	118°29.06	45.48		176°38.15	8.4'	23°48.07	-9.6'	57.6'
21	133°29.25	46.46		191°5.55	8.4'	23°38.44	-9.8'	57.6'
22	148°29.44	47.44		205°32.98	8.5'	23°28.67	-9.9'	57.7'
23	163°29.62	48.43		220°0.44	8.5'	23°18.75	-10.1'	57.7'
SD = 16.0'			$d = 1.0'$	SD = 15.5'				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	178°29.81	N01°49.41		234°27.95	8.5'	S23°8.69	-10.2'	57.8'
1	193°30.00	50.39		248°55.49	8.6'	22°58.49	-10.3'	57.8'
2	208°30.19	51.37		263°23.07	8.6'	22°48.14	-10.5'	57.8'
3	223°30.38	52.36		277°50.69	8.7'	22°37.65	-10.6'	57.9'
4	238°30.56	53.34		292°18.34	8.7'	22°27.02	-10.8'	57.9'
5	253°30.75	54.32		306°46.04	8.7'	22°16.26	-10.9'	58.0'
6	268°30.94	N01°55.31		321°13.77	8.8'	S22°5.35	-11.0'	58.0'
7	283°31.13	56.29		335°41.55	8.8'	21°54.30	-11.2'	58.0'
8	298°31.32	57.27		350°9.36	8.9'	21°43.12	-11.3'	58.1'
9	313°31.51	58.25		4°37.22	8.9'	21°31.80	-11.5'	58.1'
10	328°31.69	01°59.24		19°5.11	8.9'	21°20.35	-11.6'	58.2'
11	343°31.88	02°0.22		33°33.05	9.0'	21°8.76	-11.7'	58.2'
12	358°32.07	N02°1.20		48°1.02	9.0'	S20°57.04	-11.9'	58.2'
13	13°32.26	2.18		62°29.04	9.1'	20°45.19	-12.0'	58.3'
14	28°32.45	3.17		76°57.09	9.1'	20°33.20	-12.1'	58.3'
15	43°32.64	4.15		91°25.19	9.1'	20°21.09	-12.2'	58.4'
16	58°32.82	5.13		105°53.33	9.2'	20°8.84	-12.4'	58.4'
17	73°33.01	6.11		120°21.50	9.2'	19°56.47	-12.5'	58.4'
18	88°33.20	N02°7.09		134°49.72	9.3'	S19°43.97	-12.6'	58.5'
19	103°33.39	8.07		149°17.98	9.3'	19°31.34	-12.8'	58.5'
20	118°33.58	9.06		163°46.28	9.3'	19°18.59	-12.9'	58.6'
21	133°33.76	10.04		178°14.62	9.4'	19°5.71	-13.0'	58.6'
22	148°33.95	11.02		192°43.00	9.4'	18°52.71	-13.1'	58.6'
23	163°34.14	12.00		207°11.42	9.5'	18°39.59	-13.2'	58.7'
SD = 16.0'			$d = 1.0'$	SD = 15.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	02:51	04:27	05:37	18:38	19:49	21:27
N 70°	03:15	04:37	05:40	18:35	19:38	21:02
68°	03:33	04:46	05:42	18:32	19:29	20:43
66°	03:47	04:53	05:44	18:30	19:22	20:28
64°	03:59	04:58	05:46	18:28	19:16	20:16
62°	04:08	05:03	05:48	18:26	19:11	20:06
60°	04:16	05:07	05:49	18:25	19:07	19:58
N 58°	04:23	05:11	05:50	18:23	19:03	19:51
56°	04:29	05:14	05:51	18:22	19:00	19:45
54°	04:34	05:17	05:52	18:21	18:57	19:39
52°	04:39	05:19	05:53	18:20	18:54	19:35
50°	04:43	05:21	05:54	18:20	18:52	19:30
45°	04:51	05:26	05:55	18:18	18:47	19:22
N 40°	04:58	05:30	05:57	18:16	18:43	19:15
35°	05:03	05:33	05:58	18:15	18:40	19:10
30°	05:07	05:35	05:59	18:14	18:38	19:06
20°	05:13	05:38	06:00	18:12	18:34	19:00
N 10°	05:16	05:41	06:02	18:11	18:32	18:56
0°	05:18	05:42	06:03	18:09	18:30	18:54
S 10°	05:19	05:43	06:04	18:08	18:29	18:54
20°	05:17	05:43	06:05	18:07	18:29	18:55
30°	05:14	05:42	06:06	18:06	18:30	18:58
35°	05:12	05:41	06:06	18:05	18:31	19:00
40°	05:09	05:40	06:07	18:05	18:32	19:03
45°	05:04	05:38	06:08	18:04	18:33	19:07
S 50°	04:58	05:36	06:08	18:03	18:35	19:13
52°	04:55	05:35	06:09	18:03	18:36	19:16
54°	04:52	05:34	06:09	18:02	18:37	19:19
56°	04:48	05:32	06:09	18:02	18:39	19:22
58°	04:44	05:31	06:10	18:01	18:40	19:26
S 60°	04:39	05:29	06:10	18:01	18:42	19:31

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	08:09	■	■	09:30
66°	■	■	06:59	■	■	10:39
64°	■	07:12	06:22	■	08:32	11:15
62°	■	06:07	05:56	■	09:37	11:40
60°	05:20	05:32	05:35	08:27	10:11	12:00
N 58°	04:43	05:06	05:18	09:04	10:36	12:16
56°	04:17	04:46	05:04	09:30	10:56	12:30
54°	03:56	04:29	04:51	09:51	11:12	12:42
52°	03:38	04:15	04:40	10:08	11:26	12:52
50°	03:23	04:02	04:30	10:23	11:39	13:02
45°	02:53	03:36	04:09	10:53	12:04	13:21
N 40°	02:30	03:15	03:53	11:16	12:24	13:37
35°	02:10	02:57	03:38	11:35	12:41	13:50
30°	01:53	02:42	03:26	11:52	12:55	14:02
20°	01:25	02:16	03:04	12:19	13:20	14:21
N 10°	01:01	01:54	02:46	12:43	13:40	14:38
0°	00:38	01:34	02:28	13:05	14:00	14:53
S 10°	00:16	01:13	02:10	13:27	14:19	15:09
20°	00:50	01:52	13:50	14:40	15:25
30°	00:24	01:30	14:17	15:03	15:44
35°	00:09	01:17	14:33	15:17	15:55
40°	23:51	01:02	14:51	15:33	16:07
45°	23:29	00:44	15:14	15:52	16:22
S 50°	23:02	00:22	15:42	16:15	16:40
52°	22:49	00:11	15:56	16:26	16:48
54°	22:33	23:59	16:12	16:39	16:57
56°	22:15	23:45	16:30	16:53	17:08
58°	21:52	23:29	16:53	17:10	17:19
S 60°	21:22	23:09	17:23	17:31	17:33

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	45-25%
23	06:37	06:28	12:06	06:51	19:19	
24	06:19	06:10	12:06	07:47	20:14	
25	06:01	05:52	12:06	08:41	21:07	

March 26, 27, 28 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	183°41.65		186°12.31	N07°47.26	69°41.82	N24°27.91	109°50.65	N22°17.00	188°39.27	S04°14.79
1	198°44.11		201°16.05	46.40	84°43.52	27.73	124°52.73	17.05	203°41.45	14.68
2	213°46.58		216°19.79	45.53	99°45.21	27.54	139°54.81	17.09	218°43.63	14.56
3	228°49.04		231°23.53	· · 44.66	114°46.91	· · 27.36	154°56.89	· · 17.14	233°45.82	· · 14.44
4	243°51.51		246°27.26	43.80	129°48.60	27.18	169°58.98	17.18	248°48.00	14.32
5	258°53.97		261°30.99	42.93	144°50.30	27.00	185°1.06	17.23	263°50.18	14.21
6	273°56.44		276°34.72	N07°42.06	159°51.99	N24°26.81	200°3.14	N22°17.28	278°52.37	S04°14.09
7	288°58.90		291°38.45	41.19	174°53.68	26.63	215°5.22	17.32	293°54.55	13.97
8	304°1.36		306°42.18	40.32	189°55.37	26.45	230°7.30	17.37	308°56.73	13.85
9	319°3.83		321°45.90	· · 39.45	204°57.06	· · 26.26	245°9.38	· · 17.42	323°58.91	· · 13.73
10	334°6.29		336°49.62	38.58	219°58.75	26.08	260°11.46	17.46	339°1.10	13.62
11	349°8.76		351°53.35	37.70	235°0.44	25.90	275°13.54	17.51	354°3.28	13.50
12	4°11.22		6°57.06	N07°36.83	250°2.13	N24°25.71	290°15.62	N22°17.55	9°5.46	S04°13.38
13	19°13.68		22°07.78	35.96	265°3.82	25.53	305°17.70	17.60	24°7.65	13.26
14	34°16.15		37°4.49	35.08	280°5.50	25.35	320°19.78	17.65	39°9.83	13.15
15	49°18.61		52°8.21	· · 34.21	295°7.19	· · 25.16	335°21.85	· · 17.69	54°12.01	· · 13.03
16	64°21.08		67°11.92	33.33	310°8.88	24.98	350°23.93	17.74	69°14.19	12.91
17	79°23.54		82°15.63	32.45	325°10.56	24.79	5°26.01	17.79	84°16.38	12.79
18	94°26.00		97°19.33	N07°31.58	340°12.24	N24°24.61	20°28.09	N22°17.83	99°18.56	S04°12.68
19	109°28.47		112°23.04	30.70	355°13.93	24.42	35°30.17	17.88	114°20.74	12.56
20	124°30.93		127°26.74	29.82	10°15.61	24.24	50°32.24	17.92	129°22.93	12.44
21	139°33.40		142°30.44	· · 28.94	25°17.29	· · 24.05	65°34.32	· · 17.97	144°25.11	· · 12.32
22	154°35.86		157°34.13	28.06	40°18.97	23.87	80°36.40	18.02	159°27.29	12.20
23	169°38.32		172°37.83	27.18	55°20.65	23.68	95°38.47	18.06	174°29.48	12.09
Mer.pass. 11:43		ν3.7' d-0.9' m-4.18		ν1.7' d-0.2' m0.32		ν2.1' d0.0' m-2.14		ν2.2' d-0.1' m1.15		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	184°40.79		187°41.52	N07°26.30	70°22.33	N24°23.50	110°40.55	N22°18.11	189°31.66	S04°11.97
1	199°43.25		202°45.21	25.42	85°24.01	23.31	125°42.63	18.16	204°33.84	11.85
2	214°45.72		217°48.90	24.54	100°25.69	23.12	140°44.70	18.20	219°36.03	11.73
3	229°48.18		232°52.59	· · 23.65	115°27.37	· · 22.94	155°46.78	· · 18.25	234°38.21	· · 11.62
4	244°50.64		247°56.27	22.77	130°29.04	22.75	170°48.85	18.30	249°40.39	11.50
5	259°53.11		262°59.96	21.89	145°30.72	22.57	185°50.93	18.34	264°42.58	11.38
6	274°55.57		278°3.63	N07°21.00	160°32.39	N24°22.38	200°53.00	N22°18.39	279°44.76	S04°11.26
7	289°58.04		293°7.31	20.12	175°34.07	22.19	215°55.08	18.43	294°46.94	11.15
8	305°0.50		308°10.99	19.23	190°35.74	22.00	230°57.15	18.48	309°49.13	11.03
9	320°2.96		323°14.66	· · 18.35	205°37.41	· · 21.82	245°59.23	· · 18.53	324°51.31	· · 10.91
10	335°5.43		338°18.33	17.46	220°39.09	21.63	261°1.30	18.57	339°53.49	10.80
11	350°7.89		353°22.00	16.58	235°40.76	21.44	276°3.38	18.62	354°55.68	10.68
12	5°10.36		8°25.66	N07°15.69	250°42.43	N24°21.26	291°5.45	N22°18.67	9°57.86	S04°10.56
13	20°12.82		23°29.33	14.80	265°44.10	21.07	306°7.52	18.71	25°0.04	10.44
14	35°15.29		38°32.99	13.91	280°45.77	20.88	321°9.60	18.76	40°2.23	10.33
15	50°17.75		53°36.65	· · 13.03	295°47.44	· · 20.69	336°11.67	· · 18.81	55°4.41	· · 10.21
16	65°20.21		68°40.30	12.14	310°49.10	20.50	351°13.74	18.85	70°6.59	10.09
17	80°22.68		83°43.96	11.25	325°50.77	20.32	6°15.81	18.90	85°8.78	9.97
18	95°25.14		98°47.61	N07°10.36	340°52.44	N24°20.13	21°17.89	N22°18.94	100°10.96	S04°9.86
19	110°27.61		113°51.26	9.47	355°54.10	19.94	36°19.96	18.99	115°13.14	9.74
20	125°30.07		128°54.91	8.58	10°55.77	19.75	51°22.03	19.04	130°15.33	9.62
21	140°32.53		143°58.55	· · 7.69	25°57.43	· · 19.56	66°24.10	· · 19.08	145°17.51	· · 9.51
22	155°35.00		159°2.19	6.80	40°59.09	19.37	81°26.17	19.13	160°19.70	9.39
23	170°37.46		174°5.83	5.90	56°0.76	19.18	96°28.24	19.18	175°21.88	9.27
Mer.pass. 11:39		ν3.7' d-0.9' m-4.13		ν1.7' d-0.2' m0.34		ν2.1' d0.0' m-2.13		ν2.2' d-0.1' m1.15		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	185°39.93		189°9.47	N07°5.01	71°2.42	N24°18.99	111°30.31	N22°19.22	190°24.06	S04°9.15
1	200°42.39		204°13.10	4.12	86°4.08	18.80	126°32.38	19.27	205°26.25	9.04
2	215°44.85		219°16.73	3.23	101°5.74	18.61	141°34.45	19.32	220°28.43	8.92
3	230°47.32		234°20.36	· · 2.34	116°7.40	· · 18.42	156°36.52	· · 19.36	235°30.61	· · 8.80
4	245°49.78		249°23.99	1.44	131°9.06	18.23	171°38.59	19.41	250°32.80	8.69
5	260°52.25		264°27.62	07°0.55	146°10.72	18.04	186°40.66	19.46	265°34.98	8.57
6	275°54.71		279°31.24	N06°59.66	161°12.38	N24°17.85	201°42.73	N22°19.50	280°37.17	S04°8.45
7	290°57.17		294°34.86	58.76	176°14.03	17.66	216°44.80	19.55	295°39.35	8.33
8	305°59.64		309°38.47	57.87	191°15.69	17.47	231°46.87	19.59	310°41.53	8.22
9	321°2.10		324°42.09	· · 56.97	206°17.35	· · 17.28	246°48.94	· · 19.64	325°43.72	· · 8.10
10	336°4.57		339°45.70	56.08	221°19.00	17.09	261°51.01	19.69	340°45.90	7.98
11	351°7.03		354°49.31	55.18	236°20.65	16.90	276°53.08	19.73	355°48.09	7.87
12	6°9.49		9°52.91	N06°54.29	251°22.31	N24°16.71	291°55.14	N22°19.78	10°50.27	S04°7.75
13	21°11.96		24°56.52	53.39	266°23.96	16.52	306°57.21	19.83	25°52.45	7.63
14	36°14.42		40°0.12	52.50	281°25.61	16.33	321°59.28	19.87	40°54.64	7.51
15	51°16.89		55°3.72	· · 51.60	296°27.26	· · 16.13	337°1.35	· · 19.92	55°56.82	· · 7.40
16	66°19.35		70°7.31	50.70	311°28.91	15.94	352°3.41	19.97	70°59.01	7.28
17	81°21.81		85°10.90	49.81	326°30.56	15.75	7°5.48	20.01	86°1.19	7.16
18	96°24.28		100°14.49	N06°48.91	341°32.21	N24°15.56	22°7.54	N22°20.06	101°3.38	S04°7.05
19	111°26.74		115°18.08	48.01	356°33.86	15.37	37°9.61	20.11	116°5.56	6.93
20	126°29.21		130°21.67	47.12	11°35.51	15.17	52°11.68	20.15	131°7.74	6.81
21	141°31.67		145°25.25	· · 46.22	26°37.16	· · 14.98	67°13.74	· · 20.20	146°9.93	· · 6.70
22	156°34.13		160°28.83	45.32	41°38.80	14.79	82°15.81	20.25	161°12.11	6.58
23	171°36.60		175°32.40	44.43	56°40.45	14.59	97°17.87	20.29	176°14.30	6.46
Mer.pass. 11:35		ν3.6' d-0.9' m-4.05		ν1.7' d-0.2' m0.36		ν2.1' d0.0' m-2.13		ν2.2' d-0.1' m1.16		

Stars		
	SHA	Dec
Alpheratz	357°34.97	29°13.66
Ankaa	353°7.37	-42°10.22
Schedar	349°31.46	56°40.50
Diphda	348°47.44	-17°51.01
Achernar	335°20.56	-57°6.64
Hamal	327°51.32	23°34.86
Polaris	314°20.04	89°22.43
Acamar	315°11.94	-40°12.39
Menkar	314°6.21	4°11.23
Mirfak	308°28.37	49°57.14
Aldebaran	290°39.58	16°33.58
Rigel	281°3.80	-8°10.48
Capella	280°21.78	46°1.53
Bellatrix	278°22.78	6°22.29
Elnath	278°1.74	28°37.77
Alnilam	275°37.62	-1°11.25
Betelgeuse	270°51.94	7°24.65
Canopus	263°52.33	-52°42.79
Sirius	258°26.07	-16°45.21
Adhara	255°5.69	-29°0.59
Procyon	244°50.56	5°9.54
Pollux	243°16.97	27°57.95
Avior	234°14.41	-59°35.65
Suhail	222°45.93	-43°32.28
Miaplacidus	221°37.72	-69°49.44
Alphard	217°47.37	-8°46.22
Regulus	207°33.99	11°50.55
Dubhe	193°40.12	61°36.93
Deneb	182°24.45	14°25.74
Geniah	175°43.10	-17°41.06
Acrux	172°59.29	-63°14.40
Gacrux	171°50.93	-57°15.34
Alioth	166°12.22	55°49.24
Spica	158°21.82	-11°17.72
Alkaid	152°51.39	49°11.03
Hadar	148°35.24	-60°29.64
Menkent	147°57.09	-36°29.69
Arcturus	145°47.45	19°2.85
Rigel Kent.	139°39.56	-60°56.31
Kochab	137°18.79	74°2.81
Zuben'ubi	136°55.57	-16°8.90
Alphecca	126°3.35	26°37.51
Antares	112°15.46	-26°29.30
Atria	107°9.36	-69°4.15
Sabik	102°2.48	-15°45.45
Shaula	96°10.05	-37°7.26
Rasalhague	95°58.32	12°32.25
Eltanin	90°42.04	51°28.72
Kaus Aust.	83°32.28	-34°22.31
Vega	80°33.13	38°48.05
Nunki	75°47.59	-26°15.92
Altair	61°59.91	8°55.88
Peacock	53°5.71	-56°39.08
Deneb	49°25.96	45°21.89
Enif	33°38.88	9°59.25
Al Na'ir	27°33.05	-46°50.30
Fomalhaut	15°14.64	-29°29.38
Scheat	13°45.39	28°13.00
Markab	13°30.04	15°20.30
Mar 26 Wed	SHA	Mer.pass
Venus	2°30.66	11:32
Mars	246°0.17	19:19
Jupiter	286°9.00	16:38
Saturn	4°57.62	11:24
Mar 27 Thu	SHA	Mer.pass
Venus	3°0.73	11:26
Mars	245°41.54	19:16
Jupiter	285°59.76	16:35
Saturn	4°50.87	11:20
Mar 28 Fri	SHA	Mer.pass
Venus	3°29.54	11:21
Mars	245°22.49	19:14
Jupiter	285°50.39	16:32
Saturn	4°44.14	11:17
Horizontal parallax		
	Venus:	0.5
	Mars:	0.1


h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.33	N02°12.98	221°39.88	9.5'	S18°26.34	-13.4'	58.7'
1	193°34.52	13.96	236°8.38	9.5'	18°12.98	-13.5'	58.8'
2	208°34.71	14.95	250°36.91	9.6'	17°59.50	-13.6'	58.8'
3	223°34.89	· · 15.93	265°5.49	9.6'	17°45.90	-13.7'	58.8'
4	238°35.08	16.91	279°34.10	9.7'	17°32.19	-13.8'	58.9'
5	253°35.27	17.89	294°2.76	9.7'	17°18.36	-13.9'	58.9'
6	268°35.46	N02°18.87	308°31.45	9.7'	S17°4.42	-14.1'	58.9'
7	283°35.65	19.85	323°0.18	9.8'	16°50.36	-14.2'	59.0'
8	298°35.83	20.83	337°28.94	9.8'	16°36.19	-14.3'	59.0'
9	313°36.02	· · 21.81	351°57.74	9.8'	16°21.92	-14.4'	59.1'
10	328°36.21	22.79	6°26.58	9.9'	16°7.53	-14.5'	59.1'
11	343°36.40	23.77	20°55.45	9.9'	15°53.04	-14.6'	59.1'
12	358°36.59	N02°24.75	35°24.36	9.9'	S15°38.44	-14.7'	59.2'
13	13°36.78	25.73	49°53.31	10.0'	15°23.74	-14.8'	59.2'
14	28°36.96	26.71	64°22.28	10.0'	15°8.93	-14.9'	59.3'
15	43°37.15	· · 27.69	78°51.29	10.0'	14°54.02	-15.0'	59.3'
16	58°37.34	28.67	93°20.34	10.1'	14°39.01	-15.1'	59.3'
17	73°37.53	29.65	107°49.41	10.1'	14°23.90	-15.2'	59.4'
18	88°37.72	N02°30.63	122°18.52	10.1'	S14°8.69	-15.3'	59.4'
19	103°37.90	31.61	136°47.65	10.2'	13°53.39	-15.4'	59.4'
20	118°38.09	32.59	151°16.82	10.2'	13°37.99	-15.5'	59.5'
21	133°38.28	· · 33.57	165°46.02	10.2'	13°22.50	-15.6'	59.5'
22	148°38.47	34.55	180°15.24	10.3'	13°6.91	-15.7'	59.5'
23	163°38.66	35.53	194°44.50	10.3'	12°51.24	-15.8'	59.6'
SD = 16.0'		$d = 1.0'$	SD = 16.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.84	N02°36.51	209°13.78	10.3'	S12°35.47	-15.9'	59.6'
1	193°39.03	37.49	223°43.09	10.3'	12°19.62	-15.9'	59.7'
2	208°39.22	38.47	238°12.42	10.4'	12°3.68	-16.0'	59.7'
3	223°39.41	· · 39.45	252°41.78	10.4'	11°47.66	-16.1'	59.7'
4	238°39.60	40.43	267°11.16	10.4'	11°31.55	-16.2'	59.8'
5	253°39.79	41.41	281°40.56	10.4'	11°15.36	-16.3'	59.8'
6	268°39.97	N02°42.39	296°9.99	10.4'	S10°59.09	-16.3'	59.8'
7	283°40.16	43.36	310°39.44	10.5'	10°42.74	-16.4'	59.9'
8	298°40.35	44.34	325°8.91	10.5'	10°26.31	-16.5'	59.9'
9	313°40.54	· · 45.32	339°38.39	10.5'	10°9.81	-16.6'	59.9'
10	328°40.72	46.30	354°7.90	10.5'	09°53.24	-16.6'	60.0'
11	343°40.91	47.28	8°37.43	10.5'	09°36.59	-16.7'	60.0'
12	358°41.10	N02°48.26	23°6.97	10.6'	S09°19.87	-16.8'	60.0'
13	13°41.29	49.24	37°36.52	10.6'	09°3.08	-16.9'	60.1'
14	28°41.48	50.21	52°6.09	10.6'	08°46.22	-16.9'	60.1'
15	43°41.66	· · 51.19	66°35.68	10.6'	08°29.30	-17.0'	60.1'
16	58°41.85	52.17	81°5.28	10.6'	08°12.32	-17.0'	60.1'
17	73°42.04	53.15	95°34.89	10.6'	07°55.27	-17.1'	60.2'
18	88°42.23	N02°54.12	110°4.51	10.6'	S07°38.16	-17.2'	60.2'
19	103°42.42	55.10	124°34.14	10.6'	07°20.99	-17.2'	60.2'
20	118°42.60	56.08	139°3.77	10.6'	07°3.76	-17.3'	60.3'
21	133°42.79	· · 57.06	153°33.42	10.7'	06°46.48	-17.3'	60.3'
22	148°42.98	58.03	168°3.07	10.7'	06°29.15	-17.4'	60.3'
23	163°43.17	59.01	182°32.73	10.7'	06°11.76	-17.4'	60.4'
SD = 16.0'		$d = 1.0'$	SD = 16.3'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.36	N02°59.99	197°2.39	10.7'	S05°54.32	-17.5'	60.4'
1	193°43.54	0.97	211°32.05	10.7'	05°36.83	-17.5'	60.4'
2	208°43.73	1.94	226°1.72	10.7'	05°19.30	-17.6'	60.4'
3	223°43.92	· · 2.92	240°31.38	10.7'	05°1.72	-17.6'	60.5'
4	238°44.11	3.90	255°1.05	10.7'	04°44.10	-17.7'	60.5'
5	253°44.29	4.87	269°30.71	10.7'	04°26.43	-17.7'	60.5'
6	268°44.48	N03°5.85	284°0.38	10.7'	S04°8.73	-17.7'	60.5'
7	283°44.67	6.83	298°30.03	10.7'	03°50.99	-17.8'	60.6'
8	298°44.86	7.80	312°59.69	10.6'	03°33.21	-17.8'	60.6'
9	313°45.04	· · 8.78	327°29.33	10.6'	03°15.40	-17.8'	60.6'
10	328°45.23	9.75	341°58.97	10.6'	02°57.56	-17.9'	60.6'
11	343°45.42	10.73	356°28.60	10.6'	02°39.68	-17.9'	60.7'
12	358°45.61	N03°11.71	10°58.22	10.6'	S02°21.78	-17.9'	60.7'
13	13°45.79	12.68	25°27.83	10.6'	02°3.85	-18.0'	60.7'
14	28°45.98	13.66	39°57.43	10.6'	01°45.90	-18.0'	60.7'
15	43°46.17	· · 14.63	54°27.01	10.6'	01°27.92	-18.0'	60.7'
16	58°46.36	15.61	68°56.58	10.6'	01°9.92	-18.0'	60.8'
17	73°46.54	16.58	83°26.13	10.5'	00°51.91	-18.0'	60.8'
18	88°46.73	N03°17.56	97°55.67	10.5'	S00°33.87	-18.0'	60.8'
19	103°46.92	18.53	112°25.19	10.5'	S00°15.83	-18.1'	60.8'
20	118°47.11	19.51	126°54.69	10.5'	N00°2.23	18.1'	60.8'
21	133°47.29	· · 20.48	141°24.16	10.5'	00°20.31	18.1'	60.9'
22	148°47.48	21.46	155°53.62	10.4'	00°38.39	18.1'	60.9'
23	163°47.67	22.43	170°23.05	10.4'	00°56.47	18.1'	60.9'
SD = 16.0'		$d = 1.0'$	SD = 16.5'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	02:27	04:10	05:21	18:52	20:04	21:51
N 70°	02:56	04:22	05:26	18:47	19:51	21:20
68°	03:17	04:32	05:30	18:43	19:41	20:58
66°	03:33	04:40	05:33	18:40	19:33	20:41
64°	03:46	04:47	05:36	18:37	19:26	20:27
62°	03:57	04:53	05:38	18:34	19:20	20:16
60°	04:06	04:58	05:40	18:32	19:14	20:07
N 58°	04:14	05:02	05:42	18:30	19:10	19:59
56°	04:21	05:06	05:43	18:28	19:06	19:52
54°	04:26	05:09	05:45	18:27	19:03	19:46
52°	04:32	05:12	05:46	18:26	19:00	19:40
50°	04:36	05:15	05:47	18:24	18:57	19:36
48°	04:46	05:20	05:50	18:22	18:51	19:26
N 40°	04:53	05:25	05:52	18:19	18:46	19:19
38°	04:59	05:28	05:54	18:17	18:43	19:13
36°	05:03	05:31	05:55	18:16	18:40	19:08
34°	05:10	05:36	05:58	18:13	18:35	19:01
N 10°	05:15	05:39	06:00	18:11	18:32	18:56
0°	05:17	05:41	06:02	18:09	18:29	18:53
S 10°	05:18	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:04	18:26	18:52
30°	05:16	05:44	06:08	18:02	18:26	18:54
35°	05:14	05:44	06:09	18:01	18:26	18:56
40°	05:12	05:43	06:10	18:00	18:27	18:58
45°	05:08	05:42	06:11	17:58	18:27	19:02
S 50°	05:03	05:41	06:13	17:57	18:29	19:06
52°	05:01	05:40	06:14	17:56	18:29	19:08
54°	04:58	05:39	06:15	17:55	18:30	19:11
56°	04:55	05:38	06:15	17:54	18:31	19:14
58°	04:51	05:37	06:16	17:53	18:32	19:18
S 60°	04:47	05:36	06:17	17:52	18:33	19:22

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	08:01	06:43	05:58	11:32	14:40	17:15
N 70°	07:15	06:26	05:52	12:16	14:54	17:16
68°	06:45	06:12	05:47	12:45	15:06	17:17
66°	06:22	06:00	05:43	13:06	15:15	17:18
64°	06:04	05:51	05:40	13:23	15:22	17:19
62°	05:49	05:43	05:37	13:37	15:29	17:20
60°	05:36	05:35	05:34	13:48	15:35	17:20
N 58°	05:25	05:29	05:32	13:58	15:40	17:21
56°	05:15	05:23	05:30	14:07	15:44	17:21
54°	05:07	05:18	05:28	14:15	15:48	17:22
52°	04:59	05:14	05:26	14:22	15:52	17:22
50°	04:52	05:09	05:24	14:28	15:55	17:22
45°	04:37	05:00	05:21	14:41	16:02	17:23
N 40°	04:25	04:52	05:18	14:52	16:07	17:24
35°	04:14	04:46	05:16	15:01	16:12	17:24
30°	04:05	04:40	05:13	15:09	16:17	17:25
20°	03:48	04:30	05:09	15:23	16:24	17:25
N 10°	03:34	04:21	05:06	15:34	16:30	17:26
0°	03:21	04:12	05:03	15:46	16:36	17:26
S 10°	03:08	04:04	04:59	15:56	16:42	17:27
20°	02:53	03:55	04:56	16:08	16:48	17:28
30°	02:37	03:44	04:52	16:21	16:55	17:28
35°	02:27	03:38	04:50	16:29	16:59	17:28
40°	02:16	03:31	04:47	16:37	17:04	17:29
45°	02:03	03:23	04:44	16:47	17:09	17:29
S 50°	01:47	03:13	04:41	16:59	17:15	17:30
52°	01:39	03:09	04:39	17:04	17:18	17:30
54°	01:31	03:04	04:37	17:10	17:21	17:30
56°	01:21	02:58	04:35	17:17	17:24	17:30
58°	01:10	02:52	04:33	17:25	17:28	17:31
S 60°	00:58	02:45	04:30	17:33	17:32	17:31

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 26-28 16-3%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
26	05:43	05:34	12:06	09:33	21:59	
27	05:25	05:16	12:05	10:24	22:49	
28	05:07	04:58	12:05	11:15	23:40	

March 29, 30, 31 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	186°39.06		190°35.98	N06°43.53	71°42.09	N24°14.40	112°19.94	N22°20.34	191°16.48	S04°6.35
1	201°41.53		205°39.55	42.63	86°43.74	14.21	127°22.00	20.39	206°18.67	6.23
2	216°43.99		220°43.12	41.73	101°45.38	14.01	142°24.07	20.43	221°20.85	6.11
3	231°46.45		235°46.68	· · 40.83	116°47.02	· · 13.82	157°26.13	· · 20.48	236°23.04	· · 6.00
4	246°48.92		250°50.24	39.94	131°48.67	13.63	172°28.20	20.53	251°25.22	5.88
5	261°51.38		265°53.80	39.04	146°50.31	13.43	187°30.26	20.57	266°27.40	5.76
6	276°53.85		280°57.36	N06°38.14	161°51.95	N24°13.24	202°32.32	N22°20.62	281°29.59	S04°5.65
7	291°56.31		296°0.92	37.24	176°53.59	13.05	217°34.39	20.67	296°31.77	5.53
8	306°58.77		311°4.47	36.34	191°55.23	12.85	232°36.45	20.71	311°33.96	5.41
9	322°1.24		326°8.02	· · 35.45	206°56.87	· · 12.66	247°38.51	· · 20.76	326°36.14	· · 5.30
10	337°3.70		341°11.56	34.55	221°58.51	12.46	262°40.57	20.80	341°38.33	5.18
11	352°6.17		356°15.10	33.65	237°0.14	12.27	277°42.64	20.85	356°40.51	5.06
12	7°8.63		11°18.64	N06°32.75	252°1.78	N24°12.07	292°44.70	N22°20.90	11°42.70	S04°4.95
13	22°11.09		26°22.18	31.85	267°3.42	11.88	307°46.76	20.94	26°44.88	4.83
14	37°13.56		41°25.71	30.95	282°5.05	11.68	322°48.82	20.99	41°47.07	4.71
15	52°16.02		56°29.25	· · 30.06	297°6.69	· · 11.49	337°50.88	· · 21.04	56°49.25	· · 4.60
16	67°18.49		71°32.77	29.16	312°8.32	11.29	352°52.95	21.08	71°51.44	4.48
17	82°20.95		86°36.30	28.26	327°9.95	11.09	7°55.01	21.13	86°53.62	4.36
18	97°23.41		101°39.82	N06°27.36	342°11.58	N24°10.90	22°57.07	N22°21.18	101°55.81	S04°4.25
19	112°25.88		116°43.34	26.46	357°13.22	10.70	37°59.13	21.22	116°57.99	4.13
20	127°28.34		131°46.86	25.56	12°14.85	10.51	53°1.19	21.27	132°0.18	4.01
21	142°30.81		146°50.37	· · 24.67	27°16.48	· · 10.31	68°3.25	· · 21.32	147°2.36	· · 3.90
22	157°33.27		161°53.88	23.77	42°18.11	10.11	83°5.31	21.36	162°4.55	3.78
23	172°35.73		176°57.39	22.87	57°19.74	9.92	98°7.37	21.41	177°6.73	3.66
Mer.pass. 11:32		ν3.6' d-0.9' m-4.06		ν1.6' d-0.2' m0.38		ν2.1' d0.0' m-2.12		ν2.2' d-0.1' m1.16		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	187°38.20		192°0.89	N06°21.97	72°21.37	N24°9.72	113°9.43	N22°21.46	192°8.92	S04°3.55
1	202°40.66		207°4.40	21.07	87°22.99	9.52	128°11.49	21.50	207°11.10	3.43
2	217°43.13		222°7.89	20.17	102°24.62	9.32	143°13.54	21.55	222°13.29	3.32
3	232°45.59		237°11.39	· · 19.28	117°26.25	· · 9.13	158°15.60	· · 21.60	237°15.47	· · 3.20
4	247°48.05		252°14.88	18.38	132°27.87	8.93	173°17.66	21.64	252°17.66	3.08
5	262°50.52		267°18.37	17.48	147°29.50	8.73	188°19.72	21.69	267°19.84	2.97
6	277°52.98		282°21.86	N06°16.58	162°31.12	N24°8.53	203°21.78	N22°21.74	282°22.03	S04°2.85
7	292°55.45		297°25.34	15.69	177°32.75	8.34	218°23.84	21.78	297°24.21	2.73
8	307°57.91		312°28.82	14.79	192°34.37	8.14	233°25.89	21.83	312°26.40	2.62
9	323°0.38		327°32.30	· · 13.89	207°35.99	· · 7.94	248°27.95	· · 21.88	327°28.58	· · 2.50
10	338°2.84		342°35.77	13.00	222°37.61	7.74	263°30.01	21.92	342°30.77	2.39
11	353°5.30		357°39.24	12.10	237°39.23	7.54	278°32.06	21.97	357°32.96	2.27
12	8°7.77		12°42.71	N06°11.20	252°40.85	N24°7.34	293°34.12	N22°22.02	12°35.14	S04°2.15
13	23°10.23		27°46.18	10.31	267°42.47	7.14	308°36.18	22.06	27°37.33	2.04
14	38°12.70		42°49.64	9.41	282°44.09	6.94	323°38.23	22.11	42°39.51	1.92
15	53°15.16		57°53.10	· · 8.52	297°45.71	· · 6.75	338°40.29	· · 22.16	57°41.70	· · 1.80
16	68°17.62		72°56.55	7.62	312°47.33	6.55	353°42.34	22.20	72°43.88	1.69
17	83°20.09		88°0.00	6.72	327°48.94	6.35	8°44.40	22.25	87°46.07	1.57
18	98°22.55		103°3.45	N06°5.83	342°50.56	N24°6.15	23°46.46	N22°22.30	102°48.25	S04°1.46
19	113°25.02		118°6.90	4.93	357°52.18	5.95	38°48.51	22.34	117°50.44	1.34
20	128°27.48		133°10.34	4.04	12°53.79	5.75	53°50.57	22.39	132°52.63	1.22
21	143°29.94		148°13.78	· · 3.14	27°55.41	· · 5.55	68°52.62	· · 22.44	147°54.81	· · 1.11
22	158°32.41		163°17.22	2.25	42°57.02	5.35	83°54.67	22.48	162°57.00	0.99
23	173°34.87		178°20.65	1.36	57°58.63	5.14	98°56.73	22.53	177°59.18	0.88
Mer.pass. 11:28		ν3.5' d-0.9' m-4.12		ν1.6' d-0.2' m0.40		ν2.1' d0.0' m-2.12		ν2.2' d-0.1' m1.16		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	188°37.34		193°24.08	N06°0.46	73°0.24	N24°4.94	113°58.78	N22°22.58	193°1.37	S04°0.76
1	203°39.80		208°27.50	05°59.57	88°1.86	4.74	129°0.84	22.62	208°3.56	0.64
2	218°42.26		223°30.93	58.68	103°3.47	4.54	144°2.89	22.67	223°5.74	0.53
3	233°44.73		238°34.35	· · 57.78	118°5.08	· · 4.34	159°4.94	· · 22.72	238°7.93	· · 0.41
4	248°47.19		253°37.77	56.89	133°6.69	4.14	174°6.99	22.76	253°10.11	0.30
5	263°49.66		268°41.18	56.00	148°8.30	3.94	189°9.05	22.81	268°12.30	0.18
6	278°52.12		283°44.59	N05°55.11	163°9.90	N24°3.74	204°11.10	N22°22.86	283°14.49	S04°0.06
7	293°54.58		298°48.00	54.22	178°11.51	3.53	219°13.15	22.90	298°16.67	03°59.95
8	308°57.05		313°51.40	53.33	193°13.12	3.33	234°15.20	22.95	313°18.86	59.83
9	323°59.51		328°54.80	· · 52.43	208°14.72	· · 3.13	249°17.26	· · 23.00	328°21.04	· · 59.72
10	339°1.98		343°58.20	51.54	223°16.33	2.93	264°19.31	23.04	343°23.23	59.60
11	354°4.44		359°1.59	50.65	238°17.93	2.72	279°21.36	23.09	358°25.42	59.49
12	9°6.91		14°4.98	N05°49.76	253°19.54	N24°2.52	294°23.41	N22°23.14	13°27.60	S03°59.37
13	24°9.37		29°8.37	48.88	268°21.14	2.32	309°25.46	23.18	28°29.79	59.25
14	39°11.83		44°11.75	47.99	283°22.75	2.12	324°27.51	23.23	43°31.98	59.14
15	54°14.30		59°15.13	· · 47.10	298°24.35	· · 1.91	339°29.56	· · 23.28	58°34.16	· · 59.02
16	69°16.76		74°18.51	46.21	313°25.95	1.71	354°31.61	23.32	73°36.35	58.91
17	84°19.23		89°21.89	45.32	328°27.55	1.51	9°33.66	23.37	88°38.53	58.79
18	99°21.69		104°25.26	N05°44.44	343°29.15	N24°1.30	24°35.71	N22°23.42	103°40.72	S03°58.67
19	114°24.15		119°28.62	43.55	358°30.75	1.10	39°37.76	23.46	118°42.91	58.56
20	129°26.62		134°31.99	42.66	13°32.35	0.89	54°39.81	23.51	133°45.09	58.44
21	144°29.08		149°35.35	· · 41.78	28°33.95	· · 0.69	69°41.86	· · 23.56	148°47.28	· · 58.33
22	159°31.55		164°38.70	40.89	43°35.55	0.49	84°43.91	23.60	163°49.47	58.21
23	174°34.01		179°42.06	40.01	58°37.14	0.28	99°45.96	23.65	178°51.65	58.10
Mer.pass. 11:24		ν3.4' d-0.9' m-4.18		ν1.6' d-0.2' m0.42		ν2.1' d0.0' m-2.11		ν2.2' d-0.1' m1.16		

	SHA	Dec
Alpheratz	357°34.97	29°13.66
Ankaa	353°7.37	-42°10.20
Schedar	349°31.47	56°40.48
Diphda	348°47.44	-17°51.00
Achernar	335°20.57	-57°6.63
Hamal	327°51.33	23°34.85
Polaris	314°21.06	89°22.42
Acamar	315°11.96	-40°12.38
Menkar	314°6.22	4°11.23
Mirfak	308°28.39	49°57.13
Aldebaran	290°39.59	-16°33.58
Rigel	281°3.82	-8°10.47
Capella	280°21.80	46°1.53
Bellatrix	278°22.80	6°22.29
Elnath	278°1.76	28°37.77
Alnilam	275°37.64	-1°11.24
Betelgeuse	270°51.96	7°24.65
Canopus	263°52.36	-52°42.79
Sirius	258°26.09	-16°45.21
Adhara	255°5.71	-29°0.59
Procyon	244°50.58	5°9.54
Pollux	243°16.99	27°57.95
Avior	234°14.44	-59°35.66
Suhail	222°45.95	-43°32.29
Miaplacidus	221°37.76	-69°49.46
Alphard	217°47.38	-8°46.22
Regulus	207°34.00	11°50.55
Dubhe	193°40.14	61°36.94
Denebola	182°24.45	14°25.74
Gienah	175°43.10	-17°41.07
Acrux	172°59.29	-63°14.42
Gacrux	171°50.93	-57°15.36
Alioth	166°12.21	55°49.26
Spica	158°21.82	-11°17.72
Alkaid	152°51.38	49°11.04
Hadar	148°35.22	-60°29.66
Menkent	147°57.08	-36°29.70
Arcturus	145°47.44	19°2.85
Rigel Kent.	139°39.54	-60°56.32
Kochab	137°18.75	74°2.82
Zuben'ubi	136°55.56	-16°8.91
Alphecca	126°3.33	26°37.51
Antares	112°15.44	-26°29.30
Atria	107°9.32	-69°4.15
Sabik	102°2.46	-15°45.45
Shaula	96°10.03	-37°7.27
Rasalhague	95°58.30	12°32.25
Eltanin	90°42.01	51°28.72
Kaus Aust.	83°32.26	-34°22.31
Vega	80°33.10	38°48.05
Nunki	75°47.57	-26°15.92
Altair	61°59.89	8°55.88
Peacock	53°5.69	-56°39.08
Deneb	49°25.94	45°21.89
Enif	33°38.86	9°59.25
Al Na'ir	27°33.03	-46°50.29
Fomalhaut	15°14.64	-29°29.37
Scheat	13°45.38	28°13.00

h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		178°47.86	N03°23.41	184°52.46	10.4'	N01°14.57	18.1' 60.9'
1		193°48.04	24.38	199°21.84	10.4'	01°32.66	18.1' 60.9'
2		208°48.23	25.36	213°51.19	10.3'	01°50.76	18.1' 60.9'
3		223°48.42	· · 26.33	228°20.52	10.3'	02°8.86	18.1' 61.0'
4		238°48.60	27.31	242°49.81	10.3'	02°26.95	18.1' 61.0'
5		253°48.79	28.28	257°19.08	10.2'	02°45.04	18.1' 61.0'
6		268°48.98	N03°29.25	271°48.31	10.2'	N03°3.12	18.1' 61.0'
7		283°49.17	30.23	286°17.52	10.2'	03°21.19	18.1' 61.0'
8		298°49.35	31.20	300°46.68	10.1'	03°39.25	18.0' 61.0'
9		313°49.54	· · 32.17	315°15.81	10.1'	03°57.29	18.0' 61.0'
10		328°49.73	33.15	329°44.91	10.1'	04°15.32	18.0' 61.0'
11		343°49.91	34.12	344°13.96	10.0'	04°33.34	18.0' 61.1'
12		358°50.10	N03°35.09	358°42.98	10.0'	N04°51.33	18.0' 61.1'
13		13°50.29	36.07	13°11.95	9.9'	05°9.30	17.9' 61.1'
14		28°50.48	37.04	27°40.89	9.9'	05°27.25	17.9' 61.1'
15		43°50.66	· · 38.01	42°9.78	9.8'	05°45.17	17.9' 61.1'
16		58°50.85	38.99	56°38.63	9.8'	06°3.06	17.9' 61.1'
17		73°51.04	39.96	71°7.43	9.8'	06°20.92	17.8' 61.1'
18		88°51.22	N03°40.93	85°36.19	9.7'	N06°38.75	17.8' 61.1'
19		103°51.41	41.90	100°4.90	9.7'	06°56.55	17.8' 61.1'
20		118°51.60	42.87	114°33.55	9.6'	07°14.31	17.7' 61.1'
21		133°51.78	· · 43.85	129°2.16	9.6'	07°32.03	17.7' 61.1'
22		148°51.97	44.82	143°30.72	9.5'	07°49.71	17.6' 61.1'
23		163°52.16	45.79	157°59.23	9.5'	08°7.35	17.6' 61.1'
		SD = 16.0' $d = 1.0'$		SD = 16.6'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		178°52.34	N03°46.76	172°27.68	9.4'	N08°24.94	17.5' 61.1'
1		193°52.53	47.73	186°56.08	9.3'	08°42.48	17.5' 61.1'
2		208°52.72	48.71	201°24.43	9.3'	08°59.97	17.4' 61.1'
3		223°52.90	· · 49.68	215°52.72	9.2'	09°17.41	17.4' 61.1'
4		238°53.09	50.65	230°20.95	9.2'	09°34.80	17.3' 61.1'
5		253°53.28	51.62	244°49.12	9.1'	09°52.13	17.3' 61.1'
6		268°53.46	N03°52.59	259°17.23	9.1'	N10°9.41	17.2' 61.1'
7		283°53.65	53.56	273°45.28	9.0'	10°26.62	17.2' 61.1'
8		298°53.84	54.53	288°13.27	8.9'	10°43.77	17.1' 61.1'
9		313°54.02	· · 55.50	302°41.20	8.9'	11°0.86	17.0' 61.1'
10		328°54.21	56.47	317°9.06	8.8'	11°17.88	16.9' 61.1'
11		343°54.39	57.44	331°36.86	8.7'	11°34.83	16.9' 61.1'
12		358°54.58	N03°58.41	346°4.60	8.7'	N11°51.71	16.8' 61.1'
13		13°54.77	03°59.38	0°32.27	8.6'	12°8.51	16.7' 61.1'
14		28°54.95	04°0.35	14°59.87	8.5'	12°25.24	16.7' 61.1'
15		43°55.14	· · 1.32	29°27.40	8.5'	12°41.89	16.6' 61.1'
16		58°55.33	2.29	43°54.86	8.4'	12°58.46	16.5' 61.1'
17		73°55.51	3.26	58°22.26	8.3'	13°14.95	16.4' 61.1'
18		88°55.70	N04°4.23	72°49.58	8.3'	N13°31.36	16.3' 61.1'
19		103°55.88	5.20	87°16.84	8.2'	13°47.68	16.2' 61.1'
20		118°56.07	6.17	101°44.02	8.1'	14°3.91	16.1' 61.1'
21		133°56.26	· · 7.14	116°11.13	8.0'	14°20.05	16.0' 61.1'
22		148°56.44	8.11	130°38.17	8.0'	14°36.10	16.0' 61.1'
23		163°56.63	9.08	145°5.13	7.9'	14°52.05	15.9' 61.1'
		SD = 16.0' $d = 1.0'$		SD = 16.7'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		178°56.81	N04°10.05	159°32.02	7.8'	N15°7.91	15.8' 61.1'
1		193°57.00	11.01	173°58.83	7.7'	15°23.66	15.7' 61.0'
2		208°57.18	11.98	188°25.57	7.7'	15°39.32	15.6' 61.0'
3		223°57.37	· · 12.95	202°52.23	7.6'	15°54.87	15.4' 61.0'
4		238°57.56	13.92	217°18.81	7.5'	16°10.32	15.3' 61.0'
5		253°57.74	14.89	231°45.32	7.4'	16°25.66	15.2' 61.0'
6		268°57.93	N04°15.86	246°11.75	7.4'	N16°40.88	15.1' 61.0'
7		283°58.11	16.82	260°38.10	7.3'	16°56.00	15.0' 61.0'
8		298°58.30	17.79	275°4.38	7.2'	17°11.01	14.9' 61.0'
9		313°58.48	· · 18.76	289°30.57	7.1'	17°25.90	14.8' 60.9'
10		328°58.67	19.73	303°56.69	7.0'	17°40.67	14.7' 60.9'
11		343°58.86	20.69	318°22.73	7.0'	17°55.32	14.5' 60.9'
12		358°59.04	N04°21.66	332°48.69	6.9'	N18°9.85	14.4' 60.9'
13		13°59.23	22.63	347°14.57	6.8'	18°24.25	14.3' 60.9'
14		28°59.41	23.59	1°40.37	6.7'	18°38.53	14.2' 60.9'
15		43°59.60	· · 24.56	16°6.09	6.6'	18°52.69	14.0' 60.8'
16		58°59.78	25.53	30°31.73	6.6'	19°6.71	13.9' 60.8'
17		73°59.97	26.49	44°57.29	6.5'	19°20.60	13.8' 60.8'
18		89°0.15	N04°27.46	59°22.78	6.4'	N19°34.36	13.6' 60.8'
19		104°0.34	28.42	73°48.18	6.3'	19°47.98	13.5' 60.8'
20		119°0.52	29.39	88°13.50	6.2'	20°1.46	13.3' 60.7'
21		134°0.71	· · 30.36	102°38.75	6.2'	20°14.81	13.2' 60.7'
22		149°0.89	31.32	117°3.91	6.1'	20°28.02	13.1' 60.7'
23		164°1.08	32.29	131°29.00	6.0'	20°41.08	12.9' 60.7'
		SD = 16.0' $d = 1.0'$		SD = 16.7'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	01:58	03:52	05:05	19:06	20:20	22:19
N 70°	02:35	04:07	05:12	19:00	20:05	21:40
68°	03:00	04:18	05:17	18:54	19:53	21:13
66°	03:18	04:28	05:21	18:50	19:43	20:54
64°	03:33	04:36	05:25	18:46	19:35	20:38
62°	03:45	04:43	05:28	18:42	19:28	20:26
60°	03:56	04:48	05:31	18:39	19:22	20:15
N 58°	04:04	04:53	05:33	18:37	19:17	20:06
56°	04:12	04:58	05:35	18:35	19:13	19:59
54°	04:18	05:02	05:37	18:33	19:09	19:52
52°	04:24	05:05	05:39	18:31	19:05	19:46
50°	04:29	05:08	05:41	18:29	19:02	19:41
45°	04:40	05:15	05:44	18:25	18:55	19:30
N 40°	04:48	05:20	05:47	18:22	18:50	19:22
35°	04:54	05:24	05:49	18:20	18:45	19:15
30°	05:00	05:28	05:52	18:18	18:42	19:10
20°	05:07	05:33	05:55	18:14	18:36	19:02
N 10°	05:13	05:37	05:58	18:11	18:32	18:56
0°	05:16	05:40	06:01	18:08	18:28	18:52
S 10°	05:18	05:43	06:04	18:05	18:26	18:50
20°	05:19	05:45	06:07	18:02	18:24	18:49
30°	05:18	05:46	06:10	17:59	18:23	18:50
35°	05:17	05:46	06:11	17:57	18:22	18:51
40°	05:15	05:46	06:13	17:55	18:22	18:53
45°	05:12	05:46	06:15	17:53	18:22	18:56
S 50°	05:08	05:46	06:18	17:50	18:22	19:00
52°	05:06	05:45	06:19	17:49	18:22	19:01
54°	05:04	05:45	06:20	17:48	18:23	19:04
56°	05:01	05:44	06:22	17:46	18:23	19:06
58°	04:58	05:44	06:23	17:44	18:23	19:09
S 60°	04:55	05:43	06:25	17:43	18:24	19:12

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	05:18	04:35	03:26	19:50	22:54	
N 70°	05:22	04:49	04:03	19:39	22:19	
68°	05:25	05:01	04:29	19:31	21:55	· · ·
66°	05:27	05:10	04:50	19:23	21:36	· · ·
64°	05:29	05:19	05:06	19:17	21:22	23:38
62°	05:31	05:26	05:20	19:12	21:09	23:14
60°	05:33	05:32	05:32	19:07	20:59	22:55
N 58°	05:34	05:38	05:42	19:04	20:50	22:40
56°	05:36	05:42	05:51	19:00	20:42	22:26
54°	05:37	05:47	05:59	18:57	20:35	22:15
52°	05:38	05:51	06:06	18:54	20:28	22:05
50°	05:39	05:55	06:13	18:51	20:23	21:56
45°	05:41	06:03	06:27	18:46	20:11	21:37
N 40°	05:43	06:09	06:39	18:41	20:01	21:22
35°	05:45	06:15	06:49	18:37	19:52	21:09
30°	05:46	06:20	06:58	18:34	19:45	20:58
20°	05:49	06:29	07:13	18:28	19:32	20:39
N 10°	05:51	06:38	07:27	18:22	19:21	20:22
0°	05:53	06:45	07:40	18:17	19:11	20:07
S 10°	05:55	06:53	07:53	18:13	19:00	19:51
20°	05:58	07:01	08:07	18:07	18:49	19:35
30°	06:01	07:11	08:23	18:01	18:37	19:16
35°	06:02	07:16	08:32	17:58	18:30	19:06
40°	06:04	07:23	08:43	17:54	18:22	18:53
45°	06:06	07:30	08:56	17:50	18:12	18:39
S 50°	06:09	07:39	09:12	17:44	18:01	18:21
52°	06:10	07:43	09:19	17:42	17:56	18:13
54°	06:11	07:48	09:28	17:39	17:50	18:04
56°	06:13	07:53	09:37	17:36	17:44	17:54
58°	06:15	07:59	09:48	17:33	17:37	17:42
S 60°	06:16	08:06	10:00	17:30	17:29	17:29

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-4%
29	04:49	04:40	12:05	12:05	—:—	
30	04:31	04:22	12:04	12:58	00:31	
31	04:13	04:04	12:04	13:53	01:25	

April 01, 02, 03 UT (Tue., Wed., Thu.)

h	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	189°36.47	194°45.41	N05°39.12	73°38.74	N24°0.08	114°48.00	N22°23.70	193°53.84	S03°57.98	Alpheratz	357°34.96	29°13.65						
1	204°38.94	209°48.75	38.24	88°40.34	23°59.87	129°50.05	23.74	208°56.03	57.87	Ankaa	353°7.36	-42°10.19						
2	219°41.40	224°52.10	37.36	103°41.93	59.67	144°52.10	23.79	223°58.21	57.75	Schedar	349°31.45	56°40.47						
3	234°43.87	239°55.44	•• 36.47	118°43.53	•• 59.46	159°54.15	•• 23.84	239°0.40	•• 57.63	Diphda	348°47.44	-17°51.00						
4	249°46.33	254°58.78	35.59	133°45.12	59.26	174°56.20	23.88	254°2.59	57.52	Achernar	335°20.58	-57°6.61						
5	264°48.80	270°2.11	34.71	148°46.71	59.05	189°58.24	23.93	269°4.77	57.40	Hamal	327°51.33	23°34.84						
6	279°51.26	285°5.44	N05°33.83	163°48.31	N23°58.84	205°0.29	N22°23.98	284°6.96	S03°57.29	Polaris	314°21.63	89°22.40						
7	294°53.72	300°8.76	32.95	178°49.90	58.64	220°2.34	24.03	299°9.15	57.17	Acamar	315°11.97	-40°12.37						
8	309°56.19	315°12.09	32.07	193°51.49	58.43	235°4.38	24.07	314°11.34	57.06	Menkar	314°6.23	4°11.23						
9	324°58.65	330°15.41	•• 31.19	208°53.08	•• 58.23	250°6.43	•• 24.12	329°13.52	•• 56.94	Mirfak	308°28.40	49°57.12						
10	340°1.12	345°18.72	30.31	223°54.67	58.02	265°8.48	24.17	344°15.71	56.83	Aldebaran	290°39.60	16°33.58						
11	355°3.58	0°22.03	29.43	238°56.26	57.81	280°10.52	24.21	359°17.90	56.71	Rigel	281°3.83	-8°10.48						
12	10°6.04	15°25.34	N05°28.55	253°57.85	N23°57.61	295°12.57	N22°24.26	14°20.08	S03°56.60	Capella	280°21.82	46°1.52						
13	25°8.51	30°28.65	27.67	268°59.44	57.40	310°14.61	24.31	29°22.27	56.48	Bellatrix	278°22.81	6°22.29						
14	40°10.97	45°31.95	26.80	284°1.02	57.19	325°16.66	24.35	44°24.46	56.37	Elnath	278°1.78	28°37.76						
15	55°13.44	60°35.25	•• 25.92	299°2.61	•• 56.99	340°18.70	•• 24.40	59°26.65	•• 56.25	Alnilam	275°37.65	-1°11.25						
16	70°15.90	75°38.54	25.04	314°4.20	56.78	355°20.75	24.45	74°28.83	56.13	Betelgeuse	270°51.97	7°24.65						
17	85°18.36	90°41.84	24.17	329°5.78	56.57	10°22.79	24.49	89°31.02	56.02	Canopus	263°52.39	-52°42.79						
18	100°20.83	105°45.12	N05°23.29	344°7.37	N23°56.36	25°24.84	N22°24.54	104°33.21	S03°55.90	Sirius	258°26.10	-16°45.21						
19	115°23.29	120°48.41	22.42	359°8.95	56.16	40°26.88	24.59	119°35.39	55.79	Adhara	255°5.72	-29°0.59						
20	130°25.76	135°51.69	21.55	14°10.54	55.95	55°28.92	24.63	134°37.58	55.67	Procyon	244°50.59	5°9.54						
21	145°28.22	150°54.97	•• 20.67	29°12.12	•• 55.74	70°30.97	•• 24.68	149°39.77	•• 55.56	Pollux	243°17.01	27°57.95						
22	160°30.69	165°58.24	19.80	44°13.70	55.53	85°33.01	24.73	164°41.96	55.44	Avior	234°14.46	-59°35.67						
23	175°33.15	181°1.51	18.93	59°15.28	55.32	100°35.05	24.77	179°44.14	55.33	Suhail	222°45.97	-43°32.30						
Mer.pass. 11:20			ν3.3' d-0.9' m-4.24			ν1.6' d-0.2' m0.44			ν2.0' d0.0' m-2.11			ν2.2' d-0.1' m1.16						
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec					
0	190°35.61	196°4.78	N05°18.06	74°16.86	N23°55.12	115°37.10	N22°24.82	194°46.33	S03°55.21	Regulus	207°34.01	11°50.55						
1	205°38.08	211°8.04	17.19	89°18.45	54.91	130°39.14	24.87	209°48.52	55.10	Dubhe	193°40.15	61°36.95						
2	220°40.54	226°11.30	16.32	104°20.03	54.70	145°41.18	24.91	224°50.71	54.98	Denebola	182°24.45	14°25.75						
3	235°43.01	241°14.56	•• 15.45	119°21.60	•• 54.49	160°43.23	•• 24.96	239°52.89	•• 54.87	Gienah	175°43.09	-17°41.07						
4	250°45.47	256°17.81	14.58	134°23.18	54.28	175°45.27	25.01	254°55.08	54.75	Acrux	172°59.28	-63°14.43						
5	265°47.93	271°21.06	13.72	149°24.76	54.07	190°47.31	25.05	269°57.27	54.64	Gacrux	171°50.92	-57°15.37						
6	280°50.40	286°24.30	N05°12.85	164°26.34	N23°53.86	205°49.35	N22°25.10	284°59.46	S03°54.52	Alioth	166°12.21	55°49.27						
7	295°52.86	301°27.54	11.98	179°27.92	53.65	220°51.39	25.15	300°1.65	54.41	Spica	158°21.81	-11°17.72						
8	310°55.33	316°30.78	11.12	194°29.49	53.44	235°53.43	25.19	315°3.83	54.29	Alkaid	152°51.37	49°11.05						
9	325°57.79	331°34.02	•• 10.25	209°31.07	•• 53.23	250°55.47	•• 25.24	330°6.02	•• 54.18	Hadar	148°35.20	-60°29.67						
10	341°0.26	346°37.25	9.39	224°32.64	53.02	265°57.52	25.29	345°8.21	54.06	Menkent	147°57.06	-36°29.71						
11	356°2.72	1°40.47	8.53	239°34.22	52.81	280°59.56	25.33	0°10.40	53.95	Arcturus	145°47.43	19°2.86						
12	11°5.18	16°43.70	N05°7.66	254°35.79	N23°52.60	296°1.60	N22°25.38	15°12.59	S03°53.83	Rigel Kent.	139°39.51	-60°56.34						
13	26°7.65	31°46.92	6.80	269°37.36	52.39	311°3.64	25.43	30°14.77	53.72	Kochab	137°18.73	74°2.84						
14	41°10.11	46°50.13	5.94	284°38.94	52.18	326°5.68	25.47	45°16.96	53.60	Zuben'ubi	136°55.54	-16°8.91						
15	56°12.58	61°53.35	•• 5.08	299°40.51	•• 51.97	341°7.72	•• 25.52	60°19.15	•• 53.49	Alphecca	126°3.32	26°37.52						
16	71°15.04	76°56.55	4.22	314°42.08	51.76	356°9.76	25.57	75°21.34	53.37	Antares	112°15.42	-26°29.30						
17	86°17.50	91°59.76	3.36	329°43.65	51.55	11°11.79	25.61	90°23.53	53.26	Atria	107°9.26	-69°4.16						
18	101°19.97	107°2.96	N05°2.51	344°45.22	N23°51.33	26°13.83	N22°25.66	105°25.71	S03°53.14	Sabik	102°2.44	-15°45.45						
19	116°22.43	122°6.16	1.65	359°46.79	51.12	41°15.87	25.71	120°27.90	53.03	Shaula	96°10.00	-37°7.26						
20	131°24.90	137°9.35	05°0.79	14°48.36	50.91	56°17.91	25.76	135°30.09	52.91	Rasalhague	95°58.28	12°32.26						
21	146°27.36	152°12.54	04°59.94	29°49.93	•• 50.70	71°19.95	•• 25.80	150°32.28	•• 52.80	Eltanin	90°41.98	51°28.73						
22	161°29.83	167°15.73	59.08	44°51.49	50.49	86°21.99	25.85	165°34.47	52.68	Kaus Aust.	83°32.23	-34°22.30						
23	176°32.29	182°18.91	58.23	59°53.06	50.27	101°24.03	25.90	180°36.66	52.57	Vega	80°33.08	38°48.05						
Mer.pass. 11:16			ν3.3' d-0.9' m-4.30			ν1.6' d-0.2' m0.46			ν2.0' d0.0' m-2.10			ν2.2' d-0.1' m1.16						
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec					
0	191°34.75	197°22.09	N04°57.38	74°54.63	N23°50.06	116°26.06	N22°25.94	195°38.84	S03°52.46	Peacock	53°5.65	-56°39.07						
1	206°37.22	212°25.27	56.53	89°56.19	49.85	131°28.10	25.99	210°41.03	52.34	Deneb	49°25.91	45°21.88						
2	221°39.68	227°28.44	55.67	104°57.76	49.64	146°30.14	26.04	225°43.22	52.23	Enif	33°38.85	9°59.25						
3	236°42.15	242°31.61	•• 54.82	119°59.32	•• 49.42	161°32.17	•• 26.08	240°45.41	•• 52.11	Al Na'ir	27°33.01	-46°50.27						
4	251°44.61	257°34.78	53.98	135°0.89	49.21	176°34.21	26.13	255°47.60	52.00	Fomalhaut	15°14.62	-29°29.35						
5	266°47.08	272°37.94	53.13	150°2.45	49.00	191°36.25	26.18	270°49.79	51.88	Scheat	13°4							

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		179°1.26	N04°33.25	145°54.01	5.9'	N20°54.00	12.8' 60.7'
1		194°1.45	34.22	160°18.94	5.9'	21°6.77	12.6' 60.6'
2		209°1.63	35.18	174°43.80	5.8'	21°19.39	12.5' 60.6'
3		224°1.82	· · 36.15	189°8.57	5.7'	21°31.86	12.3' 60.6'
4		239°2.00	37.11	203°33.27	5.6'	21°44.18	12.2' 60.6'
5		254°2.19	38.08	217°57.90	5.5'	21°56.35	12.0' 60.6'
6		269°2.37	N04°39.04	232°22.45	5.5'	N22°8.37	11.9' 60.5'
7		284°2.56	40.01	246°46.92	5.4'	22°20.22	11.7' 60.5'
8		299°2.74	40.97	261°11.32	5.3'	22°31.92	11.5' 60.5'
9		314°2.92	· · 41.93	275°35.65	5.3'	22°43.46	11.4' 60.5'
10		329°3.11	42.90	289°59.91	5.2'	22°54.84	11.2' 60.4'
11		344°3.29	43.86	304°24.09	5.1'	23°6.05	11.0' 60.4'
12		359°3.48	N04°44.83	318°48.21	5.0'	N23°17.10	10.9' 60.4'
13		14°3.66	45.79	333°12.25	5.0'	23°27.99	10.7' 60.4'
14		29°3.85	46.75	347°36.23	4.9'	23°38.70	10.5' 60.3'
15		44°4.03	· · 47.72	2°0.14	4.8'	23°49.25	10.4' 60.3'
16		59°4.22	48.68	16°23.98	4.8'	23°59.63	10.2' 60.3'
17		74°4.40	49.64	30°47.76	4.7'	24°9.83	10.0' 60.2'
18		89°4.58	N04°50.60	45°11.47	4.7'	N24°19.87	9.9' 60.2'
19		104°4.77	51.57	59°35.12	4.6'	24°29.72	9.7' 60.2'
20		119°4.95	52.53	73°58.71	4.5'	24°39.41	9.5' 60.2'
21		134°5.14	· · 53.49	88°22.24	4.5'	24°48.91	9.3' 60.1'
22		149°5.32	54.45	102°45.71	4.4'	24°58.24	9.1' 60.1'
23		164°5.50	55.41	117°9.13	4.4'	25°7.39	9.0' 60.1'
		SD = 16.0' $d = 1.0'$		SD = 16.5'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		179°5.69	N04°56.38	131°32.49	4.3'	N25°16.36	8.8' 60.0'
1		194°5.87	57.34	145°55.79	4.3'	25°25.14	8.6' 60.0'
2		209°6.05	58.30	160°19.05	4.2'	25°33.75	8.4' 60.0'
3		224°6.24	04°59.26	174°42.25	4.2'	25°42.17	8.2' 60.0'
4		239°6.42	05°0.22	189°5.40	4.1'	25°50.40	8.1' 59.9'
5		254°6.61	1.18	203°28.51	4.1'	25°58.45	7.9' 59.9'
6		269°6.79	N05°2.14	217°51.57	4.0'	N26°6.32	7.7' 59.9'
7		284°6.97	3.10	232°14.59	4.0'	26°13.99	7.5' 59.8'
8		299°7.16	4.06	246°37.57	3.9'	26°21.48	7.3' 59.8'
9		314°7.34	· · 5.02	261°0.50	3.9'	26°28.78	7.1' 59.8'
10		329°7.52	5.98	275°23.40	3.9'	26°35.89	6.9' 59.7'
11		344°7.71	6.94	289°46.27	3.8'	26°42.81	6.7' 59.7'
12		359°7.89	N05°7.90	304°9.10	3.8'	N26°49.54	6.5' 59.7'
13		14°8.07	8.86	318°31.90	3.8'	26°56.07	6.3' 59.6'
14		29°8.26	9.82	332°54.67	3.7'	27°2.42	6.1' 59.6'
15		44°8.44	· · 10.78	347°17.41	3.7'	27°8.56	6.0' 59.6'
16		59°8.62	11.74	1°40.13	3.7'	27°14.52	5.8' 59.5'
17		74°8.80	12.70	16°2.82	3.7'	27°20.28	5.6' 59.5'
18		89°8.99	N05°13.66	30°25.50	3.7'	N27°25.85	5.4' 59.5'
19		104°9.17	14.62	44°48.16	3.6'	27°31.22	5.2' 59.4'
20		119°9.35	15.58	59°10.80	3.6'	27°36.40	5.0' 59.4'
21		134°9.54	· · 16.54	73°33.42	3.6'	27°41.38	4.8' 59.4'
22		149°9.72	17.49	87°56.04	3.6'	27°46.17	4.6' 59.3'
23		164°9.90	18.45	102°18.65	3.6'	27°50.76	4.4' 59.3'
		SD = 16.0' $d = 1.0'$		SD = 16.4'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		179°10.08	N05°19.41	116°41.25	3.6'	N27°55.15	4.2' 59.3'
1		194°10.27	20.37	131°3.84	3.6'	27°59.35	4.0' 59.2'
2		209°10.45	21.32	145°26.44	3.6'	28°3.35	3.8' 59.2'
3		224°10.63	· · 22.28	159°49.03	3.6'	28°7.15	3.6' 59.2'
4		239°10.81	23.24	174°11.63	3.6'	28°10.76	3.4' 59.1'
5		254°11.00	24.20	188°34.23	3.6'	28°14.16	3.2' 59.1'
6		269°11.18	N05°25.15	202°56.85	3.6'	N28°17.38	3.0' 59.1'
7		284°11.36	26.11	217°19.47	3.6'	28°20.39	2.8' 59.0'
8		299°11.54	27.07	231°42.11	3.7'	28°23.21	2.6' 59.0'
9		314°11.72	· · 28.02	246°4.76	3.7'	28°25.84	2.4' 58.9'
10		329°11.91	28.98	260°27.43	3.7'	28°28.26	2.2' 58.9'
11		344°12.09	29.93	274°50.12	3.7'	28°30.49	2.0' 58.9'
12		359°12.27	N05°30.89	289°12.83	3.7'	N28°32.53	1.8' 58.8'
13		14°12.45	31.85	303°35.57	3.8'	28°34.37	1.6' 58.8'
14		29°12.63	32.80	317°58.34	3.8'	28°36.01	1.5' 58.8'
15		44°12.81	· · 33.76	332°21.13	3.8'	28°37.46	1.3' 58.7'
16		59°13.00	34.71	346°43.96	3.9'	28°38.72	1.1' 58.7'
17		74°13.18	35.67	1°6.83	3.9'	28°39.78	0.9' 58.7'
18		89°13.36	N05°36.62	15°29.73	3.9'	N28°40.65	0.7' 58.6'
19		104°13.54	37.58	29°52.67	4.0'	28°41.33	0.5' 58.6'
20		119°13.72	38.53	44°15.66	4.0'	28°41.82	0.3' 58.6'
21		134°13.90	· · 39.49	58°38.69	4.1'	28°42.11	0.1' 58.5'
22		149°14.08	40.44	73°1.76	4.1'	28°42.22	-0.1' 58.5'
23		164°14.27	41.39	87°24.89	4.2'	28°42.13	-0.3' 58.5'
		SD = 16.0' $d = 1.0'$		SD = 16.2'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	01:22	03:34	04:50	19:20	20:38	23:00
N 70°	02:11	03:51	04:58	19:12	20:20	22:03
68°	02:41	04:04	05:04	19:05	20:06	21:31
66°	03:03	04:15	05:10	18:59	19:54	21:08
64°	03:20	04:24	05:14	18:55	19:45	20:50
62°	03:34	04:32	05:18	18:50	19:37	20:36
60°	03:45	04:39	05:22	18:47	19:30	20:24
N 58°	03:55	04:44	05:25	18:44	19:24	20:14
56°	04:03	04:49	05:28	18:41	19:19	20:06
54°	04:10	04:54	05:30	18:38	19:14	19:59
52°	04:16	04:58	05:32	18:36	19:10	19:52
50°	04:22	05:01	05:34	18:34	19:07	19:46
45°	04:34	05:09	05:39	18:29	18:59	19:34
N 40°	04:43	05:15	05:42	18:25	18:53	19:25
35°	04:50	05:20	05:45	18:22	18:48	19:18
30°	04:56	05:24	05:48	18:19	18:43	19:12
20°	05:05	05:31	05:53	18:15	18:37	19:03
N 10°	05:11	05:36	05:57	18:10	18:32	18:56
0°	05:15	05:39	06:00	18:07	18:27	18:52
S 10°	05:18	05:43	06:04	18:03	18:24	18:49
20°	05:20	05:45	06:07	17:59	18:21	18:47
30°	05:20	05:47	06:11	17:55	18:19	18:47
35°	05:19	05:48	06:14	17:53	18:18	18:47
40°	05:18	05:49	06:16	17:50	18:17	18:48
45°	05:16	05:50	06:19	17:47	18:16	18:50
S 50°	05:13	05:50	06:22	17:44	18:16	18:53
52°	05:11	05:50	06:24	17:42	18:16	18:55
54°	05:09	05:50	06:26	17:40	18:15	18:56
56°	05:07	05:50	06:28	17:38	18:15	18:58
58°	05:05	05:50	06:30	17:36	18:15	19:01
S 60°	05:02	05:50	06:32	17:34	18:15	19:03

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	03:19	<input type="checkbox"/>	<input type="checkbox"/>	01:05	<input type="checkbox"/>	<input type="checkbox"/>
66°	04:15	<input type="checkbox"/>	<input type="checkbox"/>	00:10	<input type="checkbox"/>	<input type="checkbox"/>
64°	04:49	04:02	<input type="checkbox"/>	· · ·	02:30	<input type="checkbox"/>
62°	05:13	05:04	<input type="checkbox"/>	· · ·	01:29	<input type="checkbox"/>
60°	05:33	05:39	05:57	· · ·	00:55	02:47
N 58°	05:50	06:04	06:34	· · ·	00:30	02:11
56°	06:04	06:24	07:00	· · ·	00:10	01:44
54°	06:16	06:41	07:21	23:54	· · ·	01:23
52°	06:27	06:56	07:39	23:40	· · ·	01:06
50°	06:36	07:09	07:54	23:28	· · ·	00:51
45°	06:57	07:35	08:24	23:02	· · ·	00:21
N 40°	07:14	07:56	08:48	22:42	23:58	· · ·
35°	07:28	08:14	09:08	22:25	23:38	· · ·
30°	07:40	08:29	09:25	22:11	23:22	· · ·
20°	08:01	08:55	09:53	21:47	22:54	23:58
N 10°	08:20	09:17	10:18	21:26	22:30	23:33
0°	08:37	09:38	10:41	21:06	22:08	23:10
S 10°	08:55	09:59	11:03	20:47	21:46	22:47
20°	09:14	10:22	11:28	20:26	21:22	22:22
30°	09:36	10:49	11:57	20:02	20:54	21:53
35°	09:49	11:05	12:14	19:48	20:38	21:36
40°	10:04	11:23	12:34	19:32	20:19	21:16
45°	10:22	11:45	12:59	19:12	19:56	20:51
S 50°	10:45	12:14	13:30	18:49	19:27	20:20
52°	10:56	12:28	13:46	18:37	19:12	20:04
54°	11:08	12:44	14:05	18:24	18:56	19:45
56°	11:22	13:03	14:27	18:09	18:36	19:22
58°	11:39	13:28	14:56	17:52	18:12	18:53
S 60°	12:00	14:00	15:41	17:31	17:39	18:09

Day	Sun		Mer. Pass hh:mm	Moon		Age 3-5 10-28%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
01	03:55	03:46	12:04	14:52	02:22	
02	03:37	03:28	12:03	15:53	03:22	
03	03:20	03:11	12:03	16:55	04:24	

April 04, 05, 06 UT (Fri., Sat., Sun.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	192°33.89		198°37.29	N04°37.17	75°32.04	N23°44.91	117°14.90	N22°27.06	196°31.38	S03°49.71
1	207°36.36		213°40.37	36.34	90°33.59	44.70	132°16.94	27.11	211°33.57	49.60
2	222°38.82		228°43.45	35.52	105°35.14	44.48	147°18.97	27.16	226°35.76	49.48
3	237°41.29		243°46.53	· · 34.69	120°36.70	· · 44.26	162°21.00	· · 27.21	241°37.95	· · 49.37
4	252°43.75		258°49.61	33.86	135°38.24	44.05	177°23.03	27.25	256°40.13	49.25
5	267°46.22		273°52.68	33.03	150°39.79	43.83	192°25.06	27.30	271°42.32	49.14
6	282°48.68		288°55.74	N04°32.21	165°41.34	N23°43.61	207°27.09	N22°27.35	286°44.51	S03°49.03
7	297°51.14		303°58.81	31.39	180°42.89	43.40	222°29.13	27.39	301°46.70	48.91
8	312°53.61		319°1.87	30.56	195°44.44	43.18	237°31.16	27.44	316°48.89	48.80
9	327°56.07		334°4.92	· · 29.74	210°45.98	· · 42.96	252°33.19	· · 27.49	331°51.08	· · 48.68
10	342°58.54		349°7.97	28.92	225°47.53	42.74	267°35.22	27.53	346°53.27	48.57
11	358°1.00		4°11.02	28.10	240°49.08	42.52	282°37.25	27.58	1°55.46	48.46
12	13°3.47		19°14.06	N04°27.28	255°50.62	N23°42.31	297°39.28	N22°27.63	16°57.65	S03°48.34
13	28°5.93		34°17.10	26.46	270°52.17	42.09	312°41.31	27.67	31°59.84	48.23
14	43°8.39		49°20.14	25.65	285°53.71	41.87	327°43.34	27.72	47°2.03	48.11
15	58°10.86		64°23.17	· · 24.83	300°55.25	· · 41.65	342°45.37	· · 27.77	62°4.22	· · 48.00
16	73°13.32		79°26.20	24.02	315°56.80	41.43	357°47.40	27.81	77°6.41	47.89
17	88°15.79		94°29.23	23.20	330°58.34	41.21	12°49.42	27.86	92°8.60	47.77
18	103°18.25		109°32.25	N04°22.39	345°59.88	N23°40.99	27°51.45	N22°27.91	107°10.79	S03°47.66
19	118°20.71		124°35.26	21.58	1°1.42	40.77	42°53.48	27.95	122°12.98	47.54
20	133°23.18		139°38.28	20.77	16°2.96	40.55	57°55.51	28.00	137°15.17	47.43
21	148°25.64		154°41.29	· · 19.96	31°4.50	· · 40.33	72°57.54	· · 28.05	152°17.36	· · 47.32
22	163°28.11		169°44.29	19.15	46°6.04	40.11	87°59.57	28.09	167°19.55	47.20
23	178°30.57		184°47.29	18.34	61°7.58	39.89	103°1.59	28.14	182°21.74	47.09
Mer.pass. 11:08		ν3.1' d-0.8' m-4.40		ν1.6' d-0.2' m0.50		ν2.0' d0.0' m-2.09		ν2.2' d-0.1' m1.16		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	193°33.04		199°50.29	N04°17.54	76°9.12	N23°39.67	118°3.62	N22°28.19	197°23.93	S03°46.98
1	208°35.50		214°53.28	16.73	91°10.66	39.45	133°5.65	28.23	212°26.12	46.86
2	223°37.96		229°56.27	15.93	106°12.19	39.23	148°7.68	28.28	227°28.31	46.75
3	238°40.43		244°59.26	· · 15.13	121°13.73	· · 39.01	163°9.70	· · 28.33	242°30.50	· · 46.64
4	253°42.89		260°2.24	14.33	136°15.26	38.79	178°11.73	28.37	257°32.69	46.52
5	268°45.36		275°5.22	13.53	151°16.80	38.57	193°13.76	28.42	272°34.89	46.41
6	283°47.82		290°8.20	N04°12.73	166°18.33	N23°38.35	208°15.78	N22°28.47	287°37.08	S03°46.29
7	298°50.28		305°11.17	11.93	181°19.87	38.13	223°17.81	28.51	302°39.27	46.18
8	313°52.75		320°14.13	11.13	196°21.40	37.90	238°19.83	28.56	317°41.46	46.07
9	328°55.21		335°17.09	· · 10.34	211°22.94	· · 37.68	253°21.86	· · 28.61	332°43.65	· · 45.95
10	343°57.68		350°20.05	9.54	226°24.47	37.46	268°23.88	28.65	347°45.84	45.84
11	359°0.14		5°23.01	8.75	241°26.00	37.24	283°25.91	28.70	2°48.03	45.73
12	14°2.61		20°25.96	N04°7.96	256°27.53	N23°37.02	298°27.93	N22°28.75	17°50.22	S03°45.61
13	29°5.07		35°28.91	7.17	271°29.06	36.79	313°29.96	28.79	32°52.41	45.50
14	44°7.53		50°31.85	6.38	286°30.59	36.57	328°31.98	28.84	47°54.60	45.39
15	59°10.00		65°34.79	· · 5.59	301°32.12	· · 36.35	343°34.01	· · 28.89	62°56.79	· · 45.27
16	74°12.46		80°37.72	4.80	316°33.65	36.13	358°36.03	28.93	77°58.98	45.16
17	89°14.93		95°40.66	4.02	331°35.18	35.90	13°38.06	28.98	93°1.17	45.05
18	104°17.39		110°43.58	N04°3.23	346°36.71	N23°35.68	28°40.08	N22°29.03	108°3.37	S03°44.93
19	119°19.85		125°46.51	2.45	1°38.24	35.46	43°42.10	29.07	123°5.56	44.82
20	134°22.32		140°49.43	1.67	16°39.76	35.23	58°44.13	29.12	138°7.75	44.71
21	149°24.78		155°52.34	· · 0.89	31°41.29	· · 35.01	73°46.15	· · 29.17	153°9.94	· · 44.60
22	164°27.25		170°55.25	04°0.11	46°42.81	34.78	88°48.17	29.21	168°12.13	44.48
23	179°29.71		185°58.16	03°59.33	61°44.34	34.56	103°50.20	29.26	183°14.32	44.37
Mer.pass. 11:04		ν3.0' d-0.8' m-4.45		ν1.5' d-0.2' m0.52		ν2.0' d0.0' m-2.09		ν2.2' d-0.1' m1.16		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	194°32.18		201°1.07	N03°58.55	76°45.86	N23°34.34	118°52.22	N22°29.31	198°16.51	S03°44.26
1	209°34.64		216°3.97	57.78	91°47.39	34.11	133°54.24	29.35	213°18.70	44.14
2	224°37.10		231°6.86	57.00	106°48.91	33.89	148°56.26	29.40	228°20.90	44.03
3	239°39.57		246°9.75	· · 56.23	121°50.44	· · 33.66	163°58.28	· · 29.45	243°23.09	· · 43.92
4	254°42.03		261°12.64	55.45	136°51.96	33.44	179°0.31	29.49	258°25.28	43.80
5	269°44.50		276°15.53	54.68	151°53.48	33.21	194°2.33	29.54	273°27.47	43.69
6	284°46.96		291°18.41	N03°53.91	166°55.00	N23°32.99	209°4.35	N22°29.59	288°29.66	S03°43.58
7	299°49.42		306°21.28	53.15	181°56.52	32.76	224°6.37	29.63	303°31.85	43.46
8	314°51.89		321°24.16	52.38	196°58.04	32.54	239°8.39	29.68	318°34.04	43.35
9	329°54.35		336°27.02	· · 51.61	211°59.56	· · 32.31	254°10.41	· · 29.73	333°36.24	· · 43.24
10	344°56.82		351°29.89	50.85	227°1.08	32.08	269°12.43	29.77	348°38.43	43.13
11	359°59.28		6°32.75	50.09	242°2.60	31.86	284°14.45	29.82	3°40.62	43.01
12	15°1.74		21°35.61	N03°49.32	257°4.12	N23°31.63	299°16.47	N22°29.87	18°42.81	S03°42.90
13	30°4.21		36°38.46	48.56	272°5.64	31.41	314°18.49	29.91	33°45.00	42.79
14	45°6.67		51°41.31	47.80	287°7.15	31.18	329°20.51	29.96	48°47.20	42.67
15	60°9.14		66°44.15	· · 47.05	302°8.67	· · 30.95	344°22.53	· · 30.01	63°49.39	· · 42.56
16	75°11.60		81°46.99	46.29	317°10.18	30.72	359°24.55	30.05	78°51.58	42.45
17	90°14.07		96°49.83	45.53	332°11.70	30.50	14°26.57	30.10	93°53.77	42.34
18	105°16.53		111°52.66	N03°44.78	347°13.22	N23°30.27	29°28.59	N22°30.15	108°55.96	S03°42.22
19	120°18.99		126°55.49	44.03	2°14.73	30.04	44°30.61	30.19	123°58.16	42.11
20	135°21.46		141°58.32	43.28	17°16.24	29.82	59°32.63	30.24	139°0.35	42.00
21	150°23.92		157°1.14	· · 42.53	32°17.76	· · 29.59	74°34.64	· · 30.29	154°2.54	· · 41.89
22	165°26.39		172°3.96	41.78	47°19.27	29.36	89°36.66	30.33	169°4.73	41.77
23	180°28.85		187°6.77	41.03	62°20.78	29.13	104°38.68	30.38	184°6.92	41.66
Mer.pass. 11:00		ν2.9' d-0.8' m-4.49		ν1.5' d-0.2' m0.54		ν2.0' d0.0' m-2.08		ν2.2' d-0.1' m1.17		

Stars		
	SHA	Dec
Alpheratz	357°34.95	29°13.65
Ankaa	353°7.35	-42°10.17
Schedar	349°31.44	56°40.46
Diphda	348°47.43	-17°50.98
Achernar	335°20.58	-57°6.59
Hamal	327°51.33	23°34.84
Polaris	314°22.09	89°22.39
Acamar	315°11.97	-40°12.36
Menkar	314°6.23	4°11.24
Mirfak	308°28.40	49°57.12
Aldebaran	290°39.61	16°33.57
Rigel	281°3.83	-8°10.47
Capella	280°21.82	46°1.52
Bellatrix	278°22.81	6°22.29
Elnath	278°1.78	28°37.76
Alnilam	275°37.66	-1°11.25
Betelgeuse	270°51.98	7°24.65
Canopus	263°52.41	-52°42.79
Sirius	258°26.11	-16°45.21
Adhara	255°5.73	-29°0.59
Procyon	244°50.60	5°9.54
Pollux	243°17.01	27°57.95
Avior	234°14.49	-59°35.68
Suhail	222°45.98	-43°32.31
Miaplacidus	221°37.83	-69°49.48
Alphard	217°47.39	-8°46.23
Regulus	207°34.01	11°50.55
Dubhe	193°40.16	61°36.96
Denebola	182°24.45	14°25.75
Gienah	175°43.08	-17°41.08
Acrux	172°59.27	-63°14.45
Gacrux	171°50.91	-57°15.39
Alioth	166°12.20	55°49.28
Spica	158°21.79	-11°17.73
Alkaid	152°51.35	49°11.06
Hadar	148°35.17	-60°29.69
Menkent	147°57.04	-36°29.72
Arcturus	145°47.42	19°2.86
Rigel Kent.	139°39.48	-60°56.35
Kochab	137°18.70	74°2.85
Zuben'ubi	136°55.52	-16°8.91
Alphecca	126°3.30	26°37.53
Antares	112°15.39	-26°29.31
Atria	107°9.19	-69°4.17
Sabik	102°2.41	-15°45.45
Shaula	96°9.96	-37°7.27
Rasalhague	95°58.25	12°32.26
Eltanin	90°41.94	51°28.73
Kaus Aust.	83°32.20	-34°22.30
Vega	80°33.05	38°48.06
Nunki	75°47.51	-26°15.91
Altair	61°59.84	8°55.89
Peacock	53°5.61	-56°39.05
Deneb	49°25.88	45°21.88
Enif	33°38.82	9°59.26
Al Na'ir	27°32.98	-46°50.25
Fomalhaut	15°14.60	-29°29.34
Scheat	13°45.35	28°12.99
Markab	13°30.00	15°20

h		Sun		Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.45	N05°42.35	101°48.07	4.2'	N28°41.85	-0.5'	58.4'
1	194°14.63	43.30	116°11.30	4.3'	28°41.39	-0.7'	58.4'
2	209°14.81	44.25	130°34.59	4.3'	28°40.74	-0.8'	58.3'
3	224°14.99	· · 45.21	144°57.94	4.4'	28°39.90	-1.0'	58.3'
4	239°15.17	46.16	159°21.34	4.5'	28°38.88	-1.2'	58.3'
5	254°15.35	47.11	173°44.81	4.5'	28°37.67	-1.4'	58.2'
6	269°15.53	N05°48.07	188°8.35	4.6'	N28°36.27	-1.6'	58.2'
7	284°15.71	49.02	202°31.95	4.7'	28°34.70	-1.8'	58.2'
8	299°15.89	49.97	216°55.62	4.7'	28°32.94	-1.9'	58.1'
9	314°16.07	· · 50.92	231°19.37	4.8'	28°31.00	-2.1'	58.1'
10	329°16.25	51.87	245°43.18	4.9'	28°28.88	-2.3'	58.1'
11	344°16.43	52.83	260°7.07	5.0'	28°26.58	-2.5'	58.0'
12	359°16.62	N05°53.78	274°31.04	5.0'	N28°24.10	-2.7'	58.0'
13	14°16.80	54.73	288°55.09	5.1'	28°21.45	-2.8'	58.0'
14	29°16.98	55.68	303°19.21	5.2'	28°18.62	-3.0'	57.9'
15	44°17.16	· · 56.63	317°43.42	5.3'	28°15.62	-3.2'	57.9'
16	59°17.34	57.58	332°7.71	5.4'	28°12.44	-3.3'	57.8'
17	74°17.52	58.53	346°32.09	5.5'	28°9.09	-3.5'	57.8'
18	89°17.70	N05°59.48	0°56.56	5.6'	N28°5.57	-3.7'	57.8'
19	104°17.88	06°0.43	15°21.11	5.6'	28°1.88	-3.9'	57.7'
20	119°18.06	1.38	29°45.76	5.7'	27°58.02	-4.0'	57.7'
21	134°18.23	· · 2.33	44°10.50	5.8'	27°54.00	-4.2'	57.7'
22	149°18.41	3.28	58°35.33	5.9'	27°49.80	-4.4'	57.6'
23	164°18.59	4.23	73°0.25	6.0'	27°45.45	-4.5'	57.6'
SD = 16.0'		d = 1.0'	SD = 15.9'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°18.77	N06°5.18	87°25.27	6.1'	N27°40.93	-4.7'	57.6'
1	194°18.95	6.13	101°50.39	6.2'	27°36.25	-4.8'	57.5'
2	209°19.13	7.08	116°15.61	6.3'	27°31.41	-5.0'	57.5'
3	224°19.31	· · 8.03	130°40.92	6.4'	27°26.41	-5.2'	57.5'
4	239°19.49	8.98	145°6.34	6.5'	27°21.25	-5.3'	57.4'
5	254°19.67	9.93	159°31.86	6.6'	27°15.93	-5.5'	57.4'
6	269°19.85	N06°10.88	173°57.48	6.7'	N27°10.46	-5.6'	57.4'
7	284°20.03	11.82	188°23.21	6.8'	27°4.84	-5.8'	57.3'
8	299°20.21	12.77	202°49.04	6.9'	26°59.07	-5.9'	57.3'
9	314°20.39	· · 13.72	217°14.98	7.0'	26°53.14	-6.1'	57.3'
10	329°20.56	14.67	231°41.02	7.2'	26°47.07	-6.2'	57.2'
11	344°20.74	15.61	246°7.18	7.3'	26°40.85	-6.4'	57.2'
12	359°20.92	N06°16.56	260°33.44	7.4'	N26°34.48	-6.5'	57.2'
13	14°21.10	17.51	274°59.81	7.5'	26°27.96	-6.7'	57.1'
14	29°21.28	18.45	289°26.29	7.6'	26°21.31	-6.8'	57.1'
15	44°21.46	· · 19.40	303°52.88	7.7'	26°14.51	-6.9'	57.1'
16	59°21.63	20.35	318°19.58	7.8'	26°7.57	-7.1'	57.0'
17	74°21.81	21.29	332°46.39	7.9'	26°0.49	-7.2'	57.0'
18	89°21.99	N06°22.24	347°13.31	8.0'	N25°53.28	-7.3'	57.0'
19	104°22.17	23.18	1°40.35	8.1'	25°45.93	-7.5'	56.9'
20	119°22.35	24.13	16°7.50	8.3'	25°38.45	-7.6'	56.9'
21	134°22.53	· · 25.08	30°34.76	8.4'	25°30.83	-7.7'	56.9'
22	149°22.70	26.02	45°2.14	8.5'	25°23.08	-7.9'	56.8'
23	164°22.88	26.97	59°29.63	8.6'	25°15.20	-8.0'	56.8'
SD = 16.0'		d = 0.9'	SD = 15.7'				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.06	N06°27.91	73°57.23	8.7'	N25°7.20	-8.1'	56.8'
1	194°23.24	28.86	88°24.95	8.8'	24°59.06	-8.3'	56.7'
2	209°23.41	29.80	102°52.78	8.9'	24°50.81	-8.4'	56.7'
3	224°23.59	· · 30.74	117°20.72	9.1'	24°42.42	-8.5'	56.7'
4	239°23.77	31.69	131°48.78	9.2'	24°33.92	-8.6'	56.7'
5	254°23.95	32.63	146°16.96	9.3'	24°25.30	-8.7'	56.6'
6	269°24.12	N06°33.58	160°45.25	9.4'	N24°16.55	-8.9'	56.6'
7	284°24.30	34.52	175°13.65	9.5'	24°7.69	-9.0'	56.6'
8	299°24.48	35.46	189°42.17	9.6'	23°58.71	-9.1'	56.5'
9	314°24.65	· · 36.40	204°10.80	9.7'	23°49.62	-9.2'	56.5'
10	329°24.83	37.35	218°39.54	9.9'	23°40.41	-9.3'	56.5'
11	344°25.01	38.29	233°8.40	10.0'	23°31.09	-9.4'	56.4'
12	359°25.18	N06°39.23	247°37.37	10.1'	N23°21.67	-9.5'	56.4'
13	14°25.36	40.17	262°6.45	10.2'	23°12.13	-9.6'	56.4'
14	29°25.54	41.12	276°35.65	10.3'	23°2.49	-9.8'	56.4'
15	44°25.71	· · 42.06	291°4.96	10.4'	22°52.73	-9.9'	56.3'
16	59°25.89	43.00	305°34.38	10.5'	22°42.88	-10.0'	56.3'
17	74°26.07	43.94	320°3.91	10.6'	22°32.92	-10.1'	56.3'
18	89°26.24	N06°44.88	334°33.56	10.8'	N22°22.86	-10.2'	56.2'
19	104°26.42	45.82	349°3.31	10.9'	22°12.70	-10.3'	56.2'
20	119°26.59	46.76	3°33.18	11.0'	22°2.44	-10.4'	56.2'
21	134°26.77	· · 47.70	18°3.15	11.1'	21°52.09	-10.5'	56.2'
22	149°26.95	48.65	32°33.24	11.2'	21°41.64	-10.5'	56.1'
23	164°27.12	49.59	47°3.43	11.3'	21°31.09	-10.6'	56.1'
SD = 16.0'		d = 0.9'	SD = 15.5'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	03:14	04:34	19:35	20:56	////
N 70°	01:43	03:34	04:43	19:25	20:35	22:31
68°	02:21	03:50	04:51	19:16	20:18	21:50
66°	02:47	04:03	04:58	19:09	20:05	21:23
64°	03:06	04:13	05:04	19:03	19:55	21:03
62°	03:21	04:22	05:08	18:58	19:46	20:47
60°	03:34	04:29	05:13	18:54	19:38	20:34
N 58°	03:45	04:36	05:16	18:50	19:31	20:23
56°	03:54	04:41	05:20	18:47	19:25	20:13
54°	04:02	04:46	05:23	18:44	19:20	20:05
52°	04:09	04:51	05:25	18:41	19:16	19:58
50°	04:15	04:55	05:28	18:38	19:12	19:52
45°	04:27	05:03	05:33	18:33	19:03	19:39
N 40°	04:37	05:10	05:37	18:28	18:56	19:29
35°	04:45	05:16	05:41	18:25	18:50	19:21
30°	04:52	05:20	05:44	18:21	18:45	19:14
20°	05:02	05:28	05:50	18:15	18:38	19:04
N 10°	05:09	05:34	05:55	18:10	18:32	18:56
0°	05:14	05:39	05:59	18:06	18:27	18:51
S 10°	05:18	05:43	06:04	18:01	18:23	18:47
20°	05:20	05:46	06:08	17:57	18:19	18:44
30°	05:21	05:49	06:13	17:52	18:16	18:43
35°	05:21	05:51	06:16	17:49	18:14	18:43
40°	05:21	05:52	06:19	17:45	18:13	18:44
45°	05:19	05:53	06:23	17:42	18:11	18:45
S 50°	05:17	05:55	06:27	17:37	18:10	18:47
52°	05:16	05:55	06:29	17:35	18:09	18:48
54°	05:15	05:56	06:31	17:33	18:08	18:49
56°	05:13	05:56	06:34	17:31	18:08	18:51
58°	05:11	05:57	06:36	17:28	18:07	18:52
S 60°	05:09	05:57	06:39	17:25	18:06	18:54

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
68°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
66°	<div></div>	<div></div>	07:42	<div></div>	<div></div>	07:11
64°	<div></div>	<div></div>	09:07	<div></div>	<div></div>	05:45
62°	<div></div>	07:38	09:44	<div></div>	05:20	05:07
60°	06:50	08:25	10:10	04:03	04:32	04:41
N 58°	07:31	08:56	10:30	03:23	04:01	04:20
56°	07:59	09:19	10:47	02:55	03:38	04:02
54°	08:21	09:37	11:01	02:33	03:19	03:47
52°	08:39	09:53	11:14	02:15	03:03	03:34
50°	08:54	10:07	11:25	01:59	02:49	03:23
45°	09:25	10:35	11:47	01:28	02:20	02:59
N 40°	09:49	10:56	12:05	01:04	01:58	02:40
35°	10:09	11:14	12:21	00:44	01:39	02:24
30°	10:26	11:30	12:34	00:27	01:23	02:10
20°	10:54	11:56	12:56	· · ·	00:56	01:46
N 10°	11:19	12:19	13:15	· · ·	00:32	01:25
0°	11:42	12:40	13:33	· · ·	00:10	01:06
S 10°	12:05	13:01	13:51	23:48	· · ·	00:46
20°	12:29	13:23	14:10	23:24	· · ·	00:25
30°	12:58	13:49	14:32	22:56	· · ·	00:01
35°	13:14	14:04	14:45	22:40	23:46	· · ·
40°	13:34	14:22	14:59	22:21	23:29	· · ·
45°	13:58	14:43	15:17	21:57	23:09	· · ·
S 50°	14:29	15:10	15:38	21:27	22:43	· · ·
52°	14:44	15:23	15:48	21:12	22:31	23:52
54°	15:02	15:37	15:59	20:54	22:16	23:42
56°	15:23	15:55	16:12	20:33	22:00	23:29
58°	15:50	16:15	16:27	20:06	21:39	23:15
S 60°	16:28	16:42	16:45	19:28	21:14	22:58

Day	Sun		Mer. Pass hh:mm	Moon		Age 6-8 38-60%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
04	03:02	02:54	12:03	17:56	05:26	
05	02:45	02:36	12:03	18:53	06:25	
06	02:28	02:19	12:02	19:45	07:20	

April 07, 08, 09 UT (Mon., Tue., Wed.)



	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	195°31.31	202°9.58	N03°40.28	77°22.29	N23°28.90	119°40.70	N22°30.42	199°9.12	S03°41.55	
1	210°33.78	217°12.39	39.54	92°23.80	28.67	134°42.71	30.47	214°11.31	41.44	
2	225°36.24	232°15.19	38.80	107°25.31	28.45	149°44.73	30.52	229°13.50	41.32	
3	240°38.71	247°17.98	•• 38.05	122°26.82	•• 28.22	164°46.75	•• 30.56	244°15.69	•• 41.21	
4	255°41.17	262°20.78	37.31	137°28.33	27.99	179°48.77	30.61	259°17.89	41.10	
5	270°43.63	277°23.57	36.57	152°29.84	27.76	194°50.78	30.66	274°20.08	40.99	
6	285°46.10	292°26.35	N03°35.84	167°31.35	N23°27.53	209°52.80	N22°30.70	289°22.27	S03°40.87	
7	300°48.56	307°29.13	35.10	182°32.86	27.30	224°54.81	30.75	304°24.46	40.76	
8	315°51.03	322°31.91	34.37	197°34.37	27.07	239°56.83	30.80	319°26.66	40.65	
9	330°53.49	337°34.69	•• 33.63	212°35.87	•• 26.84	254°58.85	•• 30.84	334°28.85	•• 40.54	
10	345°55.96	352°37.46	32.90	227°37.38	26.61	270°0.86	30.89	349°31.04	40.42	
11	0°58.42	7°40.22	32.17	242°38.89	26.38	285°2.88	30.94	4°33.24	40.31	
12	16°0.88	22°42.98	N03°31.44	257°40.39	N23°26.15	300°4.89	N22°30.98	19°35.43	S03°40.20	
13	31°3.35	37°45.74	30.71	272°41.90	25.92	315°6.91	31.03	34°37.62	40.09	
14	46°5.81	52°48.50	29.99	287°43.40	25.69	330°8.92	31.08	49°39.81	39.98	
15	61°8.28	67°51.24	•• 29.26	302°44.90	•• 25.46	345°10.94	•• 31.12	64°42.01	•• 39.86	
16	76°10.74	82°53.99	28.54	317°46.41	25.23	0°12.95	31.17	79°44.20	39.75	
17	91°13.20	97°56.73	27.82	332°47.91	25.00	15°14.97	31.22	94°46.39	39.64	
18	106°15.67	112°59.47	N03°27.09	347°49.41	N23°24.77	30°16.98	N22°31.26	109°48.59	S03°39.53	
19	121°18.13	128°2.21	26.38	2°50.91	24.53	45°18.99	31.31	124°50.78	39.41	
20	136°20.60	143°4.94	25.66	17°52.41	24.30	60°21.01	31.35	139°52.97	39.30	
21	151°23.06	158°7.66	•• 24.94	32°53.91	•• 24.07	75°23.02	•• 31.40	154°55.17	•• 39.19	
22	166°25.52	173°10.38	24.23	47°55.42	23.84	90°25.03	31.45	169°57.36	39.08	
23	181°27.99	188°13.10	23.51	62°56.91	23.61	105°27.05	31.49	184°59.55	38.97	
Mer.pass. 10:56		ν2.8' d-0.7' m-4.53		ν1.5' d-0.2' m0.55		ν2.0' d0.0' m-2.08		ν2.2' d-0.1' m1.17		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	196°30.45	203°15.82	N03°22.80	77°58.41	N23°23.38	120°29.06	N22°31.54	200°1.75	S03°38.85	
1	211°32.92	218°18.53	22.09	92°59.91	23.14	135°31.07	31.59	215°3.94	38.74	
2	226°35.38	233°21.23	21.38	108°1.41	22.91	150°33.08	31.63	230°6.13	38.63	
3	241°37.84	248°23.93	•• 20.67	123°2.91	•• 22.68	165°35.10	•• 31.68	245°8.33	•• 38.52	
4	256°40.31	263°26.63	19.97	138°4.40	22.44	180°37.11	31.73	260°10.52	38.41	
5	271°42.77	278°29.33	19.26	153°5.90	22.21	195°39.12	31.77	275°12.71	38.30	
6	286°45.24	293°32.02	N03°18.56	168°7.40	N23°21.98	210°41.13	N22°31.82	290°14.91	S03°38.18	
7	301°47.70	308°34.70	17.86	183°8.89	21.74	225°43.14	31.86	305°17.10	38.07	
8	316°50.17	323°37.39	17.16	198°10.39	21.51	240°45.15	31.91	320°19.29	37.96	
9	331°52.63	338°40.07	•• 16.46	213°11.88	•• 21.28	255°47.17	•• 31.96	335°21.49	•• 37.85	
10	346°55.09	353°42.74	15.76	228°13.37	21.04	270°49.18	32.00	350°23.68	37.74	
11	1°57.56	8°45.41	15.06	243°14.87	20.81	285°51.19	32.05	5°25.88	37.63	
12	17°0.02	23°48.08	N03°14.37	258°16.36	N23°20.57	300°53.20	N22°32.10	20°28.07	S03°37.51	
13	32°2.49	38°50.74	13.68	273°17.85	20.34	315°55.21	32.14	35°30.26	37.40	
14	47°4.95	53°53.40	12.99	288°19.35	20.11	330°57.22	32.19	50°32.46	37.29	
15	62°7.41	68°56.05	•• 12.30	303°20.84	•• 19.87	345°59.23	•• 32.24	65°34.65	•• 37.18	
16	77°9.88	83°58.70	11.61	318°22.33	19.64	1°1.24	32.28	80°36.85	37.07	
17	92°12.34	99°1.35	10.92	333°23.82	19.40	16°3.25	32.33	95°39.04	36.96	
18	107°14.81	114°3.99	N03°10.24	348°25.31	N23°19.17	31°5.26	N22°32.37	110°41.24	S03°36.84	
19	122°17.27	129°6.63	9.55	3°26.80	18.93	46°7.26	32.42	125°43.43	36.73	
20	137°19.73	144°9.27	8.87	18°28.29	18.69	61°9.27	32.47	140°45.62	36.62	
21	152°22.20	159°11.90	•• 8.19	33°29.77	•• 18.46	76°11.28	•• 32.51	155°47.82	•• 36.51	
22	167°24.66	174°14.53	7.51	48°31.26	18.22	91°13.29	32.56	170°50.01	36.40	
23	182°27.13	189°17.15	6.83	63°32.75	17.99	106°15.30	32.61	185°52.21	36.29	
Mer.pass. 10:52		ν2.7' d-0.7' m-4.56		ν1.5' d-0.2' m0.57		ν2.0' d0.0' m-2.07		ν2.2' d-0.1' m1.17		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	197°29.59	204°19.77	N03°6.16	78°34.24	N23°17.75	121°17.31	N22°32.65	200°54.40	S03°36.18	
1	212°32.05	219°22.38	5.48	93°35.72	17.51	136°19.31	32.70	215°56.60	36.06	
2	227°34.52	234°25.00	4.81	108°37.21	17.28	151°21.32	32.74	230°58.79	35.95	
3	242°36.98	249°27.60	•• 4.14	123°38.69	•• 17.04	166°23.33	•• 32.79	246°0.99	•• 35.84	
4	257°39.45	264°30.21	3.47	138°40.18	16.80	181°25.34	32.84	261°3.18	35.73	
5	272°41.91	279°32.81	2.80	153°41.66	16.57	196°27.34	32.88	276°5.38	35.62	
6	287°44.37	294°35.40	N03°2.13	168°43.15	N23°16.33	211°29.35	N22°32.93	291°7.57	S03°35.51	
7	302°46.84	309°37.99	1.47	183°44.63	16.09	226°31.36	32.97	306°9.76	35.40	
8	317°49.30	324°40.58	0.80	198°46.11	15.85	241°33.36	33.02	321°11.96	35.29	
9	332°51.77	339°43.16	03°0.14	213°47.59	•• 15.62	256°35.37	•• 33.07	336°14.15	•• 35.17	
10	347°54.23	354°45.74	02°59.48	228°49.07	15.38	271°37.38	33.11	351°16.35	35.06	
11	2°56.69	9°48.32	58.82	243°50.56	15.14	286°39.38	33.16	6°18.54	34.95	
12	17°59.16	24°50.89	N02°58.16	258°52.04	N23°14.90	301°41.39	N22°33.21	21°20.74	S03°34.84	
13	33°1.62	39°53.46	57.51	273°53.52	14.66	316°43.39	33.25	36°22.93	34.73	
14	48°4.09	54°56.02	56.85	288°55.00	14.42	331°45.40	33.30	51°25.13	34.62	
15	63°6.55	69°58.58	•• 56.20	303°56.48	•• 14.18	346°47.40	•• 33.34	66°27.33	•• 34.51	
16	78°9.02	85°1.14	55.55	318°57.95	13.95	1°49.41	33.39	81°29.52	34.40	
17	93°11.48	100°3.69	54.90	333°59.43	13.71	16°51.41	33.44	96°31.72	34.29	
18	108°13.94	115°6.24	N02°54.25	349°0.91	N23°13.47	31°53.42	N22°33.48	111°33.91	S03°34.18	
19	123°16.41	130°8.78	53.61	4°2.39	13.23	46°55.42	33.53	126°36.11	34.06	
20	138°18.87	145°11.32	52.96	19°3.87	12.99	61°57.43	33.57	141°38.30	33.95	
21	153°21.34	160°13.86	•• 52.32	34°5.34	•• 12.75	76°59.43	•• 33.62	156°40.50	•• 33.84	
22	168°23.80	175°16.39	51.68	49°6.82	12.51	92°1.43	33.67	171°42.69	33.73	
23	183°26.26	190°18.92	51.04	64°8.29	12.27	107°3.44	33.71	186°44.89	33.62	
Mer.pass. 10:48		ν2.6' d-0.7' m-4.59		ν1.5' d-0.2' m0.59		ν2.0' d0.0' m-2.07		ν2.2' d-0.1' m1.17		


h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.30	N06°50.53	61°33.73	11.4'	N21°20.45	-10.7'	56.1'
1	194°27.47	51.46	76°4.14	11.5'	21°9.72	-10.8'	56.0'
2	209°27.65	52.40	90°34.65	11.6'	20°58.90	-10.9'	56.0'
3	224°27.82	· · 53.34	105°5.27	11.7'	20°47.98	-11.0'	56.0'
4	239°28.00	54.28	119°36.00	11.8'	20°36.99	-11.1'	56.0'
5	254°28.17	55.22	134°6.83	11.9'	20°25.90	-11.2'	55.9'
6	269°28.35	N06°56.16	148°37.77	12.0'	N20°14.73	-11.3'	55.9'
7	284°28.52	57.10	163°8.81	12.1'	20°3.48	-11.3'	55.9'
8	299°28.70	58.04	177°39.95	12.2'	19°52.14	-11.4'	55.9'
9	314°28.87	· · 58.98	192°11.19	12.3'	19°40.72	-11.5'	55.8'
10	329°29.05	06°59.91	206°42.53	12.4'	19°29.23	-11.6'	55.8'
11	344°29.22	07°0.85	221°13.98	12.5'	19°17.65	-11.7'	55.8'
12	359°29.40	N07°1.79	235°45.52	12.6'	N19°6.00	-11.7'	55.8'
13	14°29.57	2.73	250°17.16	12.7'	18°54.27	-11.8'	55.7'
14	29°29.75	3.66	264°48.90	12.8'	18°42.47	-11.9'	55.7'
15	44°29.92	· · 4.60	279°20.73	12.9'	18°30.59	-11.9'	55.7'
16	59°30.09	5.54	293°52.66	13.0'	18°18.64	-12.0'	55.7'
17	74°30.27	6.47	308°24.69	13.1'	18°6.62	-12.1'	55.6'
18	89°30.44	N07°7.41	322°56.81	13.2'	N17°54.53	-12.2'	55.6'
19	104°30.62	8.34	337°29.02	13.3'	17°42.37	-12.2'	55.6'
20	119°30.79	9.28	352°1.33	13.4'	17°30.15	-12.3'	55.6'
21	134°30.96	· · 10.22	6°33.72	13.5'	17°17.86	-12.4'	55.5'
22	149°31.14	11.15	21°6.21	13.6'	17°5.50	-12.4'	55.5'
23	164°31.31	12.09	35°38.78	13.7'	16°53.08	-12.5'	55.5'
SD = 16.0'		$d = 0.9'$	SD = 15.3'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.48	N07°13.02	50°11.44	13.8'	N16°40.60	-12.5'	55.5'
1	194°31.66	13.96	64°44.20	13.8'	16°28.06	-12.6'	55.4'
2	209°31.83	14.89	79°17.03	13.9'	16°15.45	-12.7'	55.4'
3	224°32.00	· · 15.82	93°49.95	14.0'	16°2.79	-12.7'	55.4'
4	239°32.18	16.76	108°22.96	14.1'	15°50.07	-12.8'	55.4'
5	254°32.35	17.69	122°56.05	14.2'	15°37.29	-12.8'	55.4'
6	269°32.52	N07°18.63	137°29.22	14.3'	N15°24.46	-12.9'	55.3'
7	284°32.70	19.56	152°2.47	14.3'	15°11.57	-12.9'	55.3'
8	299°32.87	20.49	166°35.80	14.4'	14°58.63	-13.0'	55.3'
9	314°33.04	· · 21.42	181°9.21	14.5'	14°45.63	-13.0'	55.3'
10	329°33.21	22.36	195°42.70	14.6'	14°32.59	-13.1'	55.2'
11	344°33.39	23.29	210°16.26	14.6'	14°19.49	-13.1'	55.2'
12	359°33.56	N07°24.22	224°49.91	14.7'	N14°6.35	-13.2'	55.2'
13	14°33.73	25.15	239°23.62	14.8'	13°53.16	-13.2'	55.2'
14	29°33.90	26.09	253°57.41	14.9'	13°39.92	-13.3'	55.2'
15	44°34.07	· · 27.02	268°31.27	14.9'	13°26.63	-13.3'	55.1'
16	59°34.24	27.95	283°5.20	15.0'	13°13.30	-13.4'	55.1'
17	74°34.42	28.88	297°39.21	15.1'	12°59.93	-13.4'	55.1'
18	89°34.59	N07°29.81	312°13.28	15.1'	N12°46.51	-13.5'	55.1'
19	104°34.76	30.74	326°47.42	15.2'	12°33.05	-13.5'	55.1'
20	119°34.93	31.67	341°21.62	15.3'	12°19.55	-13.5'	55.0'
21	134°35.10	· · 32.60	355°55.90	15.3'	12°6.01	-13.6'	55.0'
22	149°35.27	33.53	10°30.23	15.4'	11°52.43	-13.6'	55.0'
23	164°35.44	34.46	25°4.64	15.5'	11°38.82	-13.7'	55.0'
SD = 16.0'		$d = 0.9'$	SD = 15.1'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.62	N07°35.39	39°39.10	15.5'	N11°25.17	-13.7'	55.0'
1	194°35.79	36.32	54°13.62	15.6'	11°11.48	-13.7'	55.0'
2	209°35.96	37.25	68°48.21	15.6'	10°57.75	-13.8'	54.9'
3	224°36.13	· · 38.18	83°22.85	15.7'	10°43.99	-13.8'	54.9'
4	239°36.30	39.11	97°57.56	15.8'	10°30.20	-13.8'	54.9'
5	254°36.47	40.04	112°32.32	15.8'	10°16.38	-13.9'	54.9'
6	269°36.64	N07°40.96	127°7.13	15.9'	N10°2.52	-13.9'	54.9'
7	284°36.81	41.89	141°42.00	15.9'	09°48.64	-13.9'	54.8'
8	299°36.98	42.82	156°16.92	16.0'	09°34.72	-13.9'	54.8'
9	314°37.15	· · 43.75	170°51.90	16.0'	09°20.78	-14.0'	54.8'
10	329°37.32	44.68	185°26.93	16.1'	09°6.81	-14.0'	54.8'
11	344°37.49	45.60	200°2.00	16.1'	08°52.81	-14.0'	54.8'
12	359°37.66	N07°46.53	214°37.13	16.2'	N08°38.79	-14.0'	54.8'
13	14°37.83	47.46	229°12.31	16.2'	08°24.74	-14.1'	54.7'
14	29°38.00	48.38	243°47.53	16.3'	08°10.67	-14.1'	54.7'
15	44°38.17	· · 49.31	258°22.79	16.3'	07°56.57	-14.1'	54.7'
16	59°38.34	50.23	272°58.11	16.4'	07°42.46	-14.1'	54.7'
17	74°38.51	51.16	287°33.46	16.4'	07°28.32	-14.2'	54.7'
18	89°38.67	N07°52.09	302°8.86	16.4'	N07°14.16	-14.2'	54.7'
19	104°38.84	53.01	316°44.30	16.5'	06°59.98	-14.2'	54.6'
20	119°39.01	53.94	331°19.78	16.5'	06°45.78	-14.2'	54.6'
21	134°39.18	· · 54.86	345°55.30	16.6'	06°31.57	-14.2'	54.6'
22	149°39.35	55.78	0°30.85	16.6'	06°17.33	-14.2'	54.6'
23	164°39.52	56.71	15°6.45	16.6'	06°3.09	-14.3'	54.6'
SD = 16.0'		$d = 0.9'$	SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	02:53	04:17	19:50	21:16	////
N 70°	01:06	03:17	04:29	19:37	20:51	23:14
68°	01:58	03:35	04:39	19:27	20:32	22:12
66°	02:29	03:50	04:46	19:19	20:17	21:39
64°	02:51	04:01	04:53	19:12	20:05	21:16
62°	03:09	04:11	04:59	19:07	19:55	20:58
60°	03:23	04:19	05:04	19:01	19:46	20:43
N 58°	03:34	04:27	05:08	18:57	19:39	20:31
56°	03:45	04:33	05:12	18:53	19:32	20:21
54°	03:53	04:39	05:15	18:49	19:26	20:12
52°	04:01	04:44	05:19	18:46	19:21	20:04
50°	04:08	04:48	05:21	18:43	19:17	19:57
45°	04:21	04:58	05:28	18:37	19:07	19:43
N 40°	04:32	05:05	05:33	18:31	18:59	19:32
35°	04:41	05:11	05:37	18:27	18:53	19:23
30°	04:48	05:17	05:41	18:23	18:47	19:16
20°	04:59	05:25	05:48	18:16	18:39	19:05
N 10°	05:07	05:32	05:53	18:10	18:32	18:56
0°	05:13	05:38	05:58	18:05	18:26	18:50
S 10°	05:18	05:42	06:04	18:00	18:21	18:45
20°	05:21	05:47	06:09	17:54	18:16	18:42
30°	05:23	05:51	06:15	17:48	18:12	18:40
35°	05:24	05:53	06:18	17:45	18:10	18:39
40°	05:24	05:55	06:22	17:41	18:08	18:39
45°	05:23	05:57	06:27	17:36	18:06	18:40
S 50°	05:22	05:59	06:32	17:31	18:03	18:41
52°	05:21	06:00	06:34	17:28	18:02	18:41
54°	05:20	06:01	06:37	17:26	18:01	18:42
56°	05:19	06:02	06:40	17:23	18:00	18:43
58°	05:18	06:03	06:43	17:20	17:59	18:44
S 60°	05:16	06:04	06:46	17:16	17:58	18:46

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°		11:38	14:01		06:37	05:43
N 70°	09:01	12:08	14:14	07:38	06:05	05:27
68°	10:12	12:31	14:24	06:25	05:41	05:15
66°	10:49	12:48	14:33	05:47	05:22	05:05
64°	11:14	13:02	14:40	05:21	05:07	04:56
62°	11:34	13:13	14:46	05:00	04:54	04:49
60°	11:50	13:23	14:51	04:43	04:43	04:42
N 58°	12:04	13:32	14:55	04:29	04:34	04:36
56°	12:15	13:39	14:59	04:16	04:25	04:31
54°	12:25	13:46	15:03	04:05	04:18	04:27
52°	12:34	13:52	15:06	03:56	04:11	04:23
50°	12:42	13:57	15:09	03:47	04:05	04:19
45°	12:59	14:09	15:16	03:29	03:52	04:10
N 40°	13:13	14:18	15:21	03:14	03:41	04:03
35°	13:25	14:27	15:26	03:01	03:31	03:57
30°	13:35	14:34	15:30	02:49	03:23	03:52
20°	13:53	14:46	15:36	02:30	03:08	03:43
N 10°	14:08	14:57	15:43	02:13	02:56	03:35
0°	14:22	15:07	15:48	01:57	02:44	03:27
S 10°	14:36	15:16	15:54	01:41	02:32	03:19
20°	14:51	15:27	16:00	01:24	02:19	03:11
30°	15:08	15:39	16:07	01:04	02:04	03:01
35°	15:18	15:46	16:11	00:52	01:55	02:55
40°	15:29	15:54	16:15	00:38	01:45	02:49
45°	15:42	16:03	16:20	00:22	01:33	02:41
S 50°	15:58	16:13	16:26	00:02	01:19	02:32
52°	16:06	16:19	16:29	· · ·	01:12	02:28
54°	16:14	16:24	16:32	· · ·	01:04	02:23
56°	16:23	16:30	16:35	· · ·	00:56	02:18
58°	16:34	16:37	16:39	· · ·	00:46	02:12
S 60°	16:45	16:45	16:43	· · ·	00:35	02:06

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	70-86%
07	02:11	02:02	12:02	20:33	08:10	
08	01:54	01:46	12:02	21:17	08:55	
09	01:38	01:29	12:01	21:58	09:38	

April 10, 11, 12 UT (Thu., Fri., Sat.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	198°28.73	205°21.45	N02°50.40	79°9.77	N23°12.03	122°5.44	N22°33.76	201°47.08	S03°33.51	Alpheratz	357°34.93	29°13.64
1	213°31.19	220°23.97	49.76	94°11.24	11.79	137°7.44	33.80	216°49.28	33.40	Ankaa	353°7.33	-42°10.14
2	228°33.66	235°26.48	49.13	109°12.72	11.55	152°9.45	33.85	231°51.48	33.29	Schedar	349°31.43	56°40.44
3	243°36.12	250°29.00	· · 48.49	124°14.19	· · 11.31	167°11.45	· · 33.90	246°53.67	· · 33.18	Diphda	348°47.42	-17°50.97
4	258°38.58	265°31.51	47.86	139°15.66	11.06	182°13.45	33.94	261°55.87	33.07	Achernar	335°20.58	-57°6.55
5	273°41.05	280°34.01	47.23	154°17.13	10.82	197°15.46	33.99	276°58.06	32.96	Hamal	327°51.33	23°34.84
6	288°43.51	295°36.51	N02°46.60	169°18.61	N23°10.58	212°17.46	N22°34.04	292°0.26	S03°32.85	Polaris	314°23.51	89°22.36
7	303°45.98	310°39.01	45.98	184°20.08	10.34	227°19.46	34.08	307°2.46	32.74	Acamar	315°11.99	-40°12.33
8	318°48.44	325°41.50	45.35	199°21.55	10.10	242°21.46	34.13	322°4.65	32.63	Menkar	314°6.24	4°11.24
9	333°50.90	340°43.99	· · 44.73	214°23.02	· · 9.86	257°23.46	· · 34.17	337°6.85	· · 32.51	Mirfak	308°28.42	49°57.10
10	348°53.37	355°46.48	44.10	229°24.49	9.61	272°25.46	34.22	352°9.04	32.40	Aldebaran	290°39.62	16°33.58
11	3°55.83	10°48.96	43.48	244°25.96	9.37	287°27.47	34.26	7°11.24	32.29	Rigel	281°3.86	-8°10.46
12	18°58.30	25°51.44	N02°42.86	259°27.43	N23°9.13	302°29.47	N22°34.31	22°13.44	S03°32.18	Capella	280°21.86	46°1.51
13	34°0.76	40°53.91	42.25	274°28.90	8.89	317°31.47	34.36	37°15.63	32.07	Bellatrix	278°22.83	6°22.29
14	49°3.22	55°56.38	41.63	289°30.36	8.64	332°33.47	34.40	52°17.83	31.96	Elnath	278°1.81	28°37.76
15	64°5.69	70°58.85	· · 41.02	304°31.83	· · 8.40	347°35.47	· · 34.45	67°20.03	· · 31.85	Alnilam	275°37.68	-1°11.24
16	79°8.15	86°1.31	40.41	319°33.30	8.16	2°37.47	34.49	82°22.22	31.74	Betelgeuse	270°52.00	7°24.65
17	94°10.62	101°3.77	39.79	334°34.77	7.91	17°39.47	34.54	97°24.42	31.63	Canopus	263°52.46	-52°42.78
18	109°13.08	116°6.22	N02°39.19	349°36.23	N23°7.67	32°41.47	N22°34.59	112°26.62	S03°31.52	Sirius	258°26.14	-16°45.21
19	124°15.54	131°8.67	38.58	4°37.70	7.43	47°43.47	34.63	127°28.81	31.41	Adhara	255°5.77	-29°0.59
20	139°18.01	146°11.12	37.97	19°39.16	7.18	62°45.47	34.68	142°31.01	31.30	Procyon	244°50.62	5°9.54
21	154°20.47	161°13.56	· · 37.37	34°40.63	· · 6.94	77°47.47	· · 34.72	157°33.21	· · 31.19	Pollux	243°17.04	27°57.96
22	169°22.94	176°16.00	36.77	49°42.09	6.70	92°49.47	34.77	172°35.40	31.08	Avior	234°14.55	-59°35.69
23	184°25.40	191°18.43	36.17	64°43.56	6.45	107°51.47	34.82	187°37.60	30.97	Shuail	222°46.01	-43°32.32
Mer.pass. 10:44		ν2.5' d-0.6' m-4.62		ν1.5' d-0.2' m0.61		ν2.0' d0.0' m-2.06		ν2.2' d-0.1' m1.17		Miaplacidus	221°37.92	-69°49.50
										Alphard	217°47.41	-8°46.23</


h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.69	N07°57.63	29°42.08	16.7'	N05°48.82	-14.3'	54.6'
1	194°39.85	58.56	44°17.74	16.7'	05°34.54	-14.3'	54.6'
2	209°40.02	07°59.48	58°53.44	16.7'	05°20.25	-14.3'	54.5'
3	224°40.19	08°0.40	73°29.17	16.8'	05°5.95	-14.3'	54.5'
4	239°40.36	1.33	88°4.93	16.8'	04°51.63	-14.3'	54.5'
5	254°40.53	2.25	102°40.72	16.8'	04°37.30	-14.3'	54.5'
6	269°40.69	N08°3.17	117°16.54	16.8'	N04°22.96	-14.3'	54.5'
7	284°40.86	4.09	131°52.39	16.9'	04°8.61	-14.4'	54.5'
8	299°41.03	5.02	146°28.26	16.9'	03°54.26	-14.4'	54.5'
9	314°41.20	• • 5.94	161°4.17	16.9'	03°39.89	-14.4'	54.5'
10	329°41.36	6.86	175°40.09	17.0'	03°25.52	-14.4'	54.4'
11	344°41.53	7.78	190°16.04	17.0'	03°11.14	-14.4'	54.4'
12	359°41.70	N08°8.70	204°52.02	17.0'	N02°56.76	-14.4'	54.4'
13	14°41.86	9.62	219°28.01	17.0'	02°42.37	-14.4'	54.4'
14	29°42.03	10.55	234°4.03	17.0'	02°27.98	-14.4'	54.4'
15	44°42.20	• • 11.47	248°40.06	17.1'	02°13.58	-14.4'	54.4'
16	59°42.36	12.39	263°16.11	17.1'	01°59.18	-14.4'	54.4'
17	74°42.53	13.31	277°52.18	17.1'	01°44.78	-14.4'	54.4'
18	89°42.70	N08°14.23	292°28.27	17.1'	N01°30.38	-14.4'	54.3'
19	104°42.86	15.15	307°4.37	17.1'	01°15.98	-14.4'	54.3'
20	119°43.03	16.06	321°40.49	17.1'	01°1.58	-14.4'	54.3'
21	134°43.19	• • 16.98	336°16.62	17.1'	00°47.19	-14.4'	54.3'
22	149°43.36	17.90	350°52.76	17.2'	00°32.79	-14.4'	54.3'
23	164°43.52	18.82	5°28.91	17.2'	00°18.40	-14.4'	54.3'
SD = 16.0'		$d = 0.9'$	SD = 14.9'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.69	N08°19.74	20°5.07	17.2'	N00°4.01	-14.4'	54.3'
1	194°43.86	20.66	34°41.24	17.2'	S00°10.38	14.4'	54.3'
2	209°44.02	21.58	49°17.42	17.2'	00°24.75	14.4'	54.3'
3	224°44.19	• • 22.49	63°53.60	17.2'	00°39.13	14.4'	54.2'
4	239°44.35	23.41	78°29.79	17.2'	00°53.49	14.4'	54.2'
5	254°44.52	24.33	93°5.99	17.2'	01°7.85	14.3'	54.2'
6	269°44.68	N08°25.24	107°42.19	17.2'	S01°22.20	14.3'	54.2'
7	284°44.84	26.16	122°18.39	17.2'	01°36.54	14.3'	54.2'
8	299°45.01	27.08	136°54.59	17.2'	01°50.87	14.3'	54.2'
9	314°45.17	• • 27.99	151°30.80	17.2'	02°5.19	14.3'	54.2'
10	329°45.34	28.91	166°7.00	17.2'	02°19.49	14.3'	54.2'
11	344°45.50	29.83	180°43.20	17.2'	02°33.79	14.3'	54.2'
12	359°45.67	N08°30.74	195°19.40	17.2'	S02°48.07	14.3'	54.2'
13	14°45.83	31.66	209°55.60	17.2'	03°2.34	14.3'	54.2'
14	29°45.99	32.57	224°31.79	17.2'	03°16.59	14.2'	54.1'
15	44°46.16	• • 33.49	239°7.98	17.2'	03°30.83	14.2'	54.1'
16	59°46.32	34.40	253°44.16	17.2'	03°45.05	14.2'	54.1'
17	74°46.48	35.31	268°20.33	17.2'	03°59.26	14.2'	54.1'
18	89°46.65	N08°36.23	282°56.49	17.2'	S04°13.44	14.2'	54.1'
19	104°46.81	37.14	297°32.64	17.1'	04°27.61	14.1'	54.1'
20	119°46.97	38.05	312°8.79	17.1'	04°41.76	14.1'	54.1'
21	134°47.14	• • 38.97	326°44.92	17.1'	04°55.89	14.1'	54.1'
22	149°47.30	39.88	341°21.04	17.1'	05°10.00	14.1'	54.1'
23	164°47.46	40.79	355°57.15	17.1'	05°24.08	14.1'	54.1'
SD = 16.0'		$d = 0.9'$	SD = 14.8'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°47.62	N08°41.71	10°33.24	17.1'	S05°38.15	14.0'	54.1'
1	194°47.79	42.62	25°9.31	17.1'	05°52.19	14.0'	54.1'
2	209°47.95	43.53	39°45.37	17.0'	06°6.20	14.0'	54.1'
3	224°48.11	• • 44.44	54°21.41	17.0'	06°20.20	14.0'	54.0'
4	239°48.27	45.35	68°57.44	17.0'	06°34.16	13.9'	54.0'
5	254°48.43	46.26	83°33.44	17.0'	06°48.11	13.9'	54.0'
6	269°48.60	N08°47.18	98°9.43	17.0'	S07°2.02	13.9'	54.0'
7	284°48.76	48.09	112°45.39	16.9'	07°15.90	13.9'	54.0'
8	299°48.92	49.00	127°21.33	16.9'	07°29.76	13.8'	54.0'
9	314°49.08	• • 49.91	141°57.25	16.9'	07°43.59	13.8'	54.0'
10	329°49.24	50.82	156°33.14	16.9'	07°57.39	13.8'	54.0'
11	344°49.40	51.73	171°9.01	16.8'	08°11.16	13.7'	54.0'
12	359°49.56	N08°52.64	185°44.86	16.8'	S08°24.89	13.7'	54.0'
13	14°49.72	53.54	200°20.67	16.8'	08°38.59	13.7'	54.0'
14	29°49.88	54.45	214°56.46	16.8'	08°52.26	13.6'	54.0'
15	44°50.04	• • 55.36	229°32.22	16.7'	09°5.90	13.6'	54.0'
16	59°50.20	56.27	244°7.95	16.7'	09°19.50	13.6'	54.0'
17	74°50.36	57.18	258°43.65	16.7'	09°33.06	13.5'	54.0'
18	89°50.52	N08°58.09	273°19.32	16.6'	S09°46.59	13.5'	54.0'
19	104°50.68	58.99	287°54.95	16.6'	10°0.08	13.5'	54.0'
20	119°50.84	08°59.90	302°30.56	16.6'	10°13.54	13.4'	54.0'
21	134°51.00	09°0.81	317°6.13	16.5'	10°26.95	13.4'	54.0'
22	149°51.16	1.71	331°41.66	16.5'	10°40.33	13.3'	53.9'
23	164°51.32	2.62	346°17.16	16.5'	10°53.66	13.3'	53.9'
SD = 16.0'		$d = 0.9'$	SD = 14.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	02:31	04:01	20:05	21:38	////
N 70°	////	02:59	04:15	19:50	21:07	////
68°	01:31	03:20	04:26	19:39	20:46	22:40
66°	02:10	03:36	04:35	19:29	20:29	21:58
64°	02:36	03:49	04:42	19:21	20:15	21:30
62°	02:55	04:00	04:49	19:15	20:04	21:10
60°	03:11	04:10	04:55	19:09	19:54	20:53
N 58°	03:24	04:18	05:00	19:04	19:46	20:40
56°	03:35	04:25	05:04	18:59	19:39	20:29
54°	03:45	04:31	05:08	18:55	19:32	20:19
52°	03:53	04:37	05:12	18:51	19:27	20:10
50°	04:00	04:41	05:15	18:48	19:22	20:03
45°	04:15	04:52	05:22	18:41	19:11	19:48
N 40°	04:27	05:00	05:28	18:35	19:02	19:36
35°	04:37	05:07	05:33	18:29	18:55	19:26
30°	04:44	05:13	05:38	18:25	18:49	19:18
20°	04:57	05:23	05:45	18:17	18:39	19:06
N 10°	05:06	05:30	05:52	18:10	18:32	18:56
0°	05:13	05:37	05:58	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:58	18:19	18:44
20°	05:22	05:48	06:10	17:52	18:14	18:40
30°	05:25	05:53	06:17	17:45	18:09	18:37
35°	05:26	05:55	06:21	17:41	18:06	18:36
40°	05:26	05:58	06:25	17:36	18:03	18:35
45°	05:27	06:01	06:30	17:31	18:00	18:34
S 50°	05:26	06:04	06:36	17:25	17:57	18:35
52°	05:26	06:05	06:39	17:22	17:56	18:35
54°	05:26	06:07	06:42	17:19	17:54	18:35
56°	05:25	06:08	06:46	17:15	17:53	18:36
58°	05:24	06:10	06:49	17:11	17:51	18:36
S 60°	05:23	06:11	06:54	17:07	17:49	18:37

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	16:04	18:02	20:07	05:06	04:33	04:00
N 70°	16:07	17:56	19:49	05:00	04:35	04:09
68°	16:09	17:51	19:35	04:55	04:36	04:17
66°	16:11	17:46	19:24	04:50	04:37	04:23
64°	16:12	17:43	19:15	04:47	04:38	04:29
62°	16:14	17:40	19:07	04:44	04:38	04:33
60°	16:15	17:37	19:00	04:41	04:39	04:37
N 58°	16:16	17:35	18:54	04:38	04:40	04:41
56°	16:17	17:33	18:49	04:36	04:40	04:44
54°	16:17	17:31	18:44	04:34	04:41	04:47
52°	16:18	17:29	18:40	04:32	04:41	04:50
50°	16:19	17:28	18:36	04:31	04:42	04:52
45°	16:20	17:24	18:28	04:27	04:42	04:58
N 40°	16:22	17:21	18:21	04:24	04:43	05:02
35°	16:23	17:19	18:15	04:21	04:44	05:06
30°	16:24	17:17	18:10	04:19	04:44	05:10
20°	16:25	17:13	18:02	04:15	04:45	05:16
N 10°	16:27	17:10	17:54	04:11	04:46	05:21
0°	16:28	17:07	17:47	04:07	04:47	05:26
S 10°	16:29	17:04	17:40	04:04	04:48	05:31
20°	16:31	17:01	17:32	04:00	04:48	05:37
30°	16:33	16:58	17:24	03:56	04:49	05:43
35°	16:33	16:56	17:19	03:53	04:50	05:46
40°	16:35	16:54	17:13	03:50	04:51	05:50
45°	16:36	16:51	17:07	03:47	04:51	05:55
S 50°	16:37	16:48	16:59	03:43	04:52	06:01
52°	16:38	16:47	16:56	03:41	04:52	06:03
54°	16:39	16:45	16:52	03:39	04:53	06:06
56°	16:39	16:44	16:48	03:37	04:53	06:09
58°	16:40	16:42	16:43	03:34	04:54	06:13
S 60°	16:41	16:40	16:38	03:31	04:54	06:17

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 12-14 92-99%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
10	01:21	01:13	12:01	22:37	10:18	
11	01:05	00:57	12:01	23:17	10:57	
12	00:50	00:42	12:01	23:56	11:36	

April 13, 14, 15 UT (Sun., Mon., Tue.)

	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	201°26.14	208°13.03	N02°8.80	80°54.71	N22°54.27	124°29.19	N22°37.05	204°25.31	S03°25.60	
1	216°28.60	223°15.27	8.28	95°56.15	54.02	139°31.18	37.10	219°27.51	25.49	
2	231°31.07	238°17.51	7.77	110°57.59	53.76	154°33.17	37.14	234°29.70	25.39	
3	246°33.53	253°19.75	•• 7.26	125°59.03	•• 53.51	169°35.16	•• 37.19	249°31.90	•• 25.28	
4	261°35.99	268°21.98	6.75	141°04.47	53.26	184°37.14	37.23	264°34.10	25.17	
5	276°38.46	283°24.21	6.24	156°1.91	53.00	199°39.13	37.28	279°36.30	25.06	
6	291°40.92	298°26.43	N02°5.73	171°3.35	N22°52.75	214°41.12	N22°37.32	294°38.50	S03°24.95	
7	306°43.39	313°28.66	5.22	186°4.79	52.49	229°43.11	37.37	309°40.70	24.84	
8	321°45.85	328°30.87	4.72	201°6.23	52.24	244°45.10	37.41	324°42.90	24.73	
9	336°48.31	343°33.09	•• 4.22	216°7.66	•• 51.99	259°47.09	•• 37.46	339°45.10	•• 24.62	
10	351°50.78	358°35.30	3.72	231°9.10	51.73	274°49.08	37.50	354°47.30	24.52	
11	6°53.24	13°37.50	3.22	246°10.54	51.48	289°51.06	37.55	9°49.50	24.41	
12	21°55.71	28°39.71	N02°2.72	261°11.97	N22°51.22	304°53.05	N22°37.59	24°51.70	S03°24.30	
13	36°58.17	43°41.91	2.23	276°13.41	50.97	319°55.04	37.64	39°53.90	24.19	
14	52°0.63	58°44.10	1.74	291°14.84	50.71	334°57.03	37.68	54°56.10	24.08	
15	67°3.10	73°46.29	•• 1.25	306°16.28	•• 50.46	349°59.01	•• 37.73	69°58.30	•• 23.97	
16	82°5.56	88°48.48	0.76	321°17.71	50.20	5°1.00	37.77	85°0.50	23.87	
17	97°8.03	103°50.66	02°0.27	336°19.15	49.95	20°2.99	37.82	100°2.70	23.76	
18	112°10.49	118°52.85	N01°59.78	351°20.58	N22°49.69	35°4.97	N22°37.87	115°4.90	S03°23.65	
19	127°12.96	133°55.02	59.30	6°22.01	49.43	50°6.96	37.91	130°7.10	23.54	
20	142°15.42	148°57.20	58.82	21°23.44	49.18	65°8.95	37.96	145°9.30	23.43	
21	157°17.88	163°59.36	•• 58.34	36°24.88	•• 48.92	80°10.93	•• 38.00	160°11.50	•• 23.32	
22	172°20.35	179°1.53	57.86	51°26.31	48.66	95°12.92	38.05	175°13.71	23.22	
23	187°22.81	194°3.69	57.38	66°27.74	48.41	110°14.90	38.09	190°15.91	23.11	
Mer.pass. 10:33		ν2.2' d-0.5' m-4.69		ν1.4' d-0.3' m0.66		ν2.0' d0.0' m-2.05		ν2.2' d-0.1' m1.17		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	202°25.28	209°5.85	N01°56.90	81°29.17	N22°48.15	125°16.89	N22°38.14	205°18.11	S03°23.00	
1	217°27.74	224°8.01	56.43	96°30.60	47.89	140°18.87	38.18	220°20.31	22.89	
2	232°30.20	239°10.16	55.96	111°32.03	47.64	155°20.86	38.23	235°22.51	22.78	
3	247°32.67	254°12.30	•• 55.49	126°33.46	•• 47.38	170°22.84	•• 38.27	250°24.71	•• 22.67	
4	262°35.13	269°14.45	55.02	141°34.89	47.12	185°24.83	38.32	265°26.91	22.57	
5	277°37.60	284°16.59	54.55	156°36.32	46.86	200°26.81	38.36	280°29.11	22.46	
6	292°40.06	299°18.72	N01°54.09	171°37.74	N22°46.61	215°28.80	N22°38.41	295°31.31	S03°22.35	
7	307°42.52	314°20.86	53.62	186°39.17	46.35	230°30.78	38.45	310°33.51	22.24	
8	322°44.99	329°22.99	53.16	201°40.60	46.09	245°32.77	38.50	325°35.71	22.13	
9	337°47.45	344°25.11	•• 52.70	216°42.03	•• 45.83	260°34.75	•• 38.54	340°37.91	•• 22.03	
10	352°49.92	359°27.23	52.25	231°43.45	45.57	275°36.73	38.59	355°40.12	21.92	
11	7°52.38	14°29.35	51.79	246°44.88	45.31	290°38.72	38.63	10°42.32	21.81	
12	22°54.84	29°31.47	N01°51.34	261°46.30	N22°45.05	305°40.70	N22°38.68	25°44.52	S03°21.70	
13	37°57.31	44°33.58	50.88	276°47.73	44.79	320°42.68	38.72	40°46.72	21.59	
14	52°59.77	59°35.68	50.43	291°49.15	44.54	335°44.67	38.77	55°48.92	21.49	
15	68°2.24	74°37.79	•• 49.98	306°50.58	•• 44.28	350°46.65	•• 38.81	70°51.12	•• 21.38	
16	83°4.70	89°39.89	49.54	321°52.00	44.02	5°48.63	38.86	85°53.32	21.27	
17	98°7.16	104°41.98	49.09	336°53.43	43.76	20°50.61	38.90	100°55.53	21.16	
18	113°9.63	119°44.08	N01°48.65	351°54.85	N22°43.50	35°52.60	N22°38.95	115°57.73	S03°21.06	
19	128°12.09	134°46.17	48.20	6°56.27	43.24	50°54.58	38.99	130°59.93	20.95	
20	143°14.56	149°48.25	47.76	21°57.69	42.98	65°56.56	39.04	146°2.13	20.84	
21	158°17.02	164°50.33	•• 47.33	36°59.12	•• 42.72	80°58.54	•• 39.08	161°4.33	•• 20.73	
22	173°19.49	179°52.41	46.89	52°0.54	42.45	96°0.52	39.13	176°6.53	20.62	
23	188°21.95	194°54.49	46.45	67°1.96	42.19	111°2.51	39.17	191°8.74	20.52	
Mer.pass. 10:29		ν2.2' d-0.5' m-4.70		ν1.4' d-0.3' m0.68		ν2.0' d0.0' m-2.05		ν2.2' d-0.1' m1.17		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	203°24.41	209°56.56	N01°46.02	82°3.38	N22°41.93	126°4.49	N22°39.21	206°10.94	S03°20.41	
1	218°26.88	224°58.63	45.59	97°4.80	41.67	141°6.47	39.26	221°13.14	20.30	
2	233°29.34	240°0.69	45.16	112°6.22	41.41	156°8.45	39.30	236°15.34	20.19	
3	248°31.81	255°2.75	•• 44.73	127°7.64	•• 41.15	171°10.43	•• 39.35	251°17.54	•• 20.09	
4	263°34.27	270°4.81	44.31	142°9.06	40.89	186°12.41	39.39	266°19.75	19.98	
5	278°36.73	285°6.86	43.88	157°10.47	40.62	201°14.39	39.44	281°21.95	19.87	
6	293°39.20	300°8.91	N01°43.46	172°11.89	N22°40.36	216°16.37	N22°39.48	296°24.15	S03°19.76	
7	308°41.66	315°10.96	43.04	187°13.31	40.10	231°18.35	39.53	311°26.35	19.66	
8	323°44.13	330°13.00	42.62	202°14.73	39.84	246°20.33	39.57	326°28.56	19.55	
9	338°46.59	345°15.04	•• 42.20	217°16.14	•• 39.57	261°22.31	•• 39.62	341°30.76	•• 19.44	
10	353°49.05	0°17.08	41.79	232°17.56	39.31	276°24.29	39.66	356°32.96	19.34	
11	8°51.52	15°19.11	41.37	247°18.97	39.05	291°26.27	39.71	11°35.16	19.23	
12	23°53.98	30°21.14	N01°40.96	262°20.39	N22°38.79	306°28.25	N22°39.75	26°37.37	S03°19.12	
13	38°56.45	45°23.16	40.55	277°21.81	38.52	321°30.23	39.80	41°39.57	19.01	
14	53°58.91	60°25.18	40.14	292°23.22	38.26	336°32.20	39.84	56°41.77	18.91	
15	69°1.38	75°27.20	•• 39.74	307°24.63	•• 37.99	351°34.18	•• 39.89	71°43.98	•• 18.80	
16	84°3.84	90°29.21	39.33	322°26.05	37.73	6°36.16	39.93	86°46.18	18.69	
17	99°6.30	105°31.23	38.93	337°27.46	37.47	21°38.14	39.97	101°48.38	18.59	
18	114°8.77	120°33.23	N01°38.53	352°28.87	N22°37.20	36°40.12	N22°40.02	116°50.58	S03°18.48	
19	129°11.23	135°35.24	38.13	7°30.29	36.94	51°42.10	40.06	131°52.79	18.37	
20	144°13.70	150°37.24	37.73	22°31.70	36.67	66°44.07	40.11	146°54.99	18.26	
21	159°16.16	165°39.23	•• 37.34	37°33.11	•• 36.41	81°46.05	•• 40.15	161°57.19	•• 18.16	
22	174°18.62	180°41.23	36.94	52°34.52	36.14	96°48.03	40.20	176°59.40	18.05	
23	189°21.09	195°43.22	36.55	67°35.93	35.88	111°50.00	40.24	192°1.60	17.94	
Mer.pass. 10:25		ν2.1' d-0.4' m-4.72		ν1.4' d-0.3' m0.70		ν2.0' d0.0' m-2.04		ν2.2' d-0.1' m1.17		

Stars		
	SHA	Dec
Alpheratz	357°34.92	29°13.63
Ankaa	353°7.33	-42°10.13
Schedar	349°31.42	56°40.43
Diphda	348°47.41	-17°50.96
Achernar	335°20.58	-57°6.54
Hamal	327°51.33	23°34.83
Polaris	314°24.00	89°22.35
Acamar	315°12.00	-40°12.32
Menkar	314°6.24	4°11.24
Mirfak	308°28.43	49°57.09
Aldebaran	290°39.64	16°33.57
Rigel	281°3.87	-8°10.46
Capella	280°21.87	46°1.51
Bellatrix	278°22.85	6°22.29
Elnath	278°1.82	28°37.76
Alnilam	275°37.70	-1°11.24
Betelgeuse	270°52.02	7°24.65
Canopus	263°52.49	-52°42.78
Sirius	258°26.16	-16°45.21
Adhara	255°5.79	-29°0.59
Procyon	244°50.64	5°9.54
Pollux	243°17.06	27°57.96
Avior	234°14.58	-59°35.69
Suhail	222°46.03	-43°32.32
Miaplacidus	221°37.96	-69°49.51
Alphard	217°47.43	-8°46.23
Regulus	207°34.04	11°50.56
Dubhe	193°40.20	61°37.00
Denebola	182°24.46	14°25.76
Gienah	175°43.09	-17°41.09
Acrux	172°59.28	-63°14.50
Gacrux	171°50.92	-57°15.44
Alioth	166°12.20	55°49.32
Spica	158°21.78	-11°17.74
Alkaid	152°51.33	49°11.10
Hadar	148°35.13	-60°29.73
Menkent	147°57.01	-36°29.75
Arcturus	145°47.39	19°2.88
Rigel Kent.	139°39.43	-60°56.39
Kochab	137°18.62	74°2.89
Zuben'ubi	136°55.49	-16°8.92
Alphecca	126°3.25	26°37.55
Antares	112°15.34	-26°29.32
Atria	107°9.05	-69°4.19
Sabik	102°2.36	-15°45.45
Shaula	96°9.89	-37°7.27
Rasalhague	95°58.19	12°32.27
Eltanin	90°41.86	51°28.75
Kaus Aust.	83°32.12	-34°22.30
Vega	80°32.98	38°48.07
Nunki	75°47.44	-26°15.91
Altair	61°59.78	8°55.90
Peacock	53°5.50	-56°39.03
Deneb	49°25.80	45°21.88
Enif	33°38.77	9°59.26
Al Na'ir	27°32.92	-46°50.22
Fomalhaut	15°14.56	-29°29.31
Scheat	13°45.31	28°12.98
Markab	13°29.96	15°20.30
Apr 13 Sun	SHA	Mer.pass
Venus	6°46.89	10:06
Mars	239°28.57	18:35
Jupiter	283°3.05	15:40
Saturn	2°59.17	10:21
Apr 14 Mon	SHA	Mer.pass
Venus	6°40.58	10:02
Mars	239°3.89	18:32
Jupiter	282°51.61	15:37
Saturn	2°52.83	10:17
Apr 15 Tue	SHA	Mer.pass
Venus	6°32.15	09:59
Mars	238°38.96	18:30
Jupiter	282°40.07	15:34
Saturn	2°46.53	10:14
Horizontal parallax		
	Venus:	0.4
	Mars:	0.1

h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
Sun							HP
0	179°51.48	N09°3.53		0°52.62	16.4'	S11°6.96	13.3'
1	194°51.64	4.43		15°28.04	16.4'	11°20.21	13.2'
2	209°51.80	5.34		30°3.43	16.3'	11°33.41	13.2'
3	224°51.96	6.24		44°38.77	16.3'	11°46.58	13.1'
4	239°52.12	7.15		59°14.08	16.3'	11°59.70	13.1'
5	254°52.27	8.05		73°49.34	16.2'	12°12.77	13.0'
6	269°52.43	N09°8.96		88°24.56	16.2'	S12°25.80	13.0'
7	284°52.59	9.86		102°59.74	16.1'	12°38.78	12.9'
8	299°52.75	10.77		117°34.88	16.1'	12°51.72	12.9'
9	314°52.91	11.67		132°9.97	16.0'	13°4.60	12.8'
10	329°53.07	12.58		146°45.02	16.0'	13°17.44	12.8'
11	344°53.22	13.48		161°20.02	16.0'	13°30.22	12.7'
12	359°53.38	N09°14.38		175°54.97	15.9'	S13°42.96	12.7'
13	14°53.54	15.28		190°29.87	15.9'	13°55.64	12.6'
14	29°53.69	16.19		205°4.73	15.8'	14°8.27	12.6'
15	44°53.85	17.09		219°39.54	15.8'	14°20.85	12.5'
16	59°54.01	17.99		234°14.30	15.7'	14°33.37	12.5'
17	74°54.17	18.89		248°49.01	15.7'	14°45.83	12.4'
18	89°54.32	N09°19.79		263°23.66	15.6'	S14°58.24	12.4'
19	104°54.48	20.70		277°58.27	15.6'	15°10.60	12.3'
20	119°54.63	21.60		292°32.82	15.5'	15°22.89	12.2'
21	134°54.79	22.50		307°7.31	15.4'	15°35.13	12.2'
22	149°54.95	23.40		321°41.76	15.4'	15°47.30	12.1'
23	164°55.10	24.30		336°16.14	15.3'	15°59.42	12.1'
SD = 15.9'			$d = 0.9'$			SD = 14.7'	

Mon	GHA	Dec		GHA	ν	Dec	d
0	179°55.26	N09°25.20		350°50.47	15.3'	S16°11.47	12.0'
1	194°55.41	26.10		5°24.75	15.2'	16°23.46	11.9'
2	209°55.57	27.00		19°58.97	15.2'	16°35.39	11.9'
3	224°55.72	27.90		34°33.13	15.1'	16°47.26	11.8'
4	239°55.88	28.79		49°7.23	15.0'	16°59.06	11.7'
5	254°56.03	29.69		63°41.27	15.0'	17°10.79	11.7'
6	269°56.19	N09°30.59		78°15.25	14.9'	S17°22.46	11.6'
7	284°56.34	31.49		92°49.17	14.9'	17°34.06	11.5'
8	299°56.50	32.39		107°23.03	14.8'	17°45.59	11.5'
9	314°56.65	33.28		121°56.83	14.7'	17°57.05	11.4'
10	329°56.81	34.18		136°30.57	14.7'	18°8.44	11.3'
11	344°56.96	35.08		151°4.24	14.6'	18°19.76	11.2'
12	359°57.12	N09°35.98		165°37.85	14.5'	S18°31.01	11.2'
13	14°57.27	36.87		180°11.40	14.5'	18°42.19	11.1'
14	29°57.42	37.77		194°44.88	14.4'	18°53.29	11.0'
15	44°57.58	38.66		209°18.30	14.4'	19°4.32	11.0'
16	59°57.73	39.56		223°51.65	14.3'	19°15.27	10.9'
17	74°57.88	40.45		238°24.93	14.2'	19°26.14	10.8'
18	89°58.04	N09°41.35		252°58.15	14.2'	S19°36.94	10.7'
19	104°58.19	42.24		267°31.30	14.1'	19°47.66	10.6'
20	119°58.34	43.14		282°4.38	14.0'	19°58.30	10.6'
21	134°58.49	44.03		296°37.40	13.9'	20°8.86	10.5'
22	149°58.65	44.93		311°10.34	13.9'	20°19.34	10.4'
23	164°58.80	45.82		325°43.22	13.8'	20°29.73	10.3'
SD = 15.9'			$d = 0.9'$			SD = 14.7'	

Tue	GHA	Dec		GHA	ν	Dec	d
0	179°58.95	N09°46.71		340°16.03	13.7'	S20°40.04	10.2'
1	194°59.10	47.61		354°48.77	13.7'	20°50.27	10.1'
2	209°59.25	48.50		9°21.43	13.6'	21°0.42	10.1'
3	224°59.41	49.39		23°54.03	13.5'	21°10.48	10.0'
4	239°59.56	50.28		38°26.56	13.5'	21°20.45	9.9'
5	254°59.71	51.18		52°59.01	13.4'	21°30.33	9.8'
6	269°59.86	N09°52.07		67°31.40	13.3'	S21°40.13	9.7'
7	285°0.01	52.96		82°3.71	13.2'	21°49.83	9.6'
8	300°0.16	53.85		96°35.95	13.2'	21°59.45	9.5'
9	315°0.31	54.74		111°8.12	13.1'	22°8.97	9.4'
10	330°0.46	55.63		125°40.22	13.0'	22°18.40	9.3'
11	345°0.61	56.52		140°12.24	13.0'	22°27.74	9.2'
12	0°0.76	N09°57.41		154°44.19	12.9'	S22°36.99	9.1'
13	15°0.91	58.30		169°16.07	12.8'	22°46.14	9.1'
14	30°1.06	09°59.19		183°47.87	12.7'	22°55.19	9.0'
15	45°1.21	10°0.08		198°19.60	12.7'	23°4.15	8.9'
16	60°1.36	0.97		212°51.26	12.6'	23°13.00	8.8'
17	75°1.51	1.86		227°22.85	12.5'	23°21.76	8.7'
18	90°1.66	N10°2.74		241°54.36	12.4'	S23°30.42	8.6'
19	105°1.81	3.63		256°25.79	12.4'	23°38.98	8.5'
20	120°1.96	4.52		270°57.16	12.3'	23°47.44	8.4'
21	135°2.11	5.41		285°28.45	12.2'	23°55.80	8.3'
22	150°2.26	6.29		299°59.66	12.1'	24°4.05	8.1'
23	165°2.41	7.18		314°30.81	12.1'	24°12.19	8.0'
SD = 15.9'			$d = 0.9'$			SD = 14.7'	

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	02:05	03:44	20:21	22:03	////
N 70°	////	02:40	04:00	20:04	21:26	////
68°	00:53	03:04	04:13	19:50	21:00	23:26
66°	01:48	03:23	04:23	19:40	20:41	22:19
64°	02:19	03:37	04:32	19:31	20:26	21:46
62°	02:42	03:50	04:39	19:23	20:13	21:22
60°	02:59	04:00	04:46	19:16	20:02	21:04
N 58°	03:14	04:09	04:52	19:10	19:53	20:49
56°	03:26	04:17	04:57	19:05	19:45	20:37
54°	03:36	04:23	05:01	19:00	19:38	20:26
52°	03:45	04:29	05:05	18:56	19:32	20:17
50°	03:53	04:35	05:09	18:53	19:27	20:09
45°	04:09	04:46	05:17	18:44	19:15	19:52
N 40°	04:22	04:56	05:24	18:38	19:06	19:39
35°	04:32	05:03	05:29	18:32	18:58	19:29
30°	04:41	05:10	05:34	18:27	18:51	19:20
20°	04:54	05:20	05:43	18:18	18:40	19:07
N 10°	05:04	05:29	05:50	18:10	18:32	18:57
0°	05:12	05:36	05:57	18:04	18:24	18:49
S 10°	05:18	05:42	06:04	17:57	18:18	18:43
20°	05:23	05:48	06:11	17:49	18:12	18:37
30°	05:27	05:54	06:19	17:41	18:06	18:33
35°	05:28	05:57	06:23	17:37	18:02	18:32
40°	05:29	06:01	06:28	17:32	17:59	18:30
45°	05:30	06:04	06:34	17:26	17:55	18:29
S 50°	05:31	06:08	06:41	17:19	17:51	18:29
52°	05:31	06:10	06:44	17:15	17:50	18:29
54°	05:31	06:12	06:48	17:12	17:48	18:29
56°	05:31	06:14	06:52	17:08	17:46	18:29
58°	05:30	06:16	06:56	17:03	17:43	18:29
S 60°	05:30	06:18	07:01	16:58	17:41	18:29

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	22:43	■	■	03:20	02:10	■
N 70°	21:59	■	■	03:39	02:56	■
68°	21:30	23:57	■	03:55	03:26	02:29
66°	21:08	23:08	■	04:08	03:49	03:20
64°	20:51	22:37	..	04:19	04:07	03:52
62°	20:38	22:14	23:58	04:28	04:22	04:16
60°	20:26	21:56	23:30	04:36	04:35	04:35
N 58°	20:16	21:40	23:07	04:43	04:46	04:51
56°	20:07	21:28	22:49	04:49	04:55	05:04
54°	19:59	21:16	22:34	04:55	05:04	05:16
52°	19:53	21:07	22:21	05:00	05:11	05:27
50°	19:46	20:58	22:10	05:04	05:18	05:36
45°	19:33	20:39	21:46	05:14	05:33	05:56
N 40°	19:22	20:24	21:27	05:23	05:45	06:12
35°	19:13	20:12	21:11	05:30	05:56	06:25
30°	19:05	20:01	20:58	05:36	06:05	06:37
20°	18:51	19:42	20:35	05:47	06:21	06:58
N 10°	18:39	19:26	20:15	05:57	06:35	07:16
0°	18:28	19:11	19:56	06:06	06:48	07:32
S 10°	18:16	18:56	19:38	06:15	07:01	07:49
20°	18:05	18:40	19:19	06:25	07:15	08:07
30°	17:51	18:22	18:56	06:37	07:32	08:28
35°	17:43	18:11	18:43	06:43	07:41	08:40
40°	17:35	17:59	18:28	06:51	07:52	08:55
45°	17:24	17:45	18:10	06:59	08:05	09:11
S 50°	17:12	17:28	17:48	07:10	08:21	09:32
52°	17:07	17:20	17:37	07:15	08:28	09:42
54°	17:00	17:11	17:26	07:20	08:36	09:54
56°	16:53	17:01	17:12	07:26	08:46	10:07
58°	16:46	16:50	16:57	07:33	08:56	10:22
S 60°	16:37	16:37	16:38	07:41	09:08	10:40

Day	Sun		Mer. Pass hh:mm	Moon		Age 15-17 100-96%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
13	00:34	00:26	12:00	—:—	12:17	
14	00:19	00:12	12:00	00:38	12:59	
15	00:04	00:03	12:00	01:21	13:44	

April 16, 17, 18 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	204°23.55		210°45.20	N01°36.16	82°37.34	N22°35.61	126°51.98	N22°40.29	207°3.80	S03°17.84
1	219°26.02		225°47.19	35.77	97°38.75	35.35	141°53.96	40.33	222°6.01	17.73
2	234°28.48		240°49.17	35.38	112°40.16	35.08	156°55.94	40.38	237°8.21	17.62
3	249°30.94		255°51.14	•• 35.00	127°41.57	•• 34.82	171°57.91	•• 40.42	252°10.41	•• 17.52
4	264°33.41		270°53.11	34.61	142°42.98	34.55	186°59.89	40.46	267°12.62	17.41
5	279°35.87		285°55.08	34.23	157°44.39	34.28	202°1.86	40.51	282°14.82	17.30
6	294°38.34		300°57.05	N01°33.85	172°45.80	N22°34.02	217°3.84	N22°40.55	297°17.02	S03°17.20
7	309°40.80		315°59.01	33.47	187°47.21	33.75	232°5.82	40.60	312°19.23	17.09
8	324°43.27		331°0.97	33.10	202°48.61	33.48	247°7.79	40.64	327°21.43	16.98
9	339°45.73		346°2.92	•• 32.72	217°50.02	•• 33.22	262°9.77	•• 40.69	342°23.64	•• 16.88
10	354°48.19		1°4.88	32.35	232°51.43	32.95	277°11.74	40.73	357°25.84	16.77
11	9°50.66		16°6.82	31.98	247°52.83	32.68	292°13.72	40.78	12°28.04	16.66
12	24°53.12		31°8.77	N01°31.61	262°54.24	N22°32.42	307°15.69	N22°40.82	27°30.25	S03°16.56
13	39°55.59		46°10.71	31.24	277°55.64	32.15	322°17.67	40.86	42°32.45	16.45
14	54°58.05		61°12.65	30.88	292°57.05	31.88	337°19.64	40.91	57°34.66	16.34
15	70°0.51		76°14.58	•• 30.51	307°58.45	•• 31.61	352°21.61	•• 40.95	72°36.86	•• 16.24
16	85°2.98		91°16.51	30.15	322°59.86	31.34	7°23.59	41.00	87°39.06	16.13
17	100°5.44		106°18.44	29.79	338°1.26	31.08	22°25.56	41.04	102°41.27	16.02
18	115°7.91		121°20.37	N01°29.43	353°2.66	N22°30.81	37°27.54	N22°41.09	117°43.47	S03°15.92
19	130°10.37		136°22.29	29.07	8°4.07	30.54	52°29.51	41.13	132°45.68	15.81
20	145°12.84		151°24.20	28.72	23°5.47	30.27	67°31.48	41.17	147°47.88	15.70
21	160°15.30		166°26.12	•• 28.37	38°6.87	•• 30.00	82°33.46	•• 41.22	162°50.09	•• 15.60
22	175°17.76		181°28.03	28.01	53°8.27	29.73	97°35.43	41.26	177°52.29	15.49
23	190°20.23		196°29.94	27.66	68°9.67	29.46	112°37.40	41.31	192°54.50	15.39
Mer.pass. 10:21		ν2.0' d-0.4' m-4.73		ν1.4' d-0.3' m0.71		ν2.0' d0.0' m-2.04		ν2.2' d-0.1' m1.17		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	205°22.69		211°31.84	N01°27.32	83°11.07	N22°29.19	127°39.38	N22°41.35	207°56.70	S03°15.28
1	220°25.16		226°33.74	26.97	98°12.47	28.92	142°41.35	41.40	222°58.91	15.17
2	235°27.62		241°35.64	26.62	113°13.87	28.65	157°43.32	41.44	238°1.11	15.07
3	250°30.08		256°37.53	•• 26.28	128°15.27	•• 28.38	172°45.29	•• 41.48	253°3.32	•• 14.96
4	265°32.55		271°39.42	25.94	143°16.67	28.11	187°47.27	41.53	268°5.52	14.86
5	280°35.01		286°41.31	25.60	158°18.07	27.84	202°49.24	41.57	283°7.73	14.75
6	295°37.48		301°43.19	N01°25.26	173°19.47	N22°27.57	217°51.21	N22°41.62	298°9.93	S03°14.64
7	310°39.94		316°45.07	24.93	188°20.87	27.30	232°53.18	41.66	313°12.14	14.54
8	325°42.41		331°46.95	24.59	203°22.27	27.03	247°55.15	41.70	328°14.34	14.43
9	340°44.87		346°48.82	•• 24.26	218°23.66	•• 26.76	262°57.12	•• 41.75	343°16.55	•• 14.33
10	355°47.33		1°50.69	23.93	233°25.06	26.49	277°59.09	41.79	358°18.75	14.22
11	10°49.80		16°52.56	23.60	248°26.46	26.22	293°1.07	41.84	13°20.96	14.11
12	25°52.26		31°54.42	N01°23.28	263°27.85	N22°25.94	308°3.04	N22°41.88	28°23.16	S03°14.01
13	40°54.73		46°56.28	22.95	278°29.25	25.67	323°5.01	41.93	43°25.37	13.90
14	55°57.19		61°58.14	22.63	293°30.64	25.40	338°6.98	41.97	58°27.57	13.80
15	70°59.65		76°59.99	•• 22.31	308°32.04	•• 25.13	353°8.95	•• 42.01	73°29.78	•• 13.69
16	86°2.12		92°1.84	21.99	323°33.43	24.86	8°10.92	42.06	88°31.99	13.58
17	101°4.58		107°3.69	21.67	338°34.83	24.58	23°12.89	42.10	103°34.19	13.48
18	116°7.05		122°5.63	N01°21.35	353°36.22	N22°24.31	38°14.86	N22°42.15	118°36.40	S03°13.37
19	131°9.51		137°7.37	21.04	8°37.61	24.04	53°16.83	42.19	133°38.60	13.27
20	146°11.98		152°9.21	20.72	23°39.01	23.76	68°18.80	42.23	148°40.81	13.16
21	161°14.44		167°11.05	•• 20.41	38°40.40	•• 23.49	83°20.76	•• 42.28	163°43.02	•• 13.06
22	176°16.90		182°12.88	20.10	53°41.79	23.22	98°22.73	42.32	178°45.22	12.95
23	191°19.37		197°14.70	19.80	68°43.18	22.94	113°24.70	42.36	193°47.43	12.85
Mer.pass. 10:17		ν1.9' d-0.3' m-4.74		ν1.4' d-0.3' m0.73		ν2.0' d0.0' m-2.03		ν2.2' d-0.1' m1.17		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	206°21.83		212°16.53	N01°19.49	83°44.57	N22°22.67	128°26.67	N22°42.41	208°49.63	S03°12.74
1	221°24.30		227°18.35	19.19	98°45.97	22.40	143°28.64	42.45	223°51.84	12.63
2	236°26.76		242°20.16	18.88	113°47.36	22.12	158°30.61	42.50	238°54.05	12.53
3	251°29.22		257°21.98	•• 18.58	128°48.75	•• 21.85	173°32.58	•• 42.54	253°56.25	•• 12.42
4	266°31.69		272°23.79	18.28	143°50.14	21.57	188°34.54	42.58	268°58.46	12.32
5	281°34.15		287°25.60	17.99	158°51.53	21.30	203°36.51	42.63	284°0.67	12.21
6	296°36.62		302°27.40	N01°17.69	173°52.91	N22°21.02	218°38.48	N22°42.67	299°2.87	S03°12.11
7	311°39.08		317°29.20	17.40	188°54.30	20.75	233°40.45	42.72	314°5.08	12.00
8	326°41.55		332°31.00	17.11	203°55.69	20.47	248°42.41	42.76	329°7.29	11.90
9	341°44.01		347°32.79	•• 16.82	218°57.08	•• 20.20	263°44.38	•• 42.80	344°9.49	•• 11.79
10	356°46.47		2°34.58	16.53	233°58.47	19.92	278°46.35	42.85	359°11.70	11.69
11	11°48.94		17°36.37	16.24	248°59.85	19.65	293°48.32	42.89	14°13.91	11.58
12	26°51.40		32°38.16	N01°15.96	264°1.24	N22°19.37	308°50.28	N22°42.93	29°16.11	S03°11.48
13	41°53.87		47°39.94	15.67	279°2.63	19.09	323°52.25	42.98	44°18.32	11.37
14	56°56.33		62°41.72	15.39	294°4.01	18.82	338°54.22	43.02	59°20.53	11.27
15	71°58.79		77°43.49	•• 15.11	309°5.40	•• 18.54	353°56.18	•• 43.07	74°22.73	•• 11.16
16	87°1.26		92°45.26	14.84	324°6.78	18.27	8°58.15	43.11	89°24.94	11.06
17	102°3.72		107°47.03	14.56	339°8.17	17.99	24°0.11	43.15	104°27.15	10.95
18	117°6.19		122°48.80	N01°14.29	354°9.55	N22°17.71	39°2.08	N22°43.20	119°29.36	S03°10.85
19	132°8.65		137°50.56	14.01	9°10.94	17.43	54°4.04	43.24	134°31.56	10.74
20	147°11.12		152°52.32	13.74	24°12.32	17.16	69°6.01	43.28	149°33.77	10.64
21	162°13.58		167°54.07	•• 13.47	39°13.71	•• 16.88	84°7.97	•• 43.33	164°35.98	•• 10.53
22	177°16.04		182°55.83	13.21	54°15.09	16.60	99°9.94	43.37	179°38.19	10.43
23	192°18.51		197°57.58	12.94	69°16.47	16.32	114°11.90	43.41	194°40.39	10.32
Mer.pass. 10:13		ν1.8' d-0.3' m-4.74		ν1.4' d-0.3' m0.74		ν2.0' d0.0' m-2.03		ν2.2' d-0.1' m1.17		

Stars		
	SHA	Dec
Alpheratz	357°34.90	29°13.63
Ankaa	353°7.32	-42°10.11
Schedar	349°31.40	56°40.42
Diphda	348°47.40	-17°50.95
Achernar	335°20.58	-57°6.52
Hamal	327°51.32	23°34.83
Polaris	314°24.22	89°22.33
Acamar	315°12.00	-40°12.30
Menkar	314°6.24	4°11.24
Mirfak	308°28.43	49°57.08
Aldebaran	290°39.64	16°33.57
Rigel	281°3.88	-8°10.46
Capella	280°21.89	46°1.50
Bellatrix	278°22.86	6°22.29
Elnath	278°1.83	28°37.75
Alnilam	275°37.70	-1°11.24
Betelgeuse	270°52.03	7°24.65
Canopus	263°52.51	-52°42.77
Sirius	258°26.17	-16°45.21
Adhara	255°5.80	-29°0.59
Procyon	244°50.65	5°9.54
Pollux	243°17.07	27°57.96
Avior	234°14.61	-59°35.70
Suhail	222°46.05	-43°32.33
Miaplacidus	221°37.99	-69°49.52
Alphard	217°47.44	-8°46.23
Regulus	207°34.05	11°50.56
Dubhe	193°40.22	61°37.01
Denebola	182°24.46	14°25.77
Gienah	175°43.09	-17°41.10
Acrux	172°59.28	-63°14.52
Gacrux	171°50.92	-57°15.45
Alioth	166°12.21	55°49.34
Spica	158°21.77	-11°17.74
Alkaid	152°51.33	49°11.12
Hadar	148°35.11	-60°29.75
Menkent	147°57.00	-36°29.76
Arcturus	145°47.39	19°2.89
Rigel Kent.	139°39.41	-60°56.41
Kochab	137°18.61	74°2.91
Zuben'ubi	136°55.48	-16°8.92
Alphecca	126°3.24	26°37.56
Antares	112°15.31	-26°29.32
Atria	107°9.00	-69°4.20
Sabik	102°2.33	-15°45.45
Shaula	96°9.87	-37°7.27
Rasalhague	95°58.17	12°32.28
Eltanin	90°41.83	51°28.76
Kaus Aust.	83°32.10	-34°22.30
Vega	80°32.95	38°48.08
Nunki	75°47.42	-26°15.90
Altair	61°59.75	8°55.90
Peacock	53°5.47	-56°39.03
Deneb	49°25.78	45°21.88
Enif	33°38.75	9°59.27
Al Na'ir	27°32.89	-46°50.21
Fomalhaut	15°14.54	-29°29.30
Scheat	13°45.29	28°12.98
Markab	13°29.95	15°20.30
Apr 16 Wed	SHA	Mer.pass
Venus	6°21.65	09:56
Mars	238°13.79	18:28
Jupiter	282°28.43	15:30
Saturn	2°40.25	10:10
Apr 17 Thu	SHA	Mer.pass
Venus	6°9.15	09:53
Mars	237°48.38	18:26
Jupiter	282°16.68	15:27
Saturn	2°34.01	10:07
Apr 18 Fri	SHA	Mer.pass
Venus	5°54.69	09:50
Mars	237°22.74	18:23
Jupiter	282°4.84	15:24
Saturn	2°27.80	10:03
Horizontal parallax		
	Venus:	0.4
	Mars:	0.1

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°2.55	N10°8.07	329°1.87	12.0'	S24°20.24	7.9'	54.1'
1	195°2.70	8.95	343°32.87	11.9'	24°28.17	7.8'	54.1'
2	210°2.85	8.84	358°3.79	11.8'	24°36.00	7.7'	54.1'
3	225°3.00	· · 10.73	12°34.64	11.8'	24°43.72	7.6'	54.1'
4	240°3.14	11.61	27°5.42	11.7'	24°51.33	7.5'	54.1'
5	255°3.29	12.50	41°36.12	11.6'	24°58.83	7.4'	54.1'
6	270°3.44	N10°13.38	56°6.75	11.6'	S25°6.22	7.3'	54.2'
7	285°3.59	14.27	70°37.31	11.5'	25°13.50	7.2'	54.2'
8	300°3.73	15.15	85°7.80	11.4'	25°20.67	7.1'	54.2'
9	315°3.88	· · 16.03	99°38.21	11.3'	25°27.72	6.9'	54.2'
10	330°4.03	16.92	114°8.55	11.3'	25°34.66	6.8'	54.2'
11	345°4.17	17.80	128°38.83	11.2'	25°41.48	6.7'	54.2'
12	0°4.32	N10°18.68	143°9.03	11.1'	S25°48.19	6.6'	54.2'
13	15°4.47	19.57	157°39.16	11.1'	25°54.78	6.5'	54.2'
14	30°4.61	20.45	172°9.22	11.0'	26°1.25	6.4'	54.2'
15	45°4.76	· · 21.33	186°39.21	10.9'	26°7.60	6.2'	54.3'
16	60°4.90	22.21	201°9.13	10.9'	26°13.84	6.1'	54.3'
17	75°5.05	23.09	215°38.98	10.8'	26°19.95	6.0'	54.3'
18	90°5.19	N10°23.97	230°8.76	10.7'	S26°25.94	5.9'	54.3'
19	105°5.34	24.86	244°38.48	10.6'	26°31.81	5.7'	54.3'
20	120°5.48	25.74	259°8.13	10.6'	26°37.56	5.6'	54.3'
21	135°5.63	· · 26.62	273°37.71	10.5'	26°43.18	5.5'	54.3'
22	150°5.77	27.50	288°7.22	10.5'	26°48.68	5.4'	54.3'
23	165°5.92	28.38	302°36.67	10.4'	26°54.05	5.2'	54.4'
SD = 15.9'		$d = 0.9'$	SD = 14.8'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°6.06	N10°29.26	317°6.06	10.3'	S26°59.30	5.1'	54.4'
1	195°6.21	30.14	331°35.38	10.3'	27°4.42	5.0'	54.4'
2	210°6.35	31.01	346°4.64	10.2'	27°9.41	4.9'	54.4'
3	225°6.49	· · 31.89	0°33.83	10.1'	27°14.27	4.7'	54.4'
4	240°6.64	32.77	15°2.97	10.1'	27°19.01	4.6'	54.4'
5	255°6.78	33.65	29°32.04	10.0'	27°23.61	4.5'	54.4'
6	270°6.92	N10°34.53	44°1.05	10.0'	S27°28.08	4.3'	54.4'
7	285°7.07	35.40	58°30.00	9.9'	27°32.43	4.2'	54.5'
8	300°7.21	36.28	72°58.89	9.8'	27°36.63	4.1'	54.5'
9	315°7.35	· · 37.16	87°27.73	9.8'	27°40.71	3.9'	54.5'
10	330°7.50	38.03	101°56.51	9.7'	27°44.65	3.8'	54.5'
11	345°7.64	38.91	116°25.23	9.7'	27°48.46	3.7'	54.5'
12	0°7.78	N10°39.79	130°53.90	9.6'	S27°52.13	3.5'	54.5'
13	15°7.92	40.66	145°22.51	9.6'	27°55.67	3.4'	54.6'
14	30°8.06	41.54	159°51.07	9.5'	27°59.07	3.3'	54.6'
15	45°8.21	· · 42.41	174°19.58	9.5'	28°2.33	3.1'	54.6'
16	60°8.35	43.29	188°48.03	9.4'	28°5.45	3.0'	54.6'
17	75°8.49	44.16	203°16.44	9.4'	28°8.44	2.8'	54.6'
18	90°8.63	N10°45.04	217°44.79	9.3'	S28°11.28	2.7'	54.6'
19	105°8.77	45.91	232°13.10	9.3'	28°13.99	2.6'	54.7'
20	120°8.91	46.78	246°41.36	9.2'	28°16.56	2.4'	54.7'
21	135°9.05	· · 47.66	261°9.58	9.2'	28°18.98	2.3'	54.7'
22	150°9.19	48.53	275°37.75	9.1'	28°21.27	2.1'	54.7'
23	165°9.33	49.40	290°5.87	9.1'	28°23.41	2.0'	54.7'
SD = 15.9'		$d = 0.9'$	SD = 14.8'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°9.47	N10°50.27	304°33.96	9.0'	S28°25.41	1.9'	54.7'
1	195°9.61	51.15	319°2.00	9.0'	28°27.27	1.7'	54.8'
2	210°9.75	52.02	333°30.00	9.0'	28°28.98	1.6'	54.8'
3	225°9.89	· · 52.89	347°57.96	8.9'	28°30.55	1.4'	54.8'
4	240°10.03	53.76	2°25.89	8.9'	28°31.97	1.3'	54.8'
5	255°10.17	54.63	16°53.78	8.9'	28°33.25	1.1'	54.8'
6	270°10.31	N10°55.50	31°21.63	8.8'	S28°34.39	1.0'	54.9'
7	285°10.45	56.37	45°49.45	8.8'	28°35.37	0.8'	54.9'
8	300°10.59	57.24	60°17.24	8.8'	28°36.21	0.7'	54.9'
9	315°10.72	· · 58.11	74°44.99	8.7'	28°36.91	0.5'	54.9'
10	330°10.86	58.98	89°12.72	8.7'	28°37.46	0.4'	54.9'
11	345°11.00	10°59.85	103°40.42	8.7'	28°37.86	0.3'	55.0'
12	0°11.14	N11°0.72	118°8.08	8.6'	S28°38.11	0.1'	55.0'
13	15°11.28	1.58	132°35.73	8.6'	28°38.21	-0.0'	55.0'
14	30°11.41	2.45	147°3.34	8.6'	28°38.17	-0.2'	55.0'
15	45°11.55	· · 3.32	161°30.94	8.6'	28°37.97	-0.3'	55.0'
16	60°11.69	4.19	175°58.51	8.6'	28°37.63	-0.5'	55.1'
17	75°11.83	5.05	190°26.06	8.5'	28°37.14	-0.6'	55.1'
18	90°11.96	N11°5.92	204°53.59	8.5'	S28°36.50	-0.8'	55.1'
19	105°12.10	6.79	219°21.10	8.5'	28°35.70	-0.9'	55.1'
20	120°12.24	7.65	233°48.60	8.5'	28°34.76	-1.1'	55.2'
21	135°12.37	· · 8.52	248°16.08	8.5'	28°33.67	-1.2'	55.2'
22	150°12.51	9.38	262°43.54	8.5'	28°32.43	-1.4'	55.2'
23	165°12.64	10.25	277°10.99	8.4'	28°31.03	-1.5'	55.2'
SD = 15.9'		$d = 0.9'$	SD = 14.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	01:35	03:26	20:37	22:35	////
N 70°	////	02:19	03:45	20:17	21:46	////
68°	////	02:47	04:00	20:02	21:16	////
66°	01:22	03:09	04:11	19:50	20:54	22:46
64°	02:01	03:25	04:21	19:40	20:37	22:03
62°	02:27	03:39	04:30	19:31	20:23	21:36
60°	02:47	03:50	04:37	19:24	20:11	21:15
N 58°	03:03	04:00	04:43	19:17	20:01	20:59
56°	03:16	04:08	04:49	19:11	19:52	20:45
54°	03:28	04:16	04:54	19:06	19:45	20:33
52°	03:37	04:22	04:59	19:01	19:38	20:23
50°	03:46	04:28	05:03	18:57	19:32	20:15
45°	04:03	04:41	05:12	18:48	19:19	19:57
N 40°	04:17	04:51	05:19	18:41	19:09	19:43
35°	04:28	04:59	05:25	18:34	19:00	19:32
30°	04:37	05:06	05:31	18:29	18:53	19:22
20°	04:51	05:18	05:40	18:19	18:41	19:08
N 10°	05:02	05:27	05:49	18:11	18:32	18:57
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:18	05:42	06:04	17:55	18:17	18:41
20°	05:23	05:49	06:12	17:47	18:10	18:35
30°	05:28	05:56	06:20	17:38	18:02	18:30
35°	05:30	06:00	06:25	17:33	17:59	18:28
40°	05:32	06:04	06:31	17:27	17:55	18:26
45°	05:34	06:08	06:38	17:21	17:50	18:25
S 50°	05:35	06:13	06:46	17:13	17:45	18:23
52°	05:36	06:15	06:49	17:09	17:43	18:23
54°	05:36	06:17	06:53	17:05	17:41	18:22
56°	05:36	06:19	06:58	17:00	17:39	18:22
58°	05:36	06:22	07:03	16:55	17:36	18:21
S 60°	05:37	06:25	07:08	16:50	17:33	18:21

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	■	■	■
64°	00:42	■	■	03:23	■	■
62°	· ·	01:58	■	04:07	03:51	■
60°	· ·	01:05	02:30	04:37	04:44	05:08
N 58°	· ·	00:33	01:48	05:00	05:17	05:50
56°	· ·	00:09	01:20	05:18	05:41	06:18
54°	23:50	· ·	00:58	05:34	06:00	06:41
52°	23:34	· ·	00:40	05:47	06:17	06:59
50°	23:20	· ·	00:24	05:59	06:31	07:14
45°	22:52	23:53	· ·	06:24	07:00	07:45
N 40°	22:30	23:29	· ·	06:43	07:22	08:10
35°	22:11	23:10	· ·	07:00	07:41	08:30
30°	21:56	22:53	23:47	07:14	07:57	08:47
20°	21:29	22:24	23:18	07:39	08:25	09:15
N 10°	21:07	22:00	22:54	08:00	08:48	09:40
0°	20:45	21:37	22:31	08:20	09:10	10:03
S 10°	20:24	21:15	22:08	08:40	09:32	10:26
20°	20:02	20:50	21:43	09:01	09:56	10:50
30°	19:36	20:22	21:15	09:26	10:23	11:19
35°	19:21	20:05	20:58	09:40	10:40	11:36
40°	19:03	19:46	20:38	09:57	10:59	11:56
45°	18:42	19:23	20:14	10:18	11:22	12:20
S 50°	18:15	18:53	19:43	10:44	11:51	12:51
52°	18:02	18:38	19:28	10:56	12:06	13:06
54°	17:47	18:21	19:10	11:11	12:23	13:24
56°	17:30	18:00	18:48	11:28	12:44	13:46
58°	17:09	17:34	18:20	11:48	13:10	14:14
S 60°	16:43	16:58	17:39	12:14	13:46	14:55

Day	Sun		Mer. Pass hh:mm	Moon		Age 18-20 92-79%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
16	00:10	00:17	12:00	02:08	14:32	
17	00:24	00:31	11:59	02:58	15:24	
18	00:38	00:45	11:59	03:50	16:17	

April 19, 20, 21 UT (Sat., Sun., Mon.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars			
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	207°20.97	212°59.32	N01°12.68	84°17.85	N22°16.05	129°13.87	N22°43.46	209°42.60	S03°10.22			Alpheratz	357°34.89 29°13.63	
1	222°23.44	228°1.07	12.41	99°19.23	15.77	144°15.83	43.50	224°44.81	10.11			Ankaa	353°7.30 -42°10.09	
2	237°25.90	243°2.81	12.15	114°20.62	15.49	159°17.80	43.54	239°47.02	10.01			Schedar	349°31.38 56°40.41	
3	252°28.36	258°4.54	•• 11.90	129°22.00	•• 15.21	174°19.76	•• 43.59	254°49.22	•• 9.90			Diphda	348°47.39 -17°50.94	
4	267°30.83	273°6.28	11.64	144°23.38	14.93	189°21.73	43.63	269°51.43	9.80			Achernar	335°20.57 -57°6.50	
5	282°33.29	288°8.01	11.38	159°24.76	14.65	204°23.69	43.68	284°53.64	9.70			Hamal	327°51.31 23°34.83	
6	297°35.76	303°9.73	N01°11.13	174°26.14	N22°14.37	219°25.65	N22°43.72	299°55.85	S03°9.59			Polaris	314°24.38 89°22.32	
7	312°38.22	318°11.46	10.88	189°27.52	14.09	234°27.62	43.76	314°58.06	9.49			Acamar	315°12.00 -40°12.29	
8	327°40.69	333°13.18	10.63	204°28.90	13.81	249°29.58	43.81	330°0.26	9.38			Menkar	314°6.24 4°11.25	
9	342°43.15	348°14.90	•• 10.38	219°30.28	•• 13.54	264°31.54	•• 43.85	345°2.47	•• 9.28			Mirfak	308°28.43 49°57.07	
10	357°45.61	3°16.61	10.13	234°31.65	13.26	279°33.51	43.89	0°4.68	9.17			Aldebaran	290°39.64 16°33.57	
11	12°48.08	18°18.32	9.89	249°33.03	12.98	294°35.47	43.94	15°6.89	9.07			Rigel	281°3.88 -8°10.45	
12	27°50.54	33°20.03	N01°9.65	264°34.41	N22°12.70	309°37.43	N22°43.98	30°9.10	S03°8.96			Capella	280°21.89 46°1.49	
13	42°53.01	48°21.74	9.41	279°35.79	12.41	324°39.39	44.02	45°11.31	8.86			Bellatrix	278°22.86 6°22.30	
14	57°55.47	63°23.44	9.17	294°37.16	12.13	339°41.36	44.07	60°13.52	8.76			Elnath	278°1.84 28°37.75	
15	72°57.93	78°25.14	•• 8.93	309°38.54	•• 11.85	354°43.32	•• 44.11	75°15.72	•• 8.65			Alnilam	275°37.71 -1°11.23	
16	88°0.40	93°26.83	8.69	324°39.92	11.57	9°45.28	44.15	90°17.93	8.55			Betelgeuse	270°52.03 7°24.65	
17	103°2.86	108°28.53	8.46	339°41.29	11.29	24°47.24	44.20	105°20.14	8.44			Canopus	263°52.54 -52°42.77	
18	118°5.33	123°30.22	N01°8.22	354°42.67	N22°11.01	39°49.20	N22°44.24	120°22.35	S03°8.34			Sirius	258°26.18 -16°45.20	
19	133°7.79	138°31.90	7.99	9°44.04	10.73	54°51.17	44.28	135°24.56	8.23			Adhara	255°5.81 -29°0.58	
20	148°10.26	153°33.59	7.76	24°45.42	10.45	69°53.13	44.33	150°26.77	8.13			Procyon	244°50.66 5°9.54	
21	163°12.72	168°35.27	•• 7.54	39°46.79	•• 10.17	84°55.09	•• 44.37	165°28.98	•• 8.03			Pollux	243°17.08 27°57.96	
22	178°15.18	183°36.94	7.31	54°48.17	9.88	99°57.05	44.41	180°31.19	7.92			Avior	234°14.64 -59°35.70	
23	193°17.65	198°38.62	7.09	69°49.54	9.60	114°59.01	44.46	195°33.40	7.82			Suhail	222°46.06 -43°32.33	
Mer.pass. 10:09		ν1.7' d-0.3' m-4.75		ν1.4' d-0.3' m0.76		ν2.0' d0.0' m-2.03		ν2.2' d-0.1' m1.17		Miaplacidus			221°38.04 -69°49.52	
										Alphard			217°47.44 -8°46.23	
										Regulus			207°34.05 11°50.57	
										Dubhe			193°40.24 61°37.02	
										Denebola			182°24.46 14°25.77	
										Gienah			175°43.08 -17°41.10	
										Acrux			172°59.28 -63°14.53	
										Gacrux			171°50.91 -57°15.47	
										Alioth			166°12.21 55°49.35	
										Spica			158°21.76 -11°17.74	
										Alkaid			152°51.32 49°11.13	
										Hadar			148°35.10 -60°29.76	
										Menkent			147°56.99 -36°29.77	
										Arcturus			145°47.37 19°2.90	
										Rigel Kent.			139°39.39 -60°56.42	
										Kochab			137°18.59 74°2.92	
										Zuben'ubi			136°55.46 -16°8.93	
										Alphecca			126°3.22 26°37.57	
										Antares			112°15.29 -26°29.32	
										Atria			107°8.95 -69°4.21	
										Sabik			102°2.31 -15°45.44	
										Shaula			96°9.83 -37°7.28	
										Rasalhague			95°58.15 12°32.28	
										Eltanin			90°41.80 51°28.77	
										Kaus Aust.			83°32.06 -34°22.30	
										Vega			80°32.92 38°48.09	
										Nunki			75°47.38 -26°15.90	
										Altair			61°59.73 8°55.91	
										Peacock			53°5.42 -56°39.02	
										Deneb			49°25.74 45°21.88	
										Enif			33°38.73 9°59.27	
										Al Na'ir			27°32.86 -46°50.19	
										Fomalhaut			15°14.52 -29°29.28	
										Scheat			13°45.26 28°12.98	
										Markab			13°29.93 15°20.30	
										Apr 19 Sat			SHA	Mer.pass
										Venus			5°38.35	09:47
										Mars			236°56.88	18:21
										Jupiter			281°52.90	15:21
										Saturn			2°21.63	10:00
										Apr 20 Sun			SHA	Mer.pass
										Venus			5°20.18	09:44
										Mars			236°30.80	18:19
										Jupiter			281°40.86	15:18
										Saturn			2°15.49	09:56
										Apr 21 Mon			SHA	Mer.pass
										Venus			5°0.24	09:42
										Mars			236°4.51	18:17
										Jupiter			281°28.73	15:15
										Saturn			2°9.39	09:53
										Horizontal parallax				
										Venus:			0.4	
										Mars:			0.1	
Mer.pass. 10:01		ν1.6' d-0.2' m-4.76		ν1.4' d-0.3' m0.79		ν2.0' d0.0' m-2.02		ν2.2' d-0.1' m1.17						

h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
Sat							HP
0	180°12.78	N11°11.11		291°38.43	8.4'	S28°29.49	-1.7'
1	195°12.92	11.98		306°5.86	8.4'	28°27.79	-1.8'
2	210°13.05	12.84		320°33.29	8.4'	28°25.94	-2.0'
3	225°13.19	· · 13.71		335°0.70	8.4'	28°23.95	-2.1'
4	240°13.32	14.57		349°28.11	8.4'	28°21.80	-2.3'
5	255°13.46	15.43		3°55.51	8.4'	28°19.49	-2.5'
6	270°13.59	N11°16.30		18°22.91	8.4'	S28°17.04	-2.6'
7	285°13.72	17.16		32°50.30	8.4'	28°14.44	-2.8'
8	300°13.86	18.02		47°17.70	8.4'	28°11.68	-2.9'
9	315°13.99	· · 18.88		61°45.09	8.4'	28°8.77	-3.1'
10	330°14.13	19.74		76°12.49	8.4'	28°5.72	-3.2'
11	345°14.26	20.61		90°39.89	8.4'	28°2.51	-3.4'
12	0°14.39	N11°21.47		105°7.29	8.4'	S27°59.14	-3.5'
13	15°14.53	22.33		119°34.70	8.4'	27°55.63	-3.7'
14	30°14.66	23.19		134°2.11	8.4'	27°51.97	-3.8'
15	45°14.79	· · 24.05		148°29.54	8.4'	27°48.15	-4.0'
16	60°14.93	24.91		162°56.97	8.4'	27°44.18	-4.1'
17	75°15.06	25.77		177°24.41	8.5'	27°40.07	-4.3'
18	90°15.19	N11°26.62		191°51.86	8.5'	S27°35.80	-4.4'
19	105°15.32	27.48		206°19.33	8.5'	27°31.38	-4.6'
20	120°15.45	28.34		220°46.80	8.5'	27°26.81	-4.7'
21	135°15.59	· · 29.20		235°14.30	8.5'	27°22.09	-4.9'
22	150°15.72	30.06		249°41.81	8.5'	27°17.22	-5.0'
23	165°15.85	30.92		264°9.33	8.5'	27°12.20	-5.2'
SD = 15.9'			$d = 0.9'$	SD = 15.1'			

Sun	GHA	Dec		GHA	ν	Dec	d
0	180°15.98	N11°31.77		278°36.88	8.6'	S27°7.03	-5.3'
1	195°16.11	32.63		293°4.44	8.6'	27°1.71	-5.5'
2	210°16.24	33.49		307°32.02	8.6'	26°56.25	-5.6'
3	225°16.37	· · 34.34		321°59.62	8.6'	26°50.63	-5.8'
4	240°16.50	35.20		336°27.25	8.6'	26°44.87	-5.9'
5	255°16.63	36.05		350°54.90	8.7'	26°38.95	-6.1'
6	270°16.76	N11°36.91		5°22.57	8.7'	S26°32.89	-6.2'
7	285°16.89	37.76		19°50.27	8.7'	26°26.69	-6.4'
8	300°17.02	38.62		34°17.99	8.7'	26°20.33	-6.5'
9	315°17.15	· · 39.47		48°45.74	8.8'	26°13.83	-6.6'
10	330°17.28	40.32		63°13.52	8.8'	26°7.19	-6.8'
11	345°17.41	41.18		77°41.32	8.8'	26°0.39	-6.9'
12	0°17.54	N11°42.03		92°9.16	8.9'	S25°53.46	-7.1'
13	15°17.67	42.88		106°37.02	8.9'	25°46.37	-7.2'
14	30°17.80	43.74		121°4.92	8.9'	25°39.15	-7.4'
15	45°17.93	· · 44.59		135°32.84	9.0'	25°31.78	-7.5'
16	60°18.05	45.44		150°0.80	9.0'	25°24.26	-7.7'
17	75°18.18	46.29		164°28.79	9.0'	25°16.61	-7.8'
18	90°18.31	N11°47.14		178°56.82	9.1'	S25°8.81	-7.9'
19	105°18.44	47.99		193°24.87	9.1'	25°0.87	-8.1'
20	120°18.56	48.84		207°52.97	9.1'	24°52.79	-8.2'
21	135°18.69	· · 49.69		222°21.09	9.2'	24°44.56	-8.4'
22	150°18.82	50.54		236°49.26	9.2'	24°36.20	-8.5'
23	165°18.95	51.39		251°17.46	9.2'	24°27.70	-8.6'
SD = 15.9'			$d = 0.9'$	SD = 15.2'			

Mon	GHA	Dec		GHA	ν	Dec	d
0	180°19.07	N11°52.24		265°45.69	9.3'	S24°19.06	-8.8'
1	195°19.20	53.09		280°13.96	9.3'	24°10.28	-8.9'
2	210°19.32	53.94		294°42.27	9.3'	24°1.36	-9.1'
3	225°19.45	· · 54.79		309°10.62	9.4'	23°52.31	-9.2'
4	240°19.58	55.64		323°39.01	9.4'	23°43.12	-9.3'
5	255°19.70	56.48		338°7.43	9.5'	23°33.79	-9.5'
6	270°19.83	N11°57.33		352°35.90	9.5'	S23°24.33	-9.6'
7	285°19.95	58.18		7°4.40	9.5'	23°14.74	-9.7'
8	300°20.08	59.02		21°32.94	9.6'	23°5.01	-9.9'
9	315°20.20	11°59.87		36°1.52	9.6'	22°55.15	-10.0'
10	330°20.33	12°0.72		50°30.14	9.7'	22°45.15	-10.1'
11	345°20.45	1.56		64°58.80	9.7'	22°35.03	-10.3'
12	0°20.57	N12°2.41		79°27.50	9.7'	S22°24.77	-10.4'
13	15°20.70	3.25		93°56.25	9.8'	22°14.38	-10.5'
14	30°20.82	4.09		108°25.03	9.8'	22°3.87	-10.6'
15	45°20.95	· · 4.94		122°53.85	9.9'	21°53.22	-10.8'
16	60°21.07	5.78		137°22.71	9.9'	21°42.45	-10.9'
17	75°21.19	6.63		151°51.62	9.9'	21°31.55	-11.0'
18	90°21.32	N12°7.47		166°20.56	10.0'	S21°20.53	-11.1'
19	105°21.44	8.31		180°49.54	10.0'	21°9.38	-11.3'
20	120°21.56	9.15		195°18.57	10.1'	20°58.11	-11.4'
21	135°21.68	· · 10.00		209°47.63	10.1'	20°46.71	-11.5'
22	150°21.81	10.84		224°16.73	10.1'	20°35.19	-11.6'
23	165°21.93	11.68		238°45.88	10.2'	20°23.55	-11.8'
SD = 15.9'			$d = 0.8'$	SD = 15.5'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	00:52	03:08	20:54	23:30	////
N 70°	////	01:55	03:30	20:32	22:09	////
68°	////	02:30	03:46	20:14	21:33	////
66°	00:45	02:54	04:00	20:00	21:07	23:34
64°	01:41	03:13	04:11	19:49	20:48	22:23
62°	02:12	03:28	04:20	19:39	20:32	21:50
60°	02:34	03:40	04:28	19:31	20:19	21:27
N 58°	02:52	03:51	04:35	19:24	20:08	21:08
56°	03:07	04:00	04:42	19:17	19:59	20:53
54°	03:19	04:08	04:47	19:12	19:51	20:41
52°	03:29	04:16	04:52	19:07	19:43	20:30
50°	03:39	04:22	04:57	19:02	19:37	20:20
45°	03:58	04:35	05:07	18:52	19:23	20:01
N 40°	04:12	04:46	05:15	18:44	19:12	19:46
35°	04:24	04:55	05:22	18:37	19:03	19:34
30°	04:34	05:03	05:28	18:30	18:55	19:25
20°	04:49	05:15	05:38	18:20	18:42	19:09
N 10°	05:01	05:26	05:47	18:11	18:32	18:57
0°	05:10	05:34	05:55	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:54	18:15	18:40
20°	05:24	05:50	06:12	17:45	18:07	18:33
30°	05:30	05:58	06:22	17:35	17:59	18:27
35°	05:32	06:02	06:28	17:29	17:55	18:25
40°	05:35	06:07	06:34	17:23	17:51	18:22
45°	05:37	06:11	06:41	17:16	17:46	18:20
S 50°	05:39	06:17	06:50	17:07	17:40	18:18
52°	05:40	06:20	06:54	17:03	17:37	18:17
54°	05:41	06:22	06:59	16:58	17:35	18:16
56°	05:42	06:25	07:04	16:53	17:32	18:15
58°	05:42	06:28	07:09	16:48	17:28	18:14
S 60°	05:43	06:32	07:15	16:41	17:25	18:13

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	05:43	■	■	07:32
64°	■	■	04:44	■	■	08:30
62°	■	04:23	04:10	■	07:00	09:04
60°	03:21	03:39	03:45	06:09	07:44	09:28
N 58°	02:41	03:10	03:25	06:49	08:12	09:47
56°	02:13	02:48	03:09	07:17	08:35	10:03
54°	01:51	02:29	02:54	07:38	08:53	10:17
52°	01:33	02:14	02:42	07:56	09:08	10:29
50°	01:18	02:00	02:31	08:12	09:21	10:39
45°	00:47	01:32	02:08	08:42	09:48	11:01
N 40°	00:23	01:10	01:50	09:06	10:10	11:18
35°	00:04	00:52	01:34	09:25	10:27	11:33
30°	· · ·	00:36	01:20	09:42	10:42	11:46
20°	· · ·	00:09	00:57	10:10	11:08	12:07
N 10°	23:46	· · ·	00:37	10:34	11:30	12:26
0°	23:25	· · ·	00:18	10:57	11:51	12:43
S 10°	23:03	23:59	· · ·	11:19	12:11	13:00
20°	22:40	23:39	· · ·	11:43	12:33	13:18
30°	22:13	23:15	· · ·	12:11	12:58	13:39
35°	21:57	23:01	· · ·	12:27	13:12	13:51
40°	21:38	22:45	23:56	12:46	13:29	14:05
45°	21:16	22:26	23:41	13:09	13:49	14:22
S 50°	20:47	22:01	23:22	13:39	14:15	14:42
52°	20:33	21:50	23:13	13:53	14:27	14:51
54°	20:16	21:36	23:03	14:10	14:41	15:02
56°	19:57	21:21	22:52	14:30	14:57	15:14
58°	19:32	21:02	22:39	14:54	15:16	15:27
S 60°	18:59	20:39	22:24	15:28	15:39	15:43

Day	Sun		Mer. Pass hh:mm	Moon		Age 21-23 70-51%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
19	00:51	00:58	11:59	04:44	17:11	
20	01:04	01:10	11:59	05:38	18:04	
21	01:16	01:22	11:59	06:31	18:57	

April 22, 23, 24 UT (Tue., Wed., Thu.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	210°18.39	214°56.99	N00°58.19	85°56.41	N21°55.55	131°34.89	N22°46.55	212°21.72	S03°2.76	Alpheratz	357°34.87 29°13.63
1	225°20.86	229°58.52	58.05	100°57.76	55.26	146°36.85	46.59	227°23.94	2.66	Ankaa	353°7.28 -42°10.08
2	240°23.32	245°0.04	57.92	115°59.12	54.97	161°38.80	46.64	242°26.15	2.56	Schedar	349°31.36 56°40.40
3	255°25.78	260°1.56	•• 57.78	131°0.47	•• 54.68	176°40.75	•• 46.68	257°28.36	•• 2.46	Diphda	348°47.38 -17°50.92
4	270°28.25	275°3.08	57.65	146°1.83	54.39	191°42.70	46.72	272°30.57	2.35	Achernar	335°20.56 -57°6.48
5	285°30.71	290°4.60	57.51	161°3.18	54.10	206°44.66	46.76	287°32.79	2.25	Hamal	327°51.31 23°34.83
6	300°33.18	305°6.11	N00°57.38	176°4.54	N21°53.80	221°46.61	N22°46.81	302°35.00	S03°2.15	Polaris	314°24.70 89°22.30
7	315°35.64	320°7.62	57.25	191°5.89	53.51	236°48.56	46.85	317°37.21	2.05	Acamar	315°12.00 -40°12.27
8	330°38.10	335°9.13	57.12	206°7.25	53.22	251°50.51	46.89	332°39.43	1.95	Menkar	314°6.23 4°11.25
9	345°40.57	350°10.63	•• 57.00	221°8.60	•• 52.93	266°52.46	•• 46.93	347°41.64	•• 1.84	Mirfak	308°28.43 49°57.07
10	0°43.03	5°12.13	56.87	236°9.95	52.63	281°54.42	46.97	2°43.85	1.74	Aldebaran	290°39.65 16°33.57
11	15°45.50	20°13.63	56.75	251°11.30	52.34	296°56.37	47.02	17°46.06	1.64	Rigel	281°3.89 -8°10.45
12	30°47.96	35°15.12	N00°56.63	266°12.66	N21°52.05	311°58.32	N22°47.06	32°48.28	S03°1.54	Capella	280°21.90 46°1.49
13	45°50.42	50°16.62	56.51	281°14.01	51.75	327°0.27	47.10	47°50.49	1.44	Bellatrix	278°22.87 6°22.30
14	60°52.89	65°18.11	56.39	296°15.36	51.46	342°2.22	47.14	62°52.70	1.33	Elnath	278°1.84 28°37.75
15	75°55.35	80°19.59	•• 56.27	311°16.71	•• 51.17	357°4.17	•• 47.18	77°54.92	•• 1.23	Alnilam	275°37.72 -1°11.23
16	90°57.82	95°21.08	56.16	326°18.06	50.87	12°6.12	47.23	92°57.13	1.13	Betelgeuse	270°52.04 7°24.66
17	106°0.28	110°22.56	56.05	341°19.41	50.58	27°8.07	47.27	107°59.35	1.03	Canopus	263°52.56 -52°42.76
18	121°2.75	125°24.04	N00°55.94	356°20.76	N21°50.28	42°10.02	N22°47.31	123°1.56	S03°0.93	Sirius	258°26.19 -16°45.20
19	136°5.21	140°25.52	55.83	11°22.11	49.99	57°11.97	47.35	138°3.77	0.83	Adhara	255°5.82 -29°0.58
20	151°7.67	155°26.99	55.72	26°23.46	49.70	72°13.92	47.40	153°5.99	0.72	Procyon	244°50.67 5°9.55
21	166°10.14	170°28.46	•• 55.61	41°24.81	•• 49.40	87°15.87	•• 47.44	168°8.20	•• 0.62	Pollux	243°17.09 27°57.96
22	181°12.60	185°29.93	55.51	56°26.16	49.11	102°17.82	47.48	183°10.41	0.52	Avior	234°14.67 -59°35.70
23	196°15.07	200°31.39	55.40	71°27.50	48.81	117°19.77	47.52	198°12.63	0.42	Suhail	222°46.08 -43°32.34
Mer.pass. 09:57		ν1.5' d-0.1' m-4.76		ν1.4' d-0.3' m0.81		ν2.0' d0.0' m-2.01		ν2.2' d-0.1' m1.17		Miaplacidus	221°38.08 -69°49.53
										Alphard	217°47.45 -8°46.23
										Regulus	207°34.06 11°50.57
										Dubhe	193°40.25 61°37.03
										Denebola	182°24.46 14°25.77
										Gienah	175°43.08 -17°41.11
										Acrux	172°59.29 -63°14.55
										Gacrux	171°50.92 -57°15.48
										Alioth	166°12.21 55°49.36
										Spica	158°21.76 -11°17.75
										Alkaid	152°51.32 49°11.14
										Hadar	148°35.09 -60°29.78
										Menkent	147°56.98 -36°29.78
										Arcturus	145°47.37 19°2.90
										Rigel Kent.	139°39.37 -60°56.44
										Kochab	137°18.58 74°2.94
										Zuben'ubi	136°55.45 -16°8.93
										Alphecca	126°3.21 26°37.57
										Antares	112°15.27 -26°29.33
										Atria	107°8.90 -69°4.22
										Sabik	102°2.29 -15°45.45
										Shaula	96°9.81 -37°7.28
										Rasalhague	95°58.13 12°32.29
										Eltanin	90°41.78 51°28.78
										Kaus Aust.	83°32.03 -34°22.30
										Vega	80°32.90 38°48.09
										Nunki	75°47.36 -26°15.90
										Altair	61°59.70 8°55.91
										Peacock	53°5.38 -56°39.01
										Deneb	49°25.72 45°21.88
										Enif	33°38.70 9°59.28
										Al Na'ir	27°32.83 -46°50.18
										Fomalhaut	15°14.49 -29°29.27
										Scheat	13°45.24 28°12.98
										Markab	13°29.91 15°20.30
Apr 22 Tue			SHA	Mer.pass							
Venus			4°38.60	09:39							
Mars			235°38.02	18:15							
Jupiter			281°16.50	15:12							
Saturn			2°3.33	09:49							
Apr 23 Wed			SHA	Mer.pass							
Venus			4°15.33	09:37							
Mars			235°11.32	18:12							
Jupiter			281°4.19	15:09							
Saturn			1°57.31	09:46							
Apr 24 Thu			SHA	Mer.pass							
Venus			3°50.48	09:35							
Mars			234°44.43	18:10							
Jupiter			280°51.79	15:05							
Saturn			1°51.33	09:42							
Horizontal parallax											
Venus: 0.4											
Mars: 0.1											


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue							
0	180°22.05	N12°12.52	253°15.06	10.2'	S20°11.78	-11.9'	57.5'
1	195°22.17	13.36	267°44.29	10.3'	19°59.90	-12.0'	57.6'
2	210°22.29	14.20	282°13.55	10.3'	19°47.90	-12.1'	57.6'
3	225°22.41	· · 15.04	296°42.85	10.3'	19°35.78	-12.2'	57.6'
4	240°22.53	15.88	311°12.19	10.4'	19°23.54	-12.4'	57.7'
5	255°22.65	16.72	325°41.57	10.4'	19°11.18	-12.5'	57.7'
6	270°22.78	N12°17.56	340°10.98	10.5'	S18°58.71	-12.6'	57.8'
7	285°22.90	18.40	354°40.44	10.5'	18°46.13	-12.7'	57.8'
8	300°23.02	19.23	9°9.93	10.5'	18°33.43	-12.8'	57.8'
9	315°23.14	· · 20.07	23°39.46	10.6'	18°20.62	-12.9'	57.9'
10	330°23.26	20.91	38°9.02	10.6'	18°7.70	-13.0'	57.9'
11	345°23.37	21.75	52°38.62	10.6'	17°54.66	-13.1'	58.0'
12	0°23.49	N12°22.58	67°8.26	10.7'	S17°41.52	-13.3'	58.0'
13	15°23.61	23.42	81°37.93	10.7'	17°28.27	-13.4'	58.0'
14	30°23.73	24.26	96°7.64	10.7'	17°14.91	-13.5'	58.1'
15	45°23.85	· · 25.09	110°37.38	10.8'	17°1.44	-13.6'	58.1'
16	60°23.97	25.93	125°7.15	10.8'	16°47.87	-13.7'	58.1'
17	75°24.09	26.76	139°36.95	10.8'	16°34.19	-13.8'	58.2'
18	90°24.21	N12°27.60	154°6.79	10.9'	S16°20.41	-13.9'	58.2'
19	105°24.32	28.43	168°36.66	10.9'	16°6.53	-14.0'	58.3'
20	120°24.44	29.27	183°6.56	10.9'	15°52.54	-14.1'	58.3'
21	135°24.56	· · 30.10	197°36.49	11.0'	15°38.45	-14.2'	58.3'
22	150°24.68	30.93	212°6.45	11.0'	15°24.27	-14.3'	58.4'
23	165°24.79	31.77	226°36.44	11.0'	15°9.99	-14.4'	58.4'
SD = 15.9'			SD = 15.7'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°24.91	N12°32.60	241°6.46	11.0'	S14°55.60	-14.5'	58.5'
1	195°25.03	33.43	255°36.51	11.1'	14°41.13	-14.6'	58.5'
2	210°25.14	34.26	270°6.58	11.1'	14°26.56	-14.7'	58.5'
3	225°25.26	· · 35.09	284°36.68	11.1'	14°11.89	-14.8'	58.6'
4	240°25.37	35.92	299°6.80	11.1'	13°57.13	-14.9'	58.6'
5	255°25.49	36.75	313°36.95	11.2'	13°42.28	-14.9'	58.7'
6	270°25.61	N12°37.59	328°7.12	11.2'	S13°27.34	-15.0'	58.7'
7	285°25.72	38.42	342°37.31	11.2'	13°12.31	-15.1'	58.7'
8	300°25.84	39.25	357°7.52	11.2'	12°57.19	-15.2'	58.8'
9	315°25.95	· · 40.07	11°37.76	11.3'	12°41.99	-15.3'	58.8'
10	330°26.07	40.90	26°8.01	11.3'	12°26.70	-15.4'	58.9'
11	345°26.18	41.73	40°38.29	11.3'	12°11.32	-15.5'	58.9'
12	0°26.29	N12°42.56	55°8.58	11.3'	S11°55.86	-15.5'	58.9'
13	15°26.41	43.39	69°38.89	11.3'	11°40.32	-15.6'	59.0'
14	30°26.52	44.22	84°9.21	11.3'	11°24.70	-15.7'	59.0'
15	45°26.64	· · 45.04	98°39.55	11.4'	11°9.00	-15.8'	59.0'
16	60°26.75	45.87	113°9.91	11.4'	10°53.22	-15.9'	59.1'
17	75°26.86	46.70	127°40.27	11.4'	10°37.37	-15.9'	59.1'
18	90°26.98	N12°47.52	142°10.65	11.4'	S10°21.44	-16.0'	59.2'
19	105°27.09	48.35	156°41.04	11.4'	10°5.43	-16.1'	59.2'
20	120°27.20	49.17	171°11.44	11.4'	09°49.35	-16.2'	59.2'
21	135°27.31	· · 50.00	185°41.85	11.4'	09°33.20	-16.2'	59.3'
22	150°27.43	50.82	200°12.27	11.4'	09°16.98	-16.3'	59.3'
23	165°27.54	51.65	214°42.69	11.4'	09°0.69	-16.4'	59.3'
SD = 15.9'			SD = 15.9'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°27.65	N12°52.47	229°13.12	11.4'	S08°44.33	-16.4'	59.4'
1	195°27.76	53.29	243°43.56	11.4'	08°27.91	-16.5'	59.4'
2	210°27.87	54.12	258°13.99	11.4'	08°11.42	-16.6'	59.5'
3	225°27.98	· · 54.94	272°44.43	11.4'	07°54.86	-16.6'	59.5'
4	240°28.09	55.76	287°14.87	11.4'	07°38.25	-16.7'	59.5'
5	255°28.21	56.58	301°45.31	11.4'	07°21.57	-16.7'	59.6'
6	270°28.32	N12°57.41	316°15.75	11.4'	S07°4.84	-16.8'	59.6'
7	285°28.43	58.23	330°46.19	11.4'	06°48.04	-16.8'	59.6'
8	300°28.54	59.05	345°16.62	11.4'	06°31.20	-16.9'	59.7'
9	315°28.65	12°59.87	359°47.05	11.4'	06°14.29	-17.0'	59.7'
10	330°28.76	13°0.69	14°17.48	11.4'	05°57.33	-17.0'	59.7'
11	345°28.86	1.51	28°47.89	11.4'	05°40.32	-17.1'	59.8'
12	0°28.97	N13°2.33	43°18.30	11.4'	S05°23.26	-17.1'	59.8'
13	15°29.08	3.15	57°48.69	11.4'	05°6.15	-17.2'	59.9'
14	30°29.19	3.97	72°19.08	11.4'	04°49.00	-17.2'	59.9'
15	45°29.30	· · 4.78	86°49.45	11.4'	04°31.80	-17.2'	59.9'
16	60°29.41	5.60	101°19.81	11.3'	04°14.55	-17.3'	60.0'
17	75°29.52	6.42	115°50.16	11.3'	03°57.26	-17.3'	60.0'
18	90°29.62	N13°7.24	130°20.49	11.3'	S03°39.93	-17.4'	60.0'
19	105°29.73	8.05	144°50.80	11.3'	03°22.56	-17.4'	60.1'
20	120°29.84	8.87	159°21.09	11.3'	03°5.15	-17.4'	60.1'
21	135°29.95	· · 9.69	173°51.37	11.3'	02°47.71	-17.5'	60.1'
22	150°30.05	10.50	188°21.62	11.2'	02°30.23	-17.5'	60.2'
23	165°30.16	11.32	202°51.85	11.2'	02°12.72	-17.5'	60.2'
SD = 15.9'			SD = 16.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	02:49	21:12	////	////
N 70°	////	01:27	03:14	20:46	22:39	////
68°	////	02:11	03:33	20:27	21:51	////
66°	////	02:39	03:48	20:11	21:22	////
64°	01:16	03:00	04:00	19:58	21:00	22:49
62°	01:55	03:17	04:11	19:48	20:42	22:06
60°	02:21	03:31	04:20	19:38	20:28	21:39
N 58°	02:41	03:42	04:28	19:31	20:16	21:19
56°	02:57	03:52	04:34	19:24	20:06	21:02
54°	03:10	04:01	04:40	19:17	19:57	20:48
52°	03:22	04:09	04:46	19:12	19:49	20:37
50°	03:32	04:16	04:51	19:07	19:42	20:27
45°	03:52	04:30	05:02	18:56	19:27	20:06
N 40°	04:07	04:42	05:10	18:47	19:15	19:50
35°	04:20	04:52	05:18	18:39	19:06	19:37
30°	04:30	05:00	05:25	18:32	18:57	19:27
20°	04:47	05:13	05:36	18:21	18:44	19:10
N 10°	04:59	05:24	05:46	18:11	18:32	18:58
0°	05:09	05:34	05:55	18:02	18:23	18:47
S 10°	05:18	05:42	06:04	17:52	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:05	18:31
30°	05:31	06:00	06:24	17:32	17:57	18:25
35°	05:35	06:04	06:30	17:26	17:52	18:21
40°	05:38	06:09	06:37	17:19	17:47	18:18
45°	05:41	06:15	06:45	17:11	17:41	18:15
S 50°	05:43	06:21	06:55	17:01	17:34	18:12
52°	05:45	06:24	06:59	16:56	17:31	18:11
54°	05:46	06:27	07:04	16:52	17:28	18:10
56°	05:47	06:31	07:10	16:46	17:25	18:08
58°	05:48	06:34	07:16	16:40	17:21	18:07
S 60°	05:50	06:38	07:22	16:33	17:17	18:06

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	■	05:22	04:30	■	11:32	14:09
N 70°	06:07	04:56	04:19	08:59	11:55	14:17
68°	05:17	04:37	04:10	09:47	12:12	14:23
66°	04:45	04:21	04:03	10:18	12:27	14:28
64°	04:22	04:08	03:56	10:40	12:38	14:32
62°	04:03	03:56	03:51	10:58	12:48	14:35
60°	03:47	03:47	03:46	11:13	12:56	14:38
N 58°	03:33	03:38	03:42	11:25	13:03	14:41
56°	03:22	03:31	03:38	11:36	13:10	14:44
54°	03:12	03:24	03:34	11:45	13:15	14:46
52°	03:03	03:18	03:31	11:54	13:20	14:48
50°	02:54	03:13	03:28	12:01	13:25	14:49
45°	02:37	03:01	03:22	12:17	13:35	14:53
N 40°	02:23	02:51	03:17	12:30	13:43	14:56
35°	02:10	02:43	03:12	12:41	13:50	14:59
30°	02:00	02:35	03:08	12:51	13:56	15:02
20°	01:41	02:22	03:01	13:07	14:06	15:06
N 10°	01:25	02:11	02:55	13:21	14:15	15:09
0°	01:10	02:00	02:49	13:34	14:24	15:12
S 10°	00:55	01:49	02:43	13:47	14:32	15:16
20°	00:38	01:38	02:37	14:01	14:41	15:19
30°	00:19	01:24	02:30	14:17	14:51	15:23
35°	00:08	01:17	02:26	14:26	14:56	15:25
40°	· · ·	01:08	02:21	14:36	15:03	15:28
45°	· · ·	00:58	02:16	14:48	15:10	15:30
S 50°	· · ·	00:45	02:09	15:02	15:19	15:34
52°	· · ·	00:39	02:06	15:09	15:23	15:35
54°	· · ·	00:32	02:03	15:16	15:27	15:37
56°	· · ·	00:25	01:59	15:25	15:32	15:39
58°	· · ·	00:17	01:55	15:34	15:38	15:41
S 60°	· · ·	00:07	01:50	15:44	15:44	15:43

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 24-26 40-20%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
22	01:28	01:34	11:58	07:22	19:47	
23	01:40	01:45	11:58	08:12	20:36	
24	01:51	01:56	11:58	09:01	21:25	

April 25, 26, 27 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	213°15.80	216°39.92	N00°52.31	87°33.16	N21°34.12	133°55.10	N22°49.55	215°1.20	S02°55.49			Alpheratz	357°34.86 29°13.63
1	228°18.27	231°41.25	52.28	102°34.49	33.82	148°57.04	49.59	230°3.42	55.39			Ankaa	353°7.27 -42°10.06
2	243°20.73	246°42.58	52.26	117°35.82	33.51	163°58.98	49.63	245°5.63	55.29			Schedar	349°31.35 56°40.39
3	258°23.20	261°43.91	· · 52.24	132°37.15	· · 33.21	179°0.92	· · 49.67	260°7.85	· · 55.19			Diphda	348°47.37 -17°50.91
4	273°25.66	276°45.24	52.22	147°38.48	32.90	194°2.87	49.72	275°10.07	55.09			Achernar	335°20.56 -57°6.47
5	288°28.12	291°46.56	52.20	162°39.82	32.60	209°4.81	49.76	290°12.29	54.99			Hamal	327°51.31 23°34.83
6	303°30.59	306°47.88	N00°52.19	177°41.15	N21°32.29	224°6.75	N22°49.80	305°14.50	S02°54.89			Polaris	314°25.03 89°22.29
7	318°33.05	321°49.20	52.17	192°42.48	31.98	239°8.69	49.84	320°16.72	54.79			Acamar	315°12.01 -40°12.26
8	333°35.52	336°50.52	52.16	207°43.80	31.68	254°10.63	49.88	335°18.94	54.69			Menkar	314°6.24 4°11.26
9	348°37.98	351°51.83	· · 52.15	222°45.13	· · 31.37	269°12.57	· · 49.92	350°21.16	· · 54.59			Mirfak	308°28.44 49°57.06
10	3°40.44	6°53.14	52.14	237°46.46	31.07	284°14.51	49.96	5°23.38	54.49			Aldebaran	290°39.65 16°33.57
11	18°42.91	21°54.45	52.13	252°47.79	30.76	299°16.45	50.00	20°25.60	54.39			Rigel	281°3.90 -8°10.44
12	33°45.37	36°55.76	N00°52.13	267°49.12	N21°30.45	314°18.39	N22°50.04	35°27.81	S02°54.29			Capella	280°21.91 46°1.49
13	48°47.84	51°57.06	52.12	282°50.45	30.15	329°20.33	50.08	50°30.03	54.19			Bellatrix	278°22.88 6°22.30
14	63°50.30	66°58.37	52.12	297°51.78	29.84	344°22.27	50.12	65°32.25	54.09			Elnath	278°1.85 28°37.75
15	78°52.77	81°59.66	· · 52.11	312°53.10	· · 29.53	359°24.21	· · 50.16	80°34.47	· · 53.99			Alnilam	275°37.73 -1°11.22
16	93°55.23	97°0.96	52.11	327°54.43	29.23	14°26.15	50.20	95°36.69	53.89			Betelgeuse	270°52.05 7°24.66
17	108°57.69	112°2.26	52.11	342°55.76	28.92	29°28.09	50.25	110°38.91	53.79			Canopus	263°52.58 -52°42.75
18	124°0.16	127°3.55	N00°52.12	357°57.08	N21°28.61	44°30.03	N22°50.29	125°41.13	S02°53.70			Sirius	258°26.20 -16°45.19
19	139°2.62	142°4.84	52.12	12°58.41	28.30	59°31.97	50.33	140°43.34	53.60			Adhara	255°5.84 -29°0.57
20	154°5.09	157°6.12	52.13	27°59.73	28.00	74°33.91	50.37	155°45.56	53.50			Procyon	244°50.68 5°9.55
21	169°7.55	172°7.41	· · 52.13	43°1.06	· · 27.69	89°35.84	· · 50.41	170°47.78	· · 53.40			Pollux	243°17.11 27°57.97
22	184°10.01	187°8.69	52.14	58°2.38	27.38	104°37.78	50.45	185°50.00	53.30			Avior	234°14.71 -59°35.70
23	199°12.48	202°9.97	52.15	73°3.71	27.07	119°39.72	50.49	200°52.22	53.20			Suhail	222°46.10 -43°32.34
Mer.pass. 09:45		ν1.3' d-0.0' m-4.75		ν1.3' d-0.3' m0.85		ν1.9' d0.0' m-2.00		ν2.2' d-0.1' m1.17					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	214°14.94	217°11.25	N00°52.16	88°5.03	N21°26.76	134°41.66	N22°50.53	215°54.44	S02°53.10			Miaplacidus	221°38.13 -69°49.53
1	229°17.41	232°12.52	52.18	103°6.36	26.45	149°43.60	50.57	230°56.66	53.00			Alphard	217°47.47 -8°46.23
2	244°19.87	247°13.79	52.19	118°7.68	26.14	164°45.54	50.61	245°58.88	52.90			Regulus	207°34.07 11°50.57
3	259°22.33	262°15.06	· · 52.21	133°9.00	· · 25.83	179°47.47	· · 50.65	261°1.10	· · 52.80			Dubhe	193°40.27 61°37.04
4	274°24.80	277°16.33	52.23	148°10.33	25.53	194°49.41	50.69	276°3.32	52.71			Denebola	182°24.47 14°25.78
5	289°27.26	292°17.60	52.24	163°11.65	25.22	209°51.35	50.73	291°5.54	52.61			Gienah	175°43.09 -17°41.11
6	304°29.73	307°18.86	N00°52.27	178°12.97	N21°24.91	224°53.29	N22°50.77	306°7.76	S02°52.51			Acrux	172°59.30 -63°14.56
7	319°32.19	322°20.12	52.29	193°14.30	24.60	239°55.22	50.81	321°9.98	52.41			Gacrux	171°50.93 -57°15.49
8	334°34.65	337°21.38	52.31	208°15.62	24.29	254°57.16	50.85	336°12.20	52.31			Alioth	166°12.21 55°49.38
9	349°37.12	352°22.63	· · 52.34	223°16.94	· · 23.98	269°59.10	· · 50.89	351°14.42	· · 52.21			Spica	158°21.76 -11°17.75
10	4°39.58	7°23.89	52.36	238°18.26	23.66	285°1.03	50.93	6°16.64	52.11			Alkaid	152°51.32 49°11.16
11	19°42.05	22°25.14	52.39	253°19.58	23.35	300°2.97	50.97	21°18.86	52.02			Hadar	148°35.08 -60°29.79
12	34°44.51	37°26.38	N00°52.42	268°20.90	N21°23.04	315°4.91	N22°51.01	36°21.08	S02°51.92			Menkent	147°56.98 -36°29.79
13	49°46.97	52°27.63	52.45	283°22.22	22.73	330°6.84	51.05	51°23.30	51.82			Arcturus	145°47.36 19°2.91
14	64°49.44	67°28.87	52.49	298°23.54	22.42	345°8.78	51.09	66°25.52	51.72			Rigel Kent.	139°39.37 -60°56.45
15	79°51.90	82°30.12	· · 52.52	313°24.86	· · 22.11	0°10.72	· · 51.13	81°27.74	· · 51.62			Kochab	137°18.56 74°2.95
16	94°54.37	97°31.36	52.55	328°26.18	21.80	15°12.65	51.17	96°29.96	51.52			Zuben'ubi	136°55.44 -16°8.93
17	109°56.83	112°32.59	52.59	343°27.50	21.49	30°14.59	51.21	111°32.18	51.43			Alphecca	126°3.20 26°37.59
18	124°59.29	127°33.83	N00°52.63	358°28.82	N21°21.17	45°16.52	N22°51.25	126°34.40	S02°51.33			Antares	112°15.26 -26°29.33
19	140°1.76	142°35.06	52.67	13°30.14	20.86	60°18.46	51.29	141°36.62	51.23			Atria	107°8.86 -69°4.23
20	155°4.22	157°36.29	52.71	28°31.46	20.55	75°20.39	51.33	156°38.84	51.13			Sabik	102°2.27 -15°45.45
21	170°6.69	172°37.52	· · 52.76	43°32.77	· · 20.24	90°22.33	· · 51.37	171°41.06	· · 51.03			Shaula	96°9.79 -37°7.29
22	185°9.15	187°38.74	52.80	58°34.09	19.92	105°24.27	51.41	186°43.28	50.93			Rasalhague	95°58.11 12°32.29
23	200°11.61	202°39.96	52.85	73°35.41	19.61	120°26.20	51.45	201°45.50	50.84			Eltanin	90°41.75 51°28.79
Mer.pass. 09:41		ν1.3' d0.0' m-4.75		ν1.3' d-0.3' m0.87		ν1.9' d0.0' m-2.00		ν2.2' d-0.1' m1.17					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	215°14.08	217°41.18	N00°52.89	88°36.73	N21°19.30	135°28.13	N22°51.49	216°47.72	S02°50.74			Kaus Aust.	83°32.01 -34°22.30
1	230°16.54	232°42.40	52.94	103°38.04	18.98	150°30.07	51.53	231°49.95	50.64			Vega	80°32.88 38°48.10
2	245°19.01	247°43.62	52.99	118°39.36	18.67	165°32.00	51.57	246°52.17	50.54			Nunki	75°47.34 -26°15.90
3	260°21.47	262°44.83	· · 53.04	133°40.68	· · 18.36	180°33.94	· · 51.61	261°54.39	· · 50.44			Altair	61°59.68 8°55.92
4	275°23.94	277°46.04	53.10	148°41.99	18.04	195°35.87	51.65	276°56.61	50.35			Peacock	53°5.34 -56°39.01
5	290°26.40	292°47.25	53.15	163°43.31	17.73	210°37.81	51.69	291°58.83	50.25			Deneb	49°25.69 45°21.88
6	305°28.86	307°48.46	N00°53.21	178°44.62	N21°17.41	225°39.74	N22°51.73	307°1.05	S02°50.15			Enif	33°38.69 9°59.28
7	320°31.33	322°49.66	53.27	193°45.94	17.10	240°41.67	51.77	322°3.27	50.05			Al Na'ir	27°32.80 -46°50.17
8	335°33.79	337°50.87	53.33	208°47.25	16.78	255°43.61	51.81	337°5.50	49.95			Fomalhaut	15°14.48 -29°29.26
9	350°36.26	352°52.07	· · 53.39	223°48.57	· · 16.47	270°45.54	· · 51.85	352°7.72	· · 49.86			Scheat	13°45.23 28°12.98
10	5°38.72	7°53.26											

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	180°30.27	N13°12.13	217°22.06	11.2'	S01°55.18	-17.6'	60.2'
1	195°30.37	12.95	231°52.24	11.2'	01°37.60	-17.6'	60.2'
2	210°30.48	13.76	246°22.39	11.1'	01°20.00	-17.6'	60.3'
3	225°30.59	•• 14.58	260°52.52	11.1'	01°2.38	-17.7'	60.3'
4	240°30.69	15.39	275°22.62	11.1'	00°44.73	-17.7'	60.3'
5	255°30.80	16.20	289°52.68	11.0'	00°27.05	-17.7'	60.4'
6	270°30.90	N13°17.01	304°22.72	11.0'	S00°9.36	-17.7'	60.4'
7	285°31.01	17.83	318°52.72	11.0'	N00°8.36	17.7'	60.4'
8	300°31.11	18.64	333°22.69	10.9'	00°26.09	17.7'	60.5'
9	315°31.22	•• 19.45	347°52.62	10.9'	00°43.83	17.8'	60.5'
10	330°31.32	20.26	2°22.52	10.9'	01°1.59	17.8'	60.5'
11	345°31.43	21.07	16°52.37	10.8'	01°19.36	17.8'	60.5'
12	0°31.53	N13°21.88	31°22.19	10.8'	N01°37.15	17.8'	60.6'
13	15°31.63	22.69	45°51.97	10.7'	01°54.94	17.8'	60.6'
14	30°31.74	23.50	60°21.70	10.7'	02°12.73	17.8'	60.6'
15	45°31.84	•• 24.31	74°51.39	10.6'	02°30.53	17.8'	60.6'
16	60°31.94	25.12	89°21.03	10.6'	03°48.34	17.8'	60.7'
17	75°32.05	25.93	103°50.63	10.5'	02°8.14	17.8'	60.7'
18	90°32.15	N13°26.74	118°20.18	10.5'	N03°23.94	17.8'	60.7'
19	105°32.25	27.55	132°49.68	10.4'	03°41.74	17.8'	60.7'
20	120°32.35	28.35	147°19.13	10.4'	03°59.54	17.8'	60.8'
21	135°32.46	•• 29.16	161°48.53	10.3'	04°17.32	17.8'	60.8'
22	150°32.56	29.97	176°17.87	10.3'	04°35.10	17.8'	60.8'
23	165°32.66	30.77	190°47.16	10.2'	04°52.87	17.8'	60.8'
SD = 15.9'			SD = 16.4'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.76	N13°31.58	205°16.40	10.2'	N05°10.62	17.7'	60.9'
1	195°32.86	32.38	219°45.57	10.1'	05°28.36	17.7'	60.9'
2	210°32.96	33.19	234°14.69	10.1'	05°46.08	17.7'	60.9'
3	225°33.06	•• 33.99	248°43.75	10.0'	06°3.78	17.7'	60.9'
4	240°33.16	34.80	263°12.75	9.9'	06°21.45	17.7'	60.9'
5	255°33.26	35.60	277°41.68	9.9'	06°39.11	17.6'	61.0'
6	270°33.36	N13°36.41	292°10.56	9.8'	N06°56.74	17.6'	61.0'
7	285°33.46	37.21	306°39.36	9.7'	07°14.34	17.6'	61.0'
8	300°33.56	38.01	321°8.10	9.7'	07°31.91	17.5'	61.0'
9	315°33.66	•• 38.81	335°36.78	9.6'	07°49.45	17.5'	61.0'
10	330°33.76	39.62	350°5.38	9.5'	08°6.96	17.5'	61.1'
11	345°33.86	40.42	4°33.92	9.5'	08°24.43	17.4'	61.1'
12	0°33.96	N13°41.22	19°2.38	9.4'	N08°41.86	17.4'	61.1'
13	15°34.06	42.02	33°30.77	9.3'	08°59.25	17.3'	61.1'
14	30°34.16	42.82	47°59.09	9.2'	09°16.60	17.3'	61.1'
15	45°34.26	•• 43.62	62°27.34	9.2'	09°33.90	17.3'	61.1'
16	60°34.35	44.42	76°55.51	9.1'	09°51.15	17.2'	61.2'
17	75°34.45	45.22	91°23.60	9.0'	10°8.36	17.2'	61.2'
18	90°34.55	N13°46.02	105°51.61	8.9'	N10°25.51	17.1'	61.2'
19	105°34.65	46.82	120°19.55	8.9'	10°42.61	17.0'	61.2'
20	120°34.74	47.61	134°47.40	8.8'	10°59.65	17.0'	61.2'
21	135°34.84	•• 48.41	149°15.17	8.7'	11°16.64	16.9'	61.2'
22	150°34.94	49.21	163°42.86	8.6'	11°33.56	16.9'	61.2'
23	165°35.03	50.01	178°10.47	8.5'	11°50.42	16.8'	61.2'
SD = 15.9'			SD = 16.6'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.13	N13°50.80	192°38.00	8.4'	N12°7.22	16.7'	61.2'
1	195°35.22	51.60	207°5.43	8.4'	12°23.94	16.7'	61.3'
2	210°35.32	52.39	221°32.79	8.3'	12°40.60	16.6'	61.3'
3	225°35.41	•• 53.19	236°0.05	8.2'	12°57.19	16.5'	61.3'
4	240°35.51	53.98	250°27.23	8.1'	13°13.70	16.4'	61.3'
5	255°35.61	54.78	264°54.32	8.0'	13°30.13	16.4'	61.3'
6	270°35.70	N13°55.57	279°21.32	7.9'	N13°46.48	16.3'	61.3'
7	285°35.79	56.37	293°48.23	7.8'	14°2.76	16.2'	61.3'
8	300°35.89	57.16	308°15.04	7.7'	14°18.95	16.1'	61.3'
9	315°35.98	•• 57.95	322°41.77	7.6'	14°35.05	16.0'	61.3'
10	330°36.08	58.74	337°8.40	7.5'	14°51.06	15.9'	61.3'
11	345°36.17	13°59.54	351°34.94	7.4'	15°6.98	15.8'	61.3'
12	0°36.26	N14°0.33	6°1.39	7.4'	N15°22.81	15.7'	61.3'
13	15°36.36	1.12	20°27.74	7.3'	15°38.55	15.6'	61.3'
14	30°36.45	1.91	34°54.00	7.2'	15°54.18	15.5'	61.3'
15	45°36.54	•• 2.70	49°20.16	7.1'	16°9.72	15.4'	61.3'
16	60°36.64	3.49	63°46.22	7.0'	16°25.15	15.3'	61.3'
17	75°36.73	4.28	78°12.19	6.9'	16°40.48	15.2'	61.3'
18	90°36.82	N14°5.07	92°38.06	6.8'	N16°55.70	15.1'	61.3'
19	105°36.91	5.86	107°3.83	6.7'	17°10.82	15.0'	61.3'
20	120°37.00	6.65	121°29.51	6.6'	17°25.82	14.9'	61.3'
21	135°37.09	•• 7.44	135°55.08	6.5'	17°40.70	14.8'	61.3'
22	150°37.19	8.22	150°20.56	6.4'	17°55.47	14.7'	61.3'
23	165°37.28	9.01	164°45.94	6.3'	18°10.12	14.5'	61.3'
SD = 15.9'			SD = 16.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	02:29	21:32	////	////
N 70°	////	00:48	02:58	21:02	23:28	////
68°	////	01:50	03:19	20:39	22:12	////
66°	////	02:23	03:36	20:22	21:37	////
64°	00:42	02:47	03:50	20:08	21:12	23:32
62°	01:37	03:06	04:01	19:56	20:53	22:25
60°	02:07	03:21	04:11	19:46	20:37	21:52
N 58°	02:29	03:33	04:20	19:37	20:24	21:29
56°	02:47	03:44	04:27	19:30	20:13	21:11
54°	03:01	03:54	04:34	19:23	20:03	20:56
52°	03:14	04:02	04:40	19:17	19:55	20:44
50°	03:24	04:09	04:45	19:11	19:47	20:33
45°	03:46	04:25	04:57	18:59	19:31	20:11
N 40°	04:03	04:38	05:06	18:50	19:19	19:54
35°	04:16	04:48	05:15	18:41	19:08	19:40
30°	04:27	04:57	05:22	18:34	18:59	19:29
20°	04:44	05:11	05:34	18:22	18:45	19:12
N 10°	04:58	05:23	05:45	18:11	18:33	18:58
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:51	18:13	18:38
20°	05:26	05:52	06:14	17:41	18:03	18:30
30°	05:33	06:01	06:26	17:29	17:54	18:22
35°	05:37	06:07	06:33	17:22	17:48	18:18
40°	05:40	06:12	06:40	17:15	17:43	18:15
45°	05:44	06:18	06:49	17:06	17:36	18:11
S 50°	05:48	06:26	06:59	16:55	17:29	18:07
52°	05:49	06:29	07:04	16:51	17:26	18:05
54°	05:51	06:32	07:10	16:45	17:22	18:04
56°	05:52	06:36	07:15	16:39	17:18	18:02
58°	05:54	06:40	07:22	16:32	17:14	18:00
S 60°	05:56	06:45	07:30	16:25	17:09	17:59

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	03:50	03:11	02:21	16:39	19:21	☐
N 70°	03:49	03:19	02:42	16:35	19:02	22:06
68°	03:48	03:26	03:00	16:31	18:47	21:24
66°	03:47	03:31	03:13	16:28	18:35	20:56
64°	03:46	03:36	03:25	16:26	18:25	20:35
62°	03:46	03:40	03:35	16:24	18:17	20:18
60°	03:45	03:44	03:44	16:22	18:10	20:04
N 58°	03:44	03:47	03:51	16:21	18:04	19:53
56°	03:44	03:50	03:58	16:19	17:58	19:42
54°	03:44	03:53	04:04	16:18	17:54	19:33
52°	03:43	03:55	04:09	16:17	17:49	19:25
50°	03:43	03:58	04:14	16:16	17:45	19:18
45°	03:42	04:03	04:25	16:14	17:37	19:03
N 40°	03:42	04:07	04:34	16:12	17:30	18:50
35°	03:41	04:10	04:42	16:10	17:23	18:40
30°	03:41	04:14	04:49	16:09	17:18	18:31
20°	03:40	04:19	05:01	16:06	17:09	18:15
N 10°	03:39	04:24	05:12	16:04	17:01	18:01
0°	03:38	04:29	05:22	16:02	16:53	17:48
S 10°	03:38	04:34	05:32	16:00	16:46	17:36
20°	03:37	04:39	05:43	15:58	16:38	17:22
30°	03:36	04:45	05:56	15:55	16:29	17:07
35°	03:36	04:48	06:03	15:54	16:24	16:58
40°	03:36	04:52	06:12	15:52	16:18	16:48
45°	03:35	04:57	06:22	15:50	16:11	16:36
S 50°	03:35	05:02	06:34	15:48	16:03	16:22
52°	03:34	05:05	06:39	15:47	16:00	16:15
54°	03:34	05:08	06:46	15:46	15:56	16:08
56°	03:34	05:11	06:53	15:45	15:51	16:00
58°	03:33	05:15	07:01	15:43	15:46	15:51
S 60°	03:33	05:19	07:10	15:42	15:41	15:40

Day	Sun		Mer. Pass hh:mm	Moon		Age 27-0 12-1%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
25	02:01	02:06	11:58	09:50	22:15	
26	02:11	02:16	11:58	10:41	23:08	
27	02:21	02:25	11:58	11:35	--:--	

April 28, 29, 30 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°13.22		218°9.79	N00°54.47	89°8.24	N21°11.72	136°14.53	N22°52.44	217°41.05	S02°48.40
1	231°15.68		233°10.96	54.56	104°9.55	11.41	151°16.46	52.48	232°43.28	48.30
2	246°18.15		248°12.12	54.64	119°10.86	11.09	166°18.39	52.52	247°45.50	48.20
3	261°20.61		263°13.28	· · 54.73	134°12.17	· · 10.77	181°20.32	· · 52.56	262°47.72	· · 48.10
4	276°23.07		278°14.44	54.82	149°13.48	10.45	196°22.25	52.60	277°49.95	48.01
5	291°25.54		293°15.59	54.91	164°14.79	10.13	211°24.18	52.64	292°52.17	47.91
6	306°28.00		308°16.74	N00°55.00	179°16.10	N21°9.81	226°26.11	N22°52.68	307°54.39	S02°47.81
7	321°30.47		323°17.89	55.09	194°17.40	9.49	241°28.04	52.72	322°56.62	47.72
8	336°32.93		338°19.04	55.18	209°18.71	9.17	256°29.97	52.76	337°58.84	47.62
9	351°35.39		353°20.19	· · 55.28	224°20.02	· · 8.86	271°31.90	· · 52.80	353°1.06	· · 47.52
10	6°37.86		8°21.33	55.38	239°21.33	8.54	286°33.83	52.84	8°3.29	47.43
11	21°40.32		23°22.48	55.47	254°22.63	8.22	301°35.76	52.87	23°5.51	47.33
12	36°42.79		38°23.62	N00°55.57	269°23.94	N21°7.90	316°37.69	N22°52.91	38°7.73	S02°47.23
13	51°45.25		53°24.75	55.67	284°25.24	7.58	331°39.62	52.95	53°9.96	47.14
14	66°47.72		68°25.89	55.78	299°26.55	7.26	346°41.55	52.99	68°12.18	47.04
15	81°50.18		83°27.02	· · 55.88	314°27.86	· · 6.94	1°43.48	· · 53.03	83°14.41	· · 46.94
16	96°52.64		98°28.15	55.99	329°29.16	6.61	16°45.41	53.07	98°16.63	46.85
17	111°55.11		113°29.28	56.09	344°30.47	6.29	31°47.34	53.11	113°18.85	46.75
18	126°57.57		128°30.41	N00°56.20	359°31.77	N21°5.97	46°49.27	N22°53.15	128°21.08	S02°46.65
19	142°00.04		143°31.53	56.31	14°33.07	5.65	61°51.20	53.19	143°23.30	46.56
20	157°2.50		158°32.66	56.42	29°34.38	5.33	76°53.13	53.23	158°25.53	46.46
21	172°4.96		173°33.78	· · 56.53	44°35.68	· · 5.01	91°55.05	· · 53.26	173°27.75	· · 46.36
22	187°7.43		188°34.90	56.65	59°36.99	4.69	106°56.98	53.30	188°29.98	46.27
23	202°9.89		203°36.01	56.76	74°38.29	4.36	121°58.91	53.34	203°32.20	46.17
Mer.pass. 09:34		ν1.2' d0.1' m-4.74		ν1.3' d-0.3' m0.90		ν1.9' d0.0' m-1.99		ν2.2' d-0.1' m1.17		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°12.36		218°37.13	N00°56.88	89°39.59	N21°4.04	137°0.84	N22°53.38	218°34.43	S02°46.08
1	232°14.82		233°38.24	56.99	104°40.89	3.72	152°2.77	53.42	233°36.65	45.98
2	247°17.29		248°39.35	57.11	119°42.20	3.40	167°4.69	53.46	248°38.88	45.88
3	262°19.75		263°40.46	· · 57.23	134°43.50	· · 3.07	182°6.62	· · 53.50	263°41.10	· · 45.79
4	277°22.21		278°41.56	57.36	149°44.80	2.75	197°8.55	53.54	278°43.33	45.69
5	292°24.68		293°42.67	57.48	164°46.10	2.43	212°10.48	53.57	293°45.55	45.59
6	307°27.14		308°43.77	N00°57.60	179°47.40	N21°2.10	227°12.40	N22°53.61	308°47.78	S02°45.50
7	322°29.61		323°44.87	57.73	194°48.70	1.78	242°14.33	53.65	323°50.00	45.40
8	337°32.07		338°45.97	57.86	209°50.00	1.46	257°16.26	53.69	338°52.23	45.31
9	352°34.53		353°47.06	· · 57.99	224°51.30	· · 1.13	272°18.18	· · 53.73	353°54.45	· · 45.21
10	7°37.00		8°48.15	58.12	239°52.60	0.81	287°20.11	53.77	8°56.68	45.11
11	22°39.46		23°49.25	58.25	254°53.90	0.48	302°22.04	53.81	23°58.91	45.02
12	37°41.93		38°50.33	N00°58.38	269°55.20	N21°0.16	317°23.96	N22°53.84	39°1.13	S02°44.92
13	52°44.39		53°51.42	58.52	284°56.50	20°59.84	332°25.89	53.88	54°3.36	44.83
14	67°46.86		68°52.51	58.65	299°57.80	59.51	347°27.82	53.92	69°5.58	44.73
15	82°49.32		83°53.59	· · 58.79	314°59.10	· · 59.19	2°29.74	· · 53.96	84°7.81	· · 44.64
16	97°51.78		98°54.67	58.93	330°0.40	58.86	17°31.67	54.00	99°10.04	44.54
17	112°54.25		113°55.75	59.07	345°1.70	58.54	32°33.59	54.04	114°12.26	44.44
18	127°56.71		128°56.83	N00°59.21	0°2.99	N20°58.21	47°35.52	N22°54.08	129°14.49	S02°44.35
19	142°59.18		143°57.90	59.35	15°4.29	57.88	62°37.45	54.11	144°16.71	44.25
20	158°1.64		158°58.97	59.49	30°5.59	57.56	77°39.37	54.15	159°18.94	44.16
21	173°4.11		174°0.04	· · 59.64	45°6.89	· · 57.23	92°41.30	· · 54.19	174°21.17	· · 44.06
22	188°6.57		189°1.11	59.79	60°8.18	56.91	107°43.22	54.23	189°23.39	43.97
23	203°9.03		204°2.18	59.93	75°9.48	56.58	122°45.15	54.27	204°25.62	43.87
Mer.pass. 09:30		ν1.1' d0.1' m-4.73		ν1.3' d-0.3' m0.91		ν1.9' d0.0' m-1.99		ν2.2' d-0.1' m1.17		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°11.50		219°3.24	N01°0.08	90°10.77	N20°56.25	137°47.07	N22°54.31	219°27.85	S02°43.78
1	233°13.96		234°4.31	0.23	105°12.07	55.93	152°49.00	54.34	234°30.07	43.68
2	248°16.43		249°5.37	0.39	120°13.37	55.60	167°50.92	54.38	249°32.30	43.59
3	263°18.89		264°6.42	· · 0.54	135°14.66	· · 55.27	182°52.84	· · 54.42	264°34.53	· · 43.49
4	278°21.35		279°7.48	0.70	150°15.96	54.94	197°54.77	54.46	279°36.76	43.40
5	293°23.82		294°8.54	0.85	165°17.25	54.62	212°56.69	54.50	294°38.98	43.30
6	308°26.28		309°9.59	N01°1.01	180°18.55	N20°54.29	227°58.62	N22°54.53	309°41.21	S02°43.21
7	323°28.75		324°10.64	1.17	195°19.84	53.96	243°0.54	54.57	324°43.44	43.11
8	338°31.21		339°11.69	1.33	210°21.13	53.63	258°2.46	54.61	339°45.66	43.02
9	353°33.68		354°12.73	· · 1.49	225°22.43	· · 53.30	273°4.39	· · 54.65	354°47.89	· · 42.92
10	8°36.14		9°13.78	1.65	240°23.72	52.97	288°6.31	54.69	9°50.12	42.83
11	23°38.60		24°14.82	1.82	255°25.01	52.65	303°8.23	54.72	24°52.35	42.73
12	38°41.07		39°15.86	N01°1.98	270°26.31	N20°52.32	318°10.16	N22°54.76	39°54.58	S02°42.64
13	53°43.53		54°16.90	2.15	285°27.60	51.99	333°12.08	54.80	54°56.80	42.54
14	68°46.00		69°17.94	2.32	300°28.89	51.66	348°14.00	54.84	69°59.03	42.45
15	83°48.46		84°18.97	· · 2.49	315°30.18	· · 51.33	3°15.93	· · 54.88	85°1.26	· · 42.35
16	98°50.93		99°20.00	2.66	330°31.47	51.00	18°17.85	54.91	100°3.49	42.26
17	113°53.39		114°21.03	2.83	345°32.77	50.67	33°19.77	54.95	115°5.72	42.16
18	128°55.85		129°22.06	N01°3.00	0°34.06	N20°50.34	48°21.69	N22°54.99	130°7.94	S02°42.07
19	143°58.32		144°23.09	3.18	15°35.35	50.01	63°23.62	55.03	145°10.17	41.97
20	159°0.78		159°24.11	3.35	30°36.64	49.68	78°25.54	55.07	160°12.40	41.88
21	174°3.25		174°25.14	· · 3.53	45°37.93	· · 49.35	93°27.46	· · 55.10	175°14.63	· · 41.78
22	189°5.71		189°26.16	3.71	60°39.22	49.02	108°29.38	55.14	190°16.86	41.69
23	204°8.17		204°27.17	3.89	75°40.51	48.69	123°31.30	55.18	205°19.09	41.60
Mer.pass. 09:26		ν1.1' d0.2' m-4.72		ν1.3' d-0.3' m0.92		ν1.9' d0.0' m-1.99		ν2.2' d-0.1' m1.17		

	SHA	Dec
Alpheratz	357°34.84	29°13.63
Ankaa	353°7.26	-42°10.05
Schedar	349°31.32	56°40.38
Diphda	348°47.36	-17°50.90
Achernar	335°20.55	-57°6.45
Hamal	327°51.30	23°34.82
Polaris	314°24.91	89°22.27
Acamar	315°12.01	-40°12.24
Menkar	314°6.23	4°11.26
Mirfak	308°28.44	49°57.05
Aldebaran	290°39.66	16°33.57
Rigel	281°3.91	-8°10.44
Capella	280°21.92	46°1.48
Bellatrix	278°22.88	6°22.30
Elnath	278°1.86	28°37.74
Alnilam	275°37.74	-1°11.22
Betelgeuse	270°52.06	7°24.66
Canopus	263°52.60	-52°42.75
Sirius	258°26.21	-16°45.19
Adhara	255°5.86	-29°0.57
Procyon	244°50.69	5°9.55
Pollux	243°17.12	27°57.97
Avior	234°14.73	-59°35.70
Suhail	222°46.12	-43°32.34
Miaplacidus	221°38.17	-69°49.54
Alphard	217°47.48	-8°46.23
Regulus	207°34.08	11°50.58
Dubhe	193°40.30	61°37.05
Denebola	182°24.47	14°25.78
Gienah	175°43.09	-17°41.11
Acrux	172°59.31	-63°14.58
Gacrux	171°50.93	-57°15.51
Alioth	166°12.23	55°49.39
Spica	158°21.76	-11°17.75
Alkaid	152°51.32	49°11.17
Hadar	148°35.07	-60°29.81
Menkent	147°56.97	-36°29.80
Arcturus	145°47.36	19°2.92
Rigel Kent.	139°39.36	-60°56.46
Kochab	137°18.57	74°2.97
Zuben'ubi	136°55.44	-16°8.93
Alphecca	126°3.19	26°37.60
Antares	112°15.24	-26°29.33
Atria	107°8.82	-69°4.24
Sabik	102°2.25	-15°45.44
Shaula	96°9.76	-37°7.28
Rasalhague	95°58.09	12°32.30
Eltanin	90°41.73	51°28.80
Kaus Aust.	83°31.99	-34°22.30
Vega	80°32.85	38°48.11
Nunki	75°47.31	-26°15.89
Altair	61°59.66	8°55.93
Peacock	53°5.31	-56°39.00
Deneb	49°25.66	45°21.89
Enif	33°38.66	9°59.29
Al Na'ir	27°32.78	-46°50.16
Fomalhaut	15°14.46	-29°29.25

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.37	N14°9.80	179°11.23	6.2'	N18°24.65	14.4'	61.3'
1	195°37.46	10.58	193°36.41	6.1'	18°39.06	14.3'	61.3'
2	210°37.55	11.37	208°1.50	6.0'	18°53.34	14.2'	61.3'
3	225°37.64	· · 12.16	222°26.48	5.9'	19°7.49	14.0'	61.3'
4	240°37.73	12.94	236°51.37	5.8'	19°21.51	13.9'	61.3'
5	255°37.82	13.73	251°16.16	5.7'	19°35.40	13.8'	61.3'
6	270°37.91	N14°14.51	265°40.85	5.6'	N19°49.16	13.6'	61.3'
7	285°38.00	15.29	280°5.44	5.5'	20°2.77	13.5'	61.3'
8	300°38.09	16.08	294°29.94	5.4'	20°16.25	13.3'	61.2'
9	315°38.17	· · 16.86	308°54.33	5.3'	20°29.59	13.2'	61.2'
10	330°38.26	17.64	323°18.63	5.2'	20°42.79	13.0'	61.2'
11	345°38.35	18.43	337°42.84	5.1'	20°55.84	12.9'	61.2'
12	0°38.44	N14°19.21	352°6.94	5.0'	N21°8.74	12.8'	61.2'
13	15°38.53	19.99	6°30.95	4.9'	21°21.49	12.6'	61.2'
14	30°38.61	20.77	20°54.87	4.8'	21°34.09	12.4'	61.2'
15	45°38.70	· · 21.55	35°18.69	4.7'	21°46.54	12.3'	61.2'
16	60°38.79	22.33	49°42.42	4.6'	21°58.83	12.1'	61.2'
17	75°38.88	23.11	64°6.05	4.5'	22°10.96	12.0'	61.1'
18	90°38.96	N14°23.89	78°29.60	4.5'	N22°22.93	11.8'	61.1'
19	105°39.05	24.67	92°53.05	4.4'	22°34.74	11.6'	61.1'
20	120°39.14	25.45	107°16.41	4.3'	22°46.39	11.5'	61.1'
21	135°39.22	· · 26.23	121°39.69	4.2'	22°57.87	11.3'	61.1'
22	150°39.31	27.00	136°2.87	4.1'	23°9.18	11.1'	61.1'
23	165°39.39	27.78	150°25.97	4.0'	23°20.33	11.0'	61.0'
SD = 15.9'		$d = 0.8'$	SD = 16.7'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.48	N14°28.56	164°48.98	3.9'	N23°31.30	10.8'	61.0'
1	195°39.56	29.34	179°11.91	3.8'	23°42.10	10.6'	61.0'
2	210°39.65	30.11	193°34.76	3.8'	23°52.72	10.4'	61.0'
3	225°39.73	· · 30.89	207°57.52	3.7'	24°3.17	10.3'	61.0'
4	240°39.82	31.66	222°20.21	3.6'	24°13.44	10.1'	61.0'
5	255°39.90	32.44	236°42.81	3.5'	24°23.53	9.9'	60.9'
6	270°39.99	N14°33.21	251°5.34	3.5'	N24°33.44	9.7'	60.9'
7	285°40.07	33.99	265°27.80	3.4'	24°43.16	9.5'	60.9'
8	300°40.15	34.76	279°50.18	3.3'	24°52.70	9.4'	60.9'
9	315°40.24	· · 35.53	294°12.49	3.2'	25°2.06	9.2'	60.8'
10	330°40.32	36.31	308°34.73	3.2'	25°11.22	9.0'	60.8'
11	345°40.40	37.08	322°56.90	3.1'	25°20.20	8.8'	60.8'
12	0°40.49	N14°37.85	337°19.01	3.0'	N25°28.98	8.6'	60.8'
13	15°40.57	38.62	351°41.05	3.0'	25°37.58	8.4'	60.8'
14	30°40.65	39.39	6°3.03	2.9'	25°45.98	8.2'	60.7'
15	45°40.73	· · 40.16	20°24.96	2.9'	25°54.19	8.0'	60.7'
16	60°40.81	40.93	34°46.82	2.8'	26°2.20	7.8'	60.7'
17	75°40.90	41.70	49°8.63	2.8'	26°10.01	7.6'	60.7'
18	90°40.98	N14°42.47	63°30.39	2.7'	N26°17.63	7.4'	60.6'
19	105°41.06	43.24	77°52.10	2.7'	26°25.05	7.2'	60.6'
20	120°41.14	44.01	92°13.76	2.6'	26°32.27	7.0'	60.6'
21	135°41.22	· · 44.78	106°35.37	2.6'	26°39.28	6.8'	60.5'
22	150°41.30	45.55	120°56.94	2.5'	26°46.10	6.6'	60.5'
23	165°41.38	46.31	135°18.47	2.5'	26°52.71	6.4'	60.5'
SD = 15.9'		$d = 0.8'$	SD = 16.6'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.46	N14°47.08	149°39.97	2.5'	N26°59.12	6.2'	60.5'
1	195°41.54	47.85	164°1.43	2.4'	27°5.32	6.0'	60.4'
2	210°41.62	48.61	178°22.85	2.4'	27°11.32	5.8'	60.4'
3	225°41.70	· · 49.38	192°44.25	2.4'	27°17.12	5.6'	60.4'
4	240°41.78	50.14	207°5.62	2.3'	27°22.70	5.4'	60.3'
5	255°41.86	50.91	221°26.97	2.3'	27°28.08	5.2'	60.3'
6	270°41.94	N14°51.67	235°48.29	2.3'	N27°33.26	5.0'	60.3'
7	285°42.01	52.44	250°9.60	2.3'	27°38.22	4.8'	60.2'
8	300°42.09	53.20	264°30.89	2.3'	27°42.98	4.5'	60.2'
9	315°42.17	· · 53.96	278°52.17	2.3'	27°47.53	4.3'	60.2'
10	330°42.25	54.73	293°13.44	2.3'	27°51.87	4.1'	60.2'
11	345°42.33	55.49	307°34.71	2.3'	27°56.00	3.9'	60.1'
12	0°42.40	N14°56.25	321°55.97	2.3'	N27°59.92	3.7'	60.1'
13	15°42.48	57.01	336°17.22	2.3'	28°3.63	3.5'	60.1'
14	30°42.56	57.77	350°38.49	2.3'	28°7.14	3.3'	60.0'
15	45°42.63	· · 58.53	4°59.75	2.3'	28°10.43	3.1'	60.0'
16	60°42.71	14°59.29	19°21.03	2.3'	28°13.51	2.9'	60.0'
17	75°42.79	15°0.05	33°42.31	2.3'	28°16.39	2.7'	59.9'
18	90°42.86	N15°0.81	48°3.62	2.3'	N28°19.05	2.5'	59.9'
19	105°42.94	1.57	62°24.93	2.3'	28°21.51	2.2'	59.8'
20	120°43.01	2.33	76°46.27	2.4'	28°23.76	2.0'	59.8'
21	135°43.09	· · 3.09	91°7.64	2.4'	28°25.79	1.8'	59.8'
22	150°43.16	3.84	105°29.03	2.4'	28°27.62	1.6'	59.7'
23	165°43.24	4.60	119°50.45	2.5'	28°29.25	1.4'	59.7'
SD = 15.9'		$d = 0.8'$	SD = 16.5'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	02:07	21:54	////	////
N 70°	////	////	02:41	21:18	////	////
68°	////	01:25	03:06	20:52	22:38	////
66°	////	02:06	03:25	20:33	21:53	////
64°	////	02:33	03:40	20:17	21:25	////
62°	01:15	02:54	03:52	20:04	21:03	22:47
60°	01:52	03:11	04:03	19:53	20:46	22:07
N 58°	02:17	03:25	04:12	19:44	20:32	21:40
56°	02:37	03:36	04:20	19:36	20:20	21:20
54°	02:53	03:47	04:27	19:28	20:10	21:04
52°	03:06	03:55	04:34	19:22	20:00	20:51
50°	03:17	04:03	04:40	19:16	19:52	20:39
45°	03:40	04:20	04:52	19:03	19:36	20:15
N 40°	03:58	04:33	05:02	18:53	19:22	19:58
35°	04:12	04:44	05:11	18:44	19:11	19:43
30°	04:24	04:54	05:19	18:36	19:01	19:32
20°	04:42	05:09	05:32	18:23	18:46	19:13
N 10°	04:56	05:22	05:43	18:11	18:33	18:59
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:50	18:12	18:37
20°	05:27	05:53	06:15	17:39	18:02	18:28
30°	05:35	06:03	06:28	17:26	17:51	18:19
35°	05:39	06:09	06:35	17:19	17:45	18:15
40°	05:43	06:15	06:43	17:11	17:39	18:11
45°	05:47	06:22	06:53	17:01	17:32	18:07
S 50°	05:52	06:30	07:04	16:50	17:24	18:02
52°	05:54	06:33	07:09	16:45	17:20	18:00
54°	05:55	06:37	07:15	16:39	17:16	17:58
56°	05:58	06:42	07:21	16:32	17:12	17:56
58°	06:00	06:46	07:29	16:25	17:07	17:54
S 60°	06:02	06:51	07:37	16:17	17:02	17:52

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	01:36	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	02:19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	02:49	01:46	<input type="checkbox"/>	· · ·	00:05	<input type="checkbox"/>
64°	03:11	02:48	<input type="checkbox"/>	23:04	<input type="checkbox"/>	<input type="checkbox"/>
62°	03:29	03:23	03:11	22:30	· · ·	00:54
60°	03:44	03:48	04:00	22:05	· · ·	00:06
N 58°	03:57	04:09	04:31	21:46	23:36	· · ·
56°	04:09	04:25	04:54	21:29	23:12	· · ·
54°	04:19	04:40	05:14	21:16	22:54	· · ·
52°	04:27	04:53	05:30	21:04	22:38	23:58
50°	04:35	05:04	05:44	20:53	22:24	23:42
45°	04:53	05:27	06:13	20:31	21:56	23:11
N 40°	05:07	05:46	06:35	20:13	21:34	22:47
35°	05:19	06:02	06:54	19:58	21:16	22:28
30°	05:29	06:16	07:10	19:45	21:00	22:11
20°	05:48	06:40	07:38	19:24	20:34	21:42
N 10°	06:04	07:00	08:02	19:05	20:11	21:17
0°	06:19	07:20	08:24	18:47	19:50	20:55
S 10°	06:34	07:39	08:46	18:30	19:29	20:32
20°	06:51	08:00	09:10	18:11	19:06	20:07
30°	07:10	08:25	09:38	17:50	18:40	19:38
35°	07:21	08:39	09:55	17:37	18:25	19:21
40°	07:34	08:56	10:14	17:23	18:07	19:02
45°	07:49	09:17	10:38	17:06	17:46	18:38
S 50°	08:08	09:42	11:08	16:46	17:19	18:07
52°	08:17	09:55	11:24	16:36	17:06	17:51
54°	08:28	10:09	11:41	16:25	16:51	17:34
56°	08:39	10:26	12:03	16:13	16:34	17:12
58°	08:53	10:46	12:30	15:58	16:13	16:44
S 60°	09:08	11:12	13:09	15:42	15:47	16:05

Day	Sun			Moon	
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm
28	02:29	02:34	11:57	12:33	00:03
29	02:38	02:42	11:57	13:35	01:03
30	02:46	02:50	11:57	14:39	02:07

May 01, 02, 03 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°10.64		219°28.19	N01°4.07	90°41.80	N20°48.35	138°33.23	N22°55.22	220°21.32	S02°41.50
1	234°13.10		234°29.21	4.25	105°43.09	48.02	153°35.15	55.25	235°23.54	41.41
2	249°15.57		249°30.22	4.44	120°44.38	47.69	168°37.07	55.29	250°25.77	41.31
3	264°18.03		264°31.23	· · 4.62	135°45.67	· · 47.36	183°38.99	· · 55.33	265°28.00	· · 41.22
4	279°20.50		279°32.24	4.81	150°46.95	47.03	198°40.91	55.37	280°30.23	41.12
5	294°22.96		294°33.25	5.00	165°48.24	46.70	213°42.83	55.40	295°32.46	41.03
6	309°25.42		309°34.25	N01°5.19	180°49.53	N20°46.36	228°44.75	N22°55.44	310°34.69	S02°40.94
7	324°27.89		324°35.26	5.38	195°50.82	46.03	243°46.67	55.48	325°36.92	40.84
8	339°30.35		339°36.26	5.57	210°52.11	45.70	258°48.59	55.52	340°39.15	40.75
9	354°32.82		354°37.26	· · 5.76	225°53.39	· · 45.37	273°50.51	· · 55.55	355°41.38	· · 40.65
10	9°35.28		9°38.25	5.96	240°54.68	45.03	288°52.43	55.59	10°43.61	40.56
11	24°37.75		24°39.25	6.15	255°55.97	44.70	303°54.35	55.63	25°45.84	40.47
12	39°40.21		39°40.24	N01°6.35	270°57.25	N20°44.37	318°56.27	N22°55.67	40°48.07	S02°40.37
13	54°42.67		54°41.23	6.55	285°58.54	44.03	333°58.19	55.70	55°50.30	40.28
14	69°45.14		69°42.22	6.75	300°59.83	43.70	349°0.11	55.74	70°52.53	40.18
15	84°47.60		84°43.21	· · 6.95	316°1.11	· · 43.36	4°2.03	· · 55.78	85°54.76	· · 40.09
16	99°50.07		99°44.20	7.15	331°2.40	43.03	19°3.95	55.82	100°56.99	40.00
17	114°52.53		114°45.18	7.35	346°3.68	42.70	34°5.87	55.85	115°59.22	39.90
18	129°54.99		129°46.17	N01°7.56	1°4.97	N20°42.36	49°7.79	N22°55.89	131°1.45	S02°39.81
19	144°57.46		144°47.15	7.76	16°6.25	42.03	64°9.71	55.93	146°3.68	39.72
20	159°59.92		159°48.12	7.97	31°7.54	41.69	79°11.63	55.96	161°5.91	39.62
21	175°2.39		174°49.10	· · 8.18	46°8.82	· · 41.36	94°13.55	· · 56.00	176°8.14	· · 39.53
22	190°4.85		189°50.08	8.39	61°10.10	41.02	109°15.47	56.04	191°10.37	39.44
23	205°7.32		204°51.05	8.60	76°11.39	40.69	124°17.39	56.08	206°12.60	39.34
Mer.pass. 09:22		ν1.0' d0.2' m-4.72		ν1.3' d-0.3' m0.94		ν1.9' d0.0' m-1.98		ν2.2' d-0.1' m1.17		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°9.78		219°52.02	N01°8.81	91°12.67	N20°40.35	139°19.31	N22°56.11	221°14.83	S02°39.25
1	235°12.24		234°52.99	9.03	106°13.95	40.01	154°21.22	56.15	236°17.06	39.16
2	250°14.71		249°53.96	9.24	121°15.24	39.68	169°23.14	56.19	251°19.29	39.06
3	265°17.17		264°54.92	· · 9.46	136°16.52	· · 39.34	184°25.06	· · 56.22	266°21.52	· · 38.97
4	280°19.64		279°55.89	9.68	151°17.80	39.01	199°26.98	56.26	281°23.76	38.88
5	295°22.10		294°56.85	9.89	166°19.08	38.67	214°28.90	56.30	296°25.99	38.78
6	310°24.57		309°57.81	N01°10.11	181°20.36	N20°38.33	229°30.81	N22°56.33	311°28.22	S02°38.69
7	325°27.03		324°58.77	10.34	196°21.65	38.00	244°32.73	56.37	326°30.45	38.60
8	340°29.49		339°59.72	10.56	211°22.93	37.66	259°34.65	56.41	341°32.68	38.50
9	355°31.96		355°0.68	· · 10.78	226°24.21	· · 37.32	274°36.57	· · 56.45	356°34.91	· · 38.41
10	10°34.42		10°1.63	11.01	241°25.49	36.98	289°38.48	56.48	11°37.14	38.32
11	25°36.89		25°2.58	11.23	256°26.77	36.65	304°40.40	56.52	26°39.38	38.23
12	40°39.35		40°3.53	N01°11.46	271°28.05	N20°36.31	319°42.32	N22°56.56	41°41.61	S02°38.13
13	55°41.81		55°4.48	11.69	286°29.33	35.97	334°44.23	56.59	56°43.84	38.04
14	70°44.28		70°5.42	11.92	301°30.61	35.63	349°46.15	56.63	71°46.07	37.95
15	85°46.74		85°6.37	· · 12.15	316°31.89	· · 35.29	4°48.07	· · 56.67	86°48.30	· · 37.85
16	100°49.21		100°7.31	12.38	331°33.17	34.95	19°49.98	56.70	101°50.54	37.76
17	115°51.67		115°8.25	12.62	346°34.45	34.62	34°51.90	56.74	116°52.77	37.67
18	130°54.14		130°9.19	N01°12.85	1°35.73	N20°34.28	49°53.82	N22°56.78	131°55.00	S02°37.58
19	145°56.60		145°10.12	13.09	16°37.00	33.94	64°55.73	56.81	146°57.23	37.48
20	160°59.06		160°11.06	13.33	31°38.28	33.60	79°57.65	56.85	161°59.47	37.39
21	176°1.53		175°11.99	· · 13.57	46°39.56	· · 33.26	94°59.56	· · 56.89	177°1.70	· · 37.30
22	191°3.99		190°12.92	13.81	61°40.84	32.92	110°1.48	56.92	192°3.93	37.21
23	206°6.46		205°13.85	14.05	76°42.12	32.58	125°3.40	56.96	207°6.16	37.11
Mer.pass. 09:18		ν1.0' d0.2' m-4.71		ν1.3' d-0.3' m0.95		ν1.9' d0.0' m-1.98		ν2.2' d-0.1' m1.17		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°8.92		220°14.78	N01°14.29	91°43.39	N20°32.24	140°5.31	N22°57.00	222°8.40	S02°37.02
1	236°11.39		235°15.70	14.53	106°44.67	31.90	155°7.23	57.03	237°10.63	36.93
2	251°13.85		250°16.63	14.78	121°45.95	31.56	170°9.14	57.07	252°12.86	36.84
3	266°16.31		265°17.55	· · 15.02	136°47.22	· · 31.22	185°11.06	· · 57.10	267°15.10	· · 36.74
4	281°18.78		280°18.47	15.27	151°48.50	30.88	200°12.97	57.14	282°17.33	36.65
5	296°21.24		295°19.39	15.52	166°49.78	30.53	215°14.89	57.18	297°19.56	36.56
6	311°23.71		310°20.30	N01°15.77	181°51.05	N20°30.19	230°16.80	N22°57.21	312°21.80	S02°36.47
7	326°26.17		325°21.22	16.02	196°52.33	29.85	245°18.72	57.25	327°24.03	36.38
8	341°28.63		340°22.13	16.27	211°53.60	29.51	260°20.63	57.29	342°26.26	36.28
9	356°31.10		355°23.04	· · 16.53	226°54.88	· · 29.17	275°22.55	· · 57.32	357°28.50	· · 36.19
10	11°33.56		10°23.95	16.78	241°56.15	28.83	290°24.46	57.36	12°30.73	36.10
11	26°36.03		25°24.86	17.04	256°57.43	28.48	305°26.37	57.39	27°32.96	36.01
12	41°38.49		40°25.77	N01°17.30	271°58.70	N20°28.14	320°28.29	N22°57.43	42°35.20	S02°35.92
13	56°40.96		55°26.67	17.55	286°59.98	27.80	335°30.20	57.47	57°37.43	35.83
14	71°43.42		70°27.57	17.81	302°1.25	27.46	350°32.12	57.50	72°39.67	35.73
15	86°45.88		85°28.47	· · 18.07	317°2.52	· · 27.11	5°34.03	· · 57.54	87°41.90	· · 35.64
16	101°48.35		100°29.37	18.34	332°3.80	26.77	20°35.94	57.58	102°44.13	35.55
17	116°50.81		115°30.27	18.60	347°5.07	26.43	35°37.86	57.61	117°46.37	35.46
18	131°53.28		130°31.17	N01°18.86	2°6.34	N20°26.08	50°39.77	N22°57.65	132°48.60	S02°35.37
19	146°55.74		145°32.06	19.13	17°7.62	25.74	65°41.68	57.68	147°50.84	35.28
20	161°58.20		160°32.95	19.40	32°8.89	25.40	80°43.60	57.72	162°53.07	35.18
21	177°0.67		175°33.84	· · 19.67	47°10.16	· · 25.05	95°45.51	· · 57.75	177°55.31	· · 35.09
22	192°3.13		190°34.73	19.93	62°11.43	24.71	110°47.42	57.79	192°57.54	35.00
23	207°5.60		205°35.62	20.21	77°12.70	24.36	125°49.33	57.83	207°59.78	34.91
Mer.pass. 09:14		ν0.9' d0.2' m-4.70		ν1.3' d-0.3' m0.97		ν1.9' d0.0' m-1.98		ν2.2' d-0.1' m1.17		

	SHA	Dec
Alpheratz	357°34.82	29°13.63
Ankaa	353°7.24	-42°10.03
Schedar	349°31.29	56°40.38
Diphda	348°47.34	-17°50.89
Achernar	335°20.54	-57°6.43
Hamal	327°51.28	23°34.83
Polaris	314°24.59	89°22.26
Acamar	315°12.00	-40°12.23
Menkar	314°6.22	4°11.27
Mirfak	308°28.42	49°57.04
Aldebaran	290°39.65	16°33.57
Rigel	281°3.91	-8°10.43
Capella	280°21.92	46°1.47
Bellatrix	278°22.88	6°22.30
Elnath	278°1.86	28°37.74
Alnilam	275°37.73	-1°11.22
Betelgeuse	270°52.06	7°24.66
Canopus	263°52.62	-52°42.74
Sirius	258°26.22	-16°45.19
Adhara	255°5.86	-29°0.56
Procyon	244°50.70	5°9.55
Pollux	243°17.13	27°57.96
Avior	234°14.76	-59°35.70
Suhail	222°46.13	-43°32.35
Miaplacidus	221°38.21	-69°49.55
Alphard	217°47.48	-8°46.23
Regulus	207°34.08	11°50.58
Dubhe	193°40.32	61°37.06
Denebola	182°24.47	14°25.79
Gienah	175°43.09	-17°41.12
Acrux	172°59.31	-63°14.59
Gacrux	171°50.93	-57°15.52
Alioth	166°12.23	55°49.40
Spica	158°21.75	-11°17.75
Alkaid	152°51.32	49°11.18
Hadar	148°35.06	-60°29.82
Menkent	147°56.96	-36°29.81
Arcturus	145°47.35	19°2.93
Rigel Kent.	139°39.33	-60°56.48
Kochab	137°18.57	74°2.99
Zuben'ubi	136°55.42	-16°8.94
Alphecca	126°3.18	26°37.61
Antares	112°15.21	-26°29.33
Atria	107°8.77	-69°4.25
Sabik	102°2.23	-15°45.44
Shaula	96°9.73	-37°7.29
Rasalhague	95°58.07	12°32.31
Eltanin	90°41.70	51°28.81
Kaus Aust.	83°31.96	-34°22.29
Vega	80°32.83	38°48.12
Nunki	75°47.28	-26°15.89
Altair	61°59.63	8°55.94
Peacock	53°5.26	-56°39.00
Deneb	49°25.63	45°21.90
Enif	33°38.64	9°59.30
Al Na'ir	27°32.74	-46°50.15

h	Sun			Moon			
Thu	GHA	Dec		GHA	ν	Dec	d HP
0	180°43.31	N15°5.36		134°11.90	2.5'	N28°30.66	1.2' 59.7'
1	195°43.39	6.11		148°33.38	2.5'	28°31.87	1.0' 59.6'
2	210°43.46	6.87		162°54.91	2.6'	28°32.87	0.8' 59.6'
3	225°43.53	7.62		177°16.48	2.6'	28°33.67	0.6' 59.6'
4	240°43.61	8.38		191°38.09	2.7'	28°34.26	0.4' 59.5'
5	255°43.68	9.13		205°59.75	2.7'	28°34.64	0.2' 59.5'
6	270°43.76	N15°9.89		220°21.46	2.8'	N28°34.82	-0.0' 59.5'
7	285°43.83	10.64		234°43.22	2.8'	28°34.80	-0.2' 59.4'
8	300°43.90	11.39		249°5.04	2.9'	28°34.58	-0.4' 59.4'
9	315°43.97	12.15		263°26.91	2.9'	28°34.15	-0.6' 59.3'
10	330°44.05	12.90		277°48.85	3.0'	28°33.53	-0.8' 59.3'
11	345°44.12	13.65		292°10.85	3.1'	28°32.70	-1.0' 59.3'
12	0°44.19	N15°14.40		306°32.92	3.1'	N28°31.68	-1.2' 59.2'
13	15°44.26	15.15		320°55.06	3.2'	28°30.46	-1.4' 59.2'
14	30°44.33	15.90		335°17.27	3.3'	28°29.04	-1.6' 59.1'
15	45°44.40	16.65		349°39.55	3.4'	28°27.43	-1.8' 59.1'
16	60°44.47	17.40		4°1.91	3.4'	28°25.62	-2.0' 59.1'
17	75°44.55	18.15		18°24.35	3.5'	28°23.62	-2.2' 59.0'
18	90°44.62	N15°18.90		32°46.88	3.6'	N28°21.43	-2.4' 59.0'
19	105°44.69	19.65		47°9.48	3.7'	28°19.05	-2.6' 59.0'
20	120°44.76	20.40		61°32.18	3.8'	28°16.48	-2.8' 58.9'
21	135°44.83	21.14		75°54.96	3.9'	28°13.72	-2.9' 58.9'
22	150°44.90	21.89		90°17.83	4.0'	28°10.77	-3.1' 58.8'
23	165°44.96	22.64		104°40.79	4.1'	28°7.64	-3.3' 58.8'
SD = 15.9'			$d = 0.8'$	SD = 16.3'			

Fri	GHA	Dec		GHA	ν	Dec	d HP
0	180°45.03	N15°23.38		119°3.85	4.2'	N28°4.33	-3.5' 58.8'
1	195°45.10	24.13		133°27.01	4.3'	28°0.83	-3.7' 58.7'
2	210°45.17	24.87		147°50.27	4.4'	27°57.15	-3.9' 58.7'
3	225°45.24	25.62		162°13.62	4.5'	27°53.29	-4.0' 58.6'
4	240°45.31	26.36		176°37.08	4.6'	27°49.26	-4.2' 58.6'
5	255°45.38	27.11		191°0.65	4.7'	27°45.04	-4.4' 58.6'
6	270°45.44	N15°27.85		205°24.32	4.8'	N27°40.66	-4.6' 58.5'
7	285°45.51	28.59		219°48.09	4.9'	27°36.10	-4.7' 58.5'
8	300°45.58	29.33		234°11.98	5.0'	27°31.36	-4.9' 58.4'
9	315°45.65	30.08		248°35.98	5.1'	27°26.46	-5.1' 58.4'
10	330°45.71	30.82		263°0.09	5.2'	27°21.39	-5.2' 58.4'
11	345°45.78	31.56		277°24.32	5.3'	27°16.15	-5.4' 58.3'
12	0°45.85	N15°32.30		291°48.66	5.5'	N27°10.74	-5.6' 58.3'
13	15°45.91	33.04		306°13.11	5.6'	27°5.18	-5.7' 58.2'
14	30°45.98	33.78		320°37.69	5.7'	26°59.45	-5.9' 58.2'
15	45°46.04	34.52		335°2.38	5.8'	26°53.56	-6.0' 58.2'
16	60°46.11	35.26		349°27.19	5.9'	26°47.51	-6.2' 58.1'
17	75°46.17	36.00		3°52.13	6.1'	26°41.30	-6.4' 58.1'
18	90°46.24	N15°36.73		18°17.18	6.2'	N26°34.94	-6.5' 58.0'
19	105°46.30	37.47		32°42.36	6.3'	26°28.43	-6.7' 58.0'
20	120°46.37	38.21		47°7.66	6.4'	26°21.77	-6.8' 58.0'
21	135°46.43	38.95		61°33.09	6.6'	26°14.95	-7.0' 57.9'
22	150°46.50	39.68		75°58.64	6.7'	26°7.99	-7.1' 57.9'
23	165°46.56	40.42		90°24.32	6.8'	26°0.88	-7.3' 57.8'
SD = 15.9'			$d = 0.7'$	SD = 16.0'			

Sat	GHA	Dec		GHA	ν	Dec	d HP
0	180°46.62	N15°41.15		104°50.12	6.9'	N25°53.62	-7.4' 57.8'
1	195°46.69	41.89		119°16.06	7.1'	25°46.23	-7.5' 57.8'
2	210°46.75	42.62		133°42.12	7.2'	25°38.69	-7.7' 57.7'
3	225°46.81	43.35		148°8.30	7.3'	25°31.01	-7.8' 57.7'
4	240°46.88	44.09		162°34.62	7.4'	25°23.19	-8.0' 57.7'
5	255°46.94	44.82		177°1.06	7.6'	25°15.24	-8.1' 57.6'
6	270°47.00	N15°45.55		191°27.64	7.7'	N25°7.16	-8.2' 57.6'
7	285°47.06	46.29		205°54.34	7.8'	24°58.94	-8.3' 57.5'
8	300°47.12	47.02		220°21.17	8.0'	24°50.59	-8.5' 57.5'
9	315°47.19	47.75		234°48.14	8.1'	24°42.12	-8.6' 57.5'
10	330°47.25	48.48		249°15.23	8.2'	24°33.51	-8.7' 57.4'
11	345°47.31	49.21		263°42.45	8.4'	24°24.78	-8.9' 57.4'
12	0°47.37	N15°49.94		278°9.80	8.5'	N24°15.93	-9.0' 57.3'
13	15°47.43	50.67		292°37.28	8.6'	24°6.96	-9.1' 57.3'
14	30°47.49	51.40		307°4.89	8.7'	23°57.86	-9.2' 57.3'
15	45°47.55	52.12		321°32.63	8.9'	23°48.65	-9.3' 57.2'
16	60°47.61	52.85		336°0.50	9.0'	23°39.32	-9.4' 57.2'
17	75°47.67	53.58		350°28.50	9.1'	23°29.88	-9.6' 57.2'
18	90°47.73	N15°54.31		4°56.63	9.3'	N23°20.32	-9.7' 57.1'
19	105°47.79	55.03		19°24.88	9.4'	23°10.65	-9.8' 57.1'
20	120°47.85	55.76		33°53.26	9.5'	23°0.87	-9.9' 57.0'
21	135°47.91	56.49		48°21.77	9.6'	22°50.98	-10.0' 57.0'
22	150°47.96	57.21		62°50.41	9.8'	22°40.99	-10.1' 57.0'
23	165°48.02	57.93		77°19.18	9.9'	22°30.89	-10.2' 56.9'
SD = 15.9'			$d = 0.7'$	SD = 15.8'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	01:42	22:20	////	////
N 70°	////	////	02:24	21:35	////	////
68°	////	00:52	02:52	21:06	23:16	////
66°	////	01:48	03:13	20:44	22:12	////
64°	////	02:20	03:29	20:27	21:38	////
62°	00:46	02:43	03:43	20:13	21:14	23:21
60°	01:36	03:01	03:55	20:01	20:55	22:23
N 58°	02:05	03:16	04:05	19:51	20:40	21:52
56°	02:27	03:29	04:13	19:42	20:27	21:30
54°	02:44	03:40	04:21	19:34	20:16	21:12
52°	02:58	03:49	04:28	19:27	20:06	20:58
50°	03:10	03:58	04:34	19:21	19:58	20:45
45°	03:35	04:15	04:48	19:07	19:40	20:20
N 40°	03:53	04:29	04:59	18:56	19:25	20:01
35°	04:08	04:41	05:08	18:46	19:14	19:46
30°	04:21	04:51	05:16	18:38	19:04	19:34
20°	04:40	05:07	05:30	18:24	18:47	19:14
N 10°	04:55	05:20	05:42	18:12	18:34	18:59
0°	05:07	05:32	05:54	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:49	18:11	18:36
20°	05:27	05:54	06:16	17:37	18:00	18:26
30°	05:36	06:05	06:30	17:24	17:49	18:17
35°	05:41	06:11	06:37	17:16	17:42	18:12
40°	05:46	06:18	06:46	17:07	17:36	18:08
45°	05:50	06:25	06:56	16:57	17:28	18:03
S 50°	05:56	06:34	07:08	16:45	17:19	17:58
52°	05:58	06:38	07:14	16:39	17:15	17:55
54°	06:00	06:42	07:20	16:33	17:11	17:53
56°	06:03	06:47	07:27	16:26	17:06	17:50
58°	06:05	06:52	07:35	16:18	17:01	17:48
S 60°	06:08	06:58	07:44	16:09	16:55	17:45

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64°	<input type="checkbox"/>	<input type="checkbox"/>	06:26	<input type="checkbox"/>	<input type="checkbox"/>	04:10
62°	<input type="checkbox"/>	04:57	07:15	<input type="checkbox"/>	03:36	03:20
60°	04:37	06:00	07:46	01:45	02:33	02:48
N 58°	05:17	06:34	08:10	01:05	01:59	02:25
56°	05:45	06:59	08:28	00:37	01:34	02:05
54°	06:06	07:19	08:44	00:16	01:13	01:49
52°	06:24	07:36	08:58	00:56	01:35
50°	06:40	07:50	09:09	00:42	01:23
45°	07:11	08:20	09:34	00:12	00:57
N 40°	07:35	08:42	09:53	23:49	00:37
35°	07:55	09:01	10:10	23:29	00:20
30°	08:12	09:17	10:23	23:13	00:05
20°	08:40	09:45	10:47	22:45	23:40
N 10°	09:05	10:08	11:08	22:21	23:18
0°	09:28	10:30	11:27	21:58	22:58	23:52
S 10°	09:51	10:52	11:46	21:35	22:37	23:35
20°	10:16	11:15	12:06	21:11	22:15	23:16
30°	10:45	11:42	12:29	20:43	21:49	22:54
35°	11:02	11:58	12:43	20:26	21:34	22:42
40°	11:22	12:16	12:59	20:06	21:16	22:27
45°	11:46	12:39	13:17	19:42	20:54	22:09
S 50°	12:17	13:07	13:40	19:11	20:27	21:48
52°	12:33	13:21	13:51	18:55	20:13	21:37
54°	12:51	13:36	14:04	18:37	19:58	21:25
56°	13:13	13:55	14:18	18:15	19:40	21:11
58°	13:42	14:18	14:35	17:47	19:17	20:55
S 60°	14:24	14:48	14:55	17:05	18:47	20:36

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	15-34%
01	02:53	02:57	11:57	15:43	03:11	
02	03:00	03:03	11:57	16:44	04:14	
03	03:06	03:09	11:57	17:39	05:12	





May 04, 05, 06 UT (Sun., Mon., Tue.)


h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°8.06		220°36.50	N01°20.48	92°13.98	N20°24.02	140°51.25	N22°57.86	223°2.01	S02°34.82
1	237°10.53		235°37.39	20.75	107°15.25	23.67	155°53.16	57.90	238°4.25	34.73
2	252°12.99		250°38.27	21.02	122°16.52	23.33	170°55.07	57.93	253°6.48	34.64
3	267°15.45		265°39.15	•• 21.30	137°17.79	•• 22.98	185°56.98	•• 57.97	268°8.72	•• 34.54
4	282°17.92		280°40.03	21.58	152°19.06	22.64	200°58.90	58.01	283°10.95	34.45
5	297°20.38		295°40.90	21.85	167°20.33	22.29	206°0.81	58.04	298°13.19	34.36
6	312°22.85		310°41.78	N01°22.13	182°21.60	N20°21.95	231°2.72	N22°58.08	313°15.42	S02°34.27
7	327°25.31		325°42.65	22.41	197°22.87	21.60	246°4.63	58.11	328°17.66	34.18
8	342°27.77		340°43.52	22.69	212°24.14	21.26	261°6.54	58.15	343°19.89	34.09
9	357°30.24		355°44.39	•• 22.98	227°25.41	•• 20.91	276°8.45	•• 58.18	358°22.13	•• 34.00
10	12°32.70		10°45.26	23.26	242°26.68	20.56	291°10.37	58.22	13°24.37	33.91
11	27°35.17		25°46.13	23.54	257°27.95	20.22	306°12.28	58.25	28°26.60	33.82
12	42°37.63		40°46.99	N01°23.83	272°29.21	N20°19.87	321°14.19	N22°58.29	43°28.84	S02°33.73
13	57°40.09		55°47.86	24.12	287°30.48	19.52	336°16.10	58.33	58°31.07	33.64
14	72°42.56		70°48.72	24.41	302°31.75	19.18	351°18.01	58.36	73°33.31	33.54
15	87°45.02		85°49.58	•• 24.70	317°33.02	•• 18.83	6°19.92	•• 58.40	88°35.55	•• 33.45
16	102°47.49		100°50.44	24.99	332°34.29	18.48	21°21.83	58.43	103°37.78	33.36
17	117°49.95		115°51.29	25.28	347°35.55	18.13	36°23.74	58.47	118°40.02	33.27
18	132°52.42		130°52.15	N01°25.57	2°36.82	N20°17.78	51°25.65	N22°58.50	133°42.26	S02°33.18
19	147°54.88		145°53.00	25.87	17°38.09	17.44	66°27.56	58.54	148°44.49	33.09
20	162°57.34		160°53.85	26.16	32°39.36	17.09	81°29.47	58.57	163°46.73	33.00
21	177°59.81		175°54.70	•• 26.46	47°40.62	•• 16.74	96°31.38	•• 58.61	178°48.97	•• 32.91
22	193°2.27		190°55.55	26.76	62°41.89	16.39	111°33.29	58.64	193°51.20	32.82
23	208°4.74		205°56.40	27.05	77°43.15	16.04	126°35.20	58.68	208°53.44	32.73
Mer.pass. 09:10			ν0.9' d0.3' m-4.69		ν1.3' d-0.3' m0.98		ν1.9' d0.0' m-1.97		ν2.2' d-0.1' m1.17	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°7.20		220°57.24	N01°27.35	92°44.42	N20°15.69	141°37.11	N22°58.71	223°55.68	S02°32.64
1	238°9.66		235°58.08	27.66	107°45.69	15.34	156°39.02	58.75	238°57.91	32.55
2	253°12.13		250°58.93	27.96	122°46.95	14.99	171°40.93	58.78	254°0.15	32.46
3	268°14.59		265°59.77	•• 28.26	137°48.22	•• 14.65	186°42.84	•• 58.82	269°2.39	•• 32.37
4	283°17.06		281°0.60	28.57	152°49.48	14.30	201°44.75	58.85	284°4.63	32.28
5	298°19.52		296°1.44	28.87	167°50.75	13.95	216°46.66	58.89	299°6.86	32.19
6	313°21.98		311°2.28	N01°29.18	182°52.01	N20°13.60	231°48.57	N22°58.92	314°9.10	S02°32.10
7	328°24.45		326°3.11	29.49	197°53.28	13.24	246°50.48	58.96	329°11.34	32.01
8	343°26.91		341°3.94	29.80	212°54.54	12.89	261°52.39	58.99	344°13.58	31.92
9	358°29.38		356°4.77	•• 30.11	227°55.80	•• 12.54	276°54.30	•• 59.03	359°15.82	•• 31.83
10	13°31.84		11°56.60	30.42	242°57.07	12.19	291°56.20	59.06	14°18.05	31.74
11	28°34.31		26°6.43	30.73	257°58.33	11.84	306°58.11	59.10	29°20.29	31.65
12	43°36.77		41°7.25	N01°31.04	272°59.59	N20°11.49	322°0.02	N22°59.13	44°22.53	S02°31.56
13	58°39.23		56°8.08	31.36	288°0.86	11.14	337°1.93	59.17	59°24.77	31.47
14	73°41.70		71°8.90	31.68	303°2.12	10.79	352°3.84	59.20	74°27.01	31.38
15	88°44.16		86°9.72	•• 31.99	318°3.38	•• 10.44	7°5.74	•• 59.24	89°29.24	•• 31.29
16	103°46.63		101°10.54	32.31	333°4.64	10.08	22°7.65	59.27	104°31.48	31.20
17	118°49.09		116°11.35	32.63	348°5.91	9.73	37°9.56	59.31	119°33.72	31.11
18	133°51.55		131°12.17	N01°32.95	3°7.17	N20°9.38	52°11.47	N22°59.34	134°35.96	S02°31.02
19	148°54.02		146°12.98	33.27	18°8.43	9.03	67°13.38	59.38	149°38.20	30.93
20	163°56.48		161°13.80	33.60	33°9.69	8.67	82°15.28	59.41	164°40.44	30.84
21	178°58.95		176°14.61	•• 33.92	48°10.95	•• 8.32	97°17.19	•• 59.45	179°42.68	•• 30.75
22	194°1.41		191°15.42	34.25	63°12.21	7.97	112°19.10	59.48	194°44.92	30.67
23	209°3.87		206°16.22	34.57	78°13.47	7.61	127°21.00	59.52	209°47.16	30.58
Mer.pass. 09:06			ν0.8' d0.3' m-4.68		ν1.3' d-0.3' m0.99		ν1.9' d0.0' m-1.97		ν2.2' d-0.1' m1.16	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	224°6.34		221°17.03	N01°34.90	93°14.73	N20°7.26	142°22.91	N22°59.55	224°49.39	S02°30.49
1	239°8.80		236°17.83	35.23	108°15.99	6.91	157°24.82	59.58	239°51.63	30.40
2	254°11.27		251°18.64	35.56	123°17.26	6.55	172°26.72	59.62	254°53.87	30.31
3	269°13.73		266°19.44	•• 35.89	138°18.51	•• 6.20	187°28.63	•• 59.65	269°56.11	•• 30.22
4	284°16.19		281°20.24	36.22	153°19.77	5.84	202°30.54	59.69	284°58.35	30.13
5	299°18.66		296°21.04	36.55	168°21.03	5.49	217°32.44	59.72	300°0.59	30.04
6	314°21.12		311°21.83	N01°36.89	183°22.29	N20°5.14	232°34.35	N22°59.76	315°2.83	S02°29.95
7	329°23.59		326°22.63	37.22	198°23.55	4.78	247°36.26	59.79	330°5.07	29.86
8	344°26.05		341°23.42	37.56	213°24.81	4.43	262°38.16	59.82	345°7.31	29.78
9	359°28.51		356°24.21	•• 37.90	228°26.07	•• 4.07	277°40.07	•• 59.86	0°9.55	•• 29.69
10	14°30.98		11°25.00	38.24	243°27.33	3.72	292°41.97	59.89	15°11.79	29.60
11	29°33.44		26°25.79	38.58	258°28.59	3.36	307°43.88	22°59.93	30°14.03	29.51
12	44°35.91		41°26.58	N01°38.92	273°29.84	N20°3.00	322°45.79	N22°59.96	45°16.27	S02°29.42
13	59°38.37		56°27.37	39.26	288°31.10	2.65	337°47.69	0.00	60°18.51	29.33
14	74°40.84		71°28.15	39.60	303°32.36	2.29	352°49.60	0.03	75°20.75	29.24
15	89°43.30		86°28.93	•• 39.95	318°33.62	•• 1.94	7°51.50	•• 0.06	90°23.00	•• 29.15
16	104°45.76		101°29.71	40.29	333°34.87	1.58	22°53.41	0.10	105°25.24	29.07
17	119°48.23		116°30.49	40.64	348°36.13	1.22	37°55.31	0.13	120°27.48	28.98
18	134°50.69		131°31.27	N01°40.98	3°37.39	N20°0.87	52°57.22	N23°0.17	135°29.72	S02°28.89
19	149°53.16		146°32.05	41.33	18°38.64	0.51	67°59.12	0.20	150°31.96	28.80
20	164°55.62		161°32.82	41.68	33°39.90	20°0.15	83°1.03	0.23	165°34.20	28.71
21	179°58.08		176°33.60	•• 42.03	48°41.16	19°59.79	98°2.93	•• 0.27	180°36.44	•• 28.62
22	195°0.55		191°34.37	42.39	63°42.41	59.44	113°4.83	0.30	195°38.68	28.54
23	210°3.01		206°35.14	42.74	78°43.67	59.08	128°6.74	0.33	210°40.92	28.45
Mer.pass. 09:02			ν0.8' d0.3' m-4.67		ν1.3' d-0.4' m1.00		ν1.9' d0.0' m-1.97		ν2.2' d-0.1' m1.16	

	SHA	Dec
Alpheratz	357°34.79	29°13.63
Ankaa	353°7.22	-42°10.01
Schedar	349°31.27	56°40.37
Diphda	348°47.32	-17°50.88
Achernar	335°20.52	-57°6.41
Hamal	327°51.27	23°34.83
Polaris	314°24.51	89°22.24
Acamar	315°12.00	-40°12.21
Menkar	314°6.22	4°11.27
Mirfak	308°28.41	49°57.03
Aldebaran	290°39.65	16°33.58
Rigel	281°3.91	-8°10.42
Capella	280°21.92	46°1.46
Bellatrix	278°22.88	6°22.31
Elnath	278°1.86	28°37.74
Alnilam	275°37.74	-1°11.21
Betelgeuse	270°52.06	7°24.67
Canopus	263°52.64	-52°42.73
Sirius	258°26.23	-16°45.18
Adhara	255°5.87	-29°0.56
Procyon	244°50.70	5°9.55
Pollux	243°17.13	27°57.96
Avior	234°14.79	-59°35.70
Suhail	222°46.15	-43°32.35
Miaplacidus	221°38.26	-69°49.55
Alphard	217°47.49	-8°46.23
Regulus	207°34.09	11°50.58
Dubhe	193°40.33	61°37.06
Denebola	182°24.48	14°25.79
Giennah	175°43.09	-17°41.12
Acrux	172°59.32	-63°14.61
Gacrux	171°50.94	-57°15.53
Alioth	166°12.23	55°49.41
Spica	158°21.75	-11°17.75
Alkaid	152°51.32	49°11.19
Hadar	148°35.05	-60°29.84
Menkent	147°56.95	-36°29.82
Arcturus	145°47.34	19°2.93
Rigel Kent.	139°39.32	-60°56.50
Kochab	137°18.56	74°3.00
Zuben'ubi	136°55.41	-16°8.94
Alphecca	126°3.16	26°37.62
Antares	112°15.19	-26°29.34
Atria	107°8.72	-69°4.27
Sabik	102°2.21	-15°45.44
Shaula	96°9.71	-37°7.29
Rasalhague	95°58.05	12°32.32
Eltanin	90°41.68	51°28.83
Kaus Aust.	83°31.93	-34°22.30
Vega	80°32.80	38°48.13
Nunki	75°47.25	-26°15.89
Altair	61°59.61	8°55.94
Peacock	53°5.21	-56°38.99
Deneb	49°25.60	45°21.90
Enif	33°38.61	9°59.30
Al Na'ir	27°32.71	-46°50.13
Fomalhaut	15°14.40	-29°29.22
Scheat	13°45.16	28°12.99
Markab	13°29.82	15°20.32
May 04 Sun	SHA	Mer.pass
Venus	358°28.44	09:17
Mars	230°5.91	17:50
Jupiter	278°43.19	14:35
Saturn	0°53.95	09:07
May 05 Mon	SHA	Mer.pass
Venus	357°50.04	09:16
Mars	229°37.22	17:48
Jupiter	278°29.91	14:32
Saturn	0°48.48	09:03
May 06 Tue	SHA	Mer.pass
Venus	357°10.69	09:14
Mars	229°8.40	17:46
Jupiter	278°16.57	14:29
Saturn	0°43.06	08:59
Horizontal parallax		
	Venus:	0.3
	Mars:	0.1

h		Sun		Moon			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		180°48.08	N15°58.66	91°48.07	10.0'	N22°20.69	-10.3' 56.9'
1		195°48.14	15°59.38	106°17.08	10.1'	22°10.38	-10.4' 56.9'
2		210°48.20	16°01.1	120°46.22	10.3'	21°59.98	-10.5' 56.8'
3		225°48.25	· · 0.83	135°15.49	10.4'	21°49.48	-10.6' 56.8'
4		240°48.31	1.55	149°44.88	10.5'	21°38.88	-10.7' 56.8'
5		255°48.37	2.27	164°14.39	10.6'	21°28.19	-10.8' 56.7'
6		270°48.42	N16°2.99	178°44.03	10.8'	N21°17.40	-10.9' 56.7'
7		285°48.48	3.71	193°13.78	10.9'	21°6.52	-11.0' 56.6'
8		300°48.54	4.44	207°43.66	11.0'	20°55.55	-11.1' 56.6'
9		315°48.59	· · 5.16	222°13.66	11.1'	20°44.49	-11.1' 56.6'
10		330°48.65	5.87	236°43.77	11.2'	20°33.34	-11.2' 56.5'
11		345°48.70	6.59	251°14.01	11.4'	20°22.11	-11.3' 56.5'
12		0°48.76	N16°7.31	265°44.36	11.5'	N20°10.79	-11.4' 56.5'
13		15°48.81	8.03	280°14.83	11.6'	19°59.39	-11.5' 56.4'
14		30°48.87	8.75	294°45.42	11.7'	19°47.91	-11.6' 56.4'
15		45°48.92	· · 9.47	309°16.12	11.8'	19°36.35	-11.6' 56.4'
16		60°48.98	10.18	323°46.93	11.9'	19°24.71	-11.7' 56.3'
17		75°49.03	10.90	338°17.86	12.0'	19°12.99	-11.8' 56.3'
18		90°49.08	N16°11.61	352°48.90	12.2'	N19°1.20	-11.9' 56.3'
19		105°49.14	12.33	7°20.05	12.3'	18°49.33	-11.9' 56.2'
20		120°49.19	13.04	21°51.31	12.4'	18°37.39	-12.0' 56.2'
21		135°49.24	· · 13.76	36°22.68	12.5'	18°25.38	-12.1' 56.2'
22		150°49.30	14.47	50°54.16	12.6'	18°13.29	-12.2' 56.1'
23		165°49.35	15.19	65°25.74	12.7'	18°1.14	-12.2' 56.1'
		SD = 15.9' $d = 0.7'$		SD = 15.5'			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		180°49.40	N16°15.90	79°57.43	12.8'	N17°48.92	-12.3' 56.1'
1		195°49.45	16.61	94°29.23	12.9'	17°36.64	-12.4' 56.0'
2		210°49.51	17.32	109°1.13	13.0'	17°24.29	-12.4' 56.0'
3		225°49.56	· · 18.03	123°33.13	13.1'	17°11.88	-12.5' 56.0'
4		240°49.61	18.75	138°5.23	13.2'	16°59.40	-12.5' 56.0'
5		255°49.66	19.46	152°37.43	13.3'	16°46.86	-12.6' 55.9'
6		270°49.71	N16°20.17	167°9.73	13.4'	N16°34.26	-12.7' 55.9'
7		285°49.76	20.88	181°42.13	13.5'	16°21.61	-12.7' 55.9'
8		300°49.81	21.58	196°14.63	13.6'	16°8.90	-12.8' 55.8'
9		315°49.86	· · 22.29	210°47.22	13.7'	15°56.13	-12.8' 55.8'
10		330°49.91	23.00	225°19.91	13.8'	15°43.30	-12.9' 55.8'
11		345°49.96	23.71	239°52.69	13.9'	15°30.42	-12.9' 55.7'
12		0°50.01	N16°24.42	254°25.56	14.0'	N15°17.49	-13.0' 55.7'
13		15°50.06	25.12	268°58.52	14.1'	15°4.51	-13.0' 55.7'
14		30°50.11	25.83	283°31.57	14.1'	14°51.48	-13.1' 55.7'
15		45°50.16	· · 26.54	298°4.71	14.2'	14°38.40	-13.1' 55.6'
16		60°50.21	27.24	312°37.94	14.3'	14°25.27	-13.2' 55.6'
17		75°50.26	27.95	327°11.25	14.4'	14°12.09	-13.2' 55.6'
18		90°50.31	N16°28.65	341°44.65	14.5'	N13°58.87	-13.3' 55.5'
19		105°50.35	29.35	356°18.13	14.6'	13°45.60	-13.3' 55.5'
20		120°50.40	30.06	10°51.69	14.6'	13°32.29	-13.4' 55.5'
21		135°50.45	· · 30.76	25°25.33	14.7'	13°18.94	-13.4' 55.5'
22		150°50.50	31.46	39°59.06	14.8'	13°5.54	-13.4' 55.4'
23		165°50.54	32.16	54°32.86	14.9'	12°52.11	-13.5' 55.4'
		SD = 15.9' $d = 0.7'$		SD = 15.3'			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		180°50.59	N16°32.87	69°6.74	15.0'	N12°38.63	-13.5' 55.4'
1		195°50.64	33.57	83°40.69	15.0'	12°25.12	-13.6' 55.4'
2		210°50.68	34.27	98°14.72	15.1'	12°11.57	-13.6' 55.3'
3		225°50.73	· · 34.97	112°48.83	15.2'	11°57.98	-13.6' 55.3'
4		240°50.77	35.67	127°23.00	15.2'	11°44.36	-13.7' 55.3'
5		255°50.82	36.37	141°57.25	15.3'	11°30.71	-13.7' 55.3'
6		270°50.87	N16°37.06	156°31.56	15.4'	N11°17.02	-13.7' 55.2'
7		285°50.91	37.76	171°5.95	15.5'	11°3.29	-13.8' 55.2'
8		300°50.96	38.46	185°40.40	15.5'	10°49.54	-13.8' 55.2'
9		315°51.00	· · 39.16	200°14.92	15.6'	10°35.76	-13.8' 55.2'
10		330°51.04	39.85	214°49.50	15.6'	10°21.94	-13.8' 55.1'
11		345°51.09	40.55	229°24.14	15.7'	10°8.10	-13.9' 55.1'
12		0°51.13	N16°41.25	243°58.85	15.8'	N09°54.23	-13.9' 55.1'
13		15°51.18	41.94	258°33.62	15.8'	09°40.33	-13.9' 55.1'
14		30°51.22	42.64	273°8.45	15.9'	09°26.41	-13.9' 55.0'
15		45°51.26	· · 43.33	287°43.33	15.9'	09°12.46	-14.0' 55.0'
16		60°51.31	44.02	302°18.27	16.0'	08°58.49	-14.0' 55.0'
17		75°51.35	44.72	316°53.27	16.1'	08°44.49	-14.0' 55.0'
18		90°51.39	N16°45.41	331°28.33	16.1'	N08°30.47	-14.0' 54.9'
19		105°51.43	46.10	346°3.43	16.2'	08°16.43	-14.1' 54.9'
20		120°51.47	46.79	0°38.59	16.2'	08°2.37	-14.1' 54.9'
21		135°51.52	· · 47.49	15°13.80	16.3'	07°48.29	-14.1' 54.9'
22		150°51.56	48.18	29°49.06	16.3'	07°34.19	-14.1' 54.9'
23		165°51.60	48.87	44°24.37	16.4'	07°20.07	-14.1' 54.8'
		SD = 15.8' $d = 0.7'$		SD = 15.1'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	01:11	22:54	////	////
N 70°	////	////	02:05	21:54	////	////
68°	////	////	02:37	21:20	////	////
66°	////	01:27	03:01	20:55	22:33	////
64°	////	02:05	03:19	20:36	21:52	////
62°	////	02:31	03:34	20:21	21:25	////
60°	01:17	02:51	03:47	20:08	21:05	22:42
N 58°	01:52	03:07	03:58	19:57	20:48	22:05
56°	02:16	03:21	04:07	19:48	20:34	21:40
54°	02:35	03:33	04:15	19:39	20:22	21:21
52°	02:50	03:43	04:23	19:32	20:12	21:05
50°	03:04	03:52	04:29	19:25	20:03	20:51
45°	03:30	04:11	04:43	19:11	19:44	20:25
N 40°	03:49	04:25	04:55	18:59	19:29	20:05
35°	04:05	04:38	05:05	18:49	19:16	19:49
30°	04:18	04:48	05:14	18:40	19:06	19:36
20°	04:38	05:05	05:28	18:25	18:48	19:16
N 10°	04:54	05:19	05:41	18:12	18:34	19:00
0°	05:07	05:32	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:10	18:35
20°	05:28	05:55	06:17	17:36	17:59	18:25
30°	05:38	06:07	06:32	17:21	17:46	18:15
35°	05:43	06:13	06:40	17:13	17:40	18:10
40°	05:48	06:21	06:49	17:04	17:32	18:05
45°	05:54	06:29	07:00	16:53	17:24	17:59
S 50°	06:00	06:38	07:13	16:40	17:15	17:53
52°	06:02	06:42	07:19	16:34	17:10	17:51
54°	06:05	06:47	07:26	16:27	17:05	17:48
56°	06:08	06:52	07:33	16:20	17:00	17:45
58°	06:11	06:58	07:41	16:11	16:55	17:42
S 60°	06:14	07:04	07:51	16:02	16:48	17:39

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°		08:53	11:33		05:17	04:07
N 70°		09:36	11:50		04:32	03:49
68°	07:24	10:04	12:03	05:04	04:02	03:33
66°	08:16	10:25	12:14	04:10	03:40	03:21
64°	08:48	10:42	12:23	03:37	03:22	03:11
62°	09:12	10:55	12:30	03:13	03:07	03:02
60°	09:30	11:07	12:37	02:53	02:54	02:54
N 58°	09:46	11:17	12:42	02:37	02:43	02:47
56°	09:59	11:26	12:47	02:23	02:34	02:41
54°	10:10	11:33	12:52	02:11	02:25	02:36
52°	10:20	11:40	12:56	02:00	02:18	02:31
50°	10:29	11:46	13:00	01:51	02:11	02:26
45°	10:48	11:59	13:07	01:31	01:56	02:17
N 40°	11:03	12:10	13:14	01:14	01:44	02:08
35°	11:16	12:20	13:20	01:01	01:34	02:01
30°	11:27	12:28	13:25	00:48	01:24	01:55
20°	11:46	12:41	13:33	00:27	01:08	01:44
N 10°	12:03	12:53	13:41	00:09	00:54	01:35
0°	12:18	13:05	13:47	· · ·	00:41	01:26
S 10°	12:33	13:16	13:54	· · ·	00:28	01:16
20°	12:50	13:28	14:02	· · ·	00:13	01:07
30°	13:08	13:41	14:10	23:57	· · ·	00:55
35°	13:19	13:49	14:15	23:47	· · ·	00:49
40°	13:31	13:58	14:20	23:36	· · ·	00:41
45°	13:46	14:08	14:27	23:23	· · ·	00:33
S 50°	14:03	14:21	14:34	23:07	· · ·	00:22
52°	14:12	14:26	14:38	22:59	· · ·	00:17
54°	14:21	14:33	14:41	22:50	· · ·	00:11
56°	14:31	14:40	14:45	22:41	· · ·	00:05
58°	14:43	14:47	14:50	22:30	23:58	· · ·
S 60°	14:57	14:56	14:55	22:17	23:51	· · ·

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	44-64%
04	03:12	03:15	11:57	18:30	06:05	
05	03:18	03:20	11:57	19:15	06:53	
06	03:22	03:25	11:57	19:57	07:37	

May 07, 08, 09 UT (Wed., Thu., Fri.)


h	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec	
0	225°5.48	221°35.91	N01°43.09	93°44.92	N19°58.72		143°8.64	N23°0.37		225°43.17	S02°28.36				
1	240°7.94	236°36.68	43.45	108°46.18	58.36		158°10.55	0.40		240°45.41	28.27				
2	255°10.40	251°37.44	43.80	123°47.43	58.00		173°12.45	0.44		255°47.65	28.18				
3	270°12.87	266°38.21	· · 44.16	138°48.69	· · 57.65		188°14.35	· · 0.47		270°49.89	· · 28.10				
4	285°15.33	281°38.97	44.52	153°49.94	57.29		203°16.26	0.50		285°52.13	28.01				
5	300°17.80	296°39.73	44.88	168°51.20	56.93		218°18.16	0.54		300°54.37	27.92				
6	315°20.26	311°40.49	N01°45.24	183°52.45	N19°56.57		233°20.07	N23°0.57		315°56.62	S02°27.83				
7	330°22.72	326°41.25	45.60	198°53.70	56.21		248°21.97	0.60		330°58.86	27.74				
8	345°25.19	341°42.01	45.96	213°54.96	55.85		263°23.87	0.64		346°1.10	27.66				
9	0°27.65	356°42.76	· · 46.33	228°56.21	· · 55.49		278°25.78	· · 0.67		1°3.34	· · 27.57				
10	15°30.12	11°43.51	46.69	243°57.46	55.13		293°27.68	0.70		16°5.59	27.48				
11	30°32.58	26°44.27	47.06	258°58.72	54.77		308°29.58	0.74		31°7.83	27.39				
12	45°35.04	41°45.02	N01°47.42	273°59.97	N19°54.41		323°31.48	N23°0.77		46°10.07	S02°27.31				
13	60°37.51	56°45.77	47.79	289°1.22	54.05		338°33.39	0.81		61°12.31	27.22				
14	75°39.97	71°46.51	48.16	304°2.47	53.69		353°35.29	0.84		76°14.56	27.13				
15	90°42.44	86°47.26	· · 48.53	319°3.73	· · 53.33		8°37.19	· · 0.87		91°16.80	· · 27.04				
16	105°44.90	101°48.01	48.90	334°4.98	52.97		23°39.09	0.91		106°19.04	26.96				
17	120°47.36	116°48.75	49.27	349°6.23	52.61		38°41.00	0.94		121°21.28	26.87				
18	135°49.83	131°49.49	N01°49.65	4°7.48	N19°52.25		53°42.90	N23°0.97		136°23.53	S02°26.78				
19	150°52.29	146°50.23	50.02	19°8.73	51.89		68°44.80	1.01		151°25.77	26.69				
20	165°54.76	161°50.97	50.40	34°9.98	51.52		83°46.70	1.04		166°28.01	26.61				
21	180°57.22	176°51.71	· · 50.77	49°11.24	· · 51.16		98°48.61	· · 1.07		181°30.26	· · 26.52				
22	195°59.69	191°52.44	51.15	64°12.49	50.80		113°50.51	1.10		196°32.50	26.43				
23	211°2.15	206°53.18	51.53	79°13.74	50.44		128°52.41	1.14		211°34.74	26.35				
Mer.pass. 08:58			ν0.8' d0.4' m-4.66			ν1.3' d-0.4' m1.02			ν1.9' d0.0' m-1.97			ν2.2' d-0.1' m1.16			
Thu	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec	
0	226°4.61	221°53.91	N01°51.91	94°14.99	N19°50.08		143°54.31	N23°1.17		226°36.99	S02°26.26				
1	241°7.08	236°54.64	52.29	109°16.24	49.71		158°56.21	1.20		241°39.23	26.17				
2	256°9.54	251°55.37	52.67	124°17.49	49.35		173°58.11	1.24		256°41.48	26.08				
3	271°12.01	266°56.10	· · 53.05	139°18.74	· · 48.99		189°0.01	· · 1.27		271°43.72	· · 26.00				
4	286°14.47	281°56.83	53.44	154°19.99	48.62		204°1.92	1.30		286°45.96	25.91				
5	301°16.93	296°57.56	53.82	169°21.24	48.26		219°3.82	1.34		301°48.21	25.82				
6	316°19.40	311°58.28	N01°54.21	184°22.49	N19°47.90		234°5.72	N23°1.37		316°50.45	S02°25.74				
7	331°21.86	326°59.00	54.60	199°23.73	47.53		249°7.62	1.40		331°52.70	25.65				
8	346°24.33	341°59.72	54.98	214°24.98	47.17		264°9.52	1.43		346°54.94	25.56				
9	1°26.79	357°0.44	· · 55.37	229°26.23	· · 46.81		279°11.42	· · 1.47		1°57.19	· · 25.48				
10	16°29.25	12°1.16	55.76	244°27.48	46.44		294°13.32	1.50		16°59.43	25.39				
11	31°31.72	27°1.88	56.15	259°28.73	46.08		309°15.22	1.53		32°1.68	25.30				
12	46°34.18	42°2.60	N01°56.55	274°29.98	N19°45.71		324°17.12	N23°1.57		47°3.92	S02°25.22				
13	61°36.65	57°3.31	56.94	289°31.22	45.35		339°19.02	1.60		62°6.17	25.13				
14	76°39.11	72°4.02	57.33	304°32.47	44.98		354°20.92	1.63		77°8.41	25.04				
15	91°41.57	87°4.73	· · 57.73	319°33.72	· · 44.62		9°22.82	· · 1.66		92°10.66	· · 24.96				
16	106°44.04	102°5.44	58.13	334°34.97	44.25		24°24.72	1.70		107°12.90	24.87				
17	121°46.50	117°6.15	58.52	349°36.21	43.89		39°26.62	1.73		122°15.15	24.79				
18	136°48.97	132°6.86	N01°58.92	4°37.46	N19°43.52		54°28.52	N23°1.76		137°17.39	S02°24.70				
19	151°51.43	147°7.57	59.32	19°38.71	43.16		69°30.42	1.79		152°19.64	24.61				
20	166°53.89	162°8.27	01°59.72	34°39.95	42.79		84°32.32	1.83		167°21.88	24.53				
21	181°56.36	177°8.97	02°0.12	49°41.20	· · 42.42		99°34.22	· · 1.86		182°24.13	· · 24.44				
22	196°58.82	192°9.67	0.52	64°42.44	42.06		114°36.12	1.89		197°26.37	24.35				
23	212°1.29	207°10.37	0.93	79°43.69	41.69		129°38.02	1.92		212°28.62	24.27				
Mer.pass. 08:54			ν0.7' d0.4' m-4.65			ν1.3' d-0.4' m1.03			ν1.9' d0.0' m-1.96			ν2.2' d-0.1' m1.16			
Fri	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec	
0	227°3.75	222°11.07	N02°1.33	94°44.93	N19°41.32		144°39.91	N23°1.96		227°30.87	S02°24.18				
1	242°6.21	237°11.77	1.74	109°46.18	40.96		159°41.81	1.99		242°33.11	24.10				
2	257°8.68	252°12.47	2.14	124°47.43	40.59		174°43.71	2.02		257°35.36	24.01				
3	272°11.14	267°13.16	· · 2.55	139°48.67	· · 40.22		189°45.61	· · 2.05		272°37.60	· · 23.92				
4	287°13.61	282°13.85	2.96	154°49.92	39.85		204°47.51	2.08		287°39.85	23.84				
5	302°16.07	297°14.55	3.37	169°51.16	39.49		219°49.41	2.12		302°42.10	23.75				
6	317°18.53	312°15.24	N02°3.78	184°52.40	N19°39.12		234°51.31	N23°2.15		317°44.34	S02°23.67				
7	332°21.00	327°15.92	4.19	199°53.65	38.75		249°53.20	2.18		332°46.59	23.58				
8	347°23.46	342°16.61	4.60	214°54.89	38.38		264°55.10	2.21		347°48.84	23.50				
9	2°25.93	357°17.30	· · 5.02	229°56.14	· · 38.01		279°57.00	· · 2.25		2°51.08	· · 23.41				
10	17°28.39	12°17.98	5.43	244°57.38	37.64		294°58.90	2.28		17°53.33	23.33				
11	32°30.86	27°18.67	5.85	259°58.62	37.28		310°0.80	2.31		32°55.58	23.24				
12	47°33.32	42°19.35	N02°6.26	274°59.87	N19°36.91		325°2.69	N23°2.34		47°57.83	S02°23.15				
13	62°35.78	57°20.03	6.68	290°1.11	36.54		340°4.59	2.37		63°0.07	23.07				
14	77°38.25	72°20.71	7.10	305°2.35	36.17		355°6.49	2.41		78°2.32	22.98				
15	92°40.71	87°21.39	· · 7.52	320°3.59	· · 35.80		10°8.39	· · 2.44		93°4.57	· · 22.90				
16	107°43.18	102°22.06	7.94	335°4.84	35.43		25°10.28	2.47		108°6.82	22.81				
17	122°45.64	117°22.74	8.36	350°6.08	35.06		40°12.18	2.50		123°9.06	22.73				
18	137°48.10	132°23.41	N02°8.78	5°7.32	N19°34.69		55°14.08	N23°2.53		138°11.31	S02°22.64				
19	152°50.57	147°24.08	9.21	20°8.56	34.32		70°15.97	2.56		153°13.56	22.56				
20	167°53.03	162°24.75	9.63	35°9.80	33.95		85°17.87	2.60		168°15.81	22.47				
21	182°55.50	177°25.42	· · 10.06	50°11.05	· · 33.58		100°19.77	· · 2.63		183°18.05	· · 22.39				
22	197°57.96	192°26.09	10.48	65°12.29	33.21		115°21.66	2.66		198°20.30	22.30				
23	213°0.42	207°26.76	10.91	80°13.53	32.84		130°23.56	2.69		213°22.55	22.22				
Mer.pass. 08:50			ν0.7' d0.4' m-4.64			ν1.2' d-0.4' m1.04			ν1.9' d0.0' m-1.96			ν2.2' d-0.1' m1.15			

	SHA	Dec
Alpheratz	357°34.78	29°13.63
Ankaa	353°7.20	-42°10.00
Schedar	349°31.25	56°40.37
Diphda	348°47.31	-17°50.87
Achernar	335°20.51	-57°6.39
Hamal	327°51.26	23°34.83
Polaris	314°24.50	89°22.23
Acamar	315°11.99	-40°12.19
Menkar	314°6.21	4°11.28
Mirfak	308°28.41	49°57.02
Aldebaran	290°39.65	16°33.58
Rigel	281°3.91	-8°10.42
Capella	280°21.93	46°1.46
Bellatrix	278°22.89	6°22.31
Elnath	278°1.87	28°37.

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.64	N16°49.56	58°59.72	16.4'	N07°5.94	-14.2'	54.8'
1	195°51.68	50.25	73°35.12	16.4'	06°51.79	-14.2'	54.8'
2	210°51.72	50.93	88°10.57	16.5'	06°37.62	-14.2'	54.8'
3	225°51.76	· · 51.62	102°46.06	16.5'	06°23.44	-14.2'	54.8'
4	240°51.80	52.31	117°21.59	16.6'	06°9.24	-14.2'	54.7'
5	255°51.84	53.00	131°57.16	16.6'	05°55.03	-14.2'	54.7'
6	270°51.88	N16°53.68	146°32.77	16.6'	N05°40.81	-14.2'	54.7'
7	285°51.92	54.37	161°8.42	16.7'	05°26.58	-14.2'	54.7'
8	300°51.96	55.06	175°44.11	16.7'	05°12.33	-14.3'	54.7'
9	315°52.00	· · 55.74	190°19.83	16.8'	04°58.08	-14.3'	54.7'
10	330°52.04	56.43	204°55.59	16.8'	04°43.81	-14.3'	54.6'
11	345°52.08	57.11	219°31.38	16.8'	04°29.54	-14.3'	54.6'
12	0°52.11	N16°57.80	234°7.20	16.9'	N04°15.26	-14.3'	54.6'
13	15°52.15	58.48	248°43.06	16.9'	04°0.97	-14.3'	54.6'
14	30°52.19	59.16	263°18.94	16.9'	03°46.68	-14.3'	54.6'
15	45°52.23	16°59.84	277°54.86	16.9'	03°32.38	-14.3'	54.5'
16	60°52.26	17°05.53	292°30.80	17.0'	03°18.07	-14.3'	54.5'
17	75°52.30	1.21	307°6.77	17.0'	03°3.76	-14.3'	54.5'
18	90°52.34	N17°1.89	321°42.76	17.0'	N02°49.45	-14.3'	54.5'
19	105°52.37	2.57	336°18.78	17.0'	02°35.14	-14.3'	54.5'
20	120°52.41	3.25	350°54.82	17.1'	02°20.82	-14.3'	54.5'
21	135°52.45	· · 3.93	5°30.89	17.1'	02°6.50	-14.3'	54.5'
22	150°52.48	4.61	20°6.97	17.1'	01°52.19	-14.3'	54.4'
23	165°52.52	5.29	34°43.07	17.1'	01°37.87	-14.3'	54.4'
SD = 15.8'		$d = 0.7'$	SD = 15.0'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.55	N17°5.96	49°19.19	17.1'	N01°23.55	-14.3'	54.4'
1	195°52.59	6.64	63°55.33	17.2'	01°9.24	-14.3'	54.4'
2	210°52.62	7.32	78°31.49	17.2'	00°54.93	-14.3'	54.4'
3	225°52.66	· · 8.00	93°7.66	17.2'	00°40.62	-14.3'	54.4'
4	240°52.69	8.67	107°43.84	17.2'	00°26.31	-14.3'	54.3'
5	255°52.73	9.35	122°20.03	17.2'	N00°12.01	-14.3'	54.3'
6	270°52.76	N17°10.02	136°56.24	17.2'	S00°2.28	14.3'	54.3'
7	285°52.79	10.70	151°32.46	17.2'	00°16.57	14.3'	54.3'
8	300°52.83	11.37	166°8.68	17.2'	00°30.86	14.3'	54.3'
9	315°52.86	· · 12.04	180°44.92	17.2'	00°45.13	14.3'	54.3'
10	330°52.89	12.72	195°21.16	17.2'	00°59.40	14.3'	54.3'
11	345°52.92	13.39	209°57.41	17.3'	01°13.65	14.2'	54.3'
12	0°52.96	N17°14.06	224°33.66	17.3'	S01°27.90	14.2'	54.2'
13	15°52.99	14.73	239°9.91	17.3'	01°42.14	14.2'	54.2'
14	30°53.02	15.40	253°46.17	17.3'	01°56.37	14.2'	54.2'
15	45°53.05	· · 16.07	268°22.43	17.3'	02°10.58	14.2'	54.2'
16	60°53.08	16.74	282°58.69	17.3'	02°24.78	14.2'	54.2'
17	75°53.12	17.41	297°34.95	17.3'	02°38.97	14.2'	54.2'
18	90°53.15	N17°18.08	312°11.20	17.3'	S02°53.15	14.2'	54.2'
19	105°53.18	18.75	326°47.46	17.2'	03°7.31	14.1'	54.2'
20	120°53.21	19.42	341°23.71	17.2'	03°21.45	14.1'	54.2'
21	135°53.24	· · 20.09	355°59.95	17.2'	03°35.58	14.1'	54.2'
22	150°53.27	20.75	10°36.19	17.2'	03°49.70	14.1'	54.1'
23	165°53.30	21.42	25°12.42	17.2'	04°3.79	14.1'	54.1'
SD = 15.8'		$d = 0.7'$	SD = 14.8'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.33	N17°22.09	39°48.64	17.2'	S04°17.87	14.1'	54.1'
1	195°53.36	22.75	54°24.85	17.2'	04°31.93	14.0'	54.1'
2	210°53.38	23.42	69°1.05	17.2'	04°45.97	14.0'	54.1'
3	225°53.41	· · 24.08	83°37.24	17.2'	04°59.98	14.0'	54.1'
4	240°53.44	24.74	98°13.42	17.2'	05°13.98	14.0'	54.1'
5	255°53.47	25.41	112°49.58	17.1'	05°27.96	14.0'	54.1'
6	270°53.50	N17°26.07	127°25.73	17.1'	S05°41.91	13.9'	54.1'
7	285°53.53	26.73	142°1.86	17.1'	05°55.84	13.9'	54.1'
8	300°53.55	27.40	156°37.98	17.1'	06°9.75	13.9'	54.1'
9	315°53.58	· · 28.06	171°14.08	17.1'	06°23.63	13.9'	54.0'
10	330°53.61	28.72	185°50.16	17.1'	06°37.49	13.8'	54.0'
11	345°53.63	29.38	200°26.21	17.0'	06°51.32	13.8'	54.0'
12	0°53.66	N17°30.04	215°2.25	17.0'	S07°5.12	13.8'	54.0'
13	15°53.69	30.70	229°38.27	17.0'	07°18.90	13.7'	54.0'
14	30°53.71	31.36	244°14.26	17.0'	07°32.65	13.7'	54.0'
15	45°53.74	· · 32.01	258°50.23	16.9'	07°46.37	13.7'	54.0'
16	60°53.76	32.67	273°26.17	16.9'	08°0.06	13.7'	54.0'
17	75°53.79	33.33	288°2.09	16.9'	08°13.71	13.6'	54.0'
18	90°53.82	N17°33.99	302°37.98	16.9'	S08°27.34	13.6'	54.0'
19	105°53.84	34.64	317°13.85	16.8'	08°40.94	13.6'	54.0'
20	120°53.86	35.30	331°49.68	16.8'	08°54.50	13.5'	54.0'
21	135°53.89	· · 35.95	346°25.48	16.8'	09°8.03	13.5'	54.0'
22	150°53.91	36.61	1°1.26	16.7'	09°21.53	13.5'	54.0'
23	165°53.94	37.26	15°37.00	16.7'	09°34.99	13.4'	54.0'
SD = 15.8'		$d = 0.7'$	SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	00:17	////	////	////
N 70°	////	////	01:45	22:15	////	////
68°	////	////	02:23	21:34	////	////
66°	////	01:01	02:49	21:07	23:01	////
64°	////	01:49	03:09	20:46	22:08	////
62°	////	02:19	03:25	20:29	21:37	////
60°	00:54	02:41	03:39	20:16	21:14	23:07
N 58°	01:38	02:59	03:51	20:04	20:56	22:19
56°	02:05	03:14	04:01	19:54	20:41	21:50
54°	02:26	03:26	04:09	19:45	20:28	21:29
52°	02:43	03:37	04:17	19:37	20:17	21:12
50°	02:57	03:46	04:24	19:30	20:08	20:58
45°	03:24	04:06	04:39	19:14	19:48	20:30
N 40°	03:45	04:22	04:52	19:02	19:32	20:09
35°	04:01	04:35	05:02	18:51	19:19	19:52
30°	04:15	04:46	05:11	18:42	19:08	19:39
20°	04:36	05:04	05:27	18:26	18:50	19:17
N 10°	04:53	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:05	17:47	18:09	18:35
20°	05:29	05:56	06:19	17:34	17:57	18:24
30°	05:40	06:08	06:34	17:19	17:44	18:13
35°	05:45	06:15	06:42	17:10	17:37	18:07
40°	05:51	06:23	06:52	17:01	17:29	18:02
45°	05:57	06:32	07:03	16:49	17:20	17:56
S 50°	06:03	06:42	07:17	16:35	17:10	17:49
52°	06:06	06:47	07:24	16:29	17:05	17:46
54°	06:09	06:52	07:31	16:22	17:00	17:43
56°	06:12	06:57	07:39	16:14	16:55	17:40
58°	06:16	07:04	07:48	16:05	16:49	17:36
S 60°	06:19	07:10	07:58	15:54	16:42	17:33

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	13:39	15:37	17:38	03:28	02:55	02:23
N 70°	13:45	15:34	17:24	03:19	02:54	02:29
68°	13:49	15:31	17:14	03:12	02:53	02:35
66°	13:53	15:29	17:05	03:06	02:53	02:39
64°	13:56	15:27	16:58	03:01	02:52	02:43
62°	13:59	15:25	16:51	02:57	02:52	02:47
60°	14:01	15:24	16:46	02:53	02:51	02:50
N 58°	14:03	15:22	16:41	02:49	02:51	02:53
56°	14:05	15:21	16:37	02:46	02:51	02:55
54°	14:07	15:20	16:33	02:44	02:51	02:57
52°	14:08	15:19	16:30	02:41	02:50	02:59
50°	14:10	15:18	16:27	02:39	02:50	03:01
45°	14:13	15:16	16:20	02:34	02:50	03:05
N 40°	14:15	15:15	16:14	02:30	02:49	03:08
35°	14:17	15:14	16:10	02:26	02:49	03:11
30°	14:19	15:12	16:05	02:23	02:48	03:14
20°	14:22	15:10	15:58	02:17	02:48	03:18
N 10°	14:25	15:09	15:52	02:12	02:47	03:22
0°	14:28	15:07	15:46	02:07	02:47	03:26
S 10°	14:31	15:05	15:40	02:02	02:46	03:30
20°	14:33	15:04	15:34	01:57	02:46	03:34
30°	14:37	15:02	15:27	01:51	02:45	03:38
35°	14:38	15:01	15:24	01:48	02:45	03:41
40°	14:40	15:00	15:19	01:44	02:44	03:44
45°	14:43	14:58	15:14	01:39	02:44	03:47
S 50°	14:46	14:57	15:08	01:34	02:43	03:51
52°	14:47	14:56	15:05	01:31	02:43	03:53
54°	14:48	14:55	15:02	01:28	02:42	03:55
56°	14:50	14:54	14:59	01:25	02:42	03:58
58°	14:52	14:53	14:55	01:22	02:42	04:00
S 60°	14:54	14:52	14:51	01:18	02:41	04:03

Day	Sun		Mer. Pass	Moon		Age 10-12 73-88%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
07	03:27	03:28	11:57	20:37	08:18	
08	03:30	03:32	11:56	21:16	08:57	
09	03:33	03:35	11:56	21:56	09:36	

May 10, 11, 12 UT (Sat., Sun., Mon.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°2.89	222°27.43	N02°11.34	95°14.77	N19°32.46	145°25.46	N23°2.72	228°24.80	S02°22.13						
1	243°5.35	237°28.09	11.77	110°16.01	32.09	160°27.35	2.75	243°27.05	22.05						
2	258°7.82	252°28.75	12.20	125°17.25	31.72	175°29.25	2.79	258°29.30	21.96						
3	273°10.28	267°29.41	•• 12.63	140°18.49	•• 31.35	190°31.15	•• 2.82	273°31.54	•• 21.88						
4	288°12.74	282°30.07	13.06	155°19.73	30.98	205°33.04	2.85	288°33.79	21.79						
5	303°15.21	297°30.73	13.50	170°20.97	30.61	220°34.94	2.88	303°36.04	21.71						
6	318°17.67	312°31.39	N02°13.93	185°22.21	N19°30.23	235°36.83	N23°2.91	318°38.29	S02°21.62						
7	333°20.14	327°32.05	14.36	200°23.45	29.86	250°38.73	2.94	333°40.54	21.54						
8	348°22.60	342°32.70	14.80	215°24.69	29.49	265°40.62	2.97	348°42.79	21.46						
9	3°25.06	357°33.35	•• 15.24	230°25.93	•• 29.12	280°42.52	•• 3.01	3°45.04	•• 21.37						
10	18°27.53	12°34.01	15.68	245°27.17	28.74	295°44.41	3.04	18°47.29	21.29						
11	33°29.99	27°34.66	16.12	260°28.41	28.37	310°46.31	3.07	33°49.54	21.20						
12	48°32.46	42°35.31	N02°16.56	275°29.64	N19°28.00	325°48.21	N23°3.10	48°51.79	S02°21.12						
13	63°34.92	57°35.96	17.00	290°30.88	27.62	340°50.10	3.13	63°54.04	21.03						
14	78°37.39	72°36.60	17.44	305°32.12	27.25	355°52.00	3.16	78°56.29	20.95						
15	93°39.85	87°37.25	•• 17.88	320°33.36	•• 26.87	10°53.89	•• 3.19	93°58.53	•• 20.87						
16	108°42.31	102°37.89	18.32	335°34.60	26.50	25°55.78	3.22	109°0.78	20.78						
17	123°44.78	117°38.53	18.77	350°35.83	26.13	40°57.68	3.26	124°3.03	20.70						
18	138°47.24	132°39.18	N02°19.21	5°37.07	N19°25.75	55°59.57	N23°3.29	139°5.28	S02°20.61						
19	153°49.71	147°39.82	19.66	20°38.31	25.38	71°1.47	3.32	154°7.53	20.53						
20	168°52.17	162°40.46	20.11	35°39.55	25.00	86°3.36	3.35	169°9.79	20.44						
21	183°54.63	177°41.09	•• 20.56	50°40.78	•• 24.63	101°5.26	•• 3.38	184°12.04	•• 20.36						
22	198°57.10	192°41.73	21.01	65°42.02	24.25	116°7.15	3.41	199°14.29	20.28						
23	213°59.56	207°42.36	21.46	80°43.26	23.88	131°9.05	3.44	214°16.54	20.19						
Mer.pass. 08:46			ν0.7' d0.4' m-4.63			ν1.2' d-0.4' m1.05			ν1.9' d0.0' m-1.96			ν2.2' d-0.1' m1.15			
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	229°2.03	222°43.00	N02°21.91	95°44.49	N19°23.50	146°10.94	N23°3.47	229°18.79	S02°20.11						
1	244°4.49	237°43.63	22.36	110°45.73	23.12	161°12.83	3.50	244°21.04	20.03						
2	259°6.95	252°44.26	22.81	125°46.97	22.75	176°14.73	3.53	259°23.29	19.94						
3	274°9.42	267°44.89	•• 23.27	140°48.20	•• 22.37	191°16.62	•• 3.56	274°25.54	•• 19.86						
4	289°11.88	282°45.52	23.72	155°49.44	22.00	206°18.51	3.59	289°27.79	19.77						
5	304°14.35	297°46.15	24.18	170°50.67	21.62	221°20.41	3.63	304°30.04	19.69						
6	319°16.81	312°46.77	N02°24.64	185°51.91	N19°21.24	236°22.30	N23°3.66	319°32.29	S02°19.61						
7	334°19.27	327°47.40	25.10	200°53.14	20.87	251°24.19	3.69	334°34.54	19.52						
8	349°21.74	342°48.02	25.55	215°54.38	20.49	266°26.09	3.72	349°36.80	19.44						
9	4°24.20	357°48.64	•• 26.01	230°55.61	•• 20.11	281°27.98	•• 3.75	4°39.05	•• 19.36						
10	19°26.67	12°49.26	26.47	245°56.85	19.73	296°29.87	3.78	19°41.30	19.27						
11	34°29.13	27°49.88	26.94	260°58.08	19.36	311°31.77	3.81	34°43.55	19.19						
12	49°31.60	42°50.50	N02°27.40	275°59.32	N19°18.98	326°33.66	N23°3.84	49°45.80	S02°19.11						
13	64°34.06	57°51.12	27.86	291°0.55	18.60	341°35.55	3.87	64°48.05	19.02						
14	79°36.52	72°51.74	28.33	306°1.78	18.22	356°37.44	3.90	79°50.31	18.94						
15	94°38.99	87°52.35	•• 28.79	321°3.02	•• 17.84	11°39.34	•• 3.93	94°52.56	•• 18.86						
16	109°41.45	102°52.96	29.26	336°4.25	17.46	26°41.23	3.96	109°54.81	18.78						
17	124°43.92	117°53.57	29.73	351°5.48	17.09	41°43.12	3.99	124°57.06	18.69						
18	139°46.38	132°54.19	N02°30.19	6°6.72	N19°16.71	56°45.01	N23°4.02	139°59.32	S02°18.61						
19	154°48.84	147°54.79	30.66	21°7.95	16.33	71°46.90	4.05	155°1.57	18.53						
20	169°51.31	162°55.40	31.13	36°9.18	15.95	86°48.80	4.08	170°3.82	18.44						
21	184°53.77	177°56.01	•• 31.60	51°10.41	•• 15.57	101°50.69	•• 4.11	185°6.07	•• 18.36						
22	199°56.24	192°56.62	32.08	66°11.65	15.19	116°52.58	4.14	200°8.33	18.28						
23	214°58.70	207°57.22	32.55	81°12.88	14.81	131°54.47	4.17	215°10.58	18.20						
Mer.pass. 08:42			ν0.6' d0.5' m-4.62			ν1.2' d-0.4' m1.07			ν1.9' d0.0' m-1.96			ν2.3' d-0.1' m1.15			
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230°1.16	222°57.82	N02°33.02	96°14.11	N19°14.43	146°56.36	N23°4.20	230°12.83	S02°18.11						
1	245°3.63	237°58.42	33.50	111°15.34	14.05	161°58.25	4.23	245°15.09	18.03						
2	260°6.09	252°59.02	33.97	126°16.57	13.67	177°0.15	4.26	260°17.34	17.95						
3	275°8.56	267°59.62	•• 34.45	141°17.81	•• 13.29	192°2.04	•• 4.29	275°19.59	•• 17.87						
4	290°11.02	283°0.22	34.93	156°19.04	12.91	207°3.93	4.32	290°21.84	17.78						
5	305°13.49	298°0.82	35.40	171°20.27	12.53	222°5.82	4.35	305°24.10	17.70						
6	320°15.95	313°1.41	N02°35.88	186°21.50	N19°12.15	237°7.71	N23°4.38	320°26.35	S02°17.62						
7	335°18.41	328°2.01	36.36	201°22.73	11.76	252°9.60	4.41	335°28.61	17.54						
8	350°20.88	343°2.60	36.84	216°23.96	11.38	267°11.49	4.44	350°30.86	17.45						
9	5°23.34	358°3.19	•• 37.33	231°25.19	•• 11.00	282°13.38	•• 4.47	5°33.11	•• 17.37						
10	20°25.81	13°3.78	37.81	246°26.42	10.62	297°15.27	4.50	20°35.37	17.29						
11	35°28.27	28°4.37	38.29	261°27.65	10.24	312°17.16	4.53	35°37.62	17.21						
12	50°30.73	43°4.96	N02°38.78	276°28.88	N19°9.86	327°19.05	N23°4.56	50°39.88	S02°17.12						
13	65°33.20	58°5.55	39.26	291°30.11	9.47	342°20.94	4.59	65°42.13	17.04						
14	80°35.66	73°6.13	39.75	306°31.34	9.09	357°22.83	4.62	80°44.38	16.96						
15	95°38.13	88°6.72	•• 40.23	321°32.57	•• 8.71	12°24.72	•• 4.65	95°46.64	•• 16.88						
16	110°40.59	103°7.30	40.72	336°33.80	8.32	27°26.61	4.68	110°48.89	16.80						
17	125°43.05	118°7.88	41.21	351°35.03	7.94	42°28.50	4.71	125°51.15	16.72						
18	140°45.52	133°8.47	N02°41.70	6°36.26	N19°7.56	57°30.39	N23°4.74	140°53.40	S02°16.63						
19	155°47.98	148°9.04	42.19	21°37.49	7.17	72°32.28	4.77	155°55.66	16.55						
20	170°50.45	163°9.62	42.68	36°38.71	6.79	87°34.17	4.80	170°57.91	16.47						
21	185°52.91	178°10.20	•• 43.18	51°39.94	•• 6.41	102°36.06	•• 4.83	186°0.17	•• 16.39						
22	200°55.38	193°10.78	43.67	66°41.17	6.02	117°37.95	4.86	201°2.42	16.31						
23	215°57.84	208°11.35	44.16	81°42.40	5.64	132°39.84	4.89	216°4.68	16.22						
Mer.pass. 08:39			ν0.6' d0.5' m-4.61			ν1.2' d-0.4' m1.08			ν1.9' d0.0' m-1.95			ν2.3' d-0.1' m1.14			

Stars		
	SHA	Dec
Alpheratz	357° 34.76	29° 13.63
Ankaa	353° 7.18	-42° 9.99
Schedar	349° 31.22	56° 40.36
Diphda	348° 47.29	-17° 50.86
Achernar	335° 20.50	-57° 6.37
Hamal	327° 51.25	23° 34.82
Polaris	314° 24.26	89° 22.21
Acamar	315° 11.99	-40° 12.18
Menkar	314° 6.21	4° 11.28
Mirfak	308° 28.41	49° 57.01
Aldebaran	290° 39.66	16° 33.58
Rigel	281° 3.92	-8° 10.41
Capella	280° 21.94	46° 1.45
Bellatrix	278° 22.90	6° 22.32
Elmath	278° 1.87	28° 37.74
Alnilam	275° 37.75	-1° 11.20
Betelgeuse	270° 52.08	7° 24.67
Canopus	263° 52.68	-52° 42.71
Sirius	258° 26.25	-16° 45.17
Adhara	255° 5.90	-29° 0.54
Procyon	244° 50.73	5° 9.56
Pollux	243° 17.16	27° 57.97
Avior	234° 14.85	-59° 35.69
Suhail	222° 46.19	-43° 32.34
Miaplacidus	221° 38.35	-69° 49.55
Alphard	217° 47.52	-8° 46.23
Regulus	207° 34.12	11° 50.59
Dubhe	193° 40.39	61° 37.08
Denebola	182° 24.50	14° 25.80
Gienah	175° 43.11	-17° 41.12
Acrux	172° 59.36	-63° 14.63
Gacrux	171° 50.97	-57° 15.55
Alioth	166° 12.26	55° 49.44
Spica	158° 21.75	-11° 17.75
Alkaid	152° 51.33	49° 11.22
Hadar	148° 35.06	-60° 29.86
Menkent	147° 56.95	-36° 29.83
Arcturus	145° 47.35	19° 2.95
Rigel Kent.	139° 39.32	-60° 56.52
Kochab	137° 18.57	74° 3.03
Zuben'ubi	136° 55.40	-16° 8.94
Alphecca	126° 3.15	26° 37.64
Antares	112° 15.17	-26° 29.34
Atria	107° 8.67	-69° 4.29
Sabik	102° 2.18	-15° 45.44
Shaula	96° 9.67	-37° 7.30
Rasalhague	95° 58.02	12° 32.33
Eltanin	90° 41.64	51° 28.85
Kaus Aust.	83° 31.89	-34° 22.30
Vega	80° 32.76	38° 48.15
Nunki	75° 47.21	-26° 15.88
Altair	61° 59.57	8° 55.96
Peacock	53° 5.15	-56° 38.99
Deneb	49° 25.55	45° 21.92
Enif	33° 38.57	9° 59.32
Al Na'ir	27° 32.66	-46° 50.12
Fomalhaut	15° 14.37	-29° 29.20
Scheat	13° 45.12	28° 12.99
Markab	13° 29.79	15° 20.33
May 10 Sat	SHA	Mer.pass
Venus	354° 24.54	09:10
Mars	227° 11.88	17:38
Jupiter	277° 22.57	14:16
Saturn	0° 21.91	08:45
May 11 Sun	SHA	Mer.pass
Venus	353° 40.97	09:09
Mars	226° 42.47	17:36
Jupiter	277° 8.91	14:13
Saturn	0° 16.76	08:41
May 12 Mon	SHA	Mer.pass
Venus	352° 56.66	09:08
Mars	226° 12.95	17:34
Jupiter	276° 55.20	14:10
Saturn	0° 11.67	08:38
Horizontal parallax		
Venus:		0.3
Mars:		0.1


h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		180°53.96	N17°37.92	30°12.70	16.7'	S09°48.41	13.4' 54.0'
1		195°53.98	38.57	44°48.38	16.6'	10°1.80	13.4' 54.0'
2		210°54.01	39.22	59°24.02	16.6'	10°15.15	13.3' 54.0'
3		225°54.03	· · 39.87	73°59.62	16.6'	10°28.46	13.3' 53.9'
4		240°54.05	40.53	88°35.19	16.5'	10°41.74	13.2' 53.9'
5		255°54.07	41.18	103°10.72	16.5'	10°54.97	13.2' 53.9'
6		270°54.10	N17°41.83	117°46.21	16.5'	S11°8.17	13.2' 53.9'
7		285°54.12	42.48	132°21.66	16.4'	11°21.32	13.1' 53.9'
8		300°54.14	43.13	146°57.07	16.4'	11°34.43	13.1' 53.9'
9		315°54.16	· · 43.78	161°32.44	16.3'	11°47.50	13.0' 53.9'
10		330°54.18	44.43	176°7.77	16.3'	12°0.53	13.0' 53.9'
11		345°54.20	45.07	190°43.06	16.2'	12°13.51	12.9' 53.9'
12		0°54.22	N17°45.72	205°18.30	16.2'	S12°26.44	12.9' 53.9'
13		15°54.24	46.37	219°53.49	16.2'	12°39.33	12.8' 53.9'
14		30°54.26	47.01	234°28.64	16.1'	12°52.17	12.8' 53.9'
15		45°54.28	· · 47.66	249°3.75	16.1'	13°4.97	12.7' 53.9'
16		60°54.30	48.31	263°38.80	16.0'	13°17.11	12.7' 53.9'
17		75°54.32	48.95	278°13.81	16.0'	13°30.41	12.6' 53.9'
18		90°54.34	N17°49.60	292°48.77	15.9'	S13°43.06	12.6' 53.9'
19		105°54.36	50.24	307°23.68	15.9'	13°55.66	12.5' 53.9'
20		120°54.38	50.88	321°58.54	15.8'	14°8.20	12.5' 53.9'
21		135°54.40	· · 51.53	336°33.35	15.8'	14°20.69	12.4' 53.9'
22		150°54.42	52.17	351°8.10	15.7'	14°33.13	12.4' 53.9'
23		165°54.44	52.81	5°42.80	15.6'	14°45.52	12.3' 53.9'
		SD = 15.8' $d = 0.7'$		SD = 14.7'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		180°54.45	N17°53.45	20°17.45	15.6'	S14°57.84	12.3' 53.9'
1		195°54.47	54.09	34°52.04	15.5'	15°10.12	12.2' 53.9'
2		210°54.49	54.73	49°26.58	15.5'	15°22.33	12.2' 53.9'
3		225°54.50	· · 55.37	64°1.06	15.4'	15°34.49	12.1' 53.9'
4		240°54.52	56.01	78°35.49	15.4'	15°46.59	12.0' 53.9'
5		255°54.54	56.65	93°9.85	15.3'	15°58.63	12.0' 53.9'
6		270°54.55	N17°57.29	107°44.16	15.2'	S16°10.61	11.9' 53.9'
7		285°54.57	57.93	122°18.41	15.2'	16°22.53	11.9' 53.9'
8		300°54.59	58.56	136°52.60	15.1'	16°34.39	11.8' 53.9'
9		315°54.60	· · 59.20	151°26.73	15.1'	16°46.18	11.7' 53.9'
10		330°54.62	17°59.84	166°0.80	15.0'	16°57.91	11.7' 53.9'
11		345°54.63	18°0.47	180°34.80	14.9'	17°9.58	11.6' 53.9'
12		0°54.65	N18°1.11	195°8.75	14.9'	S17°21.18	11.5' 53.9'
13		15°54.66	1.74	209°42.63	14.8'	17°32.71	11.5' 53.9'
14		30°54.67	2.37	224°16.44	14.8'	17°44.17	11.4' 53.9'
15		45°54.69	· · 3.01	238°50.19	14.7'	17°55.57	11.3' 53.9'
16		60°54.70	3.64	253°23.88	14.6'	18°6.90	11.3' 53.9'
17		75°54.72	4.27	267°57.50	14.6'	18°18.16	11.2' 53.9'
18		90°54.73	N18°4.90	282°31.05	14.5'	S18°29.34	11.1' 53.9'
19		105°54.74	5.54	297°4.54	14.4'	18°40.45	11.0' 53.9'
20		120°54.76	6.17	311°37.96	14.4'	18°51.50	11.0' 53.9'
21		135°54.77	· · 6.80	326°11.31	14.3'	19°2.46	10.9' 53.9'
22		150°54.78	7.43	340°44.60	14.2'	19°13.35	10.8' 53.9'
23		165°54.79	8.06	355°17.81	14.1'	19°24.17	10.7' 53.9'
		SD = 15.8' $d = 0.6'$		SD = 14.7'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		180°54.80	N18°8.69	9°50.96	14.1'	S19°34.91	10.7' 54.0'
1		195°54.82	9.31	24°24.04	14.0'	19°45.57	10.6' 54.0'
2		210°54.83	9.94	38°57.04	13.9'	19°56.15	10.5' 54.0'
3		225°54.84	· · 10.57	53°29.98	13.9'	20°6.65	10.4' 54.0'
4		240°54.85	11.19	68°2.84	13.8'	20°17.08	10.3' 54.0'
5		255°54.86	11.82	82°35.63	13.7'	20°27.42	10.3' 54.0'
6		270°54.87	N18°12.45	97°8.35	13.6'	S20°37.68	10.2' 54.0'
7		285°54.88	13.07	111°41.00	13.6'	20°47.85	10.1' 54.0'
8		300°54.89	13.70	126°13.58	13.5'	20°57.94	10.0' 54.0'
9		315°54.90	· · 14.32	140°46.08	13.4'	21°7.94	9.9' 54.0'
10		330°54.91	14.94	155°18.51	13.4'	21°17.86	9.8' 54.0'
11		345°54.92	15.57	169°50.86	13.3'	21°27.69	9.7' 54.0'
12		0°54.93	N18°16.19	184°23.15	13.2'	S21°37.44	9.7' 54.0'
13		15°54.93	16.81	198°55.35	13.1'	21°47.09	9.6' 54.0'
14		30°54.94	17.43	213°27.49	13.1'	21°56.65	9.5' 54.0'
15		45°54.95	· · 18.05	227°59.55	13.0'	22°6.12	9.4' 54.0'
16		60°54.96	18.67	242°31.53	12.9'	22°15.50	9.3' 54.0'
17		75°54.97	19.29	257°3.44	12.8'	22°24.79	9.2' 54.0'
18		90°54.97	N18°19.91	271°35.27	12.8'	S22°33.98	9.1' 54.0'
19		105°54.98	20.53	286°7.03	12.7'	22°43.08	9.0' 54.1'
20		120°54.99	21.15	300°38.72	12.6'	22°52.08	8.9' 54.1'
21		135°54.99	· · 21.77	315°10.33	12.5'	23°0.98	8.8' 54.1'
22		150°55.00	22.38	329°41.86	12.5'	23°9.79	8.7' 54.1'
23		165°55.01	23.00	344°13.32	12.4'	23°18.49	8.6' 54.1'
		SD = 15.8' $d = 0.6'$		SD = 14.7'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°	////	////	01:21	22:39	////	////
68°	////	////	02:07	21:50	////	////
66°	////	00:19	02:37	21:19	////	////
64°	////	01:33	02:59	20:56	22:25	////
62°	////	02:07	03:17	20:38	21:49	////
60°	00:17	02:31	03:31	20:23	21:24	////
N 58°	01:23	02:51	03:44	20:10	21:04	22:34
56°	01:55	03:06	03:54	20:00	20:48	22:01
54°	02:17	03:20	04:04	19:50	20:35	21:38
52°	02:35	03:31	04:12	19:42	20:23	21:19
50°	02:50	03:41	04:20	19:34	20:13	21:04
45°	03:19	04:02	04:36	19:18	19:52	20:34
N 40°	03:41	04:18	04:49	19:05	19:35	20:13
35°	03:58	04:32	05:00	18:54	19:21	19:55
30°	04:12	04:43	05:09	18:44	19:10	19:41
20°	04:34	05:02	05:26	18:27	18:51	19:19
N 10°	04:52	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:06	17:47	18:09	18:34
20°	05:30	05:57	06:20	17:33	17:56	18:22
30°	05:41	06:10	06:35	17:17	17:42	18:11
35°	05:47	06:18	06:44	17:08	17:35	18:05
40°	05:53	06:26	06:55	16:58	17:26	17:59
45°	06:00	06:35	07:07	16:45	17:17	17:52
S 50°	06:07	06:46	07:21	16:31	17:06	17:45
52°	06:10	06:51	07:28	16:24	17:01	17:42
54°	06:13	06:57	07:36	16:16	16:56	17:39
56°	06:17	07:02	07:44	16:08	16:50	17:35
58°	06:21	07:09	07:54	15:58	16:43	17:31
S 60°	06:25	07:16	08:05	15:47	16:36	17:27

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	19:57			01:46	00:53	
N 70°	19:26	22:17		02:02	01:26	00:04
68°	19:03	21:13		02:15	01:50	01:09
66°	18:46	20:38	23:10	02:25	02:08	01:45
64°	18:32	20:13	22:09	02:34	02:24	02:11
62°	18:20	19:54	21:35	02:42	02:37	02:31
60°	18:10	19:38	21:11	02:49	02:48	02:48
N 58°	18:02	19:25	20:51	02:54	02:57	03:02
56°	17:54	19:13	20:35	03:00	03:06	03:14
54°	17:47	19:03	20:21	03:04	03:13	03:24
52°	17:41	18:55	20:09	03:09	03:20	03:34
50°	17:36	18:47	19:59	03:13	03:26	03:42
45°	17:24	18:30	19:37	03:21	03:39	04:00
N 40°	17:15	18:16	19:19	03:28	03:50	04:15
35°	17:07	18:05	19:04	03:34	04:00	04:28
30°	16:59	17:55	18:52	03:40	04:08	04:39
20°	16:47	17:38	18:30	03:49	04:22	04:58
N 10°	16:36	17:23	18:11	03:58	04:35	05:15
0°	16:27	17:09	17:54	04:05	04:47	05:30
S 10°	16:17	16:55	17:37	04:13	04:59	05:46
20°	16:06	16:40	17:18	04:22	05:11	06:03
30°	15:54	16:24	16:57	04:31	05:26	06:22
35°	15:48	16:14	16:45	04:37	05:34	06:33
40°	15:40	16:03	16:31	04:43	05:44	06:47
45°	15:31	15:50	16:14	04:51	05:56	07:02
S 50°	15:20	15:35	15:54	05:00	06:10	07:21
52°	15:15	15:28	15:44	05:04	06:16	07:30
54°	15:10	15:20	15:33	05:09	06:24	07:41
56°	15:04	15:11	15:21	05:14	06:32	07:52
58°	14:57	15:01	15:07	05:20	06:41	08:06
S 60°	14:50	14:49	14:50	05:26	06:52	08:22

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 13-15 94-99%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
10	03:36	03:37	11:56	22:36	10:16	
11	03:38	03:39	11:56	23:19	10:58	
12	03:39	03:40	11:56	--:--	11:42	

May 13, 14, 15 UT (Tue., Wed., Thu.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	231°0.30	223°11.92	N02°44.66	96°43.63	N19°5.25	147°41.73	N23°4.92	231°6.93	S02°16.14	Alpheratz	357°34.74 29°13.63
1	246°2.77	238°12.50	45.15	111°44.85	4.87	162°43.62	4.95	246°9.19	16.06	Ankaa	353°7.16 -42°9.97
2	261°5.23	253°13.07	45.65	126°46.08	4.48	177°45.51	4.97	261°11.45	15.98	Schedar	349°31.19 56°40.35
3	276°7.70	268°13.64	· · 46.15	141°47.31	· · 4.10	192°47.40	· · 5.00	276°13.70	· · 15.90	Diphda	348°47.28 -17°50.84
4	291°10.16	283°14.21	46.65	156°48.54	3.71	207°49.28	5.03	291°15.96	15.82	Achernar	335°20.49 -57°6.36
5	306°12.62	298°14.77	47.15	171°49.76	3.33	222°51.17	5.06	306°18.21	15.74	Hamal	327°51.24 23°34.82
6	321°15.09	313°15.34	N02°47.65	186°50.99	N19°2.94	237°53.06	N23°5.09	321°20.47	S02°15.66	Polaris	314°23.74 89°22.20
7	336°17.55	328°15.91	48.15	201°52.22	2.56	252°54.95	5.12	336°22.72	15.57	Acamar	315°11.99 -40°12.17
8	351°20.02	343°16.47	48.65	216°53.44	2.17	267°56.84	5.15	351°24.98	15.49	Menkar	314°6.20 4°11.29
9	6°22.48	358°17.03	· · 49.15	231°54.67	· · 1.79	282°58.73	· · 5.18	6°27.24	· · 15.41	Mirfak	308°28.40 49°57.00
10	21°24.95	13°17.59	49.66	246°55.89	1.40	298°0.61	5.21	21°29.49	15.33	Aldebaran	290°39.65 16°33.57
11	36°27.41	28°18.15	50.16	261°57.12	1.01	313°2.50	5.24	36°31.75	15.25	Rigel	281°3.92 -8°10.44
12	51°29.87	43°18.71	N02°50.66	276°58.35	N19°0.63	328°4.39	N23°5.27	51°34.01	S02°15.17	Capella	280°21.94 46°1.44
13	66°32.34	58°19.27	51.17	291°59.57	19°0.24	343°6.28	5.29	66°36.26	15.09	Bellatrix	278°22.90 6°22.32
14	81°34.80	73°19.83	51.68	307°0.80	18°59.85	358°8.17	5.32	81°38.52	15.01	Elmath	278°1.88 28°37.73
15	96°37.27	88°20.38	· · 52.19	322°2.02	· · 59.47	13°10.05	· · 5.35	96°40.78	· · 14.93	Alnilam	275°37.75 -1°11.20
16	111°39.73	103°20.94	52.69	337°3.25	59.08	28°11.94	5.38	111°43.03	14.85	Betelgeuse	270°52.08 7°24.67
17	126°42.19	118°21.49	53.20	352°4.47	58.69	43°13.83	5.41	126°45.29	14.76	Canopus	263°52.70 -52°42.70
18	141°44.66	133°22.04	N02°53.71	7°5.70	N18°58.30	58°15.72	N23°5.44	141°47.55	S02°14.68	Sirius	258°26.26 -16°45.16
19	156°47.12	148°22.59	54.23	22°6.92	57.92	73°17.60	5.47	156°49.81	14.60	Adhara	255°5.91 -29°0.54
20	171°49.59	163°23.14	54.74	37°8.15	57.53	88°19.49	5.50	171°52.06	14.52	Procyon	244°50.74 5°9.56
21	186°52.05	178°23.69	· · 55.25	52°9.37	· · 57.14	103°21.38	· · 5.53	186°54.32	· · 14.44	Pollux	243°17.17 27°57.96
22	201°54.52	193°24.24	55.77	67°10.59	56.75	118°23.26	5.55	201°56.58	14.36	Avior	234°14.88 -59°35.69
23	216°56.98	208°24.79	56.28	82°11.82	56.36	133°25.15	5.58	216°58.84	14.28	Suhail	222°46.20 -43°32.34
Mer.pass. 08:35		ν0.6' d0.5' m-4.60		ν1.2' d-0.4' m1.09		ν1.9' d0.0' m-1.95		ν2.3' d-0.1' m1.14		Miaplacidus	221°38.39 -69°49.55
										Alphard	217°47.52 -8°46.22
										Regulus	207°34.12 11°50.59
										Dubhe	193°40.42

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		180°55.01	N18°23.62	358°44.70	12.3'	S23°27.10	8.5' 54.1'
1		195°55.02	24.23	13°16.01	12.2'	23°35.61	8.4' 54.1'
2		210°55.02	24.85	27°47.24	12.2'	23°44.01	8.3' 54.1'
3		225°55.03	· · 25.46	42°18.40	12.1'	23°52.31	8.2' 54.1'
4		240°55.03	26.07	56°49.48	12.0'	24°05.1	8.1' 54.1'
5		255°55.04	26.69	71°20.49	11.9'	24°8.60	8.0' 54.1'
6		270°55.04	N18°27.30	85°51.42	11.9'	S24°16.58	7.9' 54.1'
7		285°55.05	27.91	100°22.27	11.8'	24°24.46	7.8' 54.1'
8		300°55.05	28.52	114°53.06	11.7'	24°32.23	7.7' 54.1'
9		315°55.05	· · 29.13	129°23.76	11.6'	24°39.90	7.6' 54.2'
10		330°55.06	29.74	143°54.40	11.6'	24°47.45	7.4' 54.2'
11		345°55.06	30.35	158°24.96	11.5'	24°54.89	7.3' 54.2'
12		0°55.06	N18°30.96	172°55.45	11.4'	S25°2.22	7.2' 54.2'
13		15°55.07	31.57	187°25.86	11.3'	25°9.44	7.1' 54.2'
14		30°55.07	32.18	201°56.20	11.3'	25°16.55	7.0' 54.2'
15		45°55.07	· · 32.79	216°26.47	11.2'	25°23.54	6.9' 54.2'
16		60°55.07	33.40	230°56.66	11.1'	25°30.41	6.8' 54.2'
17		75°55.07	34.00	245°26.79	11.1'	25°37.17	6.6' 54.2'
18		90°55.07	N18°34.61	259°56.84	11.0'	S25°43.82	6.5' 54.2'
19		105°55.08	35.22	274°26.83	10.9'	25°50.34	6.4' 54.2'
20		120°55.08	35.82	288°56.74	10.8'	25°56.75	6.3' 54.3'
21		135°55.08	· · 36.43	303°26.58	10.8'	26°3.03	6.2' 54.3'
22		150°55.08	37.03	317°56.35	10.7'	26°9.20	6.0' 54.3'
23		165°55.08	37.63	332°26.06	10.6'	26°15.24	5.9' 54.3'
		SD = 15.8'		SD = 14.8'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		180°55.08	N18°38.24	346°55.70	10.6'	S26°21.16	5.8' 54.3'
1		195°55.08	38.84	1°25.27	10.5'	26°26.96	5.7' 54.3'
2		210°55.08	39.44	15°54.77	10.4'	26°32.63	5.5' 54.3'
3		225°55.08	· · 40.04	30°24.21	10.4'	26°38.18	5.4' 54.3'
4		240°55.07	40.64	44°53.58	10.3'	26°43.61	5.3' 54.3'
5		255°55.07	41.24	59°22.89	10.2'	26°48.90	5.2' 54.4'
6		270°55.07	N18°41.84	73°52.14	10.2'	S26°54.07	5.0' 54.4'
7		285°55.07	42.44	88°21.32	10.1'	26°59.12	4.9' 54.4'
8		300°55.07	43.04	102°50.44	10.1'	27°4.03	4.8' 54.4'
9		315°55.07	· · 43.64	117°19.50	10.0'	27°8.81	4.7' 54.4'
10		330°55.06	44.24	131°48.50	9.9'	27°13.46	4.5' 54.4'
11		345°55.06	44.83	146°17.44	9.9'	27°17.98	4.4' 54.4'
12		0°55.06	N18°45.43	160°46.32	9.8'	S27°22.37	4.3' 54.4'
13		15°55.05	46.02	175°15.15	9.8'	27°26.63	4.1' 54.5'
14		30°55.05	46.62	189°43.92	9.7'	27°30.75	4.0' 54.5'
15		45°55.05	· · 47.21	204°12.63	9.7'	27°34.74	3.9' 54.5'
16		60°55.04	47.81	218°41.29	9.6'	27°38.59	3.7' 54.5'
17		75°55.04	48.40	233°9.89	9.6'	27°42.31	3.6' 54.5'
18		90°55.03	N18°49.00	247°38.45	9.5'	S27°45.89	3.4' 54.5'
19		105°55.03	49.59	262°6.95	9.5'	27°49.33	3.3' 54.5'
20		120°55.02	50.18	276°35.40	9.4'	27°52.64	3.2' 54.5'
21		135°55.02	· · 50.77	291°3.80	9.4'	27°55.81	3.0' 54.6'
22		150°55.01	51.36	305°32.16	9.3'	27°58.84	2.9' 54.6'
23		165°55.01	51.95	320°0.47	9.3'	28°1.73	2.8' 54.6'
		SD = 15.8'		SD = 14.8'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		180°55.00	N18°52.54	334°28.73	9.2'	S28°4.48	2.6' 54.6'
1		195°54.99	53.13	348°56.95	9.2'	28°7.09	2.5' 54.6'
2		210°54.99	53.72	3°25.13	9.1'	28°9.56	2.3' 54.6'
3		225°54.98	· · 54.31	17°53.27	9.1'	28°11.88	2.2' 54.6'
4		240°54.97	54.90	32°21.36	9.1'	28°14.07	2.0' 54.7'
5		255°54.97	55.48	46°49.42	9.0'	28°16.11	1.9' 54.7'
6		270°54.96	N18°56.07	61°17.44	9.0'	S28°18.01	1.8' 54.7'
7		285°54.95	56.66	75°45.42	8.9'	28°19.76	1.6' 54.7'
8		300°54.94	57.24	90°13.37	8.9'	28°21.37	1.5' 54.7'
9		315°54.93	· · 57.83	104°41.28	8.9'	28°22.84	1.3' 54.7'
10		330°54.93	58.41	119°9.16	8.9'	28°24.16	1.2' 54.8'
11		345°54.92	58.99	133°37.01	8.8'	28°25.34	1.0' 54.8'
12		0°54.91	N18°59.58	148°4.84	8.8'	S28°26.37	0.9' 54.8'
13		15°54.90	19°0.16	162°32.63	8.8'	28°27.25	0.7' 54.8'
14		30°54.89	0.74	177°0.40	8.7'	28°27.99	0.6' 54.8'
15		45°54.88	· · 1.32	191°28.14	8.7'	28°28.58	0.4' 54.8'
16		60°54.87	1.91	205°55.85	8.7'	28°29.02	0.3' 54.8'
17		75°54.86	2.49	220°23.55	8.7'	28°29.32	0.1' 54.9'
18		90°54.85	N19°3.07	234°51.22	8.7'	S28°29.47	0.0' 54.9'
19		105°54.84	3.64	249°18.88	8.6'	28°29.47	-0.1' 54.9'
20		120°54.83	4.22	263°46.51	8.6'	28°29.32	-0.3' 54.9'
21		135°54.81	· · 4.80	278°14.13	8.6'	28°29.02	-0.4' 54.9'
22		150°54.80	5.38	292°41.74	8.6'	28°28.58	-0.6' 54.9'
23		165°54.79	5.96	307°9.33	8.6'	28°27.98	-0.7' 55.0'
		SD = 15.8'		SD = 14.9'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	////	////	00:51	23:15	////	////
68°	////	////	01:51	22:06	////	////
66°	////	////	02:25	21:31	////	////
64°	////	01:14	02:50	21:05	22:45	////
62°	////	01:55	03:09	20:46	22:02	////
60°	////	02:22	03:24	20:30	21:34	////
N 58°	01:06	02:42	03:37	20:17	21:12	22:52
56°	01:43	02:59	03:49	20:05	20:55	22:13
54°	02:09	03:13	03:59	19:55	20:41	21:46
52°	02:28	03:25	04:07	19:46	20:28	21:26
50°	02:44	03:36	04:15	19:38	20:18	21:10
45°	03:15	03:58	04:32	19:21	19:56	20:39
N 40°	03:37	04:15	04:46	19:08	19:38	20:16
35°	03:55	04:29	04:57	18:56	19:24	19:58
30°	04:10	04:41	05:07	18:46	19:12	19:43
20°	04:33	05:01	05:24	18:29	18:52	19:20
N 10°	04:51	05:17	05:39	18:14	18:36	19:02
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:58	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:15	17:40	18:09
35°	05:49	06:20	06:47	17:06	17:33	18:03
40°	05:56	06:29	06:58	16:55	17:24	17:57
45°	06:03	06:38	07:10	16:42	17:14	17:49
S 50°	06:11	06:50	07:26	16:27	17:02	17:42
52°	06:14	06:55	07:33	16:19	16:57	17:38
54°	06:18	07:01	07:41	16:11	16:51	17:34
56°	06:21	07:07	07:50	16:02	16:45	17:31
58°	06:26	07:14	08:00	15:52	16:38	17:26
S 60°	06:30	07:22	08:12	15:40	16:30	17:22

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	00:48	■	■
64°	■	■	■	01:50	■	■
62°	23:27	■	■	02:24	02:14	■
60°	22:46	· ·	00:15	02:49	02:55	03:13
N 58°	22:18	23:37	· ·	03:09	03:24	03:52
56°	21:56	23:10	· ·	03:26	03:46	04:19
54°	21:38	22:49	23:47	03:40	04:04	04:40
52°	21:23	22:32	23:29	03:53	04:19	04:58
50°	21:10	22:17	23:14	04:04	04:33	05:13
45°	20:43	21:46	22:43	04:27	05:00	05:43
N 40°	20:22	21:23	22:19	04:45	05:22	06:07
35°	20:05	21:04	21:59	05:01	05:40	06:27
30°	19:50	20:47	21:42	05:15	05:56	06:43
20°	19:24	20:19	21:14	05:38	06:22	07:12
N 10°	19:02	19:55	20:49	05:58	06:45	07:36
0°	18:42	19:33	20:26	06:17	07:06	07:59
S 10°	18:22	19:11	20:04	06:36	07:28	08:21
20°	18:00	18:47	19:39	06:56	07:51	08:46
30°	17:35	18:20	19:11	07:20	08:17	09:14
35°	17:21	18:04	18:54	07:33	08:33	09:31
40°	17:04	17:45	18:34	07:50	08:52	09:50
45°	16:44	17:22	18:10	08:09	09:14	10:14
S 50°	16:19	16:53	17:40	08:33	09:42	10:45
52°	16:07	16:39	17:24	08:45	09:56	11:00
54°	15:53	16:22	17:06	08:58	10:13	11:18
56°	15:37	16:03	16:45	09:14	10:32	11:39
58°	15:18	15:38	16:17	09:32	10:56	12:07
S 60°	14:54	15:06	15:38	09:55	11:28	12:46

Day	Sun		Moon		
	Eqn.of Time 00 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm Lower hh:mm		Age 16-18 100-95%
13	03:40	03:40	11:56	00:05	12:29
14	03:40	03:40	11:56	00:54	13:20
15	03:40	03:40	11:56	01:46	14:12

May 16, 17, 18 UT (Fri., Sat., Sun.)

h	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	233°57.72	223°50.15	N03°22.50	98°11.59	N18°37.10	149°57.50	N23°6.94	233°49.59	S02°10.40				Alpheratz	357°34.71	29°13.64			
1	249°0.19	238°50.64	23.05	113°12.80	36.70	164°59.38	6.97	248°51.86	10.32				Ankaa	353°7.14	-42°9.95			
2	264°2.65	253°51.13	23.61	128°14.02	36.30	180°1.26	7.00	263°54.12	10.24				Schedar	349°31.16	56°40.35			
3	279°5.12	268°51.62	•• 24.17	143°15.23	•• 35.90	195°3.14	•• 7.03	278°56.38	•• 10.17				Diphda	348°47.25	-17°50.83			
4	294°7.58	283°52.11	24.72	158°16.45	35.51	210°5.02	7.05	293°58.65	10.09				Achernar	335°20.47	-57°6.34			
5	309°10.05	298°52.59	25.28	173°17.66	35.11	225°6.91	7.08	309°0.91	10.01				Hamal	327°51.22	23°34.83			
6	324°12.51	313°53.08	N03°25.84	188°18.88	N18°34.71	240°8.79	N23°7.11	324°3.17	S02°9.93				Polaris	314°23.15	89°22.18			
7	339°14.97	328°53.56	26.40	203°20.09	34.31	255°10.67	7.13	339°5.44	9.86				Acamar	315°11.98	-40°12.15			
8	354°17.44	343°54.04	26.96	218°21.31	33.91	270°12.55	7.16	354°7.70	9.78				Menkar	314°6.19	4°11.29			
9	9°19.90	358°54.52	•• 27.52	233°22.52	•• 33.51	285°14.43	•• 7.19	9°9.96	•• 9.70				Mirfak	308°28.38	49°57.00			
10	24°22.37	13°55.00	28.08	248°23.74	33.11	300°16.31	7.21	24°12.23	9.62				Aldebaran	290°39.65	-16°33.58			
11	39°24.83	28°55.48	28.64	263°24.95	32.71	315°18.20	7.24	39°14.49	9.55				Rigel	281°3.92	-8°10.40			
12	54°27.30	43°55.96	N03°29.21	278°26.17	N18°32.31	330°20.08	N23°7.27	54°16.75	S02°9.47				Capella	280°21.93	46°1.44			
13	69°29.76	58°56.44	29.77	293°27.38	31.91	345°21.96	7.29	69°19.02	9.39				Bellatrix	278°22.89	6°22.32			
14	84°32.22	73°56.91	30.34	308°28.59	31.51	0°23.84	7.32	84°21.28	9.31				Elnath	278°1.87	28°37.73			
15	99°34.69	88°57.39	•• 30.90	323°29.81	•• 31.11	15°25.72	•• 7.35	99°23.55	•• 9.24				Alnilam	275°37.75	-1°11.19			
16	114°37.15	103°57.86	31.47	338°31.02	30.71	30°27.60	7.37	114°25.81	9.16				Betelgeuse	270°52.08	7°24.67			
17	129°39.62	118°58.34	32.03	353°32.23	30.31	45°29.48	7.40	129°28.08	9.08				Canopus	263°52.71	-52°42.69			
18	144°42.08	133°58.81	N03°32.60	8°33.45	N18°29.91	60°31.36	N23°7.43	144°30.34	S02°9.00				Sirius	258°26.26	-16°45.16			
19	159°44.54	148°59.28	33.17	23°34.66	29.51	75°33.24	7.45	159°32.61	8.93				Adhara	255°5.92	-29°0.53			
20	174°47.01	163°59.75	33.74	38°35.87	29.11	90°35.12	7.48	174°34.87	8.85				Procyon	244°50.74	5°9.56			
21	189°49.47	179°0.22	•• 34.31	53°37.08	•• 28.71	105°37.01	•• 7.50	189°37.14	•• 8.77				Pollux	243°17.17	27°57.96			
22	204°51.94	194°0.68	34.88	68°38.30	28.31	120°38.89	7.53	204°39.40	8.70				Avior	234°14.90	-59°35.69			
23	219°54.40	209°1.15	35.45	83°39.51	27.91	135°40.77	7.56	219°41.67	8.62				Suhail	222°46.22	-43°32.34			
Mer.pass. 08:23			ν0.5' d0.6' m-4.57			ν1.2' d-0.4' m1.12			ν1.9' d0.0' m-1.94			ν2.3' d-0.1' m1.13						
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	234°56.87	224°1.62	N03°36.02	98°40.72	N18°27.50	150°42.65	N23°7.58	234°43.93	S02°8.54				Miaplacidus	221°38.43	-69°49.55			
1	249°59.33	239°2.08	36.60	113°41.93	27.10	165°44.53	7.61	249°46.20	8.47				Alphard	217°47.53	-8°46.22			
2	265°1.79	254°2.54	37.17	128°43.15	26.70	180°46.41	7.64	264°48.46	8.39				Regulus	207°34.13	11°50.59			
3	280°4.26	269°3.01	•• 37.74	143°44.36	•• 26.30	195°48.29	•• 7.66	279°50.73	•• 8.31				Dubhe	193°40.44	61°37.09			
4	295°6.72	284°3.47	38.32	158°45.57	25.90	210°50.17	7.69	294°53.00	8.24				Denebola	182°24.50	14°25.81			
5	310°9.19	299°3.93	38.89	173°46.78	25.49	225°52.05	7.71	309°55.26	8.16				Gienah	175°43.11	-17°41.13			
6	325°11.65	314°4.39	N03°39.47	188°47.99	N18°25.09	240°53.93	N23°7.74	324°57.53	S02°8.08				Acrux	172°59.38	-63°14.65			
7	340°14.11	329°4.84	40.05	203°49.20	24.69	255°55.81	7.77	339°59.79	8.01				Gacrux	171°50.98	-57°15.57			
8	355°16.58	344°5.30	40.63	218°50.41	24.28	270°57.69	7.79	355°2.06	7.93				Alioth	166°12.29	55°49.46			
9	10°19.04	359°5.76	•• 41.21	233°51.62	•• 23.88	285°59.56	•• 7.82	10°4.33	•• 7.85				Spica	158°21.75	-11°17.75			
10	25°21.51	14°6.21	41.78	248°52.83	23.48	301°1.44	7.84	25°6.59	7.78				Alkaid	152°51.34	49°11.25			
11	40°23.97	29°6.67	42.36	263°54.05	23.07	316°3.32	7.87	40°8.86	7.70				Hadar	148°35.05	-60°29.89			
12	55°26.44	44°7.12	N03°42.95	278°55.26	N18°22.67	331°5.20	N23°7.90	55°11.13	S02°7.62				Menkent	147°56.94	-36°29.84			
13	70°28.90	59°7.57	43.53	293°56.47	22.26	346°7.08	7.92	70°13.39	7.55				Arcturus	145°47.34	19°2.96			
14	85°31.36	74°8.02	44.11	308°57.68	21.86	1°8.96	7.95	85°15.66	7.47				Rigel Kent.	139°39.31	-60°56.55			
15	100°33.83	89°8.47	•• 44.69	323°58.89	•• 21.46	16°10.84	•• 7.97	100°17.93	•• 7.40				Kochab	137°18.60	74°3.06			
16	115°36.29	104°8.92	45.28	339°0.10	21.05	31°12.72	8.00	115°20.19	7.32				Zuben'ubi	136°55.39	-16°8.94			
17	130°38.76	119°9.37	45.86	354°1.30	20.65	46°14.60	8.02	130°22.46	7.24				Alphecca	126°3.14	26°37.66			
18	145°41.22	134°9.82	N03°46.45	9°2.51	N18°20.24	61°16.48	N23°8.05	145°24.73	S02°7.17				Antares	112°15.14	-26°29.35			
19	160°43.69	149°10.26	47.03	24°3.72	19.84	76°18.35	8.08	160°26.99	7.09				Atria	107°8.59	-69°4.31			
20	175°46.15	164°10.71	47.62	39°4.93	19.43	91°20.23	8.10	175°29.26	7.02				Sabik	102°2.15	-15°45.43			
21	190°48.61	179°11.15	•• 48.21	54°6.14	•• 19.02	106°22.11	•• 8.13	190°31.53	•• 6.94				Shaula	96°9.62	-37°7.30			
22	205°51.08	194°11.59	48.79	69°7.35	18.62	121°23.99	8.15	205°33.80	6.87				Rasalhague	95°57.99	12°32.35			
23	220°53.54	209°12.03	49.38	84°8.56	18.21	136°25.87	8.18	220°36.07	6.79				Eltanin	90°41.60	51°28.88			
Mer.pass. 08:19			ν0.5' d0.6' m-4.55			ν1.2' d-0.4' m1.14			ν1.9' d0.0' m-1.94			ν2.3' d-0.1' m1.13						
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	235°56.01	224°12.47	N03°49.97	99°9.77	N18°17.81	151°27.75	N23°8.20	235°38.33	S02°6.71				May 16 Fri	SHA	Mer.pass			
1	250°58.47	239°12.91	50.56	114°10.98	17.40	166°29.62	8.23	250°40.60	6.64				Venus	349°52.43	09:04			
2	266°0.93	254°13.35	51.15	129°12.18	16.99	181°31.50	8.25	265°42.87	6.56				Mars	224°13.86	17:26			
3	281°3.40	269°13.79	•• 51.74	144°13.39	•• 16.59	196°33.38	•• 8.28	280°45.14	•• 6.49				Jupiter	275°59.77	13:58			
4	296°5.86	284°14.2																

h		Sun		Moon			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		180°54.78	N19°6.53	321°36.91	8.6'	S28°27.24	-0.9' 55.0'
1		195°54.77	7.11	336°4.47	8.6'	28°26.35	-1.0' 55.0'
2		210°54.75	7.68	350°32.03	8.6'	28°25.31	-1.2' 55.0'
3		225°54.74	· · 8.26	4°59.58	8.5'	28°24.12	-1.3' 55.0'
4		240°54.73	8.83	19°27.13	8.5'	28°22.78	-1.5' 55.1'
5		255°54.72	9.41	33°54.67	8.5'	28°21.29	-1.6' 55.1'
6		270°54.70	N19°9.98	48°22.20	8.5'	S28°19.65	-1.8' 55.1'
7		285°54.69	10.55	62°49.73	8.5'	28°17.86	-1.9' 55.1'
8		300°54.67	11.12	77°17.27	8.5'	28°15.92	-2.1' 55.1'
9		315°54.66	· · 11.70	91°44.80	8.5'	28°13.84	-2.2' 55.2'
10		330°54.64	12.27	106°12.34	8.5'	28°11.60	-2.4' 55.2'
11		345°54.63	12.84	120°39.87	8.5'	28°9.21	-2.5' 55.2'
12		0°54.62	N19°13.41	135°7.42	8.6'	S28°6.68	-2.7' 55.2'
13		15°54.60	13.98	149°34.97	8.6'	28°3.99	-2.8' 55.2'
14		30°54.58	14.54	164°2.53	8.6'	28°1.16	-3.0' 55.2'
15		45°54.57	· · 15.11	178°30.09	8.6'	27°58.17	-3.1' 55.3'
16		60°54.55	15.68	192°57.67	8.6'	27°55.04	-3.3' 55.3'
17		75°54.54	16.25	207°25.26	8.6'	27°51.76	-3.4' 55.3'
18		90°54.52	N19°16.81	221°52.86	8.6'	S27°48.33	-3.6' 55.3'
19		105°54.50	17.38	236°20.48	8.6'	27°44.75	-3.7' 55.4'
20		120°54.49	17.94	250°48.11	8.6'	27°41.02	-3.9' 55.4'
21		135°54.47	· · 18.51	265°15.76	8.7'	27°37.15	-4.0' 55.4'
22		150°54.45	19.07	279°43.43	8.7'	27°33.12	-4.2' 55.4'
23		165°54.43	19.64	294°11.11	8.7'	27°28.95	-4.3' 55.4'
		SD = 15.8' $d = 0.6'$		SD = 15.0'			

Sat		GHA	Dec	GHA	ν	Dec	d HP
0		180°54.42	N19°20.20	308°38.82	8.7'	S27°24.64	-4.5' 55.5'
1		195°54.40	20.76	323°6.55	8.8'	27°20.17	-4.6' 55.5'
2		210°54.38	21.32	337°34.30	8.8'	27°15.56	-4.8' 55.5'
3		225°54.36	· · 21.89	352°2.08	8.8'	27°10.81	-4.9' 55.5'
4		240°54.34	22.45	6°29.88	8.8'	27°5.90	-5.0' 55.5'
5		255°54.32	23.01	20°57.71	8.9'	27°0.86	-5.2' 55.6'
6		270°54.30	N19°23.57	35°25.56	8.9'	S26°55.66	-5.3' 55.6'
7		285°54.28	24.12	49°53.44	8.9'	26°50.33	-5.5' 55.6'
8		300°54.26	24.68	64°21.36	8.9'	26°44.84	-5.6' 55.6'
9		315°54.24	· · 25.24	78°49.30	9.0'	26°39.22	-5.8' 55.7'
10		330°54.22	25.80	93°17.28	9.0'	26°33.45	-5.9' 55.7'
11		345°54.20	26.36	107°45.28	9.0'	26°27.54	-6.1' 55.7'
12		0°54.18	N19°26.91	122°13.33	9.1'	S26°21.48	-6.2' 55.7'
13		15°54.16	27.47	136°41.40	9.1'	26°15.29	-6.3' 55.8'
14		30°54.14	28.02	151°9.51	9.1'	26°8.95	-6.5' 55.8'
15		45°54.11	· · 28.58	165°37.66	9.2'	26°2.47	-6.6' 55.8'
16		60°54.09	29.13	180°5.84	9.2'	25°55.85	-6.8' 55.8'
17		75°54.07	29.68	194°34.07	9.3'	25°49.09	-6.9' 55.8'
18		90°54.05	N19°30.24	209°2.33	9.3'	S25°42.20	-7.0' 55.9'
19		105°54.03	30.79	223°30.63	9.3'	25°35.16	-7.2' 55.9'
20		120°54.00	31.34	237°58.97	9.4'	25°27.98	-7.3' 55.9'
21		135°53.98	· · 31.89	252°27.35	9.4'	25°20.67	-7.4' 55.9'
22		150°53.96	32.44	266°55.77	9.5'	25°13.22	-7.6' 56.0'
23		165°53.93	32.99	281°24.23	9.5'	25°5.64	-7.7' 56.0'
		SD = 15.8' $d = 0.6'$		SD = 15.1'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		180°53.91	N19°33.54	295°52.74	9.5'	S24°57.92	-7.9' 56.0'
1		195°53.88	34.09	310°21.29	9.6'	24°50.06	-8.0' 56.0'
2		210°53.86	34.64	324°49.88	9.6'	24°42.07	-8.1' 56.1'
3		225°53.83	· · 35.18	339°18.52	9.7'	24°33.95	-8.3' 56.1'
4		240°53.81	35.73	353°47.20	9.7'	24°25.69	-8.4' 56.1'
5		255°53.78	36.28	8°15.93	9.8'	24°17.30	-8.5' 56.2'
6		270°53.76	N19°36.82	22°44.70	9.8'	S24°8.78	-8.7' 56.2'
7		285°53.73	37.37	37°13.52	9.9'	24°0.13	-8.8' 56.2'
8		300°53.71	37.91	51°42.38	9.9'	23°51.35	-8.9' 56.2'
9		315°53.68	· · 38.46	66°11.29	10.0'	23°42.44	-9.0' 56.3'
10		330°53.65	39.00	80°40.25	10.0'	23°33.40	-9.2' 56.3'
11		345°53.63	39.54	95°9.26	10.1'	23°24.24	-9.3' 56.3'
12		0°53.60	N19°40.09	109°38.31	10.1'	S23°14.94	-9.4' 56.3'
13		15°53.57	40.63	124°7.41	10.1'	23°5.52	-9.5' 56.4'
14		30°53.55	41.17	138°36.56	10.2'	22°55.98	-9.7' 56.4'
15		45°53.52	· · 41.71	153°5.76	10.2'	22°46.31	-9.8' 56.4'
16		60°53.49	42.25	167°35.00	10.3'	22°36.51	-9.9' 56.5'
17		75°53.46	42.79	182°4.30	10.3'	22°26.60	-10.0' 56.5'
18		90°53.43	N19°43.33	196°33.64	10.4'	S22°16.56	-10.2' 56.5'
19		105°53.41	43.87	211°3.03	10.4'	22°6.40	-10.3' 56.5'
20		120°53.38	44.40	225°32.47	10.5'	21°56.11	-10.4' 56.6'
21		135°53.35	· · 44.94	240°1.96	10.5'	21°45.71	-10.5' 56.6'
22		150°53.32	45.48	254°31.49	10.6'	21°35.19	-10.6' 56.6'
23		165°53.29	46.01	269°1.08	10.6'	21°24.55	-10.8' 56.7'
		SD = 15.8' $d = 0.5'$		SD = 15.3'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	////	////	01:34	22:24	////	////
66°	////	////	02:13	21:43	////	////
64°	////	00:50	02:40	21:15	23:12	////
62°	////	01:42	03:01	20:54	22:15	////
60°	////	02:12	03:17	20:37	21:43	////
N 58°	00:45	02:34	03:31	20:23	21:20	23:16
56°	01:32	02:52	03:43	20:11	21:02	22:25
54°	02:00	03:07	03:54	20:00	20:47	21:55
52°	02:21	03:20	04:03	19:51	20:34	21:34
50°	02:38	03:31	04:11	19:42	20:22	21:16
45°	03:10	03:54	04:29	19:25	19:59	20:44
N 40°	03:34	04:12	04:43	19:10	19:41	20:20
35°	03:52	04:27	04:55	18:58	19:27	20:01
30°	04:07	04:39	05:05	18:48	19:14	19:46
20°	04:31	04:59	05:23	18:30	18:54	19:22
N 10°	04:50	05:16	05:39	18:14	18:37	19:03
0°	05:05	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:45	06:07	17:46	18:08	18:34
20°	05:32	05:59	06:22	17:31	17:54	18:21
30°	05:45	06:14	06:39	17:13	17:39	18:08
35°	05:51	06:22	06:49	17:03	17:31	18:01
40°	05:58	06:31	07:00	16:52	17:21	17:54
45°	06:06	06:41	07:14	16:39	17:11	17:47
S 50°	06:14	06:54	07:30	16:23	16:59	17:38
52°	06:18	06:59	07:37	16:15	16:53	17:35
54°	06:22	07:05	07:46	16:07	16:47	17:31
56°	06:26	07:12	07:55	15:57	16:40	17:26
58°	06:30	07:19	08:06	15:46	16:33	17:22
S 60°	06:35	07:28	08:18	15:34	16:24	17:17

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	03:04	██	██	05:59
62°	██	02:36	02:22	██	04:36	06:40
60°	01:18	01:44	01:54	04:02	05:28	07:08
N 58°	00:37	01:13	01:31	04:43	05:59	07:30
56°	00:09	00:49	01:13	05:11	06:23	07:47
54°	· ·	00:29	00:58	05:33	06:42	08:02
52°	· ·	00:13	00:45	05:51	06:58	08:15
50°	23:59	· ·	00:33	06:06	07:12	08:26
45°	23:30	· ·	00:08	06:37	07:40	08:50
N 40°	23:08	23:49	· ·	07:01	08:02	09:08
35°	22:49	23:32	· ·	07:20	08:20	09:24
30°	22:33	23:18	23:58	07:37	08:36	09:37
20°	22:06	22:54	23:38	08:05	09:02	10:00
N 10°	21:42	22:33	23:21	08:30	09:25	10:20
0°	21:20	22:13	23:05	08:52	09:46	10:38
S 10°	20:58	21:53	22:48	09:15	10:07	10:56
20°	20:35	21:32	22:31	09:39	10:29	11:16
30°	20:07	21:08	22:10	10:07	10:55	11:38
35°	19:51	20:53	21:58	10:24	11:10	11:51
40°	19:32	20:36	21:44	10:43	11:28	12:05
45°	19:09	20:16	21:28	11:06	11:49	12:23
S 50°	18:39	19:50	21:08	11:36	12:15	12:44
52°	18:25	19:38	20:58	11:51	12:28	12:55
54°	18:08	19:23	20:47	12:08	12:43	13:06
56°	17:47	19:07	20:34	12:28	13:00	13:19
58°	17:22	18:47	20:20	12:54	13:21	13:35
S 60°	16:47	18:21	20:03	13:30	13:46	13:53

Day	Sun		Mer. Pass hh:mm	Moon		Age 19-21 90-75%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
16	03:39	03:38	11:56	02:39	15:06	
17	03:38	03:37	11:56	03:33	16:00	
18	03:36	03:34	11:56	04:26	16:51	

May 19, 20, 21 UT (Mon., Tue., Wed.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	236°55.15	224°22.75	N04°4.32	99°38.73	N18°8.01	152°12.80	N23°8.80	236°32.80	S02°4.91					Alpheratz	357°34.69 29°13.64		
1	251°57.61	239°23.17	4.93	114°39.93	7.59	167°14.67	8.83	251°35.07	4.84					Ankaa	353°7.11 -42°9.94		
2	267°0.07	254°23.58	5.54	129°41.14	7.18	182°16.55	8.85	266°37.34	4.77					Schedar	349°31.13 56°40.35		
3	282°2.54	269°23.99	· · 6.14	144°42.34	· · 6.77	197°18.42	· · 8.88	281°39.61	· · 4.69					Diphda	348°47.23 -17°50.82		
4	297°5.00	284°24.41	6.75	159°43.55	6.36	212°20.30	8.90	296°41.88	4.62					Achernar	335°20.44 -57°6.32		
5	312°7.47	299°24.82	7.36	174°44.75	5.95	227°22.18	8.92	311°44.15	4.54					Hamal	327°51.20 23°34.83		
6	327°9.93	314°25.23	N04°7.97	189°45.95	N18°5.54	242°24.05	N23°8.95	326°46.42	S02°4.47					Polaris	314°22.71 89°22.17		
7	342°12.40	329°25.64	8.58	204°47.16	5.13	257°25.93	8.97	341°48.69	4.40					Acamar	315°11.96 -40°12.13		
8	357°14.86	344°26.05	9.19	219°48.36	4.72	272°27.80	9.00	356°50.97	4.32					Menkar	314°6.18 4°11.30		
9	12°17.32	359°26.46	· · 9.80	234°49.57	· · 4.30	287°29.68	· · 9.02	11°53.24	· · 4.25					Mirfak	308°28.37 49°56.99		
10	27°19.79	14°26.86	10.42	249°50.77	3.89	302°31.55	9.05	26°55.51	4.17					Aldebaran	290°39.64 16°33.58		
11	42°22.25	29°27.27	11.03	264°51.97	3.48	317°33.43	9.07	41°57.78	4.10					Rigel	281°3.92 -8°10.39		
12	57°24.72	44°27.67	N04°11.64	279°53.18	N18°3.07	332°35.30	N23°9.09	57°0.05	S02°4.03					Capella	280°21.93 46°1.43		
13	72°27.18	59°28.08	12.26	294°54.38	2.65	347°37.18	9.12	72°2.32	3.95					Bellatrix	278°22.89 6°22.33		
14	87°29.64	74°28.48	12.87	309°55.58	2.24	2°39.05	9.14	87°4.60	3.88					Elnath	278°1.87 28°37.73		
15	102°32.11	89°28.88	· · 13.49	324°56.78	· · 1.83	17°40.93	· · 9.17	102°6.87	· · 3.81					Alnilam	275°37.75 -1°11.19		
16	117°34.57	104°29.29	14.10	339°57.99	1.41	32°42.80	9.19	117°9.14	3.73					Betelgeuse	270°52.08 7°24.68		
17	132°37.04	119°29.69	14.72	354°59.19	1.00	47°44.68	9.21	132°11.41	3.66					Canopus	263°52.72 -52°42.67		
18	147°39.50	134°30.08	N04°15.34	10°0.39	N18°0.59	62°46.55	N23°9.24	147°13.69	S02°3.59					Sirius	258°26.26 -16°45.15		
19	162°41.96	149°30.48	15.96	25°1.59	18°0.17	77°48.43	9.26	162°15.96	3.51					Adhara	255°5.92 -29°0.52		
20	177°44.43	164°30.88	16.57	40°2.80	17°59.76	92°50.30	9.29	177°18.23	3.44					Procyon	244°50.74 5°9.57		
21	192°46.89	179°31.28	· · 17.19	55°4.00	· · 59.34	107°52.18	· · 9.31	192°20.50	· · 3.37					Pollux	243°17.18 27°57.96		
22	207°49.36	194°31.67	17.81	70°5.20	58.93	122°54.05	9.33	207°22.78	3.29					Avior	234°14.93 -59°35.68		
23	222°51.82	209°32.07	18.44	85°6.40	58.51	137°55.92	9.36	222°25.05	3.22					Suhail	222°46.23 -43°32.34		
Mer.pass. 08:11			ν0.4' d0.6' m-4.53			ν1.2' d-0.4' m1.16			ν1.9' d0.0' m-1.94			ν2.3' d-0.1' m1.12					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	237°54.29	224°32.46	N04°19.06	100°7.60	N17°58.10	152°57.80	N23°9.38	237°27.32	S02°3.15					Dubhe	193°40.45 61°37.09		
1	252°56.75	239°32.85	19.68	115°8.80	57.69	167°59.67	9.41	252°29.60	3.07					Denebola	182°24.51 14°25.81		
2	267°59.21	254°33.25	20.30	130°10.01	57.27	183°1.55	9.43	267°31.87	3.00					Gienah	175°43.12 -17°41.13		
3	283°1.68	269°33.64	· · 20.92	145°11.21	· · 56.85	198°3.42	· · 9.45	282°34.14	· · 2.93					Acrux	172°59.40 -63°14.66		
4	298°4.14	284°34.03	21.55	160°12.41	56.44	213°5.30	9.48	297°36.42	2.85					Gacrux	171°51.00 -57°15.59		
5	313°6.61	299°34.41	22.17	175°13.61	56.02	228°7.17	9.50	312°38.69	2.78					Alioth	166°12.30 55°49.47		
6	328°9.07	314°34.80	N04°22.80	190°14.81	N17°55.61	243°9.04	N23°9.52	327°40.97	S02°2.71					Spica	158°21.75 -11°17.75		
7	343°11.53	329°35.19	23.42	205°16.01	55.19	258°10.92	9.55	342°43.24	2.64					Alkaid	152°51.34 49°11.26		
8	358°14.00	344°35.58	24.05	220°17.21	54.78	273°12.79	9.57	357°45.51	2.56					Hadar	148°35.05 -60°29.90		
9	13°16.46	359°35.96	· · 24.68	235°18.41	· · 54.36	288°14.66	· · 9.59	12°47.79	· · 2.49					Menkent	147°56.94 -36°29.85		
10	28°18.93	14°36.34	25.30	250°19.61	53.94	303°16.54	9.62	27°50.06	2.42					Arcturus	145°47.34 19°2.97		
11	43°21.39	29°36.73	25.93	265°20.81	53.53	318°18.41	9.64	42°52.34	2.35					Rigil Kent.	139°39.30 -60°56.56		
12	58°23.85	44°37.11	N04°26.56	280°22.01	N17°53.11	333°20.28	N23°9.66	57°54.61	S02°2.27					Kochab	137°18.61 74°3.08		
13	73°26.32	59°37.49	27.19	295°23.21	52.69	348°22.16	9.69	72°56.89	2.20					Zuben'ubi	136°55.38 -16°8.95		
14	88°28.78	74°37.87	27.82	310°24.41	52.27	3°24.03	9.71	87°59.16	2.13					Alphecca	126°3.13 26°37.67		
15	103°31.25	89°38.25	· · 28.45	325°25.61	· · 51.86	18°25.90	· · 9.73	103°1.44	· · 2.06					Antares	112°15.12 -26°29.35		
16	118°33.71	104°38.63	29.08	340°26.81	51.44	33°27.77	9.76	118°3.71	1.98					Atria	107°8.56 -69°4.33		
17	133°36.18	119°39.01	29.72	355°28.01	51.02	48°29.65	9.78	133°5.99	1.91					Sabik	102°2.13 -15°45.43		
18	148°38.64	134°39.38	N04°30.35	10°29.21	N17°50.60	63°31.52	N23°9.80	148°8.26	S02°1.84					Shaula	96°9.60 -37°7.31		
19	163°41.10	149°39.76	30.98	25°30.40	50.19	78°33.39	9.83	163°10.54	1.77					Rasalhague	95°57.97 12°32.36		
20	178°43.57	164°40.13	31.61	40°31.60	49.77	93°35.27	9.85	178°12.81	1.70					Eltanin	90°41.58 51°28.90		
21	193°46.03	179°40.51	· · 32.25	55°32.80	· · 49.35	108°37.14	· · 9.87	193°15.09	· · 1.62					Kaus Aust.	83°31.81 -34°22.30		
22	208°48.50	194°40.88	32.88	70°34.00	48.93	123°39.01	9.89	208°17.36	1.55					Vega	80°32.70 38°48.19		
23	223°50.96	209°41.25	33.52	85°35.20	48.51	138°40.88	9.92	223°19.64	1.48					Nunki	75°47.14 -26°15.88		
Mer.pass. 08:07			ν0.4' d0.6' m-4.52			ν1.2' d-0.4' m1.17			ν1.9' d0.0' m-1.94			ν2.3' d-0.1' m1.12					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	238°53.42	224°41.63	N04°34.16	100°36.40	N17°48.09	153°42.76	N23°9.94	238°21.92	S02°1.41					Peacock	53°5.02 -56°38.98		
1	253°55.89	239°42.00	34.79	115°37.59	47.67	168°44.63	9.96	253°24.19	1.34					Deneb	49°25.46 45°21.94		
2	268°58.35	254°42.36	35.43	130°38.79	47.25	183°46.50	9.99	268°26.47	1.26					Enif	33°38.49 9°59.34		
3	284°0.82	269°42.73	· · 36.07	145°39.99	· · 46.83	198°48.37	· · 10.01	283°28.74	· · 1.19					Al Na'ir	27°32.55 -46°50.09		
4	299°3.28	284°43.10	36.71	160°41.19	46.41	213°50.24	10.03	298°31.02	1.12					Fomalhaut	15°14.28 -29°29.17		
5	314°5.74	299°43.47	37.35	175°42.39	45.99	228°52.12	10.05	313°33.30	1.05					Scheat	13°45.04 28°13.01		
6	329°8.21	314°43.83	N04°37.98	190°43.58	N17°45.57	243°53.99	N23°10.08	328°35.57	S02°0.98					Markab	13°29.71 15°20.36		
7	344°10.67	329°44.20	38.63	205°44.78	45.15	2											

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.26	N19°46.55	283°30.71	10.7'	S21°13.80	-10.9'	56.7'
1	195°53.23	47.08	298°0.39	10.7'	21°2.93	-11.0'	56.7'
2	210°53.20	47.62	312°30.12	10.8'	20°51.94	-11.1'	56.7'
3	225°53.17	· · 48.15	326°59.89	10.8'	20°40.84	-11.2'	56.8'
4	240°53.14	48.69	341°29.71	10.9'	20°29.62	-11.3'	56.8'
5	255°53.11	49.22	355°59.59	10.9'	20°18.29	-11.4'	56.8'
6	270°53.07	N19°49.75	10°29.50	11.0'	S20°6.85	-11.6'	56.9'
7	285°53.04	50.28	24°59.47	11.0'	19°55.30	-11.7'	56.9'
8	300°53.01	50.81	39°29.48	11.1'	19°43.64	-11.8'	56.9'
9	315°52.98	· · 51.34	53°59.54	11.1'	19°31.86	-11.9'	56.9'
10	330°52.95	51.87	68°29.64	11.1'	19°19.98	-12.0'	57.0'
11	345°52.91	52.40	82°59.79	11.2'	19°8.00	-12.1'	57.0'
12	0°52.88	N19°52.93	97°29.98	11.2'	S18°55.90	-12.2'	57.0'
13	15°52.85	53.46	112°0.22	11.3'	18°43.70	-12.3'	57.1'
14	30°52.81	53.98	126°30.50	11.3'	18°31.40	-12.4'	57.1'
15	45°52.78	· · 54.51	141°0.82	11.4'	18°18.99	-12.5'	57.1'
16	60°52.75	55.04	155°31.19	11.4'	18°6.48	-12.6'	57.2'
17	75°52.71	55.56	170°1.60	11.5'	17°53.87	-12.7'	57.2'
18	90°52.68	N19°56.09	184°32.06	11.5'	S17°41.16	-12.8'	57.2'
19	105°52.64	56.61	199°2.55	11.5'	17°28.34	-12.9'	57.3'
20	120°52.61	57.13	213°33.09	11.6'	17°15.43	-13.0'	57.3'
21	135°52.57	· · 57.66	228°3.66	11.6'	17°2.42	-13.1'	57.3'
22	150°52.54	58.18	242°34.28	11.7'	16°49.31	-13.2'	57.4'
23	165°52.50	58.70	257°4.93	11.7'	16°36.11	-13.3'	57.4'
SD = 15.8'		$d = 0.5'$	SD = 15.5'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.47	N19°59.22	271°35.63	11.7'	S16°22.81	-13.4'	57.4'
1	195°52.43	19°59.74	286°6.36	11.8'	16°9.42	-13.5'	57.4'
2	210°52.40	20°0.26	300°37.12	11.8'	15°55.93	-13.6'	57.5'
3	225°52.36	· · 0.78	315°7.93	11.8'	15°42.36	-13.7'	57.5'
4	240°52.32	1.30	329°38.76	11.9'	15°28.69	-13.8'	57.5'
5	255°52.29	1.82	344°9.64	11.9'	15°14.93	-13.8'	57.6'
6	270°52.25	N20°2.34	358°40.54	11.9'	S15°1.08	-13.9'	57.6'
7	285°52.21	2.86	13°11.48	12.0'	14°47.15	-14.0'	57.6'
8	300°52.17	3.37	27°42.46	12.0'	14°33.12	-14.1'	57.7'
9	315°52.14	· · 3.89	42°13.46	12.0'	14°19.02	-14.2'	57.7'
10	330°52.10	4.40	56°44.49	12.1'	14°4.82	-14.3'	57.7'
11	345°52.06	4.92	71°15.56	12.1'	13°50.54	-14.4'	57.8'
12	0°52.02	N20°5.43	85°46.65	12.1'	S13°36.18	-14.4'	57.8'
13	15°51.98	5.95	100°17.77	12.1'	13°21.74	-14.5'	57.8'
14	30°51.94	6.46	114°48.92	12.2'	13°7.22	-14.6'	57.9'
15	45°51.90	· · 6.97	129°20.09	12.2'	12°52.62	-14.7'	57.9'
16	60°51.86	7.48	143°51.29	12.2'	12°37.93	-14.8'	57.9'
17	75°51.82	7.99	158°22.51	12.2'	12°23.18	-14.8'	58.0'
18	90°51.78	N20°8.51	172°53.75	12.3'	S12°8.34	-14.9'	58.0'
19	105°51.74	9.02	187°25.02	12.3'	11°53.43	-15.0'	58.0'
20	120°51.70	9.52	201°56.31	12.3'	11°38.44	-15.1'	58.1'
21	135°51.66	· · 10.03	216°27.61	12.3'	11°23.39	-15.1'	58.1'
22	150°51.62	10.54	230°58.94	12.3'	11°8.25	-15.2'	58.1'
23	165°51.58	11.05	245°30.28	12.4'	10°53.05	-15.3'	58.2'
SD = 15.8'		$d = 0.5'$	SD = 15.7'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.54	N20°11.56	260°1.64	12.4'	S10°37.78	-15.3'	58.2'
1	195°51.50	12.06	274°33.02	12.4'	10°22.44	-15.4'	58.2'
2	210°51.45	12.57	289°4.41	12.4'	10°7.03	-15.5'	58.3'
3	225°51.41	· · 13.07	303°35.81	12.4'	09°51.56	-15.5'	58.3'
4	240°51.37	13.58	318°7.23	12.4'	09°36.02	-15.6'	58.3'
5	255°51.33	14.08	332°38.66	12.4'	09°20.41	-15.7'	58.4'
6	270°51.28	N20°14.59	347°10.09	12.4'	S09°4.74	-15.7'	58.4'
7	285°51.24	15.09	1°41.54	12.5'	08°49.01	-15.8'	58.4'
8	300°51.20	15.59	16°12.99	12.5'	08°33.22	-15.9'	58.5'
9	315°51.15	· · 16.09	30°44.45	12.5'	08°17.37	-15.9'	58.5'
10	330°51.11	16.59	45°15.92	12.5'	08°1.46	-16.0'	58.5'
11	345°51.06	17.09	59°47.39	12.5'	07°45.50	-16.0'	58.6'
12	0°51.02	N20°17.59	74°18.86	12.5'	S07°29.47	-16.1'	58.6'
13	15°50.98	18.09	88°50.33	12.5'	07°13.40	-16.1'	58.6'
14	30°50.93	18.59	103°21.80	12.5'	06°57.26	-16.2'	58.7'
15	45°50.89	· · 19.09	117°53.28	12.5'	06°41.08	-16.2'	58.7'
16	60°50.84	19.59	132°24.75	12.5'	06°24.85	-16.3'	58.7'
17	75°50.79	20.08	146°56.21	12.5'	06°8.56	-16.3'	58.8'
18	90°50.75	N20°20.58	161°27.68	12.5'	S05°52.23	-16.4'	58.8'
19	105°50.70	21.08	175°59.13	12.4'	05°35.84	-16.4'	58.8'
20	120°50.66	21.57	190°30.58	12.4'	05°19.42	-16.5'	58.9'
21	135°50.61	· · 22.07	205°2.02	12.4'	05°2.94	-16.5'	58.9'
22	150°50.56	22.56	219°33.45	12.4'	04°46.43	-16.6'	58.9'
23	165°50.52	23.05	234°4.87	12.4'	04°29.87	-16.6'	59.0'
SD = 15.8'		$d = 0.5'$	SD = 15.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:15	22:45	////	////
66°	////	////	02:01	21:55	////	////
64°	////	00:05	02:31	21:25	////	////
62°	////	01:28	02:53	21:02	22:29	////
60°	////	02:02	03:11	20:44	21:53	////
N 58°	00:04	02:27	03:26	20:29	21:28	////
56°	01:19	02:46	03:38	20:16	21:09	22:37
54°	01:51	03:02	03:49	20:05	20:53	22:04
52°	02:14	03:15	03:59	19:55	20:39	21:41
50°	02:32	03:27	04:07	19:46	20:27	21:22
45°	03:06	03:51	04:26	19:28	20:03	20:48
N 40°	03:31	04:09	04:40	19:13	19:44	20:23
35°	03:50	04:24	04:53	19:01	19:29	20:04
30°	04:05	04:37	05:04	18:50	19:16	19:48
20°	04:30	04:58	05:22	18:31	18:55	19:23
N 10°	04:49	05:16	05:38	18:15	18:37	19:04
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:45	06:08	17:45	18:08	18:33
20°	05:33	06:00	06:23	17:30	17:53	18:20
30°	05:46	06:15	06:41	17:12	17:37	18:07
35°	05:53	06:24	06:51	17:02	17:29	18:00
40°	06:00	06:34	07:03	16:50	17:19	17:52
45°	06:08	06:44	07:17	16:36	17:08	17:44
S 50°	06:17	06:57	07:34	16:19	16:55	17:35
52°	06:21	07:03	07:41	16:11	16:49	17:31
54°	06:25	07:09	07:50	16:02	16:43	17:27
56°	06:30	07:17	08:00	15:52	16:36	17:23
58°	06:35	07:24	08:11	15:41	16:28	17:18
S 60°	06:40	07:33	08:24	15:28	16:19	17:12

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°		03:59	02:57		08:39	11:22
N 70°		03:23	02:42		09:12	11:34
68°	03:49	02:58	02:30	07:02	09:36	11:44
66°	03:06	02:38	02:19	07:44	09:54	11:52
64°	02:37	02:22	02:11	08:12	10:08	11:59
62°	02:15	02:09	02:03	08:33	10:21	12:05
60°	01:57	01:57	01:57	08:50	10:31	12:10
N 58°	01:41	01:47	01:51	09:05	10:40	12:14
56°	01:28	01:39	01:46	09:17	10:47	12:18
54°	01:17	01:31	01:41	09:28	10:54	12:21
52°	01:07	01:24	01:37	09:37	11:01	12:24
50°	00:58	01:17	01:33	09:46	11:06	12:27
45°	00:39	01:04	01:25	10:03	11:18	12:33
N 40°	00:23	00:52	01:18	10:18	11:28	12:38
35°	00:10	00:43	01:12	10:30	11:36	12:43
30°	· · ·	00:34	01:07	10:40	11:43	12:47
20°	· · ·	00:19	00:58	10:58	11:56	12:53
N 10°	· · ·	00:06	00:49	11:14	12:07	12:59
0°	23:54	· · ·	00:42	11:28	12:17	13:04
S 10°	23:42	· · ·	00:34	11:43	12:27	13:09
20°	23:28	· · ·	00:26	11:58	12:37	13:15
30°	23:13	· · ·	00:16	12:15	12:49	13:21
35°	23:04	· · ·	00:11	12:25	12:56	13:25
40°	22:54	· · ·	00:05	12:37	13:04	13:29
45°	22:42	23:57	· · ·	12:50	13:13	13:33
S 50°	22:28	23:48	· · ·	13:07	13:24	13:39
52°	22:21	23:44	· · ·	13:14	13:29	13:41
54°	22:13	23:40	· · ·	13:22	13:34	13:44
56°	22:05	23:35	· · ·	13:32	13:40	13:47
58°	21:55	23:29	· · ·	13:42	13:47	13:50
S 60°	21:44	23:23	· · ·	13:55	13:55	13:54

Day	Sun		Mer. Pass hh:mm	Moon		Age 22-24 66-45%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
19	03:33	03:32	11:56	05:17	17:41	
20	03:30	03:28	11:57	06:05	18:29	
21	03:26	03:24	11:57	06:53	19:17	

May 22, 23, 24 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	239°52.56		224°50.26	N04°49.60	101°5.11	N17°37.98	154°27.67	N23°10.48	239°16.57	S01°59.70
1	254°55.03		239°50.61	50.25	116°6.30	37.56	169°29.54	10.50	254°18.85	59.63
2	269°57.49		254°50.96	50.90	131°7.50	37.13	184°31.41	10.52	269°21.13	59.56
3	284°59.95		269°51.30	· · 51.55	146°8.69	· · 36.71	199°33.28	· · 10.54	284°23.41	· · 59.49
4	300°2.42		284°51.65	52.21	161°9.89	36.28	214°35.15	10.57	299°25.69	59.42
5	315°4.88		299°51.99	52.86	176°11.08	35.86	229°37.02	10.59	314°27.97	59.35
6	330°7.35		314°52.34	N04°53.51	191°12.28	N17°35.43	244°38.89	N23°10.61	329°30.25	S01°59.28
7	345°9.81		329°52.68	54.17	206°13.47	35.01	259°40.76	10.63	344°32.53	59.21
8	0°12.27		344°53.02	54.82	221°14.66	34.59	274°42.63	10.65	359°34.80	59.14
9	15°14.74		359°53.37	· · 55.48	236°15.86	· · 34.16	289°44.50	· · 10.67	14°37.08	· · 59.07
10	30°17.20		14°53.71	56.13	251°17.05	33.73	304°46.37	10.70	29°39.36	59.00
11	45°19.67		29°54.05	56.79	266°18.24	33.31	319°48.24	10.72	44°41.64	58.93
12	60°22.13		44°54.38	N04°57.45	281°19.44	N17°32.88	334°50.10	N23°10.74	59°43.92	S01°58.86
13	75°24.59		59°54.72	58.10	296°20.63	32.46	349°51.97	10.76	74°46.20	58.79
14	90°27.06		74°55.06	58.76	311°21.82	32.03	4°53.84	10.78	89°48.48	58.72
15	105°29.52		89°55.40	04°59.42	326°23.02	· · 31.61	19°55.71	· · 10.80	104°50.77	· · 58.65
16	120°31.99		104°55.73	05°0.08	341°24.21	31.18	34°57.58	10.83	119°53.05	58.58
17	135°34.45		119°56.07	0.74	356°25.40	30.75	49°59.45	10.85	134°55.33	58.51
18	150°36.91		134°56.40	N05°1.40	11°26.59	N17°30.33	65°1.32	N23°10.87	149°57.61	S01°58.44
19	165°39.38		149°56.73	2.06	26°27.79	29.90	80°3.19	10.89	164°59.89	58.37
20	180°41.84		164°57.06	2.72	41°28.98	29.47	95°5.06	10.91	180°2.17	58.30
21	195°44.31		179°57.40	· · 3.38	56°30.17	· · 29.05	110°6.93	· · 10.93	195°4.45	· · 58.23
22	210°46.77		194°57.73	4.04	71°31.36	28.62	125°8.80	10.95	210°6.73	58.16
23	225°49.24		209°58.05	4.71	86°32.55	28.19	140°10.66	10.97	225°9.01	58.09
Mer.pass. 07:59			ν0.3' d0.7' m-4.50		ν1.2' d-0.4' m1.19		ν1.9' d0.0' m-1.93		ν2.3' d-0.1' m1.11	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	240°51.70		224°58.38	N05°5.37	101°33.75	N17°27.76	155°12.53	N23°11.00	240°11.29	S01°58.02
1	255°54.16		239°58.71	6.03	116°34.94	27.34	170°14.40	11.02	255°13.58	57.95
2	270°56.63		254°59.04	6.70	131°36.13	26.91	185°16.27	11.04	270°15.86	57.89
3	285°59.09		269°59.36	· · 7.36	146°37.32	· · 26.48	200°18.14	· · 11.06	285°18.14	· · 57.82
4	301°1.56		284°59.69	8.03	161°38.51	26.05	215°20.01	11.08	300°20.42	57.75
5	316°4.02		300°0.01	8.69	176°39.70	25.62	230°21.87	11.10	315°22.70	57.68
6	331°6.48		315°0.34	N05°9.36	191°40.89	N17°25.19	245°23.74	N23°11.12	330°24.98	S01°57.61
7	346°8.95		330°0.66	10.03	206°42.08	24.76	260°25.61	11.14	345°27.27	57.54
8	1°11.41		345°0.98	10.70	221°43.27	24.33	275°27.48	11.16	0°29.55	57.47
9	16°13.88		0°1.30	· · 11.36	236°44.46	· · 23.91	290°29.35	· · 11.18	15°31.83	· · 57.40
10	31°16.34		15°1.62	12.03	251°45.65	23.48	305°31.21	11.20	30°34.11	57.33
11	46°18.80		30°1.94	12.70	266°46.84	23.05	320°33.08	11.22	45°36.40	57.27
12	61°21.27		45°2.26	N05°13.37	281°48.03	N17°22.62	335°34.95	N23°11.25	60°38.68	S01°57.20
13	76°23.73		60°2.57	14.04	296°49.22	22.19	350°36.82	11.27	75°40.96	57.13
14	91°26.20		75°2.89	14.71	311°50.41	21.76	5°38.69	11.29	90°43.25	57.06
15	106°28.66		90°3.21	· · 15.38	326°51.60	· · 21.33	20°40.55	· · 11.31	105°45.53	· · 56.99
16	121°31.12		105°3.52	16.06	341°52.79	20.89	35°42.42	11.33	120°47.81	56.92
17	136°33.59		120°3.84	16.73	356°53.98	20.46	50°44.29	11.35	135°50.10	56.85
18	151°36.05		135°4.15	N05°17.40	11°55.17	N17°20.03	65°46.15	N23°11.37	150°52.38	S01°56.79
19	166°38.52		150°4.46	18.07	26°56.36	19.60	80°48.02	11.39	165°54.66	56.72
20	181°40.98		165°4.77	18.75	41°57.55	19.17	95°49.89	11.41	180°56.95	56.65
21	196°43.44		180°5.08	· · 19.42	56°58.74	· · 18.74	110°51.76	· · 11.43	195°59.23	· · 56.58
22	211°45.91		195°5.39	20.10	71°59.93	18.31	125°53.62	11.45	211°1.51	56.51
23	226°48.37		210°5.70	20.77	87°1.12	17.88	140°55.49	11.47	226°3.80	56.45
Mer.pass. 07:55			ν0.3' d0.7' m-4.49		ν1.2' d-0.4' m1.20		ν1.9' d0.0' m-1.93		ν2.3' d-0.1' m1.11	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	241°50.84		225°6.01	N05°21.45	102°2.30	N17°17.44	155°57.36	N23°11.49	241°6.08	S01°56.38
1	256°53.30		240°6.32	22.12	117°3.49	17.01	170°59.22	11.51	256°8.37	56.31
2	271°55.77		255°6.62	22.80	132°4.68	16.58	186°1.09	11.53	271°10.65	56.24
3	286°58.23		270°6.93	· · 23.48	147°5.87	· · 16.15	201°2.96	· · 11.55	286°12.94	· · 56.17
4	302°0.69		285°7.23	24.16	162°7.06	15.71	216°4.82	11.57	301°15.22	56.11
5	317°3.16		300°7.54	24.83	177°8.24	15.28	231°6.69	11.59	316°17.51	56.04
6	332°5.62		315°7.84	N05°25.51	192°9.43	N17°14.85	246°8.56	N23°11.61	331°19.79	S01°55.97
7	347°8.09		330°8.14	26.19	207°10.62	14.41	261°10.42	11.63	346°22.08	55.90
8	2°10.55		345°8.44	26.87	222°11.81	13.98	276°12.29	11.65	1°24.36	55.84
9	17°13.01		0°8.74	· · 27.55	237°12.99	· · 13.55	291°14.16	· · 11.67	16°26.65	· · 55.77
10	32°15.48		15°9.04	28.23	252°14.18	13.11	306°16.02	11.69	31°28.93	55.70
11	47°17.94		30°9.34	28.91	267°15.37	12.68	321°17.89	11.71	46°31.22	55.63
12	62°20.41		45°9.64	N05°29.60	282°16.56	N17°12.24	336°19.75	N23°11.73	61°33.50	S01°55.57
13	77°22.87		60°9.94	30.28	297°17.74	11.81	351°21.62	11.75	76°35.79	55.50
14	92°25.33		75°10.23	30.96	312°18.93	11.38	6°23.49	11.77	91°38.07	55.43
15	107°27.80		90°10.53	· · 31.64	327°20.12	· · 10.94	21°25.35	· · 11.79	106°40.36	· · 55.37
16	122°30.26		105°10.83	32.33	342°21.30	10.51	36°27.22	11.81	121°42.65	55.30
17	137°32.73		120°11.12	33.01	357°22.49	10.07	51°29.08	11.83	136°44.93	55.23
18	152°35.19		135°11.41	N05°33.70	12°23.67	N17°9.64	66°30.95	N23°11.85	151°47.22	S01°55.16
19	167°37.65		150°11.70	34.38	27°24.86	9.20	81°32.81	11.87	166°49.51	55.10
20	182°40.12		165°12.00	35.07	42°26.05	8.76	96°34.68	11.89	181°51.79	55.03
21	197°42.58		180°12.29	· · 35.75	57°27.23	· · 8.33	111°36.54	· · 11.91	196°54.08	· · 54.96
22	212°45.05		195°12.58	36.44	72°28.42	7.89	126°38.41	11.93	211°56.37	54.90
23	227°47.51		210°12.87	37.13	87°29.60	7.46	141°40.27	11.94	226°58.65	54.83
Mer.pass. 07:51			ν0.3' d0.7' m-4.48		ν1.2' d-0.4' m1.21		ν1.9' d0.0' m-1.93		ν2.3' d-0.1' m1.11	

Stars		
	SHA	Dec
Alpheratz	357°34.67	29°13.64
Ankaa	353°7.09	-42°9.93
Schedar	349°31.10	56°40.34
Diphda	348°47.22	-17°50.81
Achernar	335°20.42	-57°6.30
Hamal	327°51.19	23°34.83
Polaris	314°22.32	89°22.16
Acamar	315°11.96	-40°12.11
Menkar	314°6.17	4°11.31
Mirfak	308°28.36	49°56.99
Aldebaran	290°39.64	16°33.58
Rigel	281°3.92	-8°10.38
Capella	280°21.93	46°1.43
Bellatrix	278°22.89	6°22.33
Elnath	278°1.87	28°37.73
Alnilam	275°37.75	-1°11.18
Betelgeuse	270°52.08	7°24.68
Canopus	263°52.74	-52°42.66
Sirius	258°26.27	-16°45.14
Adhara	255°5.93	-29°0.51
Procyon	244°50.75	5°9.57
Pollux	243°17.19	27°57.96
Avior	234°14.96	-59°35.68
Suhail	222°46.25	-43°32.33
Miaplacidus	221°38.53	-69°49.55
Alphard	217°47.55	-8°46.22
Regulus	207°34.15	11°50.60
Dubhe	193°40.48	61°37.10
Denebola	182°24.52	14°25.82
Gienah	175°43.13	-17°41.13
Acrux	172°59.42	-63°14.67
Gacrux	171°51.01	-57°15.59
Alioth	166°12.31	55°49.48
Spica	158°21.75	-11°17.75
Alkaid	152°51.35	49°11.27
Hadar	148°35.06	-60°29.91
Menkent	147°56.94	-36°29.86
Arcturus	145°47.34	19°2.98
Rigel Kent.	139°39.31	-60°56.57
Kochab	137°18.63	74°3.09
Zuben'ubi	136°55.38	-16°8.95
Alphecca	126°3.13	26°37.68
Antares	112°15.12	-26°29.35
Atria	107°8.54	-69°4.34
Sabik	102°2.12	-15°45.43
Shaula	96°9.59	-37°7.31
Rasalhague	95°57.96	12°32.37
Eltanin	90°41.56	51°28.91
Kaus Aust.	83°31.79	-34°22.30
Vega	80°32.68	38°48.20
Nunki	75°47.12	-26°15.88
Altair	61°59.48	8°55.99
Peacock	53°4.99	-56°38.98
Deneb	49°25.43	45°21.95
Enif	33°38.48	9°59.35
Al Na'ir	27°32.53	-46°50.08
Fomalhaut	15°14.26	-29°29.16
Scheat	13°45.02	28°13.02
Markab	13°29.69	15°20.36

May 22 Thu	SHA	Mer.pass
Venus	344°57.70	09:00
Mars	221°12.55	17:14
Jupiter	274°35.10	13:40
Saturn	359°24.01	08:02

May 23 Fri	SHA	Mer.pass
Venus	344°6.68	09:00
Mars	220°42.05	17:12
Jupiter	274°20.83	13:37
Saturn	359°19.59	07:58

May 24 Sat	SHA	Mer.pass
Venus	343°15.17	08:59
Mars	220°11.47	17:10
Jupiter	274°6.52	13:34
Saturn	359°15.25	07:54

Horizontal parallax	
Venus:	0.2
Mars:	0.1


h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.47	N20°23.55	248°36.27	12.4'	S04°13.27	-16.6'	59.0'
1	195°50.42	24.04	263°7.66	12.4'	03°56.63	-16.7'	59.0'
2	210°50.37	24.53	277°39.04	12.4'	03°39.95	-16.7'	59.1'
3	225°50.33	· · 25.02	292°10.40	12.3'	03°23.24	-16.8'	59.1'
4	240°50.28	25.51	306°41.74	12.3'	03°6.48	-16.8'	59.1'
5	255°50.23	26.00	321°13.06	12.3'	02°49.70	-16.8'	59.2'
6	270°50.18	N20°26.49	335°44.36	12.3'	S02°32.88	-16.9'	59.2'
7	285°50.13	26.98	350°15.64	12.3'	02°16.03	-16.9'	59.2'
8	300°50.08	27.46	4°46.90	12.2'	01°59.15	-16.9'	59.3'
9	315°50.03	· · 27.95	19°18.13	12.2'	01°42.24	-16.9'	59.3'
10	330°49.98	28.44	33°49.33	12.2'	01°25.30	-17.0'	59.3'
11	345°49.93	28.92	48°20.51	12.1'	01°8.34	-17.0'	59.4'
12	0°49.88	N20°29.41	62°51.66	12.1'	S00°51.35	-17.0'	59.4'
13	15°49.83	29.89	77°22.77	12.1'	00°34.34	-17.0'	59.4'
14	30°49.78	30.38	91°53.86	12.1'	00°17.31	-17.1'	59.5'
15	45°49.73	· · 30.86	106°24.91	12.0'	S00°0.25	-17.1'	59.5'
16	60°49.68	31.34	120°55.92	12.0'	N00°16.82	17.1'	59.5'
17	75°49.63	31.83	135°26.90	11.9'	00°33.91	17.1'	59.6'
18	90°49.58	N20°32.31	149°57.84	11.9'	N00°51.01	17.1'	59.6'
19	105°49.53	32.79	164°28.75	11.9'	01°8.13	17.1'	59.6'
20	120°49.47	33.27	178°59.61	11.8'	01°25.26	17.1'	59.6'
21	135°49.42	· · 33.75	193°30.43	11.8'	01°42.41	17.2'	59.7'
22	150°49.37	34.23	208°1.21	11.7'	01°59.56	17.2'	59.7'
23	165°49.32	34.71	222°31.94	11.7'	02°16.72	17.2'	59.7'
SD = 15.8'		$d = 0.5'$	SD = 16.1'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.26	N20°35.19	237°2.62	11.6'	N02°33.89	17.2'	59.8'
1	195°49.21	35.66	251°33.26	11.6'	02°51.06	17.2'	59.8'
2	210°49.16	36.14	266°3.85	11.5'	03°8.23	17.2'	59.8'
3	225°49.10	· · 36.62	280°34.39	11.5'	03°25.41	17.2'	59.9'
4	240°49.05	37.09	295°4.87	11.4'	03°42.58	17.2'	59.9'
5	255°49.00	37.57	309°35.31	11.4'	03°59.76	17.2'	59.9'
6	270°48.94	N20°38.04	324°5.68	11.3'	N04°16.93	17.2'	59.9'
7	285°48.89	38.51	338°36.00	11.3'	04°34.09	17.2'	60.0'
8	300°48.83	38.99	353°6.27	11.2'	04°51.25	17.1'	60.0'
9	315°48.78	· · 39.46	7°36.47	11.1'	05°8.40	17.1'	60.0'
10	330°48.72	39.93	22°6.61	11.1'	05°25.54	17.1'	60.0'
11	345°48.67	40.40	36°36.69	11.0'	05°42.66	17.1'	60.1'
12	0°48.61	N20°40.87	51°6.71	11.0'	N05°59.77	17.1'	60.1'
13	15°48.55	41.34	65°36.66	10.9'	06°16.87	17.1'	60.1'
14	30°48.50	41.81	80°6.55	10.8'	06°33.95	17.1'	60.2'
15	45°48.44	· · 42.28	94°36.36	10.7'	06°51.01	17.0'	60.2'
16	60°48.39	42.75	109°6.11	10.7'	07°8.05	17.0'	60.2'
17	75°48.33	43.22	123°35.79	10.6'	07°25.06	17.0'	60.2'
18	90°48.27	N20°43.68	138°5.40	10.5'	N07°42.05	17.0'	60.3'
19	105°48.21	44.15	152°34.93	10.5'	07°59.01	16.9'	60.3'
20	120°48.16	44.62	167°4.39	10.4'	08°15.95	16.9'	60.3'
21	135°48.10	· · 45.08	181°33.77	10.3'	08°32.85	16.9'	60.3'
22	150°48.04	45.54	196°3.07	10.2'	08°49.72	16.8'	60.4'
23	165°47.98	46.01	210°32.30	10.1'	09°6.56	16.8'	60.4'
SD = 15.8'		$d = 0.5'$	SD = 16.3'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.92	N20°46.47	225°1.44	10.1'	N09°23.36	16.8'	60.4'
1	195°47.87	46.93	239°30.50	10.0'	09°40.12	16.7'	60.4'
2	210°47.81	47.40	253°59.49	9.9'	09°56.84	16.7'	60.4'
3	225°47.75	· · 47.86	268°28.38	9.8'	10°13.52	16.6'	60.5'
4	240°47.69	48.32	282°57.19	9.7'	10°30.15	16.6'	60.5'
5	255°47.63	48.78	297°25.92	9.6'	10°46.74	16.5'	60.5'
6	270°47.57	N20°49.24	311°54.55	9.5'	N11°3.28	16.5'	60.5'
7	285°47.51	49.70	326°23.10	9.5'	11°19.76	16.4'	60.5'
8	300°47.45	50.15	340°51.56	9.4'	11°36.20	16.4'	60.6'
9	315°47.39	· · 50.61	355°19.93	9.3'	11°52.58	16.3'	60.6'
10	330°47.33	51.07	9°48.20	9.2'	12°8.90	16.3'	60.6'
11	345°47.27	51.53	24°16.38	9.1'	12°25.16	16.2'	60.6'
12	0°47.21	N20°51.98	38°44.46	9.0'	N12°41.37	16.1'	60.6'
13	15°47.14	52.44	53°12.45	8.9'	12°57.51	16.1'	60.7'
14	30°47.08	52.89	67°40.34	8.8'	13°13.58	16.0'	60.7'
15	45°47.02	· · 53.34	82°8.14	8.7'	13°29.58	15.9'	60.7'
16	60°46.96	53.80	96°35.83	8.6'	13°45.52	15.9'	60.7'
17	75°46.90	54.25	111°3.43	8.5'	14°1.38	15.8'	60.7'
18	90°46.83	N20°54.70	125°30.92	8.4'	N14°17.17	15.7'	60.7'
19	105°46.77	55.15	139°58.31	8.3'	14°32.89	15.6'	60.8'
20	120°46.71	55.60	154°25.60	8.2'	14°48.52	15.6'	60.8'
21	135°46.65	· · 56.05	168°52.78	8.1'	15°4.07	15.5'	60.8'
22	150°46.58	56.50	183°19.86	8.0'	15°19.54	15.4'	60.8'
23	165°46.52	56.95	197°46.83	7.9'	15°34.93	15.3'	60.8'
SD = 15.8'		$d = 0.5'$	SD = 16.5'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:52	23:11	////	////
66°	////	////	01:49	22:08	////	////
64°	////	////	02:22	21:34	////	////
62°	////	01:13	02:46	21:10	22:45	////
60°	////	01:53	03:05	20:50	22:03	////
N 58°	////	02:19	03:20	20:35	21:36	////
56°	01:06	02:40	03:33	20:21	21:15	22:52
54°	01:43	02:57	03:45	20:10	20:58	22:13
52°	02:07	03:11	03:55	19:59	20:44	21:48
50°	02:27	03:23	04:04	19:50	20:32	21:28
45°	03:02	03:48	04:23	19:31	20:07	20:52
N 40°	03:28	04:07	04:38	19:16	19:47	20:27
35°	03:47	04:22	04:51	19:03	19:31	20:07
30°	04:04	04:36	05:02	18:51	19:18	19:50
20°	04:29	04:57	05:21	18:32	18:56	19:25
N 10°	04:49	05:15	05:38	18:16	18:38	19:05
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:46	06:08	17:45	18:07	18:33
20°	05:34	06:01	06:24	17:29	17:52	18:19
30°	05:48	06:17	06:43	17:11	17:36	18:06
35°	05:55	06:26	06:53	17:00	17:27	17:58
40°	06:03	06:36	07:06	16:48	17:17	17:51
45°	06:11	06:47	07:20	16:33	17:06	17:42
S 50°	06:20	07:01	07:37	16:16	16:52	17:33
52°	06:25	07:07	07:46	16:08	16:46	17:28
54°	06:29	07:13	07:55	15:58	16:40	17:24
56°	06:34	07:21	08:05	15:48	16:32	17:19
58°	06:39	07:29	08:17	15:36	16:24	17:14
S 60°	06:45	07:38	08:31	15:22	16:15	17:08

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	02:16	01:39	00:58 23:53	13:46	16:13	19:10
N 70°	02:11	01:43	01:12	13:46	16:02	18:37
68°	02:07	01:46	01:24	13:47	15:53	18:13
66°	02:04	01:49	01:33	13:47	15:46	17:55
64°	02:01	01:51	01:41	13:48	15:40	17:40
62°	01:58	01:53	01:49	13:48	15:35	17:28
60°	01:56	01:55	01:55	13:48	15:30	17:18
N 58°	01:54	01:57	02:00	13:49	15:26	17:09
56°	01:52	01:58	02:05	13:49	15:23	17:01
54°	01:51	02:00	02:09	13:49	15:20	16:55
52°	01:49	02:01	02:13	13:49	15:17	16:48
50°	01:48	02:02	02:17	13:50	15:14	16:43
45°	01:45	02:04	02:25	13:50	15:09	16:31
N 40°	01:42	02:06	02:32	13:50	15:04	16:21
35°	01:40	02:08	02:37	13:50	15:00	16:13
30°	01:38	02:09	02:43	13:51	14:57	16:06
20°	01:35	02:12	02:52	13:51	14:51	15:53
N 10°	01:32	02:15	02:59	13:51	14:45	15:42
0°	01:29	02:17	03:07	13:52	14:40	15:32
S 10°	01:26	02:19	03:15	13:52	14:35	15:22
20°	01:23	02:22	03:23	13:52	14:30	15:11
30°	01:20	02:25	03:32	13:52	14:24	14:59
35°	01:18	02:27	03:38	13:52	14:21	14:52
40°	01:16	02:29	03:44	13:52	14:17	14:44
45°	01:13	02:31	03:51	13:53	14:12	14:34
S 50°	01:10	02:34	04:00	13:53	14:07	14:23
52°	01:09	02:35	04:04	13:53	14:05	14:18
54°	01:07	02:36	04:09	13:53	14:02	14:13
56°	01:05	02:38	04:14	13:53	13:59	14:06
58°	01:03	02:40	04:20	13:53	13:56	14:00
S 60°	01:01	02:42	04:26	13:53	13:52	13:52

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 25-27 34-14%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
22	03:22	03:20	11:57	07:40	20:04	
23	03:17	03:14	11:57	08:29	20:54	
24	03:12	03:09	11:57	09:19	21:46	

May 25, 26, 27 UT (Sun., Mon., Tue.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA
0	242°49.98	225°13.15	N05°37.81	102°30.79	N17°7.02	156°42.14	N23°11.96	242°0.94	S01°54.76						
1	257°52.44	240°13.44	38.50	117°31.97	6.58	171°44.00	11.98	257°3.23	54.70						
2	272°54.90	255°13.73	39.19	132°33.16	6.15	186°45.87	12.00	272°5.52	54.63						
3	287°57.37	270°14.01	· · 39.88	147°34.34	· · 5.71	201°47.73	· · 12.02	287°7.80	· · 54.56						
4	302°59.83	285°14.30	40.57	162°35.53	5.27	216°49.60	12.04	302°10.09	54.50						
5	318°2.30	300°14.58	41.26	177°36.71	4.84	231°51.46	12.06	317°12.38	54.43						
6	333°4.76	315°14.87	N05°41.95	192°37.90	N17°4.40	246°53.33	N23°12.08	332°14.67	S01°54.37						
7	348°7.22	330°15.15	42.64	207°39.08	3.96	261°55.19	12.10	347°16.95	54.30						
8	3°9.69	345°15.43	43.33	222°40.27	3.52	276°57.06	12.12	2°19.24	54.23						
9	18°12.15	0°15.71	· · 44.02	237°41.45	· · 3.08	291°58.92	· · 12.14	17°21.53	· · 54.17						
10	33°14.62	15°15.99	44.72	252°42.64	2.65	307°0.79	12.15	32°23.82	54.10						
11	48°17.08	30°16.27	45.41	267°43.82	2.21	322°2.65	12.17	47°26.11	54.04						
12	63°19.54	45°16.55	N05°46.10	282°45.00	N17°1.77	337°4.52	N23°12.19	62°28.40	S01°53.97						
13	78°22.01	60°16.83	46.79	297°46.19	1.33	352°6.38	12.21	77°30.68	53.90						
14	93°24.47	75°17.10	47.49	312°47.37	0.89	7°8.24	12.23	92°32.97	53.84						
15	108°26.94	90°17.38	· · 48.18	327°48.55	· · 0.45	22°10.11	· · 12.25	107°35.26	· · 53.77						
16	123°29.40	105°17.66	48.88	342°49.74	17°0.01	37°11.97	12.27	122°37.55	53.71						
17	138°31.87	120°17.93	49.57	357°50.92	16°59.57	52°13.84	12.29	137°39.84	53.64						
18	153°34.33	135°18.20	N05°50.27	12°52.10	N16°59.13	67°15.70	N23°12.30	152°42.13	S01°53.57						
19	168°36.79	150°18.48	50.97	27°53.29	58.70	82°17.56	12.32	167°44.42	53.51						
20	183°39.26	165°18.75	51.66	42°54.47	58.26	97°19.43	12.34	182°46.71	53.44						
21	198°41.72	180°19.02	· · 52.36	57°55.65	· · 57.82	112°21.29	· · 12.36	197°49.00	· · 53.38						
22	213°44.19	195°19.29	53.06	72°56.84	57.37	127°23.16	12.38	212°51.29	53.31						
23	228°46.65	210°19.56	53.75	87°58.02	56.93	142°25.02	12.40	227°53.58	53.25						
Mer.pass. 07:47			ν0.3' d0.7' m-4.47			ν1.2' d-0.4' m1.22			ν1.9' d0.0' m-1.93			ν2.3' d-0.1' m1.11			
Mon	GHA	GHA	Dec	GHA	Dec	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA
0	243°49.11	225°19.83	N05°54.45	102°59.20	N16°56.49	157°26.88	N23°12.42	242°55.87	S01°53.18						
1	258°51.58	240°20.10	55.15	118°0.38	56.05	172°28.75	12.43	257°58.16	53.12						
2	273°54.04	255°20.37	55.85	133°1.56	55.61	187°30.61	12.45	273°0.45	53.05						
3	288°56.51	270°20.63	· · 56.55	148°2.75	· · 55.17	202°32.47	· · 12.47	288°2.74	· · 52.99						
4	303°58.97	285°20.90	57.25	163°3.93	54.73	217°34.34	12.49	303°5.03	52.92						
5	319°1.44	300°21.16	57.95	178°5.11	54.29	232°36.20	12.51	318°7.32	52.86						
6	334°3.90	315°21.43	N05°58.65	193°6.29	N16°53.85	247°38.06	N23°12.52	333°9.61	S01°52.79						
7	349°6.36	330°21.69	05°59.35	208°7.47	53.40	262°39.93	12.54	348°11.90	52.73						
8	4°8.83	345°21.95	06°0.06	223°8.65	52.96	277°41.79	12.56	3°14.19	52.66						
9	19°11.29	0°22.22	· · 0.76	238°9.84	· · 52.52	292°43.65	· · 12.58	18°16.48	· · 52.60						
10	34°13.76	15°22.48	1.46	253°11.02	52.08	307°45.51	12.60	33°18.77	52.53						
11	49°16.22	30°22.74	2.16	268°12.20	51.63	322°47.38	12.61	48°21.06	52.47						
12	64°18.69	45°23.00	N06°2.87	283°13.38	N16°51.19	337°49.24	N23°12.63	63°23.36	S01°52.40						
13	79°21.15	60°23.26	3.57	298°14.56	50.75	352°51.10	12.65	78°25.65	52.34						
14	94°23.61	75°23.51	4.28	313°15.74	50.31	7°52.97	12.67	93°27.94	52.27						
15	109°26.08	90°23.77	· · 4.98	328°16.92	· · 49.86	22°54.83	· · 12.69	108°30.23	· · 52.21						
16	124°28.54	105°24.03	5.69	343°18.10	49.42	37°56.69	12.70	123°32.52	52.15						
17	139°31.01	120°24.28	6.39	358°19.28	48.98	52°58.55	12.72	138°34.82	52.08						
18	154°33.47	135°24.54	N06°7.10	13°20.46	N16°48.53	68°0.42	N23°12.74	153°37.11	S01°52.02						
19	169°35.93	150°24.79	7.81	28°21.64	48.09	83°2.28	12.76	168°39.40	51.95						
20	184°38.40	165°25.05	8.51	43°22.82	47.64	98°4.14	12.77	183°41.69	51.89						
21	199°40.86	180°25.30	· · 9.22	58°24.00	· · 47.20	113°6.00	· · 12.79	198°43.98	· · 51.82						
22	214°43.33	195°25.55	9.93	73°25.18	46.75	128°7.86	12.81	213°46.28	51.76						
23	229°45.79	210°25.80	10.64	88°26.36	46.31	143°9.73	12.83	228°48.57	51.70						
Mer.pass. 07:43			ν0.3' d0.7' m-4.45			ν1.2' d-0.4' m1.23			ν1.9' d0.0' m-1.92			ν2.3' d-0.1' m1.10			
Tue	GHA	GHA	Dec	GHA	Dec	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA
0	244°48.26	225°26.05	N06°11.34	103°27.54	N16°45.86	158°11.59	N23°12.85	243°50.86	S01°51.63						
1	259°50.72	240°26.30	12.05	118°28.72	45.42	173°13.45	12.86	258°53.16	51.57						
2	274°53.18	255°26.55	12.76	133°29.90	44.97	188°15.31	12.88	273°55.45	51.50						
3	289°55.65	270°26.80	· · 13.47	148°31.08	· · 44.53	203°17.17	· · 12.90	288°57.74	· · 51.44						
4	304°58.11	285°27.05	14.18	163°32.26	44.08	218°19.04	12.91	304°0.04	51.38						
5	320°0.58	300°27.29	14.89	178°33.44	43.64	233°20.90	12.93	319°2.33	51.31						
6	335°3.04	315°27.54	N06°15.60	193°34.61	N16°43.19	248°22.76	N23°12.95	334°4.62	S01°51.25						
7	350°5.51	330°27.78	16.32	208°35.79	42.75	263°24.62	12.97	349°6.92	51.19						
8	5°7.97	345°28.03	17.03	223°36.97	42.30	278°26.48	12.98	4°9.21	51.12						
9	20°10.43	0°28.27	· · 17.74	238°38.15	· · 41.85	293°28.34	· · 13.00	19°11.50	· · 51.06						
10	35°12.90	15°28.51	18.45	253°39.33	41.41	308°30.20	13.02	34°13.80	51.00						
11	50°15.36	30°28.76	19.17	268°40.51	40.96	323°32.07	13.03	49°16.09	50.93						
12	65°17.83	45°29.00	N06°19.88	283°41.69	N16°40.51	338°33.93	N23°13.05	64°18.39	S01°50.87						
13	80°20.29	60°29.24	20.59	298°42.86	40.06	353°35.79	13.07	79°20.68	50.81						
14	95°22.75	75°29.48	21.31	313°44.04	39.62	8°37.65	13.09	94°22.98	50.74						
15	110°25.22	90°29.72	· · 22.02	328°45.22	· · 39.17	23°39.51	· · 13.10	109°25.27	· · 50.68						
16	125°27.68	105°29.95	22.74	343°46.40	38.72	38°41.37	13.12	124°27.57	50.62						
17	140°30.15	120°30.19	23.45	358°47.57	38.27	53°43.23	13.14	139°29.86	50.55						
18	155°32.61	135°30.43	N06°24.17	13°48.75	N16°37.83	68°45.09	N23°13.15	154°32.16	S01°50.49						
19	170°35.08	150°30.66	24.88	28°49.93	37.38	83°46.95	13.17	169°34.45	50.43						
20	185°37.54	165°30.90	25.60	43°51.11	36.93	98°48.81	13.19	184°36.75	50.37						
21	200°40.00	180°31.13	· · 26.32	58°52.28	· · 36.48	113°50.68	· · 13.20	199°39.04	· · 50.30						
22	215°42.47	195°31.37	27.04	73°53.46	36.03	128°52.54	13.22	214°41.34	50.24						
23	230°44.93	210°31.60	27.75	88°54.64	35.58	143°54.40	13.24	229°43.63	50.18						
Mer.pass. 07:40			ν0.2' d0.7' m-4.44			ν1.2' d-0.4' m1.24			ν1.9' d0.0' m-1.92			ν2.3' d-0.1' m1.10			

	SHA	Dec
Alpheratz	357°34.65	29°13.65
Ankaa	353°7.07	-42°9.91
Schedar	349°31.07	56°40.34
Diphda	348°47.20	-17°50.80
Achernar	335°20.40	-57°6.29
Hamal	327°51.17	23°34.83
Polaris	314°21.55	89°22.14
Acamar	315°11.95	-40°12.10
Menkar	314°6.16	4°11.31
Mirfak	308°28.35	49°56.98
Aldebaran	290°39.63	-16°33.58
Rigel	281°3.92	-8°10.


h	Sun			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 46.45	N20° 57.40	212° 13.70	7.8'	N15° 50.22	15.2'	60.8'
1	195° 46.39	57.85	226° 40.46	7.7'	16° 5.43	15.1'	60.8'
2	210° 46.33	58.29	241° 7.11	7.5'	16° 20.54	15.0'	60.9'
3	225° 46.26	• • 58.74	255° 33.66	7.4'	16° 35.56	14.9'	60.9'
4	240° 46.20	59.19	270° 0.09	7.3'	16° 50.48	14.8'	60.9'
5	255° 46.13	20° 59.63	284° 26.42	7.2'	17° 5.31	14.7'	60.9'
6	270° 46.07	N21° 0.08	298° 52.63	7.1'	N17° 20.03	14.6'	60.9'
7	285° 46.00	0.52	313° 18.74	7.0'	17° 34.65	14.5'	60.9'
8	300° 45.94	0.96	327° 44.73	6.9'	17° 49.16	14.4'	60.9'
9	315° 45.87	• • 1.41	342° 10.61	6.8'	18° 3.56	14.3'	60.9'
10	330° 45.80	1.85	356° 36.38	6.7'	18° 17.86	14.2'	60.9'
11	345° 45.74	2.29	11° 2.03	6.5'	18° 32.04	14.1'	60.9'
12	0° 45.67	N21° 2.73	25° 27.58	6.4'	N18° 46.10	13.9'	61.0'
13	15° 45.61	3.17	39° 53.01	6.3'	19° 0.05	13.8'	61.0'
14	30° 45.54	3.61	54° 18.33	6.2'	19° 13.88	13.7'	61.0'
15	45° 45.47	• • 4.05	68° 43.53	6.1'	19° 27.58	13.6'	61.0'
16	60° 45.40	4.49	83° 8.62	6.0'	19° 41.16	13.5'	61.0'
17	75° 45.34	4.92	97° 33.60	5.9'	19° 54.62	13.3'	61.0'
18	90° 45.27	N21° 5.36	111° 58.46	5.8'	N20° 7.94	13.2'	61.0'
19	105° 45.20	5.80	126° 23.22	5.6'	20° 21.13	13.1'	61.0'
20	120° 45.13	6.23	140° 47.85	5.5'	20° 34.19	12.9'	61.0'
21	135° 45.06	• • 6.67	155° 12.38	5.4'	20° 47.12	12.8'	61.0'
22	150° 45.00	7.10	169° 36.79	5.3'	20° 59.90	12.6'	61.0'
23	165° 44.93	7.53	184° 1.10	5.2'	21° 12.55	12.5'	61.0'
SD = 15.8'			SD = 16.6'				
$d = 0.4'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.86	N21°7.97	198°25.28	5.1'	N21°25.05	12.4'	61.0'
1	195°44.79	8.40	212°49.36	5.0'	21°37.41	12.2'	61.0'
2	210°44.72	8.83	227°13.33	4.9'	21°49.62	12.1'	61.0'
3	225°44.65	9.26	241°37.19	4.7'	22°1.68	11.9'	61.0'
4	240°44.58	9.69	256°0.94	4.6'	22°13.59	11.8'	61.0'
5	255°44.51	10.12	270°24.58	4.5'	22°25.35	11.6'	61.0'
6	270°44.44	N21°10.55	284°48.11	4.4'	N22°36.95	11.4'	61.0'
7	285°44.37	10.98	299°11.53	4.3'	22°48.39	11.3'	61.0'
8	300°44.30	11.41	313°34.85	4.2'	22°59.67	11.1'	61.0'
9	315°44.23	11.84	327°58.06	4.1'	23°10.79	11.0'	61.0'
10	330°44.16	12.26	342°21.17	4.0'	23°21.75	10.8'	61.0'
11	345°44.09	12.69	356°44.18	3.9'	23°32.54	10.6'	61.0'
12	0°44.01	N21°13.12	11°7.08	3.8'	N23°43.16	10.5'	61.0'
13	15°43.94	13.54	25°29.89	3.7'	23°53.61	10.3'	61.0'
14	30°43.87	13.96	39°52.59	3.6'	24°3.89	10.1'	61.0'
15	45°43.80	14.39	54°15.20	3.5'	24°14.00	9.9'	61.0'
16	60°43.73	14.81	68°37.71	3.4'	24°23.92	9.8'	60.9'
17	75°43.65	15.23	83°0.13	3.3'	24°33.68	9.6'	60.9'
18	90°43.58	N21°15.65	97°22.45	3.2'	N24°43.25	9.4'	60.9'
19	105°43.51	16.08	111°44.68	3.1'	24°52.64	9.2'	60.9'
20	120°43.43	16.50	126°6.83	3.1'	25°1.85	9.0'	60.9'
21	135°43.36	16.92	140°28.88	3.0'	25°10.87	8.8'	60.9'
22	150°43.29	17.33	154°50.85	2.9'	25°19.70	8.6'	60.9'
23	165°43.21	17.75	169°12.74	2.8'	25°28.35	8.5'	60.9'
SD = 15.8'				SD = 16.6'			
$d = 0.4'$							

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.14	N21°18.17	183°34.55	2.7'	N25°36.81	8.3'	60.9'
1	195°43.06	18.59	197°56.27	2.6'	25°45.07	8.1'	60.9'
2	210°42.99	19.00	212°17.92	2.6'	25°53.15	7.9'	60.8'
3	225°42.92	19.42	226°39.50	2.5'	26°1.03	7.7'	60.8'
4	240°42.84	19.84	241°1.00	2.4'	26°8.71	7.5'	60.8'
5	255°42.77	20.25	255°22.43	2.4'	26°16.19	7.3'	60.8'
6	270°42.69	N21°20.66	269°43.80	2.3'	N26°23.48	7.1'	60.8'
7	285°42.62	21.08	284°5.10	2.2'	26°30.57	6.9'	60.8'
8	300°42.54	21.49	298°26.34	2.2'	26°37.45	6.7'	60.8'
9	315°42.46	21.90	312°47.52	2.1'	26°44.13	6.5'	60.7'
10	330°42.39	22.31	327°8.64	2.1'	26°50.61	6.3'	60.7'
11	345°42.31	22.72	341°29.70	2.0'	26°56.89	6.1'	60.7'
12	0°42.24	N21°23.13	355°50.72	2.0'	N27°2.96	5.9'	60.7'
13	15°42.16	23.54	10°11.69	1.9'	27°8.82	5.7'	60.7'
14	30°42.08	23.95	24°32.61	1.9'	27°14.48	5.4'	60.6'
15	45°42.00	24.36	38°53.49	1.8'	27°19.92	5.2'	60.6'
16	60°41.93	24.77	53°14.33	1.8'	27°25.16	5.0'	60.6'
17	75°41.85	25.17	67°35.13	1.8'	27°30.19	4.8'	60.6'
18	90°41.77	N21°25.58	81°55.90	1.7'	N27°35.00	4.6'	60.6'
19	105°41.69	25.99	96°16.64	1.7'	27°39.61	4.4'	60.5'
20	120°41.62	26.39	110°37.35	1.7'	27°44.00	4.2'	60.5'
21	135°41.54	26.80	124°58.04	1.7'	27°48.18	4.0'	60.5'
22	150°41.46	27.20	139°18.70	1.6'	27°52.15	3.8'	60.5'
23	165°41.38	27.60	153°39.35	1.6'	27°55.90	3.5'	60.5'
SD = 15.8'				SD = 16.6'			
$d = 0.4'$							

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:11	////	////	////
66°	////	////	01:37	22:21	////	////
64°	////	////	02:13	21:43	////	////
62°	////	00:57	02:39	21:17	23:03	////
60°	////	01:44	02:59	20:57	22:13	////
N 58°	////	02:12	03:15	20:40	21:44	////
56°	00:52	02:34	03:29	20:26	21:21	23:08
54°	01:34	02:52	03:41	20:14	21:04	22:22
52°	02:01	03:06	03:52	20:03	20:49	21:55
50°	02:21	03:19	04:01	19:54	20:36	21:34
45°	02:59	03:45	04:20	19:34	20:10	20:56
N 40°	03:25	04:05	04:36	19:18	19:50	20:30
35°	03:45	04:21	04:50	19:05	19:34	20:09
30°	04:02	04:34	05:01	18:53	19:20	19:52
20°	04:28	04:57	05:21	18:34	18:58	19:26
N 10°	04:48	05:15	05:38	18:16	18:39	19:06
0°	05:06	05:31	05:53	18:01	18:23	18:49
S 10°	05:21	05:47	06:09	17:45	18:07	18:33
20°	05:35	06:02	06:26	17:28	17:52	18:19
30°	05:49	06:19	06:45	17:09	17:35	18:05
35°	05:57	06:28	06:56	16:58	17:26	17:57
40°	06:05	06:38	07:08	16:46	17:16	17:49
45°	06:14	06:50	07:23	16:31	17:04	17:40
S 50°	06:23	07:04	07:41	16:13	16:50	17:30
52°	06:28	07:10	07:49	16:04	16:43	17:26
54°	06:32	07:17	07:59	15:55	16:36	17:21
56°	06:38	07:25	08:10	15:44	16:29	17:16
58°	06:43	07:34	08:22	15:32	16:20	17:11
S 60°	06:49	07:43	08:36	15:17	16:10	17:04

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°	00:28					
68°	00:54			21:16		
66°	23:50					
64°	01:14	00:42		20:26		
62°	01:30	01:14	00:34	19:55	22:44	
60°	01:44	01:38	01:31	19:32	21:48
N 58°	01:55	01:57	02:05	19:13	21:15	23:09
56°	02:05	02:14	02:30	18:58	20:50	22:33
54°	02:14	02:27	02:50	18:45	20:31	22:08
52°	02:22	02:39	03:06	18:34	20:15	21:47
50°	02:29	02:50	03:21	18:24	20:01	21:30
45°	02:35	03:00	03:33	18:15	19:49	21:15
N 40°	02:49	03:20	04:00	17:57	19:24	20:45
35°	03:01	03:36	04:20	17:42	19:04	20:22
30°	03:11	03:50	04:38	17:29	18:47	20:03
20°	03:19	04:02	04:53	17:18	18:33	19:47
N 10°	03:35	04:23	05:19	16:59	18:09	19:19
0°	03:48	04:42	05:41	16:43	17:48	18:55
S 10°	04:01	04:59	06:02	16:28	17:28	18:33
20°	04:14	05:17	06:23	16:13	17:09	18:11
30°	04:27	05:35	06:46	15:57	16:48	17:47
35°	04:43	05:57	07:12	15:38	16:25	17:20
40°	04:52	06:10	07:28	15:28	16:11	17:03
45°	05:03	06:25	07:46	15:15	15:55	16:44
S 50°	05:16	06:43	08:08	15:01	15:36	16:22
52°	05:31	07:05	08:37	14:44	15:12	15:53
54°	05:39	07:16	08:50	14:36	15:01	15:38
56°	05:47	07:28	09:07	14:27	14:48	15:22
58°	05:56	07:42	09:26	14:17	14:33	15:02
S 60°	06:06	07:59	09:50	14:05	14:16	14:38
	06:18	08:19	10:21	13:52	13:55	14:06

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	28-0 7-0%
25	03:06	03:03	11:57	10:14	22:43	
26	02:59	02:56	11:57	11:14	23:45	
27	02:53	02:49	11:57	12:17	—:—	

May 28, 29, 30 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	245°47.40	225°31.83	N06°28.47	103°55.81	N16°35.13	158°56.26	N23°13.25	244°45.93	S01°50.11	
1	260°49.86	240°32.06	29.19	118°56.99	34.68	173°58.12	13.27	259°48.23	50.05	
2	275°52.33	255°32.29	29.91	133°58.17	34.24	188°59.98	13.29	274°50.52	49.99	
3	290°54.79	270°32.52	•• 30.63	148°59.34	•• 33.79	204°1.84	•• 13.30	289°52.82	•• 49.93	
4	305°57.25	285°32.75	31.35	164°0.52	33.34	219°3.70	13.32	304°55.11	49.87	
5	320°59.72	300°32.98	32.07	179°1.69	32.89	234°5.56	13.34	319°57.41	49.80	
6	336°2.18	315°33.21	N06°32.79	194°2.87	N16°32.44	249°7.42	N23°13.35	334°59.71	S01°49.74	
7	351°4.65	330°33.43	33.51	209°4.05	31.99	264°9.28	13.37	350°2.00	49.68	
8	6°7.11	345°33.66	34.23	224°5.22	31.53	279°11.14	13.38	5°4.30	49.62	
9	21°9.58	0°33.89	•• 34.95	239°6.40	•• 31.08	294°13.00	•• 13.40	20°6.60	•• 49.55	
10	36°12.04	15°34.11	35.67	254°7.57	30.63	309°14.86	13.42	35°8.90	49.49	
11	51°14.50	30°34.33	36.39	269°8.75	30.18	324°16.72	13.43	50°11.19	49.43	
12	66°16.97	45°34.56	N06°37.12	284°9.92	N16°29.73	339°18.58	N23°13.45	65°13.49	S01°49.37	
13	81°19.43	60°34.78	37.84	299°11.10	29.28	354°20.44	13.47	80°15.79	49.31	
14	96°21.90	75°35.00	38.56	314°12.27	28.83	9°22.30	13.48	95°18.09	49.24	
15	111°24.36	90°35.22	•• 39.29	329°13.45	•• 28.38	24°24.16	•• 13.50	110°20.38	•• 49.18	
16	126°26.83	105°35.44	40.01	344°14.62	27.92	39°26.02	13.51	125°22.68	49.12	
17	141°29.29	120°35.66	40.74	359°15.80	27.47	54°27.88	13.53	140°24.98	49.06	
18	156°31.75	135°35.88	N06°41.46	14°16.97	N16°27.02	69°29.74	N23°13.54	155°27.28	S01°49.00	
19	171°34.22	150°36.10	42.19	29°18.15	26.57	84°31.59	13.56	170°29.58	48.94	
20	186°36.68	165°36.32	42.91	44°19.32	26.11	99°33.45	13.58	185°31.87	48.88	
21	201°39.15	180°36.53	•• 43.64	59°20.50	•• 25.66	114°35.31	•• 13.59	200°34.17	•• 48.81	
22	216°41.61	195°36.75	44.36	74°21.67	25.21	129°37.17	13.61	215°36.47	48.75	
23	231°44.08	210°36.96	45.09	89°22.84	24.76	144°39.03	13.62	230°38.77	48.69	
Mer.pass. 07:36		ν0.2' d0.7' m-4.43		ν1.2' d-0.4' m1.25		ν1.9' d0.0' m-1.92		ν2.3' d-0.1' m1.10		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	246°46.54	225°37.18	N06°45.82	104°24.02	N16°24.30	159°40.89	N23°13.64	245°41.07	S01°48.63	
1	261°49.00	240°37.39	46.54	119°25.19	23.85	174°42.75	13.66	260°43.37	48.57	
2	276°51.47	255°37.60	47.27	134°26.37	23.40	189°44.61	13.67	275°45.67	48.51	
3	291°53.93	270°37.82	•• 48.00	149°27.54	•• 22.94	204°46.47	•• 13.69	290°47.97	•• 48.45	
4	306°56.40	285°38.03	48.73	164°28.71	22.49	219°48.33	13.70	305°50.27	48.39	
5	321°58.86	300°38.24	49.46	179°29.89	22.03	234°50.19	13.72	320°52.56	48.33	
6	337°1.32	315°38.45	N06°50.18	194°31.06	N16°21.58	249°52.04	N23°13.73	335°54.86	S01°48.26	
7	352°3.79	330°38.66	50.91	209°32.23	21.12	264°53.90	13.75	350°57.16	48.20	
8	7°6.25	345°38.86	51.64	224°33.41	20.67	279°55.76	13.76	5°59.46	48.14	
9	22°8.72	0°39.07	•• 52.37	239°34.58	•• 20.22	294°57.62	•• 13.78	21°1.76	•• 48.08	
10	37°11.18	15°39.28	53.10	254°35.75	19.76	309°59.48	13.79	36°4.06	48.02	
11	52°13.65	30°39.49	53.83	269°36.93	19.30	325°1.34	13.81	51°6.36	47.96	
12	67°16.11	45°39.69	N06°54.57	284°38.10	N16°18.85	340°3.20	N23°13.82	66°8.66	S01°47.90	
13	82°18.57	60°39.90	55.30	299°39.27	18.39	355°5.05	13.84	81°10.97	47.84	
14	97°21.04	75°40.10	56.03	314°40.44	17.94	10°6.91	13.85	96°13.27	47.78	
15	112°23.50	90°40.30	•• 56.76	329°41.62	•• 17.48	25°8.77	•• 13.87	111°15.57	•• 47.72	
16	127°25.97	105°40.51	57.49	344°42.79	17.03	40°10.63	13.88	126°17.87	47.66	
17	142°28.43	120°40.71	58.23	359°43.96	16.57	55°12.49	13.90	141°20.17	47.60	
18	157°30.90	135°40.91	N06°58.96	14°45.13	N16°16.11	70°14.34	N23°13.91	156°22.47	S01°47.54	
19	172°33.36	150°41.11	06°59.69	29°46.30	15.66	85°16.20	13.93	171°24.77	47.48	
20	187°35.82	165°41.31	07°0.43	44°47.48	15.20	100°18.06	13.94	186°27.07	47.42	
21	202°38.29	180°41.51	•• 1.16	59°48.65	•• 14.74	115°19.92	•• 13.96	201°29.37	•• 47.36	
22	217°40.75	195°41.71	1.89	74°49.82	14.29	130°21.78	13.97	216°31.68	47.30	
23	232°43.22	210°41.90	2.63	89°50.99	13.83	145°23.63	13.99	231°33.98	47.24	
Mer.pass. 07:32		ν0.2' d0.7' m-4.42		ν1.2' d-0.5' m1.26		ν1.9' d0.0' m-1.92		ν2.3' d-0.1' m1.09		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	247°45.68	225°42.10	N07°3.36	104°52.16	N16°13.37	160°25.49	N23°14.00	246°36.28	S01°47.18	
1	262°48.15	240°42.30	4.10	119°53.33	12.91	175°27.35	14.02	261°38.58	47.12	
2	277°50.61	255°42.49	4.83	134°54.50	12.46	190°29.21	14.03	276°40.88	47.06	
3	292°53.07	270°42.69	•• 5.57	149°55.68	•• 12.00	205°31.07	•• 14.05	291°43.19	•• 47.00	
4	307°55.54	285°42.88	6.31	164°56.85	11.54	220°32.92	14.06	306°45.49	46.94	
5	322°58.00	300°43.07	7.04	179°58.02	11.08	235°34.78	14.08	321°47.79	46.88	
6	338°0.47	315°43.26	N07°7.78	194°59.19	N16°10.62	250°36.64	N23°14.09	336°50.09	S01°46.82	
7	353°2.93	330°43.46	8.52	210°0.36	10.16	265°38.50	14.11	351°52.40	46.76	
8	8°5.39	345°43.65	9.25	225°1.53	9.71	280°40.35	14.12	6°54.70	46.70	
9	23°7.86	0°43.84	•• 9.99	240°2.70	•• 9.25	295°42.21	•• 14.13	21°57.00	•• 46.64	
10	38°10.32	15°44.03	10.73	255°3.87	8.79	310°44.07	14.15	36°59.31	46.59	
11	53°12.79	30°44.22	11.47	270°5.04	8.33	325°45.92	14.16	52°1.61	46.53	
12	68°15.25	45°44.40	N07°12.21	285°6.21	N16°7.87	340°47.78	N23°14.18	67°3.91	S01°46.47	
13	83°17.72	60°44.59	12.95	300°7.38	7.41	355°49.64	14.19	82°6.22	46.41	
14	98°20.18	75°44.78	13.69	315°8.55	6.95	10°51.50	14.21	97°8.52	46.35	
15	113°22.64	90°44.96	•• 14.42	330°9.72	•• 6.49	25°53.35	•• 14.22	112°10.82	•• 46.29	
16	128°25.11	105°45.15	15.16	345°10.89	6.03	40°55.21	14.23	127°13.13	46.23	
17	143°27.57	120°45.33	15.90	0°12.06	5.57	55°57.07	14.25	142°15.43	46.17	
18	158°30.04	135°45.52	N07°16.65	15°13.23	N16°5.11	70°58.92	N23°14.26	157°17.74	S01°46.11	
19	173°32.50	150°45.70	17.39	30°14.40	4.65	86°0.78	14.28	172°20.04	46.06	
20	188°34.97	165°45.88	18.13	45°15.57	4.19	101°2.64	14.29	187°22.34	46.00	
21	203°37.43	180°46.07	•• 18.87	60°16.74	•• 3.73	116°4.49	•• 14.30	202°24.65	•• 45.94	
22	218°39.89	195°46.25	19.61	75°17.91	3.26	131°6.35	14.32	217°26.95	45.88	
23	233°42.36	210°46.43	20.35	90°19.07	2.80	146°8.21	14.33	232°29.26	45.82	
Mer.pass. 07:28		ν0.2' d0.7' m-4.41		ν1.2' d-0.5' m1.27		ν1.9' d0.0' m-1.92		ν2.3' d-0.1' m1.09		

	SHA	Dec
Alpheratz	357°34.61	29°13.66
Ankaa	353°7.04	-42°9.90
Schedar	349°31.03	56°40.34
Diphda	348°47.17	-17°50.78
Achernar	335°20.38	-57°6.27
Hamal	327°51.15	23°34.84
Polaris	314°20.51	89°22.13
Acamar	315°11.93	-40°12.08
Menkar	314°6.14	4°11.33
Mirfak	308°28.32	49°56.9
Aldebaran	290°39.62	16°33.58
Rigel	281°3.91	-8°10.37
Capella	280°21.92	46°1.41
Bellatrix	278°22.88	6°22.34
Elnath	278°1.86	28°37.72
Alnilam	275°37.74	-1°11.17
Betelgeuse	270°52.07	7°24.69
Canopus	263°52.76	-52°42.64
Sirius	258°26.27	-16°45.13
Adhara	255°5.94	-29°0.49
Procyon	244°50.76	5°9.57
Pollux	243°17.20	27°57.96
Avior	234°15.00	-59°35.67
Shuhail	222°46.28	-43°32.33
Miaplacidus	221°38.60	-69°49.55
Alphard	217°47.56	-8°46.21
Regulus	207°34.16	11°50.60
Dubhe	193°40.53	61°37.10
Denebola	182°24.53	14°25.83
Gienah	175°43.13	-17°41.13
Acrux	172°59.45	-63°14.69
Gacrux	171°51.03	-57°15.61
Alioth	166°12.35	55°49.50
Spica	158°21.75	-11°17.75
Alkaid	152°51.37	49°11.29
Hadar	148°35.06	-60°29.94
Menkent	147°56.94	-36°29.87
Arcturus	145°47.34	19°3.00
Rigel Kent.	139°39.30	-60°56.59
Kochab	137°18.68	74°3.12
Zuben'ubi	136°55.37	-16°8.95
Alphecca	126°3.12	26°37.71
Antares	112°15.09	-26°29.35
Atria	107°8.48	-69°4.36
Sabik	102°2.09	-15°45.43
Shaula	96°9.55	-37°7.32
Rasalhague	95°57.93	12°32.39
Eltanin	90°41.53	51°28.95
Kaus Aust.	83°31.75	-34°22.30
Vega	80°32.64	38°48.24
Nunki	75°47.07	-26°15.87
Altair	61°59.43	8°56.02
Peacock	53°4.91	-56°38.98
Deneb	49°25.37	45°21.98
Enif	33°38.42	9°59.37
Al Na'ir	27°32.46	-46°50.06
Fomalhaut	15°14.21	-29°29.13
Scheat	13°44.96	28°13.03
Markab	13°29.64	15°20.38

h		Sun		Moon			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		180°41.30	N21°28.00	167°59.99	1.6'	N27°59.44	3.3' 60.4'
1		195°41.22	28.41	182°20.61	1.6'	28°2.77	3.1' 60.4'
2		210°41.14	28.81	196°41.23	1.6'	28°5.88	2.9' 60.4'
3		225°41.06	· · 29.21	211°1.84	1.6'	28°8.77	2.7' 60.4'
4		240°40.98	29.61	225°22.46	1.6'	28°11.46	2.5' 60.3'
5		255°40.91	30.01	239°43.07	1.6'	28°13.92	2.3' 60.3'
6		270°40.83	N21°30.40	254°3.69	1.6'	N28°16.18	2.0' 60.3'
7		285°40.74	30.80	268°24.33	1.6'	28°18.21	1.8' 60.3'
8		300°40.66	31.20	282°44.97	1.7'	28°20.04	1.6' 60.2'
9		315°40.58	· · 31.60	297°5.63	1.7'	28°21.65	1.4' 60.2'
10		330°40.50	31.99	311°26.31	1.7'	28°23.04	1.2' 60.2'
11		345°40.42	32.39	325°47.01	1.7'	28°24.22	1.0' 60.2'
12		0°40.34	N21°32.78	340°7.74	1.8'	N28°25.19	0.8' 60.1'
13		15°40.26	33.18	354°28.50	1.8'	28°25.94	0.5' 60.1'
14		30°40.18	33.57	8°49.29	1.8'	28°26.48	0.3' 60.1'
15		45°40.10	· · 33.96	23°10.12	1.9'	28°26.81	0.1' 60.0'
16		60°40.01	34.35	37°30.99	1.9'	28°26.93	-0.1' 60.0'
17		75°39.93	34.74	51°51.90	2.0'	28°26.83	-0.3' 60.0'
18		90°39.85	N21°35.14	66°12.86	2.0'	N28°26.53	-0.5' 59.9'
19		105°39.77	35.53	80°33.86	2.1'	28°26.02	-0.7' 59.9'
20		120°39.68	35.91	94°54.92	2.1'	28°25.29	-0.9' 59.9'
21		135°39.60	· · 36.30	109°16.04	2.2'	28°24.36	-1.1' 59.9'
22		150°39.52	36.69	123°37.21	2.2'	28°23.23	-1.3' 59.8'
23		165°39.44	37.08	137°58.45	2.3'	28°21.88	-1.5' 59.8'
		SD = 15.8' d = 0.4'		SD = 16.5'			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		180°39.35	N21°37.47	152°19.75	2.4'	N28°20.33	-1.8' 59.8'
1		195°39.27	37.85	166°41.12	2.4'	28°18.58	-2.0' 59.7'
2		210°39.18	38.24	181°2.56	2.5'	28°16.63	-2.2' 59.7'
3		225°39.10	· · 38.62	195°24.08	2.6'	28°14.47	-2.4' 59.7'
4		240°39.02	39.01	209°45.67	2.7'	28°12.11	-2.6' 59.6'
5		255°38.93	39.39	224°7.34	2.8'	28°9.55	-2.8' 59.6'
6		270°38.85	N21°39.77	238°29.09	2.8'	N28°6.80	-3.0' 59.6'
7		285°38.76	40.15	252°50.93	2.9'	28°3.84	-3.1' 59.5'
8		300°38.68	40.54	267°12.85	3.0'	28°0.69	-3.3' 59.5'
9		315°38.59	· · 40.92	281°34.87	3.1'	27°57.35	-3.5' 59.5'
10		330°38.51	41.30	295°56.98	3.2'	27°53.82	-3.7' 59.4'
11		345°38.42	41.68	310°19.18	3.3'	27°50.09	-3.9' 59.4'
12		0°38.34	N21°42.06	324°41.48	3.4'	N27°46.17	-4.1' 59.3'
13		15°38.25	42.43	339°3.88	3.5'	27°42.07	-4.3' 59.3'
14		30°38.16	42.81	353°26.39	3.6'	27°37.78	-4.5' 59.3'
15		45°38.08	· · 43.19	7°48.99	3.7'	27°33.30	-4.7' 59.2'
16		60°37.99	43.56	22°11.71	3.8'	27°28.64	-4.8' 59.2'
17		75°37.91	43.94	36°34.53	3.9'	27°23.80	-5.0' 59.2'
18		90°37.82	N21°44.32	50°57.46	4.0'	N27°18.77	-5.2' 59.1'
19		105°37.73	44.69	65°20.50	4.2'	27°13.57	-5.4' 59.1'
20		120°37.64	45.06	79°43.66	4.3'	27°8.20	-5.6' 59.1'
21		135°37.56	· · 45.44	94°6.94	4.4'	27°2.64	-5.7' 59.0'
22		150°37.47	45.81	108°30.33	4.5'	26°56.92	-5.9' 59.0'
23		165°37.38	46.18	122°53.84	4.6'	26°51.02	-6.1' 58.9'
		SD = 15.8' d = 0.4'		SD = 16.3'			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		180°37.29	N21°46.55	137°17.47	4.8'	N26°44.95	-6.2' 58.9'
1		195°37.21	46.92	151°41.22	4.9'	26°38.72	-6.4' 58.9'
2		210°37.12	47.29	166°5.10	5.0'	26°32.32	-6.6' 58.8'
3		225°37.03	· · 47.66	180°29.10	5.1'	26°25.75	-6.7' 58.8'
4		240°36.94	48.03	194°53.23	5.3'	26°19.03	-6.9' 58.8'
5		255°36.85	48.40	209°17.49	5.4'	26°12.14	-7.0' 58.7'
6		270°36.76	N21°48.76	223°41.87	5.5'	N26°5.09	-7.2' 58.7'
7		285°36.67	49.13	238°6.38	5.6'	25°57.89	-7.4' 58.6'
8		300°36.58	49.50	252°31.03	5.8'	25°50.54	-7.5' 58.6'
9		315°36.50	· · 49.86	266°55.80	5.9'	25°43.03	-7.7' 58.6'
10		330°36.41	50.22	281°20.71	6.0'	25°35.37	-7.8' 58.5'
11		345°36.32	50.59	295°45.75	6.2'	25°27.56	-8.0' 58.5'
12		0°36.23	N21°50.95	310°10.93	6.3'	N25°19.60	-8.1' 58.5'
13		15°36.14	51.31	324°36.24	6.4'	25°11.50	-8.2' 58.4'
14		30°36.05	51.68	339°1.68	6.6'	25°3.26	-8.4' 58.4'
15		45°35.95	· · 52.04	353°27.26	6.7'	24°54.87	-8.5' 58.3'
16		60°35.86	52.40	7°52.98	6.9'	24°46.35	-8.7' 58.3'
17		75°35.77	52.76	22°18.83	7.0'	24°37.69	-8.8' 58.3'
18		90°35.68	N21°53.12	36°44.82	7.1'	N24°28.89	-8.9' 58.2'
19		105°35.59	53.47	51°10.95	7.3'	24°19.96	-9.1' 58.2'
20		120°35.50	53.83	65°37.21	7.4'	24°10.90	-9.2' 58.1'
21		135°35.41	· · 54.19	80°3.61	7.5'	24°1.72	-9.3' 58.1'
22		150°35.32	54.55	94°30.15	7.7'	23°52.40	-9.4' 58.1'
23		165°35.22	54.90	108°56.83	7.8'	23°42.96	-9.6' 58.0'
		SD = 15.8' d = 0.4'		SD = 16.1'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
68°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
66°	////	////	01:24	22:35	////	////
64°	////	////	02:05	21:52	////	////
62°	////	00:37	02:33	21:24	23:26	////
60°	////	01:34	02:54	21:03	22:23	////
N 58°	////	02:06	03:11	20:45	21:51	////
56°	00:33	02:29	03:25	20:31	21:27	23:29
54°	01:26	02:47	03:38	20:18	21:09	22:31
52°	01:55	03:03	03:48	20:07	20:53	22:01
50°	02:17	03:16	03:58	19:57	20:40	21:39
45°	02:55	03:42	04:18	19:37	20:13	21:00
N 40°	03:23	04:03	04:35	19:21	19:53	20:33
35°	03:44	04:19	04:48	19:07	19:36	20:12
30°	04:01	04:33	05:00	18:55	19:22	19:55
20°	04:27	04:56	05:20	18:35	18:59	19:28
N 10°	04:48	05:15	05:38	18:17	18:40	19:07
0°	05:06	05:32	05:54	18:01	18:23	18:49
S 10°	05:21	05:47	06:10	17:45	18:08	18:34
20°	05:36	06:03	06:27	17:28	17:52	18:19
30°	05:51	06:20	06:46	17:08	17:34	18:04
35°	05:59	06:30	06:57	16:57	17:25	17:56
40°	06:07	06:40	07:10	16:44	17:14	17:48
45°	06:16	06:53	07:26	16:29	17:02	17:39
S 50°	06:26	07:07	07:44	16:10	16:48	17:28
52°	06:31	07:14	07:53	16:02	16:41	17:24
54°	06:36	07:21	08:03	15:52	16:34	17:19
56°	06:41	07:29	08:14	15:40	16:26	17:13
58°	06:47	07:38	08:27	15:28	16:17	17:08
S 60°	06:53	07:48	08:42	15:13	16:07	17:01

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
68°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
66°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
64°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
62°	01:13	<div></div>	04:33	00:23	<div></div>	01:32
60°	02:27	03:30	05:12	· · ·	00:24	00:52
N 58°	03:03	04:07	05:40	23:46	· · ·	00:24
56°	03:29	04:34	06:01	23:19	· · ·	00:03
54°	03:50	04:55	06:18	22:58	23:45	· · ·
52°	04:07	05:13	06:33	22:41	23:29	· · ·
50°	04:22	05:28	06:46	22:25	23:16	23:50
45°	04:52	05:58	07:13	21:55	22:49	23:28
N 40°	05:16	06:22	07:34	21:31	22:27	23:10
35°	05:35	06:41	07:51	21:11	22:09	22:55
30°	05:52	06:58	08:06	20:55	21:53	22:42
20°	06:20	07:26	08:31	20:26	21:27	22:19
N 10°	06:45	07:50	08:53	20:02	21:04	21:59
0°	07:07	08:12	09:13	19:39	20:42	21:41
S 10°	07:30	08:35	09:34	19:16	20:21	21:22
20°	07:55	08:59	09:55	18:51	19:57	21:02
30°	08:24	09:27	10:20	18:22	19:30	20:38
35°	08:41	09:44	10:35	18:05	19:14	20:25
40°	09:00	10:03	10:52	17:45	18:55	20:09
45°	09:25	10:26	11:12	17:21	18:32	19:49
S 50°	09:56	10:56	11:37	16:50	18:03	19:25
52°	10:11	11:11	11:49	16:34	17:49	19:13
54°	10:30	11:28	12:03	16:16	17:32	19:00
56°	10:52	11:48	12:19	15:54	17:12	18:44
58°	11:20	12:14	12:38	15:25	16:46	18:26
S 60°	12:02	12:49	13:02	14:43	16:12	18:03

Day	Sun		Mer. Pass hh:mm	Moon		Age 1-3 1-12%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
28	02:45	02:41	11:57	13:23	00:50	
29	02:37	02:33	11:57	14:27	01:56	
30	02:29	02:25	11:58	15:27	02:58	

May 31, 01, 02 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	248°44.82		225°46.61	N07°21.09	105°20.24	N16°2.34	161°10.06	N23°14.35	247°31.56	S01°45.76
1	263°47.29		240°46.79	21.84	120°21.41	1.88	176°11.92	14.36	262°33.87	45.70
2	278°49.75		255°46.96	22.58	135°22.58	1.42	191°13.78	14.37	277°36.17	45.65
3	293°52.21		270°47.14	•• 23.32	150°23.75	•• 0.96	206°15.63	•• 14.39	292°38.48	•• 45.59
4	308°54.68		285°47.32	24.07	165°24.92	0.49	221°17.49	14.40	307°40.78	45.53
5	323°57.14		300°47.49	24.81	180°26.09	16°0.03	236°19.34	14.41	322°43.09	45.47
6	338°59.61		315°47.67	N07°25.56	195°27.25	N15°59.57	251°21.20	N23°14.43	337°45.40	S01°45.41
7	354°2.07		330°47.84	26.30	210°28.42	59.11	266°23.06	14.44	352°47.70	45.36
8	9°4.54		345°48.02	27.04	225°29.59	58.64	281°24.91	14.46	7°50.01	45.30
9	24°7.00		0°48.19	•• 27.79	240°30.76	•• 58.18	296°26.77	•• 14.47	22°52.31	•• 45.24
10	39°9.46		15°48.36	28.53	255°31.93	57.72	311°28.62	14.48	37°54.62	45.18
11	54°11.93		30°48.54	29.28	270°33.09	57.25	326°30.48	14.50	52°56.93	45.13
12	69°14.39		45°48.71	N07°30.03	285°34.26	N15°56.79	341°32.34	N23°14.51	67°59.23	S01°45.07
13	84°16.86		60°48.88	30.77	300°35.43	56.33	356°34.19	14.52	83°1.54	45.01
14	99°19.32		75°49.05	31.52	315°36.60	55.86	11°36.05	14.54	98°3.85	44.95
15	114°21.78		90°49.22	•• 32.26	330°37.76	•• 55.40	26°37.90	•• 14.55	113°6.15	•• 44.90
16	129°24.25		105°49.38	33.01	345°38.93	54.93	41°39.76	14.56	128°8.46	44.84
17	144°26.71		120°49.55	33.76	0°40.10	54.47	56°41.62	14.57	143°10.77	44.78
18	159°29.18		135°49.72	N07°34.51	15°41.27	N15°54.00	71°43.47	N23°14.59	158°13.07	S01°44.72
19	174°31.64		150°49.89	35.25	30°42.43	53.54	86°45.33	14.60	173°15.38	44.67
20	189°34.11		165°50.05	36.00	45°43.60	53.08	101°47.18	14.61	188°17.69	44.61
21	204°36.57		180°50.22	•• 36.75	60°44.77	•• 52.61	116°49.04	•• 14.63	203°20.00	•• 44.55
22	219°39.03		195°50.38	37.50	75°45.93	52.14	131°50.89	14.64	218°22.31	44.49
23	234°41.50		210°50.54	38.25	90°47.10	51.68	146°52.75	14.65	233°24.61	44.44
Mer.pass. 07:24			ν0.2' d0.7' m-4.40		ν1.2' d-0.5' m1.28		ν1.9' d0.0' m-1.92		ν2.3' d-0.1' m1.09	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	249°43.96		225°50.71	N07°39.00	105°48.27	N15°51.21	161°54.60	N23°14.67	248°26.92	S01°44.38
1	264°46.43		240°50.87	39.75	120°49.43	50.75	176°56.46	14.68	263°29.23	44.32
2	279°48.89		255°51.03	40.50	135°50.60	50.28	191°58.31	14.69	278°31.54	44.27
3	294°51.35		270°51.19	•• 41.25	150°51.77	•• 49.82	207°0.17	•• 14.70	293°33.85	•• 44.21
4	309°53.82		285°51.35	42.00	165°52.93	49.35	222°2.02	14.72	308°36.15	44.15
5	324°56.28		300°51.51	42.75	180°54.10	48.88	237°3.88	14.73	323°38.46	44.10
6	339°58.75		315°51.67	N07°43.50	195°55.26	N15°48.42	252°5.73	N23°14.74	338°40.77	S01°44.04
7	355°1.21		330°51.83	44.25	210°56.43	47.95	267°7.59	14.75	353°43.08	43.98
8	10°3.68		345°51.98	45.00	225°57.60	47.48	282°9.44	14.77	8°45.39	43.93
9	25°6.14		0°52.14	•• 45.75	240°58.76	•• 47.02	297°11.30	•• 14.78	23°47.70	•• 43.87
10	40°8.60		15°52.29	46.50	255°59.93	46.55	312°13.15	14.79	38°50.01	43.82
11	55°11.07		30°52.45	47.25	271°1.09	46.08	327°15.01	14.80	53°52.32	43.76
12	70°13.53		45°52.60	N07°48.01	286°2.26	N15°45.61	342°16.86	N23°14.82	68°54.63	S01°43.70
13	85°16.00		60°52.76	48.76	301°3.42	45.15	357°18.72	14.83	83°56.94	43.65
14	100°18.46		75°52.91	49.51	316°4.59	44.68	12°20.57	14.84	98°59.25	43.59
15	115°20.92		90°53.06	•• 50.26	331°5.75	•• 44.21	27°22.43	•• 14.85	114°1.56	•• 43.53
16	130°23.39		105°53.21	51.02	346°6.92	43.74	42°24.28	14.87	129°3.87	43.48
17	145°25.85		120°53.37	51.77	1°8.08	43.27	57°26.14	14.88	144°6.18	43.42
18	160°28.32		135°53.52	N07°52.52	16°9.25	N15°42.80	72°27.99	N23°14.89	159°8.49	S01°43.37
19	175°30.78		150°53.67	53.28	31°10.41	42.34	87°29.85	14.90	174°10.80	43.31
20	190°33.24		165°53.81	54.03	46°11.58	41.87	102°31.70	14.91	189°13.11	43.26
21	205°35.71		180°53.96	•• 54.79	61°12.74	•• 41.40	117°33.55	•• 14.93	204°15.42	•• 43.20
22	220°38.17		195°54.11	55.54	76°13.91	40.93	132°35.41	14.94	219°17.73	43.14
23	235°40.64		210°54.26	56.30	91°15.07	40.46	147°37.26	14.95	234°20.04	43.09
Mer.pass. 07:20			ν0.2' d0.7' m-4.39		ν1.2' d-0.5' m1.29		ν1.9' d0.0' m-1.91		ν2.3' d-0.1' m1.08	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	250°43.10		225°54.40	N07°57.05	106°16.24	N15°39.99	162°39.12	N23°14.96	249°22.35	S01°43.03
1	265°45.57		240°54.55	57.81	121°17.40	39.52	177°40.97	14.97	264°24.66	42.98
2	280°48.03		255°54.69	58.56	136°18.56	39.05	192°42.82	14.99	279°26.98	42.92
3	295°50.49		270°54.84	07°59.32	151°19.73	•• 38.58	207°44.68	•• 15.00	294°29.29	•• 42.87
4	310°52.96		285°54.98	08°00.08	166°20.89	38.11	222°46.53	15.01	309°31.60	42.81
5	325°55.42		300°55.12	0.83	181°22.05	37.64	237°48.39	15.02	324°33.91	42.76
6	340°57.89		315°55.26	N08°1.59	196°23.22	N15°37.17	252°50.24	N23°15.03	339°36.22	S01°42.70
7	356°0.35		330°55.41	2.34	211°24.38	36.70	267°52.09	15.04	354°38.54	42.65
8	11°2.81		345°55.55	3.10	226°25.55	36.23	282°53.95	15.06	9°40.85	42.59
9	26°5.28		0°55.69	•• 3.86	241°26.71	•• 35.75	297°55.80	•• 15.07	24°43.16	•• 42.54
10	41°7.74		15°55.83	4.62	256°27.87	35.28	312°57.66	15.08	39°45.47	42.48
11	56°10.21		30°55.96	5.37	271°29.04	34.81	327°59.51	15.09	54°47.79	42.43
12	71°12.67		45°56.10	N08°6.13	286°30.20	N15°34.34	343°1.36	N23°15.10	69°50.10	S01°42.37
13	86°15.13		60°56.24	6.89	301°31.36	33.87	358°3.22	15.11	84°52.41	42.32
14	101°17.60		75°56.38	7.65	316°32.52	33.40	13°5.07	15.12	99°54.72	42.26
15	116°20.06		90°56.51	•• 8.41	331°33.69	•• 32.92	28°6.92	•• 15.14	114°57.04	•• 42.21
16	131°22.53		105°56.65	9.17	346°34.85	32.45	43°8.78	15.15	129°59.35	42.15
17	146°24.99		120°56.78	9.93	1°36.01	31.98	58°10.63	15.16	145°1.66	42.10
18	161°27.45		135°56.91	N08°10.69	16°37.18	N15°31.51	73°12.48	N23°15.17	160°3.98	S01°42.05
19	176°29.92		150°57.05	11.44	31°38.34	31.03	88°14.34	15.18	175°6.29	41.99
20	191°32.38		165°57.18	12.20	46°39.50	30.56	103°16.19	15.19	190°8.60	41.94
21	206°34.85		180°57.31	•• 12.96	61°40.66	•• 30.09	118°18.04	•• 15.20	205°10.92	•• 41.88
22	221°37.31		195°57.44	13.72	76°41.83	29.61	133°19.90	15.21	220°13.23	41.83
23	236°39.78		210°57.57	14.49	91°42.99	29.14	148°21.75	15.23	235°15.55	41.77
Mer.pass. 07:16			ν0.1' d0.8' m-4.38		ν1.2' d-0.5' m1.29		ν1.9' d0.0' m-1.91		ν2.3' d-0.1' m1.08	

Stars		
	SHA	Dec
Alpheratz	357°34.59	29°13.66
Ankaa	353°7.01	-42°9.88
Schedar	349°30.99	56°40.34
Diphda	348°47.15	-17°50.77
Achernar	335°20.35	-57°6.25
Hamal	327°51.12	23°34.84
Polaris	314°19.69	89°22.12
Acamar	315°11.91	-40°12.06
Menkar	314°6.12	4°11.33
Mirfak	308°28.29	49°56.97
Aldebaran	290°39.61	16°33.59
Rigel	281°3.90	-8°10.36
Capella	280°21.90	46°1.40
Bellatrix	278°22.87	6°22.34
Elnath	278°1.85	28°37.72
Alnilam	275°37.74	-1°11.16
Betelgeuse	270°52.07	7°24.69
Canopus	263°52.76	-52°42.62
Sirius	258°26.27	-16°45.12
Adhara	255°5.94	-29°0.48
Procyon	244°50.76	5°9.58
Pollux	243°17.19	27°57.96
Avior	234°15.02	-59°35.66
Suhail	222°46.29	-43°32.32
Miaplacidus	221°38.65	-69°49.54
Alphard	217°47.57	-8°46.21
Regulus	207°34.16	11°50.60
Dubhe	193°40.55	61°37.10
Denebola	182°24.53	14°25.83
Gienah	175°43.14	-17°41.13
Acrux	172°59.47	-63°14.70
Gacrux	171°51.05	-57°15.62
Alioth	166°12.36	55°49.50
Spica	158°21.75	-11°17.75
Alkaid	152°51.38	49°11.30
Hadar	148°35.06	-60°29.95
Menkent	147°56.93	-36°29.87
Arcturus	145°47.34	19°3.00
Rigel Kent.	139°39.31	-60°56.61
Kochab	137°18.70	74°3.13
Zuben'ubi	136°55.36	-16°8.95
Alphecca	126°3.11	26°37.72
Antares	112°15.07	-26°29.36
Atria	107°8.45	-69°4.38
Sabik	102°2.07	-15°45.43
Shaula	96°9.53	-37°7.32
Rasalhague	95°57.92	12°32.40
Eltanin	90°41.52	51°28.96
Kaus Aust.	83°31.72	-34°22.30
Vega	80°32.63	38°48.25
Nunki	75°47.05	-26°15.87
Altair	61°59.41	8°56.03
Peacock	53°4.86	-56°38.98
Deneb	49°25.35	45°21.99
Enif	33°38.40	9°59.38
Al Na'ir	27°32.42	-46°50.06
Fomalhaut	15°14.18	-29°29.12
Scheat	13°44.93	28°13.04
Markab	13°29.61	15°20.39
May 31 Sat	SHA	Mer.pass
Venus	337°1.78	08:57
Mars	216°35.42	16:57
Jupiter	272°25.24	13:14
Saturn	358°46.74	07:29
Jun 01 Sun	SHA	Mer.pass
Venus	336°6.74	08:57
Mars	216°4.31	16:55
Jupiter	272°10.64	13:11
Saturn	358°42.96	07:25
Jun 02 Mon	SHA	Mer.pass
Venus	335°11.30	08:56
Mars	215°33.13	16:54
Jupiter	271°56.02	13:08
Saturn	358°39.25	07:21
Horizontal parallax	Venus:	0.2
	Mars:	0.1

h	Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d HP
0	180°35.13	N21°55.26		123°23.64	8.0'	N23°33.39	-9.7' 58.0'
1	195°35.04	55.61		137°50.59	8.1'	23°23.70	-9.8' 57.9'
2	210°34.95	55.96		152°17.68	8.2'	23°13.90	-9.9' 57.9'
3	225°34.86	56.32		166°44.91	8.4'	23°3.97	-10.0' 57.9'
4	240°34.76	56.67		181°12.27	8.5'	22°53.94	-10.2' 57.8'
5	255°34.67	57.02		195°39.77	8.6'	22°43.78	-10.3' 57.8'
6	270°34.58	N21°57.37		210°7.41	8.8'	N22°33.52	-10.4' 57.7'
7	285°34.48	57.72		224°35.18	8.9'	22°23.14	-10.5' 57.7'
8	300°34.39	58.07		239°3.09	9.0'	22°12.66	-10.6' 57.7'
9	315°34.30	58.42		253°31.14	9.2'	22°2.07	-10.7' 57.6'
10	330°34.20	58.77		267°59.32	9.3'	21°51.37	-10.8' 57.6'
11	345°34.11	59.12		282°27.63	9.4'	21°40.58	-10.9' 57.6'
12	0°34.01	N21°59.47		296°56.08	9.6'	N21°29.68	-11.0' 57.5'
13	15°33.92	21°59.81		311°24.66	9.7'	21°18.68	-11.1' 57.5'
14	30°33.83	22°0.16		325°53.37	9.8'	21°7.59	-11.2' 57.4'
15	45°33.73	0.50		340°22.22	10.0'	20°56.40	-11.3' 57.4'
16	60°33.64	0.85		354°51.19	10.1'	20°45.11	-11.4' 57.4'
17	75°33.54	1.19		9°20.30	10.2'	20°33.74	-11.5' 57.3'
18	90°33.45	N22°1.53		23°49.54	10.4'	N20°22.27	-11.6' 57.3'
19	105°33.35	1.88		38°18.90	10.5'	20°10.72	-11.6' 57.2'
20	120°33.26	2.22		52°48.40	10.6'	19°59.08	-11.7' 57.2'
21	135°33.16	2.56		67°18.02	10.7'	19°47.35	-11.8' 57.2'
22	150°33.06	2.90		81°47.77	10.9'	19°35.54	-11.9' 57.1'
23	165°32.97	3.24		96°17.64	11.0'	19°23.65	-12.0' 57.1'
SD = 15.8'			$d = 0.4'$	SD = 15.8'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	180°32.87	N22°3.58		110°47.64	11.1'	N19°11.68	-12.0' 57.1'
1	195°32.78	3.92		125°17.76	11.2'	18°59.63	-12.1' 57.0'
2	210°32.68	4.26		139°48.00	11.4'	18°47.50	-12.2' 57.0'
3	225°32.58	4.59		154°18.36	11.5'	18°35.30	-12.3' 56.9'
4	240°32.49	4.93		168°48.85	11.6'	18°23.03	-12.3' 56.9'
5	255°32.39	5.26		183°19.45	11.7'	18°10.68	-12.4' 56.9'
6	270°32.29	N22°5.60		197°50.18	11.8'	N17°58.26	-12.5' 56.8'
7	285°32.19	5.93		212°21.02	12.0'	17°45.77	-12.6' 56.8'
8	300°32.10	6.27		226°51.97	12.1'	17°33.22	-12.6' 56.8'
9	315°32.00	6.60		241°23.04	12.2'	17°20.60	-12.7' 56.7'
10	330°31.90	6.93		255°54.23	12.3'	17°7.91	-12.7' 56.7'
11	345°31.80	7.27		270°25.53	12.4'	16°55.16	-12.8' 56.6'
12	0°31.71	N22°7.60		284°56.94	12.5'	N16°42.35	-12.9' 56.6'
13	15°31.61	7.93		299°28.46	12.6'	16°29.48	-12.9' 56.6'
14	30°31.51	8.26		314°0.08	12.7'	16°16.55	-13.0' 56.5'
15	45°31.41	8.59		328°31.82	12.8'	16°3.56	-13.0' 56.5'
16	60°31.31	8.91		343°3.66	12.9'	15°50.52	-13.1' 56.5'
17	75°31.21	9.24		357°35.61	13.1'	15°37.42	-13.2' 56.4'
18	90°31.11	N22°9.57		12°7.67	13.2'	N15°24.27	-13.2' 56.4'
19	105°31.02	9.89		26°39.82	13.3'	15°11.07	-13.3' 56.4'
20	120°30.92	10.22		41°12.08	13.4'	14°57.82	-13.3' 56.3'
21	135°30.82	10.55		55°44.44	13.5'	14°44.52	-13.4' 56.3'
22	150°30.72	10.87		70°16.89	13.6'	14°31.16	-13.4' 56.3'
23	165°30.62	11.19		84°49.45	13.7'	14°17.77	-13.4' 56.2'
SD = 15.8'			$d = 0.3'$	SD = 15.6'			

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	180°30.52	N22°11.52		99°22.10	13.7'	N14°4.32	-13.5' 56.2'
1	195°30.42	11.84		113°54.84	13.8'	13°50.84	-13.5' 56.2'
2	210°30.32	12.16		128°27.68	13.9'	13°37.31	-13.6' 56.1'
3	225°30.22	12.48		143°0.62	14.0'	13°23.73	-13.6' 56.1'
4	240°30.12	12.80		157°33.64	14.1'	13°10.12	-13.7' 56.1'
5	255°30.02	13.12		172°6.75	14.2'	12°56.47	-13.7' 56.0'
6	270°29.91	N22°13.44		186°39.96	14.3'	N12°42.78	-13.7' 56.0'
7	285°29.81	13.76		201°13.25	14.4'	12°29.05	-13.8' 56.0'
8	300°29.71	14.08		215°46.62	14.5'	12°15.29	-13.8' 55.9'
9	315°29.61	14.39		230°20.08	14.5'	12°1.49	-13.8' 55.9'
10	330°29.51	14.71		244°53.62	14.6'	11°47.65	-13.9' 55.9'
11	345°29.41	15.02		259°27.25	14.7'	11°33.79	-13.9' 55.8'
12	0°29.31	N22°15.34		274°0.95	14.8'	N11°19.89	-13.9' 55.8'
13	15°29.20	15.65		288°34.73	14.9'	11°5.96	-14.0' 55.8'
14	30°29.10	15.97		303°8.60	14.9'	10°52.01	-14.0' 55.7'
15	45°29.00	16.28		317°42.53	15.0'	10°38.02	-14.0' 55.7'
16	60°28.90	16.59		332°16.55	15.1'	10°24.01	-14.0' 55.7'
17	75°28.79	16.90		346°50.63	15.2'	10°9.97	-14.1' 55.7'
18	90°28.69	N22°17.21		1°24.79	15.2'	N09°55.91	-14.1' 55.6'
19	105°28.59	17.52		15°59.02	15.3'	09°41.82	-14.1' 55.6'
20	120°28.49	17.83		30°33.32	15.4'	09°27.70	-14.1' 55.6'
21	135°28.38	18.14		45°7.69	15.4'	09°13.57	-14.2' 55.5'
22	150°28.28	18.45		59°42.12	15.5'	08°59.41	-14.2' 55.5'
23	165°28.18	18.76		74°16.62	15.6'	08°45.24	-14.2' 55.5'
SD = 15.8'			$d = 0.3'$	SD = 15.3'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	////	////	01:11	22:49	////	////
64°	////	////	01:57	22:01	////	////
62°	////	////	02:27	21:30	////	////
60°	////	01:26	02:49	21:08	22:33	////
N 58°	////	02:00	03:07	20:50	21:58	////
56°	////	02:24	03:22	20:35	21:33	////
54°	01:18	02:43	03:35	20:22	21:13	22:40
52°	01:50	02:59	03:46	20:11	20:57	22:08
50°	02:13	03:13	03:56	20:01	20:44	21:44
45°	02:53	03:40	04:17	19:40	20:16	21:04
N 40°	03:21	04:01	04:33	19:23	19:55	20:36
35°	03:42	04:18	04:47	19:09	19:38	20:14
30°	04:00	04:32	04:59	18:57	19:24	19:56
20°	04:27	04:56	05:20	18:36	19:00	19:29
N 10°	04:48	05:15	05:38	18:18	18:41	19:08
0°	05:06	05:32	05:54	18:02	18:24	18:50
S 10°	05:22	05:48	06:11	17:45	18:08	18:34
20°	05:37	06:04	06:28	17:28	17:51	18:19
30°	05:52	06:22	06:48	17:08	17:34	18:03
35°	06:00	06:32	06:59	16:56	17:24	17:55
40°	06:09	06:42	07:13	16:43	17:13	17:47
45°	06:18	06:55	07:28	16:27	17:01	17:37
S 50°	06:29	07:10	07:47	16:08	16:46	17:27
52°	06:34	07:17	07:56	15:59	16:39	17:22
54°	06:39	07:24	08:07	15:49	16:31	17:17
56°	06:44	07:32	08:18	15:37	16:23	17:11
58°	06:50	07:42	08:31	15:24	16:14	17:05
S 60°	06:57	07:52	08:47	15:09	16:03	16:59

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	08:56	<input type="checkbox"/>	<input type="checkbox"/>	02:35
N 70°	<input type="checkbox"/>	06:45	09:19	<input type="checkbox"/>	03:08	02:11
68°	<input type="checkbox"/>	07:25	09:35	<input type="checkbox"/>	02:27	01:52
66°	05:23	07:53	09:49	02:41	01:58	01:37
64°	06:09	08:13	10:00	01:55	01:36	01:24
62°	06:39	08:30	10:10	01:24	01:19	01:14
60°	07:01	08:44	10:18	01:01	01:04	01:04
N 58°	07:19	08:55	10:25	00:42	00:51	00:56
56°	07:35	09:05	10:31	00:26	00:40	00:49
54°	07:47	09:14	10:36	00:13	00:31	00:43
52°	07:59	09:22	10:41	00:01	00:22	00:37
50°	08:09	09:29	10:46	00:14	00:32
45°	08:30	09:45	10:55	23:57	00:20
N 40°	08:47	09:57	11:03	23:44	00:11
35°	09:01	10:07	11:10	23:32	00:02
30°	09:13	10:17	11:16	23:22	23:55
20°	09:34	10:32	11:27	23:04	23:43
N 10°	09:52	10:46	11:36	22:48	23:31
0°	10:09	10:59	11:44	22:33	23:21
S 10°	10:26	11:11	11:52	22:19	23:10	23:58
20°	10:44	11:25	12:01	22:03	22:59	23:51
30°	11:04	11:40	12:11	21:44	22:46	23:44
35°	11:16	11:49	12:17	21:33	22:38	23:39
40°	11:30	11:59	12:24	21:21	22:29	23:34
45°	11:46	12:11	12:31	21:06	22:19	23:28
S 50°	12:05	12:25	12:40	20:48	22:07	23:21
52°	12:15	12:32	12:44	20:39	22:01	23:18
54°	12:25	12:39	12:49	20:29	21:54	23:14
56°	12:37	12:47	12:54	20:18	21:47	23:10
58°	12:50	12:56	13:00	20:06	21:39	23:05
S 60°	13:06	13:07	13:06	19:51	21:29	23:00

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-39%
31	02:21	02:16	11:58	16:21	03:55	
01	02:11	02:07	11:58	17:10	04:46	
02	02:02	01:57	11:58	17:54	05:33	

June 03, 04, 05 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	251°42.24		225°57.70	N08°15.25	106°44.15	N15°28.67	163°23.60	N23°15.24	250°17.86	S01°41.72
1	266°44.70		240°57.83	16.01	121°45.31	28.19	178°25.46	15.25	265°20.18	41.67
2	281°47.17		255°57.96	16.77	136°46.47	27.72	193°27.31	15.26	280°22.49	41.61
3	296°49.63		270°58.09	· · 17.53	151°47.63	· · 27.25	208°29.16	· · 15.27	295°24.80	· · 41.56
4	311°52.10		285°58.21	18.29	166°48.80	26.77	223°31.02	15.28	310°27.12	41.51
5	326°54.56		300°58.34	19.05	181°49.96	26.30	238°32.87	15.29	325°29.43	41.45
6	341°57.02		315°58.47	N08°19.81	196°51.12	N15°25.82	253°34.72	N23°15.30	340°31.75	S01°41.40
7	356°59.49		330°58.59	20.58	211°52.28	25.35	268°36.57	15.31	355°34.06	41.34
8	12°1.95		345°58.71	21.34	226°53.44	24.87	283°38.43	15.32	10°36.38	41.29
9	27°4.42		0°58.84	· · 22.10	241°54.60	· · 24.40	298°40.28	· · 15.33	25°38.70	· · 41.24
10	42°6.88		15°58.96	22.86	256°55.76	23.92	313°42.13	15.34	40°41.01	41.18
11	57°9.34		30°59.08	23.63	271°56.93	23.45	328°43.98	15.35	55°43.33	41.13
12	72°11.81		45°59.20	N08°24.39	286°58.09	N15°22.97	343°45.84	N23°15.36	70°45.64	S01°41.08
13	87°14.27		60°59.33	25.15	301°59.25	22.49	358°47.69	15.37	85°47.96	41.02
14	102°16.74		75°59.45	25.92	317°0.41	22.02	13°49.54	15.38	100°50.28	40.97
15	117°19.20		90°59.56	· · 26.68	332°1.57	· · 21.54	28°51.39	· · 15.40	115°52.59	· · 40.92
16	132°21.66		105°59.68	27.45	347°2.73	21.07	43°53.25	15.41	130°54.91	40.87
17	147°24.13		120°59.80	28.21	2°3.89	20.59	58°55.10	15.42	145°57.22	40.81
18	162°26.59		135°59.92	N08°28.97	17°5.05	N15°20.11	73°56.95	N23°15.43	160°59.54	S01°40.76
19	177°29.06		151°0.04	29.74	32°6.21	19.64	88°58.80	15.44	176°1.86	40.71
20	192°31.52		166°0.15	30.50	47°7.37	19.16	104°0.66	15.45	191°4.18	40.65
21	207°33.99		181°0.27	· · 31.27	62°8.53	· · 18.68	119°2.51	· · 15.46	206°6.49	· · 40.60
22	222°36.45		196°0.38	32.03	77°9.69	18.21	134°4.36	15.47	221°8.81	40.55
23	237°38.91		211°0.50	32.80	92°10.85	17.73	149°6.21	15.48	236°11.13	40.50
Mer.pass. 07:12			ν0.1' d0.8' m-4.37		ν1.2' d-0.5' m1.30		ν1.9' d0.0' m-1.91		ν2.3' d-0.1' m1.08	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	252°41.38		226°0.61	N08°33.56	107°12.01	N15°17.25	164°8.06	N23°15.49	251°13.44	S01°40.44
1	267°43.84		241°0.72	34.33	122°13.17	16.77	179°9.92	15.50	266°15.76	40.39
2	282°46.31		256°0.83	35.10	137°14.33	16.29	194°11.77	15.51	281°18.08	40.34
3	297°48.77		271°0.95	· · 35.86	152°15.49	· · 15.82	209°13.62	· · 15.52	296°20.40	· · 40.29
4	312°51.23		286°1.06	36.63	167°16.65	15.34	224°15.47	15.53	311°22.72	40.23
5	327°53.70		301°1.17	37.39	182°17.81	14.86	239°17.32	15.54	326°25.03	40.18
6	342°56.16		316°1.28	N08°38.16	197°18.97	N15°14.38	254°19.18	N23°15.55	341°27.35	S01°40.13
7	357°58.63		331°1.38	38.93	212°20.13	13.90	269°21.03	15.55	356°29.67	40.08
8	13°1.09		346°1.49	39.69	227°21.29	13.42	284°22.88	15.56	11°31.99	40.03
9	28°3.55		1°1.60	· · 40.46	242°22.45	· · 12.94	299°24.73	· · 15.57	26°34.31	· · 39.97
10	43°6.02		16°1.71	41.23	257°23.61	12.47	314°26.58	15.58	41°36.63	39.92
11	58°8.48		31°1.81	42.00	272°24.77	11.99	329°28.44	15.59	56°38.95	39.87
12	73°10.95		46°1.92	N08°42.76	287°25.92	N15°11.51	344°30.29	N23°15.60	71°41.26	S01°39.82
13	88°13.41		61°2.02	43.53	302°27.08	11.03	359°32.14	15.61	86°43.58	39.77
14	103°15.87		76°2.13	44.30	317°28.24	10.55	14°33.99	15.62	101°45.90	39.71
15	118°18.34		91°2.23	· · 45.07	332°29.40	· · 10.07	29°35.84	· · 15.63	116°48.22	· · 39.66
16	133°20.80		106°2.33	45.84	347°30.56	9.59	44°37.69	15.64	131°50.54	39.61
17	148°23.27		121°2.43	46.61	2°31.72	9.11	59°39.54	15.65	146°52.86	39.56
18	163°25.73		136°2.53	N08°47.37	17°32.88	N15°8.63	74°41.40	N23°15.66	161°55.18	S01°39.51
19	178°28.19		151°2.64	48.14	32°34.03	8.14	89°43.25	15.67	176°57.50	39.46
20	193°30.66		166°2.74	48.91	47°35.19	7.66	104°45.10	15.68	191°59.82	39.41
21	208°33.12		181°2.83	· · 49.68	62°36.35	· · 7.18	119°46.95	· · 15.69	207°2.14	· · 39.35
22	223°35.59		196°2.93	50.45	77°37.51	6.70	134°48.80	15.69	222°4.46	39.30
23	238°38.05		211°3.03	51.22	92°38.67	6.22	149°50.65	15.70	237°6.78	39.25
Mer.pass. 07:08			ν0.1' d0.8' m-4.36		ν1.2' d-0.5' m1.31		ν1.9' d0.0' m-1.91		ν2.3' d-0.1' m1.07	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	253°40.52		226°3.13	N08°51.99	107°39.83	N15°5.74	164°52.50	N23°15.71	252°9.10	S01°39.20
1	268°42.98		241°3.22	52.76	122°40.98	5.26	179°54.35	15.72	267°11.43	39.15
2	283°45.44		256°3.32	53.53	137°42.14	4.77	194°56.20	15.73	282°13.75	39.10
3	298°47.91		271°3.42	· · 54.30	152°43.30	· · 4.29	209°58.06	· · 15.74	297°16.07	· · 39.05
4	313°50.37		286°3.51	55.07	167°44.46	3.81	224°59.91	15.75	312°18.39	39.00
5	328°52.84		301°3.60	55.84	182°45.61	3.33	240°1.76	15.76	327°20.71	38.95
6	343°55.30		316°3.70	N08°56.61	197°46.77	N15°2.85	255°3.61	N23°15.77	342°23.03	S01°38.90
7	358°57.76		331°3.79	57.38	212°47.93	2.36	270°5.46	15.77	357°25.35	38.85
8	14°0.23		346°3.88	58.15	227°49.09	1.88	285°7.31	15.78	12°27.67	38.79
9	29°2.69		1°3.97	· · 58.93	242°50.24	· · 1.40	300°9.16	· · 15.79	27°30.00	· · 38.74
10	44°5.16		16°4.06	08°59.70	257°51.40	0.91	315°11.01	15.80	42°32.32	38.69
11	59°7.62		31°4.15	09°0.47	272°52.56	15°0.43	330°12.86	15.81	57°34.64	38.64
12	74°10.08		46°4.24	N09°1.24	287°53.71	N14°59.95	345°14.71	N23°15.82	72°36.96	S01°38.59
13	89°12.55		61°4.33	2.01	302°54.87	59.46	0°16.56	15.83	87°39.29	38.54
14	104°15.01		76°4.42	2.78	317°56.03	58.98	15°18.41	15.83	102°41.61	38.49
15	119°17.48		91°4.51	· · 3.56	332°57.18	· · 58.50	30°20.26	· · 15.84	117°43.93	· · 38.44
16	134°19.94		106°4.59	4.33	347°58.34	58.01	45°22.12	15.85	132°46.25	38.39
17	149°22.40		121°4.68	5.10	2°59.50	57.53	60°23.97	15.86	147°48.58	38.34
18	164°24.87		136°4.76	N09°5.87	18°0.65	N14°57.04	75°25.82	N23°15.87	162°50.90	S01°38.29
19	179°27.33		151°4.85	6.65	33°1.81	56.56	90°27.67	15.88	177°53.22	38.24
20	194°29.80		166°4.93	7.42	48°2.97	56.07	105°29.52	15.88	192°55.55	38.19
21	209°32.26		181°5.02	· · 8.19	63°4.12	· · 55.59	120°31.37	· · 15.89	207°57.87	· · 38.14
22	224°34.72		196°5.10	8.97	78°5.28	55.10	135°33.22	15.90	223°0.19	38.09
23	239°37.19		211°5.18	9.74	93°6.43	54.62	150°35.07	15.91	238°2.52	38.04
Mer.pass. 07:04			ν0.1' d0.8' m-4.35		ν1.2' d-0.5' m1.32		ν1.9' d0.0' m-1.91		ν2.3' d-0.1' m1.07	

Stars		
	SHA	Dec
Alpheratz	357°34.56	29°13.67
Ankaa	353°6.98	-42°9.87
Schedar	349°30.96	56°40.34
Diphda	348°47.13	-17°50.76
Achernar	335°20.32	-57°6.24
Hamal	327°51.11	23°34.85
Polaris	314°19.00	89°22.11
Acamar	315°11.90	-40°12.05
Menkar	314°6.11	4°11.34
Mirfak	308°28.28	49°56.96
Aldebaran	290°39.60	16°33.59
Rigel	281°3.90	-8°10.35
Capella	280°21.90	46°1.40
Bellatrix	278°22.87	6°22.35
Elnath	278°1.84	28°37.72
Alnilam	275°37.74	-1°11.15
Betelgeuse	270°52.07	7°24.70
Canopus	263°52.77	-52°42.60
Sirius	258°26.27	-16°45.10
Adhara	255°5.95	-29°0.47
Procyon	244°50.76	5°9.58
Pollux	243°17.20	27°57.96
Avior	234°15.05	-59°35.65
Suhail	222°46.31	-43°32.31
Miaplacidus	221°38.69	-69°49.54
Alphard	217°47.58	-8°46.20
Regulus	207°34.18	11°50.61
Dubhe	193°40.57	61°37.10
Denebola	182°24.55	14°25.83
Gienah	175°43.15	-17°41.13
Acrux	172°59.50	-63°14.70
Gacrux	171°51.07	-57°15.62
Alioth	166°12.38	55°49.51
Spica	158°21.76	-11°17.75
Alkaid	152°51.39	49°11.31
Hadar	148°35.08	-60°29.96
Menkent	147°56.94	-36°29.88
Arcturus	145°47.35	19°3.01
Rigel Kent.	139°39.32	-60°56.62
Kochab	137°18.73	74°3.15
Zuben'ubi	136°55.37	-16°8.95
Alphecca	126°3.11	26°37.73
Antares	112°15.07	-26°29.36
Atria	107°8.44	-69°4.39
Sabik	102°2.06	-15°45.43
Shaula	96°9.51	-37°7.33
Rasalhague	95°57.91	12°32.41
Eltanin	90°41.51	51°28.97
Kaus Aust.	83°31.71	-34°22.31
Vega	80°32.61	38°48.26
Nunki	75°47.03	-26°15.87
Altair	61°59.39	8°56.03
Peacock	53°4.83	-56°38.98
Deneb	49°25.33	45°22.00
Enif	33°38.37	9°59.39
Al Na'ir	27°32.39	-46°50.05
Fomalhaut	15°14.15	-29°29.11
Scheat	13°44.91	28°13.05
Markab	13°29.59	15°20.40

Jun 03 Tue	SHA	Mer.pass
Venus	334°15.46	08:56
Mars	215°1.91	16:52
Jupiter	271°41.36	13:05
Saturn	358°35.62	07:18

Jun 04 Wed	SHA	Mer.pass
Venus	333°19.23	08:56
Mars	214°30.63	16:50
Jupiter	271°26.69	13:02
Saturn	358°32.07	07:14

Jun 05 Thu	SHA	Mer.pass
Venus	332°22.61	08:56
Mars	213°59.31	16:48
Jupiter	271°11.99	12:59
Saturn	358°28.59	07:10

Horizontal parallax	
Venus:	0.2
Mars:	0.1


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue 0	180°28.07	N22°19.06	88°51.19	15.6'	N08°31.04	-14.2'	55.5'
1	195°27.97	19.37	103°25.81	15.7'	08°16.82	-14.2'	55.4'
2	210°27.87	19.68	118°05.50	15.7'	08°25.59	-14.2'	55.4'
3	225°27.76	· · 19.98	132°35.25	15.8'	07°48.34	-14.3'	55.4'
4	240°27.66	20.28	147°10.06	15.9'	07°34.07	-14.3'	55.3'
5	255°27.55	20.59	161°44.92	15.9'	07°19.79	-14.3'	55.3'
6	270°27.45	N22°20.89	176°19.84	16.0'	N07°55.50	-14.3'	55.3'
7	285°27.34	21.19	190°54.82	16.0'	06°51.19	-14.3'	55.3'
8	300°27.24	21.49	205°29.85	16.1'	06°36.87	-14.3'	55.2'
9	315°27.13	· · 21.79	220°49.93	16.1'	06°22.54	-14.3'	55.2'
10	330°27.03	22.09	234°40.06	16.2'	06°8.19	-14.4'	55.2'
11	345°26.92	22.39	249°15.24	16.2'	05°53.84	-14.4'	55.2'
12	0°26.82	N22°22.69	263°50.47	16.3'	N05°39.48	-14.4'	55.1'
13	15°26.71	22.99	278°25.75	16.3'	05°25.11	-14.4'	55.1'
14	30°26.61	23.29	293°10.7	16.4'	05°10.73	-14.4'	55.1'
15	45°26.50	· · 23.58	307°36.43	16.4'	04°56.34	-14.4'	55.1'
16	60°26.40	23.88	322°11.84	16.4'	04°41.95	-14.4'	55.0'
17	75°26.29	24.17	336°47.29	16.5'	04°27.56	-14.4'	55.0'
18	90°26.18	N22°24.47	351°22.78	16.5'	N04°13.16	-14.4'	55.0'
19	105°26.08	24.76	5°58.31	16.6'	03°58.75	-14.4'	55.0'
20	120°25.97	25.06	20°33.88	16.6'	03°44.35	-14.4'	54.9'
21	135°25.86	· · 25.35	35°9.48	16.6'	03°29.94	-14.4'	54.9'
22	150°25.76	25.64	49°45.12	16.7'	03°15.53	-14.4'	54.9'
23	165°25.65	25.93	64°20.79	16.7'	03°1.12	-14.4'	54.9'
SD = 15.8' $d = 0.3'$			SD = 15.1'				

Wed	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°25.54	N22°26.22	78°56.49	16.7'	N02°46.71	-14.4'	54.9'
1	195°25.44	26.51	93°32.23	16.8'	02°32.30	-14.4'	54.8'
2	210°25.33	26.80	108°7.99	16.8'	02°17.89	-14.4'	54.8'
3	225°25.22	· · 27.09	122°43.79	16.8'	02°3.49	-14.4'	54.8'
4	240°25.11	27.38	137°19.61	16.8'	01°49.09	-14.4'	54.8'
5	255°25.01	27.66	151°55.46	16.9'	01°34.69	-14.4'	54.8'
6	270°24.90	N22°27.95	166°31.33	16.9'	N01°20.29	-14.4'	54.7'
7	285°24.79	28.23	181°7.23	16.9'	01°5.91	-14.4'	54.7'
8	300°24.68	28.52	195°43.15	16.9'	00°51.52	-14.4'	54.7'
9	315°24.57	· · 28.80	210°19.09	17.0'	00°37.15	-14.4'	54.7'
10	330°24.46	29.09	224°55.04	17.0'	00°22.78	-14.4'	54.7'
11	345°24.36	29.37	239°31.02	17.0'	N00°8.42	-14.4'	54.6'
12	0°24.25	N22°29.65	254°7.02	17.0'	S00°5.93	14.3'	54.6'
13	15°24.14	29.93	268°43.03	17.0'	00°20.27	14.3'	54.6'
14	30°24.03	30.21	283°19.06	17.0'	00°34.60	14.3'	54.6'
15	45°23.92	· · 30.49	297°55.10	17.1'	00°48.92	14.3'	54.6'
16	60°23.81	30.77	312°31.15	17.1'	01°32.23	14.3'	54.5'
17	75°23.70	31.05	327°7.21	17.1'	01°17.53	14.3'	54.5'
18	90°23.59	N22°31.33	341°43.29	17.1'	S01°31.81	14.3'	54.5'
19	105°23.48	31.61	356°19.37	17.1'	01°46.09	14.3'	54.5'
20	120°23.37	31.88	10°55.46	17.1'	02°03.4	14.2'	54.5'
21	135°23.26	· · 32.16	25°31.56	17.1'	02°14.58	14.2'	54.5'
22	150°23.15	32.44	40°7.66	17.1'	02°28.81	14.2'	54.4'
23	165°23.04	32.71	54°43.77	17.1'	02°43.02	14.2'	54.4'
SD = 15.8' $d = 0.3'$			SD = 15.0'				

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°22.93	N22°32.98	69°19.88	17.1'	S02°57.21	14.2'	54.4'
1	195°22.82	33.26	83°55.99	17.1'	03°11.39	14.2'	54.4'
2	210°22.71	33.53	98°32.10	17.1'	03°25.55	14.1'	54.4'
3	225°22.60	· · 33.80	113°8.21	17.1'	03°39.68	14.1'	54.4'
4	240°22.49	34.07	127°44.32	17.1'	03°53.80	14.1'	54.4'
5	255°22.38	34.34	142°20.43	17.1'	04°7.90	14.1'	54.3'
6	270°22.27	N22°34.61	156°56.53	17.1'	S04°21.98	14.1'	54.3'
7	285°22.16	34.88	171°32.63	17.1'	04°36.04	14.0'	54.3'
8	300°22.04	35.15	186°8.72	17.1'	04°50.07	14.0'	54.3'
9	315°21.93	· · 35.42	200°44.80	17.1'	05°4.08	14.0'	54.3'
10	330°21.82	35.69	215°20.88	17.1'	05°18.07	14.0'	54.3'
11	345°21.71	35.95	229°56.94	17.1'	05°32.03	13.9'	54.3'
12	0°21.60	N22°36.22	244°32.99	17.0'	S05°45.97	13.9'	54.3'
13	15°21.48	36.48	259°9.04	17.0'	05°59.88	13.9'	54.2'
14	30°21.37	36.75	273°45.06	17.0'	06°13.77	13.9'	54.2'
15	45°21.26	· · 37.01	288°21.08	17.0'	06°27.63	13.8'	54.2'
16	60°21.15	37.27	302°57.08	17.0'	06°41.46	13.8'	54.2'
17	75°21.04	37.54	317°33.06	17.0'	06°55.27	13.8'	54.2'
18	90°20.92	N22°37.80	332°9.02	16.9'	S07°9.04	13.7'	54.2'
19	105°20.81	38.06	346°44.97	16.9'	07°22.79	13.7'	54.2'
20	120°20.70	38.32	1°20.89	16.9'	07°36.51	13.7'	54.2'
21	135°20.58	· · 38.58	15°56.80	16.9'	07°50.19	13.7'	54.2'
22	150°20.47	38.84	30°32.68	16.9'	08°3.84	13.6'	54.2'
23	165°20.36	39.10	45°8.54	16.8'	08°17.46	13.6'	54.1'
SD = 15.8' $d = 0.3'$			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:58	23:03	////	////
64°	////	////	01:50	22:08	////	////
62°	////	////	02:22	21:36	////	////
60°	////	01:17	02:45	21:13	22:42	////
N 58°	////	01:54	03:04	20:54	22:04	////
56°	////	02:20	03:19	20:39	21:38	////
54°	01:10	02:40	03:32	20:25	21:18	22:49
52°	01:45	02:57	03:44	20:14	21:01	22:13
50°	02:09	03:11	03:54	20:03	20:47	21:49
45°	02:50	03:38	04:15	19:42	20:19	21:07
N 40°	03:19	04:00	04:32	19:25	19:57	20:38
35°	03:41	04:17	04:46	19:11	19:40	20:16
30°	03:59	04:32	04:59	18:58	19:25	19:58
20°	04:27	04:55	05:20	18:37	19:01	19:30
N 10°	04:48	05:15	05:38	18:19	18:42	19:09
0°	05:06	05:32	05:55	18:02	18:24	18:50
S 10°	05:23	05:49	06:11	17:45	18:08	18:34
20°	05:38	06:05	06:29	17:28	17:51	18:19
30°	05:54	06:23	06:49	17:07	17:33	18:03
35°	06:02	06:33	07:01	16:55	17:23	17:55
40°	06:11	06:44	07:15	16:42	17:12	17:46
45°	06:20	06:57	07:31	16:26	16:59	17:36
S 50°	06:31	07:12	07:50	16:06	16:44	17:25
52°	06:36	07:19	07:59	15:57	16:37	17:20
54°	06:41	07:27	08:10	15:47	16:30	17:15
56°	06:47	07:35	08:22	15:35	16:21	17:09
58°	06:53	07:45	08:35	15:21	16:11	17:03
S 60°	07:00	07:56	08:51	15:05	16:01	16:56

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	11:11	13:11	15:10	01:50	01:16	00:44
N 70°	11:20	13:11	15:00	01:38	01:12	00:48
68°	11:27	13:10	14:52	01:29	01:10	00:52
66°	11:32	13:10	14:46	01:21	01:08	00:55
64°	11:37	13:09	14:40	01:15	01:06	00:57
62°	11:41	13:09	14:35	01:09	01:04	00:59
60°	11:45	13:09	14:31	01:04	01:03	01:01
N 58°	11:48	13:08	14:27	00:59	01:01	01:03
56°	11:51	13:08	14:24	00:55	01:00	01:05
54°	11:54	13:08	14:21	00:52	00:59	01:06
52°	11:56	13:08	14:19	00:48	00:58	01:07
50°	11:58	13:08	14:16	00:45	00:57	01:09
45°	12:03	13:07	14:11	00:39	00:55	01:11
N 40°	12:06	13:07	14:07	00:33	00:54	01:13
35°	12:10	13:07	14:03	00:29	00:52	01:15
30°	12:12	13:07	14:00	00:24	00:51	01:17
20°	12:17	13:06	13:54	00:17	00:49	01:20
N 10°	12:22	13:06	13:49	00:10	00:47	01:22
0°	12:26	13:06	13:45	00:04	00:45	01:25
S 10°	12:30	13:05	13:40	· · ·	00:43	01:27
20°	12:34	13:05	13:36	· · ·	00:41	01:29
30°	12:39	13:05	13:30	· · ·	00:39	01:32
35°	12:42	13:05	13:27	· · ·	00:37	01:34
40°	12:45	13:05	13:24	· · ·	00:36	01:36
45°	12:49	13:04	13:20	· · ·	00:34	01:38
S 50°	12:53	13:04	13:15	· · ·	00:32	01:41
52°	12:55	13:04	13:13	· · ·	00:31	01:42
54°	12:57	13:04	13:11	· · ·	00:30	01:43
56°	12:59	13:04	13:08	· · ·	00:28	01:45
58°	13:02	13:04	13:05	· · ·	00:27	01:46
S 60°	13:05	13:04	13:02	· · ·	00:26	01:48

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 7-9 49-68%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
03	01:52	01:47	11:58	18:35	06:15	
04	01:42	01:37	11:58	19:15	06:55	
05	01:32	01:26	11:59	19:54	07:35	

June 06, 07, 08 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	254°39.65		226°5.26	N09°10.51	108°7.59	N14°54.13	165°36.92	N23°15.92	253°4.84	S01°37.99	Alpheratz	357°34.54 29°13.67
1	269°42.12		241°5.34	11.29	123°8.75	53.65	180°38.77	15.92	268°7.17	37.94	Ankaa	353°6.96 -42°9.86
2	284°44.58		256°5.42	12.06	138°9.90	53.16	195°40.62	15.93	283°9.49	37.90	Schedar	349°30.93 56°40.34
3	299°47.05		271°5.50	· · 12.83	153°11.06	· · 52.68	210°42.47	· · 15.94	298°11.81	· · 37.85	Diphda	348°47.11 -17°50.75
4	314°49.51		286°5.58	13.61	168°12.21	52.19	225°44.32	15.95	313°14.14	37.80	Achernar	335°20.30 -57°6.22
5	329°51.97		301°5.66	14.38	183°13.37	51.70	240°46.17	15.96	328°16.46	37.75	Hamal	327°51.09 23°34.85
6	344°54.44		316°5.74	N09°15.16	198°14.52	N14°51.22	255°48.02	N23°15.96	343°18.79	S01°37.70	Polaris	314°18.12 89°22.09
7	359°56.90		331°5.81	15.93	213°15.68	50.73	270°49.87	15.97	358°21.11	37.65	Acamar	315°11.89 -40°12.03
8	14°59.37		346°5.89	16.70	228°16.84	50.24	285°51.72	15.98	13°23.44	37.60	Menkar	314°6.10 4°11.34
9	30°1.83		1°5.96	· · 17.48	243°17.99	· · 49.76	300°53.57	· · 15.99	28°25.76	· · 37.55	Mirfak	308°28.26 49°56.96
10	45°4.29		16°6.04	18.25	258°19.15	49.27	315°55.42	15.99	43°28.09	37.50	Aldebaran	290°39.60 16°33.59
11	60°6.76		31°6.11	19.03	273°20.30	48.78	330°57.27	16.00	58°30.41	37.45	Rigel	281°3.90 -8°10.34
12	75°9.22		46°6.19	N09°19.80	288°21.46	N14°48.29	345°59.12	N23°16.01	73°32.74	S01°37.40	Capella	280°21.90 46°1.39
13	90°11.69		61°6.26	20.58	303°22.61	47.81	1°0.97	16.02	88°35.06	37.35	Bellatrix	278°22.87 6°22.35
14	105°14.15		76°6.33	21.35	318°23.77	47.32	16°2.82	16.02	103°37.39	37.31	Elnath	278°1.84 28°37.72
15	120°16.61		91°6.40	· · 22.13	333°24.92	· · 46.83	31°4.67	· · 16.03	118°39.72	· · 37.26	Alnilam	275°37.73 -1°11.15
16	135°19.08		106°6.47	22.90	348°26.07	46.34	46°6.52	16.04	133°42.04	37.21	Betelgeuse	270°52.07 7°24.70
17	150°21.54		121°6.54	23.68	3°27.23	45.86	61°8.37	16.05	148°44.37	37.16	Canopus	263°52.78 -52°42.59
18	165°24.01		136°6.61	N09°24.46	18°28.38	N14°45.37	76°10.22	N23°16.05	163°46.69	S01°37.11	Sirius	258°26.28 -16°45.10
19	180°26.47		151°6.68	25.23	33°29.54	44.88	91°12.07	16.06	178°49.02	37.06	Adhara	255°5.96 -29°0.46
20	195°28.93		166°6.75	26.01	48°30.69	44.39	106°13.91	16.07	193°51.35	37.02	Procyon	244°50.77 5°9.59
21	210°31.40		181°6.82	· · 26.78	63°31.85	· · 43.90	121°15.76	· · 16.07	208°53.67	· · 36.97	Pollux	243°17.21 27°57.96
22	225°33.86		196°6.88	27.56	78°33.00	43.41	136°17.61	16.08	223°56.00	36.92	Avior	234°15.07 -59°35.64
23	240°36.33		211°6.95	28.34	93°34.16	42.92	151°19.46	16.09	238°58.33	36.87	Suhail	222°46.32 -43°32.31
Mer.pass. 07:00		ν0.1' d0.8' m-4.34		ν1.2' d-0.5' m1.33		ν1.9' d0.0' m-1.91		ν2.3' d-0.0' m1.06				
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	255°38.79		226°7.01	N09°29.11	108°35.31	N14°42.43	166°21.31	N23°16.10	254°0.66	S01°36.82	Regulus	207°34.19 11°50.61
1	270°41.26		241°7.08	29.89	123°36.46	41.94	181°23.16	16.10	269°2.98	36.77	Dubhe	193°40.61 61°37.11
2	285°43.72		256°7.14	30.67	138°37.62	41.45	196°25.01	16.11	284°5.31	36.73	Denebola	182°24.56 14°25.84
3	300°46.18		271°7.21	· · 31.44	153°38.77	· · 40.96	211°26.86	· · 16.12	299°7.64	· · 36.68	Gienah	175°43.16 -17°41.13
4	315°48.65		286°7.27	32.22	168°39.92	40.47	226°28.71	16.12	314°9.97	36.63	Acrux	172°59.52 -63°14.71
5	330°51.11		301°7.33	33.00	183°41.08	39.98	241°30.56	16.13	329°12.29	36.58	Gacrux	171°51.09 -57°15.63
6	345°53.58		316°7.39	N09°33.77	198°42.23	N14°39.49	256°32.41	N23°16.14	344°14.62	S01°36.53	Alioth	166°12.40 55°49.52
7	0°56.04		331°7.45	34.55	213°43.39	39.00	271°34.26	16.14	359°16.95	36.49	Spica	158°21.77 -11°17.74
8	15°58.50		346°7.51	35.33	228°44.54	38.51	286°36.11	16.15	14°19.28	36.44	Alkaid	152°51.40 49°11.32
9	31°0.97		1°7.57	· · 36.11	243°45.69	· · 38.02	301°37.96	· · 16.16	29°21.61	· · 36.39	Hadar	148°35.09 -60°29.97
10	46°3.43		16°7.63	36.88	258°46.85	37.53	316°39.80	16.16	44°23.94	36.34	Menkent	147°56.95 -36°29.88
11	61°5.90		31°7.69	37.66	273°48.00	37.04	331°41.65	16.17	59°26.26	36.30	Arcturus	145°47.35 19°3.02
12	76°8.36		46°7.75	N09°38.44	288°49.15	N14°36.55	346°43.50	N23°16.18	74°28.59	S01°36.25	Rigel Kent.	139°39.33 -60°56.63
13	91°10.82		61°7.80	39.22	303°50.30	36.06	1°45.35	16.18	89°30.92	36.20	Kochab	137°18.76 74°3.16
14	106°13.29		76°7.86	39.99	318°51.46	35.57	16°47.20	16.19	104°33.25	36.16	Zuben'ubi	136°55.37 -16°8.95
15	121°15.75		91°7.92	· · 40.77	333°52.61	· · 35.07	31°49.05	· · 16.20	119°35.58	· · 36.11	Alphecca	126°3.12 26°37.74
16	136°18.22		106°7.97	41.55	348°53.76	34.58	46°50.90	16.20	134°37.91	36.06	Antares	112°15.07 -26°29.36
17	151°20.68		121°8.02	42.33	3°54.92	34.09	61°52.75	16.21	149°40.24	36.01	Atria	107°8.43 -69°4.40
18	166°23.15		136°8.08	N09°43.11	18°56.07	N14°33.60	76°54.60	N23°16.21	164°42.57	S01°35.97	Sabik	102°2.06 -15°45.42
19	181°25.61		151°8.13	43.89	33°57.22	33.11	91°56.44	16.22	179°44.90	35.92	Shaula	96°9.51 -37°7.33
20	196°28.07		166°8.18	44.66	48°58.37	32.61	106°58.29	16.23	194°47.23	35.87	Rasalhague	95°57.90 12°32.42
21	211°30.54		181°8.23	· · 45.44	63°59.53	· · 32.12	122°0.14	· · 16.23	209°49.56	· · 35.83	Eltanin	90°41.50 51°28.99
22	226°33.00		196°8.29	46.22	79°0.68	31.63	137°1.99	16.24	224°51.89	35.78	Kaus Aust.	83°31.69 -34°22.31
23	241°35.47		211°8.34	47.00	94°1.83	31.14	152°3.84	16.25	239°54.22	35.73	Vega	80°32.60 38°48.28
Mer.pass. 06:56		ν0.1' d0.8' m-4.33		ν1.2' d-0.5' m1.34		ν1.8' d0.0' m-1.91		ν2.3' d-0.0' m1.06				
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	256°37.93		226°8.39	N09°47.78	109°2.98	N14°30.64	167°5.69	N23°16.25	254°56.55	S01°35.69	Nunki	75°47.02 -26°15.87
1	271°40.39		241°8.43	48.56	124°4.14	30.15	182°7.54	16.26	269°58.88	35.64	Altair	90°41.50 51°28.99
2	286°42.86		256°8.48	49.34	139°5.29	29.66	197°9.38	16.26	285°1.21	35.59	Peacock	53°4.80 -56°38.98
3	301°45.32		271°8.53	· · 50.12	154°6.44	· · 29.16	212°11.23	· · 16.27	300°3.54	· · 35.55	Deneb	49°25.30 45°22.02
4	316°47.79		286°8.58	50.90	169°7.59	28.67	227°13.08	16.27	315°5.87	35.50	Enif	33°38.36 9°59.40
5	331°50.25		301°8.62	51.67	184°8.74	28.17	242°14.93	16.28	330°8.20	35.45	Al Na'ir	27°32.36 -46°50.05
6	346°52.71		316°8.67	N09°52.45	199°9.89	N14°27.68	257°16.78	N23°16.29	345°10.53	S01°35.41	Fomalhaut	15°14.13 -29°29.11
7	1°55.18		331°8.71	53.23	214°11.05	27.19	272°18.63	16.29	0°12.87	35.36	Scheat	13°44.89 28°13.06
8	16°57.64		346°8.76	54.01	229°12.20	26.69	287°20.47	16.30	15°15.20	35.32	Markab	13°29.57 15°20.41
9	32°0.11		1°8.80	· · 54.79	244°13.35	· · 26.20	302°22.32	· · 16.30	30°17.53	· · 35.27		
10	47°2.57		16°8.85	55.57	259°14.50	25.70	317°24.17	16.31	45°19.86	35.22		
11	62°5.04		31°8.89	56.35	274°15.65	25.21	332°26.02	16.31	60°22.19	35.18		
12	77°7.50		46°8.93	N09°57.13	289°16.80	N14°24.71	347°27.87	N23°16.32	75°24.53	S01°35.13		
13	92°9.96		61°8.97	57.91	304°17.96	24.22	2°29.72	16.33	90°26.86	35.09		
14	107°12.43		76°9.01	58.69	319°19.11	23.72	17°31.56	16.33	105°29.19	35.04		
15	122°14.89		91°9.05</									

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°20.24	N22°39.35	59°44.37	16.8'	S08°31.05	13.6'	54.1'
1	195°20.13	39.61	74°20.18	16.8'	08°44.61	13.5'	54.1'
2	210°20.02	39.87	88°55.97	16.8'	08°58.13	13.5'	54.1'
3	225°19.90	· · 40.12	103°31.72	16.7'	09°11.61	13.4'	54.1'
4	240°19.79	40.38	118°7.45	16.7'	09°25.06	13.4'	54.1'
5	255°19.67	40.63	132°43.15	16.7'	09°38.47	13.4'	54.1'
6	270°19.56	N22°40.88	147°18.82	16.6'	S09°51.85	13.3'	54.1'
7	285°19.45	41.13	161°54.45	16.6'	10°5.19	13.3'	54.1'
8	300°19.33	41.39	176°30.06	16.6'	10°18.48	13.3'	54.1'
9	315°19.22	· · 41.64	191°5.63	16.5'	10°31.74	13.2'	54.1'
10	330°19.10	41.89	205°41.16	16.5'	10°44.96	13.2'	54.1'
11	345°18.99	42.14	220°16.66	16.5'	10°58.14	13.1'	54.1'
12	0°18.87	N22°42.39	234°52.12	16.4'	S11°11.28	13.1'	54.1'
13	15°18.76	42.64	249°27.55	16.4'	11°24.38	13.1'	54.1'
14	30°18.64	42.88	264°2.93	16.3'	11°37.43	13.0'	54.0'
15	45°18.53	· · 43.13	278°38.28	16.3'	11°50.44	13.0'	54.0'
16	60°18.41	43.38	293°13.58	16.3'	12°3.40	12.9'	54.0'
17	75°18.30	43.62	307°48.85	16.2'	12°16.32	12.9'	54.0'
18	90°18.18	N22°43.87	322°24.07	16.2'	S12°29.19	12.8'	54.0'
19	105°18.06	44.11	336°59.25	16.1'	12°42.02	12.8'	54.0'
20	120°17.95	44.36	351°34.38	16.1'	12°54.80	12.7'	54.0'
21	135°17.83	· · 44.60	6°9.47	16.0'	13°7.53	12.7'	54.0'
22	150°17.72	44.84	20°44.51	16.0'	13°20.21	12.6'	54.0'
23	165°17.60	45.08	35°19.50	15.9'	13°32.84	12.6'	54.0'
SD = 15.8'		$d = 0.3'$	SD = 14.8'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°17.48	N22°45.32	49°54.45	15.9'	S13°45.42	12.5'	54.0'
1	195°17.37	45.56	64°29.35	15.8'	13°57.95	12.5'	54.0'
2	210°17.25	45.80	79°4.19	15.8'	14°10.43	12.4'	54.0'
3	225°17.13	· · 46.04	93°38.99	15.7'	14°22.86	12.4'	54.0'
4	240°17.02	46.28	108°13.73	15.7'	14°35.23	12.3'	54.0'
5	255°16.90	46.52	122°48.42	15.6'	14°47.55	12.3'	54.0'
6	270°16.78	N22°46.75	137°23.06	15.6'	S14°59.81	12.2'	54.0'
7	285°16.66	46.99	151°57.64	15.5'	15°12.01	12.1'	54.0'
8	300°16.55	47.22	166°32.17	15.5'	15°24.16	12.1'	54.0'
9	315°16.43	· · 47.46	181°6.64	15.4'	15°36.25	12.0'	54.0'
10	330°16.31	47.69	195°41.05	15.4'	15°48.28	12.0'	54.0'
11	345°16.19	47.93	210°15.41	15.3'	16°0.26	11.9'	54.0'
12	0°16.08	N22°48.16	224°49.71	15.2'	S16°12.17	11.9'	54.0'
13	15°15.96	48.39	239°23.95	15.2'	16°24.02	11.8'	54.0'
14	30°15.84	48.62	253°58.12	15.1'	16°35.81	11.7'	54.0'
15	45°15.72	· · 48.85	268°32.24	15.1'	16°47.54	11.7'	54.0'
16	60°15.60	49.08	283°6.30	15.0'	16°59.20	11.6'	54.0'
17	75°15.49	49.31	297°40.29	14.9'	17°10.80	11.5'	54.0'
18	90°15.37	N22°49.54	312°14.22	14.9'	S17°22.33	11.5'	54.0'
19	105°15.25	49.77	326°48.08	14.8'	17°33.79	11.4'	54.0'
20	120°15.13	49.99	341°21.88	14.7'	17°45.19	11.3'	54.0'
21	135°15.01	· · 50.22	355°55.62	14.7'	17°56.52	11.3'	54.0'
22	150°14.89	50.44	10°29.29	14.6'	18°7.79	11.2'	54.0'
23	165°14.77	50.67	25°2.89	14.5'	18°18.98	11.1'	54.0'
SD = 15.8'		$d = 0.2'$	SD = 14.7'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°14.65	N22°50.89	39°36.43	14.5'	S18°30.10	11.0'	54.0'
1	195°14.54	51.12	54°9.89	14.4'	18°41.15	11.0'	54.0'
2	210°14.42	51.34	68°43.29	14.3'	18°52.13	10.9'	54.0'
3	225°14.30	· · 51.56	83°16.62	14.3'	19°3.03	10.8'	54.0'
4	240°14.18	51.78	97°49.88	14.2'	19°13.86	10.8'	54.0'
5	255°14.06	52.00	112°23.07	14.1'	19°24.61	10.7'	54.0'
6	270°13.94	N22°52.22	126°56.19	14.0'	S19°35.29	10.6'	54.0'
7	285°13.82	52.44	141°29.23	14.0'	19°45.89	10.5'	54.0'
8	300°13.70	52.66	156°2.21	13.9'	19°56.41	10.4'	54.0'
9	315°13.58	· · 52.88	170°35.11	13.8'	20°6.86	10.4'	54.1'
10	330°13.46	53.10	185°7.94	13.8'	20°17.22	10.3'	54.1'
11	345°13.34	53.31	199°40.69	13.7'	20°27.50	10.2'	54.1'
12	0°13.22	N22°53.53	214°13.37	13.6'	S20°37.70	10.1'	54.1'
13	15°13.10	53.74	228°45.98	13.5'	20°47.82	10.0'	54.1'
14	30°12.97	53.96	243°18.51	13.5'	20°57.85	9.9'	54.1'
15	45°12.85	· · 54.17	257°50.96	13.4'	21°7.80	9.9'	54.1'
16	60°12.73	54.38	272°23.34	13.3'	21°17.66	9.8'	54.1'
17	75°12.61	54.60	286°55.65	13.2'	21°27.44	9.7'	54.1'
18	90°12.49	N22°54.81	301°27.88	13.2'	S21°37.12	9.6'	54.1'
19	105°12.37	55.02	316°0.03	13.1'	21°46.72	9.5'	54.1'
20	120°12.25	55.23	330°32.10	13.0'	21°56.23	9.4'	54.1'
21	135°12.13	· · 55.44	345°4.10	12.9'	22°5.65	9.3'	54.1'
22	150°12.01	55.65	359°36.02	12.8'	22°14.98	9.2'	54.1'
23	165°11.88	55.85	14°7.86	12.8'	22°24.21	9.1'	54.1'
SD = 15.8'		$d = 0.2'$	SD = 14.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	////	////	00:44	23:19	////	////
64°	////	////	01:44	22:15	////	////
62°	////	////	02:17	21:42	////	////
60°	////	01:09	02:42	21:17	22:51	////
N 58°	////	01:50	03:01	20:58	22:10	////
56°	////	02:17	03:17	20:42	21:42	////
54°	01:03	02:37	03:30	20:28	21:21	22:57
52°	01:41	02:54	03:42	20:16	21:04	22:19
50°	02:06	03:09	03:52	20:06	20:50	21:53
45°	02:48	03:37	04:14	19:44	20:21	21:10
N 40°	03:18	03:59	04:31	19:27	19:59	20:40
35°	03:40	04:16	04:46	19:12	19:42	20:18
30°	03:58	04:31	04:58	19:00	19:27	20:00
20°	04:26	04:55	05:20	18:38	19:03	19:32
N 10°	04:48	05:15	05:38	18:20	18:43	19:10
0°	05:07	05:33	05:55	18:03	18:25	18:51
S 10°	05:23	05:49	06:12	17:46	18:08	18:35
20°	05:39	06:06	06:30	17:28	17:52	18:19
30°	05:55	06:25	06:51	17:07	17:33	18:03
35°	06:03	06:35	07:03	16:55	17:23	17:55
40°	06:12	06:46	07:16	16:41	17:12	17:46
45°	06:22	06:59	07:33	16:25	16:59	17:36
S 50°	06:33	07:15	07:53	16:05	16:43	17:24
52°	06:38	07:22	08:02	15:56	16:36	17:19
54°	06:44	07:30	08:13	15:45	16:28	17:14
56°	06:50	07:38	08:25	15:33	16:19	17:08
58°	06:56	07:48	08:39	15:19	16:10	17:02
S 60°	07:03	07:59	08:55	15:02	15:58	16:54

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	17:20	■	■	00:10 23:25	■	■
N 70°	16:57	19:19	■	00:22 23:50	22:56	■
68°	16:39	18:39	■	00:33 23:37	■	■
66°	16:24	18:12	20:21	00:41	00:26	00:05 23:29
64°	16:13	17:51	19:41	00:48	00:39	00:27
62°	16:03	17:35	19:13	00:55	00:50	00:44
60°	15:54	17:21	18:52	01:00	00:59	00:59
N 58°	15:47	17:09	18:34	01:05	01:08	01:11
56°	15:41	16:59	18:20	01:09	01:15	01:22
54°	15:35	16:50	18:08	01:13	01:21	01:32
52°	15:30	16:42	17:57	01:17	01:27	01:40
50°	15:25	16:35	17:47	01:20	01:33	01:48
45°	15:15	16:20	17:27	01:27	01:44	02:05
N 40°	15:07	16:08	17:10	01:33	01:54	02:18
35°	15:00	15:57	16:57	01:38	02:03	02:30
30°	14:53	15:48	16:45	01:43	02:10	02:40
20°	14:43	15:33	16:24	01:51	02:23	02:58
N 10°	14:33	15:19	16:07	01:57	02:34	03:13
0°	14:25	15:06	15:51	02:04	02:45	03:27
S 10°	14:16	14:54	15:34	02:11	02:55	03:42
20°	14:07	14:41	15:17	02:18	03:07	03:57
30°	13:57	14:25	14:57	02:26	03:20	04:15
35°	13:51	14:17	14:46	02:30	03:27	04:26
40°	13:44	14:07	14:33	02:36	03:36	04:38
45°	13:37	13:55	14:18	02:42	03:46	04:52
S 50°	13:27	13:41	13:59	02:49	03:59	05:10
52°	13:23	13:35	13:50	02:53	04:05	05:18
54°	13:18	13:28	13:40	02:57	04:11	05:27
56°	13:13	13:20	13:29	03:01	04:18	05:38
58°	13:08	13:11	13:16	03:06	04:26	05:50
S 60°	13:01	13:01	13:01	03:11	04:35	06:04

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-90%
06	01:21	01:15	11:59	20:35	08:14	
07	01:10	01:04	11:59	21:17	08:55	
08	00:59	00:53	11:59	22:02	09:39	

June 09, 10, 11 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	257°37.07		226°9.38	N10°6.50	109°30.61	N14°18.76	167°50.04	N23°16.38	255°52.52	S01°34.59
1	272°39.53		241°9.41	7.28	124°31.76	18.26	182°51.89	16.39	270°54.85	34.54
2	287°42.00		256°9.45	8.06	139°32.91	17.77	197°53.74	16.39	285°57.19	34.50
3	302°44.46		271°9.48	•• 8.84	154°34.06	•• 17.27	212°55.59	•• 16.40	300°59.52	•• 34.45
4	317°46.93		286°9.51	9.62	169°35.21	16.77	227°57.43	16.40	316°1.86	34.41
5	332°49.39		301°9.54	10.40	184°36.36	16.27	242°59.28	16.41	331°4.19	34.36
6	347°51.85		316°9.57	N10°11.18	199°37.51	N14°15.77	258°1.13	N23°16.41	346°6.53	S01°34.32
7	2°54.32		331°9.60	11.96	214°38.66	15.28	273°2.98	16.42	1°8.86	34.27
8	17°56.78		346°9.63	12.74	229°39.81	14.78	288°4.82	16.42	16°11.20	34.23
9	32°59.25		1°9.66	•• 13.52	244°40.96	•• 14.28	303°6.67	•• 16.43	31°13.53	•• 34.18
10	48°1.71		16°9.68	14.31	259°42.11	13.78	318°8.52	16.43	46°15.87	34.14
11	63°4.18		31°9.71	15.09	274°43.26	13.28	333°10.37	16.44	61°18.20	34.09
12	78°6.64		46°9.74	N10°15.87	289°44.41	N14°12.78	348°12.21	N23°16.44	76°20.54	S01°34.05
13	93°9.10		61°9.76	16.65	304°45.56	12.29	3°14.06	16.45	91°22.87	34.00
14	108°11.57		76°9.79	17.43	319°46.71	11.79	18°15.91	16.45	106°25.21	33.96
15	123°14.03		91°9.81	•• 18.21	334°47.86	•• 11.29	33°17.76	•• 16.45	121°27.54	•• 33.92
16	138°16.50		106°9.84	18.99	349°49.01	10.79	48°19.60	16.46	136°29.88	33.87
17	153°18.96		121°9.86	19.78	4°50.16	10.29	63°21.45	16.46	151°32.22	33.83
18	168°21.42		136°9.88	N10°20.56	19°51.31	N14°9.79	78°23.30	N23°16.47	166°34.55	S01°33.78
19	183°23.89		151°9.90	21.34	34°52.46	9.29	93°25.15	16.47	181°36.89	33.74
20	198°26.35		166°9.92	22.12	49°53.61	8.79	108°26.99	16.48	196°39.23	33.70
21	213°28.82		181°9.94	•• 22.90	64°54.76	•• 8.29	123°28.84	•• 16.48	211°41.56	•• 33.65
22	228°31.28		196°9.96	23.69	79°55.90	7.79	138°30.69	16.48	226°43.90	33.61
23	243°33.75		211°9.98	24.47	94°57.05	7.29	153°32.53	16.49	241°46.24	33.56
Mer.pass. 06:48		ν0.0' d0.8' m-4.31		ν1.2' d-0.5' m1.35		ν1.8' d0.0' m-1.90		ν2.3' d-0.0' m1.05		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	258°36.21		226°10.00	N10°25.25	109°58.20	N14°6.79	168°34.38	N23°16.49	256°48.57	S01°33.52
1	273°38.67		241°10.02	26.03	124°59.35	6.29	183°36.23	16.50	271°50.91	33.48
2	288°41.14		256°10.04	26.81	140°0.50	5.78	198°38.08	16.50	286°53.25	33.43
3	303°43.60		271°10.05	•• 27.60	155°1.65	•• 5.28	213°39.92	•• 16.50	301°55.58	•• 33.39
4	318°46.07		286°10.07	28.38	170°2.80	4.78	228°41.77	16.51	316°57.92	33.35
5	333°48.53		301°10.08	29.16	185°3.94	4.28	243°43.62	16.51	332°0.26	33.30
6	348°50.99		316°10.10	N10°29.94	200°5.09	N14°3.78	258°45.46	N23°16.52	347°2.60	S01°33.26
7	3°53.46		331°10.11	30.72	215°6.24	3.28	273°47.31	16.52	2°4.94	33.22
8	18°55.92		346°10.12	31.51	230°7.39	2.78	288°49.16	16.52	17°7.27	33.17
9	33°58.39		1°10.14	•• 32.29	245°8.54	•• 2.27	303°51.00	•• 16.53	32°9.61	•• 33.13
10	49°0.85		16°10.15	33.07	260°9.68	1.77	318°52.85	16.53	47°11.95	33.09
11	64°3.32		31°10.16	33.85	275°10.83	1.27	333°54.70	16.53	62°14.29	33.04
12	79°5.78		46°10.17	N10°34.63	290°11.98	N14°0.77	348°56.54	N23°16.54	77°16.63	S01°33.00
13	94°8.24		61°10.18	35.42	305°13.13	14°0.26	3°58.39	16.54	92°18.97	32.96
14	109°10.71		76°10.19	36.20	320°14.28	13°59.76	19°0.24	16.55	107°21.31	32.92
15	124°13.17		91°10.20	•• 36.98	335°15.42	•• 59.26	34°2.08	•• 16.55	122°23.65	•• 32.87
16	139°15.64		106°10.21	37.76	350°16.57	58.75	49°3.93	16.55	137°25.98	32.83
17	154°18.10		121°10.21	38.55	5°17.72	58.25	64°5.78	16.56	152°28.32	32.79
18	169°20.57		136°10.22	N10°39.33	20°18.86	N13°57.75	79°7.62	N23°16.56	167°30.66	S01°32.75
19	184°23.03		151°10.23	40.11	35°20.01	57.24	94°9.47	16.56	182°33.00	32.70
20	199°25.49		166°10.23	40.89	50°21.16	56.74	109°11.32	16.57	197°35.34	32.66
21	214°27.96		181°10.24	•• 41.68	65°22.31	•• 56.24	124°13.16	•• 16.57	212°37.68	•• 32.62
22	229°30.42		196°10.24	42.46	80°23.45	55.73	139°15.01	16.57	227°40.02	32.58
23	244°32.89		211°10.24	43.24	95°24.60	55.23	154°16.86	16.57	242°42.36	32.53
Mer.pass. 06:44		ν0.0' d0.8' m-4.30		ν1.1' d-0.5' m1.36		ν1.8' d0.0' m-1.90		ν2.3' d-0.0' m1.05		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	259°35.35		226°10.25	N10°44.02	110°25.75	N13°54.72	169°18.70	N23°16.58	257°44.70	S01°32.49
1	274°37.81		241°10.25	44.81	125°26.89	54.22	184°20.55	16.58	272°47.05	32.45
2	289°40.28		256°10.25	45.59	140°28.04	53.71	199°22.40	16.58	287°49.39	32.41
3	304°42.74		271°10.25	•• 46.37	155°29.19	•• 53.21	214°24.24	•• 16.59	302°51.73	•• 32.37
4	319°45.21		286°10.25	47.15	170°30.33	52.70	229°26.09	16.59	317°54.07	32.32
5	334°47.67		301°10.25	47.94	185°31.48	52.20	244°27.93	16.59	332°56.41	32.28
6	349°50.14		316°10.25	N10°48.72	200°32.63	N13°51.69	259°29.78	N23°16.60	347°58.75	S01°32.24
7	4°52.60		331°10.25	49.50	215°33.77	51.19	274°31.63	16.60	3°1.09	32.20
8	19°55.06		346°10.25	50.29	230°34.92	50.68	289°33.47	16.60	18°3.43	32.16
9	34°57.53		1°10.24	•• 51.07	245°36.07	•• 50.18	304°35.32	•• 16.60	33°5.77	•• 32.12
10	49°59.99		16°10.24	51.85	260°37.21	49.67	319°37.17	16.61	48°8.12	32.07
11	65°2.46		31°10.24	52.63	275°38.36	49.17	334°39.01	16.61	63°10.46	32.03
12	80°4.92		46°10.23	N10°53.42	290°39.51	N13°48.66	349°40.86	N23°16.61	78°12.80	S01°31.99
13	95°7.39		61°10.23	54.20	305°40.65	48.15	4°42.70	16.61	93°15.14	31.95
14	110°9.85		76°10.22	54.98	320°41.80	47.65	19°44.55	16.62	108°17.49	31.91
15	125°12.31		91°10.21	•• 55.76	335°42.94	•• 47.14	34°46.40	•• 16.62	123°19.83	•• 31.87
16	140°14.78		106°10.20	56.55	350°44.09	46.63	49°48.24	16.62	138°22.17	31.83
17	155°17.24		121°10.20	57.33	5°45.23	46.13	64°50.09	16.62	153°24.51	31.79
18	170°19.71		136°10.19	N10°58.11	20°46.38	N13°45.62	79°51.93	N23°16.63	168°26.86	S01°31.74
19	185°22.17		151°10.18	58.89	35°47.53	45.11	94°53.78	16.63	183°29.20	31.70
20	200°24.63		166°10.17	10°59.68	50°48.67	44.60	109°55.63	16.63	198°31.54	31.66
21	215°27.10		181°10.16	11°0.46	65°49.82	•• 44.10	124°57.47	•• 16.63	213°33.89	•• 31.62
22	230°29.56		196°10.15	1.24	80°50.96	43.59	139°59.32	16.64	228°36.23	31.58
23	245°32.03		211°10.13	2.02	95°52.11	43.08	155°1.16	16.64	243°38.57	31.54
Mer.pass. 06:41		ν0.0' d0.8' m-4.29		ν1.1' d-0.5' m1.37		ν1.8' d0.0' m-1.90		ν2.3' d-0.0' m1.04		

Stars		
	SHA	Dec
Alpheratz	357°34.52	29°13.68
Ankaa	353°6.94	-42°9.85
Schedar	349°30.89	56°40.34
Diphda	348°47.09	-17°50.74
Achernar	335°20.27	-57°6.21
Hamal	327°51.07	23°34.85
Polaris	314°16.97	89°22.08
Acamar	315°11.87	-40°12.02
Menkar	314°6.08	4°11.35
Mirfak	308°28.24	49°56.95
Aldebaran	290°39.58	16°33.59
Rigel	281°3.89	-8°10.33
Capella	280°21.88	46°1.38
Bellatrix	278°22.86	6°22.36
Elnath	278°1.83	28°37.71
Alnilam	275°37.73	-1°11.14
Betelgeuse	270°52.06	7°24.70
Canopus	263°52.79	-52°42.58
Sirius	258°26.28	-16°45.09
Adhara	255°5.96	-29°0.45
Procyon	244°50.77	5°9.59
Pollux	243°17.21	27°57.95
Avior	234°15.09	-59°35.63
Suhail	222°46.33	-43°32.30
Miaplacidus	221°38.76	-69°49.52
Alphard	217°47.59	-8°46.19
Regulus	207°34.19	11°50.61
Dubhe	193°40.63	61°37.10
Denebola	182°24.57	14°25.84
Gienah	175°43.16	-17°41.12
Acrux	172°59.54	-63°14.71
Gacrux	171°51.10	-57°15.63
Alioth	166°12.42	55°49.53
Spica	158°21.77	-11°17.74
Alkaid	152°51.42	49°11.33
Hadar	148°35.10	-60°29.97
Menkent	147°56.95	-36°29.88
Arcturus	145°47.36	19°3.03
Rigel Kent.	139°39.34	-60°56.64
Kochab	137°18.80	74°3.17
Zuben'ubi	136°55.37	-16°8.94
Alphecca	126°3.12	26°37.75
Antares	112°15.06	-26°29.36
Atria	107°8.41	-69°4.42
Sabik	102°2.05	-15°45.42
Shaula	96°9.49	-37°7.33
Rasalhague	95°57.89	12°32.43
Eltanin	90°41.49	51°29.01
Kaus Aust.	83°31.68	-34°22.31
Vega	80°32.59	38°48.30
Nunki	75°47.00	-26°15.86
Altair	61°59.36	8°56.06
Peacock	53°4.77	-56°38.98
Deneb	49°25.28	45°22.03
Enif	33°38.33	9°59.41
Al Na'ir	27°32.33	-46°50.04
Fomalhaut	15°14.10	-29°29.10
Scheat	13°44.86	28°13.07
Markab	13°29.55	15°20.42
Jun 09 Mon	SHA	Mer.pass
Venus	328°32.31	08:55
Mars	211°53.54	16:41
Jupiter	270°12.97	12:47
Saturn	358°15.45	06:55
Jun 10 Tue	SHA	Mer.pass
Venus	327°33.79	08:55
Mars	211°21.99	16:39
Jupiter	269°58.17	12:44
Saturn	358°12.36	06:52
Jun 11 Wed	SHA	Mer.pass
Venus	326°34.90	08:55
Mars	210°50.40	16:37
Jupiter	269°43.35	12:41
Saturn	358°9.35	06:48
Horizontal parallax		
	Venus:	0.2
	Mars:	0.1

h		Sun		Moon				
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		180°11.76	N22°56.06	28°39.63	12.7'	S22°33.35	9.0'	54.1'
1		195°11.64	56.27	43°11.31	12.6'	22°42.40	9.0'	54.1'
2		210°11.52	56.47	57°42.92	12.5'	22°51.35	8.9'	54.2'
3		225°11.40	56.68	72°14.45	12.5'	23°0.20	8.8'	54.2'
4		240°11.27	56.88	86°45.90	12.4'	23°8.96	8.7'	54.2'
5		255°11.15	57.09	101°17.27	12.3'	23°17.62	8.6'	54.2'
6		270°11.03	N22°57.29	115°48.57	12.2'	S23°26.17	8.5'	54.2'
7		285°10.91	57.49	130°19.78	12.1'	23°34.63	8.4'	54.2'
8		300°10.78	57.70	144°50.92	12.1'	23°42.99	8.3'	54.2'
9		315°10.66	57.90	159°21.98	12.0'	23°51.24	8.1'	54.2'
10		330°10.54	58.10	173°52.96	11.9'	23°59.39	8.0'	54.2'
11		345°10.42	58.30	188°23.86	11.8'	24°7.43	7.9'	54.2'
12		0°10.29	N22°58.50	202°54.68	11.7'	S24°15.37	7.8'	54.2'
13		15°10.17	58.69	217°25.42	11.7'	24°23.21	7.7'	54.3'
14		30°10.05	58.89	231°56.09	11.6'	24°30.93	7.6'	54.3'
15		45°9.92	59.09	246°26.68	11.5'	24°38.55	7.5'	54.3'
16		60°9.80	59.28	260°57.19	11.4'	24°46.05	7.4'	54.3'
17		75°9.68	59.48	275°27.62	11.4'	24°53.45	7.3'	54.3'
18		90°9.55	N22°59.67	289°57.98	11.3'	S25°0.73	7.2'	54.3'
19		105°9.43	22°59.87	304°28.26	11.2'	25°7.91	7.1'	54.3'
20		120°9.31	23°0.06	318°58.46	11.1'	25°14.96	6.9'	54.3'
21		135°9.18	0.25	333°28.58	11.1'	25°21.91	6.8'	54.3'
22		150°9.06	0.45	347°58.64	11.0'	25°28.74	6.7'	54.3'
23		165°8.93	0.64	2°28.61	10.9'	25°35.45	6.6'	54.4'
		SD = 15.8'				SD = 14.8'		

Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		180°8.81	N23°0.83	16°58.51	10.8'	S25°42.05	6.5'	54.4'
1		195°8.69	1.02	31°28.34	10.8'	25°48.52	6.4'	54.4'
2		210°8.56	1.21	45°58.09	10.7'	25°54.88	6.2'	54.4'
3		225°8.44	1.40	60°27.77	10.6'	26°1.12	6.1'	54.4'
4		240°8.31	1.58	74°57.37	10.5'	26°7.23	6.0'	54.4'
5		255°8.19	1.77	89°26.90	10.5'	26°13.23	5.9'	54.4'
6		270°8.06	N23°1.96	103°56.37	10.4'	S26°19.10	5.7'	54.4'
7		285°7.94	2.14	118°25.76	10.3'	26°24.85	5.6'	54.4'
8		300°7.81	2.33	132°55.08	10.3'	26°30.47	5.5'	54.5'
9		315°7.69	2.51	147°24.33	10.2'	26°35.97	5.4'	54.5'
10		330°7.56	2.69	161°53.51	10.1'	26°41.34	5.2'	54.5'
11		345°7.44	2.88	176°22.62	10.0'	26°46.58	5.1'	54.5'
12		0°7.31	N23°3.06	190°51.67	10.0'	S26°51.69	5.0'	54.5'
13		15°7.19	3.24	205°20.65	9.9'	26°56.68	4.9'	54.5'
14		30°7.06	3.42	219°49.57	9.9'	27°1.54	4.7'	54.5'
15		45°6.94	3.60	234°18.42	9.8'	27°6.26	4.6'	54.5'
16		60°6.81	3.78	248°47.20	9.7'	27°10.85	4.5'	54.6'
17		75°6.69	3.96	263°15.93	9.7'	27°15.32	4.3'	54.6'
18		90°6.56	N23°4.14	277°44.59	9.6'	S27°19.64	4.2'	54.6'
19		105°6.44	4.31	292°13.19	9.5'	27°23.84	4.1'	54.6'
20		120°6.31	4.49	306°41.73	9.5'	27°27.90	3.9'	54.6'
21		135°6.18	4.67	321°10.22	9.4'	27°31.82	3.8'	54.6'
22		150°6.06	4.84	335°38.64	9.4'	27°35.61	3.6'	54.6'
23		165°5.93	5.02	350°7.01	9.3'	27°39.26	3.5'	54.7'
		SD = 15.7'				SD = 14.8'		

Wed		GHA	Dec	GHA	ν	Dec	d	HP
0		180°5.80	N23°5.19	4°35.33	9.3'	S27°42.77	3.4'	54.7'
1		195°5.68	5.36	19°3.59	9.2'	27°46.14	3.2'	54.7'
2		210°5.55	5.53	33°31.79	9.2'	27°49.38	3.1'	54.7'
3		225°5.43	5.71	47°59.95	9.1'	27°52.47	3.0'	54.7'
4		240°5.30	5.88	62°28.06	9.1'	27°55.42	2.8'	54.7'
5		255°5.17	6.05	76°56.11	9.0'	27°58.24	2.7'	54.7'
6		270°5.04	N23°6.22	91°24.12	9.0'	S28°0.91	2.5'	54.8'
7		285°4.92	6.39	105°52.08	8.9'	28°3.44	2.4'	54.8'
8		300°4.79	6.55	120°20.00	8.9'	28°5.82	2.2'	54.8'
9		315°4.66	6.72	134°47.87	8.8'	28°8.06	2.1'	54.8'
10		330°4.54	6.89	149°15.70	8.8'	28°10.16	2.0'	54.8'
11		345°4.41	7.05	163°43.49	8.7'	28°12.11	1.8'	54.8'
12		0°4.28	N23°7.22	178°11.24	8.7'	S28°13.92	1.7'	54.9'
13		15°4.15	7.38	192°38.95	8.7'	28°15.58	1.5'	54.9'
14		30°4.03	7.55	207°6.62	8.6'	28°17.10	1.4'	54.9'
15		45°3.90	7.71	221°34.26	8.6'	28°18.47	1.2'	54.9'
16		60°3.77	7.87	236°1.87	8.6'	28°19.69	1.1'	54.9'
17		75°3.64	8.03	250°29.44	8.5'	28°20.77	0.9'	54.9'
18		90°3.52	N23°8.19	264°56.98	8.5'	S28°21.69	0.8'	54.9'
19		105°3.39	8.35	279°24.49	8.5'	28°22.47	0.6'	55.0'
20		120°3.26	8.51	293°51.98	8.5'	28°23.10	0.5'	55.0'
21		135°3.13	8.67	308°19.44	8.4'	28°23.58	0.3'	55.0'
22		150°3.00	8.83	322°46.87	8.4'	28°23.91	0.2'	55.0'
23		165°2.88	8.99	337°14.28	8.4'	28°24.09	0.0'	55.0'
		SD = 15.7'				SD = 14.9'		

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	////	////	00:27	23:39	////	////
64°	////	////	01:39	22:21	////	////
62°	////	////	02:14	21:46	////	////
60°	////	01:02	02:39	21:21	22:59	////
N 58°	////	01:46	02:59	21:01	22:14	////
56°	////	02:14	03:15	20:45	21:46	////
54°	00:57	02:35	03:29	20:31	21:25	23:04
52°	01:37	02:52	03:41	20:19	21:07	22:23
50°	02:03	03:07	03:51	20:08	20:52	21:57
45°	02:47	03:36	04:13	19:46	20:23	21:12
N 40°	03:17	03:58	04:31	19:28	20:01	20:42
35°	03:40	04:16	04:46	19:14	19:43	20:20
30°	03:58	04:31	04:58	19:01	19:28	20:01
20°	04:26	04:55	05:20	18:39	19:04	19:33
N 10°	04:49	05:16	05:39	18:20	18:43	19:10
0°	05:07	05:33	05:56	18:03	18:26	18:52
S 10°	05:24	05:50	06:13	17:46	18:09	18:35
20°	05:40	06:07	06:31	17:28	17:52	18:19
30°	05:56	06:26	06:52	17:07	17:33	18:03
35°	06:04	06:36	07:04	16:55	17:23	17:54
40°	06:14	06:48	07:18	16:41	17:11	17:45
45°	06:24	07:01	07:35	16:24	16:58	17:35
S 50°	06:35	07:17	07:55	16:04	16:42	17:24
52°	06:40	07:24	08:04	15:54	16:35	17:19
54°	06:46	07:32	08:15	15:44	16:27	17:13
56°	06:52	07:41	08:28	15:31	16:18	17:07
58°	06:58	07:51	08:42	15:17	16:08	17:00
S 60°	07:06	08:02	08:59	15:00	15:57	16:53

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	■	■	■
64°	22:04	■	■	00:10 23:26	■	■
62°	21:00	23:07	■	00:38	00:30	00:10
60°	20:26	21:59	23:12	01:00	01:05	01:19
N 58°	20:01	21:24	23:21	01:18	01:30	01:54
56°	19:42	20:59	22:03	01:33	01:51	02:19
54°	19:25	20:39	21:42	01:46	02:07	02:40
52°	19:11	20:22	21:24	01:58	02:22	02:57
50°	18:59	20:08	21:08	02:08	02:35	03:11
45°	18:34	19:38	20:38	02:29	03:01	03:41
N 40°	18:13	19:15	20:14	02:47	03:21	04:04
35°	17:57	18:57	19:54	03:01	03:39	04:23
30°	17:42	18:41	19:37	03:14	03:54	04:40
20°	17:18	18:13	19:09	03:36	04:19	05:07
N 10°	16:57	17:50	18:44	03:55	04:41	05:31
0°	16:38	17:28	18:21	04:13	05:02	05:54
S 10°	16:19	17:07	17:59	04:31	05:23	06:16
20°	15:58	16:44	17:34	04:50	05:45	06:40
30°	15:34	16:17	17:06	05:12	06:11	07:08
35°	15:20	16:01	16:49	05:26	06:26	07:25
40°	15:04	15:43	16:30	05:41	06:44	07:44
45°	14:45	15:21	16:06	05:59	07:05	08:07
S 50°	14:22	14:53	15:36	06:21	07:32	08:37
52°	14:10	14:39	15:21	06:32	07:45	08:52
54°	13:58	14:24	15:04	06:45	08:01	09:10
56°	13:43	14:05	14:43	06:59	08:19	09:31
58°	13:26	13:43	14:16	07:16	08:41	09:57
S 60°	13:05	13:14	13:38	07:36	09:10	10:35

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-100%
09	00:47	00:41	11:59	22:50	10:25	
10	00:35	00:29	12:00	23:41	11:15	
11	00:23	00:17	12:00	--:--	12:08	

June 12, 13, 14 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	260°34.49		226°10.12	N11°2.81	110°53.25	N13°42.57	170°3.01	N23°16.64	258°40.92	S01°31.50
1	275°36.96		241°10.11	3.59	125°54.40	42.06	185°4.86	16.64	273°43.26	31.46
2	290°39.42		256°10.09	4.37	140°55.54	41.56	200°6.70	16.64	288°45.61	31.42
3	305°41.88		271°10.08	· · 5.15	155°56.69	· · 41.05	215°8.55	· · 16.65	303°47.95	· · 31.38
4	320°44.35		286°10.06	5.94	170°57.83	40.54	230°10.39	16.65	318°50.29	31.34
5	335°46.81		301°10.05	6.72	185°58.98	40.03	245°12.24	16.65	333°52.64	31.30
6	350°49.28		316°10.03	N11°7.50	201°0.12	N13°39.52	260°14.08	N23°16.65	348°54.98	S01°31.26
7	5°51.74		331°10.01	8.28	216°1.27	39.01	275°15.93	16.65	3°57.33	31.22
8	20°54.21		346°10.00	9.07	231°2.41	38.50	290°17.78	16.66	18°59.67	31.18
9	35°56.67		1°9.98	· · 9.85	246°3.56	· · 37.99	305°19.62	· · 16.66	34°2.02	· · 31.14
10	50°59.13		16°9.96	10.63	261°4.70	37.48	320°21.47	16.66	49°4.36	31.10
11	66°1.60		31°9.94	11.41	276°5.85	36.97	335°23.31	16.66	64°6.71	31.06
12	81°4.06		46°9.92	N11°12.20	291°6.99	N13°36.46	350°25.16	N23°16.66	79°9.05	S01°31.02
13	96°6.53		61°9.90	12.98	306°8.14	35.95	5°27.00	16.66	94°11.40	30.98
14	111°8.99		76°9.88	13.76	321°9.28	35.44	20°28.85	16.67	109°13.75	30.94
15	126°11.45		91°9.85	· · 14.54	336°10.42	· · 34.93	35°30.69	· · 16.67	124°16.09	· · 30.90
16	141°13.92		106°9.83	15.33	351°11.57	34.42	50°32.54	16.67	139°18.44	30.86
17	156°16.38		121°9.81	16.11	6°12.71	33.91	65°34.39	16.67	154°20.78	30.82
18	171°18.85		136°9.78	N11°16.89	21°13.86	N13°33.40	80°36.23	N23°16.67	169°23.13	S01°30.78
19	186°21.31		151°9.76	17.67	36°15.00	32.89	95°38.08	16.67	184°25.48	30.74
20	201°23.78		166°9.73	18.45	51°16.14	32.38	110°39.92	16.67	199°27.82	30.70
21	216°26.24		181°9.71	· · 19.24	66°17.29	· · 31.87	125°41.77	· · 16.67	214°30.17	· · 30.66
22	231°28.70		196°9.68	20.02	81°18.43	31.36	140°43.61	16.68	229°32.52	30.62
23	246°31.17		211°9.65	20.80	96°19.58	30.84	155°45.46	16.68	244°34.86	30.58
Mer.pass. 06:37		ν-0.0' d0.8' m-4.29		ν1.1' d-0.5' m1.37		ν1.8' d0.0' m-1.90		ν2.3' d-0.0' m1.04		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	261°33.63		226°9.62	N11°21.58	111°20.72	N13°30.33	170°47.30	N23°16.68	259°37.21	S01°30.54
1	276°36.10		241°9.60	22.36	126°21.86	29.82	185°49.15	16.68	274°39.56	30.50
2	291°38.56		256°9.57	23.15	141°23.01	29.31	200°50.99	16.68	289°41.91	30.47
3	306°41.03		271°9.54	· · 23.93	156°24.15	· · 28.80	215°52.84	· · 16.68	304°44.25	· · 30.43
4	321°43.49		286°9.51	24.71	171°25.29	28.28	230°54.68	16.68	319°46.60	30.39
5	336°45.95		301°9.47	25.49	186°26.44	27.77	245°56.53	16.68	334°48.95	30.35
6	351°48.42		316°9.44	N11°26.27	201°27.58	N13°27.26	260°58.37	N23°16.68	349°51.30	S01°30.31
7	6°50.88		331°9.41	27.06	216°28.72	26.75	276°0.22	16.69	4°53.65	30.27
8	21°53.35		346°9.38	27.84	231°29.87	26.23	291°2.06	16.69	19°55.99	30.23
9	36°55.81		1°9.34	· · 28.62	246°31.01	· · 25.72	306°3.91	· · 16.69	34°58.34	· · 30.20
10	51°58.27		16°9.31	29.40	261°32.15	25.21	321°5.76	16.69	50°0.69	30.16
11	67°0.74		31°9.27	30.18	276°33.29	24.69	336°7.60	16.69	65°3.04	30.12
12	82°3.20		46°9.24	N11°30.96	291°34.44	N13°24.18	351°9.45	N23°16.69	80°5.39	S01°30.08
13	97°5.67		61°9.20	31.74	306°35.58	23.67	6°11.29	16.69	95°7.74	30.04
14	112°8.13		76°9.16	32.53	321°36.72	23.15	21°13.14	16.69	110°10.09	30.00
15	127°10.60		91°9.13	· · 33.31	336°37.86	· · 22.64	36°14.98	· · 16.69	125°12.44	· · 29.97
16	142°13.06		106°9.09	34.09	351°39.01	22.12	51°16.83	16.69	140°14.79	29.93
17	157°15.52		121°9.05	34.87	6°40.15	21.61	66°18.67	16.69	155°17.14	29.89
18	172°17.99		136°9.01	N11°35.65	21°41.29	N13°21.10	81°20.51	N23°16.69	170°19.49	S01°29.85
19	187°20.45		151°8.97	36.43	36°42.43	20.58	96°22.36	16.69	185°21.84	29.81
20	202°22.92		166°8.93	37.21	51°43.58	20.07	111°24.20	16.69	200°24.19	29.78
21	217°25.38		181°8.89	· · 37.99	66°44.72	· · 19.55	126°26.05	· · 16.69	215°26.54	· · 29.74
22	232°27.85		196°8.84	38.78	81°45.86	19.04	141°27.89	16.69	230°28.89	29.70
23	247°30.31		211°8.80	39.56	96°47.00	18.52	156°29.74	16.69	245°31.24	29.66
Mer.pass. 06:33		ν-0.0' d0.8' m-4.28		ν1.1' d-0.5' m1.38		ν1.8' d0.0' m-1.90		ν2.3' d-0.0' m1.04		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	262°32.77		226°8.76	N11°40.34	111°48.14	N13°18.01	171°31.58	N23°16.69	260°33.59	S01°29.63
1	277°35.24		241°8.71	41.12	126°49.29	17.49	186°33.43	16.69	275°35.94	29.59
2	292°37.70		256°8.67	41.90	141°50.43	16.98	201°35.27	16.69	290°38.29	29.55
3	307°40.17		271°8.62	· · 42.68	156°51.57	· · 16.46	216°37.12	· · 16.69	305°40.64	· · 29.51
4	322°42.63		286°8.58	43.46	171°52.71	15.94	231°38.96	16.69	320°42.99	29.48
5	337°45.09		301°8.53	44.24	186°53.85	15.43	246°40.81	16.69	335°45.34	29.44
6	352°47.56		316°8.48	N11°45.02	201°55.00	N13°14.91	261°42.65	N23°16.69	350°47.69	S01°29.40
7	7°50.02		331°8.44	45.80	216°56.14	14.39	276°44.50	16.69	5°50.05	29.36
8	22°52.49		346°8.39	46.58	231°57.28	13.88	291°46.34	16.69	20°52.40	29.33
9	37°54.95		1°8.34	· · 47.36	246°58.42	· · 13.36	306°48.19	· · 16.69	35°54.75	· · 29.29
10	52°57.42		16°8.29	48.14	261°59.56	12.84	321°50.03	16.69	50°57.10	29.25
11	67°59.88		31°8.24	48.92	277°0.70	12.33	336°51.88	16.69	65°59.45	29.22
12	83°2.34		46°8.19	N11°49.70	292°1.84	N13°11.81	351°53.72	N23°16.69	81°1.81	S01°29.18
13	98°4.81		61°8.13	50.48	307°2.98	11.29	6°55.56	16.69	96°4.16	29.14
14	113°7.27		76°8.08	51.26	322°4.13	10.78	21°57.41	16.69	111°6.51	29.11
15	128°9.74		91°8.03	· · 52.04	337°5.27	· · 10.26	36°59.25	· · 16.69	126°8.86	· · 29.07
16	143°12.20		106°7.98	52.82	352°6.41	9.74	52°1.10	16.69	141°11.22	29.03
17	158°14.66		121°7.92	53.60	7°7.55	9.22	67°2.94	16.69	156°13.57	29.00
18	173°17.13		136°7.87	N11°54.38	22°8.69	N13°8.70	82°4.79	N23°16.69	171°15.92	S01°28.96
19	188°19.59		151°7.81	55.16	37°9.83	8.19	97°6.63	16.69	186°18.28	28.92
20	203°22.06		166°7.75	55.94	52°10.97	7.67	112°8.48	16.69	201°20.63	28.89
21	218°24.52		181°7.70	· · 56.72	67°12.11	· · 7.15	127°10.32	· · 16.69	216°22.98	· · 28.85
22	233°26.99		196°7.64	57.50	82°13.25	6.63	142°12.16	16.69	231°25.34	28.82
23	248°29.45		211°7.58	58.28	97°14.39	6.11	157°14.01	16.69	246°27.69	28.78
Mer.pass. 06:29		ν-0.0' d0.8' m-4.27		ν1.1' d-0.5' m1.39		ν1.8' d0.0' m-1.90		ν2.4' d-0.0' m1.03		

	SHA	Dec
Alpheratz	357°34.48	29°13.69
Ankaa	353°6.90	-42°9.83
Schedar	349°30.85	56°40.35
Diphda	348°47.06	-17°50.72
Achernar	335°20.24	-57°6.19
Hamal	327°51.04	23°34.86
Polaris	314°15.75	89°22.07
Acamar	315°11.85	-40°12.00
Menkar	314°6.06	4°11.36
Mirfak	308°28.21	49°56.95
Aldebaran	290°39.57	16°33.60
Rigel	281°3.88	-8°10.32
Capella	280°21.87	46°1.37
Bellatrix	278°22.85	6°22.36
Elnath	278°1.82	28°37.71
Alnilam	275°37.72	-1°11.14
Betelgeuse	270°52.05	7°24.71
Canopus	263°52.79	-52°42.56
Sirius	258°26.27	-16°45.08
Adhara	255°5.96	-29°0.44
Procyon	244°50.77	5°9.59
Pollux	243°17.21	27°57.95
Avior	234°15.10	-59°35.62
Suhail	222°46.34	-43°32.29
Miaplacidus	221°38.80	-69°49.52
Alphard	217°47.60	-8°46.19
Regulus	207°34.20	11°50.61
Dubhe	193°40.65	61°37.10
Denebola	182°24.57	14°25.84
Gienah	175°43.17	-17°41.12
Acrux	172°59.56	-63°14.72
Gacrux	171°51.12	-57°15.64
Alioth	166°12.44	55°49.53
Spica	158°21.77	-11°17.74
Alkaid	152°51.43	49°11.34
Hadar	148°35.10	-60°29.98
Menkent	147°56.95	-36°29.89
Arcturus	145°47.36	19°3.03
Rigel Kent.	139°39.34	-60°56.65
Kochab	137°18.84	74°3.18
Zuben'ubi	130°55.37	-16°8.94
Alphecca	126°3.11	26°37.76
Antares	112°15.05	-26°29.37
Atria	107°8.39	-69°4.43
Sabik	102°2.04	-15°45.42
Shaula	96°9.47	-37°7.34
Rasalhague	95°57.88	12°32.44
Eltanin	90°41.48	51°29.03
Kaus Aust.	83°31.66	-34°22.31
Vega	80°32.57	38°48.31
Nunki	75°46.98	-26°15.86
Altair	61°59.34	8°56.07
Peacock	53°4.73	-56°38.99
Deneb	49°25.25	45°22.05
Enif	33°38.31	9°59.43
Al Na'ir	27°32.30	-46°50.04
Fomalhaut	15°14.07	-29°29.09
Scheat	13°44.83	

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°2.75	N23°9.15	351°41.67	8.4'	S28°24.12	-0.1'	55.0'
1	195°2.62	9.30	6°9.04	8.4'	28°24.00	-0.3'	55.1'
2	210°2.49	9.46	20°36.39	8.3'	28°23.74	-0.4'	55.1'
3	225°2.36	· · 9.61	35°3.73	8.3'	28°23.31	-0.6'	55.1'
4	240°2.23	9.77	49°31.05	8.3'	28°22.74	-0.7'	55.1'
5	255°2.11	9.92	63°58.35	8.3'	28°22.02	-0.9'	55.1'
6	270°1.98	N23°10.07	78°25.64	8.3'	S28°21.15	-1.0'	55.1'
7	285°1.85	10.22	92°52.93	8.3'	28°20.12	-1.2'	55.2'
8	300°1.72	10.37	107°20.20	8.3'	28°18.95	-1.3'	55.2'
9	315°1.59	· · 10.52	121°47.47	8.3'	28°17.62	-1.5'	55.2'
10	330°1.46	10.67	136°14.73	8.3'	28°16.14	-1.6'	55.2'
11	345°1.33	10.82	150°41.99	8.3'	28°14.51	-1.8'	55.2'
12	0°1.20	N23°10.97	165°9.24	8.3'	S28°12.72	-1.9'	55.3'
13	15°1.07	11.12	179°36.50	8.3'	28°10.79	-2.1'	55.3'
14	30°0.94	11.27	194°3.75	8.3'	28°8.70	-2.2'	55.3'
15	45°0.81	· · 11.41	208°31.01	8.3'	28°6.46	-2.4'	55.3'
16	60°0.69	11.56	222°58.27	8.3'	28°4.07	-2.5'	55.3'
17	75°0.56	11.70	237°25.54	8.3'	28°1.53	-2.7'	55.3'
18	90°0.43	N23°11.85	251°52.81	8.3'	S27°58.84	-2.8'	55.4'
19	105°0.30	11.99	266°20.10	8.3'	27°55.99	-3.0'	55.4'
20	120°0.17	12.13	280°47.39	8.3'	27°53.00	-3.1'	55.4'
21	135°0.04	· · 12.27	295°14.69	8.3'	27°49.85	-3.3'	55.4'
22	149°59.91	12.41	309°42.01	8.3'	27°46.55	-3.4'	55.4'
23	164°59.78	12.55	324°9.34	8.3'	27°43.10	-3.6'	55.5'
SD = 15.7'		$d = 0.2'$	SD = 15.0'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.65	N23°12.69	338°36.69	8.4'	S27°39.50	-3.7'	55.5'
1	194°59.52	12.83	353°4.06	8.4'	27°35.76	-3.9'	55.5'
2	209°59.39	12.97	7°31.44	8.4'	27°31.86	-4.0'	55.5'
3	224°59.26	· · 13.11	21°58.84	8.4'	27°27.81	-4.2'	55.5'
4	239°59.13	13.25	36°26.27	8.4'	27°23.61	-4.3'	55.5'
5	254°59.00	13.38	50°53.72	8.5'	27°19.26	-4.5'	55.6'
6	269°58.86	N23°13.52	65°21.19	8.5'	S27°14.77	-4.6'	55.6'
7	284°58.73	13.65	79°48.69	8.5'	27°10.13	-4.8'	55.6'
8	299°58.60	13.79	94°16.22	8.6'	27°5.34	-4.9'	55.6'
9	314°58.47	· · 13.92	108°43.78	8.6'	27°0.40	-5.1'	55.6'
10	329°58.34	14.05	123°11.36	8.6'	26°55.31	-5.2'	55.7'
11	344°58.21	14.18	137°38.98	8.6'	26°50.08	-5.4'	55.7'
12	359°58.08	N23°14.32	152°6.63	8.7'	S26°44.70	-5.5'	55.7'
13	14°57.95	14.45	166°34.31	8.7'	26°39.18	-5.7'	55.7'
14	29°57.82	14.58	181°2.02	8.8'	26°33.51	-5.8'	55.7'
15	44°57.69	· · 14.70	195°29.77	8.8'	26°27.70	-6.0'	55.8'
16	59°57.56	14.83	209°57.56	8.8'	26°21.75	-6.1'	55.8'
17	74°57.42	14.96	224°25.39	8.9'	26°15.65	-6.2'	55.8'
18	89°57.29	N23°15.09	238°53.25	8.9'	S26°9.41	-6.4'	55.8'
19	104°57.16	15.21	253°21.16	8.9'	26°3.02	-6.5'	55.8'
20	119°57.03	15.34	267°49.10	9.0'	25°56.50	-6.7'	55.9'
21	134°56.90	· · 15.46	282°17.09	9.0'	25°49.83	-6.8'	55.9'
22	149°56.77	15.59	296°45.12	9.1'	25°43.02	-6.9'	55.9'
23	164°56.64	15.71	311°13.20	9.1'	25°36.08	-7.1'	55.9'
SD = 15.7'		$d = 0.1'$	SD = 15.1'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°56.50	N23°15.83	325°41.32	9.2'	S25°28.99	-7.2'	55.9'
1	194°56.37	15.96	340°9.48	9.2'	25°21.77	-7.4'	56.0'
2	209°56.24	16.08	354°37.69	9.3'	25°14.41	-7.5'	56.0'
3	224°56.11	· · 16.20	9°5.95	9.3'	25°6.91	-7.6'	56.0'
4	239°55.98	16.32	23°34.25	9.4'	24°59.28	-7.8'	56.0'
5	254°55.84	16.44	38°2.61	9.4'	24°51.51	-7.9'	56.0'
6	269°55.71	N23°16.56	52°31.01	9.5'	S24°43.60	-8.0'	56.1'
7	284°55.58	16.67	66°59.46	9.5'	24°35.57	-8.2'	56.1'
8	299°55.45	16.79	81°27.97	9.6'	24°27.40	-8.3'	56.1'
9	314°55.32	· · 16.91	95°56.52	9.6'	24°19.09	-8.4'	56.1'
10	329°55.18	17.02	110°25.13	9.7'	24°10.66	-8.6'	56.1'
11	344°55.05	17.14	124°53.79	9.7'	24°2.10	-8.7'	56.2'
12	359°54.92	N23°17.25	139°22.50	9.8'	S23°53.40	-8.8'	56.2'
13	14°54.79	17.37	153°51.26	9.8'	23°44.58	-9.0'	56.2'
14	29°54.65	17.48	168°20.08	9.9'	23°35.63	-9.1'	56.2'
15	44°54.52	· · 17.59	182°48.96	9.9'	23°26.55	-9.2'	56.3'
16	59°54.39	17.70	197°17.88	10.0'	23°17.35	-9.3'	56.3'
17	74°54.26	17.81	211°46.86	10.0'	23°8.02	-9.5'	56.3'
18	89°54.12	N23°17.92	226°15.90	10.1'	S22°58.57	-9.6'	56.3'
19	104°53.99	18.03	240°44.99	10.1'	22°48.99	-9.7'	56.3'
20	119°53.86	18.14	255°14.14	10.2'	22°39.29	-9.8'	56.4'
21	134°53.72	· · 18.25	269°43.34	10.3'	22°29.47	-9.9'	56.4'
22	149°53.59	18.35	284°12.60	10.3'	22°19.52	-10.1'	56.4'
23	164°53.46	18.46	298°41.92	10.4'	22°9.46	-10.2'	56.4'
SD = 15.7'		$d = 0.1'$	SD = 15.3'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	////	////	01:35	22:26	////	////
62°	////	////	02:11	21:50	////	////
60°	////	00:56	02:37	21:24	23:06	////
N 58°	////	01:43	02:57	21:04	22:18	////
56°	////	02:12	03:14	20:47	21:49	////
54°	00:51	02:34	03:28	20:33	21:27	23:11
52°	01:34	02:51	03:40	20:21	21:09	22:27
50°	02:01	03:06	03:50	20:10	20:54	21:59
45°	02:46	03:35	04:13	19:48	20:25	21:14
N 40°	03:16	03:58	04:31	19:30	20:03	20:44
35°	03:39	04:16	04:45	19:15	19:45	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:03
20°	04:27	04:56	05:20	18:40	19:05	19:34
N 10°	04:49	05:16	05:39	18:21	18:44	19:11
0°	05:08	05:34	05:56	18:04	18:26	18:52
S 10°	05:25	05:51	06:14	17:46	18:09	18:36
20°	05:41	06:08	06:32	17:28	17:52	18:20
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:06	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°	06:25	07:02	07:36	16:24	16:58	17:35
S 50°	06:37	07:18	07:57	16:03	16:42	17:23
52°	06:42	07:26	08:06	15:54	16:35	17:18
54°	06:48	07:34	08:17	15:43	16:26	17:13
56°	06:54	07:43	08:30	15:30	16:17	17:06
58°	07:00	07:53	08:44	15:16	16:07	17:00
S 60°	07:08	08:04	09:02	14:58	15:56	16:52

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	■	■	■
64°	■	■	01:28	■	■	03:27
62°	■	00:52	00:34	■	02:11	04:20
60°	23:48	· ·	00:02	01:57	03:14	04:52
N 58°	23:14	23:37	23:49	02:38	03:48	05:16
56°	22:49	23:18	23:35	03:06	04:13	05:35
54°	22:29	23:01	23:23	03:27	04:33	05:51
52°	22:12	22:47	23:12	03:45	04:49	06:05
50°	21:58	22:35	23:02	04:01	05:04	06:17
45°	21:28	22:09	22:42	04:32	05:33	06:41
N 40°	21:05	21:49	22:25	04:56	05:55	07:01
35°	20:46	21:32	22:11	05:15	06:14	07:17
30°	20:30	21:17	21:59	05:32	06:30	07:31
20°	20:02	20:52	21:37	06:00	06:57	07:55
N 10°	19:38	20:30	21:19	06:25	07:20	08:16
0°	19:16	20:10	21:02	06:48	07:42	08:35
S 10°	18:53	19:49	20:44	07:10	08:03	08:54
20°	18:30	19:27	20:26	07:34	08:26	09:14
30°	18:02	19:02	20:04	08:03	08:53	09:37
35°	17:45	18:47	19:51	08:19	09:08	09:51
40°	17:26	18:29	19:37	08:39	09:26	10:06
45°	17:03	18:08	19:19	09:02	09:48	10:25
S 50°	16:33	17:41	18:57	09:33	10:16	10:48
52°	16:18	17:28	18:47	09:48	10:29	10:59
54°	16:00	17:13	18:35	10:05	10:44	11:11
56°	15:40	16:55	18:22	10:26	11:03	11:25
58°	15:13	16:34	18:06	10:52	11:24	11:42
S 60°	14:36	16:06	17:47	11:29	11:53	12:01

Day	Sun		Mer. Pass hh:mm	Moon		Age 16-18 99-93%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
12	00:11	00:05	12:00	00:34	13:02	
13	00:01	00:08	12:00	01:29	13:56	
14	00:14	00:20	12:00	02:22	14:48	

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.33	N23°18.57	313°11.29	10.4'	S21°59.28	-10.3'	56.5'
1	194°53.19	18.67	327°40.72	10.5'	21°48.98	-10.4'	56.5'
2	209°53.06	18.77	342°10.20	10.5'	21°38.57	-10.5'	56.5'
3	224°52.93	· · 18.88	356°39.74	10.6'	21°28.03	-10.6'	56.5'
4	239°52.79	18.98	11°9.34	10.7'	21°17.39	-10.8'	56.5'
5	254°52.66	19.08	25°39.00	10.7'	21°6.63	-10.9'	56.6'
6	269°52.53	N23°19.18	40°8.71	10.8'	S20°55.75	-11.0'	56.6'
7	284°52.39	19.29	54°38.47	10.8'	20°44.77	-11.1'	56.6'
8	299°52.26	19.39	69°8.29	10.9'	20°33.67	-11.2'	56.6'
9	314°52.13	· · 19.48	83°38.17	10.9'	20°22.46	-11.3'	56.7'
10	329°51.99	19.58	98°8.11	11.0'	20°11.15	-11.4'	56.7'
11	344°51.86	19.68	112°38.10	11.0'	19°59.72	-11.5'	56.7'
12	359°51.72	N23°19.78	127°8.14	11.1'	S19°48.19	-11.6'	56.7'
13	14°51.59	19.87	141°38.24	11.2'	19°36.55	-11.7'	56.7'
14	29°51.46	19.97	156°8.40	11.2'	19°24.81	-11.8'	56.8'
15	44°51.32	· · 20.06	170°38.61	11.3'	19°12.96	-11.9'	56.8'
16	59°51.19	20.16	185°8.87	11.3'	19°1.02	-12.1'	56.8'
17	74°51.05	20.25	199°39.19	11.4'	18°48.96	-12.2'	56.8'
18	89°50.92	N23°20.34	214°9.56	11.4'	S18°36.81	-12.3'	56.9'
19	104°50.79	20.44	228°39.99	11.5'	18°24.56	-12.4'	56.9'
20	119°50.65	20.53	243°10.46	11.5'	18°12.21	-12.4'	56.9'
21	134°50.52	· · 20.62	257°40.99	11.6'	17°59.76	-12.5'	56.9'
22	149°50.38	20.71	272°11.57	11.6'	17°47.22	-12.6'	57.0'
23	164°50.25	20.80	286°42.20	11.7'	17°34.58	-12.7'	57.0'
SD = 15.7' $d = 0.1'$			SD = 15.4'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.12	N23°20.89	301°12.89	11.7'	S17°21.84	-12.8'	57.0'
1	194°49.98	20.97	315°43.62	11.8'	17°9.02	-12.9'	57.0'
2	209°49.85	21.06	330°14.40	11.8'	16°56.10	-13.0'	57.0'
3	224°49.71	· · 21.15	344°45.23	11.9'	16°43.08	-13.1'	57.1'
4	239°49.58	21.23	359°16.11	11.9'	16°29.98	-13.2'	57.1'
5	254°49.44	21.32	13°47.04	12.0'	16°16.79	-13.3'	57.1'
6	269°49.31	N23°21.40	28°18.01	12.0'	S16°3.51	-13.4'	57.1'
7	284°49.17	21.49	42°49.03	12.1'	15°50.15	-13.5'	57.2'
8	299°49.04	21.57	57°20.09	12.1'	15°36.69	-13.5'	57.2'
9	314°48.91	· · 21.65	71°51.20	12.2'	15°23.16	-13.6'	57.2'
10	329°48.77	21.73	86°22.36	12.2'	15°9.54	-13.7'	57.2'
11	344°48.64	21.81	100°53.55	12.2'	14°55.83	-13.8'	57.3'
12	359°48.50	N23°21.89	115°24.79	12.3'	S14°42.05	-13.9'	57.3'
13	14°48.37	21.97	129°56.07	12.3'	14°28.18	-13.9'	57.3'
14	29°48.23	22.05	144°27.40	12.4'	14°14.24	-14.0'	57.3'
15	44°48.10	· · 22.13	158°58.76	12.4'	14°0.22	-14.1'	57.4'
16	59°47.96	22.20	173°30.16	12.4'	13°46.12	-14.2'	57.4'
17	74°47.83	22.28	188°1.60	12.5'	13°31.94	-14.3'	57.4'
18	89°47.69	N23°22.36	202°33.07	12.5'	S13°17.69	-14.3'	57.4'
19	104°47.56	22.43	217°4.59	12.5'	13°3.36	-14.4'	57.5'
20	119°47.42	22.51	231°36.14	12.6'	12°48.97	-14.5'	57.5'
21	134°47.29	· · 22.58	246°7.72	12.6'	12°34.50	-14.5'	57.5'
22	149°47.15	22.65	260°39.34	12.6'	12°19.96	-14.6'	57.5'
23	164°47.01	22.72	275°10.99	12.7'	12°5.35	-14.7'	57.6'
SD = 15.7' $d = 0.1'$			SD = 15.5'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.88	N23°22.80	289°42.67	12.7'	S11°50.67	-14.7'	57.6'
1	194°46.74	22.87	304°14.38	12.7'	11°35.92	-14.8'	57.6'
2	209°46.61	22.94	318°46.12	12.8'	11°21.11	-14.9'	57.6'
3	224°46.47	· · 23.00	333°17.89	12.8'	11°6.23	-14.9'	57.7'
4	239°46.34	23.07	347°49.69	12.8'	10°51.29	-15.0'	57.7'
5	254°46.20	23.14	2°21.51	12.8'	10°36.29	-15.1'	57.7'
6	269°46.07	N23°23.21	16°53.36	12.9'	S10°21.23	-15.1'	57.7'
7	284°45.93	23.27	31°25.23	12.9'	10°6.10	-15.2'	57.8'
8	299°45.80	23.34	45°57.13	12.9'	09°50.92	-15.2'	57.8'
9	314°45.66	· · 23.40	60°29.05	12.9'	09°35.67	-15.3'	57.8'
10	329°45.52	23.47	75°0.99	13.0'	09°20.37	-15.4'	57.8'
11	344°45.39	23.53	89°32.95	13.0'	09°5.02	-15.4'	57.9'
12	359°45.25	N23°23.59	104°4.93	13.0'	S08°49.60	-15.5'	57.9'
13	14°45.12	23.66	118°36.92	13.0'	08°34.14	-15.5'	57.9'
14	29°44.98	23.72	133°8.94	13.0'	08°18.62	-15.6'	57.9'
15	44°44.85	· · 23.78	147°40.96	13.0'	08°3.05	-15.6'	58.0'
16	59°44.71	23.84	162°13.01	13.1'	07°47.43	-15.7'	58.0'
17	74°44.57	23.90	176°45.06	13.1'	07°31.77	-15.7'	58.0'
18	89°44.44	N23°23.96	191°17.13	13.1'	S07°16.05	-15.8'	58.0'
19	104°44.30	24.01	205°49.20	13.1'	07°0.28	-15.8'	58.1'
20	119°44.17	24.07	220°21.29	13.1'	06°44.48	-15.9'	58.1'
21	134°44.03	· · 24.13	234°53.38	13.1'	06°28.62	-15.9'	58.1'
22	149°43.89	24.18	249°25.48	13.1'	06°12.72	-15.9'	58.1'
23	164°43.76	24.24	263°57.59	13.1'	05°56.79	-16.0'	58.2'
SD = 15.7' $d = 0.1'$			SD = 15.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	////	////	01:32	22:30	////	////
62°	////	////	02:10	21:52	////	////
60°	////	00:52	02:36	21:26	23:11	////
N 58°	////	01:41	02:56	21:06	22:21	////
56°	////	02:11	03:13	20:49	21:51	////
54°	00:47	02:33	03:27	20:35	21:29	23:15
52°	01:33	02:51	03:39	20:22	21:11	22:29
50°	02:00	03:06	03:50	20:11	20:56	22:02
45°	02:46	03:35	04:13	19:49	20:26	21:16
N 40°	03:16	03:58	04:31	19:31	20:04	20:46
35°	03:39	04:16	04:46	19:16	19:46	20:22
30°	03:58	04:31	04:59	19:03	19:30	20:04
20°	04:27	04:56	05:21	18:41	19:05	19:35
N 10°	04:49	05:16	05:40	18:22	18:45	19:12
0°	05:08	05:35	05:57	18:04	18:27	18:53
S 10°	05:25	05:52	06:14	17:47	18:10	18:36
20°	05:41	06:09	06:33	17:29	17:53	18:20
30°	05:58	06:28	06:54	17:07	17:34	18:04
35°	06:07	06:38	07:07	16:55	17:23	17:55
40°	06:16	06:50	07:21	16:41	17:11	17:45
45°	06:26	07:04	07:37	16:24	16:58	17:35
S 50°	06:38	07:20	07:58	16:03	16:42	17:23
52°	06:43	07:27	08:08	15:53	16:34	17:18
54°	06:49	07:35	08:19	15:42	16:26	17:12
56°	06:55	07:44	08:32	15:30	16:17	17:06
58°	07:02	07:55	08:46	15:15	16:07	17:00
S 60°	07:09	08:06	09:04	14:58	15:55	16:52

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	■	02:38	01:21	■	05:53	08:50
N 70°	■	01:49	01:02	■	06:39	09:06
68°	02:31	01:18	00:47	04:14	07:09	09:19
66°	01:27	00:54	00:35	05:16	07:31	09:30
64°	00:52	00:36	00:24	05:50	07:49	09:38
62°	00:26	00:20	00:15	06:15	08:03	09:46
60°	00:06	00:08	00:07	06:34	08:15	09:52
N 58°	23:56	· ·	00:01	06:50	08:25	09:58
56°	23:47	23:55	· ·	07:04	08:34	10:03
54°	23:38	23:49	23:58	07:16	08:42	10:07
52°	23:30	23:44	23:56	07:26	08:49	10:11
50°	23:23	23:40	23:54	07:35	08:55	10:15
45°	23:08	23:30	23:50	07:54	09:08	10:22
N 40°	22:55	23:22	23:46	08:10	09:19	10:29
35°	22:45	23:15	23:42	08:23	09:29	10:34
30°	22:35	23:08	23:39	08:34	09:37	10:39
20°	22:19	22:58	23:34	08:54	09:51	10:47
N 10°	22:05	22:48	23:30	09:10	10:03	10:55
0°	21:51	22:39	23:26	09:26	10:14	11:01
S 10°	21:38	22:30	23:21	09:41	10:26	11:08
20°	21:24	22:20	23:17	09:58	10:38	11:15
30°	21:07	22:09	23:11	10:16	10:51	11:23
35°	20:57	22:03	23:08	10:27	10:59	11:27
40°	20:46	21:56	23:05	10:39	11:08	11:32
45°	20:33	21:47	23:01	10:54	11:18	11:38
S 50°	20:17	21:37	22:56	11:12	11:30	11:45
52°	20:09	21:32	22:54	11:20	11:36	11:49
54°	20:01	21:26	22:52	11:29	11:42	11:52
56°	19:51	21:20	22:49	11:39	11:49	11:56
58°	19:40	21:14	22:46	11:51	11:57	12:00
S 60°	19:28	21:06	22:43	12:05	12:05	12:05

Day	Sun		Mer. Pass hh:mm	Moon		Age 19-21 87-69%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
15	00:27	00:33	12:01	03:14	15:39	
16	00:40	00:46	12:01	04:03	16:27	
17	00:52	00:59	12:01	04:50	17:13	

June 18, 19, 20 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	266°29.33		226°1.61	N12°54.85	113°37.46	N12°27.84	174°28.60	N23°16.52	264°19.92	S01°26.33	Alpheratz	357°34.44 29°13.71
1	281°31.80		241°1.51	55.62	128°38.60	27.31	189°30.45	16.51	279°22.29	26.30	Ankaa	353°6.84 -42°9.81
2	296°34.26		256°1.40	56.39	143°39.73	26.78	204°32.29	16.51	294°24.65	26.27	Schedar	349°30.78 56°40.36
3	311°36.72		271°1.30	•• 57.16	158°40.87	•• 26.25	219°34.13	•• 16.50	309°27.02	•• 26.24	Diphda	348°47.01 -17°50.70
4	326°39.19		286°1.19	57.93	173°42.00	25.72	234°35.98	16.50	324°29.38	26.21	Achernar	335°20.18 -57°6.16
5	341°41.65		301°1.08	58.70	188°43.14	25.19	249°37.82	16.50	339°31.75	26.17	Hamal	327°51.00 23°34.87
6	356°44.12		316°0.97	N12°59.47	203°44.27	N12°24.66	264°39.66	N23°16.49	354°34.12	S01°26.14	Polaris	314°13.73 89°22.05
7	11°46.58		331°0.86	13°0.24	218°45.41	24.13	279°41.51	16.49	9°36.48	26.11	Acamar	315°11.81 -40°11.97
8	26°49.04		346°0.75	1.01	233°46.54	23.60	294°43.35	16.48	24°38.85	26.08	Menkar	314°6.02 4°11.38
9	41°51.51		1°0.64	•• 1.77	248°47.68	•• 23.07	309°45.19	•• 16.48	39°41.21	•• 26.05	Mirfak	308°28.16 49°56.94
10	56°53.97		16°0.53	2.54	263°48.81	22.54	324°47.04	16.48	54°43.58	26.02	Aldebaran	290°39.54 16°33.61
11	71°56.44		31°0.42	3.31	278°49.95	22.01	339°48.88	16.47	69°45.95	25.99	Rigel	281°3.86 -8°10.30
12	86°58.90		46°0.31	N13°4.08	293°51.08	N12°21.48	354°50.72	N23°16.47	84°48.31	S01°25.96	Capella	280°21.84 46°1.37
13	102°1.36		61°0.20	4.85	308°52.22	20.95	9°52.57	16.46	99°50.68	25.93	Bellatrix	278°22.83 6°22.37
14	117°3.83		76°0.08	5.62	323°53.35	20.42	24°54.41	16.46	114°53.05	25.90	Elnath	278°1.80 28°37.71
15	132°6.29		90°59.97	•• 6.38	338°54.49	•• 19.88	39°56.25	•• 16.45	129°55.41	•• 25.87	Alnilam	275°37.70 -1°11.12
16	147°8.76		105°59.85	7.15	353°55.62	19.35	54°58.09	16.45	144°57.78	25.84	Betelgeuse	270°52.04 7°24.72
17	162°11.22		120°59.74	7.92	8°56.76	18.82	69°59.94	16.44	160°0.15	25.81	Canopus	263°52.79 -52°42.53
18	177°13.68		135°59.62	N13°8.68	23°57.89	N12°18.29	85°1.78	N23°16.44	175°2.51	S01°25.78	Sirius	258°26.27 -16°45.06
19	192°16.15		150°59.51	9.45	38°59.03	17.76	100°3.62	16.44	190°4.88	25.75	Adhara	255°5.96 -29°0.41
20	207°18.61		165°59.39	10.22	54°0.16	17.22	115°5.47	16.43	205°7.25	25.72	Procyon	244°50.76 5°9.60
21	222°21.08		180°59.27	•• 10.98	69°1.29	•• 16.69	130°7.31	•• 16.43	220°9.62	•• 25.69	Pollux	243°17.20 27°57.95
22	237°23.54		195°59.15	11.75	84°2.43	16.16	145°9.15	16.42	235°11.98	25.66	Avior	234°15.14 -59°35.59
23	252°26.00		210°59.03	12.52	99°3.56	15.62	160°11.00	16.42	250°14.35	25.63	Suhail	222°46.37 -43°32.27
Mer.pass. 06:13			ν-0.1' d0.8' m-4.23		ν1.1' d-0.5' m1.42		ν1.8' d-0.0' m-1.90		ν2.4' d-0.0' m1.02		Miaplacidus	221°38.87 -69°49.50
											Alphard	217°47.61 -8°46.18
											Regulus	207°34.21 11°50.62
											Dubhe	193°40.69 61°37.10
											Denebola	182°24.59 14°25.85
											Gienah	175°43.18 -17°41.12
											Acrux	172°59.61 -63°14.73
											Gacrux	171°51.16 -57°15.64
											Alioth	166°12.47 55°49.54
											Spica	158°21.79 -11°17.74
											Alkaid	152°51.45 49°11.35
											Hadar	148°35.14 -60°30.00
											Menkent	147°56.97 -36°29.90
											Arcturus	145°47.37 19°3.04
											Rigel Kent.	139°39.37 -60°56.67
											Kochab	137°18.91 74°3.20
											Zuben'ubi	136°55.37 -16°8.95
											Alphecca	126°3.12 26°37.78
											Antares	112°15.04 -26°29.37
											Atria	107°8.38 -69°4.46
											Sabik	102°2.02 -15°45.42
											Shaula	96°9.45 -37°7.35
											Rasalhague	95°57.87 12°32.46
											Eltanin	90°41.47 51°29.06
											Kaus Aust.	83°31.63 -34°22.32
											Vega	80°32.55 38°48.34
											Nunki	75°46.95 -26°15.86
											Altair	61°59.31 8°56.09
											Peacock	53°4.67 -56°39.00
											Deneb	49°25.21 45°22.07
											Enif	33°38.26 9°59.45
											Al Na'ir	27°32.23 -46°50.03
											Fomalhaut	15°14.02 -29°29.07
											Scheat	13°44.78 28°13.10
											Markab	13°29.47 15°20.45
											Jun 18 Wed	SHA Mer.pass
											Venus	319°32.28 08:56
											Mars	207°8.13 16:24
											Jupiter	267°59.27 12:21
											Saturn	357°50.59 06:22
											Jun 19 Thu	SHA Mer.pass
											Venus	318°30.45 08:56
											Mars	206°36.23 16:22
											Jupiter	267°44.37 12:18
											Saturn	357°48.25 06:18
											Jun 20 Fri	SHA Mer.pass
											Venus	317°28.25 08:56
											Mars	206°4.28 16:21
											Jupiter	267°29.46 12:15
											Saturn	357°46.00 06:14

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.62	N23°24.29	278°29.69	13.1'	S05°40.81	-16.0'	58.2'
1	194°43.49	24.34	293°1.81	13.1'	05°24.79	-16.1'	58.2'
2	209°43.35	24.40	307°33.92	13.1'	05°8.73	-16.1'	58.2'
3	224°43.21	· · 24.45	322°6.03	13.1'	04°52.63	-16.1'	58.3'
4	239°43.08	24.50	336°38.15	13.1'	04°36.50	-16.2'	58.3'
5	254°42.94	24.55	351°10.26	13.1'	04°20.33	-16.2'	58.3'
6	269°42.81	N23°24.60	5°42.36	13.1'	S04°4.13	-16.2'	58.3'
7	284°42.67	24.65	20°14.46	13.1'	03°47.90	-16.3'	58.4'
8	299°42.53	24.70	34°46.56	13.1'	03°31.63	-16.3'	58.4'
9	314°42.40	· · 24.75	49°18.65	13.1'	03°15.33	-16.3'	58.4'
10	329°42.26	24.79	63°50.72	13.1'	02°59.01	-16.4'	58.4'
11	344°42.12	24.84	78°22.79	13.1'	02°42.66	-16.4'	58.5'
12	359°41.99	N23°24.88	92°54.85	13.0'	S02°26.28	-16.4'	58.5'
13	14°41.85	24.93	107°26.89	13.0'	02°9.87	-16.4'	58.5'
14	29°41.71	24.97	121°58.92	13.0'	01°53.45	-16.5'	58.5'
15	44°41.58	· · 25.02	136°30.93	13.0'	01°37.00	-16.5'	58.6'
16	59°41.44	25.06	151°2.93	13.0'	01°20.52	-16.5'	58.6'
17	74°41.31	25.10	165°34.90	13.0'	01°4.03	-16.5'	58.6'
18	89°41.17	N23°25.14	180°6.86	12.9'	S00°47.52	-16.5'	58.6'
19	104°41.03	25.18	194°38.79	12.9'	00°30.99	-16.5'	58.6'
20	119°40.90	25.22	209°10.70	12.9'	S00°14.45	-16.6'	58.7'
21	134°40.76	· · 25.26	223°42.59	12.9'	N00°2.11	16.6'	58.7'
22	149°40.62	25.30	238°14.45	12.8'	00°18.69	16.6'	58.7'
23	164°40.49	25.34	252°46.29	12.8'	00°35.27	16.6'	58.7'
SD = 15.7'		$d = 0.1'$	SD = 15.9'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.35	N23°25.37	267°18.09	12.8'	N00°51.87	16.6'	58.8'
1	194°40.21	25.41	281°49.87	12.7'	01°8.48	16.6'	58.8'
2	209°40.08	25.45	296°21.61	12.7'	01°25.09	16.6'	58.8'
3	224°39.94	· · 25.48	310°53.32	12.7'	01°41.72	16.6'	58.8'
4	239°39.80	25.51	325°25.00	12.6'	01°58.34	16.6'	58.9'
5	254°39.67	25.55	339°56.64	12.6'	02°14.98	16.6'	58.9'
6	269°39.53	N23°25.58	354°28.24	12.6'	N02°31.61	16.6'	58.9'
7	284°39.39	25.61	8°59.81	12.5'	02°48.25	16.6'	58.9'
8	299°39.26	25.64	23°31.33	12.5'	03°4.88	16.6'	59.0'
9	314°39.12	· · 25.67	38°2.81	12.4'	03°21.52	16.6'	59.0'
10	329°38.98	25.70	52°34.25	12.4'	03°38.15	16.6'	59.0'
11	344°38.85	25.73	67°5.65	12.3'	03°54.78	16.6'	59.0'
12	359°38.71	N23°25.76	81°37.00	12.3'	N04°11.40	16.6'	59.1'
13	14°38.57	25.79	96°8.30	12.3'	04°28.02	16.6'	59.1'
14	29°38.44	25.81	110°39.55	12.2'	04°44.63	16.6'	59.1'
15	44°38.30	· · 25.84	125°10.76	12.2'	05°1.22	16.6'	59.1'
16	59°38.16	25.87	139°41.91	12.1'	05°17.81	16.6'	59.2'
17	74°38.02	25.89	154°13.00	12.0'	05°34.38	16.6'	59.2'
18	89°37.89	N23°25.91	168°44.05	12.0'	N05°50.94	16.5'	59.2'
19	104°37.75	25.94	183°15.03	11.9'	06°7.48	16.5'	59.2'
20	119°37.61	25.96	197°45.96	11.9'	06°24.01	16.5'	59.2'
21	134°37.48	· · 25.98	212°16.83	11.8'	06°40.51	16.5'	59.3'
22	149°37.34	26.00	226°47.64	11.7'	06°56.99	16.5'	59.3'
23	164°37.20	26.02	241°18.39	11.7'	07°13.46	16.4'	59.3'
SD = 15.7'		$d = 0.0'$	SD = 16.0'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.07	N23°26.04	255°49.08	11.6'	N07°29.90	16.4'	59.3'
1	194°36.93	26.06	270°19.70	11.6'	07°46.31	16.4'	59.4'
2	209°36.79	26.08	284°50.25	11.5'	08°2.69	16.4'	59.4'
3	224°36.66	· · 26.10	299°20.74	11.4'	08°19.05	16.3'	59.4'
4	239°36.52	26.11	313°51.15	11.3'	08°35.38	16.3'	59.4'
5	254°36.38	26.13	328°21.50	11.3'	08°51.67	16.3'	59.4'
6	269°36.24	N23°26.15	342°51.78	11.2'	N09°7.93	16.2'	59.5'
7	284°36.11	26.16	357°21.98	11.1'	09°24.16	16.2'	59.5'
8	299°35.97	26.17	11°52.11	11.1'	09°40.35	16.2'	59.5'
9	314°35.83	· · 26.19	26°22.16	11.0'	09°56.50	16.1'	59.5'
10	329°35.70	26.20	40°52.13	10.9'	10°12.61	16.1'	59.5'
11	344°35.56	26.21	55°22.03	10.8'	10°28.68	16.0'	59.6'
12	359°35.42	N23°26.22	69°51.84	10.7'	N10°44.70	16.0'	59.6'
13	14°35.29	26.23	84°21.58	10.7'	11°0.68	15.9'	59.6'
14	29°35.15	26.24	98°51.23	10.6'	11°16.61	15.9'	59.6'
15	44°35.01	· · 26.25	113°20.79	10.5'	11°32.49	15.8'	59.6'
16	59°34.88	26.26	127°50.28	10.4'	11°48.32	15.8'	59.7'
17	74°34.74	26.27	142°19.67	10.3'	12°4.10	15.7'	59.7'
18	89°34.60	N23°26.27	156°48.98	10.2'	N12°19.83	15.7'	59.7'
19	104°34.46	26.28	171°18.20	10.1'	12°35.49	15.6'	59.7'
20	119°34.33	26.28	185°47.33	10.0'	12°51.10	15.5'	59.7'
21	134°34.19	· · 26.29	200°16.37	9.9'	13°6.65	15.5'	59.8'
22	149°34.05	26.29	214°45.31	9.9'	13°22.14	15.4'	59.8'
23	164°33.92	26.30	229°14.16	9.8'	13°37.56	15.4'	59.8'
SD = 15.7'		$d = 0.0'$	SD = 16.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:31	22:32	////	////
62°	////	////	02:09	21:54	////	////
60°	////	00:49	02:36	21:27	23:14	////
N 58°	////	01:40	02:56	21:07	22:23	////
56°	////	02:10	03:13	20:50	21:53	////
54°	00:45	02:33	03:27	20:36	21:30	23:18
52°	01:32	02:51	03:39	20:23	21:12	22:31
50°	02:00	03:06	03:50	20:13	20:57	22:03
45°	02:46	03:35	04:13	19:50	20:27	21:17
N 40°	03:16	03:58	04:31	19:32	20:05	20:47
35°	03:40	04:16	04:46	19:17	19:47	20:23
30°	03:58	04:32	04:59	19:04	19:31	20:05
20°	04:27	04:57	05:21	18:42	19:06	19:36
N 10°	04:50	05:17	05:40	18:23	18:46	19:13
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	05:26	05:52	06:15	17:48	18:10	18:37
20°	05:42	06:10	06:34	17:29	17:53	18:21
30°	05:59	06:29	06:55	17:08	17:34	18:04
35°	06:08	06:39	07:07	16:55	17:24	17:55
40°	06:17	06:51	07:22	16:41	17:12	17:46
45°	06:27	07:05	07:38	16:24	16:58	17:36
S 50°	06:39	07:21	07:59	16:04	16:42	17:24
52°	06:44	07:28	08:09	15:54	16:35	17:18
54°	06:50	07:36	08:20	15:43	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:07
58°	07:03	07:56	08:48	15:15	16:07	17:00
S 60°	07:11	08:07	09:05	14:58	15:55	16:52

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	00:38	00:02 23:24	22:34	11:12	13:32	16:07
N 70°	00:30	00:03 23:34	22:59	11:16	13:25	15:45
68°	00:24	00:04 23:43	23:17	11:20	13:20	15:29
66°	00:19	00:04 23:50	23:33	11:22	13:16	15:15
64°	00:14	00:05 23:56	23:45	11:25	13:12	15:04
62°	00:10	00:05 23:56		11:27	13:09	14:55
60°	00:07	00:06	00:05	11:28	13:06	14:47
N 58°	00:04	00:06	00:09	11:30	13:03	14:40
56°	00:01	00:07	00:13	11:31	13:01	14:34
54°	· · ·	00:07	00:16	11:32	12:59	14:29
52°	· · ·	00:07	00:19	11:33	12:57	14:24
50°	· · ·	00:08	00:22	11:34	12:56	14:20
45°	· · ·	00:08	00:28	11:37	12:52	14:10
N 40°	· · ·	00:09	00:33	11:38	12:49	14:02
35°	· · ·	00:09	00:37	11:40	12:47	13:56
30°	· · ·	00:10	00:41	11:41	12:44	13:50
20°	· · ·	00:10	00:48	11:44	12:41	13:40
N 10°	· · ·	00:11	00:54	11:46	12:37	13:31
0°	· · ·	00:12	00:59	11:47	12:34	13:23
S 10°	· · ·	00:12	01:05	11:49	12:31	13:14
20°	· · ·	00:13	01:11	11:51	12:27	13:06
30°	· · ·	00:14	01:18	11:53	12:24	12:56
35°	· · ·	00:15	01:22	11:54	12:21	12:50
40°	· · ·	00:15	01:27	11:56	12:19	12:44
45°	· · ·	00:16	01:33	11:57	12:16	12:36
S 50°	· · ·	00:17	01:39	11:59	12:13	12:28
52°	· · ·	00:17	01:42	12:00	12:11	12:23
54°	· · ·	00:18	01:46	12:01	12:09	12:19
56°	· · ·	00:18	01:50	12:02	12:08	12:14
58°	· · ·	00:19	01:54	12:03	12:05	12:09
S 60°	· · ·	00:19	01:58	12:04	12:03	12:02

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
18	01:06	01:12	12:01	05:36	18:00	
19	01:19	01:25	12:01	06:23	18:47	
20	01:32	01:38	12:02	07:11	19:36	

June 21, 22, 23 UT (Sat., Sun., Mon.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	269°26.75	225°52.43	N13°49.80	114°59.05	N11°49.34	176°41.29	N23°16.13	267°10.57	S01°24.26			Alpheratz	357°34.41 29°13.71
1	284°29.21	240°52.28	50.56	130°0.18	48.80	191°43.14	16.12	282°12.95	24.23			Ankaa	353°6.82 -42°9.80
2	299°31.67	255°52.13	51.32	145°1.31	48.26	206°44.98	16.11	297°15.32	24.21			Schedar	349°30.74 56°40.36
3	314°34.14	270°51.97	•• 52.07	160°2.44	•• 47.72	221°46.82	•• 16.11	312°17.70	•• 24.18			Diphda	348°46.99 -17°50.69
4	329°36.60	285°51.82	52.83	175°3.57	47.18	236°48.66	16.10	327°20.08	24.16			Achernar	335°20.15 -57°6.15
5	344°39.07	300°51.67	53.58	190°4.70	46.64	251°50.51	16.09	342°22.45	24.13			Hamal	327°50.98 23°34.87
6	359°41.53	315°51.52	N13°54.33	205°5.83	N11°46.09	266°52.35	N23°16.09	357°24.83	S01°24.10			Polaris	314°12.46 89°22.04
7	14°43.99	330°51.36	55.09	220°6.96	45.55	281°54.19	16.08	12°27.20	24.08			Acamar	315°11.79 -40°11.96
8	29°46.46	345°51.21	55.84	235°8.09	45.01	296°56.03	16.07	27°29.58	24.05			Menkar	314°6.01 4°11.38
9	44°48.92	0°51.05	•• 56.60	250°9.22	•• 44.47	311°57.88	•• 16.06	42°31.96	•• 24.03			Mirfak	308°28.14 49°56.94
10	59°51.39	15°50.90	57.35	265°10.35	43.93	326°59.72	16.06	57°34.33	24.00			Aldebaran	290°39.53 16°33.61
11	74°53.85	30°50.74	58.10	280°11.48	43.39	342°1.56	16.05	72°36.71	23.98			Rigel	281°3.85 -8°10.29
12	89°56.31	45°50.58	N13°58.85	295°12.61	N11°42.85	357°3.40	N23°16.04	87°39.09	S01°23.95			Capella	280°21.83 46°1.36
13	104°58.78	60°50.42	13°59.61	310°13.74	42.31	12°5.25	16.03	102°41.47	23.92			Bellatrix	278°22.82 6°22.38
14	120°1.24	75°50.26	14°0.36	325°14.87	41.76	27°7.09	16.03	117°43.84	23.90			Elnath	278°1.79 28°37.71
15	135°3.71	90°50.11	•• 1.11	340°16.00	•• 41.22	42°8.93	•• 16.02	132°46.22	•• 23.87			Alnilam	275°37.69 -1°11.11
16	150°6.17	105°49.95	1.86	355°17.13	40.68	57°10.77	16.01	147°48.60	23.85			Betelgeuse	270°52.03 7°24.72
17	165°8.64	120°49.79	2.61	10°18.26	40.14	72°12.62	16.00	162°50.98	23.82			Canopus	263°52.79 -52°42.51
18	180°11.10	135°49.62	N14°3.37	25°19.39	N11°39.59	87°14.46	N23°16.00	177°53.36	S01°23.80			Sirius	258°26.27 -16°45.05
19	195°13.56	150°49.46	4.12	40°20.52	39.05	102°16.30	15.99	192°55.73	23.77			Adhara	255°5.96 -29°0.40
20	210°16.03	165°49.30	4.87	55°21.65	38.51	117°18.14	15.98	207°58.11	23.75			Procyon	244°50.77 5°9.60
21	225°18.49	180°49.14	•• 5.62	70°22.78	•• 37.97	132°19.99	•• 15.97	223°0.49	•• 23.72			Pollux	243°17.21 27°57.94
22	240°20.96	195°48.97	6.37	85°23.91	37.42	147°21.83	15.97	238°2.87	23.70			Avior	234°15.16 -59°35.58
23	255°23.42	210°48.81	7.12	100°25.04	36.88	162°23.67	15.96	253°5.25	23.67			Suhail	222°46.38 -43°32.26
Mer.pass. 06:01		ν -0.2' d0.8' m-4.21		ν 1.1' d-0.5' m1.44		ν 1.8' d-0.0' m-1.90		ν 2.4' d-0.0' m1.00					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	270°25.88	225°48.64	N14°7.87	115°26.17	N11°36.34	177°25.51	N23°15.95	268°7.63	S01°23.65			Miaplacidus	221°38.90 -69°49.49
1	285°28.35	240°48.48	8.62	130°27.29	35.79	192°27.36	15.94	283°10.01	23.62			Alphard	217°47.61 -8°46.17
2	300°30.81	255°48.31	9.37	145°28.42	35.25	207°29.20	15.93	298°12.39	23.60			Regulus	207°34.22 11°50.62
3	315°33.28	270°48.15	•• 10.12	160°29.55	•• 34.71	222°31.04	•• 15.93	313°14.77	•• 23.57			Dubhe	193°40.72 61°37.10
4	330°35.74	285°47.98	10.86	175°30.68	34.16	237°32.88	15.92	328°17.15	23.55			Denebola	182°24.60 14°25.85
5	345°38.21	300°47.81	11.61	190°31.81	33.62	252°34.73	15.91	343°19.53	23.53			Gienah	175°43.19 -17°41.12
6	0°40.67	315°47.64	N14°12.36	205°32.94	N11°33.07	267°36.57	N23°15.90	358°21.91	S01°23.50			Acrux	172°59.64 -63°14.73
7	15°43.13	330°47.47	13.11	220°34.07	32.53	282°38.41	15.89	13°24.29	23.48			Gacrux	171°51.18 -57°15.64
8	30°45.60	345°47.30	13.86	235°35.20	31.98	297°40.25	15.89	28°26.67	23.45			Alioth	166°12.50 55°49.54
9	45°48.06	0°47.13	•• 14.60	250°36.32	•• 31.44	312°42.10	•• 15.88	43°29.05	•• 23.43			Spica	158°21.80 -11°17.73
10	60°50.53	15°46.96	15.35	265°37.45	30.89	327°43.94	15.87	58°31.43	23.40			Alkaid	152°51.47 49°11.36
11	75°52.99	30°46.79	16.10	280°38.58	30.35	342°45.78	15.86	73°33.81	23.38			Hadar	148°35.15 -60°30.01
12	90°55.45	45°46.62	N14°16.85	295°39.71	N11°29.80	357°47.62	N23°15.85	88°36.19	S01°23.36			Menkent	147°56.98 -36°29.90
13	105°57.92	60°46.45	17.59	310°40.84	29.26	12°49.47	15.84	103°38.57	23.33			Arcturus	145°47.38 19°3.05
14	121°0.38	75°46.27	18.34	325°41.97	28.71	27°51.31	15.84	118°40.95	23.31			Rigel Kent.	139°39.38 -60°56.67
15	136°2.85	90°46.10	•• 19.08	340°43.09	•• 28.17	42°53.15	•• 15.83	133°43.33	•• 23.28			Kochab	137°18.95 74°3.22
16	151°5.31	105°45.92	19.83	355°44.22	27.62	57°54.99	15.82	148°45.71	23.26			Zuben'ubi	136°55.38 -16°8.94
17	166°7.78	120°45.75	20.57	10°45.35	27.08	72°56.84	15.81	163°48.10	23.24			Alphecca	126°3.12 26°37.79
18	181°10.24	135°45.57	N14°21.32	25°46.48	N11°26.53	87°58.68	N23°15.80	178°50.48	S01°23.21			Antares	112°15.04 -26°29.37
19	196°12.70	150°45.40	22.06	40°47.61	25.99	103°0.52	15.79	193°52.86	23.19			Atria	107°8.38 -69°4.48
20	211°15.17	165°45.22	22.81	55°48.73	25.44	118°2.36	15.78	208°55.24	23.17			Sabik	102°2.02 -15°45.41
21	226°17.63	180°45.04	•• 23.55	70°49.86	•• 24.89	133°4.21	•• 15.77	223°57.62	•• 23.14			Shaula	96°9.45 -37°7.35
22	241°20.10	195°44.86	24.30	85°50.99	24.35	148°6.05	15.77	239°0.01	23.12			Rasalhague	95°57.86 12°32.47
23	256°22.56	210°44.68	25.04	100°52.12	23.80	163°7.89	15.76	254°2.39	23.10			Eltanin	90°41.47 51°29.07
Mer.pass. 05:57		ν -0.2' d0.7' m-4.20		ν 1.1' d-0.5' m1.44		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m1.00					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	271°25.03	225°44.50	N14°25.78	115°53.24	N11°23.25	178°9.73	N23°15.75	269°4.77	S01°23.07			Kaus Aust.	83°31.62 -34°22.32
1	286°27.49	240°44.32	26.53	130°54.37	22.71	193°11.58	15.74	284°7.15	23.05			Vega	80°32.55 38°48.36
2	301°29.95	255°44.14	27.27	145°55.50	22.16	208°13.42	15.73	299°9.54	23.03			Nunki	75°46.94 -26°15.86
3	316°32.42	270°43.96	•• 28.01	160°56.63	•• 21.61	223°15.26	•• 15.72	314°11.92	•• 23.01			Altair	61°59.29 8°59.46
4	331°34.88	285°43.78	28.75	175°57.75	21.06	238°17.10	15.71	329°14.30	22.98			Peacock	53°4.64 -56°39.00
5	346°37.35	300°43.60	29.49	190°58.88	20.52	253°18.94	15.70	344°16.69	22.96			Deneb	49°25.19 45°22.09
6	1°39.81	315°43.41	N14°30.24	206°0.01	N11°19.97	268°20.79	N23°15.69	359°19.07	S01°22.94			Enif	33°38.24 9°59.46
7	16°42.27	330°43.23	30.98	221°1.14	19.42	283°22.63	15.68	14°21.46	22.91			Al Na'ir	27°32.21 -46°50.03
8	31°44.74	345°43.04	31.72	236°2.26	18.87	298°24.47	15.67	29°23.84	22.89			Fomalhaut	15°14.00 -29°29.07
9	46°47.20	0°42.86	•• 32.46	251°3.39	•• 18.33	313°26.31	•• 15.67	44°26.22	•• 22.87			Scheat	13°44.76 28°13.11
10	61°49.67	15°42.67	33.20	266°4.52	17.78	328°28.16	15.66	59°28.61	22.85			Markab	13°29.45 15°20.46
11	76°52.13	30°42.49	33.94	281°5.64	17.23	343°30.00	15.65	74°30.99	22.82				
12	91°54.60	45°42.30	N14°34.68	296°6.77	N11°16.68	358°31.84	N23°15.64	89°33.38	S01°22.80				
13	106°57.06	60°42.11	35.42	311°7.90	16.13	13°33.68	15.63	104°35.76	22.78				
14	121°59.52	75°41.92	36.16	326°9.02	15.58	28°35.53	15.62	119°38.15	22.76				
15	137°1.99	90°41.74	•• 36.90	341°10.15	•• 15.04	43°37.37	•• 15.61	134°40.53	•• 22.74				
16	152°4.45	105°41.55	37.63	356°11.28	14.49	58°39.21	15.60	149°42.92	22.71				
17	167°6.92	120°41.36	38.37	11°12.40	13.94	73°41.05	15.59	164°45.30	22.69				
18	182°9.38	135°41.16	N14°39.11	26°13.53	N11°13.39	88°42.89	N23°15.58	179°47.69	S01°22.67				
19	197°11.85	150°40.97	39.85	41°14.66	12.84	103°44.74	15.57	194°50.07	22.65				
20	212°14.31	165°40.78	40.59	56°15.78	12.29	118°46.58	15.56	209°52.46	22.63				
21	227°16.77	180°40.59	•• 41.32	71°16.91	•• 11.74	133°48.42	•• 15.55	224°54.85	•• 22.60				
22	242°19.24	195°40.40	42.06	86°18.03	11.19	148°50.26	15.54	239°57.23	22.58				
23	257°21.70	210°40.20	42.80	101°19.16	10.64	163°52.10	15.53						

h		Sun		Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.78	N23°26.30	243°42.92	9.7'	N13°52.92	15.3'	59.8'
1	194°33.64	26.30	258°11.58	9.6'	14°8.21	15.2'	59.8'
2	209°33.51	26.30	272°40.14	9.5'	14°23.43	15.1'	59.8'
3	224°33.37	· · 26.30	287°8.60	9.4'	14°38.58	15.1'	59.9'
4	239°33.23	26.30	301°36.97	9.3'	14°53.66	15.0'	59.9'
5	254°33.09	26.30	316°5.23	9.2'	15°8.66	14.9'	59.9'
6	269°32.96	N23°26.30	330°33.39	9.1'	N15°23.58	14.8'	59.9'
7	284°32.82	26.29	345°1.45	9.0'	15°38.43	14.8'	59.9'
8	299°32.68	26.29	359°29.41	8.9'	15°53.19	14.7'	59.9'
9	314°32.55	· · 26.29	13°57.26	8.7'	16°7.87	14.6'	60.0'
10	329°32.41	26.28	28°25.01	8.6'	16°22.46	14.5'	60.0'
11	344°32.27	26.28	42°52.65	8.5'	16°36.97	14.4'	60.0'
12	359°32.14	N23°26.27	57°20.19	8.4'	N16°51.39	14.3'	60.0'
13	14°32.00	26.26	71°47.62	8.3'	17°5.72	14.2'	60.0'
14	29°31.86	26.25	86°14.93	8.2'	17°19.95	14.1'	60.0'
15	44°31.73	· · 26.25	100°42.14	8.1'	17°34.09	14.0'	60.0'
16	59°31.59	26.24	115°9.24	8.0'	17°48.13	13.9'	60.1'
17	74°31.45	26.23	129°36.23	7.9'	18°2.07	13.8'	60.1'
18	89°31.32	N23°26.22	144°3.11	7.8'	N18°15.91	13.7'	60.1'
19	104°31.18	26.21	158°29.87	7.7'	18°29.65	13.6'	60.1'
20	119°31.04	26.19	172°56.53	7.5'	18°43.28	13.5'	60.1'
21	134°30.90	· · 26.18	187°23.07	7.4'	18°56.80	13.4'	60.1'
22	149°30.77	26.17	201°49.50	7.3'	19°10.22	13.3'	60.1'
23	164°30.63	26.15	216°15.81	7.2'	19°23.52	13.2'	60.1'
SD = 15.7'		$d = 0.0'$	SD = 16.3'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°30.49	N23°26.14	230°42.01	7.1'	N19°36.71	13.1'	60.1'
1	194°30.36	26.12	245°8.10	7.0'	19°49.78	13.0'	60.2'
2	209°30.22	26.11	259°34.07	6.9'	20°2.73	12.8'	60.2'
3	224°30.08	· · 26.09	273°59.92	6.7'	20°15.57	12.7'	60.2'
4	239°29.95	26.07	288°25.67	6.6'	20°28.28	12.6'	60.2'
5	254°29.81	26.05	302°51.29	6.5'	20°40.86	12.5'	60.2'
6	269°29.67	N23°26.03	317°16.80	6.4'	N20°53.32	12.3'	60.2'
7	284°29.54	26.01	331°42.20	6.3'	21°5.65	12.2'	60.2'
8	299°29.40	25.99	346°7.48	6.2'	21°17.86	12.1'	60.2'
9	314°29.26	· · 25.97	0°32.65	6.1'	21°29.92	11.9'	60.2'
10	329°29.13	25.95	14°57.70	5.9'	21°41.86	11.8'	60.2'
11	344°28.99	25.93	29°22.64	5.8'	21°53.65	11.7'	60.2'
12	359°28.85	N23°25.90	43°47.46	5.7'	N22°5.31	11.5'	60.2'
13	14°28.72	25.88	58°12.17	5.6'	22°16.82	11.4'	60.3'
14	29°28.58	25.85	72°36.76	5.5'	22°28.20	11.2'	60.3'
15	44°28.45	· · 25.83	87°1.25	5.4'	22°39.42	11.1'	60.3'
16	59°28.31	25.80	101°25.62	5.3'	22°50.50	10.9'	60.3'
17	74°28.17	25.77	115°49.88	5.1'	23°1.44	10.8'	60.3'
18	89°28.04	N23°25.75	130°14.02	5.0'	N23°12.22	10.6'	60.3'
19	104°27.90	25.72	144°38.06	4.9'	23°22.84	10.5'	60.3'
20	119°27.76	25.69	159°1.99	4.8'	23°33.31	10.3'	60.3'
21	134°27.63	· · 25.66	173°25.81	4.7'	23°43.63	10.2'	60.3'
22	149°27.49	25.63	187°49.52	4.6'	23°53.78	10.0'	60.3'
23	164°27.35	25.60	202°13.12	4.5'	24°3.78	9.8'	60.3'
SD = 15.7'		$d = -0.0'$	SD = 16.4'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.22	N23°25.56	216°36.62	4.4'	N24°13.61	9.7'	60.3'
1	194°27.08	25.53	231°0.01	4.3'	24°23.27	9.5'	60.3'
2	209°26.95	25.50	245°23.30	4.2'	24°32.77	9.3'	60.3'
3	224°26.81	· · 25.46	259°46.49	4.1'	24°42.10	9.2'	60.3'
4	239°26.67	25.43	274°9.58	4.0'	24°51.26	9.0'	60.3'
5	254°26.54	25.39	288°32.56	3.9'	25°0.25	8.8'	60.3'
6	269°26.40	N23°25.36	302°55.45	3.8'	N25°9.07	8.6'	60.3'
7	284°26.27	25.32	317°18.25	3.7'	25°17.71	8.5'	60.3'
8	299°26.13	25.28	331°40.95	3.6'	25°26.17	8.3'	60.3'
9	314°25.99	· · 25.24	346°3.55	3.5'	25°34.45	8.1'	60.3'
10	329°25.86	25.20	0°26.07	3.4'	25°42.55	7.9'	60.3'
11	344°25.72	25.16	14°48.50	3.3'	25°50.47	7.7'	60.3'
12	359°25.59	N23°25.12	29°10.84	3.3'	N25°58.20	7.5'	60.3'
13	14°25.45	25.08	43°33.09	3.2'	26°5.75	7.4'	60.3'
14	29°25.31	25.04	57°55.26	3.1'	26°13.12	7.2'	60.3'
15	44°25.18	· · 25.00	72°17.35	3.0'	26°20.29	7.0'	60.3'
16	59°25.04	24.95	86°39.36	2.9'	26°27.28	6.8'	60.3'
17	74°24.91	24.91	101°1.29	2.9'	26°34.07	6.6'	60.3'
18	89°24.77	N23°24.86	115°23.15	2.8'	N26°40.67	6.4'	60.3'
19	104°24.64	24.82	129°44.94	2.7'	26°47.08	6.2'	60.3'
20	119°24.50	24.77	144°6.66	2.7'	26°53.29	6.0'	60.3'
21	134°24.36	· · 24.72	158°28.31	2.6'	26°59.30	5.8'	60.2'
22	149°24.23	24.68	172°49.89	2.5'	27°5.12	5.6'	60.2'
23	164°24.09	24.63	187°11.42	2.5'	27°10.74	5.4'	60.2'
SD = 15.7'		$d = -0.0'$	SD = 16.4'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:31	22:33	////	////
62°	////	////	02:10	21:54	////	////
60°	////	00:50	02:36	21:28	23:14	////
N 58°	////	01:41	02:57	21:07	22:23	////
56°	////	02:11	03:13	20:51	21:53	////
54°	00:45	02:33	03:28	20:36	21:31	23:18
52°	01:33	02:51	03:40	20:24	21:13	22:31
50°	02:01	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:14	19:51	20:28	21:18
N 40°	03:17	03:59	04:32	19:33	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:51	05:18	05:41	18:23	18:46	19:14
0°	05:10	05:36	05:58	18:06	18:28	18:55
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:18	06:52	07:22	16:42	17:12	17:47
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:31	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°	21:49			18:46		
68°	22:37			18:00		
66°	23:09	22:04		17:30	20:35	
64°	23:32	23:10		17:08	19:31	
62°	23:51	23:45	23:37	16:50	18:56	21:16
60°	00:05	00:07	00:11	16:35	18:31	20:28
N 58°	00:13	00:20	00:32	16:23	18:11	19:58
56°	00:21	00:31	00:49	16:13	17:55	19:35
54°	00:27	00:42	01:03	16:03	17:41	19:16
52°	00:33	00:51	01:16	15:55	17:29	19:00
50°	00:38	00:59	01:27	15:48	17:18	18:47
45°	00:50	01:16	01:51	15:32	16:56	18:19
N 40°	00:59	01:31	02:10	15:19	16:38	17:57
35°	01:08	01:43	02:26	15:08	16:23	17:39
30°	01:15	01:54	02:39	14:58	16:10	17:23
20°	01:28	02:12	03:03	14:42	15:48	16:57
N 10°	01:39	02:29	03:24	14:28	15:29	16:34
0°	01:50	02:44	03:43	14:15	15:12	16:13
S 10°	02:00	03:00	04:03	14:02	14:54	15:52
20°	02:12	03:16	04:24	13:48	14:35	15:30
30°	02:25	03:36	04:49	13:32	14:14	15:04
35°	02:33	03:47	05:03	13:23	14:01	14:48
40°	02:42	04:00	05:20	13:12	13:47	14:31
45°	02:53	04:16	05:40	13:00	13:30	14:09
S 50°	03:05	04:35	06:06	12:45	13:09	13:43
52°	03:11	04:44	06:19	12:39	12:59	13:30
54°	03:18	04:55	06:33	12:31	12:48	13:15
56°	03:25	05:07	06:50	12:23	12:36	12:58
58°	03:34	05:20	07:10	12:13	12:21	12:37
S 60°	03:44	05:36	07:36	12:02	12:04	12:11

Day	Sun		Mer. Pass hh:mm	Moon		Age 25-27 26-9%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
21	01:45	01:51	12:02	08:02	20:29	
22	01:58	02:05	12:02	08:58	21:27	
23	02:11	02:18	12:02	09:58	22:30	

June 24, 25, 26 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	272°24.17		225°40.01	N14°43.53	116°20.29	N11°10.09	178°53.95	N23°15.52	270°2.00	S01°22.54
1	287°26.63		240°39.81	44.27	131°21.41	9.54	193°55.79	15.51	285°4.39	22.52
2	302°29.10		255°39.62	45.00	146°22.54	8.99	208°57.63	15.50	300°6.78	22.50
3	317°31.56		270°39.42	· · 45.74	161°23.66	· · 8.44	223°59.47	· · 15.49	315°9.16	· · 22.48
4	332°34.02		285°39.22	46.47	176°24.79	7.89	239°1.31	15.48	330°11.55	22.45
5	347°36.49		300°39.03	47.21	191°25.92	7.34	254°3.15	15.46	345°13.94	22.43
6	2°38.95		315°38.83	N14°47.94	206°27.04	N11°6.79	269°5.00	N23°15.45	0°16.33	S01°22.41
7	17°41.42		330°38.63	48.68	221°28.17	6.23	284°6.84	15.44	15°18.71	22.39
8	32°43.88		345°38.43	49.41	236°29.29	5.68	299°8.68	15.43	30°21.10	22.37
9	47°46.34		0°38.23	· · 50.14	251°30.42	· · 5.13	314°10.52	· · 15.42	45°23.49	· · 22.35
10	62°48.81		15°38.03	50.88	266°31.54	4.58	329°12.36	15.40	60°25.88	22.33
11	77°51.27		30°37.83	51.61	281°32.67	4.03	344°14.20	15.39	75°28.27	22.31
12	92°53.74		45°37.63	N14°52.34	296°33.79	N11°3.48	359°16.05	N23°15.37	90°30.65	S01°22.29
13	107°56.20		60°37.42	53.07	311°34.92	2.93	14°17.89	15.35	105°33.04	22.27
14	122°58.67		75°37.22	53.80	326°36.04	2.37	29°19.74	15.34	120°35.43	22.25
15	138°1.13		90°37.02	· · 54.54	341°37.17	· · 1.82	44°21.60	· · 15.32	135°37.82	· · 22.22
16	153°3.59		105°36.81	55.27	356°38.29	1.27	59°23.45	15.31	150°40.21	22.20
17	168°6.06		120°36.61	56.00	11°39.42	0.72	74°25.30	15.31	165°42.60	22.18
18	183°8.52		135°36.40	N14°56.73	26°40.54	N11°0.16	89°27.15	N23°15.30	180°44.99	S01°22.16
19	198°10.99		150°36.20	57.46	41°41.67	10°59.61	104°28.99	15.30	195°47.38	22.14
20	213°13.45		165°35.99	58.19	56°42.79	59.06	119°30.84	15.29	210°49.77	22.12
21	228°15.92		180°35.78	· · 58.92	71°43.92	· · 58.51	134°32.68	· · 15.29	225°52.16	· · 22.10
22	243°18.38		195°35.58	14°59.65	86°45.04	57.95	149°34.52	15.28	240°54.55	22.08
23	258°20.84		210°35.37	15°0.38	101°46.17	57.40	164°36.36	15.27	255°56.94	22.06
Mer.pass. 05:49		ν -0.2' d0.7' m-4.19		ν 1.1' d-0.6' m1.45		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.99		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°23.31		225°35.16	N15°1.10	116°47.29	N10°56.85	179°38.20	N23°15.26	270°59.33	S01°22.04
1	288°25.77		240°34.95	1.83	131°48.41	56.29	194°40.04	15.25	286°1.72	22.02
2	303°28.24		255°34.74	2.56	146°49.54	55.74	209°41.89	15.24	301°4.11	22.00
3	318°30.70		270°34.53	· · 3.29	161°50.66	· · 55.19	224°43.73	· · 15.23	316°6.50	· · 21.98
4	333°33.17		285°34.32	4.01	176°51.79	54.63	239°45.57	15.22	331°8.89	21.97
5	348°35.63		300°34.10	4.74	191°52.91	54.08	254°47.41	15.21	346°11.28	21.95
6	3°38.09		315°33.89	N15°5.47	206°54.03	N10°53.52	269°49.25	N23°15.20	1°13.67	S01°21.93
7	18°40.56		330°33.68	6.19	221°55.16	52.97	284°51.09	15.19	16°16.06	21.91
8	33°43.02		345°33.46	6.92	236°56.28	52.41	299°52.94	15.18	31°18.45	21.89
9	48°45.49		0°33.25	· · 7.64	251°57.41	· · 51.86	314°54.78	· · 15.17	46°20.84	· · 21.87
10	63°47.95		15°33.03	8.37	266°58.53	51.31	329°56.62	15.16	61°23.24	21.85
11	78°50.42		30°32.82	9.09	281°59.65	50.75	344°58.46	15.15	76°25.63	21.83
12	93°52.88		45°32.60	N15°9.82	297°0.78	N10°50.20	0°0.30	N23°15.14	91°28.02	S01°21.81
13	108°55.34		60°32.38	10.54	312°1.90	49.64	15°2.15	15.13	106°30.41	21.79
14	123°57.81		75°32.17	11.27	327°3.02	49.09	30°3.99	15.12	121°32.81	21.77
15	139°0.27		90°31.95	· · 11.99	342°4.15	· · 48.53	45°5.83	· · 15.10	136°35.20	· · 21.75
16	154°2.74		105°31.73	12.71	357°5.27	47.97	60°7.67	15.09	151°37.59	21.74
17	169°5.20		120°31.51	13.44	12°6.39	47.42	75°9.52	15.08	166°39.98	21.72
18	184°7.67		135°31.29	N15°14.16	27°7.52	N10°46.86	90°11.36	N23°15.07	181°42.38	S01°21.70
19	199°10.13		150°31.07	14.88	42°8.64	46.31	105°13.20	15.06	196°44.77	21.68
20	214°12.59		165°30.85	15.60	57°9.76	45.75	120°15.04	15.05	211°47.16	21.66
21	229°15.06		180°30.63	· · 16.32	72°10.89	· · 45.19	135°16.89	· · 15.03	226°49.56	· · 21.64
22	244°17.52		195°30.40	17.04	87°12.01	44.64	150°18.73	15.02	241°51.95	21.62
23	259°19.99		210°30.18	17.76	102°13.13	44.08	165°20.57	15.01	256°54.34	21.61
Mer.pass. 05:45		ν -0.2' d0.7' m-4.18		ν 1.1' d-0.6' m1.46		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.99		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	274°22.45		225°29.96	N15°18.48	117°14.26	N10°43.53	180°22.41	N23°15.00	271°56.74	S01°21.59
1	289°24.91		240°29.73	19.20	132°15.38	42.97	195°24.26	14.99	286°59.13	21.57
2	304°27.38		255°29.51	19.92	147°16.50	42.41	210°26.10	14.98	302°1.53	21.55
3	319°29.84		270°29.28	· · 20.64	162°17.62	· · 41.85	225°27.94	· · 14.96	317°3.92	· · 21.53
4	334°32.31		285°29.06	21.36	177°18.75	41.30	240°29.78	14.95	332°6.31	21.52
5	349°34.77		300°28.83	22.08	192°19.87	40.74	255°31.63	14.94	347°8.71	21.50
6	4°37.24		315°28.60	N15°22.80	207°20.99	N10°40.18	270°33.47	N23°14.93	2°11.10	S01°21.48
7	19°39.70		330°28.37	23.52	222°22.11	39.63	285°35.31	14.92	17°13.50	21.46
8	34°42.16		345°28.15	24.23	237°23.24	39.07	300°37.16	14.90	32°15.89	21.44
9	49°44.63		0°27.92	· · 24.95	252°24.36	· · 38.51	315°39.00	· · 14.89	47°18.29	· · 21.43
10	64°47.09		15°27.69	25.67	267°25.48	37.95	330°40.84	14.88	62°20.69	21.41
11	79°49.56		30°27.46	26.38	282°26.60	37.39	345°42.68	14.87	77°23.08	21.39
12	94°52.02		45°27.23	N15°27.10	297°27.72	N10°36.84	0°44.53	N23°14.85	92°25.48	S01°21.38
13	109°54.49		60°26.99	27.81	312°28.85	36.28	15°46.37	14.84	107°27.87	21.36
14	124°56.95		75°26.76	28.53	327°29.97	35.72	30°48.21	14.83	122°30.27	21.34
15	139°59.41		90°26.53	· · 29.24	342°31.09	· · 35.16	45°50.05	· · 14.82	137°32.66	· · 21.32
16	155°1.88		105°26.30	29.96	357°32.21	34.60	60°51.90	14.81	152°35.06	21.31
17	170°4.34		120°26.06	30.67	12°33.33	34.04	75°53.74	14.79	167°37.46	21.29
18	185°6.81		135°25.83	N15°31.39	27°34.46	N10°33.48	90°55.58	N23°14.78	182°39.85	S01°21.27
19	200°9.27		150°25.59	32.10	42°35.58	32.93	105°57.43	14.77	197°42.25	21.26
20	215°11.74		165°25.36	32.81	57°36.70	32.37	120°59.27	14.75	212°44.65	21.24
21	230°14.20		180°25.12	· · 33.53	72°37.82	· · 31.81	136°1.11	· · 14.74	227°47.05	· · 21.22
22	245°16.66		195°24.88	34.24	87°38.94	31.25	151°2.96	14.73	242°49.44	21.21
23	260°19.13		210°24.65	34.95	102°40.06	30.69	166°4.80	14.72	257°51.84	21.19
Mer.pass. 05:42		ν -0.2' d0.7' m-4.17		ν 1.1' d-0.6' m1.47		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.98		

Stars		
	SHA	Dec
Alpheratz	357°34.38	29°13.73
Ankaa	353°6.79	-42°9.79
Schedar	349°30.69	56°40.37
Diphda	348°46.96	-17°50.68
Achernar	335°20.11	-57°6.14
Hamal	327°50.95	23°34.88
Polaris	314°10.89	89°22.03
Acamar	315°11.77	-40°11.94
Menkar	314°5.98	4°11.39
Mirfak	308°28.10	49°56.93
Aldebaran	290°39.51	16°33.61
Rigel	281°3.83	-8°10.28
Capella	280°21.80	46°1.35
Bellatrix	278°22.81	6°22.38
Elnath	278°1.77	28°37.71
Alnilam	275°37.68	-1°11.11
Betelgeuse	270°52.02	7°24.73
Canopus	263°52.79	-52°42.50
Sirius	258°26.26	-16°45.04
Adhara	255°5.95	-29°0.39
Procyon	244°50.76	5°9.60
Pollux	243°17.20	27°57.94
Avior	234°15.17	-59°35.57
Suhail	222°46.38	-43°32.26
Miaplacidus	221°38.93	-69°49.48
Alphard	217°47.61	-8°46.17
Regulus	207°34.22	11°50.62
Dubhe	193°40.74	61°37.09
Denebola	182°24.60	14°25.85
Gienah	175°43.20	-17°41.12
Acrux	172°59.65	-63°14.73
Gacrux	171°51.19	-57°15.65
Alioth	166°12.52	55°49.54
Spica	158°21.80	-11°17.73
Alkaid	152°51.49	49°11.37
Hadar	148°35.16	-60°30.01
Menkent	147°56.98	-36°29.90
Arcturus	145°47.38	19°3.06
Rigel Kent.	139°39.39	-60°56.68
Kochab	137°19.00	74°3.22
Zuben'ubi	136°55.37	-16°8.94
Alphecca	126°3.13	26°37.80
Antares	112°15.03	-26°29.37
Atria	107°8.36	-69°4.48
Sabik	102°2.01	-15°45.41
Shaula	96°9.43	-37°7.35
Rasalhague	95°57.85	12°32.48
Eltanin	90°41.46	51°29.09
Kaus Aust.	83°31.60	-34°22.32
Vega	80°32.53	38°48.38
Nunki	75°46.92	-26°15.86
Altair	61°59.27	8°56.11
Peacock	53°4.61	-56°39.00
Deneb	49°25.17	45°22.11
Enif	33°38.22	9°59.47
Al Na'ir	27°32.17	-46°50.02
Fomalhaut	15°13.97	-29°29.06
Scheat	13°44.73	28°13.13
Markab	13°29.42	15°20.47
Jun 24 Tue	SHA	Mer.pass
Venus	313°15.84	08:57
Mars	203°56.12	16:13
Jupiter	266°29.78	12:03
Saturn	357°37.84	05:59
Jun 25 Wed	SHA	Mer.pass
Venus	312°11.85	08:58
Mars	203°23.98	16:12
Jupiter	266°14.89	12:00
Saturn	357°36.02	05:55
Jun 26 Thu	SHA	Mer.pass
Venus	311°7.51	08:58
Mars	202°51.80	16:10
Jupiter	265°59.96	11:57
Saturn	357°34.29	05:51
Horizontal parallax		
Venus:		0.2
Mars:		0.1


h	Sun			Moon				
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	179°23.96	N23°24.58		201°32.88	2.4'	N27°16.15	5.2'	60.2'
1	194°23.82	24.53		215°54.29	2.4'	27°21.37	5.0'	60.2'
2	209°23.69	24.48		230°15.65	2.3'	27°26.39	4.8'	60.2'
3	224°23.55	· · 24.42		244°36.95	2.3'	27°31.20	4.6'	60.2'
4	239°23.42	24.37		258°58.21	2.2'	27°35.81	4.4'	60.2'
5	254°23.28	24.32		273°19.42	2.2'	27°40.21	4.2'	60.2'
6	269°23.15	N23°24.27		287°40.59	2.1'	N27°44.41	4.0'	60.2'
7	284°23.01	24.21		302°1.72	2.1'	27°48.40	3.8'	60.2'
8	299°22.88	24.16		316°22.82	2.1'	27°52.19	3.6'	60.1'
9	314°22.74	· · 24.10		330°43.88	2.0'	27°55.76	3.4'	60.1'
10	329°22.61	24.04		345°4.91	2.0'	27°59.13	3.2'	60.1'
11	344°22.47	23.99		359°25.92	2.0'	28°2.29	3.0'	60.1'
12	359°22.34	N23°23.93		13°46.90	2.0'	N28°5.24	2.7'	60.1'
13	14°22.20	23.87		28°7.86	1.9'	28°7.99	2.5'	60.1'
14	29°22.07	23.81		42°28.81	1.9'	28°10.52	2.3'	60.1'
15	44°21.93	· · 23.75		56°49.74	1.9'	28°12.84	2.1'	60.1'
16	59°21.80	23.69		71°10.66	1.9'	28°14.95	1.9'	60.0'
17	74°21.66	23.63		85°31.57	1.9'	28°16.85	1.7'	60.0'
18	89°21.53	N23°23.57		99°52.48	1.9'	N28°18.54	1.5'	60.0'
19	104°21.39	23.50		114°13.40	1.9'	28°20.02	1.3'	60.0'
20	119°21.26	23.44		128°34.31	1.9'	28°21.29	1.1'	60.0'
21	134°21.12	· · 23.37		142°55.23	1.9'	28°22.35	0.8'	60.0'
22	149°20.99	23.31		157°16.16	1.9'	28°23.19	0.6'	59.9'
23	164°20.86	23.24		171°37.10	2.0'	28°23.83	0.4'	59.9'
SD = 15.7' $d = -0.1'$			SD = 16.4'					

Wed	GHA	Dec			GHA	ν	Dec	d	HP
0	179°20.72	N23°23.18			185°58.06	2.0'	N28°24.25	0.2'	59.9'
1	194°20.59	23.11			200°19.04	2.0'	28°24.47	0.0'	59.9'
2	209°20.45	23.04			214°40.04	2.0'	28°24.47	-0.2'	59.9'
3	224°20.32	22.97			229°1.07	2.1'	28°24.27	-0.4'	59.9'
4	239°20.18	22.90			243°22.13	2.1'	28°23.85	-0.6'	59.8'
5	254°20.05	22.83			257°43.22	2.1'	28°23.23	-0.8'	59.8'
6	269°19.92	N23°22.76			272°4.35	2.2'	N28°22.40	-1.0'	59.8'
7	284°19.78	22.69			286°25.52	2.2'	28°21.36	-1.2'	59.8'
8	299°19.65	22.62			300°46.73	2.3'	28°20.12	-1.5'	59.8'
9	314°19.51	22.55			315°7.98	2.3'	28°18.67	-1.7'	59.7'
10	329°19.38	22.47			329°29.29	2.4'	28°17.01	-1.9'	59.7'
11	344°19.25	22.40			343°50.64	2.4'	28°15.15	-2.1'	59.7'
12	359°19.11	N23°22.32			358°12.06	2.5'	N28°13.09	-2.3'	59.7'
13	14°18.98	22.25			12°33.53	2.5'	28°10.82	-2.5'	59.7'
14	29°18.85	22.17			26°55.06	2.6'	28°8.35	-2.7'	59.6'
15	44°18.71	22.09			41°16.65	2.7'	28°5.69	-2.9'	59.6'
16	59°18.58	22.01			55°38.32	2.7'	28°2.82	-3.1'	59.6'
17	74°18.45	21.94			70°0.05	2.8'	27°59.75	-3.3'	59.6'
18	89°18.31	N23°21.86			84°21.85	2.9'	N27°56.48	-3.5'	59.5'
19	104°18.18	21.78			98°43.74	3.0'	27°53.02	-3.7'	59.5'
20	119°18.05	21.70			113°5.70	3.0'	27°49.36	-3.9'	59.5'
21	134°17.91	21.61			127°27.74	3.1'	27°45.51	-4.0'	59.5'
22	149°17.78	21.53			141°49.86	3.2'	27°41.47	-4.2'	59.4'
23	164°17.65	21.45			156°12.07	3.3'	27°37.24	-4.4'	59.4'
SD = 15.7'				SD = 16.3'					

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.51	N23°21.37	170°34.37	3.4'	N27°32.81	-4.6'	59.4'
1	194°17.38	21.28	184°56.76	3.5'	27°28.20	-4.8'	59.4'
2	209°17.25	21.20	199°19.24	3.6'	27°23.40	-5.0'	59.3'
3	224°17.12	21.11	213°41.82	3.7'	27°18.41	-5.2'	59.3'
4	239°16.98	21.02	228°4.50	3.8'	27°13.25	-5.4'	59.3'
5	254°16.85	20.94	242°27.27	3.9'	27°7.89	-5.5'	59.2'
6	269°16.72	N23°20.85	256°50.15	4.0'	N27°2.36	-5.7'	59.2'
7	284°16.59	20.76	271°13.14	4.1'	26°56.65	-5.9'	59.2'
8	299°16.45	20.67	285°36.23	4.2'	26°50.76	-6.1'	59.2'
9	314°16.32	20.58	299°59.42	4.3'	26°44.70	-6.2'	59.1'
10	329°16.19	20.49	314°22.73	4.4'	26°38.46	-6.4'	59.1'
11	344°16.06	20.40	328°46.15	4.5'	26°32.05	-6.6'	59.1'
12	359°15.92	N23°20.30	343°9.68	4.6'	N26°25.47	-6.7'	59.1'
13	14°15.79	20.21	357°33.33	4.8'	26°18.72	-6.9'	59.0'
14	29°15.66	20.12	11°57.09	4.9'	26°11.80	-7.1'	59.0'
15	44°15.53	20.02	26°20.97	5.0'	26°4.72	-7.2'	59.0'
16	59°15.40	19.93	40°44.97	5.1'	25°57.48	-7.4'	58.9'
17	74°15.27	19.83	55°9.10	5.2'	25°50.07	-7.6'	58.9'
18	89°15.13	N23°19.74	69°33.34	5.4'	N25°42.51	-7.7'	58.9'
19	104°15.00	19.64	83°57.71	5.5'	25°34.78	-7.9'	58.8'
20	119°14.87	19.54	98°22.20	5.6'	25°26.90	-8.0'	58.8'
21	134°14.74	19.44	112°46.81	5.7'	25°18.87	-8.2'	58.8'
22	149°14.61	19.34	127°11.56	5.9'	25°10.68	-8.3'	58.7'
23	164°14.48	19.24	141°36.43	6.0'	25°2.35	-8.5'	58.7'
SD = 15.7' $d = -0.1'$				SD = 16.2'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64°	////	////	01:33	22:31	////	////
62°	////	////	02:11	21:54	////	////
60°	////	00:52	02:37	21:28	23:12	////
N 58°	////	01:42	02:58	21:07	22:23	////
56°	////	02:12	03:15	20:51	21:53	////
54°	00:48	02:34	03:29	20:36	21:31	23:16
52°	01:34	02:52	03:41	20:24	21:13	22:31
50°	02:02	03:07	03:52	20:13	20:58	22:03
45°	02:47	03:37	04:14	19:51	20:28	21:18
N 40°	03:18	04:00	04:32	19:33	20:06	20:47
35°	03:41	04:18	04:48	19:18	19:48	20:24
30°	04:00	04:33	05:01	19:05	19:32	20:06
20°	04:29	04:58	05:23	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:37	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	06:16	17:49	18:12	18:38
20°	05:43	06:11	06:35	17:30	17:55	18:22
30°	06:00	06:30	06:56	17:09	17:36	18:06
35°	06:09	06:40	07:09	16:57	17:25	17:57
40°	06:18	06:52	07:23	16:43	17:13	17:47
45°	06:28	07:06	07:39	16:26	17:00	17:37
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:29	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:32	16:19	17:08
58°	07:04	07:57	08:48	15:17	16:09	17:02
S 60°	07:12	08:08	09:06	15:00	15:57	16:54

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62°	<input type="checkbox"/>	<input type="checkbox"/>	01:39	<input type="checkbox"/>	23:46	23:37
60°	00:24	01:05	02:33	22:05	22:52	23:08
N 58°	00:55	01:44	03:05	21:26	22:19	22:45
56°	01:19	02:11	03:29	20:59	21:55	22:27
54°	01:38	02:32	03:48	20:38	21:35	22:11
52°	01:54	02:50	04:05	20:20	21:19	21:58
50°	02:08	03:05	04:19	20:05	21:04	21:46
45°	02:36	03:36	04:47	19:34	20:35	21:21
N 40°	02:59	04:00	05:10	19:10	20:12	21:02
35°	03:18	04:19	05:28	18:50	19:53	20:45
30°	03:34	04:36	05:44	18:34	19:37	20:31
20°	04:01	05:05	06:11	18:05	19:09	20:06
N 10°	04:25	05:29	06:34	17:41	18:45	19:45
0°	04:47	05:52	06:56	17:18	18:23	19:24
S 10°	05:09	06:15	07:17	16:55	18:00	19:04
20°	05:33	06:40	07:40	16:31	17:36	18:43
30°	06:01	07:08	08:07	16:02	17:08	18:17
35°	06:18	07:25	08:22	15:45	16:51	18:02
40°	06:37	07:45	08:40	15:26	16:32	17:45
45°	07:00	08:09	09:02	15:02	16:08	17:24
S 50°	07:31	08:40	09:30	14:31	15:37	16:57
52°	07:46	08:55	09:43	14:16	15:22	16:44
54°	08:03	09:13	09:59	13:58	15:04	16:29
56°	08:24	09:35	10:17	13:37	14:43	16:11
58°	08:51	10:03	10:39	13:10	14:15	15:50
S 60°	09:29	10:42	11:07	12:31	13:36	15:22

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	28-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-1%
24	02:24	02:31	12:03	11:02	23:35	
25	02:37	02:44	12:03	12:08	—:—	
26	02:50	02:56	12:03	13:10	00:39	

June 27, 28, 29 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	275°21.59		225°24.41	N15°35.66	117°41.18	N10°30.13	181°6.64	N23°14.70	272°54.24	S01°21.17	Alpheratz	357°34.35 29°13.74	
1	290°24.06		240°24.17	36.37	132°42.31	29.57	196°8.48	14.69	287°56.64	21.16	Ankaa	353°6.75 -42°9.78	
2	305°26.52		255°23.93	37.08	147°43.43	29.01	211°10.33	14.68	302°59.03	21.14	Schedar	349°30.65 56°40.38	
3	320°28.98		270°23.69	· · 37.79	162°44.55	· · 28.45	226°12.17	· · 14.67	318°1.43	· · 21.12	Diphda	348°46.93 -17°50.66	
4	335°31.45		285°23.45	38.50	177°45.67	27.89	241°14.01	14.65	333°3.83	21.11	Achernar	335°20.07 -57°6.13	
5	350°33.91		300°23.21	39.21	192°46.79	27.33	256°15.86	14.64	348°6.23	21.09	Hamal	327°50.92 23°34.89	
6	5°36.38		315°22.97	N15°39.92	207°47.91	N10°26.77	271°17.70	N23°14.63	3°8.63	S01°21.07	Polaris	314°9.51 89°22.03	
7	20°38.84		330°22.72	40.63	222°49.03	26.21	286°19.54	14.61	18°11.03	21.06	Acamar	315°11.74 -40°11.92	
8	35°41.31		345°22.48	41.34	237°50.15	25.64	301°21.39	14.60	33°13.43	21.04	Menkar	314°5.95 4°11.40	
9	50°43.77		0°22.24	· · 42.05	252°51.27	· · 25.08	316°23.23	· · 14.59	48°15.82	· · 21.03	Mirfak	308°28.07 49°56.93	
10	65°46.23		15°21.99	42.75	267°52.39	24.52	331°25.07	14.57	63°18.22	21.01	Aldebaran	290°39.48 16°33.62	
11	80°48.70		30°21.75	43.46	282°53.52	23.96	346°26.91	14.56	78°20.62	21.00	Rigel	281°3.82 -8°10.27	
12	95°51.16		45°21.50	N15°44.17	297°54.64	N10°23.40	1°28.76	N23°14.55	93°23.02	S01°20.98	Capella	280°21.78 46°1.35	
13	110°53.63		60°21.26	44.87	312°55.76	22.84	16°30.60	14.53	108°25.42	20.96	Bellatrix	278°22.79 6°22.39	
14	125°56.09		75°21.01	45.58	327°56.88	22.28	31°32.44	14.52	123°27.82	20.95	Elnath	278°1.75 28°37.71	
15	140°58.56		90°20.76	· · 46.29	342°58.00	· · 21.72	46°34.29	· · 14.51	138°30.22	· · 20.93	Alnilam	275°37.66 -1°11.10	
16	156°1.02		105°20.51	46.99	357°59.12	21.15	61°36.13	14.49	153°32.62	20.92	Betelgeuse	270°52.00 7°24.73	
17	171°3.48		120°20.26	47.70	13°0.24	20.59	76°37.97	14.48	168°35.02	20.90	Canopus	263°52.78 -52°42.48	
18	186°5.95		135°20.02	N15°48.40	28°1.36	N10°20.03	91°39.82	N23°14.47	183°37.42	S01°20.89	Sirius	258°26.25 -16°45.03	
19	201°8.41		150°19.77	49.10	43°2.48	19.47	106°41.66	14.45	198°39.82	20.87	Adhara	255°5.94 -29°0.38	
20	216°10.88		165°19.52	49.81	58°3.60	18.91	121°43.50	14.44	213°42.22	20.86	Procyon	244°50.75 5°9.61	
21	231°13.34		180°19.26	· · 50.51	73°4.72	· · 18.34	136°45.35	· · 14.43	228°44.63	· · 20.84	Pollux	243°17.19 27°57.94	
22	246°15.80		195°19.01	51.21	88°5.84	17.78	151°47.19	14.41	243°47.03	20.83	Avior	234°15.18 -59°35.56	
23	261°18.27		210°18.76	51.92	103°6.96	17.22	166°49.03	14.40	258°49.43	20.81	Suhail	222°46.39 -43°32.25	
Mer.pass. 05:38		ν-0.2' d0.7' m-4.17		ν1.1' d-0.6' m1.47		ν1.8' d-0.0' m-1.89		ν2.4' d-0.0' m0.98					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	276°20.73		225°18.51	N15°52.62	118°8.08	N10°16.65	181°50.88	N23°14.38	273°51.83	S01°20.80	Miaplacidus	221°38.96 -69°49.47	
1	291°23.20		240°18.26	53.32	133°9.20	16.09	196°52.72	14.37	288°54.23	20.78	Alphard	217°47.61 -8°46.17	
2	306°25.66		255°18.00	54.02	148°10.32	15.53	211°54.56	14.36	303°56.63	20.77	Regulus	207°34.22 11°50.62	
3	321°28.13		270°17.75	· · 54.72	163°11.44	· · 14.97	226°56.41	· · 14.34	318°59.04	· · 20.75	Dubhe	193°40.75 61°37.08	
4	336°30.59		285°17.49	55.42	178°12.56	14.40	241°58.25	14.33	334°1.44	20.74	Denebola	182°24.60 14°25.85	
5	351°33.05		300°17.24	56.12	193°13.68	13.84	257°0.09	14.32	349°3.84	20.72	Gienah	175°43.20 -17°41.12	
6	6°35.52		315°16.98	N15°56.82	208°14.80	N10°13.27	272°1.94	N23°14.30	4°6.24	S01°20.71	Acrux	172°59.68 -63°14.73	
7	21°37.98		330°16.72	57.52	223°15.91	12.71	287°3.78	14.29	19°8.64	20.69	Gacrux	171°51.21 -57°15.65	
8	36°40.45		345°16.46	58.22	238°17.03	12.15	302°5.62	14.27	34°11.05	20.68	Alioth	166°12.53 55°49.54	
9	51°42.91		0°16.21	· · 58.92	253°18.15	· · 11.58	317°7.47	· · 14.26	49°13.45	· · 20.67	Spica	158°21.80 -11°17.73	
10	66°45.37		15°15.95	15°59.62	268°19.27	11.02	332°9.31	14.24	64°15.85	20.65	Alkaid	152°51.50 49°11.37	
11	81°47.84		30°15.69	16°0.31	283°20.39	10.45	347°11.15	14.23	79°18.26	20.64	Hadar	148°35.17 -60°30.02	
12	96°50.30		45°15.43	N16°1.01	298°21.51	N10°9.89	2°13.00	N23°14.22	94°20.66	S01°20.62	Menkent	147°56.98 -36°29.91	
13	111°52.77		60°15.17	1.71	313°22.63	9.33	17°14.84	14.20	109°23.06	20.61	Arcturus	145°47.38 19°3.06	
14	126°55.23		75°14.91	2.40	328°23.75	8.76	32°16.68	14.19	124°25.47	20.60	Rigel Kent.	139°39.40 -60°56.69	
15	141°57.69		90°14.65	· · 3.10	343°24.87	· · 8.20	47°18.53	· · 14.17	139°27.87	· · 20.58	Kochab	137°19.04 74°3.23	
16	157°0.16		105°14.38	3.80	358°25.99	7.63	62°20.37	14.16	154°30.27	20.57	Zuben'ubi	136°55.37 -16°8.94	
17	172°2.62		120°14.12	4.49	13°27.11	7.07	77°22.22	14.14	169°32.68	20.56	Alphecca	126°3.12 26°37.81	
18	187°5.09		135°13.86	N16°5.19	28°28.22	N10°6.50	92°24.06	N23°14.13	184°35.08	S01°20.54	Antares	112°15.02 -26°29.38	
19	202°7.55		150°13.59	5.88	43°29.34	5.94	107°25.90	14.11	199°37.49	20.53	Atria	107°8.35 -69°4.49	
20	217°10.02		165°13.33	6.57	58°30.46	5.37	122°27.75	14.10	214°39.89	20.51	Sabik	102°2.00 -15°45.41	
21	232°12.48		180°13.06	· · 7.27	73°31.58	· · 4.80	137°29.59	· · 14.09	229°42.30	· · 20.50	Shaula	96°9.42 -37°7.36	
22	247°14.94		195°12.80	7.96	88°32.70	4.24	152°31.43	14.07	244°44.70	20.49	Rasalhague	95°57.84 12°32.49	
23	262°17.41		210°12.53	8.65	103°33.82	3.67	167°33.28	14.06	259°47.11	20.47	Eltanin	90°41.46 51°29.11	
Mer.pass. 05:34		ν-0.3' d0.7' m-4.16		ν1.1' d-0.6' m1.48		ν1.8' d-0.0' m-1.89		ν2.4' d-0.0' m0.97					
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	277°19.87		225°12.26	N16°9.34	118°34.94	N10°3.11	182°35.12	N23°14.04	274°49.51	S01°20.46	Kaus Aust.	83°31.58 -34°22.33	
1	292°22.34		240°11.99	10.04	133°36.05	2.54	197°36.96	14.03	289°51.92	20.45	Vega	80°32.52 38°48.39	
2	307°24.80		255°11.73	10.73	148°37.17	1.98	212°38.81	14.01	304°54.32	20.44	Nunki	75°46.90 -26°15.86	
3	322°27.26		270°11.46	· · 11.42	163°38.29	· · 1.41	227°40.65	· · 14.00	319°56.73	· · 20.42	Altair	61°59.26 8°56.12	
4	337°29.73		285°11.19	12.11	178°39.41	0.84	242°42.50	13.98	334°59.13	20.41	Peacock	53°4.57 -56°39.01	
5	352°32.19		300°10.92	12.80	193°40.53	10°0.28	257°44.34	13.97	350°1.54	20.40	Deneb	49°25.15 45°22.13	
6	7°34.66		315°10.65	N16°13.49	208°41.64	N09°59.71	272°46.18	N23°13.95	5°3.95	S01°20.38	Enif	33°38.19 9°59.48	
7	22°37.12		330°10.38	14.18	223°42.76	59.14	287°48.03	13.94	20°6.35	20.37	Al Na'ir	27°32.14 -46°50.02	
8	37°39.59		345°10.10	14.87	238°43.88	58.58	302°49.87	13.92	35°8.76	20.36	Fomalhaut	15°13.93 -29°29.05	
9	52°42.05		0°9.83	· · 15.55	253°45.00	· · 58.01	317°51.71	· · 13.91	50°11.17	· · 20.35	Scheat	13°44.70 28°13.14	
10	67°44.51		15°9.56	16.24	268°46.12	57.44	332°53.56	13.89	65°13.57	20.33	Markab	13°29.39 15°20.49	
11	82°46.98		30°9.28	16.93	283°47.23	56.87	347°55.40	13.88	80°15.98	20.32			

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.35	N23°19.14	156°1.43	6.1'	N24°53.87	-8.6'	58.7'
1	194°14.21	19.04	170°26.55	6.3'	24°45.24	-8.8'	58.6'
2	209°14.08	18.94	184°51.81	6.4'	24°36.46	-8.9'	58.6'
3	224°13.95	•• 18.84	199°17.20	6.5'	24°27.55	-9.1'	58.6'
4	239°13.82	18.73	213°42.72	6.7'	24°18.49	-9.2'	58.6'
5	254°13.69	18.63	228°8.37	6.8'	24°9.30	-9.3'	58.5'
6	269°13.56	N23°18.52	242°34.15	6.9'	N23°59.97	-9.5'	58.5'
7	284°13.43	18.42	257°0.07	7.0'	23°50.51	-9.6'	58.5'
8	299°13.30	18.31	271°26.11	7.2'	23°40.91	-9.7'	58.4'
9	314°13.17	•• 18.20	285°52.30	7.3'	23°31.18	-9.9'	58.4'
10	329°13.04	18.09	300°18.61	7.4'	23°21.33	-10.0'	58.4'
11	344°12.91	17.99	314°45.06	7.6'	23°11.35	-10.1'	58.3'
12	359°12.78	N23°17.88	329°11.64	7.7'	N23°1.24	-10.2'	58.3'
13	14°12.65	17.77	343°38.35	7.8'	22°51.02	-10.3'	58.3'
14	29°12.52	17.66	358°5.20	8.0'	22°40.67	-10.5'	58.2'
15	44°12.39	•• 17.54	12°32.19	8.1'	22°30.20	-10.6'	58.2'
16	59°12.26	17.43	26°59.30	8.3'	22°19.62	-10.7'	58.1'
17	74°12.13	17.32	41°26.55	8.4'	22°8.92	-10.8'	58.1'
18	89°12.00	N23°17.21	55°53.94	8.5'	N21°58.11	-10.9'	58.1'
19	104°11.87	17.09	70°21.45	8.6'	21°47.19	-11.0'	58.0'
20	119°11.74	16.98	84°49.10	8.8'	21°36.17	-11.1'	58.0'
21	134°11.61	•• 16.86	99°16.88	8.9'	21°25.03	-11.2'	58.0'
22	149°11.48	16.74	113°44.80	9.0'	21°13.79	-11.3'	57.9'
23	164°11.35	16.63	128°12.84	9.2'	21°2.45	-11.4'	57.9'
SD = 15.7'		$d = -0.1'$	SD = 16.0'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.22	N23°16.51	142°41.02	9.3'	N20°51.01	-11.5'	57.9'
1	194°11.09	16.39	157°9.33	9.4'	20°39.46	-11.6'	57.8'
2	209°10.96	16.27	171°37.77	9.6'	20°27.82	-11.7'	57.8'
3	224°10.83	•• 16.15	186°6.34	9.7'	20°16.09	-11.8'	57.8'
4	239°10.71	16.03	200°35.03	9.8'	20°4.26	-11.9'	57.7'
5	254°10.58	15.91	215°3.86	10.0'	19°52.34	-12.0'	57.7'
6	269°10.45	N23°15.79	229°32.81	10.1'	N19°40.33	-12.1'	57.7'
7	284°10.32	15.66	244°1.89	10.2'	19°28.23	-12.2'	57.6'
8	299°10.19	15.54	258°31.10	10.3'	19°16.05	-12.3'	57.6'
9	314°10.06	•• 15.42	273°0.43	10.5'	19°3.78	-12.4'	57.6'
10	329°9.93	15.29	287°29.89	10.6'	18°51.43	-12.4'	57.5'
11	344°9.81	15.16	301°59.47	10.7'	18°39.00	-12.5'	57.5'
12	359°9.68	N23°15.04	316°29.18	10.8'	N18°26.49	-12.6'	57.5'
13	14°9.55	14.91	330°59.00	10.9'	18°13.90	-12.7'	57.4'
14	29°9.42	14.78	345°28.95	11.1'	18°1.24	-12.7'	57.4'
15	44°9.29	•• 14.66	359°59.02	11.2'	17°48.50	-12.8'	57.3'
16	59°9.17	14.53	14°29.21	11.3'	17°35.69	-12.9'	57.3'
17	74°9.04	14.40	28°59.51	11.4'	17°22.81	-12.9'	57.3'
18	89°8.91	N23°14.27	43°29.93	11.5'	N17°9.86	-13.0'	57.2'
19	104°8.78	14.13	58°0.47	11.7'	16°56.85	-13.1'	57.2'
20	119°8.66	14.00	72°31.13	11.8'	16°43.76	-13.1'	57.2'
21	134°8.53	•• 13.87	87°1.90	11.9'	16°30.62	-13.2'	57.1'
22	149°8.40	13.74	101°32.78	12.0'	16°17.41	-13.3'	57.1'
23	164°8.28	13.60	116°3.77	12.1'	16°4.14	-13.3'	57.1'
SD = 15.7'		$d = -0.1'$	SD = 15.8'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°8.15	N23°13.47	130°34.88	12.2'	N15°50.81	-13.4'	57.0'
1	194°8.02	13.33	145°6.09	12.3'	15°37.42	-13.4'	57.0'
2	209°7.90	13.19	159°37.42	12.4'	15°23.98	-13.5'	57.0'
3	224°7.77	•• 13.06	174°8.85	12.5'	15°10.48	-13.6'	56.9'
4	239°7.64	12.92	188°40.39	12.6'	14°56.93	-13.6'	56.9'
5	254°7.52	12.78	203°12.03	12.7'	14°43.33	-13.7'	56.9'
6	269°7.39	N23°12.64	217°43.77	12.8'	N14°29.68	-13.7'	56.8'
7	284°7.26	12.50	232°15.62	12.9'	14°15.97	-13.8'	56.8'
8	299°7.14	12.36	246°47.57	13.1'	14°2.22	-13.8'	56.8'
9	314°7.01	•• 12.22	261°19.62	13.1'	13°48.43	-13.8'	56.7'
10	329°6.89	12.08	275°51.77	13.2'	13°34.59	-13.9'	56.7'
11	344°6.76	11.94	290°24.02	13.3'	13°20.70	-13.9'	56.7'
12	359°6.63	N23°11.79	304°56.36	13.4'	N13°6.77	-14.0'	56.6'
13	14°6.51	11.65	319°28.80	13.5'	12°52.81	-14.0'	56.6'
14	29°6.38	11.50	334°1.33	13.6'	12°38.80	-14.0'	56.6'
15	44°6.26	•• 11.36	348°33.96	13.7'	12°24.76	-14.1'	56.5'
16	59°6.13	11.21	3°6.67	13.8'	12°10.68	-14.1'	56.5'
17	74°6.01	11.06	17°39.48	13.9'	11°56.56	-14.2'	56.5'
18	89°5.88	N23°10.92	32°12.37	14.0'	N11°42.41	-14.2'	56.4'
19	104°5.76	10.77	46°45.35	14.1'	11°28.22	-14.2'	56.4'
20	119°5.63	10.62	61°18.42	14.2'	11°14.01	-14.2'	56.4'
21	134°5.51	•• 10.47	75°51.57	14.2'	10°59.76	-14.3'	56.3'
22	149°5.38	10.32	90°24.80	14.3'	10°45.49	-14.3'	56.3'
23	164°5.26	10.17	104°58.12	14.4'	10°31.18	-14.3'	56.3'
SD = 15.7'		$d = -0.1'$	SD = 15.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:37	22:29	////	////
62°	////	////	02:14	21:52	////	////
60°	////	00:57	02:40	21:27	23:08	////
N 58°	////	01:45	03:00	21:07	22:21	////
56°	////	02:14	03:16	20:50	21:52	////
54°	00:53	02:36	03:30	20:36	21:30	23:13
52°	01:37	02:54	03:43	20:24	21:12	22:29
50°	02:04	03:09	03:53	20:13	20:57	22:02
45°	02:49	03:38	04:16	19:51	20:28	21:17
N 40°	03:19	04:01	04:34	19:33	20:06	20:47
35°	03:42	04:19	04:49	19:18	19:48	20:24
30°	04:01	04:34	05:01	19:05	19:33	20:06
20°	04:30	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:15
0°	05:11	05:37	06:00	18:07	18:30	18:56
S 10°	05:28	05:54	06:17	17:50	18:13	18:39
20°	05:44	06:11	06:35	17:31	17:55	18:23
30°	06:00	06:30	06:56	17:10	17:37	18:06
35°	06:09	06:41	07:09	16:58	17:26	17:58
40°	06:18	06:52	07:23	16:44	17:14	17:49
45°	06:29	07:06	07:40	16:27	17:01	17:38
S 50°	06:40	07:22	08:00	16:07	16:45	17:27
52°	06:45	07:29	08:10	15:57	16:38	17:21
54°	06:51	07:37	08:21	15:46	16:30	17:16
56°	06:57	07:46	08:33	15:33	16:21	17:10
58°	07:04	07:56	08:48	15:19	16:11	17:03
S 60°	07:11	08:08	09:05	15:02	15:59	16:56

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°			06:01			01:13
N 70°			06:33			00:39
68°		04:25	06:56		01:03	00:14 23:47
66°		05:05	07:14		00:21 23:55	23:37
64°	03:13	05:33	07:29	00:19 23:53	23:39	23:28
62°	03:55	05:54	07:41	23:31	23:26	23:21
60°	04:23	06:11	07:51	23:13	23:14	23:14
N 58°	04:45	06:25	07:59	22:58	23:04	23:08
56°	05:02	06:37	08:07	22:45	22:56	23:03
54°	05:17	06:48	08:14	22:34	22:48	22:59
52°	05:30	06:57	08:20	22:24	22:41	22:54
50°	05:42	07:05	08:26	22:15	22:35	22:50
45°	06:05	07:23	08:37	21:55	22:21	22:42
N 40°	06:24	07:37	08:47	21:40	22:10	22:35
35°	06:40	07:49	08:55	21:27	22:00	22:29
30°	06:53	08:00	09:03	21:15	21:52	22:23
20°	07:16	08:18	09:15	20:55	21:37	22:14
N 10°	07:36	08:34	09:26	20:37	21:24	22:06
0°	07:55	08:48	09:36	20:21	21:12	21:58
S 10°	08:13	09:03	09:46	20:04	20:59	21:50
20°	08:33	09:18	09:57	19:46	20:46	21:41
30°	08:55	09:36	10:09	19:26	20:31	21:31
35°	09:09	09:46	10:16	19:13	20:22	21:26
40°	09:24	09:57	10:24	18:59	20:11	21:19
45°	09:42	10:11	10:34	18:43	19:59	21:12
S 50°	10:04	10:27	10:45	18:22	19:44	21:02
52°	10:14	10:35	10:50	18:12	19:37	20:58
54°	10:26	10:44	10:55	18:00	19:29	20:53
56°	10:40	10:53	11:02	17:47	19:21	20:48
58°	10:56	11:04	11:09	17:32	19:11	20:42
S 60°	11:14	11:16	11:17	17:14	18:59	20:35

Day	Sun		Mer. Pass hh:mm	Moon		Age 2-4 3-15%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
27	03:03	03:09	12:03	14:08	01:40	

June 30, 01, 02 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°19.01		225°5.67	N16°25.83	119°1.76	N09°49.49	183°19.37	N23°13.67	275°47.28	S01°20.17
1	293°21.47		240°5.39	26.51	134°2.88	48.92	198°21.22	13.66	290°49.69	20.16
2	308°23.94		255°5.11	27.19	149°3.99	48.35	213°23.06	13.64	305°52.10	20.14
3	323°26.40		270°4.82	•• 27.87	164°5.11	•• 47.78	228°24.91	•• 13.63	320°54.51	•• 20.13
4	338°28.87		285°4.54	28.55	179°6.23	47.21	243°26.75	13.61	335°56.92	20.12
5	353°31.33		300°4.25	29.23	194°7.34	46.64	258°28.60	13.60	350°59.33	20.11
6	8°33.80		315°3.97	N16°29.91	209°8.46	N09°46.07	273°30.44	N23°13.58	6°1.74	S01°20.10
7	23°36.26		330°3.68	30.59	224°9.58	45.50	288°32.28	13.56	21°4.15	20.09
8	38°38.72		345°3.40	31.26	239°10.69	44.93	303°34.13	13.55	36°6.56	20.08
9	53°41.19		0°3.11	•• 31.94	254°11.81	•• 44.36	318°35.97	•• 13.53	51°8.97	•• 20.07
10	68°43.65		15°2.82	32.62	269°12.92	43.79	333°37.82	13.51	66°11.38	20.06
11	83°46.12		30°2.53	33.30	284°14.04	43.22	348°39.66	13.50	81°13.79	20.04
12	98°48.58		45°2.24	N16°33.97	299°15.16	N09°42.65	3°41.51	N23°13.48	96°16.21	S01°20.03
13	113°51.04		60°1.96	34.65	314°16.27	42.08	18°43.35	13.47	111°18.62	20.02
14	128°53.51		75°1.67	35.32	329°17.39	41.51	33°45.19	13.45	126°21.03	20.01
15	143°55.97		90°1.38	•• 36.00	344°18.51	•• 40.94	48°47.04	•• 13.43	141°23.44	•• 20.00
16	158°58.44		105°1.08	36.67	359°19.62	40.37	63°48.88	13.42	156°25.85	19.99
17	174°0.90		120°0.79	37.35	14°20.74	39.80	78°50.73	13.40	171°28.26	19.98
18	189°3.36		135°0.50	N16°38.02	29°21.85	N09°39.23	93°52.57	N23°13.38	186°30.67	S01°19.97
19	204°5.83		150°0.21	38.69	44°22.97	38.65	108°54.42	13.37	201°33.09	19.96
20	219°8.29		164°59.91	39.37	59°24.08	38.08	123°56.26	13.35	216°35.50	19.95
21	234°10.76		179°59.62	•• 40.04	74°25.20	•• 37.51	138°58.11	•• 13.33	231°37.91	•• 19.94
22	249°13.22		194°59.32	40.71	89°26.32	36.94	153°59.95	13.32	246°40.32	19.93
23	264°15.68		209°59.03	41.38	104°27.43	36.37	169°1.79	13.30	261°42.74	19.92
Mer.pass. 05:26		ν -0.3' d0.7' m-4.15		ν 1.1' d-0.6' m1.49		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.96		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°18.15		224°58.73	N16°42.05	119°28.55	N09°35.80	184°3.64	N23°13.28	276°45.15	S01°19.91
1	294°20.61		239°58.44	42.72	134°29.66	35.22	199°5.48	13.27	291°47.56	19.90
2	309°23.08		254°58.14	43.39	149°30.78	34.65	214°7.33	13.25	306°49.97	19.89
3	324°25.54		269°57.84	•• 44.06	164°31.89	•• 34.08	229°9.17	•• 13.23	321°52.39	•• 19.88
4	339°28.01		284°57.54	44.73	179°33.01	33.51	244°11.02	13.22	336°54.80	19.87
5	354°30.47		299°57.24	45.40	194°34.12	32.93	259°12.86	13.20	351°57.22	19.86
6	9°32.93		314°56.95	N16°46.07	209°35.24	N09°32.36	274°14.71	N23°13.18	6°59.63	S01°19.85
7	24°35.40		329°56.64	46.74	224°36.35	31.79	289°16.55	13.17	22°2.04	19.85
8	39°37.86		344°56.34	47.40	239°37.47	31.22	304°18.40	13.15	37°4.46	19.84
9	54°40.33		359°56.04	•• 48.07	254°38.58	•• 30.64	319°20.24	•• 13.13	52°6.87	•• 19.83
10	69°42.79		14°55.74	48.74	269°39.70	30.07	334°22.09	13.11	67°9.29	19.82
11	84°45.25		29°55.44	49.40	284°40.81	29.50	349°23.93	13.10	82°11.70	19.81
12	99°47.72		44°55.14	N16°50.07	299°41.93	N09°28.92	4°25.78	N23°13.08	97°14.11	S01°19.80
13	114°50.18		59°54.83	50.73	314°43.04	28.35	19°27.62	13.06	112°16.53	19.79
14	129°52.65		74°54.53	51.39	329°44.16	27.78	34°29.47	13.05	127°18.94	19.78
15	144°55.11		89°54.22	•• 52.06	344°45.27	•• 27.20	49°31.31	•• 13.03	142°21.36	•• 19.77
16	159°57.57		104°53.92	52.72	359°46.39	26.63	64°33.16	13.01	157°23.78	19.76
17	175°0.04		119°53.61	53.38	14°47.50	26.05	79°35.00	12.99	172°26.19	19.76
18	190°2.50		134°53.30	N16°54.05	29°48.62	N09°25.48	94°36.85	N23°12.98	187°28.61	S01°19.75
19	205°4.97		149°53.00	54.71	44°49.73	24.91	109°38.69	12.96	202°31.02	19.74
20	220°7.43		164°52.69	55.37	59°50.85	24.33	124°40.54	12.94	217°33.44	19.73
21	235°9.89		179°52.38	•• 56.03	74°51.96	•• 23.76	139°42.38	•• 12.92	232°35.85	•• 19.72
22	250°12.36		194°52.07	56.69	89°53.07	23.18	154°44.23	12.91	247°38.27	19.71
23	265°14.82		209°51.76	57.35	104°54.19	22.61	169°46.07	12.89	262°40.69	19.71
Mer.pass. 05:22		ν -0.3' d0.7' m-4.14		ν 1.1' d-0.6' m1.49		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.96		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°17.29		224°51.45	N16°58.01	119°55.30	N09°22.03	184°47.92	N23°12.87	277°43.10	S01°19.70
1	295°19.75		239°51.14	58.67	134°56.42	21.46	199°49.76	12.85	292°45.52	19.69
2	310°22.21		254°50.83	16°59.33	149°57.53	20.88	214°51.61	12.83	307°47.94	19.68
3	325°24.68		269°50.52	16°59.99	164°58.64	•• 20.31	229°53.45	•• 12.82	322°50.35	•• 19.67
4	340°27.14		284°50.20	0.64	179°59.76	19.73	244°55.30	12.80	337°52.77	19.67
5	355°29.61		299°49.89	1.30	195°0.87	19.16	259°57.14	12.78	352°55.19	19.66
6	10°32.07		314°49.58	N17°1.96	210°1.99	N09°18.58	274°58.99	N23°12.76	7°57.61	S01°19.65
7	25°34.54		329°49.26	2.61	225°3.10	18.01	290°0.83	12.74	23°0.02	19.64
8	40°37.00		344°48.95	3.27	240°4.21	17.43	305°2.68	12.73	38°2.44	19.64
9	55°39.46		359°48.63	•• 3.92	255°5.33	•• 16.85	320°4.52	•• 12.71	53°4.86	•• 19.63
10	70°41.93		14°48.32	4.58	270°6.44	16.28	335°6.37	12.69	68°7.28	19.62
11	85°44.39		29°48.00	5.23	285°7.55	15.70	350°8.21	12.67	83°9.70	19.61
12	100°46.86		44°47.68	N17°5.88	300°8.67	N09°15.13	5°10.06	N23°12.65	98°12.12	S01°19.61
13	115°49.32		59°47.36	6.54	315°9.78	14.55	20°11.91	12.64	113°14.53	19.60
14	130°51.78		74°47.05	7.19	330°10.89	13.97	35°13.75	12.62	128°16.95	19.59
15	145°54.25		89°46.73	•• 7.84	345°12.01	•• 13.40	50°15.60	•• 12.60	143°19.37	•• 19.58
16	160°56.71		104°46.41	8.49	0°13.12	12.82	65°17.44	12.58	158°21.79	19.58
17	175°59.18		119°46.09	9.14	15°14.23	12.24	80°19.29	12.56	173°24.21	19.57
18	191°1.64		134°45.77	N17°9.79	30°15.35	N09°11.67	95°21.13	N23°12.54	188°26.63	S01°19.56
19	206°4.10		149°45.44	10.44	45°16.46	11.09	110°22.98	12.53	203°29.05	19.56
20	221°6.57		164°45.12	11.09	60°17.57	10.51	125°24.82	12.51	218°31.47	19.55
21	236°9.03		179°44.80	•• 11.74	75°18.69	•• 9.93	140°26.67	•• 12.49	233°33.89	•• 19.54
22	251°11.50		194°44.48	12.39	90°19.80	9.36	155°28.52	12.47	248°36.31	19.54
23	266°13.96		209°44.15	13.04	105°20.91	8.78	170°30.36	12.45	263°38.73	19.53
Mer.pass. 05:18		ν -0.3' d0.7' m-4.13		ν 1.1' d-0.6' m1.50		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.95		

	SHA	Dec
Alpheratz	357°34.32	29°13.75
Ankaa	353°6.72	-42°9.77
Schedar	349°30.62	56°40.38
Diphda	348°46.91	-17°50.65
Achernar	335°20.04	-57°6.12
Hamal	327°50.89	23°34.90
Polaris	314°8.34	89°22.02
Acamar	315°11.72	-40°11.91
Menkar	314°5.93	4°11.41
Mirfak	308°28.04	49°56.93
Aldebaran	290°39.47	-16°33.62
Rigel	281°3.81	-8°10.26
Capella	280°21.76	46°1.34
Bellatrix	278°22.78	6°22.40
Elnath	278°1.73	28°37.71
Alnilam	275°37.65	-1°11.09
Betelgeuse	270°51.99	7°24.74
Canopus	263°52.78	-52°42.46
Sirius	258°26.24	-16°45.02
Adhara	255°5.94	-29°0.36
Procyon	244°50.75	5°9.62
Pollux	243°17.18	27°57.94
Avior	234°15.19	-59°35.54
Suhail	222°46.40	-43°32.23
Miaplacidus	221°38.99	-69°49.46
Alphard	217°47.62	-8°46.16
Regulus	207°34.22	11°50.62
Dubhe	193°40.77	61°37.08
Denebola	182°24.61	14°25.86
Gemah	175°43.21	-17°41.11
Acrux	172°59.71	-63°14.73
Gacrux	171°51.23	-57°15.65
Alioth	166°12.55	55°49.55
Spica	158°21.81	-11°17.73
Alkaid	152°51.51	49°11.37
Hadar	148°35.19	-60°30.03
Menkent	147°56.99	-36°29.91
Arcturus	145°47.39	19°3.06
Rigel Kent.	139°39.42	-60°56.70
Kochab	137°19.09	74°3.24
Zuben'ubi	136°55.38	-16°8.94
Alphecca	126°3.13	26°37.81
Antares	112°15.02	-26°29.38
Atria	107°8.36	-69°4.51
Sabik	102°2.00	-15°45.41
Shaula	96°9.42	-37°7.37
Rasalhague	95°57.84	12°32.50
Eltanin	90°41.46	51°29.12
Kaus Aust.	83°31.57	-34°22.33
Vega	80°32.52	38°48.40
Nunki	75°46.89	-26°15.86
Altair	61°59.25	8°56.13
Peacock	53°4.54	-56°39.02
Deneb	49°25.13	45°22.14
Enif	33°38.18	9

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°5.13	N23°10.02	119°31.52	14.5'	N10°16.85	-14.4'	56.2'
1	194°5.01	9.86	134°4.99	14.6'	10°2.49	-14.4'	56.2'
2	209°4.89	9.71	148°38.55	14.6'	09°48.11	-14.4'	56.2'
3	224°4.76	· · 9.56	163°12.18	14.7'	09°33.71	-14.4'	56.1'
4	239°4.64	9.40	177°45.89	14.8'	09°19.28	-14.4'	56.1'
5	254°4.51	9.25	192°19.67	14.9'	09°4.83	-14.5'	56.1'
6	269°4.39	N23°9.09	206°53.52	14.9'	N08°50.36	-14.5'	56.0'
7	284°4.27	8.93	221°27.44	15.0'	08°35.87	-14.5'	56.0'
8	299°4.14	8.78	236°1.44	15.1'	08°21.37	-14.5'	56.0'
9	314°4.02	· · 8.62	250°35.50	15.1'	08°6.84	-14.5'	55.9'
10	329°3.90	8.46	265°9.63	15.2'	07°52.30	-14.6'	55.9'
11	344°3.77	8.30	279°43.82	15.3'	07°37.75	-14.6'	55.9'
12	359°3.65	N23°8.14	294°18.08	15.3'	N07°23.18	-14.6'	55.8'
13	14°3.53	7.98	308°52.40	15.4'	07°8.60	-14.6'	55.8'
14	29°3.40	7.82	323°26.79	15.4'	06°54.00	-14.6'	55.8'
15	44°3.28	· · 7.65	338°1.23	15.5'	06°39.40	-14.6'	55.8'
16	59°3.16	7.49	352°35.74	15.6'	06°24.78	-14.6'	55.7'
17	74°3.04	7.33	7°10.30	15.6'	06°10.16	-14.6'	55.7'
18	89°2.91	N23°7.16	21°44.91	15.7'	N05°55.53	-14.6'	55.7'
19	104°2.79	7.00	36°19.59	15.7'	05°40.89	-14.6'	55.6'
20	119°2.67	6.83	50°54.31	15.8'	05°26.24	-14.7'	55.6'
21	134°2.55	· · 6.66	65°29.09	15.8'	05°11.59	-14.7'	55.6'
22	149°2.43	6.50	80°3.92	15.9'	04°56.93	-14.7'	55.6'
23	164°2.31	6.33	94°38.80	15.9'	04°42.27	-14.7'	55.5'
SD = 15.7' $d = -0.2'$			SD = 15.3'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°2.18	N23°6.16	109°13.73	16.0'	N04°27.61	-14.7'	55.5'
1	194°2.06	5.99	123°48.70	16.0'	04°12.95	-14.7'	55.5'
2	209°1.94	5.82	138°23.72	16.1'	03°58.28	-14.7'	55.4'
3	224°1.82	· · 5.65	152°58.79	16.1'	03°43.62	-14.7'	55.4'
4	239°1.70	5.48	167°33.90	16.1'	03°28.95	-14.7'	55.4'
5	254°1.58	5.31	182°9.04	16.2'	03°14.29	-14.7'	55.4'
6	269°1.46	N23°5.13	196°44.23	16.2'	N02°59.62	-14.7'	55.3'
7	284°1.34	4.96	211°19.46	16.3'	02°44.97	-14.7'	55.3'
8	299°1.22	4.79	225°54.73	16.3'	02°30.31	-14.6'	55.3'
9	314°1.09	· · 4.61	240°30.03	16.3'	02°15.66	-14.6'	55.3'
10	329°0.97	4.43	255°5.37	16.4'	02°1.02	-14.6'	55.2'
11	344°0.85	4.26	269°40.74	16.4'	01°46.38	-14.6'	55.2'
12	359°0.73	N23°4.08	284°16.15	16.4'	N01°31.75	-14.6'	55.2'
13	14°0.61	3.90	298°51.59	16.5'	01°17.13	-14.6'	55.2'
14	29°0.49	3.72	313°27.05	16.5'	01°2.51	-14.6'	55.1'
15	44°0.37	· · 3.55	328°2.55	16.5'	00°47.91	-14.6'	55.1'
16	59°0.25	3.37	342°38.07	16.5'	00°33.31	-14.6'	55.1'
17	74°0.14	3.19	357°13.62	16.6'	00°18.73	-14.6'	55.1'
18	89°0.02	N23°3.00	11°49.19	16.6'	N00°4.15	-14.6'	55.0'
19	103°59.90	2.82	26°24.79	16.6'	S00°10.41	14.5'	55.0'
20	118°59.78	2.64	41°0.41	16.6'	00°24.96	14.5'	55.0'
21	133°59.66	· · 2.46	55°36.05	16.7'	00°39.49	14.5'	55.0'
22	148°59.54	2.27	70°11.71	16.7'	00°54.01	14.5'	55.0'
23	163°59.42	2.09	84°47.39	16.7'	01°8.51	14.5'	54.9'
SD = 15.7' $d = -0.2'$			SD = 15.1'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°59.30	N23°1.90	99°23.09	16.7'	S01°23.00	14.5'	54.9'
1	193°59.18	1.71	113°58.80	16.7'	01°37.47	14.5'	54.9'
2	208°59.07	1.53	128°34.53	16.7'	01°51.93	14.4'	54.9'
3	223°58.95	· · 1.34	143°10.27	16.8'	02°6.36	14.4'	54.9'
4	238°58.83	1.15	157°46.02	16.8'	02°20.78	14.4'	54.8'
5	253°58.71	0.96	172°21.79	16.8'	02°35.18	14.4'	54.8'
6	268°58.59	N23°0.77	186°57.56	16.8'	S02°49.56	14.4'	54.8'
7	283°58.48	0.58	201°33.35	16.8'	03°3.91	14.3'	54.8'
8	298°58.36	0.39	216°9.14	16.8'	03°18.25	14.3'	54.8'
9	313°58.24	· · 0.20	230°44.94	16.8'	03°32.56	14.3'	54.7'
10	328°58.12	23°0.01	245°20.74	16.8'	03°46.85	14.3'	54.7'
11	343°58.01	22°59.81	259°56.54	16.8'	04°1.12	14.2'	54.7'
12	358°57.89	N22°59.62	274°32.35	16.8'	S04°15.36	14.2'	54.7'
13	13°57.77	59.43	289°8.16	16.8'	04°29.58	14.2'	54.7'
14	28°57.66	59.23	303°43.97	16.8'	04°43.77	14.2'	54.6'
15	43°57.54	· · 59.03	318°19.78	16.8'	04°57.94	14.1'	54.6'
16	58°57.42	58.84	332°55.59	16.8'	05°12.08	14.1'	54.6'
17	73°57.31	58.64	347°31.40	16.8'	05°26.19	14.1'	54.6'
18	88°57.19	N22°58.44	2°7.20	16.8'	S05°40.28	14.1'	54.6'
19	103°57.07	58.24	16°42.99	16.8'	05°54.33	14.0'	54.6'
20	118°56.96	58.04	31°18.78	16.8'	06°8.36	14.0'	54.5'
21	133°56.84	· · 57.84	45°54.56	16.8'	06°22.36	14.0'	54.5'
22	148°56.73	57.64	60°30.33	16.8'	06°36.32	13.9'	54.5'
23	163°56.61	57.44	75°6.09	16.7'	06°50.25	13.9'	54.5'
SD = 15.7' $d = -0.2'$			SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	////	////	00:22	23:38	////	////
64°	////	////	01:42	22:25	////	////
62°	////	////	02:17	21:50	////	////
60°	////	01:04	02:42	21:25	23:02	////
N 58°	////	01:49	03:02	21:05	22:18	////
56°	////	02:17	03:19	20:49	21:50	////
54°	00:59	02:39	03:32	20:35	21:29	23:07
52°	01:40	02:56	03:45	20:23	21:11	22:27
50°	02:07	03:11	03:55	20:12	20:57	22:00
45°	02:51	03:40	04:17	19:50	20:27	21:17
N 40°	03:21	04:02	04:35	19:33	20:05	20:47
35°	03:44	04:20	04:50	19:18	19:48	20:24
30°	04:02	04:35	05:03	19:05	19:33	20:06
20°	04:31	05:00	05:24	18:44	19:08	19:37
N 10°	04:53	05:20	05:43	18:25	18:48	19:15
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	05:28	05:55	06:17	17:50	18:13	18:40
20°	05:44	06:12	06:36	17:32	17:56	18:24
30°	06:01	06:30	06:57	17:11	17:38	18:07
35°	06:09	06:41	07:09	16:59	17:27	17:59
40°	06:18	06:52	07:23	16:45	17:16	17:50
45°	06:28	07:06	07:39	16:29	17:03	17:40
S 50°	06:40	07:21	08:00	16:09	16:47	17:28
52°	06:45	07:29	08:09	15:59	16:40	17:23
54°	06:51	07:37	08:20	15:48	16:32	17:18
56°	06:57	07:45	08:32	15:36	16:23	17:12
58°	07:03	07:55	08:47	15:21	16:13	17:05
S 60°	07:10	08:07	09:04	15:04	16:01	16:58

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	08:33	10:39	12:39	00:15 23:38	23:05	22:32
N 70°	08:46	10:42	12:32	00:00 23:32	23:07	22:42
68°	08:56	10:44	12:27	23:27	23:08	22:50
66°	09:04	10:45	12:23	23:23	23:10	22:56
64°	09:11	10:47	12:19	23:19	23:11	23:02
62°	09:17	10:48	12:16	23:16	23:11	23:07
60°	09:23	10:49	12:13	23:13	23:12	23:11
N 58°	09:27	10:50	12:10	23:11	23:13	23:15
56°	09:31	10:51	12:08	23:09	23:13	23:18
54°	09:35	10:52	12:06	23:07	23:14	23:21
52°	09:38	10:53	12:05	23:05	23:14	23:24
50°	09:41	10:53	12:03	23:03	23:15	23:26
45°	09:48	10:55	11:59	23:00	23:16	23:32
N 40°	09:53	10:56	11:57	22:57	23:17	23:37
35°	09:58	10:57	11:54	22:54	23:17	23:41
30°	10:02	10:58	11:52	22:52	23:18	23:44
20°	10:09	10:59	11:48	22:48	23:19	23:50
N 10°	10:15	11:00	11:45	22:44	23:20	23:56
0°	10:20	11:02	11:42	22:40	23:21	· ·
S 10°	10:26	11:03	11:39	22:37	23:22	· ·
20°	10:32	11:04	11:36	22:33	23:23	· ·
30°	10:39	11:06	11:32	22:29	23:24	· ·
35°	10:43	11:07	11:30	22:26	23:24	· ·
40°	10:47	11:08	11:28	22:24	23:25	· ·
45°	10:52	11:09	11:25	22:20	23:26	· ·
S 50°	10:59	11:10	11:22	22:16	23:27	· ·
52°	11:01	11:11	11:20	22:14	23:27	· ·
54°	11:04	11:12	11:19	22:12	23:28	· ·
56°	11:08	11:13	11:17	22:10	23:28	· ·
58°	11:11	11:13	11:15	22:07	23:29	· ·
S 60°	11:16	11:14	11:13	22:05	23:30	· ·

Day	Sun		Mer. Pass hh:mm	Moon		Age 5-7 24-42%
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
30	03:39	03:45	12:04	16:30	04:09	
01	03:51	03:57	12:04	17:11	04:51	
02	04:03	04:08	12:04	17:51	05:31	

July 03, 04, 05 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281°16.42		224°43.83	N17°13.69	120°22.02	N09°8.20	185°32.21	N23°12.43	278°41.15	S01°19.52
1	296°18.89		239°43.50	14.33	135°23.14	7.62	200°34.05	12.41	293°43.57	19.52
2	311°21.35		254°43.18	14.98	150°24.25	7.05	215°35.90	12.39	308°45.99	19.51
3	326°23.82		269°42.85	•• 15.63	165°25.36	•• 6.47	230°37.74	•• 12.38	323°48.41	•• 19.50
4	341°26.28		284°42.52	16.27	180°26.47	5.89	245°39.59	12.36	338°50.83	19.50
5	356°28.75		299°42.20	16.92	195°27.59	5.31	260°41.44	12.34	353°53.26	19.49
6	11°31.21		314°41.87	N17°17.56	210°28.70	N09°4.73	275°43.28	N23°12.32	8°55.68	S01°19.49
7	26°33.67		329°41.54	18.20	225°29.81	4.15	290°45.13	12.30	23°58.10	19.48
8	41°36.14		344°41.21	18.85	240°30.92	3.58	305°46.97	12.28	39°0.52	19.47
9	56°38.60		359°40.88	•• 19.49	255°32.04	•• 3.00	320°48.82	•• 12.26	54°2.94	•• 19.47
10	71°41.07		14°40.55	20.13	270°33.15	2.42	335°50.67	12.24	69°5.36	19.46
11	86°43.53		29°40.22	20.77	285°34.26	1.84	350°52.51	12.22	84°7.79	19.46
12	101°45.99		44°39.89	N17°21.41	300°35.37	N09°1.26	5°54.36	N23°12.20	99°10.21	S01°19.45
13	116°48.46		59°39.55	22.06	315°36.48	0.68	20°56.20	12.19	114°12.63	19.45
14	131°50.92		74°39.22	22.70	330°37.60	09°0.10	35°58.05	12.17	129°15.05	19.44
15	146°53.39		89°38.89	•• 23.34	345°38.71	08°59.52	50°59.90	•• 12.15	144°17.48	•• 19.43
16	161°55.85		104°38.55	23.97	0°39.82	58.94	66°1.74	12.13	159°19.90	19.43
17	176°58.31		119°38.22	24.61	15°40.93	58.36	81°3.59	12.11	174°22.32	19.42
18	192°0.78		134°37.88	N17°25.25	30°42.04	N08°57.78	96°5.43	N23°12.09	189°24.75	S01°19.42
19	207°3.24		149°37.55	25.89	45°43.15	57.20	111°7.28	12.07	204°27.17	19.41
20	222°5.71		164°37.21	26.53	60°44.27	56.62	126°9.13	12.05	219°29.59	19.41
21	237°8.17		179°36.87	•• 27.16	75°45.38	•• 56.04	141°10.97	•• 12.03	234°32.02	•• 19.40
22	252°10.63		194°36.54	27.80	90°46.49	55.46	156°12.82	12.01	249°34.44	19.40
23	267°13.10		209°36.20	28.43	105°47.60	54.88	171°14.67	11.99	264°36.87	19.39
Mer.pass. 05:14		ν -0.3' d0.6' m-4.13		ν 1.1' d-0.6' m1.50		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.95		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°15.56		224°35.86	N17°29.07	120°48.71	N08°54.30	186°16.51	N23°11.97	279°39.29	S01°19.39
1	297°18.03		239°35.52	29.70	135°49.82	53.72	201°18.36	11.95	294°41.71	19.38
2	312°20.49		254°35.18	30.34	150°50.93	53.14	216°20.20	11.93	309°44.14	19.38
3	327°22.96		269°34.84	•• 30.97	165°52.05	•• 52.56	231°22.05	•• 11.91	324°46.56	•• 19.37
4	342°25.42		284°34.50	31.60	180°53.16	51.98	246°23.90	11.89	339°48.99	19.37
5	357°27.88		299°34.16	32.24	195°54.27	51.40	261°25.74	11.87	354°51.41	19.37
6	12°30.35		314°33.81	N17°32.87	210°55.38	N08°50.82	276°27.59	N23°11.85	9°53.84	S01°19.36
7	27°32.81		329°33.47	33.50	225°56.49	50.24	291°29.44	11.83	24°56.26	19.36
8	42°35.28		344°33.13	34.13	240°57.60	49.65	306°31.28	11.81	39°58.69	19.35
9	57°37.74		359°32.78	•• 34.76	255°58.71	•• 49.07	321°33.13	•• 11.79	55°1.12	•• 19.35
10	72°40.20		14°32.44	35.39	270°59.82	48.49	336°34.98	11.77	70°3.54	19.34
11	87°42.67		29°32.09	36.02	286°0.93	47.91	351°36.82	11.75	85°5.97	19.34
12	102°45.13		44°31.75	N17°36.65	301°2.04	N08°47.33	6°38.67	N23°11.73	100°8.39	S01°19.34
13	117°47.60		59°31.40	37.27	316°3.15	46.75	21°40.52	11.71	115°10.82	19.33
14	132°50.06		74°31.05	37.90	331°4.27	46.16	36°42.36	11.69	130°13.25	19.33
15	147°52.52		89°30.71	•• 38.53	346°5.38	•• 45.58	51°44.21	•• 11.67	145°15.67	•• 19.32
16	162°54.99		104°30.36	39.16	1°6.49	45.00	66°46.06	11.65	160°18.10	19.32
17	177°57.45		119°30.01	39.78	16°7.60	44.42	81°47.90	11.63	175°20.53	19.32
18	192°59.92		134°29.66	N17°40.41	31°8.71	N08°43.83	96°49.75	N23°11.61	190°22.95	S01°19.31
19	208°2.38		149°29.31	41.03	46°9.82	43.25	111°51.60	11.59	205°25.38	19.31
20	223°4.85		164°28.96	41.66	61°10.93	42.67	126°53.44	11.57	220°27.81	19.31
21	238°7.31		179°28.61	•• 42.28	76°12.04	•• 42.09	141°55.29	•• 11.55	235°30.24	•• 19.30
22	253°9.77		194°28.26	42.90	91°13.15	41.50	156°57.14	11.53	250°32.66	19.30
23	268°12.24		209°27.90	43.52	106°14.26	40.92	171°58.99	11.51	265°35.09	19.30
Mer.pass. 05:10		ν -0.3' d0.6' m-4.12		ν 1.1' d-0.6' m1.51		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.94		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°14.70		224°27.55	N17°44.15	121°15.37	N08°40.34	187°0.83	N23°11.49	280°37.52	S01°19.29
1	298°17.17		239°27.20	44.77	136°16.48	39.75	202°2.68	11.47	295°39.95	19.29
2	313°19.63		254°26.84	45.39	151°17.59	39.17	217°4.53	11.45	310°42.38	19.29
3	328°22.09		269°26.49	•• 46.01	166°18.70	•• 38.59	232°6.37	•• 11.43	325°44.81	•• 19.28
4	343°24.56		284°26.13	46.63	181°19.81	38.00	247°8.22	11.40	340°47.23	19.28
5	358°27.02		299°25.78	47.25	196°20.92	37.42	262°10.07	11.38	355°49.66	19.28
6	13°29.49		314°25.42	N17°47.87	211°22.03	N08°36.83	277°11.92	N23°11.36	10°52.09	S01°19.28
7	28°31.95		329°25.06	48.48	226°23.14	36.25	292°13.76	11.34	25°54.52	19.27
8	43°34.41		344°24.71	49.10	241°24.25	35.67	307°15.61	11.32	40°56.95	19.27
9	58°36.88		359°24.35	•• 49.72	256°25.35	•• 35.08	322°17.46	•• 11.30	55°59.38	•• 19.27
10	73°39.34		14°23.99	50.34	271°26.46	34.50	337°19.30	11.28	71°1.81	19.27
11	88°41.81		29°23.63	50.95	286°27.57	33.91	352°21.15	11.26	86°4.24	19.26
12	103°44.27		44°23.27	N17°51.57	301°28.68	N08°33.33	7°23.00	N23°11.24	101°6.67	S01°19.26
13	118°46.74		59°22.91	52.18	316°29.79	32.74	22°24.85	11.22	116°9.10	19.26
14	133°49.20		74°22.55	52.80	331°30.90	32.16	37°26.69	11.19	131°11.53	19.26
15	148°51.66		89°22.19	•• 53.41	346°32.01	•• 31.57	52°28.54	•• 11.17	146°13.96	•• 19.25
16	163°54.13		104°21.82	54.02	1°33.12	30.99	67°30.39	11.15	161°16.39	19.25
17	178°56.59		119°21.46	54.63	16°34.23	30.40	82°32.24	11.13	176°18.82	19.25
18	193°59.06		134°21.10	N17°55.25	31°35.34	N08°29.82	97°34.08	N23°11.11	191°21.25	S01°19.25
19	209°1.52		149°20.73	55.86	46°36.45	29.23	112°35.93	11.09	206°23.68	19.25
20	224°3.98		164°20.37	56.47	61°37.55	28.65	127°37.78	11.07	221°26.12	19.25
21	239°6.45		179°20.00	•• 57.08	76°38.66	•• 28.06	142°39.63	•• 11.05	236°28.55	•• 19.24
22	254°8.91		194°19.64	57.69	91°39.77	27.48	157°41.47	11.02	251°30.98	19.24
23	269°11.38		209°19.27	58.30	106°40.88	26.89	172°43.32	11.00	266°33.41	19.24
Mer.pass. 05:06		ν -0.4' d0.6' m-4.12		ν 1.1' d-0.6' m1.51		ν 1.8' d-0.0' m-1.89		ν 2.4' d-0.0' m0.94		

	Stars	
	SHA	Dec
Alpheratz	357°34.30	29°13.76
Ankaa	353°6.70	-42°9.77
Schedar	349°30.59	56°40.39
Diphda	348°46.89	-17°50.65
Achernar	335°20.01	-57°6.11
Hamal	327°50.87	23°34.90
Polaris	314°7.03	89°22.01
Acamar	315°11.70	-40°11.90
Menkar	314°5.92	4°11.42
Mirfak	308°28.02	49°56.93
Aldebaran	290°39.46	16°33.62
Rigel	281°3.80	-8°10.25
Capella	280°21.75	46°1.34
Bellatrix	278°22.77	6°22.40
Elmath	278°1.72	28°37.71
Alnilam	275°37.64	-1°11.08
Betelgeuse	270°51.98	7°24.74
Canopus	263°52.77	-52°42.45
Sirius	258°26.24	-16°45.01
Adhara	255°5.94	-29°0.35
Procyon	244°50.75	5°9.62
Pollux	243°17.18	27°57.93
Avior	234°15.20	-59°35.53
Suhail	222°46.41	-43°32.22
Miaplacidus	221°39.02	-69°49.45
Alphard	217°47.62	-8°46.15
Regulus	207°34.23	11°50.63
Dubhe	193°40.80	61°37.07
Denebola	182°24.62	14°25.86
Gienah	175°43.22	-17°41.11
Acrux	172°59.74	-63°14.73
Gacrux	171°51.26	-57°15.65
Alioth	166°12.57	55°49.55
Spica	158°21.82	-11°17.73
Alkaid	152°51.53	49°11.38
Hadar	148°35.22	-60°30.03
Menkent	147°57.00	-36°29.91
Arcturus	145°47.40	19°3.07
Rigel Kent.	139°39.44	-60°56.70
Kochab	137°19.14	74°3.24
Zuben'ubi	136°55.39	-16°8.94
Alphecca	126°3.14	26°37.82
Antares	112°15.03	-26°29.38
Atria	107°8.38	-69°4.52
Sabik	102°2.00	-15°45.41
Shaula	96°9.42	-37°7.37
Rasalhague	95°57.84	12°32.51
Eltanin	90°41.46	51°29.14
Kaus Aust.	83°31.57	-34°22.33
Vega	80°32.52	38°48.42
Nunki	75°46.88	-26°15.86
Altair	61°59.24	8°56.14
Peacock	53°4.53	-56°39.0

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.50	N22°57.24	89°41.83	16.7'	S07°4.16	13.9'	54.5'
1	193°56.38	57.04	104°17.57	16.7'	07°18.02	13.8'	54.5'
2	208°56.27	56.83	118°53.29	16.7'	07°31.86	13.8'	54.5'
3	223°56.15	· · 56.63	133°29.00	16.7'	07°45.66	13.8'	54.4'
4	238°56.04	56.42	148°4.69	16.7'	07°59.43	13.7'	54.4'
5	253°55.92	56.22	162°40.36	16.7'	08°13.16	13.7'	54.4'
6	268°55.81	N22°56.01	177°16.02	16.6'	S08°26.86	13.7'	54.4'
7	283°55.69	55.80	191°51.66	16.6'	08°40.51	13.6'	54.4'
8	298°55.58	55.60	206°27.27	16.6'	08°54.14	13.6'	54.4'
9	313°55.46	· · 55.39	221°2.86	16.6'	09°7.72	13.5'	54.4'
10	328°55.35	55.18	235°38.44	16.5'	09°21.26	13.5'	54.4'
11	343°55.24	54.97	250°13.98	16.5'	09°34.77	13.5'	54.3'
12	358°55.12	N22°54.76	264°49.50	16.5'	S09°48.24	13.4'	54.3'
13	13°55.01	54.55	279°25.00	16.5'	10°1.66	13.4'	54.3'
14	28°54.90	54.33	294°0.47	16.4'	10°15.04	13.3'	54.3'
15	43°54.78	· · 54.12	308°35.91	16.4'	10°28.38	13.3'	54.3'
16	58°54.67	53.91	323°11.32	16.4'	10°41.68	13.3'	54.3'
17	73°54.56	53.69	337°46.70	16.3'	10°54.94	13.2'	54.3'
18	88°54.44	N22°53.48	352°22.05	16.3'	S11°8.15	13.2'	54.3'
19	103°54.33	53.26	6°57.37	16.3'	11°21.32	13.1'	54.3'
20	118°54.22	53.05	21°32.65	16.2'	11°34.44	13.1'	54.3'
21	133°54.11	· · 52.83	36°7.90	16.2'	11°47.51	13.0'	54.2'
22	148°53.99	52.61	50°43.11	16.2'	12°0.54	13.0'	54.2'
23	163°53.88	52.40	65°18.29	16.1'	12°13.52	12.9'	54.2'
SD = 15.7'		$d = -0.2'$		SD = 14.9'			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.77	N22°52.18	79°53.43	16.1'	S12°26.45	12.9'	54.2'
1	193°53.66	51.96	94°28.53	16.1'	12°39.33	12.8'	54.2'
2	208°53.55	51.74	109°3.59	16.0'	12°52.17	12.8'	54.2'
3	223°53.44	· · 51.52	123°38.61	16.0'	13°4.95	12.7'	54.2'
4	238°53.32	51.29	138°13.59	15.9'	13°17.68	12.7'	54.2'
5	253°53.21	51.07	152°48.52	15.9'	13°30.36	12.6'	54.2'
6	268°53.10	N22°50.85	167°23.41	15.8'	S13°42.99	12.6'	54.2'
7	283°52.99	50.63	181°58.26	15.8'	13°55.56	12.5'	54.2'
8	298°52.88	50.40	196°33.06	15.8'	14°8.08	12.5'	54.2'
9	313°52.77	· · 50.18	211°7.81	15.7'	14°20.55	12.4'	54.2'
10	328°52.66	49.95	225°42.52	15.7'	14°32.96	12.4'	54.2'
11	343°52.55	49.72	240°17.18	15.6'	14°45.31	12.3'	54.2'
12	358°52.44	N22°49.50	254°51.79	15.6'	S14°57.61	12.2'	54.1'
13	13°52.33	49.27	269°26.34	15.5'	15°9.85	12.2'	54.1'
14	28°52.22	49.04	284°0.85	15.5'	15°22.03	12.1'	54.1'
15	43°52.11	· · 48.81	298°35.31	15.4'	15°34.15	12.1'	54.1'
16	58°52.00	48.58	313°9.71	15.3'	15°46.21	12.0'	54.1'
17	73°51.89	48.35	327°44.05	15.3'	15°58.21	11.9'	54.1'
18	88°51.78	N22°48.12	342°18.34	15.2'	S16°10.15	11.9'	54.1'
19	103°51.67	47.89	356°52.58	15.2'	16°22.03	11.8'	54.1'
20	118°51.56	47.66	11°26.76	15.1'	16°33.84	11.7'	54.1'
21	133°51.46	· · 47.42	26°0.88	15.1'	16°45.59	11.7'	54.1'
22	148°51.35	47.19	40°34.94	15.0'	16°57.28	11.6'	54.1'
23	163°51.24	46.95	55°8.95	14.9'	17°8.90	11.6'	54.1'
SD = 15.7'		$d = -0.2'$		SD = 14.8'			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.13	N22°46.72	69°42.89	14.9'	S17°20.45	11.5'	54.1'
1	193°51.02	46.48	84°16.78	14.8'	17°31.94	11.4'	54.1'
2	208°50.91	46.24	98°50.60	14.8'	17°43.35	11.3'	54.1'
3	223°50.81	· · 46.01	113°24.36	14.7'	17°54.70	11.3'	54.1'
4	238°50.70	45.77	127°58.05	14.6'	18°5.98	11.2'	54.1'
5	253°50.59	45.53	142°31.68	14.6'	18°17.19	11.1'	54.1'
6	268°50.48	N22°45.29	157°5.25	14.5'	S18°28.33	11.1'	54.1'
7	283°50.38	45.05	171°38.75	14.4'	18°39.39	11.0'	54.1'
8	298°50.27	44.81	186°12.19	14.4'	18°50.38	10.9'	54.1'
9	313°50.16	· · 44.57	200°45.56	14.3'	19°1.30	10.8'	54.1'
10	328°50.06	44.33	215°18.86	14.2'	19°12.15	10.8'	54.1'
11	343°49.95	44.08	229°52.09	14.2'	19°22.91	10.7'	54.1'
12	358°49.84	N22°43.84	244°25.25	14.1'	S19°33.60	10.6'	54.1'
13	13°49.74	43.60	258°58.35	14.0'	19°44.22	10.5'	54.1'
14	28°49.63	43.35	273°31.37	14.0'	19°54.75	10.5'	54.1'
15	43°49.52	· · 43.10	288°4.32	13.9'	20°5.21	10.4'	54.1'
16	58°49.42	42.86	302°37.20	13.8'	20°15.59	10.3'	54.1'
17	73°49.31	42.61	317°10.01	13.7'	20°25.88	10.2'	54.1'
18	88°49.21	N22°42.36	331°42.75	13.7'	S20°36.10	10.1'	54.2'
19	103°49.10	42.12	346°15.42	13.6'	20°46.23	10.0'	54.2'
20	118°49.00	41.87	0°48.01	13.5'	20°56.27	10.0'	54.2'
21	133°48.89	· · 41.62	15°20.52	13.4'	21°6.24	9.9'	54.2'
22	148°48.79	41.37	29°52.96	13.4'	21°16.11	9.8'	54.2'
23	163°48.68	41.11	44°25.33	13.3'	21°25.91	9.7'	54.2'
SD = 15.7'		$d = -0.2'$		SD = 14.8'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
68°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
66°	////	////	00:43	23:21	////	////
64°	////	////	01:48	22:20	////	////
62°	////	////	02:21	21:46	////	////
60°	////	01:12	02:46	21:22	22:55	////
N 58°	////	01:54	03:05	21:03	22:14	////
56°	////	02:21	03:21	20:47	21:47	////
54°	01:06	02:42	03:35	20:34	21:26	23:01
52°	01:45	02:59	03:47	20:22	21:09	22:23
50°	02:10	03:13	03:57	20:11	20:55	21:58
45°	02:53	03:42	04:19	19:50	20:27	21:15
N 40°	03:23	04:04	04:37	19:32	20:05	20:46
35°	03:45	04:22	04:51	19:18	19:47	20:23
30°	04:03	04:37	05:04	19:05	19:32	20:05
20°	04:32	05:01	05:25	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:31	18:57
S 10°	05:29	05:55	06:18	17:51	18:14	18:40
20°	05:45	06:12	06:36	17:33	17:57	18:25
30°	06:01	06:30	06:56	17:13	17:39	18:09
35°	06:09	06:40	07:08	17:01	17:29	18:00
40°	06:18	06:52	07:22	16:47	17:17	17:51
45°	06:28	07:05	07:39	16:31	17:04	17:41
S 50°	06:39	07:20	07:59	16:11	16:49	17:30
52°	06:44	07:28	08:08	16:01	16:42	17:25
54°	06:50	07:36	08:19	15:50	16:34	17:20
56°	06:56	07:44	08:31	15:38	16:25	17:14
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:09	08:05	09:02	15:08	16:04	17:00

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	14:44	17:21	<div></div>	21:52	20:43	<div></div>
N 70°	14:26	16:36	<div></div>	22:12	21:29	<div></div>
68°	14:12	16:07	18:34	22:28	22:00	21:04
66°	14:01	15:45	17:44	22:41	22:23	21:55
64°	13:51	15:28	17:13	22:52	22:41	22:27
62°	13:43	15:14	16:50	23:02	22:57	22:51
60°	13:36	15:02	16:31	23:10	23:09	23:10
N 58°	13:30	14:52	16:16	23:17	23:20	23:26
56°	13:25	14:43	16:03	23:23	23:30	23:39
54°	13:20	14:35	15:52	23:29	23:38	23:51
52°	13:16	14:28	15:42	23:34	23:46	· · ·
50°	13:12	14:22	15:33	23:39	23:53	· · ·
45°	13:04	14:09	15:15	23:49	· · ·	00:08
N 40°	12:57	13:58	15:00	23:57	· · ·	00:20
35°	12:51	13:48	14:47	· · ·	00:05	00:31
30°	12:46	13:40	14:36	· · ·	00:11	00:40
20°	12:37	13:26	14:17	· · ·	00:22	00:56
N 10°	12:29	13:14	14:01	· · ·	00:32	01:10
0°	12:22	13:03	13:46	00:01	00:41	01:23
S 10°	12:14	12:51	13:31	00:06	00:51	01:36
20°	12:07	12:40	13:15	00:12	01:00	01:51
30°	11:58	12:26	12:57	00:18	01:12	02:07
35°	11:53	12:18	12:46	00:21	01:19	02:17
40°	11:48	12:09	12:34	00:26	01:26	02:27
45°	11:41	11:59	12:20	00:30	01:35	02:40
S 50°	11:34	11:47	12:03	00:36	01:46	02:56
52°	11:30	11:41	11:55	00:39	01:51	03:04
54°	11:26	11:35	11:46	00:42	01:56	03:12
56°	11:22	11:28	11:36	00:45	02:02	03:21
58°	11:17	11:20	11:24	00:49	02:09	03:32
S 60°	11:12	11:11	11:11	00:53	02:17	03:44

Day	Sun		Mer. Pass hh:mm	Moon		Age 8-10 52-70%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
03	04:14	04:20	12:04	18:31	06:11	
04	04:25	04:30	12:05	19:13	06:52	
05	04:35	04:41	12:05	19:57	07:34	

July 06, 07, 08 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	284°13.84		224°18.91	N17°58.91	121°41.99	N08°26.30	187°45.17	N23°10.98	281°35.84	S01°19.24
1	299°16.30		239°18.54	17°59.51	136°43.10	25.72	202°47.02	10.96	296°38.27	19.24
2	314°18.77		254°18.17	18°0.12	151°44.21	25.13	217°48.87	10.94	311°40.71	19.24
3	329°21.23		269°17.80	· · 0.73	166°45.31	· · 24.54	232°50.71	· · 10.92	326°43.14	· · 19.23
4	344°23.70		284°17.43	1.33	181°46.42	23.96	247°52.56	10.89	341°45.57	19.23
5	359°26.16		299°17.06	1.94	196°47.53	23.37	262°54.41	10.87	356°48.00	19.23
6	14°28.63		314°16.69	N18°2.55	211°48.64	N08°22.78	277°56.26	N23°10.85	11°50.44	S01°19.23
7	29°31.09		329°16.32	3.15	226°49.75	22.20	292°58.11	10.83	26°52.87	19.23
8	44°33.55		344°15.95	3.75	241°50.86	21.61	307°59.95	10.81	41°55.30	19.23
9	59°36.02		359°15.58	· · 4.36	256°51.96	· · 21.02	323°1.80	· · 10.79	56°57.74	· · 19.23
10	74°38.48		14°15.20	4.96	271°53.07	20.44	338°3.65	10.76	72°0.17	19.23
11	89°40.95		29°14.83	5.56	286°54.18	19.85	353°5.50	10.74	87°2.60	19.23
12	104°43.41		44°14.45	N18°6.16	301°55.29	N08°19.26	8°7.35	N23°10.72	102°5.04	S01°19.23
13	119°45.87		59°14.08	6.77	316°56.40	18.68	23°9.19	10.70	117°7.47	19.23
14	134°48.34		74°13.71	7.37	331°57.50	18.09	38°11.04	10.67	132°9.91	19.22
15	149°50.80		89°13.33	· · 7.97	346°58.61	· · 17.50	53°12.89	· · 10.65	147°12.34	· · 19.22
16	164°53.27		104°12.95	8.56	1°59.72	16.91	68°14.74	10.63	162°14.77	19.22
17	179°55.73		119°12.58	9.16	17°0.83	16.32	83°16.59	10.61	177°17.21	19.22
18	194°58.20		134°12.20	N18°9.76	32°1.93	N08°15.74	98°18.44	N23°10.59	192°19.64	S01°19.22
19	210°0.66		149°11.82	10.36	47°3.04	15.15	113°20.28	10.56	207°22.08	19.22
20	225°3.12		164°11.44	10.96	62°4.15	14.56	128°22.13	10.54	222°24.51	19.22
21	240°5.59		179°11.06	· · 11.55	77°5.26	· · 13.97	143°23.98	· · 10.52	237°26.95	· · 19.22
22	255°8.05		194°10.68	12.15	92°6.36	13.38	158°25.83	10.50	252°29.39	19.22
23	270°10.52		209°10.30	12.74	107°7.47	12.79	173°27.68	10.47	267°31.82	19.22
Mer.pass. 05:02		ν-0.4' d0.6' m-4.11		ν1.1' d-0.6' m1.52		ν1.8' d-0.0' m-1.89		ν2.4' d-0.0' m0.93		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	285°12.98		224°9.92	N18°13.34	122°8.58	N08°12.21	188°29.53	N23°10.45	282°34.26	S01°19.22
1	300°15.44		239°9.54	13.93	137°9.69	11.62	203°31.37	10.43	297°36.69	19.22
2	315°17.91		254°9.16	14.53	152°10.79	11.03	218°33.22	10.41	312°39.13	19.22
3	330°20.37		269°8.77	· · 15.12	167°11.90	· · 10.44	233°35.07	· · 10.38	327°41.56	· · 19.22
4	345°22.84		284°8.39	15.71	182°13.01	9.85	248°36.92	10.36	342°44.00	19.22
5	0°25.30		299°8.01	16.30	197°14.11	9.26	263°38.77	10.34	357°46.44	19.22
6	15°27.77		314°7.62	N18°16.89	212°15.22	N08°8.67	278°40.62	N23°10.32	12°48.87	S01°19.23
7	30°30.23		329°7.24	17.48	227°16.33	8.08	293°42.47	10.29	27°51.31	19.23
8	45°32.69		344°6.85	18.07	242°17.43	7.49	308°44.32	10.27	42°53.75	19.23
9	60°35.16		359°6.47	· · 18.66	257°18.54	· · 6.90	323°46.16	· · 10.25	57°56.19	· · 19.23
10	75°37.62		14°6.08	19.25	272°19.65	6.31	338°48.01	10.22	72°58.62	19.23
11	90°40.09		29°5.69	19.84	287°20.75	5.72	353°49.86	10.20	88°1.06	19.23
12	105°42.55		44°5.30	N18°20.43	302°21.86	N08°5.13	8°51.71	N23°10.18	103°3.50	S01°19.23
13	120°45.02		59°4.91	21.01	317°22.97	4.54	23°53.56	10.16	118°5.94	19.23
14	135°47.48		74°4.52	21.60	332°24.07	3.95	38°55.41	10.13	133°8.37	19.23
15	150°49.94		89°4.14	· · 22.19	347°25.18	· · 3.36	53°57.26	· · 10.11	148°10.81	· · 19.23
16	165°52.41		104°3.74	22.77	2°26.29	2.77	68°59.11	10.09	163°13.25	19.23
17	180°54.87		119°3.35	23.35	17°27.39	2.18	84°0.96	10.06	178°15.69	19.24
18	195°57.34		134°2.96	N18°23.94	32°28.50	N08°1.59	99°2.81	N23°10.04	193°18.13	S01°19.24
19	210°59.80		149°2.57	24.52	47°29.60	1.00	114°4.66	10.02	208°20.57	19.24
20	226°2.26		164°2.18	25.10	62°30.71	08°0.41	129°6.50	9.99	223°23.01	19.24
21	241°4.73		179°1.78	· · 25.69	77°31.82	07°59.82	144°8.35	· · 9.97	238°25.44	· · 19.24
22	256°7.19		194°1.39	26.27	92°32.92	59.23	159°10.20	9.95	253°27.88	19.24
23	271°9.66		209°1.00	26.85	107°34.03	58.64	174°12.05	9.92	268°30.32	19.25
Mer.pass. 04:58		ν-0.4' d0.6' m-4.11		ν1.1' d-0.6' m1.52		ν1.8' d-0.0' m-1.89		ν2.4' d0.0' m0.93		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°12.12		224°0.60	N18°27.43	122°35.13	N07°58.05	189°13.90	N23°9.90	283°32.76	S01°19.25
1	301°14.59		239°0.21	28.01	137°36.24	57.45	204°15.75	9.88	298°35.20	19.25
2	316°17.05		253°59.81	28.59	152°37.34	56.86	219°17.60	9.85	313°37.64	19.25
3	331°19.51		268°59.41	· · 29.17	167°38.45	· · 56.27	234°19.45	· · 9.83	328°40.08	· · 19.25
4	346°21.98		283°59.02	29.74	182°39.56	55.68	249°21.30	9.81	343°42.52	19.26
5	1°24.44		298°58.62	30.32	197°40.66	55.09	264°23.15	9.78	358°44.96	19.26
6	16°26.91		313°58.22	N18°30.90	212°41.77	N07°54.50	279°25.00	N23°9.76	13°47.40	S01°19.26
7	31°29.37		328°57.82	31.47	227°42.87	53.90	294°26.85	9.74	28°49.85	19.26
8	46°31.83		343°57.42	32.05	242°43.98	53.31	309°28.70	9.71	43°52.29	19.26
9	61°34.30		358°57.02	· · 32.62	257°45.08	· · 52.72	324°30.55	· · 9.69	58°54.73	· · 19.27
10	76°36.76		13°56.62	33.20	272°46.19	52.13	339°32.40	9.66	73°57.17	19.27
11	91°39.23		28°56.22	33.77	287°47.29	51.54	354°34.25	9.64	88°59.61	19.27
12	106°41.69		43°55.82	N18°34.34	302°48.40	N07°50.94	9°36.10	N23°9.62	104°2.05	S01°19.27
13	121°44.16		58°55.41	34.91	317°49.50	50.35	24°37.95	9.59	119°4.49	19.28
14	136°46.62		73°55.01	35.49	332°50.61	49.76	39°39.80	9.57	134°6.93	19.28
15	151°49.08		88°54.61	· · 36.06	347°51.71	· · 49.16	54°41.65	· · 9.54	149°9.38	· · 19.28
16	166°51.55		103°54.20	36.63	2°52.82	48.57	69°43.50	9.52	164°11.82	19.29
17	181°54.01		118°53.80	37.20	17°53.92	47.98	84°45.35	9.50	179°14.26	19.29
18	196°56.48		133°53.39	N18°37.77	32°55.03	N07°47.39	99°47.20	N23°9.47	194°16.70	S01°19.29
19	211°58.94		148°52.99	38.33	47°56.13	46.79	114°49.05	9.45	209°19.15	19.29
20	227°1.41		163°52.58	38.90	62°57.24	46.20	129°50.90	9.42	224°21.59	19.30
21	242°3.87		178°52.17	· · 39.47	77°58.34	· · 45.61	144°52.75	· · 9.40	239°24.03	· · 19.30
22	257°6.33		193°51.77	40.04	92°59.45	45.01	159°54.60	9.38	254°26.48	19.30
23	272°8.80		208°51.36	40.60	108°0.55	44.42	174°56.45	9.35	269°28.92	19.31
Mer.pass. 04:54		ν-0.4' d0.6' m-4.10		ν1.1' d-0.6' m1.53		ν1.8' d-0.0' m-1.89		ν2.4' d0.0' m0.92		

Stars		
	SHA	Dec
Alpheratz	357°34.28	29°13.77
Ankaa	353°6.67	-42°9.76
Schedar	349°30.55	56°40.39
Diphda	348°46.86	-17°50.64
Achernar	335°19.98	-57°6.10
Hamal	327°50.85	23°34.91
Polaris	314°5.47	89°22.01
Acamar	315°11.68	-40°11.89
Menkar	314°5.90	4°11.43
Mirfak	308°27.99	49°56.93
Aldebaran	290°39.44	16°33.63
Rigel	281°3.78	-8°10.25
Capella	280°21.73	46°1.33
Bellatrix	278°22.75	6°22.41
Elnath	278°1.71	28°37.71
Alnilam	275°37.63	-1°11.08
Betelgeuse	270°51.97	7°24.75
Canopus	263°52.77	-52°42.43
Sirius	258°26.23	-16°45.00
Adhara	255°5.93	-29°0.34
Procyon	244°50.74	5°9.62
Pollux	243°17.18	27°57.93
Avior	234°15.21	-59°35.52
Suhail	222°46.41	-43°32.21
Miaplacidus	221°39.04	-69°49.44
Alphard	217°47.63	-8°46.15
Regulus	207°34.24	11°50.63
Dubhe	193°40.82	61°37.07
Denebola	182°24.63	14°25.86
Gienah	175°43.23	-17°41.10
Acrux	172°59.76	-63°14.73
Gacrux	171°51.28	-57°15.64
Alioth	166°12.60	55°49.55
Spica	158°21.83	-11°17.72
Alkaid	152°51.55	49°11.39
Hadar	148°35.24	-60°30.03
Menkent	147°57.01	-36°29.91
Arcturus	145°47.41	19°3.08
Rigel Kent.	139°39.46	-60°56.70
Kochab	137°19.19	74°3.25
Zuben'ubi	136°55.40	-16°8.94
Alphecca	126°3.15	26°37.83
Antares	112°15.03	-26°29.38
Atria	107°8.38	-69°4.53
Sabik	102°2.00	-15°45.40
Shaula	96°9.41	-37°7.37
Rasalhague	95°57.84	12°32.52
Eltanin	90°41.47	51°29.16
Kaus Aust.	83°31.56	-34°22.34
Vega	80°32.52	38°48.44
Nunki	75°46.87	-26°15.86
Altair	61°59.23	8°56.15
Peacock	53°4.51	-56°39.03
Deneb	49°25.10	45°22.17
Enif	33°38.14	9°59.52
Al Na'ir	27°32.06	-46°50.02
Fomalhaut	15°13.87	-29°29.03
Scheat	13°44.63	28°13.17
Markab	13°29.33	15°20.52
Jul 06 Sun	SHA	Mer.pass
Venus	300°5.06	09:03
Mars	197°28.15	15:52
Jupiter	263°31.33	11:28
Saturn	357°22.00	05:13
Jul 07 Mon	SHA	Mer.pass
Venus	298°56.94	09:04
Mars	196°55.60	15:50
Jupiter	263°16.55	11:25
Saturn	357°21.28	05:09
Jul 08 Tue	SHA	Mer.pass
Venus	297°48.48	09:04
Mars	196°23.01	15:48
Jupiter	263°1.78	11:22
Saturn	357°20.64	05:05
Horizontal parallax		
Venus:		0.1
Mars:		0.1

h	Sun				Moon				
Sun	GHA	Dec			GHA	ν	Dec	d	HP
0	178°48.58	N22°40.86			58°57.62	13.2'	S21°35.61	9.6'	54.2°
1	193°48.47	40.61			73°29.84	13.1'	21°45.22	9.5'	54.2°
2	208°48.37	40.36			88°1.98	13.1'	21°54.75	9.4'	54.2°
3	223°48.27	· · 40.10			102°34.04	13.0'	22°4.19	9.3'	54.2°
4	238°48.16	39.85			117°6.02	12.9'	22°13.53	9.3'	54.2°
5	253°48.06	39.59			131°37.93	12.8'	22°22.78	9.2'	54.2°
6	268°47.96	N22°39.34			146°9.76	12.8'	S22°31.94	9.1'	54.2°
7	283°47.85	39.08			160°41.51	12.7'	22°41.01	9.0'	54.2°
8	298°47.75	38.82			175°13.18	12.6'	22°49.98	8.9'	54.2°
9	313°47.65	· · 38.57			189°44.78	12.5'	22°58.85	8.8'	54.2°
10	328°47.54	38.31			204°16.29	12.4'	23°7.63	8.7'	54.3°
11	343°47.44	38.05			218°47.73	12.4'	23°16.31	8.6'	54.3°
12	358°47.34	N22°37.79			233°19.09	12.3'	S23°24.89	8.5'	54.3°
13	13°47.24	37.53			247°50.37	12.2'	23°33.37	8.4'	54.3°
14	28°47.13	37.27			262°21.57	12.1'	23°41.75	8.3'	54.3°
15	43°47.03	· · 37.00			276°52.69	12.0'	23°50.03	8.2'	54.3°
16	58°46.93	36.74			291°23.72	12.0'	23°58.21	8.1'	54.3°
17	73°46.83	36.48			305°54.68	11.9'	24°6.28	8.0'	54.3°
18	88°46.73	N22°36.21			320°25.56	11.8'	S24°14.25	7.9'	54.3°
19	103°46.63	35.95			334°56.36	11.7'	24°22.11	7.8'	54.3°
20	118°46.52	35.68			349°27.09	11.6'	24°29.87	7.6'	54.3°
21	133°46.42	· · 35.42			3°57.73	11.6'	24°37.52	7.5'	54.4°
22	148°46.32	35.15			18°28.29	11.5'	24°45.05	7.4'	54.4°
23	163°46.22	34.88			32°58.77	11.4'	24°52.48	7.3'	54.4°
SD = 15.7' $d = -0.3'$					SD = 14.8'				

Mon	GHA	Dec			GHA	ν	Dec	d	HP
0	178°46.12	N22°34.62			47°29.17	11.3°	S24°59.80	7.2'	54.4°
1	193°46.02	34.35			61°59.49	11.2°	25°7.01	7.1'	54.4°
2	208°45.92	34.08			76°29.74	11.2°	25°14.11	7.0'	54.4°
3	223°45.82	33.81			90°59.90	11.1°	25°21.09	6.9'	54.4°
4	238°45.72	33.54			105°29.99	11.0°	25°27.96	6.8'	54.4°
5	253°45.62	33.26			120°0.00	10.9°	25°34.71	6.6'	54.4°
6	268°45.52	N22°32.99			134°29.93	10.9°	S25°41.34	6.5'	54.5°
7	283°45.42	32.72			148°59.79	10.8°	25°47.86	6.4'	54.5°
8	298°45.32	32.45			163°29.56	10.7°	25°54.26	6.3'	54.5°
9	313°45.22	32.17			177°59.26	10.6°	26°0.54	6.2'	54.5°
10	328°45.13	31.90			192°28.89	10.5°	26°6.71	6.0'	54.5°
11	343°45.03	31.62			206°58.43	10.5°	26°12.75	5.9'	54.5°
12	358°44.93	N22°31.35			221°27.91	10.4°	S26°18.66	5.8'	54.5°
13	13°44.83	31.07			235°57.30	10.3°	26°24.46	5.7'	54.5°
14	28°44.73	30.79			250°26.63	10.3°	26°30.13	5.5'	54.6°
15	43°44.63	30.51			264°55.88	10.2°	26°35.67	5.4'	54.6°
16	58°44.54	30.23			279°25.05	10.1°	26°41.09	5.3'	54.6°
17	73°44.44	29.95			293°54.16	10.0°	26°46.39	5.2'	54.6°
18	88°44.34	N22°29.67			308°23.19	10.0°	S26°51.55	5.0'	54.6°
19	103°44.24	29.39			322°52.16	9.9°	26°56.59	4.9'	54.6°
20	118°44.15	29.11			337°21.05	9.8°	27°1.50	4.8'	54.6°
21	133°44.05	28.83			351°49.87	9.8°	27°6.27	4.6'	54.7°
22	148°43.95	28.55			6°18.63	9.7°	27°10.92	4.5'	54.7°
23	163°43.86	28.26			20°47.31	9.6°	27°15.44	4.4'	54.7°
SD = 15.7' $d = -0.3'$					SD = 14.8'				

Tue	GHA	Dec			GHA	ν	Dec	d	HP
0	178°43.76	N22°27.98			35°15.93	9.6°	S27°19.82	4.2'	54.7°
1	193°43.67	27.69			49°44.49	9.5°	27°24.06	4.1'	54.7°
2	208°43.57	27.41			64°12.98	9.4°	27°28.18	4.0'	54.7°
3	223°43.47	27.12			78°41.40	9.4°	27°32.16	3.8'	54.8°
4	238°43.38	26.83			93°9.76	9.3°	27°36.00	3.7'	54.8°
5	253°43.28	26.55			107°38.06	9.2°	27°39.70	3.6'	54.8°
6	268°43.19	N22°26.26			122°6.30	9.2°	S27°43.27	3.4'	54.8°
7	283°43.09	25.97			136°34.48	9.1°	27°46.70	3.3'	54.8°
8	298°43.00	25.68			151°2.60	9.1°	27°49.99	3.1'	54.8°
9	313°42.90	25.39			165°30.67	9.0°	27°53.14	3.0'	54.9°
10	328°42.81	25.10			179°58.68	9.0°	27°56.14	2.9'	54.9°
11	343°42.71	24.81			194°26.63	8.9°	27°59.01	2.7'	54.9°
12	358°42.62	N22°24.51			208°54.53	8.8°	S28°1.73	2.6'	54.9°
13	13°42.53	24.22			223°22.37	8.8°	28°4.32	2.4'	54.9°
14	28°42.43	23.93			237°50.17	8.7°	28°6.75	2.3'	54.9°
15	43°42.34	23.63			252°17.91	8.7°	28°9.05	2.1'	55.0°
16	58°42.24	23.34			266°45.61	8.6°	28°11.20	2.0'	55.0°
17	73°42.15	23.04			281°13.25	8.6°	28°13.20	1.9'	55.0°
18	88°42.06	N22°22.75			295°40.85	8.6°	S28°15.06	1.7'	55.0°
19	103°41.97	22.45			310°8.41	8.5°	28°16.77	1.6'	55.0°
20	118°41.87	22.15			324°35.93	8.5°	28°18.33	1.4'	55.1°
21	133°41.78	21.85			339°3.40	8.4°	28°19.75	1.3'	55.1°
22	148°41.69	21.55			353°30.83	8.4°	28°21.02	1.1'	55.1°
23	163°41.60	21.25			7°58.22	8.4°	28°22.14	1.0'	55.1°
SD = 15.7' $d = -0.3'$					SD = 14.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	////	////	00:59	23:07	////	////
64°	////	////	01:54	22:14	////	////
62°	////	////	02:27	21:42	////	////
60°	////	01:20	02:50	21:19	22:47	////
N 58°	////	01:59	03:09	21:00	22:09	////
56°	////	02:25	03:25	20:45	21:44	////
54°	01:14	02:46	03:38	20:31	21:24	22:54
52°	01:50	03:02	03:49	20:20	21:07	22:19
50°	02:14	03:16	04:00	20:10	20:53	21:55
45°	02:56	03:44	04:21	19:48	20:25	21:13
N 40°	03:25	04:06	04:38	19:31	20:04	20:45
35°	03:47	04:23	04:53	19:17	19:46	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:55	05:22	05:45	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:15	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:10
35°	06:09	06:40	07:08	17:02	17:30	18:02
40°	06:17	06:51	07:22	16:49	17:19	17:53
45°	06:27	07:04	07:38	16:33	17:06	17:43
S 50°	06:38	07:19	07:57	16:13	16:51	17:32
52°	06:43	07:26	08:06	16:04	16:44	17:27
54°	06:48	07:34	08:17	15:53	16:36	17:22
56°	06:54	07:43	08:29	15:41	16:28	17:16
58°	07:00	07:52	08:43	15:28	16:18	17:10
S 60°	07:07	08:03	08:59	15:12	16:07	17:03

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	■	■	■
64°	19:17	■	■	21:59	■	■
62°	18:34	20:31	■	22:44	22:31	■
60°	18:05	19:39	21:03	23:13	23:22	23:50
N 58°	17:43	19:08	20:22	23:36	23:54
56°	17:25	18:45	19:55	23:54	00:18
54°	17:10	18:25	19:33	00:10	00:37
52°	16:57	18:09	19:15	00:02	00:23	00:54
50°	16:45	17:56	19:00	00:11	00:35	01:08
45°	16:22	17:27	18:29	00:31	01:00	01:36
N 40°	16:03	17:05	18:05	00:47	01:19	01:59
35°	15:47	16:47	17:46	01:01	01:36	02:18
30°	15:33	16:32	17:29	01:13	01:50	02:34
20°	15:10	16:05	17:01	01:33	02:14	03:01
N 10°	14:50	15:42	16:36	01:51	02:36	03:25
0°	14:32	15:21	16:14	02:08	02:55	03:46
S 10°	14:14	15:00	15:51	02:25	03:15	04:08
20°	13:54	14:38	15:27	02:43	03:37	04:32
30°	13:32	14:12	14:59	03:04	04:01	04:59
35°	13:18	13:57	14:43	03:16	04:16	05:16
40°	13:03	13:39	14:24	03:30	04:33	05:35
45°	12:46	13:18	14:00	03:47	04:53	05:58
S 50°	12:24	12:52	13:30	04:08	05:19	06:27
52°	12:13	12:39	13:16	04:18	05:32	06:42
54°	12:01	12:24	12:59	04:29	05:46	06:58
56°	11:48	12:07	12:38	04:42	06:03	07:19
58°	11:32	11:46	12:13	04:57	06:23	07:44
S 60°	11:13	11:20	11:37	05:15	06:49	08:19

July 09, 10, 11 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	287°11.26	223°50.95	N18°41.17	123°1.66	N07°43.82	189°58.30	N23°9.33	284°31.36	S01°19.31	
1	302°13.73	238°50.54	41.73	138°2.76	43.23	205°0.15	9.30	299°33.81	19.31	
2	317°16.19	253°50.13	42.29	153°3.86	42.64	220°2.00	9.28	314°36.25	19.32	
3	332°18.65	268°49.72	· · 42.86	168°4.97	· · 42.04	235°3.85	· · 9.25	329°38.69	· · 19.32	
4	347°21.12	283°49.31	43.42	183°6.07	41.45	250°5.70	9.23	344°41.14	19.33	
5	2°23.58	298°48.90	43.98	198°7.18	40.85	265°7.55	9.20	359°43.58	19.33	
6	17°26.05	313°48.48	N18°44.54	213°8.28	N07°40.26	280°9.40	N23°9.18	14°46.03	S01°19.33	
7	32°28.51	328°48.07	45.11	228°9.38	39.66	295°11.25	9.16	29°48.47	19.34	
8	47°30.98	343°47.66	45.67	243°10.49	39.07	310°13.10	9.13	44°50.92	19.34	
9	62°33.44	358°47.24	· · 46.22	258°11.59	· · 38.48	325°14.95	· · 9.11	59°53.36	· · 19.35	
10	77°35.90	13°46.83	46.78	273°12.70	37.88	340°16.80	9.08	74°55.81	19.35	
11	92°38.37	28°46.41	47.34	288°13.80	37.29	355°18.65	9.06	89°58.25	19.35	
12	107°40.83	43°46.00	N18°47.90	303°14.90	N07°36.69	10°20.50	N23°9.03	105°0.70	S01°19.36	
13	122°43.30	58°45.58	48.46	318°16.01	36.10	25°22.35	9.01	120°3.14	19.36	
14	137°45.76	73°45.16	49.01	333°17.11	35.50	40°24.21	8.98	135°5.59	19.37	
15	152°48.23	88°44.75	· · 49.57	348°18.21	· · 34.90	55°26.06	· · 8.96	150°8.03	· · 19.37	
16	167°50.69	103°44.33	50.12	3°19.32	34.31	70°27.91	8.93	165°10.48	19.38	
17	182°53.15	118°43.91	50.68	18°20.42	33.71	85°29.76	8.91	180°12.93	19.38	
18	197°55.62	133°43.49	N18°51.23	33°21.52	N07°33.12	100°31.61	N23°8.88	195°15.37	S01°19.38	
19	212°58.08	148°43.07	51.78	48°22.63	32.52	115°33.46	8.86	210°17.82	19.39	
20	228°0.55	163°42.65	52.34	63°23.73	31.93	130°35.31	8.83	225°20.27	19.39	
21	243°3.01	178°42.23	· · 52.89	78°24.83	· · 31.33	145°37.16	· · 8.81	240°22.71	· · 19.40	
22	258°5.47	193°41.81	53.44	93°25.94	30.73	160°39.01	8.78	255°25.16	19.40	
23	273°7.94	208°41.39	53.99	108°27.04	30.14	175°40.86	8.76	270°27.61	19.41	
Mer.pass. 04:50		ν-0.4' d0.6' m-4.09		ν1.1' d-0.6' m1.53		ν1.9' d-0.0' m-1.89		ν2.4' d0.0' m0.92		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	288°10.40	223°40.97	N18°54.54	123°28.14	N07°29.54	190°42.72	N23°8.73	285°30.05	S01°19.41	
1	303°12.87	238°40.54	55.09	138°29.25	28.94	205°44.57	8.71	300°32.50	19.42	
2	318°15.33	253°40.12	55.64	153°30.35	28.35	220°46.42	8.68	315°34.95	19.42	
3	333°17.80	268°39.69	· · 56.19	168°31.45	· · 27.75	235°48.27	· · 8.66	330°37.40	· · 19.43	
4	348°20.26	283°39.27	56.73	183°32.55	27.15	250°50.12	8.63	345°39.84	19.44	
5	3°22.72	298°38.84	57.28	198°33.66	26.56	265°51.97	8.60	0°42.29	19.44	
6	18°25.19	313°38.42	N18°57.83	213°34.76	N07°25.96	280°53.82	N23°8.58	15°44.74	S01°19.45	
7	33°27.65	328°37.99	58.37	228°35.86	25.36	295°55.68	8.55	30°47.19	19.45	
8	48°30.12	343°37.56	58.92	243°36.96	24.77	310°57.53	8.53	45°49.64	19.46	
9	63°32.58	358°37.14	18°59.46	258°38.07	· · 24.17	325°59.38	· · 8.50	60°52.09	· · 19.46	
10	78°35.05	13°36.71	19°0.00	273°39.17	23.57	341°1.23	8.48	75°54.54	19.47	
11	93°37.51	28°36.28	0.55	288°40.27	22.98	356°3.08	8.45	90°56.98	19.48	
12	108°39.97	43°35.85	N19°1.09	303°41.37	N07°22.38	11°4.93	N23°8.43	105°59.43	S01°19.48	
13	123°42.44	58°35.42	1.63	318°42.48	21.78	26°6.79	8.40	121°1.88	19.49	
14	138°44.90	73°34.99	2.17	333°43.58	21.18	41°8.64	8.37	136°4.33	19.49	
15	153°47.37	88°34.56	· · 2.71	348°44.68	· · 20.58	56°10.49	· · 8.35	151°6.78	· · 19.50	
16	168°49.83	103°34.13	3.25	3°45.78	19.99	71°12.34	8.32	166°9.23	19.51	
17	183°52.29	118°33.70	3.79	18°46.88	19.39	86°14.19	8.30	181°11.68	19.51	
18	198°54.76	133°33.26	N19°4.32	33°47.99	N07°18.79	101°16.04	N23°8.27	196°14.13	S01°19.52	
19	213°57.22	148°32.83	4.86	48°49.09	18.19	116°17.90	8.24	211°16.58	19.52	
20	228°59.69	163°32.40	5.40	63°50.19	17.59	131°19.75	8.22	226°19.03	19.53	
21	244°2.15	178°31.96	· · 5.93	78°51.29	· · 16.99	146°21.60	· · 8.19	241°21.48	· · 19.54	
22	259°4.62	193°31.53	6.47	93°52.39	16.40	161°23.45	8.17	256°23.93	19.54	
23	274°7.08	208°31.09	7.00	108°53.49	15.80	176°25.30	8.14	271°26.39	19.55	
Mer.pass. 04:47		ν-0.4' d0.5' m-4.09		ν1.1' d-0.6' m1.53		ν1.9' d-0.0' m-1.90		ν2.4' d0.0' m0.91		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	289°9.54	223°30.65	N19°7.54	123°54.60	N07°15.20	191°27.16	N23°8.11	286°28.84	S01°19.56	
1	304°12.01	238°30.22	8.07	138°55.70	14.60	206°29.01	8.09	301°31.29	19.56	
2	319°14.47	253°29.78	8.60	153°56.80	14.00	221°30.86	8.06	316°33.74	19.57	
3	334°16.94	268°29.34	· · 9.14	168°57.90	· · 13.40	236°32.71	· · 8.04	331°36.19	· · 19.58	
4	349°19.40	283°28.90	9.67	183°59.00	12.80	251°34.57	8.01	346°38.64	19.59	
5	4°21.87	298°28.47	10.20	199°0.10	12.20	266°36.42	7.98	1°41.10	19.59	
6	19°24.33	313°28.03	N19°10.73	214°1.20	N07°11.60	281°38.27	N23°7.96	16°43.55	S01°19.60	
7	34°26.79	328°27.59	11.26	229°2.30	11.00	296°40.12	7.93	31°46.00	19.61	
8	49°29.26	343°27.15	11.79	244°3.41	10.41	311°41.98	7.90	46°48.45	19.61	
9	64°31.72	358°26.70	· · 12.31	259°4.51	· · 9.81	326°43.83	· · 7.88	61°50.90	· · 19.62	
10	79°34.19	13°26.26	12.84	274°5.61	9.21	341°45.68	7.85	76°53.36	19.63	
11	94°36.65	28°25.82	13.37	289°6.71	8.61	356°47.53	7.82	91°55.81	19.64	
12	109°39.11	43°25.38	N19°13.89	304°7.81	N07°8.01	11°49.39	N23°7.80	106°58.26	S01°19.64	
13	124°41.58	58°24.93	14.42	319°8.91	7.41	26°51.24	7.77	122°0.72	19.65	
14	139°44.04	73°24.49	14.94	334°10.01	6.81	41°53.09	7.74	137°3.17	19.66	
15	154°46.51	88°24.05	· · 15.47	349°11.11	· · 6.21	56°54.94	· · 7.72	152°5.62	· · 19.67	
16	169°48.97	103°23.60	15.99	4°12.21	5.60	71°56.80	7.69	167°8.08	19.68	
17	184°51.44	118°23.16	16.51	19°13.31	5.00	86°58.65	7.66	182°10.53	19.68	
18	199°53.90	133°22.71	N19°17.03	34°14.41	N07°4.40	102°0.50	N23°7.64	197°12.99	S01°19.69	
19	214°56.36	148°22.26	17.55	49°15.51	3.80	117°2.36	7.61	212°15.44	19.70	
20	229°58.83	163°21.82	18.08	64°16.61	3.20	132°4.21	7.58	227°17.89	19.71	
21	245°1.29	178°21.37	· · 18.59	79°17.71	· · 2.60	147°6.06	· · 7.56	242°20.35	· · 19.72	
22	260°3.76	193°20.92	19.11	94°18.81	2.00	162°7.92	7.53	257°22.80	19.72	
23	275°6.22	208°20.47	19.63	109°19.91	1.40	177°9.77	7.50	272°25.26	19.73	
Mer.pass. 04:43		ν-0.4' d0.5' m-4.08		ν1.1' d-0.6' m1.54		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.91		

	SHA	Dec
Alpheratz	357°34.25	29°13.78
Ankaa	353°6.64	-42°9.75


h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.50	N22°20.95	22°25.58	8.3'	S28°23.11	0.8'	55.1'
1	193°41.41	20.65	36°52.90	8.3'	28°23.92	0.7'	55.1'
2	208°41.32	20.35	51°20.18	8.3'	28°24.59	0.5'	55.2'
3	223°41.23	· · 20.05	65°47.44	8.2'	28°25.11	0.4'	55.2'
4	238°41.14	19.75	80°14.66	8.2'	28°25.48	0.2'	55.2'
5	253°41.05	19.44	94°41.85	8.2'	28°25.70	0.1'	55.2'
6	268°40.96	N22°19.14	109°9.01	8.1'	S28°25.76	-0.1'	55.2'
7	283°40.86	18.83	123°36.15	8.1'	28°25.67	-0.2'	55.3'
8	298°40.77	18.53	138°3.26	8.1'	28°25.43	-0.4'	55.3'
9	313°40.68	· · 18.22	152°30.35	8.1'	28°25.04	-0.5'	55.3'
10	328°40.59	17.91	166°57.42	8.0'	28°24.49	-0.7'	55.3'
11	343°40.50	17.61	181°24.46	8.0'	28°23.79	-0.9'	55.3'
12	358°40.41	N22°17.30	195°51.49	8.0'	S28°22.94	-1.0'	55.4'
13	13°40.32	16.99	210°18.50	8.0'	28°21.93	-1.2'	55.4'
14	28°40.24	16.68	224°45.50	8.0'	28°20.77	-1.3'	55.4'
15	43°40.15	· · 16.37	239°12.48	8.0'	28°19.45	-1.5'	55.4'
16	58°40.06	16.06	253°39.45	8.0'	28°17.98	-1.6'	55.4'
17	73°39.97	15.75	268°6.41	8.0'	28°16.35	-1.8'	55.5'
18	88°39.88	N22°15.43	282°33.37	7.9'	S28°14.57	-1.9'	55.5'
19	103°39.79	15.12	297°0.31	7.9'	28°12.64	-2.1'	55.5'
20	118°39.70	14.81	311°27.25	7.9'	28°10.55	-2.2'	55.5'
21	133°39.61	· · 14.49	325°54.19	7.9'	28°8.30	-2.4'	55.5'
22	148°39.53	14.18	340°21.12	7.9'	28°5.90	-2.6'	55.6'
23	163°39.44	13.86	354°48.06	7.9'	28°3.35	-2.7'	55.6'
SD = 15.7'			SD = 15.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.35	N22°13.55	9°14.99	7.9'	S28°0.64	-2.9'	55.6'
1	193°39.26	13.23	23°41.93	7.9'	27°57.78	-3.0'	55.6'
2	208°39.18	12.91	38°8.88	7.9'	27°54.76	-3.2'	55.6'
3	223°39.09	· · 12.59	52°35.83	8.0'	27°51.58	-3.3'	55.7'
4	238°39.00	12.27	67°2.78	8.0'	27°48.26	-3.5'	55.7'
5	253°38.92	11.95	81°29.75	8.0'	27°44.77	-3.6'	55.7'
6	268°38.83	N22°11.63	95°56.73	8.0'	S27°41.14	-3.8'	55.7'
7	283°38.74	11.31	110°23.72	8.0'	27°37.35	-3.9'	55.8'
8	298°38.66	10.99	124°50.72	8.0'	27°33.40	-4.1'	55.8'
9	313°38.57	· · 10.67	139°17.74	8.0'	27°29.31	-4.3'	55.8'
10	328°38.49	10.35	153°44.78	8.1'	27°25.06	-4.4'	55.8'
11	343°38.40	10.02	168°11.84	8.1'	27°20.65	-4.6'	55.8'
12	358°38.32	N22°9.70	182°38.91	8.1'	S27°16.10	-4.7'	55.9'
13	13°38.23	9.37	197°6.01	8.1'	27°11.39	-4.9'	55.9'
14	28°38.15	9.05	211°33.13	8.1'	27°6.53	-5.0'	55.9'
15	43°38.06	· · 8.72	226°0.28	8.2'	27°1.52	-5.2'	55.9'
16	58°37.98	8.39	240°27.45	8.2'	26°56.35	-5.3'	55.9'
17	73°37.89	8.07	254°54.64	8.2'	26°51.04	-5.5'	56.0'
18	88°37.81	N22°7.74	269°21.87	8.3'	S26°45.58	-5.6'	56.0'
19	103°37.72	7.41	283°49.13	8.3'	26°39.96	-5.8'	56.0'
20	118°37.64	7.08	298°16.42	8.3'	26°34.20	-5.9'	56.0'
21	133°37.56	· · 6.75	312°43.74	8.4'	26°28.29	-6.1'	56.1'
22	148°37.47	6.42	327°11.09	8.4'	26°22.23	-6.2'	56.1'
23	163°37.39	6.09	341°38.48	8.4'	26°16.02	-6.4'	56.1'
SD = 15.7'			SD = 15.2'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.31	N22°5.76	356°5.90	8.5'	S26°9.67	-6.5'	56.1'
1	193°37.22	5.42	10°33.37	8.5'	26°3.16	-6.6'	56.1'
2	208°37.14	5.09	25°0.87	8.5'	25°56.52	-6.8'	56.2'
3	223°37.06	· · 4.76	39°28.41	8.6'	25°49.73	-6.9'	56.2'
4	238°36.98	4.42	53°55.99	8.6'	25°42.79	-7.1'	56.2'
5	253°36.90	4.08	68°23.61	8.7'	25°35.71	-7.2'	56.2'
6	268°36.81	N22°3.75	82°51.28	8.7'	S25°28.48	-7.4'	56.3'
7	283°36.73	3.41	97°18.99	8.8'	25°21.12	-7.5'	56.3'
8	298°36.65	3.07	111°46.74	8.8'	25°13.61	-7.6'	56.3'
9	313°36.57	· · 2.74	126°14.54	8.8'	25°5.96	-7.8'	56.3'
10	328°36.49	2.40	140°42.39	8.9'	24°58.17	-7.9'	56.3'
11	343°36.41	2.06	155°10.29	8.9'	24°50.24	-8.1'	56.4'
12	358°36.33	N22°1.72	169°38.23	9.0'	S24°42.17	-8.2'	56.4'
13	13°36.25	1.38	184°6.22	9.0'	24°33.96	-8.3'	56.4'
14	28°36.17	1.04	198°34.27	9.1'	24°25.62	-8.5'	56.4'
15	43°36.09	· · 0.69	213°2.36	9.1'	24°17.14	-8.6'	56.5'
16	58°36.01	0.35	227°30.50	9.2'	24°8.53	-8.7'	56.5'
17	73°35.93	22°0.01	241°58.70	9.2'	23°59.78	-8.9'	56.5'
18	88°35.85	N21°59.66	256°26.95	9.3'	S23°50.89	-9.0'	56.5'
19	103°35.77	59.32	270°55.25	9.4'	23°41.88	-9.1'	56.5'
20	118°35.69	58.97	285°23.61	9.4'	23°32.73	-9.3'	56.6'
21	133°35.61	· · 58.63	299°52.02	9.5'	23°23.45	-9.4'	56.6'
22	148°35.53	58.28	314°20.49	9.5'	23°14.04	-9.5'	56.6'
23	163°35.45	57.93	328°49.01	9.6'	23°4.51	-9.7'	56.6'
SD = 15.7'			SD = 15.3'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	////	////	01:14	22:53	////	////
64°	////	////	02:02	22:07	////	////
62°	////	////	02:32	21:37	////	////
60°	////	01:30	02:55	21:15	22:39	////
N 58°	////	02:05	03:13	20:57	22:04	////
56°	////	02:30	03:28	20:42	21:40	////
54°	01:22	02:50	03:41	20:29	21:20	22:46
52°	01:55	03:06	03:53	20:18	21:04	22:14
50°	02:19	03:20	04:03	20:08	20:51	21:51
45°	02:59	03:47	04:23	19:47	20:23	21:11
N 40°	03:28	04:08	04:40	19:30	20:02	20:43
35°	03:49	04:25	04:54	19:16	19:45	20:21
30°	04:07	04:40	05:07	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:36
N 10°	04:56	05:22	05:45	18:26	18:48	19:15
0°	05:14	05:39	06:02	18:09	18:31	18:57
S 10°	05:30	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:39	07:07	17:04	17:32	18:03
40°	06:17	06:50	07:20	16:51	17:21	17:54
45°	06:26	07:03	07:36	16:35	17:08	17:45
S 50°	06:37	07:18	07:55	16:16	16:53	17:34
52°	06:42	07:25	08:04	16:07	16:47	17:30
54°	06:47	07:32	08:15	15:57	16:39	17:24
56°	06:52	07:40	08:26	15:45	16:31	17:19
58°	06:58	07:50	08:40	15:32	16:22	17:13
S 60°	07:05	08:00	08:55	15:16	16:11	17:06

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	23:58	■	■	■
64°	■	■	23:10	■	■	■
62°	■	22:49	22:40	■	■	01:52
60°	21:52	22:10	22:16	· ·	00:55	02:30
N 58°	21:14	21:43	21:58	00:30	01:32	02:57
56°	20:47	21:21	21:42	00:58	01:59	03:18
54°	20:26	21:03	21:28	01:20	02:20	03:36
52°	20:09	20:48	21:16	01:38	02:37	03:51
50°	19:54	20:35	21:06	01:53	02:52	04:03
45°	19:23	20:08	20:44	02:24	03:22	04:30
N 40°	19:00	19:46	20:26	02:48	03:45	04:50
35°	18:40	19:29	20:10	03:07	04:05	05:08
30°	18:23	19:13	19:57	03:24	04:21	05:23
20°	17:55	18:47	19:35	03:53	04:49	05:48
N 10°	17:31	18:24	19:15	04:17	05:13	06:09
0°	17:08	18:03	18:57	04:40	05:35	06:29
S 10°	16:46	17:42	18:38	05:03	05:57	06:49
20°	16:21	17:19	18:18	05:27	06:20	07:10
30°	15:53	16:53	17:55	05:56	06:48	07:35
35°	15:37	16:37	17:42	06:12	07:04	07:49
40°	15:17	16:19	17:26	06:32	07:23	08:05
45°	14:53	15:57	17:08	06:56	07:45	08:25
S 50°	14:23	15:29	16:44	07:26	08:14	08:50
52°	14:08	15:15	16:33	07:41	08:28	09:01
54°	13:50	14:59	16:20	07:59	08:44	09:15
56°	13:29	14:40	16:05	08:21	09:03	09:30
58°	13:01	14:16	15:47	08:48	09:27	09:48
S 60°	12:23	13:45	15:26	09:27	09:59	10:11

Day	Sun			Moon		
	Eqn.of Time 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 96-100%
09	05:14	05:18	12:05	23:22	10:54	
10	05:23	05:27	12:05	—:—	11:49	
11	05:31	05:35	12:06	00:16	12:43	

July 12, 13, 14 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	290°8.68		223°20.02	N19°20.15	124°21.01	N07°0.80	192°11.62	N23°7.48	287°27.71	S01°19.74
1	305°11.15		238°19.57	20.67	139°22.11	07°0.20	207°13.47	7.45	302°30.17	19.75
2	320°13.61		253°19.12	21.18	154°23.21	06°59.60	222°15.33	7.42	317°32.62	19.76
3	335°16.08		268°18.67	· · 21.70	169°24.31	· · 58.99	237°17.18	· · 7.39	332°35.08	· · 19.77
4	350°18.54		283°18.22	22.21	184°25.41	58.39	252°19.03	7.37	347°37.53	19.78
5	5°21.01		298°17.76	22.73	199°26.51	57.79	267°20.89	7.34	2°39.99	19.78
6	20°23.47		313°17.31	N19°23.24	214°27.61	N06°57.19	282°22.74	N23°7.31	17°42.45	S01°19.79
7	35°25.93		328°16.86	23.75	229°28.71	56.59	297°24.60	7.29	32°44.90	19.80
8	50°28.40		343°16.40	24.27	244°29.81	55.99	312°26.45	7.26	47°47.36	19.81
9	65°30.86		358°15.95	· · 24.78	259°30.91	· · 55.38	327°28.30	· · 7.23	62°49.82	· · 19.82
10	80°33.33		13°15.49	25.29	274°32.01	54.78	342°30.16	7.20	77°52.27	19.83
11	95°35.79		28°15.04	25.80	289°33.11	54.18	357°32.01	7.18	92°54.73	19.84
12	110°38.25		43°14.58	N19°26.31	304°34.21	N06°53.58	12°33.86	N23°7.15	107°57.19	S01°19.85
13	125°40.72		58°14.13	26.81	319°35.31	52.97	27°35.72	7.12	122°59.64	19.86
14	140°43.18		73°13.67	27.32	334°36.41	52.37	42°37.57	7.09	138°2.10	19.87
15	155°45.65		88°13.21	· · 27.83	349°37.51	· · 51.77	57°39.42	· · 7.07	153°4.56	· · 19.88
16	170°48.11		103°12.75	28.34	4°38.60	51.17	72°41.28	7.04	168°7.02	19.89
17	185°50.58		118°12.29	28.84	19°39.70	50.56	87°43.13	7.01	183°9.47	19.89
18	200°53.04		133°11.83	N19°29.35	34°40.80	N06°49.96	102°44.99	N23°6.98	198°11.93	S01°19.90
19	215°55.50		148°11.37	29.85	49°41.90	49.36	117°46.84	6.96	213°14.39	19.91
20	230°57.97		163°10.91	30.35	64°43.00	48.75	132°48.69	6.93	228°16.85	19.92
21	246°0.43		178°10.45	· · 30.86	79°44.10	· · 48.15	147°50.55	· · 6.90	243°19.31	· · 19.93
22	261°2.90		193°9.99	31.36	94°45.20	47.55	162°52.40	6.87	258°21.76	19.94
23	276°5.36		208°9.53	31.86	109°46.30	46.94	177°54.26	6.84	273°24.22	19.95
Mer.pass. 04:39		ν-0.5' d0.5' m-4.08		ν1.1' d-0.6' m1.54		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.90		

Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	291°7.82		223°9.07	N19°32.36	124°47.39	N06°46.34	192°56.11	N23°6.82	288°26.68	S01°19.96
1	306°10.29		238°8.60	32.86	139°48.49	45.74	207°57.97	6.79	303°29.14	19.97
2	321°12.75		253°8.14	33.36	154°49.59	45.13	222°59.82	6.76	318°31.60	19.98
3	336°15.22		268°7.67	· · 33.86	169°50.69	· · 44.53	238°1.67	· · 6.73	333°34.06	· · 19.99
4	351°17.68		283°7.21	34.36	184°51.79	43.93	253°3.53	6.70	348°36.52	20.01
5	6°20.15		298°6.74	34.86	199°52.89	43.32	268°5.38	6.68	3°38.98	20.02
6	21°22.61		313°6.28	N19°35.35	214°53.98	N06°42.72	283°7.24	N23°6.65	18°41.44	S01°20.03
7	36°25.07		328°5.81	35.85	229°55.08	42.11	298°9.09	6.62	33°43.90	20.04
8	51°27.54		343°5.34	36.34	244°56.18	41.51	313°10.95	6.59	48°46.36	20.05
9	66°30.00		358°4.88	· · 36.84	259°57.28	· · 40.90	328°12.80	· · 6.56	63°48.82	· · 20.06
10	81°32.47		13°4.41	37.33	274°58.38	40.30	343°14.66	6.54	78°51.28	20.07
11	96°34.93		28°3.94	37.82	289°59.47	39.69	358°16.51	6.51	93°53.74	20.08
12	111°37.39		43°3.47	N19°38.32	305°0.57	N06°39.09	13°18.37	N23°6.48	108°56.20	S01°20.09
13	126°39.86		58°3.00	38.81	320°1.67	38.49	28°20.22	6.45	123°58.66	20.10
14	141°42.32		73°2.53	39.30	335°2.77	37.88	43°22.08	6.42	139°1.12	20.11
15	156°44.79		88°2.06	· · 39.79	350°3.86	· · 37.28	58°23.93	· · 6.39	154°3.58	· · 20.12
16	171°47.25		103°1.59	40.28	5°4.96	36.67	73°25.79	6.36	169°6.05	20.13
17	186°49.71		118°1.11	40.77	20°6.06	36.07	88°27.64	6.34	184°8.51	20.15
18	201°52.18		133°0.64	N19°41.25	35°7.16	N06°35.46	103°29.50	N23°6.31	199°10.97	S01°20.16
19	216°54.64		148°0.17	41.74	50°8.25	34.85	118°31.35	6.28	214°13.43	20.17
20	231°57.11		162°59.69	42.23	65°9.35	34.25	133°33.21	6.25	229°15.89	20.18
21	246°59.57		177°59.22	· · 42.71	80°10.45	· · 33.64	148°35.06	· · 6.22	244°18.36	· · 20.19
22	262°2.04		192°58.75	43.20	95°11.54	33.04	163°36.92	6.19	259°20.82	20.20
23	277°4.50		207°58.27	43.68	110°12.64	32.43	178°38.77	6.16	274°23.28	20.22
Mer.pass. 04:35		ν-0.5' d0.5' m-4.07		ν1.1' d-0.6' m1.55		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.90		

Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°6.96		222°57.79	N19°44.16	125°13.74	N06°31.83	193°40.63	N23°6.14	289°25.74	S01°20.23
1	307°9.43		237°57.32	44.65	140°14.84	31.22	208°42.48	6.11	304°28.21	20.24
2	322°11.89		252°56.84	45.13	155°15.93	30.61	223°44.34	6.08	319°30.67	20.25
3	337°14.36		267°56.36	· · 45.61	170°17.03	· · 30.01	238°46.19	· · 6.05	334°33.13	· · 20.26
4	352°16.82		282°55.89	46.09	185°18.13	29.40	253°48.05	6.02	349°35.60	20.27
5	7°19.28		297°55.41	46.57	200°19.22	28.80	268°49.91	5.99	4°38.06	20.29
6	22°21.75		312°54.93	N19°47.05	215°20.32	N06°28.19	283°51.76	N23°5.96	19°40.52	S01°20.30
7	37°24.21		327°54.45	47.53	230°21.42	27.58	298°53.62	5.93	34°42.99	20.31
8	52°26.68		342°53.97	48.01	245°22.51	26.98	313°55.47	5.90	49°45.45	20.32
9	67°29.14		357°53.49	· · 48.48	260°23.61	· · 26.37	328°57.33	· · 5.87	64°47.92	· · 20.34
10	82°31.60		12°53.01	48.96	275°24.70	25.76	343°59.18	5.85	79°50.38	20.35
11	97°34.07		27°52.52	49.43	290°25.80	25.16	359°1.04	5.82	94°52.84	20.36
12	112°36.53		42°52.04	N19°49.91	305°26.90	N06°24.55	14°2.90	N23°5.79	109°55.31	S01°20.37
13	127°39.00		57°51.56	50.38	320°27.99	23.94	29°4.75	5.76	124°57.77	20.39
14	142°41.46		72°51.08	50.86	335°29.09	23.33	44°6.61	5.73	140°0.24	20.40
15	157°43.92		87°50.59	· · 51.33	350°30.18	· · 22.73	59°8.46	· · 5.70	155°2.70	· · 20.41
16	172°46.39		102°50.11	51.80	5°31.28	22.12	74°10.32	5.67	170°5.17	20.42
17	187°48.85		117°49.62	52.27	20°32.38	21.51	89°12.18	5.64	185°7.63	20.44
18	202°51.32		132°49.14	N19°52.74	35°33.47	N06°20.90	104°14.03	N23°5.61	200°10.10	S01°20.45
19	217°53.78		147°48.65	53.21	50°34.57	20.30	119°15.89	5.58	215°12.57	20.46
20	232°56.25		162°48.16	53.68	65°35.66	19.69	134°17.75	5.55	230°15.03	20.48
21	247°58.71		177°47.68	· · 54.15	80°36.76	· · 19.08	149°19.60	· · 5.52	245°17.50	· · 20.49
22	263°1.17		192°47.19	54.61	95°37.85	18.47	164°21.46	5.49	260°19.96	20.50
23	278°3.64		207°46.70	55.08	110°38.95	17.86	179°23.32	5.46	275°22.43	20.52
Mer.pass. 04:31		ν-0.5' d0.5' m-4.07		ν1.1' d-0.6' m1.55		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.89		

	Stars	
	SHA	Dec
Alpheratz	357°34.22	29°13.79
Ankaa	353°6.61	-42°9.75
Schedar	349°30.47	56°40.42
Diphda	348°46.81	-17°50.62
Achernar	335°19.90	-57°6.08
Hamal	327°50.79	23°34.93
Polaris	314°2.38	89°22.00
Acamar	315°11.62	-40°11.86
Menkar	314°5.84	4°11.45
Mirfak	308°27.91	49°56.93
Aldebaran	290°39.39	16°33.64
Rigel	281°3.74	-8°10.22
Capella	280°21.67	46°1.32
Bellatrix	278°22.71	6°22.42
Elnath	278°1.66	28°37.71
Alnilam	275°37.59	-1°11.06
Betelgeuse	270°51.93	7°24.76
Canopus	263°52.74	-52°42.40
Sirius	258°26.20	-16°44.98
Adhara	255°5.91	-29°0.31
Procyon	244°50.72	5°9.63
Pollux	243°17.16	27°57.92
Avior	234°15.22	-59°35.49
Suhail	222°46.42	-43°32.19
Miaplacidus	221°39.08	-69°49.41
Alphard	217°47.62	-8°46.14
Regulus	207°34.23	11°50.63
Dubhe	193°40.84	61°37.05
Denebola	182°24.64	14°25.86
Gienah	175°43.24	-17°41.10
Acrux	172°59.81	-63°14.73
Gacrux	171°51.31	-57°15.64
Alioth	166°12.63	55°49.54
Spica	158°21.84	-11°17.72
Alkaid	152°51.58	49°11.39
Hadar	148°35.27	-60°30.04
Menkent	147°57.03	-36°29.91
Arcturus	145°47.42	19°3.08
Rigil Kent.	139°39.49	-60°56.72
Kochab	137°19.29	74°3.26
Zuben'ubi	136°55.40	-16°8.94
Alphecca	126°3.16	26°37.84
Antares	112°15.03	-26°29.38
Atria	107°8.39	-69°4.55
Sabik	102°1.99	-15°45.40
Shaula	96°9.40	-37°7.38
Rasalhague	95°57.84	12°32.53
Eltanin	90°41.47	51°29.18
Kaus Aust.	83°31.54	-34°22.34
Vega	80°32.51	38°48.47
Nunki	75°46.85	-26°15.86
Altair	61°59.20	8°56.17
Peacock	53°4.45	-56°39.04
Deneb	49°25.07	45°22.21
Enif	33°38.10	9°59.54
Al Na'ir	27°32.00	-46°50.02
Fomalhaut	15°13.81	-29°29.02
Scheat	13°44.58	28°13.20
Markab	13°29.28	15°20.55



h	Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d HP
0	178°35.38	N21°57.59		343°17.59	9.6'	S22°54.84	-9.8' 56.6'
1	193°35.30	57.24		357°46.22	9.7'	22°45.05	-9.9' 56.7'
2	208°35.22	56.89		12°14.91	9.7'	22°35.13	-10.0' 56.7'
3	223°35.14	56.54	· ·	26°43.66	9.8'	22°25.09	-10.2' 56.7'
4	238°35.06	56.19		41°12.47	9.9'	22°14.92	-10.3' 56.7'
5	253°34.99	55.84		55°41.33	9.9'	22°4.63	-10.4' 56.8'
6	268°34.91	N21°55.49		70°10.25	10.0'	S21°54.21	-10.5' 56.8'
7	283°34.83	55.13		84°39.23	10.0'	21°43.68	-10.7' 56.8'
8	298°34.76	54.78		99°8.27	10.1'	21°33.03	-10.8' 56.8'
9	313°34.68	54.43	· ·	113°37.37	10.2'	21°22.26	-10.9' 56.8'
10	328°34.60	54.07		128°6.53	10.2'	21°11.37	-11.0' 56.9'
11	343°34.53	53.72		142°35.74	10.3'	21°0.36	-11.1' 56.9'
12	358°34.45	N21°53.36		157°5.01	10.3'	S20°49.24	-11.2' 56.9'
13	13°34.38	53.01		171°34.35	10.4'	20°38.00	-11.3' 56.9'
14	28°34.30	52.65		186°3.74	10.5'	20°26.65	-11.5' 56.9'
15	43°34.23	52.29	· ·	200°33.19	10.5'	20°15.19	-11.6' 57.0'
16	58°34.15	51.93		215°2.70	10.6'	20°3.62	-11.7' 57.0'
17	73°34.08	51.57		229°32.27	10.6'	19°51.93	-11.8' 57.0'
18	88°34.00	N21°51.21		244°1.89	10.7'	S19°40.14	-11.9' 57.0'
19	103°33.93	50.85		258°31.58	10.7'	19°28.24	-12.0' 57.1'
20	118°33.85	50.49		273°1.32	10.8'	19°16.24	-12.1' 57.1'
21	133°33.78	50.13	· ·	287°31.12	10.9'	19°4.12	-12.2' 57.1'
22	148°33.70	49.77		302°0.98	10.9'	18°51.91	-12.3' 57.1'
23	163°33.63	49.41		316°30.90	11.0'	18°39.59	-12.4' 57.1'
SD = 15.7'			$d = -0.3'$	SD = 15.4'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	178°33.56	N21°49.04		331°0.88	11.0'	S18°27.17	-12.5' 57.2'
1	193°33.48	48.68		345°30.91	11.1'	18°14.65	-12.6' 57.2'
2	208°33.41	48.31		0°1.00	11.1'	18°2.03	-12.7' 57.2'
3	223°33.34	47.95	· ·	14°31.14	11.2'	17°49.31	-12.8' 57.2'
4	238°33.27	47.58		29°1.34	11.3'	17°36.49	-12.9' 57.2'
5	253°33.19	47.22		43°31.60	11.3'	17°23.58	-13.0' 57.3'
6	268°33.12	N21°46.85		58°1.91	11.4'	S17°10.57	-13.1' 57.3'
7	283°33.05	46.48		72°32.27	11.4'	16°57.47	-13.2' 57.3'
8	298°32.98	46.11		87°2.70	11.5'	16°44.28	-13.3' 57.3'
9	313°32.91	45.74	· ·	101°33.17	11.5'	16°31.00	-13.4' 57.3'
10	328°32.84	45.37		116°3.70	11.6'	16°17.62	-13.5' 57.4'
11	343°32.76	45.00		130°34.28	11.6'	16°4.16	-13.5' 57.4'
12	358°32.69	N21°44.63		145°4.91	11.7'	S15°50.61	-13.6' 57.4'
13	13°32.62	44.26		159°35.59	11.7'	15°36.98	-13.7' 57.4'
14	28°32.55	43.89		174°6.32	11.8'	15°23.26	-13.8' 57.4'
15	43°32.48	43.51	· ·	188°37.11	11.8'	15°9.45	-13.9' 57.5'
16	58°32.41	43.14		203°7.94	11.9'	14°55.57	-14.0' 57.5'
17	73°32.34	42.76		217°38.82	11.9'	14°41.60	-14.0' 57.5'
18	88°32.27	N21°42.39		232°9.75	12.0'	S14°27.55	-14.1' 57.5'
19	103°32.20	42.01		246°40.73	12.0'	14°13.42	-14.2' 57.5'
20	118°32.13	41.64		261°11.75	12.1'	13°59.22	-14.3' 57.6'
21	133°32.06	41.26	· ·	275°42.82	12.1'	13°44.94	-14.4' 57.6'
22	148°31.99	40.88		290°13.94	12.2'	13°30.58	-14.4' 57.6'
23	163°31.93	40.50		304°45.09	12.2'	13°16.15	-14.5' 57.6'
SD = 15.7'			$d = -0.4'$	SD = 15.6'			

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	178°31.86	N21°40.13		319°16.30	12.2'	S13°1.65	-14.6' 57.6'
1	193°31.79	39.75		333°47.54	12.3'	12°47.07	-14.6' 57.7'
2	208°31.72	39.37		348°18.83	12.3'	12°32.43	-14.7' 57.7'
3	223°31.65	38.99	· ·	2°50.15	12.4'	12°17.72	-14.8' 57.7'
4	238°31.59	38.60		17°21.52	12.4'	12°2.94	-14.8' 57.7'
5	253°31.52	38.22		31°52.93	12.4'	11°48.09	-14.9' 57.7'
6	268°31.45	N21°37.84		46°24.37	12.5'	S11°33.18	-15.0' 57.8'
7	283°31.38	37.46		60°55.85	12.5'	11°18.20	-15.0' 57.8'
8	298°31.32	37.07		75°27.37	12.6'	11°3.17	-15.1' 57.8'
9	313°31.25	36.69	· ·	89°58.92	12.6'	10°48.07	-15.2' 57.8'
10	328°31.18	36.30		104°30.51	12.6'	10°32.91	-15.2' 57.8'
11	343°31.12	35.92		119°2.13	12.7'	10°17.69	-15.3' 57.8'
12	358°31.05	N21°35.53		133°33.78	12.7'	S10°2.41	-15.3' 57.9'
13	13°30.99	35.14		148°5.46	12.7'	09°47.08	-15.4' 57.9'
14	28°30.92	34.75		162°37.18	12.7'	09°31.69	-15.4' 57.9'
15	43°30.86	34.36	· ·	177°8.92	12.8'	09°16.25	-15.5' 57.9'
16	58°30.79	33.98		191°40.69	12.8'	09°0.76	-15.5' 57.9'
17	73°30.73	33.59		206°12.49	12.8'	08°45.22	-15.6' 58.0'
18	88°30.66	N21°33.20		220°44.31	12.8'	S08°29.62	-15.6' 58.0'
19	103°30.60	32.80		235°16.16	12.9'	08°13.98	-15.7' 58.0'
20	118°30.53	32.41		249°48.03	12.9'	07°58.29	-15.7' 58.0'
21	133°30.47	32.02	· ·	264°19.93	12.9'	07°42.55	-15.8' 58.0'
22	148°30.40	31.63		278°51.84	12.9'	07°26.77	-15.8' 58.1'
23	163°30.34	31.23		293°23.78	13.0'	07°10.94	-15.9' 58.1'
SD = 15.7'			$d = -0.4'$	SD = 15.7'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:27	22:40	////	////
64°	////	////	02:10	21:59	////	////
62°	////	00:34	02:39	21:31	23:29	////
60°	////	01:39	03:00	21:10	22:30	////
N 58°	////	02:12	03:18	20:53	21:58	////
56°	00:31	02:35	03:32	20:38	21:35	23:32
54°	01:31	02:54	03:45	20:26	21:16	22:38
52°	02:01	03:10	03:56	20:15	21:01	22:09
50°	02:23	03:23	04:06	20:05	20:48	21:47
45°	03:03	03:50	04:26	19:45	20:21	21:08
N 40°	03:30	04:10	04:42	19:29	20:01	20:41
35°	03:51	04:27	04:56	19:15	19:44	20:20
30°	04:09	04:41	05:08	19:03	19:30	20:03
20°	04:36	05:04	05:28	18:43	19:07	19:36
N 10°	04:56	05:23	05:46	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:09	18:32	18:58
S 10°	05:30	05:56	06:18	17:53	18:16	18:42
20°	05:44	06:12	06:35	17:36	18:00	18:27
30°	05:59	06:29	06:55	17:17	17:43	18:12
35°	06:07	06:39	07:06	17:06	17:33	18:05
40°	06:16	06:49	07:19	16:53	17:23	17:56
45°	06:25	07:01	07:34	16:37	17:11	17:47
S 50°	06:35	07:16	07:53	16:19	16:56	17:37
52°	06:40	07:23	08:02	16:10	16:49	17:32
54°	06:45	07:30	08:12	16:00	16:42	17:27
56°	06:50	07:38	08:23	15:49	16:34	17:22
58°	06:56	07:47	08:36	15:36	16:25	17:16
S 60°	07:02	07:57	08:51	15:21	16:15	17:10

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°		23:48	23:00			06:18
N 70°		00:24 23:24	22:49		03:58	06:39
68°	23:42	23:05	22:41		04:38	06:56
66°	23:13	22:51	22:34	02:35	05:06	07:09
64°	22:51	22:38	22:28	03:22	05:26	07:20
62°	22:33	22:28	22:23	03:52	05:43	07:29
60°	22:18	22:19	22:18	04:14	05:57	07:36
N 58°	22:06	22:11	22:14	04:32	06:09	07:43
56°	21:55	22:04	22:10	04:47	06:19	07:49
54°	21:45	21:57	22:07	05:00	06:28	07:55
52°	21:36	21:52	22:04	05:12	06:36	07:59
50°	21:29	21:46	22:01	05:22	06:43	08:04
45°	21:12	21:35	21:55	05:43	06:58	08:13
N 40°	20:58	21:26	21:50	06:00	07:10	08:21
35°	20:46	21:18	21:46	06:14	07:21	08:27
30°	20:36	21:10	21:42	06:26	07:30	08:33
20°	20:18	20:58	21:35	06:47	07:46	08:43
N 10°	20:03	20:47	21:30	07:05	07:59	08:52
0°	19:48	20:37	21:24	07:22	08:12	09:00
S 10°	19:33	20:27	21:18	07:38	08:24	09:07
20°	19:18	20:16	21:12	07:56	08:37	09:16
30°	18:59	20:03	21:06	08:16	08:52	09:25
35°	18:49	19:56	21:02	08:28	09:01	09:31
40°	18:36	19:47	20:57	08:41	09:11	09:37
45°	18:22	19:37	20:52	08:57	09:22	09:44
S 50°	18:04	19:25	20:46	09:16	09:36	09:52
52°	17:56	19:20	20:43	09:25	09:43	09:56
54°	17:46	19:13	20:40	09:35	09:50	10:00
56°	17:36	19:06	20:36	09:47	09:57	10:05
58°	17:23	18:59	20:32	10:00	10:06	10:10
S 60°	17:09	18:50	20:28	10:15	10:16	10:16

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		98-89%
12	05:38	05:42	12:06	01:09	13:35		
13	05:46	05:49	12:06	02:00	14:24		
14	05:53	05:56	12:06	02:48	15:12		

July 15, 16, 17 UT (Tue., Wed., Thu.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	293°6.10	222°46.21	N19°55.55	125°40.04	N06°17.26	194°25.17	N23°5.43	290°24.90	S01°20.53			Alpheratz	357°34.20 29°13.80
1	308°8.57	237°45.72	56.01	140°41.14	16.65	209°27.03	5.40	305°27.36	20.54			Ankaa	353°6.58 -42°9.74
2	323°11.03	252°45.23	56.47	155°42.24	16.04	224°28.89	5.37	320°29.83	20.56			Schedar	349°30.44 56°40.43
3	338°13.49	267°44.74	•• 56.94	170°43.33	•• 15.43	239°30.74	•• 5.34	335°32.30	•• 20.57			Diphda	348°46.79 -17°50.61
4	353°15.96	282°44.25	57.40	185°44.43	14.82	254°32.60	5.31	350°34.77	20.58			Achernar	335°19.86 -57°6.07
5	8°18.42	297°43.76	57.86	200°45.52	14.21	269°34.46	5.28	5°37.23	20.60			Hamal	327°50.77 23°34.93
6	23°20.89	312°43.27	N19°58.32	215°46.62	N06°13.61	284°36.31	N23°5.25	20°39.70	S01°20.61			Polaris	314°1.07 89°22.00
7	38°23.35	327°42.78	58.78	230°47.71	13.00	299°38.17	5.22	35°42.17	20.63			Acamar	315°11.60 -40°11.85
8	53°25.81	342°42.28	59.24	245°48.81	12.39	314°40.03	5.19	50°44.64	20.64			Menkar	314°5.82 4°11.46
9	68°28.28	357°41.79	19°59.70	260°49.90	•• 11.78	329°41.88	•• 5.16	65°47.10	•• 20.65			Mirfak	308°27.89 49°56.93
10	83°30.74	12°41.30	20°0.16	275°50.99	11.17	344°43.74	5.13	80°49.57	20.67			Aldebaran	290°39.37 16°33.64
11	98°33.21	27°40.80	0.62	290°52.09	10.56	359°45.60	5.10	95°52.04	20.68			Rigel	281°3.73 -8°10.21
12	113°35.67	42°40.31	N20°1.08	305°53.18	N06°9.95	14°47.45	N23°5.07	110°54.51	S01°20.70			Capella	280°21.65 46°1.32
13	128°38.13	57°39.81	1.53	320°54.28	9.34	29°49.31	5.04	125°56.98	20.71			Bellatrix	278°22.70 6°22.43
14	143°40.60	72°39.31	1.99	335°55.37	8.73	44°51.17	5.01	140°59.45	20.73			Elnath	278°1.64 28°37.71
15	158°43.06	87°38.82	•• 2.44	350°56.47	•• 8.12	59°53.03	•• 4.98	156°1.92	•• 20.74			Alnilam	275°37.58 -1°11.05
16	173°45.53	102°38.32	2.89	5°57.56	7.51	74°54.88	4.95	171°4.38	20.75			Betelgeuse	270°51.92 7°24.77
17	188°47.99	117°37.82	3.35	20°58.66	6.90	89°56.74	4.92	186°6.85	20.77			Canopus	263°52.74 -52°42.38
18	203°50.46	132°37.32	N20°3.80	35°59.75	N06°6.29	104°58.60	N23°4.89	201°9.32	S01°20.78			Sirius	258°26.20 -16°44.97
19	218°52.92	147°36.83	4.25	51°0.84	5.68	120°0.46	4.86	216°11.79	20.80			Adhara	255°5.91 -29°0.30
20	233°55.38	162°36.33	4.70	66°1.94	5.07	135°2.31	4.83	231°14.26	20.81			Procyon	244°50.71 5°9.63
21	248°57.85	177°35.83	•• 5.15	81°3.03	•• 4.46	150°4.17	•• 4.80	246°16.73	•• 20.83			Pollux	243°17.15 27°57.92
22	264°0.31	192°35.33	5.60	96°4.12	3.85	165°6.03	4.77	261°19.20	20.84			Avior	234°15.22 -59°35.47
23	279°2.78	207°34.83	6.05	111°5.22	3.24	180°7.89	4.74	276°21.67	20.86			Suhail	222°46.42 -43°32.18
Mer.pass. 04:27		ν-0.5' d0.5' m-4.07		ν1.1' d-0.6' m1.55		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.89					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	294°5.24	222°34.32	N20°6.50	126°6.31	N06°2.63	195°9.74	N23°4.71	291°24.14	S01°20.87				
1	309°7.70	237°33.82	6.94	141°7.41	2.02	210°11.60	4.68	306°26.61	20.89				
2	324°10.17	252°33.32	7.39	156°8.50	1.41	225°13.46	4.65	321°29.09	20.90				
3	339°12.63	267°32.82	•• 7.83	171°9.59	•• 0.80	240°15.32	•• 4.62	336°31.56	•• 20.92				
4	354°15.10	282°32.31	8.28	186°10.69	06°0.19	255°17.18	4.59	351°34.03	20.93				
5	9°17.56	297°31.81	8.72	201°11.78	05°59.58	270°19.03	4.56	6°36.50	20.95				
6	24°20.02	312°31.31	N20°9.16	216°12.87	N05°58.97	285°20.89	N23°4.52	21°38.97	S01°20.96				
7	39°22.49	327°30.80	9.61	231°13.97	58.36	300°22.75	4.49	36°41.44	20.98				
8	54°24.95	342°30.29	10.05	246°15.06	57.75	315°24.61	4.46	51°43.91	21.00				
9	69°27.42	357°29.79	•• 10.49	261°16.15	•• 57.13	330°26.47	•• 4.43	66°46.39	•• 21.01				
10	84°29.88	12°29.28	10.93	276°17.25	56.52	345°28.33	4.40	81°48.86	21.03				
11	99°32.34	27°28.77	11.37	291°18.34	55.91	0°30.18	4.37	96°51.33	21.04				
12	114°34.81	42°28.27	N20°11.80	306°19.43	N05°55.30	15°32.04	N23°4.34	111°53.80	S01°21.06				
13	129°37.27	57°27.76	12.24	321°20.52	54.69	30°33.90	4.31	126°56.27	21.08				
14	144°39.74	72°27.25	12.68	336°21.62	54.08	45°35.76	4.28	141°58.75	21.09				
15	159°42.20	87°26.74	•• 13.11	351°22.71	•• 53.46	60°37.62	•• 4.25	157°1.22	•• 21.11				
16	174°44.66	102°26.23	13.55	6°23.80	52.85	75°39.48	4.21	172°3.69	21.12				
17	189°47.13	117°25.72	13.98	21°24.89	52.24	90°41.34	4.18	187°6.17	21.14				
18	204°49.59	132°25.21	N20°14.42	36°25.99	N05°51.63	105°43.19	N23°4.15	202°8.64	S01°21.16				
19	219°52.06	147°24.70	14.85	51°27.08	51.02	120°45.05	4.12	217°11.11	21.17				
20	234°54.52	162°24.19	15.28	66°28.17	50.40	135°46.91	4.09	232°13.59	21.19				
21	249°56.98	177°23.68	•• 15.71	81°29.26	•• 49.79	150°48.77	•• 4.06	247°16.06	•• 21.21				
22	264°59.45	192°23.16	16.14	96°30.36	49.18	165°50.63	4.03	262°18.53	21.22				
23	280°1.91	207°22.65	16.57	111°31.45	48.57	180°52.49	4.00	277°21.01	21.24				
Mer.pass. 04:23		ν-0.5' d0.4' m-4.06		ν1.1' d-0.6' m1.56		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.88					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	295°4.38	222°22.14	N20°17.00	126°32.54	N05°47.95	195°54.35	N23°3.96	292°23.48	S01°21.26				
1	310°6.84	237°21.62	17.43	141°33.63	47.34	210°56.21	3.93	307°25.96	21.27				
2	325°9.31	252°21.11	17.86	156°34.72	46.73	225°58.07	3.90	322°28.43	21.29				
3	340°11.77	267°20.59	•• 18.28	171°35.81	•• 46.12	240°59.92	•• 3.87	337°30.91	•• 21.31				
4	355°14.23	282°20.08	18.71	186°36.91	45.50	256°1.78	3.84	352°33.38	21.32				
5	10°16.70	297°19.56	19.13	201°38.00	44.89	271°3.64	3.81	7°35.86	21.34				
6	25°19.16	312°19.04	N20°19.56	216°39.09	N05°44.28	286°5.50	N23°3.77	22°38.33	S01°21.36				
7	40°21.63	327°18.53	19.98	231°40.18	43.66	301°7.36	3.74	37°40.81	21.37				
8	55°24.09	342°18.01	20.40	246°41.27	43.05	316°9.22	3.71	52°43.28	21.39				
9	70°26.55	357°17.49	•• 20.83	261°42.36	•• 42.44	331°11.08	•• 3.68	67°45.76	•• 21.41				
10	85°29.02	12°16.97	21.25	276°43.46	41.82	346°12.94	3.65	82°48.24	21.43				
11	100°31.48	27°16.45	21.67	291°44.55	41.21	1°14.80	3.62	97°50.71	21.44				
12	115°33.95	42°15.93	N20°22.09	306°45.64	N05°40.60	16°16.66	N23°3.58	112°53.19	S01°21.46				
13	130°36.41	57°15.41	22.50	321°46.73	39.98	31°18.52	3.55	127°55.66	21.48				
14	145°38.87	72°14.89	22.92	336°47.82	39.37	46°20.38	3.52	142°58.14	21.50				
15	160°41.34	87°14.37	•• 23.34	351°48.91	•• 38.75	61°22.24	•• 3.49	158°0.62	•• 21.51				
16	175°43.80	102°13.85	23.75	6°50.00	38.14	76°24.10	3.46	173°3.09	21.53				
17	190°46.27	117°13.33	24.17	21°51.09	37.53	91°25.96	3.42	188°5.57	21.55				
18	205°48.73	132°12.80	N20°24.58	36°52.18	N05°36.91	106°27.82	N23°3.39	203°8.05	S01°21.57				
19	220°51.19	147°12.28	25.00	51°53.27	36.30	121°29.68	3.36	218°10.53	21.59				
20	235°53.66	162°11.76	25.41	66°54.36	35.63								

h		Sun		Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.28	N21°30.84	307°55.73	13.0'	S06°55.08	-15.9'	58.1'
1	193°30.21	30.44	322°27.71	13.0'	06°39.17	-15.9'	58.1'
2	208°30.15	30.05	336°59.70	13.0'	06°23.22	-16.0'	58.1'
3	223°30.09	· · 29.65	351°31.70	13.0'	06°7.23	-16.0'	58.1'
4	238°30.03	29.26	6°3.72	13.0'	05°51.21	-16.1'	58.2'
5	253°29.96	28.86	20°35.75	13.0'	05°35.15	-16.1'	58.2'
6	268°29.90	N21°28.46	35°7.80	13.1'	S05°19.05	-16.1'	58.2'
7	283°29.84	28.06	49°39.86	13.1'	05°2.92	-16.2'	58.2'
8	298°29.78	27.66	64°11.92	13.1'	04°46.76	-16.2'	58.2'
9	313°29.72	· · 27.26	78°43.99	13.1'	04°30.57	-16.2'	58.2'
10	328°29.65	26.86	93°16.07	13.1'	04°14.35	-16.2'	58.3'
11	343°29.59	26.46	107°48.16	13.1'	03°58.10	-16.3'	58.3'
12	358°29.53	N21°26.06	122°20.25	13.1'	S03°41.82	-16.3'	58.3'
13	13°29.47	25.66	136°52.35	13.1'	03°25.52	-16.3'	58.3'
14	28°29.41	25.25	151°24.44	13.1'	03°9.19	-16.3'	58.3'
15	43°29.35	· · 24.85	165°56.54	13.1'	02°52.84	-16.4'	58.3'
16	58°29.29	24.44	180°28.64	13.1'	02°36.47	-16.4'	58.4'
17	73°29.23	24.04	195°0.73	13.1'	02°20.08	-16.4'	58.4'
18	88°29.17	N21°23.63	209°32.82	13.1'	S02°3.67	-16.4'	58.4'
19	103°29.11	23.23	224°4.91	13.1'	01°47.24	-16.4'	58.4'
20	118°29.05	22.82	238°36.99	13.1'	01°30.79	-16.5'	58.4'
21	133°28.99	· · 22.41	253°9.06	13.1'	01°14.33	-16.5'	58.4'
22	148°28.94	22.00	267°41.13	13.1'	00°57.85	-16.5'	58.5'
23	163°28.88	21.59	282°13.18	13.0'	00°41.37	-16.5'	58.5'
SD = 15.7'		$d = -0.4'$	SD = 15.8'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.82	N21°21.19	296°45.23	13.0'	S00°24.87	-16.5'	58.5'
1	193°28.76	20.78	311°17.26	13.0'	S00°8.36	-16.5'	58.5'
2	208°28.70	20.36	325°49.28	13.0'	N00°8.16	16.5'	58.5'
3	223°28.64	· · 19.95	340°21.28	13.0'	00°24.69	16.5'	58.5'
4	238°28.59	19.54	354°53.27	13.0'	00°41.22	16.5'	58.6'
5	253°28.53	19.13	9°25.23	12.9'	00°57.76	16.5'	58.6'
6	268°28.47	N21°18.71	23°57.18	12.9'	N01°14.30	16.5'	58.6'
7	283°28.42	18.30	38°29.11	12.9'	01°30.84	16.5'	58.6'
8	298°28.36	17.89	53°1.02	12.9'	01°47.38	16.5'	58.6'
9	313°28.30	· · 17.47	67°32.90	12.9'	02°3.92	16.5'	58.6'
10	328°28.25	17.06	82°4.76	12.8'	02°20.46	16.5'	58.6'
11	343°28.19	16.64	96°36.59	12.8'	02°37.00	16.5'	58.7'
12	358°28.14	N21°16.22	111°8.40	12.8'	N02°53.53	16.5'	58.7'
13	13°28.08	15.80	125°40.17	12.7'	03°10.06	16.5'	58.7'
14	28°28.03	15.39	140°11.92	12.7'	03°26.57	16.5'	58.7'
15	43°27.97	· · 14.97	154°43.64	12.7'	03°43.08	16.5'	58.7'
16	58°27.92	14.55	169°15.32	12.6'	03°59.58	16.5'	58.7'
17	73°27.86	14.13	183°46.96	12.6'	04°16.07	16.5'	58.7'
18	88°27.81	N21°13.71	198°18.58	12.6'	N04°32.54	16.5'	58.8'
19	103°27.75	13.28	212°50.15	12.5'	04°49.00	16.4'	58.8'
20	118°27.70	12.86	227°21.69	12.5'	05°5.45	16.4'	58.8'
21	133°27.64	· · 12.44	241°53.18	12.5'	05°21.87	16.4'	58.8'
22	148°27.59	12.02	256°24.64	12.4'	05°38.28	16.4'	58.8'
23	163°27.54	11.59	270°56.05	12.4'	05°54.67	16.4'	58.8'
SD = 15.7'		$d = -0.4'$	SD = 16.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.48	N21°11.17	285°27.42	12.3'	N06°11.03	16.3'	58.8'
1	193°27.43	10.74	299°58.74	12.3'	06°27.37	16.3'	58.9'
2	208°27.38	10.32	314°30.02	12.2'	06°43.69	16.3'	58.9'
3	223°27.33	· · 9.89	329°1.24	12.2'	06°59.98	16.3'	58.9'
4	238°27.27	9.46	343°32.42	12.1'	07°16.25	16.2'	58.9'
5	253°27.22	9.04	358°3.55	12.1'	07°32.49	16.2'	58.9'
6	268°27.17	N21°8.61	12°34.62	12.0'	N07°48.69	16.2'	58.9'
7	283°27.12	8.18	27°5.65	12.0'	08°4.86	16.1'	58.9'
8	298°27.07	7.75	41°36.61	11.9'	08°21.00	16.1'	58.9'
9	313°27.02	· · 7.32	56°7.52	11.9'	08°37.11	16.1'	59.0'
10	328°26.97	6.89	70°38.38	11.8'	08°53.18	16.0'	59.0'
11	343°26.92	6.46	85°9.17	11.7'	09°9.21	16.0'	59.0'
12	358°26.87	N21°6.02	99°39.90	11.7'	N09°25.20	16.0'	59.0'
13	13°26.81	5.59	114°10.57	11.6'	09°41.15	15.9'	59.0'
14	28°26.76	5.16	128°41.18	11.5'	09°57.06	15.9'	59.0'
15	43°26.72	· · 4.72	143°11.73	11.5'	10°12.92	15.8'	59.0'
16	58°26.67	4.29	157°42.21	11.4'	10°28.74	15.8'	59.0'
17	73°26.62	3.85	172°12.62	11.3'	10°44.51	15.7'	59.1'
18	88°26.57	N21°3.42	186°42.96	11.3'	N11°0.24	15.7'	59.1'
19	103°26.52	2.98	201°13.23	11.2'	11°15.91	15.6'	59.1'
20	118°26.47	2.54	215°43.44	11.1'	11°31.53	15.6'	59.1'
21	133°26.42	· · 2.11	230°13.57	11.1'	11°47.10	15.5'	59.1'
22	148°26.37	1.67	244°43.63	11.0'	12°2.61	15.5'	59.1'
23	163°26.33	1.23	259°13.61	10.9'	12°18.06	15.4'	59.1'
SD = 15.7'		$d = -0.4'$	SD = 16.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	////	////	01:41	22:28	////	////
64°	////	////	02:19	21:51	////	////
62°	////	00:58	02:45	21:25	23:08	////
60°	////	01:49	03:06	21:05	22:21	////
N 58°	////	02:19	03:23	20:48	21:51	////
56°	00:54	02:41	03:37	20:35	21:30	23:13
54°	01:40	02:59	03:49	20:23	21:12	22:30
52°	02:08	03:14	03:59	20:12	20:57	22:03
50°	02:29	03:27	04:09	20:03	20:44	21:42
45°	03:06	03:53	04:29	19:43	20:19	21:05
N 40°	03:33	04:13	04:45	19:27	19:59	20:38
35°	03:54	04:29	04:58	19:14	19:43	20:18
30°	04:11	04:43	05:10	19:02	19:29	20:01
20°	04:37	05:05	05:30	18:42	19:07	19:35
N 10°	04:57	05:24	05:47	18:25	18:48	19:15
0°	05:15	05:40	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:17	18:43
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:19	17:44	18:14
35°	06:06	06:37	07:05	17:08	17:35	18:06
40°	06:14	06:48	07:18	16:55	17:25	17:58
45°	06:23	07:00	07:32	16:40	17:13	17:49
S 50°	06:33	07:14	07:51	16:22	16:59	17:39
52°	06:38	07:20	07:59	16:13	16:53	17:35
54°	06:42	07:27	08:09	16:04	16:46	17:30
56°	06:47	07:35	08:20	15:53	16:38	17:25
58°	06:53	07:44	08:32	15:41	16:29	17:20
S 60°	06:59	07:53	08:46	15:26	16:19	17:14

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	22:22	21:46	21:02	08:46	11:04	13:31
N 70°	22:21	21:53	21:21	08:53	11:01	13:14
68°	22:20	21:59	21:36	08:58	10:58	13:02
66°	22:19	22:05	21:48	09:03	10:55	12:51
64°	22:18	22:09	21:59	09:07	10:53	12:43
62°	22:18	22:13	22:08	09:10	10:52	12:35
60°	22:17	22:16	22:16	09:13	10:50	12:29
N 58°	22:17	22:19	22:23	09:16	10:49	12:23
56°	22:16	22:22	22:29	09:18	10:47	12:18
54°	22:16	22:24	22:34	09:20	10:46	12:14
52°	22:15	22:26	22:39	09:22	10:45	12:10
50°	22:15	22:29	22:44	09:24	10:44	12:06
45°	22:14	22:33	22:54	09:28	10:42	11:59
N 40°	22:13	22:37	23:02	09:31	10:41	11:52
35°	22:13	22:40	23:09	09:33	10:39	11:47
30°	22:12	22:43	23:15	09:35	10:38	11:42
20°	22:12	22:48	23:26	09:39	10:36	11:34
N 10°	22:11	22:52	23:36	09:43	10:34	11:26
0°	22:10	22:57	23:45	09:46	10:32	11:19
S 10°	22:09	23:01	23:55	09:49	10:30	11:13
20°	22:09	23:06	· · ·	09:52	10:28	11:05
30°	22:08	23:11	· · ·	09:56	10:26	10:57
35°	22:08	23:14	· · ·	09:58	10:25	10:53
40°	22:07	23:18	· · ·	10:00	10:23	10:47
45°	22:07	23:22	· · ·	10:03	10:22	10:41
S 50°	22:06	23:27	· · ·	10:06	10:20	10:34
52°	22:06	23:29	· · ·	10:08	10:19	10:31
54°	22:05	23:32	· · ·	10:09	10:18	10:27
56°	22:05	23:35	· · ·	10:11	10:17	10:23
58°	22:04	23:38	· · ·	10:13	10:16	10:18
S 60°	22:04	23:41	· · ·	10:15	10:14	10:13

Day	Sun		Mer. Pass	Moon		Age 20-22 82-62%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
15	05:59	06:02	12:06	03:35	15:58	
16	06:05	06:07	12:06	04:21	16:44	
17	06:10	06:13	12:06	05:08	17:32	

July 18, 19, 20 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	296° 3.52	222° 9.65	N20° 27.05	126° 58.73	N05° 33.22	196° 38.98	N23° 3.20	293° 22.92	S01° 21.68	Alpheratz	357° 34.18	29° 13.81
1	311° 5.98	237° 9.13	27.46	141° 59.82	32.61	211° 40.84	3.17	308° 25.39	21.70	Ankaa	353° 6.56	-42° 9.74
2	326° 8.44	252° 8.60	27.87	157° 0.91	31.99	226° 42.70	3.13	323° 27.87	21.71	Schedar	349° 30.41	56° 40.43
3	341° 10.91	267° 8.07	•• 28.28	172° 2.00	•• 31.38	241° 44.56	•• 3.10	338° 30.35	•• 21.73	Diphda	348° 46.77	-17° 50.60
4	356° 13.37	282° 7.55	28.69	187° 3.09	30.76	256° 46.42	3.07	353° 32.83	21.75	Achernar	335° 19.83	-57° 6.07
5	11° 15.84	297° 7.02	29.09	202° 4.18	30.15	271° 48.28	3.04	8° 35.31	21.77	Hamal	327° 50.75	23° 34.94
6	26° 18.30	312° 6.49	N20° 29.50	217° 5.27	N05° 29.53	286° 50.14	N23° 3.00	23° 37.79	S01° 21.79	Polaris	313° 59.52	89° 22.00
7	41° 20.76	327° 5.96	29.90	232° 6.35	28.92	301° 52.01	2.97	38° 40.27	21.81	Acamar	315° 11.58	-40° 11.84
8	56° 23.23	342° 5.43	30.30	247° 7.44	28.30	316° 53.87	2.94	53° 42.75	21.83	Menkar	314° 5.81	4° 11.46
9	71° 25.69	357° 4.90	•• 30.71	262° 8.53	•• 27.69	331° 55.73	•• 2.91	68° 45.23	•• 21.84	Mirfak	308° 27.86	49° 56.93
10	86° 28.16	12° 4.37	31.11	277° 9.62	27.07	346° 57.59	2.87	83° 47.71	21.86	Aldebaran	290° 39.36	16° 33.65
11	101° 30.62	27° 3.84	31.51	292° 10.71	26.45	1° 59.45	2.84	98° 50.19	21.88	Rigel	281° 3.72	-8° 10.72
12	116° 33.08	42° 3.31	N20° 31.91	307° 11.80	N05° 25.84	17° 1.31	N23° 2.81	113° 52.67	S01° 21.90	Capella	280° 21.63	46° 1.32
13	131° 35.55	57° 2.77	32.31	322° 12.89	25.22	32° 3.17	2.77	128° 55.15	21.92	Bellatrix	278° 22.69	6° 22.43
14	146° 38.01	72° 2.24	32.71	337° 13.98	24.61	47° 5.03	2.74	143° 57.63	21.94	El Nath	278° 1.63	28° 37.71
15	161° 40.48	87° 1.71	•• 33.10	352° 15.07	•• 23.99	62° 6.89	•• 2.71	159° 0.11	•• 21.96	Alnilam	275° 37.57	-1° 11.05
16	176° 42.94	102° 1.17	33.50	7° 16.16	23.37	77° 8.75	2.68	174° 2.59	21.98	Betelgeuse	270° 51.91	7° 24.77
17	191° 45.40	117° 0.64	33.90	22° 17.25	22.76	92° 10.62	2.64	189° 5.07	22.00	Canopus	263° 52.72	-52° 42.37
18	206° 47.87	132° 0.11	N20° 34.29	37° 18.34	N05° 22.14	107° 12.48	N23° 2.61	204° 7.55	S01° 22.02	Sirius	258° 26.19	-16° 44.96
19	221° 50.33	146° 59.57	34.69	52° 19.43	21.52	122° 14.34	2.58	219° 10.03	22.04	Adhara	255° 5.90	-29° 0.29
20	236° 52.80	161° 59.03	35.08	67° 20.51	20.91	137° 16.20	2.54	234° 12.51	22.06	Procyon	244° 50.71	5° 9.64
21	251° 55.26	176° 58.50	•• 35.47	82° 21.60	•• 20.29	152° 18.06	•• 2.51	249° 15.00	•• 22.08	Pollux	243° 17.15	27° 57.92
22	266° 57.73	191° 57.96	35.86	97° 22.69	19.67	167° 19.92	2.48	264° 17.48	22.10	Avior	234° 15.23	-59° 35.46
23	282° 0.19	206° 57.42	36.25	112° 23.78	19.06	182° 21.79	2.44	279° 19.96	22.12	Suhail	222° 46.43	-43° 32.16
Mer.pass. 04:15			ν-0.5' d0.4' m-4.05		ν1.1' d-0.6' m1.56		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.87			
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	297° 2.65	221° 56.89	N20° 36.64	127° 24.87	N05° 18.44	197° 23.65	N23° 2.41	294° 22.44	S01° 22.14	Miaplacidus	221° 39.12	-69° 49.38
1	312° 5.12	236° 56.35	37.03	142° 25.96	17.82	212° 25.51	2.38	309° 24.92	22.16	Alphard	217° 47.63	-8° 46.12
2	327° 7.58	251° 55.81	37.42	157° 27.05	17.21	227° 27.37	2.34	324° 27.41	22.18	Regulus	207° 34.24	11° 50.63
3	342° 10.05	266° 55.27	•• 37.81	172° 28.13	•• 16.59	242° 29.23	•• 2.31	339° 29.89	•• 22.20	Dubhe	193° 40.88	61° 37.03
4	357° 12.51	281° 54.73	38.20	187° 29.22	15.97	257° 31.09	2.28	354° 32.37	22.22	Denebola	182° 24.66	14° 25.87
5	12° 14.97	296° 54.19	38.58	202° 30.31	15.35	272° 32.96	2.24	9° 34.85	22.24	Gienah	175° 43.26	-17° 41.09
6	27° 17.44	311° 53.65	N20° 38.97	217° 31.40	N05° 14.74	287° 34.82	N23° 2.21	24° 37.34	S01° 22.26	Acrux	172° 59.87	-63° 14.72
7	42° 19.90	326° 53.11	39.35	232° 32.49	14.12	302° 36.68	2.18	39° 39.82	22.28	Gacrux	171° 51.36	-57° 15.63
8	57° 22.37	341° 52.57	39.74	247° 33.57	13.50	317° 38.54	2.14	54° 42.30	22.30	Alioth	166° 12.68	55° 49.54
9	72° 24.83	356° 52.03	•• 40.12	262° 34.66	•• 12.88	332° 40.41	•• 2.11	69° 44.79	•• 22.32	Spica	158° 21.86	-11° 17.71
10	87° 27.30	11° 51.48	40.50	277° 35.75	12.27	347° 42.27	2.08	84° 47.27	22.34	Alkaid	152° 51.62	49° 11.39
11	102° 29.76	26° 50.94	40.88	292° 36.84	11.65	2° 44.13	2.04	99° 49.75	22.36	Hadar	148° 35.32	-60° 30.04
12	117° 32.22	41° 50.40	N20° 41.26	307° 37.92	N05° 11.03	17° 45.99	N23° 2.01	114° 52.24	S01° 22.38	Menkent	147° 57.05	-36° 29.91
13	132° 34.69	56° 49.85	41.64	322° 39.01	10.41	32° 47.86	1.98	129° 54.72	22.40	Arcturus	145° 47.45	19° 3.09
14	147° 37.15	71° 49.31	42.02	337° 40.10	9.79	47° 49.72	1.94	144° 57.21	22.42	Rigel Kent.	139° 39.55	-60° 56.72
15	162° 39.62	86° 48.77	•• 42.40	352° 41.19	•• 9.17	62° 51.58	•• 1.91	159° 59.69	•• 22.44	Kochab	137° 19.40	74° 3.27
16	177° 42.08	101° 48.22	42.78	7° 42.27	8.56	77° 53.44	1.87	175° 2.18	22.47	Zuben'ubi	136° 55.42	-16° 8.93
17	192° 44.54	116° 47.67	43.15	22° 43.36	7.94	92° 55.31	1.84	190° 4.66	22.49	Alphecca	126° 3.18	26° 37.86
18	207° 47.01	131° 47.13	N20° 43.53	37° 44.45	N05° 7.32	107° 57.17	N23° 1.81	205° 7.15	S01° 22.51	Antares	112° 15.04	-26° 29.38
19	222° 49.47	146° 46.58	43.90	52° 45.53	6.70	122° 59.03	1.77	220° 9.63	22.53	Atria	107° 8.43	-69° 4.57
20	237° 51.94	161° 46.03	44.27	67° 46.62	6.08	138° 0.89	1.74	235° 12.12	22.55	Sabik	102° 2.00	-15° 45.40
21	252° 54.40	176° 45.49	•• 44.65	82° 47.71	•• 5.46	153° 2.76	•• 1.71	250° 14.60	•• 22.57	Shaula	96° 9.41	-37° 7.39
22	267° 56.87	191° 44.94	45.02	97° 48.80	4.84	168° 4.62	1.67	265° 17.09	22.59	Rasalhague	95° 57.84	12° 32.55
23	282° 59.33	206° 44.39	45.39	112° 49.88	4.22	183° 6.48	1.64	280° 19.57	22.62	Eltanin	90° 41.49	51° 29.21
Mer.pass. 04:11			ν-0.5' d0.4' m-4.05		ν1.1' d-0.6' m1.57		ν1.9' d-0.0' m-1.90		ν2.5' d0.0' m0.87			
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	298° 1.79	221° 43.84	N20° 45.76	127° 50.97	N05° 3.61	198° 8.35	N23° 1.60	295° 22.06	S01° 22.64	Jul 18 Fri	SHA	Mer.pass
1	313° 4.26	236° 43.29	46.13	142° 52.05	2.99	213° 10.21	1.57	310° 24.54	22.66	Venus	286° 6.14	09:12
2	328° 6.72	251° 42.74	46.50	157° 53.14	2.37	228° 12.07	1.54	325° 27.03	22.68	Mars	190° 55.21	15:31
3	343° 9.19	266° 42.19	•• 46.87	172° 54.23	•• 1.75	243° 13.94	•• 1.50	340° 29.52	•• 22.70	Jupiter	260° 35.47	10:52
4	358° 11.65	281° 41.64	47.23	187° 55.31	1.13	258° 15.80	1.47	355° 32.00	22.72	Saturn	357° 19.40	04:26
5	13° 14.11	296° 41.09	47.60	202° 56.40	05° 0.51	273° 17.66	1.43	10° 34.49	22.75			
6	28° 16.58	311° 40.54	N20° 47.97	217° 57.49	N04° 59.89	288° 19.53	N23° 1.40	25° 36.98	S01° 22.77			
7	43° 19.04	326° 39.99	48.33	232° 58.57	59.27	303° 21.39	1.36	40° 39.46	22.79			
8	58° 21.51	341° 39.43	48.69	247° 59.66	58.65	318° 23.25	1.33	55° 41.95	22.81			
9	73° 23.97	356° 38.88	•• 49.06	263° 0.74	•• 58.03	333° 25.12	•• 1.30	70° 44.44	•• 22.83			
10	88° 26.44	11° 38.33	49.42	278° 1.83	57.41	348° 26.98	1.26	85° 46.93	22.86	Jul 19 Sat	SHA	Mer.pass
11	103° 28.90	2										

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	178°26.28	N21°0.79	273°43.52	10.8'	N12°33.46	15.3'	59.1'
1	193°26.23	21°0.35	288°13.35	10.8'	12°48.80	15.3'	59.1'
2	208°26.18	20°59.91	302°43.10	10.7'	13°4.07	15.2'	59.2'
3	223°26.14	· · 59.47	317°12.78	10.6'	13°19.28	15.1'	59.2'
4	238°26.09	59.03	331°42.37	10.5'	13°34.43	15.1'	59.2'
5	253°26.04	58.58	346°11.88	10.4'	13°49.51	15.0'	59.2'
6	268°26.00	N20°58.14	0°41.31	10.3'	N14°4.53	14.9'	59.2'
7	283°25.95	57.70	15°10.66	10.3'	14°19.47	14.9'	59.2'
8	298°25.90	57.25	29°39.92	10.2'	14°34.34	14.8'	59.2'
9	313°25.86	· · 56.81	44°9.09	10.1'	14°49.14	14.7'	59.2'
10	328°25.81	56.36	58°38.18	10.0'	15°3.86	14.6'	59.2'
11	343°25.77	55.91	73°7.18	9.9'	15°18.51	14.6'	59.2'
12	358°25.72	N20°55.47	87°36.09	9.8'	N15°33.08	14.5'	59.3'
13	13°25.68	55.02	102°4.91	9.7'	15°47.56	14.4'	59.3'
14	28°25.63	54.57	116°33.64	9.6'	16°1.97	14.3'	59.3'
15	43°25.59	· · 54.12	131°2.27	9.5'	16°16.29	14.2'	59.3'
16	58°25.54	53.67	145°30.82	9.5'	16°30.53	14.2'	59.3'
17	73°25.50	53.22	159°59.27	9.4'	16°44.68	14.1'	59.3'
18	88°25.46	N20°52.77	174°27.62	9.3'	N16°58.74	14.0'	59.3'
19	103°25.41	52.32	188°55.88	9.2'	17°12.71	13.9'	59.3'
20	118°25.37	51.87	203°24.05	9.1'	17°26.59	13.8'	59.3'
21	133°25.33	· · 51.42	217°52.11	9.0'	17°40.38	13.7'	59.3'
22	148°25.28	50.96	232°20.08	8.9'	17°54.06	13.6'	59.3'
23	163°25.24	50.51	246°47.95	8.8'	18°7.66	13.5'	59.4'
SD = 15.7' $d = -0.4'$			SD = 16.1'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.20	N20°50.06	261°15.72	8.7'	N18°21.15	13.4'	59.4'
1	193°25.16	49.60	275°43.39	8.6'	18°34.54	13.3'	59.4'
2	208°25.12	49.14	290°10.96	8.5'	18°47.83	13.2'	59.4'
3	223°25.07	· · 48.69	304°38.43	8.4'	19°1.01	13.1'	59.4'
4	238°25.03	48.23	319°5.80	8.3'	19°14.08	13.0'	59.4'
5	253°24.99	47.77	333°33.06	8.2'	19°27.05	12.9'	59.4'
6	268°24.95	N20°47.32	348°0.23	8.1'	N19°39.91	12.7'	59.4'
7	283°24.91	46.86	2°27.28	8.0'	19°52.66	12.6'	59.4'
8	298°24.87	46.40	16°54.24	7.9'	20°5.29	12.5'	59.4'
9	313°24.83	· · 45.94	31°21.09	7.7'	20°17.80	12.4'	59.4'
10	328°24.79	45.48	45°47.84	7.6'	20°30.20	12.3'	59.4'
11	343°24.75	45.02	60°14.48	7.5'	20°42.48	12.2'	59.4'
12	358°24.71	N20°44.56	74°41.02	7.4'	N20°54.64	12.0'	59.4'
13	13°24.67	44.09	89°7.45	7.3'	21°6.67	11.9'	59.4'
14	28°24.63	43.63	103°33.78	7.2'	21°18.58	11.8'	59.4'
15	43°24.59	· · 43.17	118°0.01	7.1'	21°30.37	11.7'	59.5'
16	58°24.56	42.70	132°26.12	7.0'	21°42.02	11.5'	59.5'
17	73°24.52	42.24	146°52.14	6.9'	21°53.55	11.4'	59.5'
18	88°24.48	N20°41.77	161°18.04	6.8'	N22°4.94	11.3'	59.5'
19	103°24.44	41.31	175°43.85	6.7'	22°16.20	11.1'	59.5'
20	118°24.40	40.84	190°9.54	6.6'	22°27.32	11.0'	59.5'
21	133°24.37	· · 40.37	204°35.14	6.5'	22°38.31	10.8'	59.5'
22	148°24.33	39.91	219°0.63	6.4'	22°49.16	10.7'	59.5'
23	163°24.29	39.44	233°26.01	6.3'	22°59.87	10.6'	59.5'
SD = 15.7' $d = -0.5'$			SD = 16.2'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.25	N20°38.97	247°51.29	6.2'	N23°10.43	10.4'	59.5'
1	193°24.22	38.50	262°16.47	6.1'	23°20.85	10.3'	59.5'
2	208°24.18	38.03	276°41.55	6.0'	23°31.12	10.1'	59.5'
3	223°24.15	· · 37.56	291°6.52	5.9'	23°41.25	10.0'	59.5'
4	238°24.11	37.09	305°31.39	5.8'	23°51.22	9.8'	59.5'
5	253°24.07	36.61	319°56.16	5.7'	24°1.05	9.7'	59.5'
6	268°24.04	N20°36.14	334°20.83	5.6'	N24°10.72	9.5'	59.5'
7	283°24.00	35.67	348°45.41	5.5'	24°20.24	9.4'	59.5'
8	298°23.97	35.19	3°9.88	5.4'	24°29.60	9.2'	59.5'
9	313°23.93	· · 34.72	17°34.25	5.3'	24°38.80	9.0'	59.5'
10	328°23.90	34.24	31°58.53	5.2'	24°47.84	8.9'	59.5'
11	343°23.87	33.77	46°22.71	5.1'	24°56.73	8.7'	59.5'
12	358°23.83	N20°33.29	60°46.80	5.0'	N25°5.45	8.6'	59.5'
13	13°23.80	32.82	75°10.80	4.9'	25°14.00	8.4'	59.5'
14	28°23.77	32.34	89°34.70	4.8'	25°22.39	8.2'	59.5'
15	43°23.73	· · 31.86	103°58.51	4.7'	25°30.61	8.1'	59.5'
16	58°23.70	31.38	118°22.23	4.6'	25°38.66	7.9'	59.5'
17	73°23.67	30.90	132°45.87	4.5'	25°46.54	7.7'	59.5'
18	88°23.63	N20°30.42	147°9.41	4.5'	N25°54.25	7.5'	59.5'
19	103°23.60	29.94	161°32.87	4.4'	26°1.79	7.4'	59.5'
20	118°23.57	29.46	175°56.25	4.3'	26°9.15	7.2'	59.5'
21	133°23.54	· · 28.98	190°19.55	4.2'	26°16.34	7.0'	59.5'
22	148°23.51	28.50	204°42.76	4.1'	26°23.34	6.8'	59.5'
23	163°23.48	28.02	219°5.90	4.1'	26°30.17	6.6'	59.5'
SD = 15.7' $d = -0.5'$			SD = 16.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:49	23:14	////	////
66°	////	////	01:54	22:15	////	////
64°	////	////	02:28	21:42	////	////
62°	////	01:17	02:53	21:18	22:51	////
60°	////	01:59	03:12	20:59	22:11	////
N 58°	////	02:26	03:28	20:44	21:44	////
56°	01:10	02:47	03:41	20:30	21:24	22:58
54°	01:49	03:04	03:53	20:19	21:07	22:21
52°	02:14	03:19	04:03	20:09	20:53	21:56
50°	02:34	03:31	04:12	20:00	20:41	21:37
45°	03:10	03:56	04:32	19:41	20:16	21:01
N 40°	03:36	04:16	04:47	19:25	19:57	20:36
35°	03:56	04:31	05:00	19:12	19:41	20:16
30°	04:13	04:45	05:11	19:01	19:28	20:00
20°	04:38	05:07	05:31	18:42	19:06	19:34
N 10°	04:58	05:25	05:47	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:44	06:11	06:34	17:39	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:03	17:09	17:37	18:08
40°	06:13	06:46	07:16	16:57	17:27	18:00
45°	06:21	06:58	07:30	16:43	17:16	17:52
S 50°	06:31	07:11	07:48	16:25	17:02	17:42
52°	06:35	07:17	07:56	16:17	16:56	17:38
54°	06:39	07:24	08:05	16:08	16:49	17:34
56°	06:44	07:31	08:16	15:58	16:42	17:29
58°	06:50	07:40	08:27	15:46	16:34	17:24
S 60°	06:55	07:49	08:41	15:32	16:24	17:18

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	19:36			16:43		
N 70°	20:30			15:52		
68°	21:03			15:20		
66°	21:27	20:49		14:57	17:30	
64°	21:47	21:29		14:39	16:51	
62°	22:03	21:57	21:49	14:25	16:24	18:35
60°	22:16	22:19	22:27	14:13	16:03	17:58
N 58°	22:28	22:37	22:54	14:02	15:46	17:31
56°	22:38	22:52	23:15	13:53	15:32	17:11
54°	22:47	23:05	23:33	13:45	15:19	16:54
52°	22:55	23:16	23:48	13:38	15:08	16:39
50°	23:02	23:26	· ·	13:31	14:59	16:26
45°	23:18	23:48	· ·	13:17	14:39	16:00
N 40°	23:31	· ·	00:05	13:06	14:22	15:40
35°	23:42	· ·	00:20	12:56	14:09	15:22
30°	23:51	· ·	00:33	12:48	13:57	15:08
20°	· ·	00:08	00:55	12:34	13:37	14:43
N 10°	· ·	00:23	01:15	12:21	13:19	14:21
0°	· ·	00:37	01:33	12:09	13:03	14:01
S 10°	· ·	00:51	01:51	11:58	12:47	13:41
20°	00:05	01:06	02:11	11:45	12:30	13:20
30°	00:16	01:24	02:34	11:31	12:10	12:55
35°	00:23	01:34	02:47	11:23	11:58	12:41
40°	00:30	01:46	03:03	11:14	11:45	12:24
45°	00:40	02:00	03:22	11:03	11:30	12:04
S 50°	00:50	02:17	03:46	10:50	11:11	11:39
52°	00:56	02:25	03:57	10:44	11:02	11:28
54°	01:01	02:34	04:10	10:38	10:52	11:14
56°	01:08	02:45	04:25	10:30	10:41	10:58
58°	01:15	02:57	04:43	10:22	10:28	10:40
S 60°	01:23	03:10	05:05	10:13	10:14	10:17

Day	Sun		Mer. Pass hh:mm	Moon		Age 23-25 50-28%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
18	06:15	06:17	12:06	05:57	18:23	
19	06:19	06:21	12:06	06:50	19:18	
20	06:23	06:25	12:06	07:47	20:17	

July 21, 22, 23 UT (Mon., Tue., Wed.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA
0	299°0.93	221°30.53	N20°54.40	128°17.02	N04°48.72	198°53.08	N23°0.78	296°21.77	S01°23.17						
1	314°3.40	236°29.97	54.74	143°18.11	48.10	213°54.95	0.74	311°24.26	23.20						
2	329°5.86	251°29.40	55.09	158°19.19	47.48	228°56.81	0.71	326°26.75	23.22						
3	344°8.33	266°28.84	· · 55.44	173°20.28	· · 46.86	243°58.68	· · 0.67	341°29.24	· · 23.24						
4	359°10.79	281°28.28	55.79	188°21.36	46.24	259°0.54	0.64	356°31.73	23.27						
5	14°13.26	296°27.72	56.13	203°22.45	45.61	274°2.41	0.60	11°34.22	23.29						
6	29°15.72	311°27.16	N20°56.48	218°23.53	N04°44.99	289°4.27	N23°0.57	26°36.71	S01°23.32						
7	44°18.18	326°26.59	56.82	233°24.61	44.37	304°6.14	0.53	41°39.20	23.34						
8	59°20.65	341°26.03	57.16	248°25.70	43.75	319°8.00	0.50	56°41.69	23.36						
9	74°23.11	356°25.46	· · 57.51	263°26.78	· · 43.13	334°9.87	· · 0.46	71°44.18	· · 23.39						
10	89°25.58	11°24.90	57.85	278°27.87	42.50	349°11.73	0.43	86°46.68	23.41						
11	104°28.04	26°24.33	58.19	293°28.95	41.88	4°13.60	0.39	101°49.17	23.43						
12	119°30.51	41°23.77	N20°58.53	308°30.03	N04°41.26	19°15.46	N23°0.36	116°51.66	S01°23.46						
13	134°32.97	56°23.20	58.87	323°31.12	40.64	34°17.33	0.32	131°54.15	23.48						
14	149°35.43	71°22.64	59.21	338°32.20	40.02	49°19.19	0.28	146°56.64	23.51						
15	164°37.90	86°22.07	· · 59.54	353°33.28	· · 39.39	64°21.06	· · 0.25	161°59.13	· · 23.53						
16	179°40.36	101°21.50	20°59.88	8°34.37	38.77	79°22.93	0.21	177°1.63	23.55						
17	194°42.83	116°20.94	21°0.21	23°35.45	38.15	94°24.79	0.18	192°4.12	23.58						
18	209°45.29	131°20.37	N21°0.55	38°36.53	N04°37.53	109°26.66	N23°0.14	207°6.61	S01°23.60						
19	224°47.75	146°19.80	0.88	53°37.62	36.90	124°28.52	0.11	222°9.11	23.63						
20	239°50.22	161°19.23	1.22	68°38.70	36.28	139°30.39	0.07	237°11.60	23.65						
21	254°52.68	176°18.66	· · 1.55	83°39.78	· · 35.66	154°32.26	· · 0.04	252°14.09	· · 23.68						
22	269°55.15	191°18.09	1.88	98°40.87	35.03	169°34.12	0.00	267°16.58	23.70						
23	284°57.61	206°17.52	2.21	113°41.95	34.41	184°35.99	59.97	282°19.08	23.73						
Mer.pass. 04:03			ν-0.6' d0.3' m-4.04			ν1.1' d-0.6' m1.57			ν1.9' d-0.0' m-1.90			ν2.5' d0.0' m0.86			
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°0.08	221°16.95	N21°2.54	128°43.03	N04°33.79	199°37.85	N22°59.93	297°21.57	S01°23.75						
1	315°2.54	236°16.38	2.87	143°44.12	33.16	214°39.72	59.89	312°24.07	23.78						
2	330°5.00	251°15.81	3.19	158°45.20	32.54	229°41.59	59.86	327°26.56	23.80						
3	345°7.47	266°15.23	· · 3.52	173°46.28	· · 31.92	244°43.45	· · 59.82	342°29.05	· · 23.83						
4	0°9.93	281°14.66	3.85	188°47.36	31.29	259°45.32	59.79	357°31.55	23.85						
5	15°12.40	296°14.09	4.17	203°48.45	30.67	274°47.19	59.75	12°34.04	23.88						
6	30°14.86	311°13.52	N21°4.50	218°49.53	N04°30.05	289°49.05	N22°59.72	27°36.54	S01°23.90						
7	45°17.33	326°12.94	4.82	233°50.61	29.42	304°50.92	59.68	42°39.03	23.93						
8	60°19.79	341°12.37	5.14	248°51.69	28.80	319°52.79	59.64	57°41.53	23.95						
9	75°22.25	356°11.79	· · 5.46	263°52.77	· · 28.18	334°54.65	· · 59.61	72°44.02	· · 23.98						
10	90°24.72	11°11.22	5.78	278°53.86	27.55	349°56.52	59.57	87°46.52	24.00						
11	105°27.18	26°10.64	6.10	293°54.94	26.93	4°58.39	59.54	102°49.01	24.03						
12	120°29.65	41°10.07	N21°6.42	308°56.02	N04°26.30	20°0.25	N22°59.50	117°51.51	S01°24.05						
13	135°32.11	56°9.49	6.74	323°57.10	25.68	35°2.12	59.46	132°54.00	24.08						
14	150°34.58	71°8.91	7.06	338°58.18	25.05	50°3.99	59.43	147°56.50	24.11						
15	165°37.04	86°8.34	· · 7.37	353°59.27	· · 24.43	65°5.86	· · 59.39	162°59.00	· · 24.13						
16	180°39.50	101°7.76	7.69	9°0.35	23.81	80°7.72	59.36	178°1.49	24.16						
17	195°41.97	116°7.18	8.00	24°1.43	23.18	95°9.59	59.32	193°3.99	24.18						
18	210°44.43	131°6.60	N21°8.32	39°2.51	N04°22.56	110°11.46	N22°59.28	208°6.48	S01°24.21						
19	225°46.90	146°6.02	8.63	54°3.59	21.93	125°13.33	59.25	223°8.98	24.24						
20	240°49.36	161°5.44	8.94	69°4.67	21.31	140°15.19	59.21	238°11.48	24.26						
21	255°51.82	176°4.86	· · 9.25	84°5.75	· · 20.68	155°17.06	· · 59.17	253°13.97	· · 24.29						
22	270°54.29	191°4.28	9.56	99°6.83	20.06	170°18.93	59.14	268°16.47	24.31						
23	285°56.75	206°3.70	9.87	114°7.92	19.43	185°20.80	59.10	283°18.97	24.34						
Mer.pass. 03:59			ν-0.6' d0.3' m-4.04			ν1.1' d-0.6' m1.58			ν1.9' d-0.0' m-1.90			ν2.5' d0.0' m0.85			
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°59.22	221°3.12	N21°10.18	129°9.00	N04°18.81	200°22.66	N22°59.06	298°21.47	S01°24.37						
1	316°1.68	236°2.54	10.49	144°10.08	18.18	215°24.53	59.03	313°23.96	24.39						
2	331°4.15	251°1.96	10.79	159°11.16	17.56	230°26.40	58.99	328°26.46	24.42						
3	346°6.61	266°1.38	· · 11.10	174°12.24	· · 16.93	245°28.27	· · 58.95	343°28.96	· · 24.45						
4	1°9.07	281°0.79	11.40	189°13.32	16.31	260°30.14	58.92	358°31.46	24.47						
5	16°11.54	296°0.21	11.71	204°14.40	15.68	275°32.00	58.88	13°33.96	24.50						
6	31°14.00	310°59.63	N21°12.01	219°15.48	N04°15.05	290°33.87	N22°58.85	28°36.45	S01°24.53						
7	46°16.47	325°59.04	12.31	234°16.56	14.43	305°35.74	58.81	43°38.95	24.55						
8	61°18.93	340°58.46	12.61	249°17.64	13.80	320°37.61	58.77	58°41.45	24.58						
9	76°21.40	355°57.87	· · 12.92	264°18.72	· · 13.18	335°39.48	· · 58.74	73°43.95	· · 24.61						
10	91°23.86	10°57.29	13.21	279°19.80	12.55	350°41.35	58.70	88°46.45	24.63						
11	106°26.32	25°56.70	13.51	294°20.88	11.93	5°43.22	58.66	103°48.95	24.66						
12	121°28.79	40°56.12	N21°13.81	309°21.96	N04°11.30	20°45.08	N22°58.62	118°51.45	S01°24.69						
13	136°31.25	55°55.53	14.11	324°23.04	10.67	35°46.95	58.59	133°53.95	24.72						
14	151°33.72	70°54.94	14.40	339°24.12	10.05	50°48.82	58.55	148°56.45	24.74						
15	166°36.18	85°54.36	· · 14.70	354°25.20	· · 9.42	65°50.69	· · 58.51	163°58.95	· · 24.77						
16	181°38.65	100°53.77	14.99	9°26.28	8.79	80°52.56	58.48	179°1.45	24.80						
17	196°41.11	115°53.18	15.29	24°27.36	8.17	95°54.43	58.44	194°3.95	24.83						
18	211°43.57	130°52.59	N21°15.58	39°28.44	N04°7.54	110°56.30	N22°58.40	209°6.45	S01°24.85						
19	226°46.04	145°52.00	15.87	54°29.52	6.91	125°58.17	58.37	224°8.95	24.88						
20	241°48.50	160°51.41	16.16	69°30.60	6.29	141°0.04	58.33	239°11.45	24.91						
21	256°50.97	175°50.82	· · 16.45	84°31.68	· · 5.66	156°1.91	· · 58.29	254°13.95	· · 24.94						
22	271°53.43	190°50.23	16.74	99°32.75	5.03	171°3.77	58.25	269°16.45	24.96						
23	286°55.89	205°49.64	17.03	114°33.83	4.41	186°5.64	58.22	284°18.95	24.99						
Mer.pass. 03:55			ν-0.6' d0.3' m-4.03			ν1.1' d-0.6' m1.58			ν1.9' d-0.0' m-1.91			ν2.5' d0.0' m0.85			

Stars		
	SHA	Dec
Alpheratz	357°34.15	29°13.83
Ankaa	353°6.53	-42°9.74
Schedar	349°30.36	56°40.45
Diphda	348°46.74	-17°50.59
Achernar	335°19.80	-57°6.06
Hamal	327°50.72	23°34.95
Polaris	313°57.67	89°21.99
Acamar	315°11.55	-40°11.83
Menkar	314°5.78	4°11.47
Mirfak	308°27.82	49°56.93
Aldebaran	290°39.33	16°33.65
Rigel	281°3.69	-8°10.20
Capella	280°21.60	46°1.31
Bellatrix	278°22.66	6°22.43
Elnath	278°1.60	28°37.70
Alnilam	275°37.55	-1°11.04
Betelgeuse	270°51.89	7°24.77
Canopus	263°52.71	-52°42.35
Sirius	258°26.17	-16°44.95
Adhara	255°5.88	-29°0.28
Procyon	244°50.70	5°9.64
Pollux	243°17.13	27°57.91
Avior	234°15.22	-59°35.44
Suhail	222°46.43	-43°32.15
Miaplacidus	221°39.12	-69°49.37
Alphard	217°47.62	-8°46.12
Regulus	207°34.24	11°50.63
Dubhe	193°40.90	61°37.02
Denebola	182°24.66	14°25.87
Gienah	173°43.27	-17°41.08
Acrux	172°59.88	-63°14.71
Gacrux	171°51.37	-57°15.63
Alioth	166°12.70	55°49.54
Spica	158°21.86	-11°17.71
Alkaid	152°51.64	49°11.39
Hadar	148°35.34	-60°30.04
Menkent	147°57.06	-36°29.91
Arcturus	145°47.45	19°3.09
Rigel Kent.	139°39.56	-60°56.72
Kochab	137°19.46	74°3.27
Zuben'ubi	136°55.43	-16°8.93
Alphecca	126°3.19	26°37.87
Antares	112°15.04	-26°29.38
Atria	107°8.44	-60°4.58
Sabik	102°2.00	-15°45.40
Shaula	96°9.40	-37°7.39
Rasalhague	95°57.84	12°32.56
Eltanin	90°41.50	51°29.23
Kaus Aust.	83°31.53	-34°22.35
Vega	80°32.51	38°48.51
Nunki	75°46.83	-26°15.87
Altair	61°59.18	8°56.20
Peacock	53°4.41	-56°39.06
Deneb	49°25.04	45°22.26
Enif	33°38.06	9°59.57
Al Na'ir	27°31.93	-46°50.03
Fomalhaut	15°13.75	-29°29.01
Scheat	13°44.52	28°13.24
Markab	13°29.22	15°20.58
Jul 21 Mon	SHA	Mer.pass
Venus	282°29.59	09:14
Mars	189°16.09	15:26
Jupiter	259°52.15	10:43
Saturn	357°20.83	04:14
Jul 22 Tue	SHA	Mer.pass
Venus	281°16.87	09:15
Mars	188°42.96	15:24
Jupiter	259°37.78	10:40
Saturn	357°21.50	04:10
Jul 23 Wed	SHA	Mer.pass
Venus	280°3.90	09:16
Mars	188°9.78	15:22
Jupiter	259°23.45	10:37
Saturn	357°22.25	04:06
Horizontal parallax		
Venus:	0.1	
Mars:	0.1	

h	Sun			Moon				
Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	178°23.44	N20°27.53		233°28.96	4.0'	N26°36.82	6.5'	59.5'
1	193°23.41	27.05		247°51.94	3.9'	26°43.29	6.3'	59.5'
2	208°23.38	26.56		262°14.85	3.8'	26°49.57	6.1'	59.5'
3	223°23.35	· · 26.08		276°37.69	3.8'	26°55.67	5.9'	59.5'
4	238°23.32	25.59		291°0.46	3.7'	27°1.58	5.7'	59.5'
5	253°23.29	25.11		305°23.17	3.6'	27°7.31	5.5'	59.5'
6	268°23.26	N20°24.62		319°45.81	3.6'	N27°12.85	5.4'	59.5'
7	283°23.23	24.13		334°8.38	3.5'	27°18.20	5.2'	59.5'
8	298°23.20	23.64		348°30.90	3.5'	27°23.37	5.0'	59.5'
9	313°23.18	· · 23.15		2°53.36	3.4'	27°28.34	4.8'	59.5'
10	328°23.15	22.66		17°15.76	3.3'	27°33.12	4.6'	59.5'
11	343°23.12	22.17		31°38.11	3.3'	27°37.71	4.4'	59.5'
12	358°23.09	N20°21.68		46°0.41	3.3'	N27°42.10	4.2'	59.4'
13	13°23.06	21.19		60°22.66	3.2'	27°46.31	4.0'	59.4'
14	28°23.04	20.70		74°44.87	3.2'	27°50.31	3.8'	59.4'
15	43°23.01	· · 20.21		89°7.03	3.1'	27°54.12	3.6'	59.4'
16	58°22.98	19.72		103°29.15	3.1'	27°57.74	3.4'	59.4'
17	73°22.95	19.22		117°51.23	3.0'	28°1.15	3.2'	59.4'
18	88°22.93	N20°18.73		132°13.28	3.0'	N28°4.37	3.0'	59.4'
19	103°22.90	18.23		146°35.30	3.0'	28°7.39	2.8'	59.4'
20	118°22.87	17.74		160°57.29	3.0'	28°10.22	2.6'	59.4'
21	133°22.85	· · 17.24		175°19.24	2.9'	28°12.84	2.4'	59.4'
22	148°22.82	16.75		189°41.18	2.9'	28°15.26	2.2'	59.4'
23	163°22.80	16.25		204°3.09	2.9'	28°17.49	2.0'	59.4'
SD = 15.7' $d = -0.5'$			SD = 16.2'					

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.77	N20°15.75	218°24.99	2.9'	N28°19.51	1.8'	59.4'
1	193°22.75	15.25	232°46.87	2.9'	28°21.33	1.6'	59.4'
2	208°22.72	14.75	247°8.74	2.9'	28°22.95	1.4'	59.3'
3	223°22.70	· · 14.25	261°30.60	2.9'	28°24.37	1.2'	59.3'
4	238°22.67	13.75	275°52.45	2.8'	28°25.59	1.0'	59.3'
5	253°22.65	13.25	290°14.30	2.8'	28°26.61	0.8'	59.3'
6	268°22.63	N20°12.75	304°36.14	2.8'	N28°27.42	0.6'	59.3'
7	283°22.60	12.25	318°57.99	2.9'	28°28.04	0.4'	59.3'
8	298°22.58	11.75	333°19.85	2.9'	28°28.45	0.2'	59.3'
9	313°22.56	· · 11.25	347°41.71	2.9'	28°28.66	0.0'	59.3'
10	328°22.53	10.74	2°3.58	2.9'	28°28.67	-0.2'	59.3'
11	343°22.51	10.24	16°25.47	2.9'	28°28.48	-0.4'	59.3'
12	358°22.49	N20°9.73	30°47.38	2.9'	N28°28.09	-0.6'	59.2'
13	13°22.47	9.23	45°9.30	2.9'	28°27.50	-0.8'	59.2'
14	28°22.44	8.72	59°31.25	3.0'	28°26.71	-1.0'	59.2'
15	43°22.42	· · 8.22	73°53.22	3.0'	28°25.71	-1.2'	59.2'
16	58°22.40	7.71	88°15.22	3.0'	28°24.52	-1.4'	59.2'
17	73°22.38	7.20	102°37.26	3.1'	28°23.13	-1.6'	59.2'
18	88°22.36	N20°6.69	116°59.33	3.1'	N28°21.54	-1.8'	59.2'
19	103°22.34	6.18	131°21.43	3.1'	28°19.75	-2.0'	59.2'
20	118°22.32	5.67	145°43.58	3.2'	28°17.77	-2.2'	59.1'
21	133°22.30	· · 5.16	160°5.77	3.2'	28°15.59	-2.4'	59.1'
22	148°22.28	4.65	174°28.01	3.3'	28°13.21	-2.6'	59.1'
23	163°22.26	4.14	188°50.29	3.3'	28°10.64	-2.8'	59.1'
SD = 15.7' $d = -0.5'$				SD = 16.2'			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.24	N20°3.63	203°12.63	3.4'	N28°7.87	-3.0'	59.1'
1	193°22.22	3.12	217°35.02	3.4'	28°4.91	-3.2'	59.1'
2	208°22.20	2.60	231°57.46	3.5'	28°1.76	-3.3'	59.0'
3	223°22.18	· · 2.09	246°19.97	3.6'	27°58.42	-3.5'	59.0'
4	238°22.16	1.58	260°42.54	3.6'	27°54.88	-3.7'	59.0'
5	253°22.15	1.06	275°5.17	3.7'	27°51.16	-3.9'	59.0'
6	268°22.13	N20°0.55	289°27.87	3.8'	N27°47.25	-4.1'	59.0'
7	283°22.11	20°0.03	303°50.64	3.8'	27°43.15	-4.3'	59.0'
8	298°22.09	19°59.52	318°13.48	3.9'	27°38.86	-4.5'	58.9'
9	313°22.08	· · 59.00	332°36.39	4.0'	27°34.39	-4.7'	58.9'
10	328°22.06	58.48	346°59.38	4.1'	27°29.73	-4.8'	58.9'
11	343°22.04	57.96	1°22.45	4.2'	27°24.89	-5.0'	58.9'
12	358°22.03	N19°57.44	15°45.61	4.2'	N27°19.87	-5.2'	58.9'
13	13°22.01	56.92	30°8.84	4.3'	27°14.67	-5.4'	58.9'
14	28°22.00	56.40	44°32.16	4.4'	27°9.29	-5.6'	58.8'
15	43°21.98	· · 55.88	58°55.56	4.5'	27°3.73	-5.7'	58.8'
16	58°21.96	55.36	73°19.06	4.6'	26°57.99	-5.9'	58.8'
17	73°21.95	54.84	87°42.65	4.7'	26°52.08	-6.1'	58.8'
18	88°21.93	N19°54.32	102°6.33	4.8'	N26°46.00	-6.3'	58.8'
19	103°21.92	53.80	116°30.10	4.9'	26°39.74	-6.4'	58.7'
20	118°21.91	53.27	130°53.97	5.0'	26°33.32	-6.6'	58.7'
21	133°21.89	· · 52.75	145°17.94	5.1'	26°26.73	-6.8'	58.7'
22	148°21.88	52.22	159°42.01	5.2'	26°19.96	-6.9'	58.7'
23	163°21.86	51.70	174°6.18	5.3'	26°13.04	-7.1'	58.7'
SD = 15.7' $d = -0.5'$				SD = 16.1'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:16	22:51	////	////
66°	////	////	02:06	22:03	////	////
64°	////	////	02:37	21:33	////	////
62°	////	01:32	03:00	21:11	22:37	////
60°	////	02:09	03:18	20:53	22:02	////
N 58°	////	02:34	03:34	20:38	21:37	////
56°	01:24	02:54	03:46	20:25	21:18	22:45
54°	01:58	03:10	03:58	20:14	21:02	22:13
52°	02:21	03:24	04:07	20:05	20:48	21:50
50°	02:40	03:35	04:16	19:56	20:37	21:32
45°	03:15	04:00	04:35	19:38	20:13	20:57
N 40°	03:39	04:18	04:50	19:23	19:54	20:33
35°	03:59	04:34	05:02	19:10	19:39	20:14
30°	04:15	04:47	05:13	18:59	19:26	19:58
20°	04:40	05:08	05:32	18:41	19:05	19:33
N 10°	04:59	05:25	05:48	18:25	18:47	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:55	06:18	17:55	18:18	18:43
20°	05:43	06:10	06:33	17:40	18:03	18:30
30°	05:57	06:26	06:51	17:22	17:47	18:17
35°	06:04	06:34	07:02	17:12	17:39	18:10
40°	06:11	06:44	07:14	17:00	17:29	18:02
45°	06:19	06:55	07:27	16:46	17:18	17:54
S 50°	06:28	07:08	07:44	16:29	17:05	17:45
52°	06:32	07:14	07:52	16:21	17:00	17:41
54°	06:36	07:20	08:01	16:12	16:53	17:37
56°	06:41	07:28	08:11	16:02	16:46	17:33
58°	06:46	07:36	08:23	15:51	16:38	17:28
S 60°	06:51	07:44	08:36	15:38	16:29	17:22

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°						
62°						21:52
60°	22:52	23:59	∞ ∞	19:44	20:50	21:14
N 58°	23:29	∞ ∞	00:36	19:07	20:13	20:48
56°	23:56	∞ ∞	01:03	18:40	19:46	20:26
54°	∞ ∞	00:17	01:24	18:19	19:25	20:09
52°	∞ ∞	00:35	01:41	18:02	19:08	19:54
50°	00:01	00:50	01:56	17:47	18:53	19:41
45°	00:28	01:20	02:26	17:17	18:22	19:14
N 40°	00:49	01:44	02:49	16:53	17:59	18:52
35°	01:07	02:04	03:09	16:34	17:39	18:35
30°	01:23	02:20	03:25	16:17	17:22	18:19
20°	01:49	02:49	03:53	15:49	16:54	17:53
N 10°	02:12	03:13	04:17	15:25	16:29	17:30
0°	02:33	03:36	04:39	15:03	16:07	17:09
S 10°	02:55	03:59	05:02	14:41	15:44	16:47
20°	03:18	04:24	05:26	14:17	15:19	16:24
30°	03:45	04:52	05:54	13:49	14:50	15:57
35°	04:01	05:10	06:10	13:32	14:33	15:42
40°	04:19	05:29	06:29	13:13	14:13	15:23
45°	04:42	05:54	06:52	12:50	13:49	15:00
S 50°	05:11	06:25	07:22	12:20	13:18	14:31
52°	05:25	06:41	07:36	12:06	13:02	14:17
54°	05:42	06:59	07:53	11:49	12:44	14:01
56°	06:02	07:21	08:13	11:29	12:22	13:41
58°	06:26	07:50	08:38	11:04	11:53	13:16
S 60°	07:00	08:32	09:12	10:30	11:11	12:43

July 24, 25, 26 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	301°58.36		220°49.05	N21°17.31	129°34.91	N04°3.78	201°7.51	N22°58.18	299°21.45	S01°25.02
1	317°0.82		235°48.46	17.60	144°35.99	3.15	216°9.38	58.14	314°23.95	25.05
2	332°3.29		250°47.87	17.88	159°37.07	2.53	231°11.25	58.11	329°26.46	25.08
3	347°5.75		265°47.28	•• 18.17	174°38.15	•• 1.90	246°13.12	•• 58.07	344°28.96	•• 25.10
4	2°8.22		280°46.68	18.45	189°39.23	1.27	261°14.99	58.03	359°31.46	25.13
5	17°10.68		295°46.09	18.73	204°40.31	0.64	276°16.86	57.99	14°33.96	25.16
6	32°13.14		310°45.50	N21°19.02	219°41.38	N04°0.02	291°18.73	N22°57.96	29°36.46	S01°25.19
7	47°15.61		325°44.90	19.30	234°42.46	03°59.39	306°20.60	57.92	44°38.97	25.22
8	62°18.07		340°44.31	19.58	249°43.54	58.76	321°22.47	57.88	59°41.47	25.25
9	77°20.54		355°43.72	•• 19.86	264°44.62	•• 58.13	336°24.34	•• 57.84	74°43.97	•• 25.28
10	92°23.00		10°43.12	20.13	279°45.70	57.51	351°26.21	57.81	89°46.47	25.30
11	107°25.47		25°42.52	20.41	294°46.77	56.88	6°28.08	57.77	104°48.98	25.33
12	122°27.93		40°41.93	N21°20.69	309°47.85	N03°56.25	21°29.95	N22°57.73	119°51.48	S01°25.36
13	137°30.39		55°41.33	20.96	324°48.93	55.62	36°31.83	57.69	134°53.98	25.39
14	152°32.86		70°40.74	21.24	339°50.01	54.99	51°33.70	57.66	149°56.49	25.42
15	167°35.32		85°40.14	•• 21.51	354°51.09	•• 54.37	66°35.57	•• 57.62	164°58.99	•• 25.45
16	182°37.79		100°39.54	21.78	9°52.16	53.74	81°37.44	57.58	180°1.50	25.48
17	197°40.25		115°38.94	22.05	24°53.24	53.11	96°39.31	57.54	195°4.00	25.51
18	212°42.71		130°38.35	N21°22.32	39°54.32	N03°52.48	111°41.18	N22°57.51	210°6.50	S01°25.54
19	227°45.18		145°37.75	22.59	54°55.40	51.85	126°43.05	57.47	225°9.01	25.57
20	242°47.64		160°37.15	22.86	69°56.47	51.22	141°44.92	57.43	240°11.51	25.59
21	257°50.11		175°36.55	•• 23.13	84°57.55	•• 50.60	156°46.79	•• 57.39	255°14.02	•• 25.62
22	272°52.57		190°35.95	23.40	99°58.63	49.97	171°48.66	57.35	270°16.52	25.65
23	287°55.04		205°35.35	23.66	114°59.70	49.34	186°50.53	57.32	285°19.03	25.68
Mer.pass. 03:51		ν-0.6' d0.3' m-4.03		ν1.1' d-0.6' m1.58		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.84		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	302°57.50		220°34.75	N21°23.93	130°0.78	N03°48.71	201°52.41	N22°57.28	300°21.53	S01°25.71
1	317°59.96		235°34.15	24.19	145°1.86	48.08	216°54.28	57.24	315°24.04	25.74
2	333°2.43		250°33.55	24.46	160°2.93	47.45	231°56.15	57.20	330°26.54	25.77
3	348°4.89		265°32.95	•• 24.72	175°4.01	•• 46.82	246°58.02	•• 57.16	345°29.05	•• 25.80
4	3°7.36		280°32.34	24.98	190°5.09	46.19	261°59.89	57.13	0°31.55	25.83
5	18°9.82		295°31.74	25.24	205°6.16	45.57	277°1.76	57.09	15°34.06	25.86
6	33°12.28		310°31.14	N21°25.50	220°7.24	N03°44.94	292°3.64	N22°57.05	30°36.57	S01°25.89
7	48°14.75		325°30.54	25.76	235°8.32	44.31	307°5.51	57.01	45°39.07	25.92
8	63°17.21		340°29.93	26.02	250°9.39	43.68	322°7.38	56.97	60°41.58	25.95
9	78°19.68		355°29.33	•• 26.27	265°10.47	•• 43.05	337°9.25	•• 56.93	75°44.08	•• 25.98
10	93°22.14		10°28.72	26.53	280°11.55	42.42	352°11.12	56.90	90°46.59	26.01
11	108°24.61		25°28.12	26.79	295°12.62	41.79	7°13.00	56.86	105°49.10	26.04
12	123°27.07		40°27.52	N21°27.04	310°13.70	N03°41.16	22°14.87	N22°56.82	120°51.60	S01°26.07
13	138°29.53		55°26.91	27.29	325°14.77	40.53	37°16.74	56.78	135°54.11	26.10
14	153°32.00		70°26.30	27.55	340°15.85	39.90	52°18.61	56.74	150°56.62	26.13
15	168°34.46		85°25.70	•• 27.80	355°16.92	•• 39.27	67°20.49	•• 56.70	165°59.13	•• 26.16
16	183°36.93		100°25.09	28.05	10°18.00	38.64	82°22.36	56.67	181°1.63	26.20
17	198°39.39		115°24.48	28.30	25°19.08	38.01	97°24.23	56.63	196°4.14	26.23
18	213°41.85		130°23.88	N21°28.55	40°20.15	N03°37.38	112°26.10	N22°56.59	211°6.65	S01°26.26
19	228°44.32		145°23.27	28.79	55°21.23	36.75	127°27.98	56.55	226°9.16	26.29
20	243°46.78		160°22.66	29.04	70°22.30	36.12	142°29.85	56.51	241°11.67	26.32
21	258°49.25		175°22.05	•• 29.29	85°23.38	•• 35.49	157°31.72	•• 56.47	256°14.17	•• 26.35
22	273°51.71		190°21.44	29.53	100°24.45	34.86	172°33.60	56.43	271°16.68	26.38
23	288°54.17		205°20.84	29.78	115°25.53	34.23	187°35.47	56.40	286°19.19	26.41
Mer.pass. 03:48		ν-0.6' d0.3' m-4.03		ν1.1' d-0.6' m1.59		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.84		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	303°56.64		220°20.23	N21°30.02	130°26.60	N03°33.60	202°37.34	N22°56.36	301°21.70	S01°26.44
1	318°59.10		235°19.62	30.26	145°27.68	32.97	217°39.22	56.32	316°24.21	26.47
2	334°1.57		250°19.01	30.50	160°28.75	32.34	232°41.09	56.28	331°26.72	26.51
3	349°4.03		265°18.40	•• 30.74	175°29.83	•• 31.71	247°42.96	•• 56.24	346°29.23	•• 26.54
4	4°6.50		280°17.78	30.98	190°30.90	31.07	262°44.84	56.20	1°31.74	26.57
5	19°8.96		295°17.17	31.22	205°31.97	30.44	277°46.71	56.16	16°34.25	26.60
6	34°11.42		310°16.56	N21°31.46	220°33.05	N03°29.81	292°48.58	N22°56.12	31°36.76	S01°26.63
7	49°13.89		325°15.95	31.70	235°34.12	29.18	307°50.46	56.09	46°39.27	26.66
8	64°16.35		340°15.34	31.93	250°35.20	28.55	322°52.33	56.05	61°41.78	26.70
9	79°18.82		355°14.72	•• 32.17	265°36.27	•• 27.92	337°54.20	•• 56.01	76°44.29	•• 26.73
10	94°21.28		10°14.11	32.40	280°37.35	27.29	352°56.08	55.97	91°46.80	26.76
11	109°23.74		25°13.50	32.63	295°38.42	26.66	7°57.95	55.93	106°49.31	26.79
12	124°26.21		40°12.88	N21°32.87	310°39.49	N03°26.03	22°59.83	N22°55.89	121°51.82	S01°26.82
13	139°28.67		55°12.27	33.10	325°40.57	25.39	38°1.70	55.85	136°54.33	26.85
14	154°31.14		70°11.66	33.33	340°41.64	24.76	53°3.58	55.81	151°56.84	26.89
15	169°33.60		85°11.04	•• 33.56	355°42.71	•• 24.13	68°5.45	•• 55.77	166°59.35	•• 26.92
16	184°36.06		100°10.43	33.78	10°43.79	23.50	83°7.32	55.73	182°1.86	26.95
17	199°38.53		115°9.81	34.01	25°44.86	22.87	98°9.20	55.69	197°4.38	26.98
18	214°40.99		130°9.19	N21°34.24	40°45.93	N03°22.24	113°11.07	N22°55.66	212°6.89	S01°27.02
19	229°43.46		145°8.58	34.46	55°47.01	21.60	128°12.95	55.62	227°9.40	27.05
20	244°45.92		160°7.96	34.69	70°48.08	20.97	143°14.82	55.58	242°11.91	27.08
21	259°48.39		175°7.34	•• 34.91	85°49.15	•• 20.34	158°16.70	•• 55.54	257°14.42	•• 27.11
22	274°50.85		190°6.73	35.13	100°50.23	19.71	173°18.57	55.50	272°16.94	27.15
23	289°53.31		205°6.11	35.36	115°51.30	19.08	188°20.45	55.46	287°19.45	27.18
Mer.pass. 03:44		ν-0.6' d0.2' m-4.02		ν1.1' d-0.6' m1.59		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.83		

Stars		
	SHA	Dec
Alpheratz	357°34.12	29°13.84
Ankaa	353°6.49	-42°9.73
Schedar	349°30.32	56°40.46
Diphda	348°46.71	-17°50.58
Achernar	335°19.76	-57°6.06
Hamal	327°50.68	23°34.96
Polaris	313°55.99	89°22.00
Acamar	315°11.52	-40°11.82
Menkar	314°5.75	4°11.48
Mirfak	308°27.78	49°56.94
Aldebaran	290°39.30	16°33.66
Rigel	281°3.67	-8°10.19
Capella	280°21.56	46°1.31
Bellatrix	278°22.64	6°22.44
Elnath	278°1.57	28°37.71
Alnilam	275°37.52	-1°11.03
Betelgeuse	270°51.87	7°24.78
Canopus	263°52.69	-52°42.34
Sirius	258°26.15	-16°44.94
Adhara	255°5.87	-29°0.26
Procyon	244°50.68	5°9.64
Pollux	243°17.11	27°57.91
Avior	234°15.22	-59°35.43
Suhail	222°46.42	-43°32.14
Miaplacidus	221°39.14	-69°49.36
Alphard	217°47.61	-8°46.12
Regulus	207°34.23	11°50.63
Dubhe	193°40.90	61°37.01
Denebola	182°24.66	14°25.86
Gienah	175°43.27	-17°41.08
Acrux	172°59.91	-63°14.71
Gacrux	171°51.39	-57°15.62
Alioth	166°12.71	55°49.53
Spica	158°21.86	-11°17.71
Alkaid	152°51.65	49°11.39
Hadar	148°35.35	-60°30.05
Menkent	147°57.07	-36°29.91
Arcturus	145°47.46	19°3.09
Rigel Kent.	139°39.58	-60°56.73
Kochab	137°19.51	74°3.27
Zuben'ubi	136°55.43	-16°8.93
Alphecca	126°3.19	26°37.87
Antares	112°15.04	-26°29.39
Atria	107°8.44	-69°4.59
Sabik	102°1.99	-15°45.40
Shaula	96°9.40	-37°7.40
Rasalhague	95°57.84	12°32.56
Eltanin	90°41.51	51°29.24
Kaus Aust.	83°31.53	-34°22.36
Vega	80°32.51	38°48.52
Nunki	75°46.82	-26°15.87
Altair	61°59.17	8°56.21
Peacock	53°4.38	-56°39.07
Deneb	49°25.03	45°22.28
Enif	33°38.04	9°59.59
Al Na'ir	27°31.90	-46°50.03
Fomalhaut	15°13.72	-29°29.01
Scheat	13°44.50	28°13.26
Markab	13°29.20	15°20.59

Jul 24 Thu	SHA	Mer.pass
Venus	278°50.69	09:17
Mars	187°36.55	15:21
Jupiter	259°9.16	10:34
Saturn	357°23.09	04:02

Jul 25 Fri	SHA	Mer.pass
Venus	277°37.25	09:18
Mars	187°3.28	15:19
Jupiter	258°54.91	10:31
Saturn	357°24.03	03:58

Jul 26 Sat	SHA	Mer.pass
Venus	276°23.59	09:19
Mars	186°29.96	15:17
Jupiter	258°40.70	10:28
Saturn	357°25.06	03:54

Horizontal parallax	
Venus:	0.1
Mars:	0.1



h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.85	N19°51.17	188°30.45	5.4'	N26°5.94	-7.3'	58.6'
1	193°21.84	50.65	202°54.83	5.5'	25°58.69	-7.4'	58.6'
2	208°21.83	50.12	217°19.31	5.6'	25°51.28	-7.6'	58.6'
3	223°21.81	· · 49.59	231°43.90	5.7'	25°43.70	-7.7'	58.6'
4	238°21.80	49.07	246°8.60	5.8'	25°35.97	-7.9'	58.6'
5	253°21.79	48.54	260°33.41	5.9'	25°28.08	-8.0'	58.5'
6	268°21.78	N19°48.01	274°58.33	6.0'	N25°20.04	-8.2'	58.5'
7	283°21.77	47.48	289°23.36	6.1'	25°11.85	-8.3'	58.5'
8	298°21.75	46.95	303°48.51	6.3'	25°3.50	-8.5'	58.5'
9	313°21.74	· · 46.42	318°13.76	6.4'	24°55.01	-8.6'	58.4'
10	328°21.73	45.89	332°39.14	6.5'	24°46.37	-8.8'	58.4'
11	343°21.72	45.35	347°4.63	6.6'	24°37.58	-8.9'	58.4'
12	358°21.71	N19°44.82	1°30.23	6.7'	N24°28.65	-9.1'	58.4'
13	13°21.70	44.29	15°55.95	6.8'	24°19.58	-9.2'	58.3'
14	28°21.69	43.75	30°21.79	7.0'	24°10.37	-9.3'	58.3'
15	43°21.68	· · 43.22	44°47.75	7.1'	24°1.02	-9.5'	58.3'
16	58°21.67	42.69	59°13.83	7.2'	23°51.54	-9.6'	58.3'
17	73°21.66	42.15	73°40.03	7.3'	23°41.92	-9.8'	58.3'
18	88°21.66	N19°41.61	88°6.34	7.4'	N23°32.17	-9.9'	58.2'
19	103°21.65	41.08	102°32.78	7.6'	23°22.28	-10.0'	58.2'
20	118°21.64	40.54	116°59.34	7.7'	23°12.27	-10.1'	58.2'
21	133°21.63	· · 40.00	131°26.02	7.8'	23°2.13	-10.3'	58.2'
22	148°21.62	39.47	145°52.82	7.9'	22°51.87	-10.4'	58.1'
23	163°21.62	38.93	160°19.74	8.0'	22°41.48	-10.5'	58.1'
SD = 15.7' d = -0.5'			SD = 16.0'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.61	N19°38.39	174°46.78	8.2'	N22°30.98	-10.6'	58.1'
1	193°21.60	37.85	189°13.95	8.3'	22°20.35	-10.7'	58.1'
2	208°21.60	37.31	203°41.24	8.4'	22°9.60	-10.9'	58.0'
3	223°21.59	· · 36.77	218°8.65	8.5'	21°58.74	-11.0'	58.0'
4	238°21.58	36.22	232°36.18	8.7'	21°47.77	-11.1'	58.0'
5	253°21.58	35.68	247°3.83	8.8'	21°36.68	-11.2'	57.9'
6	268°21.57	N19°35.14	261°31.61	8.9'	N21°25.48	-11.3'	57.9'
7	283°21.57	34.60	275°59.50	9.0'	21°14.18	-11.4'	57.9'
8	298°21.56	34.05	290°27.52	9.1'	21°2.76	-11.5'	57.9'
9	313°21.56	· · 33.51	304°55.66	9.3'	20°51.25	-11.6'	57.8'
10	328°21.55	32.96	319°23.92	9.4'	20°39.63	-11.7'	57.8'
11	343°21.55	32.42	333°52.30	9.5'	20°27.90	-11.8'	57.8'
12	358°21.54	N19°31.87	348°20.80	9.6'	N20°16.08	-11.9'	57.8'
13	13°21.54	31.32	2°49.42	9.7'	20°4.17	-12.0'	57.7'
14	28°21.54	30.78	17°18.15	9.9'	19°52.15	-12.1'	57.7'
15	43°21.53	· · 30.23	31°47.01	10.0'	19°40.04	-12.2'	57.7'
16	58°21.53	29.68	46°15.99	10.1'	19°27.85	-12.3'	57.6'
17	73°21.53	29.13	60°45.08	10.2'	19°15.56	-12.4'	57.6'
18	88°21.53	N19°28.58	75°14.29	10.3'	N19°3.18	-12.5'	57.6'
19	103°21.52	28.03	89°43.61	10.4'	18°50.71	-12.5'	57.6'
20	118°21.52	27.48	104°13.05	10.6'	18°38.16	-12.6'	57.5'
21	133°21.52	· · 26.93	118°42.61	10.7'	18°25.53	-12.7'	57.5'
22	148°21.52	26.38	133°12.28	10.8'	18°12.82	-12.8'	57.5'
23	163°21.52	25.83	147°42.07	10.9'	18°0.02	-12.9'	57.4'
SD = 15.7' d = -0.5'			SD = 15.8'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.52	N19°25.27	162°11.96	11.0'	N17°47.15	-12.9'	57.4'
1	193°21.52	24.72	176°41.97	11.1'	17°34.20	-13.0'	57.4'
2	208°21.52	24.17	191°12.09	11.2'	17°21.18	-13.1'	57.4'
3	223°21.52	· · 23.61	205°42.33	11.3'	17°8.08	-13.2'	57.3'
4	238°21.52	23.06	220°12.67	11.4'	16°54.91	-13.2'	57.3'
5	253°21.52	22.50	234°43.12	11.6'	16°41.68	-13.3'	57.3'
6	268°21.52	N19°21.95	249°13.67	11.7'	N16°28.37	-13.4'	57.2'
7	283°21.52	21.39	263°44.34	11.8'	16°15.00	-13.4'	57.2'
8	298°21.52	20.83	278°15.11	11.9'	16°1.56	-13.5'	57.2'
9	313°21.52	· · 20.27	292°45.98	12.0'	15°48.06	-13.6'	57.2'
10	328°21.52	19.71	307°16.96	12.1'	15°34.50	-13.6'	57.1'
11	343°21.52	19.16	321°48.05	12.2'	15°20.88	-13.7'	57.1'
12	358°21.53	N19°18.60	336°19.23	12.3'	N15°7.20	-13.7'	57.1'
13	13°21.53	18.04	350°50.52	12.4'	14°53.46	-13.8'	57.0'
14	28°21.53	17.48	5°21.90	12.5'	14°39.67	-13.8'	57.0'
15	43°21.54	· · 16.91	19°53.39	12.6'	14°25.83	-13.9'	57.0'
16	58°21.54	16.35	34°24.97	12.7'	14°11.93	-13.9'	57.0'
17	73°21.54	15.79	48°56.65	12.8'	13°57.98	-14.0'	56.9'
18	88°21.55	N19°15.23	63°28.42	12.9'	N13°43.98	-14.0'	56.9'
19	103°21.55	14.66	78°0.29	13.0'	13°29.93	-14.1'	56.9'
20	118°21.55	14.10	92°32.26	13.1'	13°15.84	-14.1'	56.8'
21	133°21.56	· · 13.54	107°4.31	13.1'	13°1.70	-14.2'	56.8'
22	148°21.56	12.97	121°36.46	13.2'	12°47.52	-14.2'	56.8'
23	163°21.57	12.41	136°8.70	13.3'	12°33.29	-14.3'	56.7'
SD = 15.7' d = -0.6'			SD = 15.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:37	22:31	////	////
66°	////	////	02:19	21:51	////	////
64°	////	00:47	02:47	21:24	23:16	////
62°	////	01:46	03:08	21:03	22:23	////
60°	////	02:18	03:25	20:46	21:52	////
N 58°	00:43	02:42	03:39	20:32	21:29	23:21
56°	01:37	03:00	03:52	20:20	21:11	22:33
54°	02:07	03:15	04:02	20:10	20:56	22:04
52°	02:28	03:29	04:12	20:01	20:43	21:43
50°	02:46	03:40	04:20	19:52	20:32	21:26
45°	03:19	04:03	04:38	19:35	20:09	20:53
N 40°	03:43	04:21	04:52	19:20	19:51	20:30
35°	04:02	04:36	05:04	19:08	19:37	20:11
30°	04:17	04:49	05:15	18:58	19:24	19:56
20°	04:41	05:09	05:33	18:40	19:04	19:32
N 10°	05:00	05:26	05:49	18:24	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:09	06:33	17:41	18:04	18:31
30°	05:55	06:24	06:50	17:24	17:49	18:18
35°	06:02	06:33	07:00	17:14	17:41	18:12
40°	06:09	06:42	07:11	17:02	17:32	18:05
45°	06:17	06:52	07:25	16:49	17:21	17:57
S 50°	06:25	07:05	07:41	16:33	17:09	17:49
52°	06:29	07:10	07:48	16:25	17:03	17:45
54°	06:33	07:17	07:57	16:17	16:57	17:41
56°	06:37	07:23	08:06	16:07	16:50	17:37
58°	06:42	07:31	08:17	15:57	16:43	17:32
S 60°	06:47	07:39	08:30	15:44	16:34	17:27

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°			02:31			00:21 22:47
N 70°			03:32		23:18	22:25
68°			04:07		22:42	22:09
66°		02:05	04:31	22:54	22:16	21:55
64°		02:45	04:50	22:13	21:55	21:43
62°	01:07	03:13	05:06	21:44	21:39	21:34
60°	01:44	03:34	05:18	21:22	21:25	21:25
N 58°	02:10	03:51	05:29	21:04	21:13	21:18
56°	02:31	04:06	05:39	20:49	21:02	21:11
54°	02:48	04:18	05:47	20:36	20:53	21:05
52°	03:02	04:29	05:55	20:24	20:45	21:00
50°	03:15	04:39	06:02	20:14	20:38	20:55
45°	03:41	04:59	06:16	19:52	20:22	20:44
N 40°	04:02	05:16	06:28	19:35	20:08	20:35
35°	04:19	05:29	06:38	19:20	19:57	20:28
30°	04:33	05:41	06:46	19:07	19:47	20:21
20°	04:58	06:02	07:01	18:45	19:30	20:09
N 10°	05:20	06:19	07:14	18:25	19:15	19:59
0°	05:40	06:36	07:26	18:07	19:01	19:49
S 10°	06:00	06:52	07:39	17:49	18:46	19:39
20°	06:21	07:09	07:51	17:29	18:31	19:28
30°	06:46	07:29	08:06	17:06	18:13	19:16
35°	07:00	07:41	08:14	16:53	18:02	19:09
40°	07:17	07:54	08:24	16:37	17:50	19:01
45°	07:37	08:10	08:35	16:18	17:36	18:51
S 50°	08:01	08:29	08:49	15:54	17:19	18:40
52°	08:13	08:38	08:55	15:43	17:10	18:34
54°	08:27	08:48	09:02	15:30	17:01	18:28
56°	08:42	08:59	09:09	15:15	16:50	18:21
58°	09:01	09:12	09:18	14:57	16:38	18:14
S 60°	09:24	09:27	09:28	14:35	16:24	18:05

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		1-2%
24	06:33	06:33	12:07	11:54	—:—		
25	06:34	06:34	12:07	12:48	00:22		
26	06:34	06:34	12:07	13:38	01:14		

July 27, 28, 29 UT (Sun., Mon., Tue.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	304°55.78	220°5.49	N21°35.58	130°52.37	N03°18.44	203°22.32	N22°55.42	302°21.96	S01°27.21	Alpheratz	357°34.10 29°13.85
1	319°58.24	235°4.87	35.80	145°53.45	17.81	218°24.20	55.38	317°24.47	27.24	Ankaa	353°6.46 -42°9.73
2	335°0.71	250°4.25	36.02	160°54.52	17.18	233°26.07	55.34	332°26.99	27.28	Schedar	349°30.29 56°40.47
3	350°3.17	265°3.63	· · 36.23	175°55.59	· · 16.55	248°27.95	· · 55.30	347°29.50	· · 27.31	Diphda	348°46.69 -17°50.58
4	5°5.63	280°3.02	36.45	190°56.66	15.91	263°29.82	55.26	2°32.01	27.34	Achernar	335°19.72 -57°6.05
5	20°8.10	295°2.40	36.67	205°57.74	15.28	278°31.70	55.22	17°34.53	27.38	Hamal	327°50.66 23°34.97
6	35°10.56	310°1.78	N21°36.88	220°58.81	N03°14.65	293°33.57	N22°55.18	32°37.04	S01°27.41	Polaris	313°54.57 89°22.00
7	50°13.03	325°1.15	37.10	235°59.88	14.02	308°35.45	55.14	47°39.55	27.44	Acamar	315°11.49 -40°11.81
8	65°15.49	340°0.53	37.31	251°0.95	13.38	323°37.33	55.10	62°42.07	27.48	Menkar	314°5.73 4°11.49
9	80°17.95	354°59.91	· · 37.52	266°2.02	· · 12.75	338°39.20	· · 55.06	77°44.58	· · 27.51	Mirfak	308°27.75 49°56.94
10	95°20.42	9°59.29	37.73	281°3.10	12.12	353°41.08	55.02	92°47.10	27.54	Aldebaran	290°39.28 16°33.66
11	110°22.88	24°58.67	37.94	296°4.17	11.48	8°42.95	54.98	107°49.61	27.58	Rigel	281°3.65 -8°10.18
12	125°25.35	39°58.05	N21°38.15	311°5.24	N03°10.85	23°44.83	N22°54.94	122°52.12	S01°27.61	Capella	280°21.54 46°1.31
13	140°27.81	54°57.42	38.36	326°6.31	10.22	38°46.71	54.90	137°54.64	27.64	Bellatrix	278°22.62 6°22.45
14	155°30.27	69°56.80	38.57	341°7.38	9.59	53°48.58	54.86	152°57.15	27.68	Elnath	278°1.55 28°37.71
15	170°32.74	84°56.18	· · 38.78	356°8.46	· · 8.95	68°50.46	· · 54.82	167°59.67	· · 27.71	Anilam	275°37.51 -1°11.02
16	185°35.20	99°55.55	38.98	11°9.53	8.32	83°52.34	54.78	183°2.18	27.75	Betelgeuse	270°51.85 7°24.78
17	200°37.67	114°54.93	39.19	26°10.60	7.69	98°54.21	54.74	198°4.70	27.78	Canopus	263°52.67 -52°42.32
18	215°40.13	129°54.31	N21°39.39	41°11.67	N03°7.05	113°56.09	N22°54.70	213°7.21	S01°27.81	Sirius	258°26.14 -16°44.93
19	230°42.60	144°53.68	39.59	56°12.74	6.42	128°57.97	54.66	228°9.73	27.85	Adhara	255°5.86 -29°0.25
20	245°45.06	159°53.06	39.80	71°13.81	5.79	143°59.84	54.62	243°12.25	27.88	Procyon	244°50.67 5°9.65
21	260°47.52	174°52.43	· · 40.00	86°14.88	· · 5.15	159°1.72	· · 54.58	258°14.76	· · 27.92	Pollux	243°17.10 27°57.91
22	275°49.99	189°51.81	40.20	101°15.95	4.52	174°3.60	54.54	273°17.28	27.95	Avior	234°15.22 -59°35.41
23	290°52.45	204°51.18	40.40	116°17.03	3.88	189°5.47	54.50	288°19.79	27.98	Suhail	222°46.42 -43°32.12
Mer.pass. 03:40		ν-0.6' d0.2' m-4.02		ν1.1' d-0.6' m1.59		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.83		Miaplacidus	221°39.15 -69°49.34
										Alphard	217°47.61 -8°46.11
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.23 11°50.63
0	305°54.92	219°05.55	N21°40.60	131°18.10	N03°3.25	204°7.35	N22°54.46	303°22.31	S01°28.02	Dubhe	193°40.91 61°37.00
1	320°57.38	234°49.93	40.79	146°19.17	2.62	219°9.23	54.42	318°24.83	28.05	Denebola	182°24.67 14°25.86
2	335°59.84	249°49.30	40.99	161°20.24	1.98	234°11.10	54.38	333°27.34	28.09	Gienah	175°43.28 -17°41.08
3	351°2.31	264°48.67	· · 41.18	176°21.31	· · 1.35	249°12.98	· · 54.34	348°29.86	· · 28.12	Acru	172°59.94 -63°14.70
4	6°4.77	279°48.05	41.38	191°22.38	0.71	264°14.86	54.30	3°32.38	28.16	Gacrux	171°51.41 -57°15.62
5	21°7.24	294°47.42	41.57	206°23.45	03°0.08	279°16.74	54.26	18°34.89	28.19	Alioth	166°12.73 55°49.52
6	36°9.70	309°46.79	N21°41.76	221°24.52	N02°59.45	294°18.61	N22°54.22	33°37.41	S01°28.23	Spica	158°21.88 -11°17.71
7	51°12.16	324°46.16	41.96	236°25.59	58.81	309°20.49	54.18	48°39.93	28.26	Alkaid	152°51.67 49°11.39
8	66°14.63	339°45.53	42.15	251°26.66	58.18	324°22.37	54.14	63°42.45	28.30	Hadar	148°35.38 -60°30.05
9	81°17.09	354°44.90	· · 42.34	266°27.73	· · 57.54	339°24.25	· · 54.10	78°44.96	· · 28.33	Menkent	147°57.08 -36°29.91
10	96°19.56	9°44.27	42.52	281°28.80	56.91	354°26.13	54.06	93°47.48	28.36	Arcturus	145°47.47 19°3.09
11	111°22.02	24°43.64	42.71	296°29.87	56.27	9°28.00	54.02	108°50.00	28.40	Rigel Kent.	139°39.61 -60°56.73
12	126°24.48	39°43.01	N21°42.90	311°30.94	N02°55.64	24°29.88	N22°53.98	123°52.52	S01°28.44	Kochab	137°19.56 74°3.27
13	141°26.95	54°42.38	43.09	326°32.01	55.00	39°31.76	53.94	138°55.04	28.47	Zuben'ubi	136°55.44 -16°8.93
14	156°29.41	69°41.75	43.27	341°33.08	54.37	54°33.64	53.90	153°57.56	28.51	Alphecca	126°3.21 26°37.87
15	171°31.88	84°41.12	· · 43.45	356°34.15	· · 53.74	69°35.52	· · 53.85	169°0.07	· · 28.54	Antares	112°15.05 -26°29.39
16	186°34.34	99°40.49	43.64	11°35.22	53.10	84°37.39	53.81	184°2.59	28.58	Atria	107°8.47 -69°4.60
17	201°36.80	114°39.86	43.82	26°36.29	52.47	99°39.27	53.77	199°5.11	28.61	Sabik	102°2.00 -15°45.40
18	216°39.27	129°39.22	N21°44.00	41°37.36	N02°51.83	114°41.15	N22°53.73	214°7.63	S01°28.65	Shaula	96°9.41 -37°7.40
19	231°41.73	144°38.59	44.18	56°38.42	51.20	129°43.03	53.69	229°10.15	28.68	Rasalhague	95°57.85 12°32.57
20	246°44.20	159°37.96	44.36	71°39.49	50.56	144°44.91	53.65	244°12.67	28.72	Eltanin	90°41.52 51°29.25
21	261°46.66	174°37.33	· · 44.54	86°40.56	· · 49.93	159°46.79	· · 53.61	259°15.19	· · 28.75	Kaus Aust.	83°31.53 -34°22.36
22	276°49.12	189°36.69	44.71	101°41.63	49.29	174°48.67	53.57	274°17.71	28.79	Vega	80°32.52 38°48.53
23	291°51.59	204°36.06	44.89	116°42.70	48.65	189°50.55	53.53	289°20.23	28.83	Nunki	75°46.82 -26°15.87
Mer.pass. 03:36		ν-0.6' d0.2' m-4.02		ν1.1' d-0.6' m1.59		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.82		Altair	61°59.17 8°56.22
										Peacock	53°4.37 -56°39.08
										Deneb	49°25.03 45°22.29
										Enif	33°38.03 9°59.59
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.88 -46°50.04
0	306°54.05	219°35.42	N21°45.07	131°43.77	N02°48.02	204°52.42	N22°53.49	304°22.75	S01°28.86	Fomalhaut	15°13.70 -29°29.01
1	321°56.52	234°34.79	45.24	146°44.84	47.38	219°54.30	53.45	319°25.27	28.90	Scheat	13°44.48 28°13.27
2	336°58.98	249°34.16	45.41	161°45.91	46.75	234°56.18	53.41	334°27.79	28.93	Markab	13°29.18 15°20.60
3	352°1.45	264°33.52	· · 45.59	176°46.97	· · 46.11	249°58.06	· · 53.36	349°30.31	· · 28.97	Jul 27 Sun	SHA Mer.pass
4	7°3.91	279°32.89	45.76	191°48.04	45.48	264°59.94	53.32	4°32.83	29.01	Venus	275°9.71 09:20
5	22°6.37	294°32.25	45.93	206°49.11	44.84	280°1.82	53.28	19°35.35	29.04	Mars	185°56.60 15:15
6	37°8.84	309°31.61	N21°46.10	221°50.18	N02°44.21	295°3.70	N22°53.24	34°37.87	S01°29.08	Jupiter	258°26.54 10:25
7	52°11.30	324°30.98	46.27	236°51.25	43.57	310°5.58	53.20	49°40.39	29.11	Saturn	357°26.18 03:50
8	67°13.77	339°30.34	46.43	251°52.32	42.93	325°7.46	53.16	64°42.92	29.15	Jul 28 Mon	SHA Mer.pass
9	82°16.23	354°29.70	· · 46.60	266°53.38	· · 42.30	340°9.34	· · 53.12	79°45.44	· · 29.19	Venus	273°55.64 09:21
10	97°18.69	9°29.07	46.77	281°54.45	41.66	355°11.22	53.08	94°47.96	29.22	Mars	185°23.18 15:14
11	112°21.16	24°28.43	46.93	296°55.52	41.03	10°13.10	53.04	109°50.48	29.26	Jupiter	258°12.43 10:22
12	127°23.62	39°27.79	N21°47.09	311°56.59	N02°40.39	25°14.98	N22°52.99	124°53.00	S01°29.30	Saturn	357°27.39 03:46
13	142°26.09	54°27.15	47.26	326°57.65	39.75	40°16.86	52.95	139°55.52	29.33	Jul 29 Tue	SHA Mer.pass
14	157°28.55	69°26.51	47.42	341°58.72	39.12	55°18.74	52.91	154°58.05	29.37	Venus	272°41.37 09:22
15	172°31.01	84°25.88	· · 47.58	356°59.79	· · 38.48	70°20.62	· · 52.87	170°0.57	· · 29.41	Mars	184°49.72 15:12
16	187°33.48	99°25.24	47.74	12°0.86	37.84	85°22.50	52.83	185°3.09	29.44	Jupiter	257°58.37 10:19
17	202°35.94	114°24.60	47.90	27°1.92	37.21	100°24.38	52.79	200°5.61	29.48	Saturn	357°28.70 03:42
18	217°38.41	129°23.96	N21°48.06	42°2.99	N02°36.57	115°26.26	N22°52.75	215°8.14	S01°29.52	Horizontal parallax	
19	232°40.87	144°23.32	48.21	57°4.06	35.94	130°28.14	52.70	230°10.66	29.55	Venus:	0.1
20	247°43.33	159°22.68	48.37	72°5.13	35.30	145°30.02	52.66	245°13.18	29.59	Mars:	0.1
21	262°45.80	174°22.04	· · 48.53	87°6.19	· · 34.66	160°31.91	· · 52.62	260°15.71	· · 29.63		
22	277°48.26	189°21.40	48.68	102°7.26	34.03	175°33.79	52.58	275°18.23	29.67		
23	292°50.73	204°20.76	48.83	117°8.33	33.39	190°35.67	52.54	290°20.75	29.70		
Mer.pass. 03:32		ν-0.6' d0.2' m-4.01		ν1.1' d-0.6' m1.60		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.82			


h	Sun			Moon			
Sun	GHA	Dec		GHA	ν	Dec	d HP
0	178°21.58	N19°11.84		150°41.02	13.4'	N12°19.03	-14.3' 56.7'
1	193°21.58	11.27		165°13.44	13.5'	12°4.72	-14.3' 56.7'
2	208°21.59	10.71		179°45.94	13.6'	11°50.38	-14.4' 56.7'
3	223°21.59	· · 10.14		194°18.52	13.7'	11°36.00	-14.4' 56.6'
4	238°21.60	9.57		208°51.19	13.8'	11°21.59	-14.4' 56.6'
5	253°21.61	9.00		223°23.94	13.8'	11°7.14	-14.5' 56.6'
6	268°21.61	N19°8.43		237°56.78	13.9'	N10°52.65	-14.5' 56.5'
7	283°21.62	7.86		252°29.69	14.0'	10°38.14	-14.5' 56.5'
8	298°21.63	7.29		267°2.69	14.1'	10°23.60	-14.6' 56.5'
9	313°21.64	· · 6.72		281°35.76	14.1'	10°9.02	-14.6' 56.5'
10	328°21.64	6.15		296°8.91	14.2'	09°54.42	-14.6' 56.4'
11	343°21.65	5.58		310°42.14	14.3'	09°39.80	-14.7' 56.4'
12	358°21.66	N19°5.00		325°15.44	14.4'	N09°25.14	-14.7' 56.4'
13	13°21.67	4.43		339°48.81	14.4'	09°10.47	-14.7' 56.3'
14	28°21.68	3.86		354°22.26	14.5'	08°55.77	-14.7' 56.3'
15	43°21.69	· · 3.28		8°55.77	14.6'	08°41.05	-14.7' 56.3'
16	58°21.70	2.71		23°29.36	14.7'	08°26.31	-14.8' 56.3'
17	73°21.71	2.13		38°3.01	14.7'	08°11.55	-14.8' 56.2'
18	88°21.72	N19°1.55		52°36.73	14.8'	N07°56.77	-14.8' 56.2'
19	103°21.73	0.98		67°10.52	14.9'	07°41.97	-14.8' 56.2'
20	118°21.74	19°0.40		81°44.37	14.9'	07°27.16	-14.8' 56.1'
21	133°21.75	18°59.82		96°18.28	15.0'	07°12.34	-14.8' 56.1'
22	148°21.76	59.25		110°52.26	15.0'	06°57.50	-14.9' 56.1'
23	163°21.78	58.67		125°26.30	15.1'	06°42.64	-14.9' 56.1'
SD = 15.7'			$d = -0.6'$			SD = 15.5'	

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	178°21.79	N18°58.09		140°0.39	15.2'	N06°27.78	-14.9' 56.0'
1	193°21.80	57.51		154°34.55	15.2'	06°12.91	-14.9' 56.0'
2	208°21.81	56.93		169°8.76	15.3'	05°58.02	-14.9' 56.0'
3	223°21.82	· · 56.35		183°43.03	15.3'	05°43.13	-14.9' 55.9'
4	238°21.84	55.76		198°17.35	15.4'	05°28.23	-14.9' 55.9'
5	253°21.85	55.18		212°51.73	15.4'	05°13.33	-14.9' 55.9'
6	268°21.86	N18°54.60		227°26.15	15.5'	N04°58.42	-14.9' 55.9'
7	283°21.88	54.02		242°0.63	15.5'	04°43.50	-14.9' 55.8'
8	298°21.89	53.43		256°35.16	15.6'	04°28.58	-14.9' 55.8'
9	313°21.91	· · 52.85		271°9.74	15.6'	04°13.66	-14.9' 55.8'
10	328°21.92	52.27		285°44.36	15.7'	03°58.74	-14.9' 55.8'
11	343°21.94	51.68		300°19.03	15.7'	03°43.82	-14.9' 55.7'
12	358°21.95	N18°51.09		314°53.74	15.8'	N03°28.90	-14.9' 55.7'
13	13°21.97	50.51		329°28.50	15.8'	03°13.98	-14.9' 55.7'
14	28°21.98	49.92		344°3.29	15.8'	02°59.06	-14.9' 55.6'
15	43°22.00	· · 49.33		358°38.13	15.9'	02°44.15	-14.9' 55.6'
16	58°22.01	48.75		13°13.01	15.9'	02°29.24	-14.9' 55.6'
17	73°22.03	48.16		27°47.93	16.0'	02°14.33	-14.9' 55.6'
18	88°22.05	N18°47.57		42°22.88	16.0'	N01°59.43	-14.9' 55.5'
19	103°22.06	46.98		56°57.87	16.0'	01°44.54	-14.9' 55.5'
20	118°22.08	46.39		71°32.89	16.1'	01°29.66	-14.9' 55.5'
21	133°22.10	· · 45.80		86°7.95	16.1'	01°14.78	-14.9' 55.5'
22	148°22.12	45.21		100°43.04	16.1'	00°59.92	-14.9' 55.4'
23	163°22.13	44.62		115°18.16	16.1'	00°45.07	-14.8' 55.4'
SD = 15.7'			$d = -0.6'$			SD = 15.3'	

Tue	GHA	Dec		GHA	ν	Dec	d HP
0	178°22.15	N18°44.02		129°53.31	16.2'	N00°30.22	-14.8' 55.4'
1	193°22.17	43.43		144°28.48	16.2'	00°15.39	-14.8' 55.4'
2	208°22.19	42.84		159°3.69	16.2'	N00°0.57	-14.8' 55.3'
3	223°22.21	· · 42.24		173°38.92	16.3'	S00°14.23	14.8' 55.3'
4	238°22.23	41.65		188°14.18	16.3'	00°29.02	14.8' 55.3'
5	253°22.25	41.05		202°49.45	16.3'	00°43.80	14.8' 55.3'
6	268°22.27	N18°40.46		217°24.76	16.3'	S00°58.55	14.7' 55.3'
7	283°22.29	39.86		232°0.08	16.3'	01°13.29	14.7' 55.2'
8	298°22.31	39.27		246°35.42	16.4'	01°28.02	14.7' 55.2'
9	313°22.33	· · 38.67		261°10.78	16.4'	01°42.72	14.7' 55.2'
10	328°22.35	38.07		275°46.16	16.4'	01°57.41	14.7' 55.2'
11	343°22.37	37.47		290°21.55	16.4'	02°12.07	14.6' 55.1'
12	358°22.39	N18°36.88		304°56.96	16.4'	S02°26.72	14.6' 55.1'
13	13°22.42	36.28		319°32.39	16.4'	02°41.34	14.6' 55.1'
14	28°22.44	35.68		334°7.82	16.4'	02°55.94	14.6' 55.1'
15	43°22.46	· · 35.08		348°43.27	16.5'	03°10.51	14.6' 55.1'
16	58°22.48	34.48		3°18.73	16.5'	03°25.07	14.5' 55.0'
17	73°22.51	33.88		17°54.20	16.5'	03°39.59	14.5' 55.0'
18	88°22.53	N18°33.27		32°29.67	16.5'	S03°54.10	14.5' 55.0'
19	103°22.55	32.67		47°5.15	16.5'	04°8.57	14.4' 55.0'
20	118°22.58	32.07		61°40.64	16.5'	04°23.02	14.4' 54.9'
21	133°22.60	· · 31.47		76°16.13	16.5'	04°37.44	14.4' 54.9'
22	148°22.63	30.86		90°51.63	16.5'	04°51.84	14.4' 54.9'
23	163°22.65	30.26		105°27.13	16.5'	05°6.20	14.3' 54.9'
SD = 15.7'			$d = -0.6'$			SD = 15.1'	

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°	////	////	00:41	23:17	////	////
68°	////	////	01:55	22:14	////	////
66°	////	////	02:31	21:39	////	////
64°	////	01:15	02:56	21:15	22:52	////
62°	////	01:59	03:16	20:55	22:10	////
60°	////	02:28	03:32	20:40	21:42	////
N 58°	01:08	02:50	03:45	20:26	21:22	22:59
56°	01:49	03:07	03:57	20:15	21:05	22:21
54°	02:15	03:21	04:07	20:05	20:50	21:55
52°	02:35	03:34	04:16	19:56	20:38	21:36
50°	02:52	03:45	04:24	19:48	20:27	21:20
45°	03:23	04:07	04:41	19:31	20:05	20:49
N 40°	03:46	04:24	04:55	19:18	19:48	20:26
35°	04:04	04:38	05:07	19:06	19:34	20:08
30°	04:19	04:51	05:17	18:56	19:22	19:53
20°	04:42	05:10	05:34	18:39	19:02	19:30
N 10°	05:01	05:27	05:49	18:24	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:41	06:08	06:31	17:42	18:05	18:32
30°	05:54	06:23	06:48	17:25	17:51	18:20
35°	06:00	06:31	06:58	17:16	17:43	18:13
40°	06:07	06:39	07:09	17:05	17:34	18:07
45°	06:14	06:49	07:21	16:52	17:24	18:00
S 50°	06:22	07:01	07:37	16:37	17:12	17:52
52°	06:25	07:07	07:44	16:29	17:07	17:48
54°	06:29	07:12	07:52	16:21	17:01	17:45
56°	06:33	07:19	08:01	16:12	16:55	17:41
58°	06:37	07:26	08:12	16:02	16:48	17:37
S 60°	06:42	07:34	08:23	15:50	16:40	17:32

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	05:44	07:59	10:03	22:03	21:29	20:56
N 70°	06:03	08:06	10:00	21:54	21:27	21:02
68°	06:17	08:11	09:57	21:46	21:26	21:08
66°	06:29	08:15	09:55	21:39	21:25	21:12
64°	06:39	08:19	09:54	21:34	21:25	21:16
62°	06:48	08:22	09:52	21:29	21:24	21:19
60°	06:55	08:25	09:51	21:24	21:23	21:22
N 58°	07:01	08:27	09:50	21:21	21:23	21:24
56°	07:07	08:29	09:49	21:17	21:22	21:27
54°	07:12	08:31	09:48	21:14	21:22	21:29
52°	07:16	08:33	09:47	21:11	21:21	21:31
50°	07:20	08:35	09:46	21:09	21:21	21:32
45°	07:29	08:38	09:45	21:03	21:20	21:36
N 40°	07:36	08:41	09:43	20:59	21:19	21:39
35°	07:42	08:43	09:42	20:54	21:19	21:42
30°	07:48	08:46	09:41	20:51	21:18	21:45
20°	07:57	08:49	09:40	20:44	21:17	21:49
N 10°	08:05	08:53	09:38	20:39	21:16	21:53
0°	08:13	08:56	09:37	20:34	21:15	21:56
S 10°	08:20	08:59	09:35	20:28	21:15	22:00
20°	08:28	09:02	09:34	20:22	21:14	22:03
30°	08:37	09:06	09:32	20:16	21:13	22:08
35°	08:43	09:08	09:31	20:12	21:12	22:10
40°	08:49	09:10	09:30	20:08	21:11	22:13
45°	08:55	09:13	09:29	20:02	21:10	22:16
S 50°	09:04	09:16	09:28	19:56	21:09	22:20
52°	09:07	09:18	09:27	19:53	21:09	22:22
54°	09:12	09:20	09:27	19:50	21:08	22:24
56°	09:16	09:21	09:26	19:47	21:08	22:26
58°	09:21	09:23	09:25	19:43	21:07	22:29
S 60°	09:27	09:26	09:24	19:38	21:06	22:31

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	3-5 6-19%
27	06:34	06:33	12:07	14:23	02:01	
28	06:33	06:32	12:07	15:06	02:45	
29	06:31	06:30	12:07	15:46	03:26	

July 30, 31, 01 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	307°53.19	219°20.11	N21°48.98	132°9.39	N02°32.75	205°37.55	N22°52.50	305°23.28	S01°29.74	
1	322°55.65	234°19.47	49.14	147°10.46	32.11	220°39.43	52.45	320°25.80	29.78	
2	337°58.12	249°18.83	49.29	162°11.53	31.48	235°41.31	52.41	335°28.32	29.82	
3	353°0.58	264°18.19	· · 49.44	177°12.59	· · 30.84	250°43.19	· · 52.37	350°30.85	· · 29.85	
4	8°3.05	279°17.55	49.58	192°13.66	30.20	265°45.07	52.33	5°33.37	29.89	
5	23°5.51	294°16.90	49.73	207°14.72	29.57	280°46.96	52.29	20°35.90	29.93	
6	38°7.97	309°16.26	N21°49.88	222°15.79	N02°28.93	295°48.84	N22°52.25	35°38.42	S01°29.97	
7	53°10.44	324°15.62	50.02	237°16.86	28.29	310°50.72	52.20	50°40.95	30.00	
8	68°12.90	339°14.97	50.17	252°17.92	27.65	325°52.60	52.16	65°43.47	30.04	
9	83°15.37	354°14.33	· · 50.31	267°18.99	· · 27.02	340°54.48	· · 52.12	80°46.00	· · 30.08	
10	98°17.83	9°13.68	50.45	282°20.05	26.38	355°56.37	52.08	95°48.52	30.12	
11	113°20.30	24°13.04	50.59	297°21.12	25.74	10°58.25	52.04	110°51.05	30.16	
12	128°22.76	39°12.39	N21°50.73	312°22.19	N02°25.10	26°0.13	N22°51.99	125°53.57	S01°30.19	
13	143°25.22	54°11.75	50.87	327°23.25	24.47	41°2.01	51.95	140°56.10	30.23	
14	158°27.69	69°11.10	51.01	342°24.32	23.83	56°3.90	51.91	155°58.62	30.27	
15	173°30.15	84°10.46	· · 51.15	357°25.38	· · 23.19	71°5.78	· · 51.87	171°1.15	· · 30.31	
16	188°32.62	99°9.81	51.29	12°26.45	22.55	86°7.66	51.83	186°3.68	30.35	
17	203°35.08	114°9.16	51.42	27°27.51	21.92	101°9.54	51.78	201°6.20	30.39	
18	218°37.54	129°8.52	N21°51.56	42°28.58	N02°21.28	116°11.43	N22°51.74	216°8.73	S01°30.42	
19	233°40.01	144°7.87	51.69	57°29.64	20.64	131°13.31	51.70	231°11.26	30.46	
20	248°42.47	159°7.22	51.82	72°30.71	20.00	146°15.19	51.66	246°13.78	30.50	
21	263°44.94	174°6.58	· · 51.95	87°31.77	· · 19.36	161°17.07	· · 51.61	261°16.31	· · 30.54	
22	278°47.40	189°5.93	52.09	102°32.84	18.73	176°18.96	51.57	276°18.84	30.58	
23	293°49.86	204°5.28	52.22	117°33.90	18.09	191°20.84	51.53	291°21.36	30.62	
Mer.pass. 03:28		ν-0.6' d0.2' m-4.01		ν1.1' d-0.6' m1.60		ν1.9' d-0.0' m-1.91		ν2.5' d0.0' m0.81		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	308°52.33	219°4.63	N21°52.34	132°34.97	N02°17.45	206°22.72	N22°51.49	306°23.89	S01°30.66	
1	323°54.79	234°3.98	52.47	147°36.03	16.81	221°24.61	51.44	321°26.42	30.70	
2	338°57.26	249°3.33	52.60	162°37.09	16.17	236°26.49	51.40	336°28.95	30.73	
3	353°59.72	264°2.69	· · 52.72	177°38.16	· · 15.53	251°28.37	· · 51.36	351°31.47	· · 30.77	
4	9°2.18	279°2.04	52.85	192°39.22	14.90	266°30.26	51.32	6°34.00	30.81	
5	24°4.65	294°1.39	52.97	207°40.29	14.26	281°32.14	51.27	21°36.53	30.85	
6	39°7.11	309°0.74	N21°53.10	222°41.35	N02°13.62	296°34.03	N22°51.23	36°39.06	S01°30.89	
7	54°9.58	324°0.09	53.22	237°42.41	12.98	311°35.91	51.19	51°41.59	30.93	
8	69°12.04	338°59.44	53.34	252°43.48	12.34	326°37.79	51.15	66°44.12	30.97	
9	84°14.50	353°58.78	· · 53.46	267°44.54	· · 11.70	341°39.68	· · 51.10	81°46.65	· · 31.01	
10	99°16.97	8°58.13	53.58	282°45.61	11.06	356°41.56	51.06	96°49.17	31.05	
11	114°19.43	23°57.48	53.70	297°46.67	10.42	11°43.45	51.02	111°51.70	31.09	
12	129°21.90	38°56.83	N21°53.81	312°47.73	N02°9.79	26°45.33	N22°50.98	126°54.23	S01°31.13	
13	144°24.36	53°56.18	53.93	327°48.80	9.15	41°47.22	50.93	141°56.76	31.17	
14	159°26.83	68°55.53	54.04	342°49.86	8.51	56°49.10	50.89	156°59.29	31.21	
15	174°29.29	83°54.87	· · 54.16	357°50.92	· · 7.87	71°50.98	· · 50.85	172°1.82	· · 31.25	
16	189°31.75	98°54.22	54.27	12°51.99	7.23	86°52.87	50.81	187°4.35	31.29	
17	204°34.22	113°53.57	54.38	27°53.05	6.59	101°54.75	50.76	202°6.88	31.33	
18	219°36.68	128°52.92	N21°54.49	42°54.11	N02°5.95	116°56.64	N22°50.72	217°9.41	S01°31.37	
19	234°39.15	143°52.26	54.60	57°55.17	5.31	131°58.52	50.68	232°11.94	31.41	
20	249°41.61	158°51.61	54.71	72°56.24	4.67	147°0.41	50.63	247°14.47	31.45	
21	264°44.07	173°50.95	· · 54.82	87°57.30	· · 4.03	162°2.29	· · 50.59	262°17.00	· · 31.49	
22	279°46.54	188°50.30	54.93	102°58.36	3.39	177°4.18	50.55	277°19.53	31.53	
23	294°49.00	203°49.65	55.03	117°59.42	2.75	192°6.07	50.50	292°22.06	31.57	
Mer.pass. 03:24		ν-0.6' d0.1' m-4.01		ν1.1' d-0.6' m1.60		ν1.9' d-0.0' m-1.92		ν2.5' d0.0' m0.81		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	309°51.47	218°48.99	N21°55.14	133°0.49	N02°2.11	207°7.95	N22°50.46	307°24.59	S01°31.61	
1	324°53.93	233°48.34	55.24	148°1.55	1.47	222°9.84	50.42	322°27.13	31.65	
2	339°56.39	248°47.68	55.35	163°2.61	0.83	237°11.72	50.38	337°29.66	31.69	
3	354°58.86	263°47.02	· · 55.45	178°3.67	02°0.19	252°13.61	· · 50.33	352°32.19	· · 31.73	
4	10°1.32	278°46.37	55.55	193°4.73	01°59.55	267°15.49	50.29	7°34.72	31.77	
5	25°3.79	293°45.71	55.65	208°5.80	58.91	282°17.38	50.25	22°37.25	31.81	
6	40°6.25	308°45.06	N21°55.75	223°6.86	N01°58.27	297°19.27	N22°50.20	37°39.78	S01°31.85	
7	55°8.71	323°44.40	55.85	238°7.92	57.63	312°21.15	50.16	52°42.32	31.89	
8	70°11.18	338°43.74	55.94	253°8.98	56.99	327°23.04	50.12	67°44.85	31.93	
9	85°13.64	353°43.09	· · 56.04	268°10.04	· · 56.35	342°24.92	· · 50.07	82°47.38	· · 31.97	
10	100°16.11	8°42.43	56.14	283°11.10	55.71	357°26.81	50.03	97°49.91	32.01	
11	115°18.57	23°41.77	56.23	298°12.17	55.07	12°28.70	49.99	112°52.45	32.05	
12	130°21.04	38°41.11	N21°56.32	313°13.23	N01°54.43	27°30.58	N22°49.94	127°54.98	S01°32.10	
13	145°23.50	53°40.45	56.42	328°14.29	53.79	42°32.47	49.90	142°57.51	32.14	
14	160°25.96	68°39.80	56.51	343°15.35	53.15	57°34.36	49.86	158°0.04	32.18	
15	175°28.43	83°39.14	· · 56.60	358°16.41	· · 52.51	72°36.25	· · 49.81	173°2.58	· · 32.22	
16	190°30.89	98°38.48	56.69	13°17.47	51.87	87°38.13	49.77	188°5.11	32.26	
17	205°33.36	113°37.82	56.77	28°18.53	51.23	102°40.02	49.73	203°7.64	32.30	
18	220°35.82	128°37.16	N21°56.86	43°19.59	N01°50.59	117°41.91	N22°49.68	218°10.18	S01°32.34	
19	235°38.28	143°36.50	56.95	58°20.65	49.95	132°43.79	49.64	233°12.71	32.38	
20	250°40.75	158°35.84	57.03	73°21.71	49.31	147°45.68	49.59	248°15.25	32.43	
21	265°43.21	173°35.18	· · 57.12	88°22.77	· · 48.67	162°47.57	· · 49.55	263°17.78	· · 32.47	
22	280°45.68	188°34.52	57.20	103°23.84	48.03	177°49.46	49.51	278°20.31	32.51	
23	295°48.14	203°33.86	57.28	118°24.90	47.39	192°51.34	49.46	293°22.85	32.55	
Mer.pass. 03:20		ν-0.7' d0.1' m-4.00		ν1.1' d-0.6' m1.60		ν1.9' d-0.0' m-1.92		ν2.5' d0.0' m0.80		


h		Sun		Moon			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		178°22.67	N18°29.65	120°2.63	16.5'	S05°20.53	14.3' 54.9'
1		193°22.70	29.05	134°38.13	16.5'	05°34.84	14.3' 54.8'
2		208°22.73	28.44	149°13.62	16.5'	05°49.11	14.2' 54.8'
3		223°22.75	· · 27.84	163°49.12	16.5'	06°3.35	14.2' 54.8'
4		238°22.78	27.23	178°24.61	16.5'	06°17.56	14.2' 54.8'
5		253°22.80	26.62	193°0.10	16.5'	06°31.73	14.1' 54.8'
6		268°22.83	N18°26.01	207°35.58	16.5'	S06°45.87	14.1' 54.8'
7		283°22.86	25.40	222°11.05	16.5'	06°59.98	14.1' 54.7'
8		298°22.88	24.80	236°46.52	16.5'	07°14.05	14.0' 54.7'
9		313°22.91	· · 24.19	251°21.98	16.4'	07°28.08	14.0' 54.7'
10		328°22.94	23.58	265°57.42	16.4'	07°42.08	14.0' 54.7'
11		343°22.97	22.96	280°32.86	16.4'	07°56.04	13.9' 54.7'
12		358°22.99	N18°22.35	295°8.28	16.4'	S08°9.96	13.9' 54.7'
13		13°23.02	21.74	309°43.69	16.4'	08°23.84	13.8' 54.6'
14		28°23.05	21.13	324°19.08	16.4'	08°37.68	13.8' 54.6'
15		43°23.08	· · 20.52	338°54.46	16.4'	08°51.49	13.8' 54.6'
16		58°23.11	19.90	353°29.82	16.3'	09°5.25	13.7' 54.6'
17		73°23.14	19.29	8°5.17	16.3'	09°18.97	13.7' 54.6'
18		88°23.17	N18°18.68	22°40.49	16.3'	S09°32.65	13.6' 54.6'
19		103°23.20	18.06	37°15.80	16.3'	09°46.28	13.6' 54.5'
20		118°23.23	17.45	51°51.08	16.3'	09°59.87	13.5' 54.5'
21		133°23.26	· · 16.83	66°26.34	16.2'	10°13.42	13.5' 54.5'
22		148°23.29	16.21	81°1.58	16.2'	10°26.92	13.5' 54.5'
23		163°23.32	15.60	95°36.79	16.2'	10°40.37	13.4' 54.5'
SD = 15.7' $d = -0.6'$				SD = 15.0'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		178°23.35	N18°14.98	110°11.98	16.2'	S10°53.78	13.4' 54.5'
1		193°23.38	14.36	124°47.14	16.1'	11°7.14	13.3' 54.5'
2		208°23.42	13.74	139°22.28	16.1'	11°20.46	13.3' 54.5'
3		223°23.45	· · 13.12	153°57.38	16.1'	11°33.72	13.2' 54.4'
4		238°23.48	12.50	168°32.46	16.0'	11°46.94	13.2' 54.4'
5		253°23.51	11.89	183°7.51	16.0'	12°0.10	13.1' 54.4'
6		268°23.55	N18°11.26	197°42.52	16.0'	S12°13.22	13.1' 54.4'
7		283°23.58	10.64	212°17.50	15.9'	12°26.28	13.0' 54.4'
8		298°23.61	10.02	226°52.45	15.9'	12°39.29	13.0' 54.4'
9		313°23.65	· · 9.40	241°27.36	15.9'	12°52.25	12.9' 54.4'
10		328°23.68	8.78	256°2.24	15.8'	13°5.16	12.9' 54.4'
11		343°23.72	8.15	270°37.08	15.8'	13°18.01	12.8' 54.4'
12		358°23.75	N18°7.53	285°11.88	15.8'	S13°30.80	12.7' 54.3'
13		13°23.79	6.91	299°46.64	15.7'	13°43.55	12.7' 54.3'
14		28°23.82	6.28	314°21.37	15.7'	13°56.23	12.6' 54.3'
15		43°23.86	· · 5.66	328°56.05	15.6'	14°8.86	12.6' 54.3'
16		58°23.89	5.03	343°30.69	15.6'	14°21.43	12.5' 54.3'
17		73°23.93	4.41	358°5.29	15.6'	14°33.94	12.5' 54.3'
18		88°23.96	N18°3.78	12°39.85	15.5'	S14°46.39	12.4' 54.3'
19		103°24.00	3.15	27°14.36	15.5'	14°58.79	12.3' 54.3'
20		118°24.04	2.52	41°48.83	15.4'	15°11.12	12.3' 54.3'
21		133°24.07	· · 1.90	56°23.25	15.4'	15°23.39	12.2' 54.3'
22		148°24.11	1.27	70°57.62	15.3'	15°35.60	12.1' 54.3'
23		163°24.15	0.64	85°31.95	15.3'	15°47.74	12.1' 54.3'
SD = 15.7' $d = -0.6'$				SD = 14.9'			

Fri		GHA	Dec	GHA	ν	Dec	d HP
0		178°24.19	N18°0.01	100°6.23	15.2'	S15°59.83	12.0' 54.2'
1		193°24.23	17°59.38	114°40.45	15.2'	16°11.84	12.0' 54.2'
2		208°24.26	58.75	129°14.63	15.1'	16°23.80	11.9' 54.2'
3		223°24.30	· · 58.12	143°48.75	15.1'	16°35.68	11.8' 54.2'
4		238°24.34	57.49	158°22.83	15.0'	16°47.51	11.8' 54.2'
5		253°24.38	56.85	172°56.84	15.0'	16°59.26	11.7' 54.2'
6		268°24.42	N17°56.22	187°30.81	14.9'	S17°10.94	11.6' 54.2'
7		283°24.46	55.59	202°4.72	14.9'	17°22.56	11.5' 54.2'
8		298°24.50	54.95	216°38.57	14.8'	17°34.11	11.5' 54.2'
9		313°24.54	· · 54.32	231°12.37	14.7'	17°45.59	11.4' 54.2'
10		328°24.58	53.68	245°46.11	14.7'	17°56.99	11.3' 54.2'
11		343°24.62	53.05	260°19.79	14.6'	18°8.33	11.3' 54.2'
12		358°24.66	N17°52.41	274°53.42	14.6'	S18°19.59	11.2' 54.2'
13		13°24.70	51.78	289°26.98	14.5'	18°30.78	11.1' 54.2'
14		28°24.75	51.14	304°0.48	14.4'	18°41.89	11.0' 54.2'
15		43°24.79	· · 50.50	318°33.93	14.4'	18°52.93	11.0' 54.2'
16		58°24.83	49.87	333°7.31	14.3'	19°3.89	10.9' 54.2'
17		73°24.87	49.23	347°40.62	14.3'	19°14.78	10.8' 54.2'
18		88°24.92	N17°48.59	2°13.88	14.2'	S19°25.59	10.7' 54.2'
19		103°24.96	47.95	16°47.07	14.1'	19°36.32	10.7' 54.2'
20		118°25.00	47.31	31°20.19	14.1'	19°46.97	10.6' 54.2'
21		133°25.05	· · 46.67	45°53.25	14.0'	19°57.54	10.5' 54.2'
22		148°25.09	46.03	60°26.25	13.9'	20°8.03	10.4' 54.2'
23		163°25.13	45.39	74°59.18	13.9'	20°18.44	10.3' 54.2'
SD = 15.8' $d = -0.6'$				SD = 14.8'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°	////	////	01:19	22:45	////	////
68°	////	////	02:11	21:57	////	////
66°	////	////	02:43	21:27	////	////
64°	////	01:35	03:06	21:05	22:33	////
62°	////	02:12	03:24	20:47	21:57	////
60°	////	02:38	03:39	20:32	21:33	////
N 58°	01:26	02:57	03:52	20:20	21:13	22:42
56°	02:00	03:14	04:02	20:09	20:57	22:10
54°	02:24	03:27	04:12	20:00	20:44	21:47
52°	02:43	03:39	04:21	19:51	20:33	21:28
50°	02:58	03:49	04:28	19:44	20:22	21:13
45°	03:28	04:11	04:44	19:28	20:01	20:44
N 40°	03:50	04:27	04:58	19:15	19:45	20:22
35°	04:07	04:41	05:09	19:04	19:31	20:05
30°	04:21	04:53	05:19	18:54	19:20	19:51
20°	04:44	05:12	05:35	18:37	19:01	19:29
N 10°	05:01	05:27	05:50	18:23	18:45	19:11
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:54	06:16	17:57	18:19	18:44
20°	05:40	06:07	06:30	17:43	18:06	18:33
30°	05:52	06:21	06:46	17:27	17:52	18:21
35°	05:58	06:28	06:55	17:18	17:45	18:15
40°	06:04	06:37	07:06	17:08	17:36	18:09
45°	06:11	06:46	07:18	16:55	17:27	18:03
S 50°	06:18	06:57	07:33	16:41	17:16	17:55
52°	06:21	07:02	07:40	16:34	17:11	17:52
54°	06:25	07:08	07:47	16:26	17:06	17:49
56°	06:28	07:14	07:56	16:18	17:00	17:45
58°	06:32	07:21	08:05	16:08	16:53	17:41
S 60°	06:37	07:28	08:17	15:57	16:46	17:37

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	12:06	14:26		20:19	19:26	
N 70°	11:53	13:56	16:45	20:35	19:58	18:38
68°	11:43	13:33	15:43	20:47	20:22	19:42
66°	11:34	13:16	15:09	20:58	20:41	20:17
64°	11:27	13:02	14:44	21:06	20:56	20:43
62°	11:21	12:51	14:25	21:14	21:09	21:03
60°	11:15	12:41	14:09	21:21	21:20	21:20
N 58°	11:11	12:32	13:56	21:26	21:29	21:34
56°	11:07	12:25	13:44	21:32	21:38	21:46
54°	11:03	12:18	13:34	21:36	21:45	21:56
52°	11:00	12:12	13:26	21:41	21:52	22:06
50°	10:56	12:07	13:18	21:44	21:58	22:14
45°	10:50	11:55	13:01	21:53	22:11	22:32
N 40°	10:45	11:46	12:47	22:00	22:22	22:47
35°	10:40	11:38	12:36	22:06	22:31	22:59
30°	10:36	11:30	12:26	22:11	22:39	23:10
20°	10:29	11:18	12:09	22:21	22:54	23:29
N 10°	10:23	11:08	11:54	22:29	23:06	23:46
0°	10:17	10:58	11:40	22:37	23:18	· · ·
S 10°	10:11	10:48	11:27	22:44	23:30	· · ·
20°	10:05	10:38	11:12	22:53	23:43	· · ·
30°	09:59	10:26	10:55	23:02	23:57	· · ·
35°	09:55	10:19	10:46	23:08	· · ·	00:06
40°	09:50	10:12	10:35	23:14	· · ·	00:15
45°	09:45	10:03	10:22	23:21	· · ·	00:27
S 50°	09:40	09:52	10:07	23:30	· · ·	00:41
52°	09:37	09:47	10:00	23:34	· · ·	00:47
54°	09:34	09:42	09:52	23:39	· · ·	00:55
56°	09:31	09:36	09:43	23:44	· · ·	01:03
58°	09:27	09:29	09:33	23:50	· · ·	01:12
S 60°	09:23	09:22	09:21	23:56	· · ·	01:23

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm		6-8 27-45%
30	06:29	06:28	12:06	16:27	04:07		
31	06:27	06:25	12:06	17:08	04:47		
01	06:23	06:21	12:06	17:51	05:29		

h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		178°25.18	N17°44.75	89°32.04	13.8'	S20°28.77	10.2' 54.2'
1		193°25.22	44.10	104°4.83	13.7'	20°39.01	10.2' 54.2'
2		208°25.27	43.46	118°37.55	13.7'	20°49.17	10.1' 54.2'
3		223°25.31	· · 42.82	133°10.21	13.6'	20°59.24	10.0' 54.2'
4		238°25.36	42.17	147°42.79	13.5'	21°9.23	9.9' 54.2'
5		253°25.40	41.53	162°15.31	13.4'	21°19.14	9.8' 54.2'
6		268°25.45	N17°40.89	176°47.75	13.4'	S21°28.95	9.7' 54.2'
7		283°25.50	40.24	191°20.13	13.3'	21°38.68	9.6' 54.2'
8		298°25.54	39.59	205°52.43	13.2'	21°48.31	9.5' 54.2'
9		313°25.59	· · 38.95	220°24.66	13.2'	21°57.86	9.5' 54.2'
10		328°25.64	38.30	234°56.82	13.1'	22°7.32	9.4' 54.2'
11		343°25.68	37.65	249°28.90	13.0'	22°16.68	9.3' 54.2'
12		358°25.73	N17°37.01	264°0.92	12.9'	S22°25.95	9.2' 54.2'
13		13°25.78	36.36	278°32.86	12.9'	22°35.13	9.1' 54.2'
14		28°25.83	35.71	293°4.72	12.8'	22°44.22	9.0' 54.2'
15		43°25.88	· · 35.06	307°36.51	12.7'	22°53.20	8.9' 54.2'
16		58°25.92	34.41	322°8.22	12.6'	23°2.10	8.8' 54.2'
17		73°25.97	33.76	336°39.86	12.6'	23°10.89	8.7' 54.2'
18		88°26.02	N17°33.11	351°11.43	12.5'	S23°19.59	8.6' 54.2'
19		103°26.07	32.46	5°42.92	12.4'	23°28.19	8.5' 54.3'
20		118°26.12	31.81	20°14.33	12.3'	23°36.68	8.4' 54.3'
21		133°26.17	· · 31.16	34°45.67	12.3'	23°45.08	8.3' 54.3'
22		148°26.22	30.50	49°16.93	12.2'	23°53.38	8.2' 54.3'
23		163°26.27	29.85	63°48.12	12.1'	24°1.57	8.1' 54.3'
SD = 15.8' d = -0.6'				SD = 14.8'			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		178°26.32	N17°29.20	78°19.23	12.0'	S24°9.66	8.0' 54.3'
1		193°26.38	28.54	92°50.26	12.0'	24°17.64	7.9' 54.3'
2		208°26.43	27.89	107°21.21	11.9'	24°25.52	7.8' 54.3'
3		223°26.48	· · 27.23	121°52.09	11.8'	24°33.30	7.7' 54.3'
4		238°26.53	26.58	136°22.89	11.7'	24°40.96	7.6' 54.3'
5		253°26.58	25.92	150°53.62	11.6'	24°48.52	7.4' 54.3'
6		268°26.64	N17°25.26	165°24.27	11.6'	S24°55.97	7.3' 54.3'
7		283°26.69	24.61	179°54.84	11.5'	25°3.31	7.2' 54.4'
8		298°26.74	23.95	194°25.33	11.4'	25°10.54	7.1' 54.4'
9		313°26.79	· · 23.29	208°55.75	11.3'	25°17.66	7.0' 54.4'
10		328°26.85	22.63	223°26.09	11.3'	25°24.66	6.9' 54.4'
11		343°26.90	21.97	237°56.36	11.2'	25°31.55	6.8' 54.4'
12		358°26.96	N17°21.31	252°26.55	11.1'	S25°38.33	6.7' 54.4'
13		13°27.01	20.65	266°56.66	11.0'	25°44.99	6.5' 54.4'
14		28°27.07	19.99	281°26.69	11.0'	25°51.54	6.4' 54.4'
15		43°27.12	· · 19.33	295°56.66	10.9'	25°57.96	6.3' 54.4'
16		58°27.18	18.67	310°26.54	10.8'	26°4.27	6.2' 54.5'
17		73°27.23	18.01	324°56.35	10.7'	26°10.46	6.1' 54.5'
18		88°27.29	N17°17.35	339°26.09	10.7'	S26°16.53	5.9' 54.5'
19		103°27.34	16.69	353°55.75	10.6'	26°22.48	5.8' 54.5'
20		118°27.40	16.02	8°25.34	10.5'	26°28.31	5.7' 54.5'
21		133°27.46	· · 15.36	22°54.86	10.4'	26°34.02	5.6' 54.5'
22		148°27.51	14.69	37°24.30	10.4'	26°39.60	5.5' 54.5'
23		163°27.57	14.03	51°53.67	10.3'	26°45.06	5.3' 54.6'
SD = 15.8' d = -0.7'				SD = 14.8'			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		178°27.63	N17°13.36	66°22.96	10.2'	S26°50.39	5.2' 54.6'
1		193°27.68	12.70	80°52.19	10.2'	26°55.59	5.1' 54.6'
2		208°27.74	12.03	95°21.35	10.1'	27°0.67	5.0' 54.6'
3		223°27.80	· · 11.37	109°50.43	10.0'	27°5.62	4.8' 54.6'
4		238°27.86	10.70	124°19.45	9.9'	27°10.45	4.7' 54.6'
5		253°27.92	10.03	138°48.39	9.9'	27°15.14	4.6' 54.6'
6		268°27.98	N17°9.36	153°17.27	9.8'	S27°19.70	4.4' 54.7'
7		283°28.04	8.69	167°46.08	9.7'	27°24.13	4.3' 54.7'
8		298°28.10	8.02	182°14.82	9.7'	27°28.43	4.2' 54.7'
9		313°28.16	· · 7.35	196°43.50	9.6'	27°32.60	4.0' 54.7'
10		328°28.22	6.68	211°12.11	9.5'	27°36.63	3.9' 54.7'
11		343°28.28	6.01	225°40.66	9.5'	27°40.53	3.8' 54.7'
12		358°28.34	N17°5.34	240°9.14	9.4'	S27°44.29	3.6' 54.8'
13		13°28.40	4.67	254°37.57	9.4'	27°47.92	3.5' 54.8'
14		28°28.46	4.00	269°5.93	9.3'	27°51.41	3.4' 54.8'
15		43°28.52	· · 3.33	283°34.23	9.2'	27°54.76	3.2' 54.8'
16		58°28.58	2.65	298°2.46	9.2'	27°57.97	3.1' 54.8'
17		73°28.64	1.98	312°30.64	9.1'	28°1.04	2.9' 54.8'
18		88°28.71	N17°1.31	326°58.77	9.1'	S28°3.98	2.8' 54.9'
19		103°28.77	0.63	341°26.83	9.0'	28°6.77	2.7' 54.9'
20		118°28.83	16°59.96	355°54.84	9.0'	28°9.42	2.5' 54.9'
21		133°28.89	16°59.28	10°22.80	8.9'	28°11.93	2.4' 54.9'
22		148°28.96	58.61	24°50.70	8.8'	28°14.30	2.2' 54.9'
23		163°29.02	57.93	39°18.55	8.8'	28°16.53	2.1' 55.0'
SD = 15.8' d = -0.7'				SD = 14.9'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°						
N 70°	////	////	01:45	22:21	////	////
68°	////	////	02:26	21:42	////	////
66°	////	00:56	02:54	21:15	23:06	////
64°	////	01:52	03:15	20:55	22:16	////
62°	////	02:24	03:32	20:38	21:45	////
60°	00:51	02:47	03:46	20:25	21:23	23:12
N 58°	01:42	03:05	03:58	20:13	21:05	22:27
56°	02:11	03:20	04:08	20:03	20:50	21:59
54°	02:32	03:33	04:17	19:54	20:38	21:38
52°	02:50	03:44	04:25	19:46	20:27	21:21
50°	03:04	03:54	04:32	19:39	20:17	21:07
45°	03:32	04:14	04:48	19:24	19:57	20:39
N 40°	03:53	04:30	05:00	19:11	19:41	20:18
35°	04:10	04:43	05:11	19:01	19:28	20:02
30°	04:24	04:55	05:20	18:52	19:17	19:48
20°	04:45	05:13	05:36	18:36	18:59	19:27
N 10°	05:02	05:28	05:50	18:22	18:44	19:10
0°	05:16	05:41	06:03	18:10	18:31	18:56
S 10°	05:28	05:53	06:15	17:57	18:19	18:44
20°	05:39	06:06	06:29	17:44	18:07	18:33
30°	05:50	06:19	06:44	17:29	17:54	18:23
35°	05:56	06:26	06:53	17:20	17:47	18:17
40°	06:01	06:34	07:03	17:10	17:39	18:11
45°	06:08	06:43	07:14	16:59	17:30	18:05
S 50°	06:14	06:53	07:28	16:45	17:20	17:59
52°	06:17	06:58	07:35	16:38	17:15	17:56
54°	06:20	07:03	07:42	16:31	17:10	17:53
56°	06:24	07:09	07:50	16:23	17:04	17:50
58°	06:27	07:15	07:59	16:14	16:58	17:46
S 60°	06:31	07:22	08:09	16:04	16:51	17:42

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°	17:39			19:22		
64°	16:39			20:22		
62°	16:06	17:57		20:56	20:45	
60°	15:41	17:16	18:47	21:21	21:27	21:44
N 58°	15:22	16:48	18:08	21:41	21:55	22:22
56°	15:06	16:27	17:41	21:58	22:17	22:50
54°	14:52	16:09	17:20	22:12	22:35	23:11
52°	14:40	15:54	17:03	22:24	22:51	23:29
50°	14:30	15:41	16:48	22:35	23:04	23:44
45°	14:08	15:14	16:18	22:58	23:31	· · ·
N 40°	13:50	14:53	15:54	23:17	23:53	· · ·
35°	13:35	14:36	15:35	23:32	· · ·	00:11
30°	13:23	14:21	15:18	23:46	· · ·	00:27
20°	13:01	13:55	14:50	· · ·	00:09	00:53
N 10°	12:42	13:33	14:26	· · ·	00:29	01:16
0°	12:25	13:13	14:04	00:02	00:48	01:37
S 10°	12:08	12:53	13:42	00:17	01:07	01:59
20°	11:50	12:31	13:18	00:34	01:27	02:22
30°	11:28	12:07	12:51	00:53	01:51	02:48
35°	11:16	11:52	12:35	01:05	02:04	03:04
40°	11:02	11:35	12:16	01:18	02:20	03:23
45°	10:46	11:15	11:53	01:33	02:40	03:45
S 50°	10:25	10:50	11:24	01:52	03:04	04:13
52°	10:16	10:38	11:10	02:01	03:16	04:27
54°	10:05	10:24	10:53	02:12	03:29	04:44
56°	09:53	10:08	10:34	02:23	03:44	05:03
58°	09:39	09:49	10:10	02:37	04:03	05:27
S 60°	09:22	09:26	09:37	02:52	04:26	05:59

Day	Sun		Mer. Pass	Moon		Age 9-11 55-73%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
02	06:19	06:17	12:06	18:36	06:13	
03	06:15	06:12	12:06	19:25	07:00	
04	06:09	06:07	12:06	20:17	07:51	


h	Sun			Moon				
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	178°29.08	N16°57.25		53°46.35	8.7'	S28°18.61	1.9'	55.0'
1	193°29.15	56.58		68°14.10	8.7'	28°20.54	1.8'	55.0'
2	208°29.21	55.90		82°41.80	8.7'	28°22.33	1.6'	55.0'
3	223°29.28	• • 55.22		97°9.45	8.6'	28°23.98	1.5'	55.0'
4	238°29.34	54.54		111°37.06	8.6'	28°25.47	1.4'	55.1'
5	253°29.41	53.86		126°4.62	8.5'	28°26.82	1.2'	55.1'
6	268°29.47	N16°53.18		140°32.14	8.5'	S28°28.03	1.1'	55.1'
7	283°29.54	52.50		154°59.62	8.4'	28°29.08	0.9'	55.1'
8	298°29.60	51.82		169°27.05	8.4'	28°29.99	0.8'	55.1'
9	313°29.67	• • 51.14		183°54.45	8.4'	28°30.74	0.6'	55.2'
10	328°29.74	50.46		198°21.81	8.3'	28°31.35	0.5'	55.2'
11	343°29.80	49.78		212°49.13	8.3'	28°31.80	0.3'	55.2'
12	358°29.87	N16°49.10		227°16.41	8.3'	S28°32.11	0.2'	55.2'
13	13°29.94	48.41		241°43.66	8.2'	28°32.26	0.0'	55.3'
14	28°30.00	47.73		256°10.88	8.2'	28°32.27	-0.1'	55.3'
15	43°30.07	• • 47.05		270°38.07	8.2'	28°32.12	-0.3'	55.3'
16	58°30.14	46.36		285°5.23	8.1'	28°31.82	-0.5'	55.3'
17	73°30.21	45.68		299°32.36	8.1'	28°31.36	-0.6'	55.4'
18	88°30.28	N16°44.99		313°59.47	8.1'	S28°30.75	-0.8'	55.4'
19	103°30.35	44.31		328°26.55	8.1'	28°29.99	-0.9'	55.4'
20	118°30.41	43.62		342°53.61	8.0'	28°29.08	-1.1'	55.4'
21	133°30.48	• • 42.93		357°20.64	8.0'	28°28.01	-1.2'	55.4'
22	148°30.55	42.25		11°47.66	8.0'	28°26.78	-1.4'	55.5'
23	163°30.62	41.56		26°14.65	8.0'	28°25.41	-1.5'	55.5'
SD = 15.8' $d = -0.7'$				SD = 15.0'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.69	N16°40.87	40°41.63	8.0'	S28°23.87	-1.7'	55.5'
1	193°30.76	40.18	55°8.59	7.9'	28°22.19	-1.8'	55.5'
2	208°30.83	39.50	69°35.54	7.9'	28°20.34	-2.0'	55.6'
3	223°30.91	· · 38.81	84°2.48	7.9'	28°18.34	-2.2'	55.6'
4	238°30.98	38.12	98°29.40	7.9'	28°16.19	-2.3'	55.6'
5	253°31.05	37.43	112°56.32	7.9'	28°13.88	-2.5'	55.6'
6	268°31.12	N16°36.74	127°23.22	7.9'	S28°11.41	-2.6'	55.7'
7	283°31.19	36.04	141°50.13	7.9'	28°8.79	-2.8'	55.7'
8	298°31.26	35.35	156°17.02	7.9'	28°6.02	-2.9'	55.7'
9	313°31.34	· · 34.66	170°43.91	7.9'	28°3.08	-3.1'	55.7'
10	328°31.41	33.97	185°10.81	7.9'	27°59.99	-3.2'	55.8'
11	343°31.48	33.27	199°37.70	7.9'	27°56.75	-3.4'	55.8'
12	358°31.56	N16°32.58	214°4.59	7.9'	S27°53.35	-3.6'	55.8'
13	13°31.63	31.89	228°31.48	7.9'	27°49.79	-3.7'	55.8'
14	28°31.70	31.19	242°58.38	7.9'	27°46.08	-3.9'	55.9'
15	43°31.78	· · 30.50	257°25.29	7.9'	27°42.21	-4.0'	55.9'
16	58°31.85	29.80	271°52.20	7.9'	27°38.19	-4.2'	55.9'
17	73°31.93	29.11	286°19.12	7.9'	27°34.01	-4.3'	55.9'
18	88°32.00	N16°28.41	300°46.05	7.9'	S27°29.67	-4.5'	56.0'
19	103°32.08	27.71	315°13.00	8.0'	27°25.18	-4.6'	56.0'
20	118°32.15	27.02	329°39.95	8.0'	27°20.54	-4.8'	56.0'
21	133°32.23	· · 26.32	344°6.92	8.0'	27°15.74	-5.0'	56.1'
22	148°32.30	25.62	358°33.91	8.0'	27°10.79	-5.1'	56.1'
23	163°32.38	24.92	13°0.92	8.0'	27°5.68	-5.3'	56.1'
SD = 15.8' $d = -0.7'$				SD = 15.1'			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.46	N16°24.22	27°27.94	8.0'	S27°0.42	-5.4'	56.1'
1	193°32.53	23.52	41°54.98	8.1'	26°55.01	-5.6'	56.2'
2	208°32.61	22.82	56°22.05	8.1'	26°49.44	-5.7'	56.2'
3	223°32.69	• • 22.12	70°49.14	8.1'	26°43.72	-5.9'	56.2'
4	238°32.76	21.42	85°16.25	8.1'	26°37.85	-6.0'	56.2'
5	253°32.84	20.72	99°43.39	8.2'	26°31.82	-6.2'	56.3'
6	268°32.92	N16°20.02	114°10.55	8.2'	S26°25.65	-6.3'	56.3'
7	283°33.00	19.32	128°37.74	8.2'	26°19.32	-6.5'	56.3'
8	298°33.08	18.62	143°4.96	8.3'	26°12.85	-6.6'	56.3'
9	313°33.16	• • 17.91	157°32.21	8.3'	26°6.22	-6.8'	56.4'
10	328°33.23	17.21	171°59.50	8.3'	25°59.44	-6.9'	56.4'
11	343°33.31	16.50	186°26.81	8.3'	25°52.52	-7.1'	56.4'
12	358°33.39	N16°15.80	200°54.16	8.4'	S25°45.45	-7.2'	56.5'
13	13°33.47	15.10	215°21.55	8.4'	25°38.23	-7.4'	56.5'
14	28°33.55	14.39	229°48.97	8.5'	25°30.86	-7.5'	56.5'
15	43°33.63	• • 13.68	244°16.42	8.5'	25°23.34	-7.7'	56.5'
16	58°33.71	12.98	258°43.92	8.5'	25°15.68	-7.8'	56.6'
17	73°33.79	12.27	273°11.45	8.6'	25°7.88	-8.0'	56.6'
18	88°33.88	N16°11.56	287°39.02	8.6'	S24°59.93	-8.1'	56.6'
19	103°33.96	10.86	302°6.64	8.7'	24°51.83	-8.2'	56.6'
20	118°34.04	10.15	316°34.29	8.7'	24°43.60	-8.4'	56.7'
21	133°34.12	• • 9.44	331°1.99	8.7'	24°35.22	-8.5'	56.7'
22	148°34.20	8.73	345°29.73	8.8'	24°26.70	-8.7'	56.7'
23	163°34.28	8.02	359°57.52	8.8'	24°18.03	-8.8'	56.8'
SD = 15.8' $d = -0.7'$				SD = 15.3'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	01:02	22:57	////	////
N 70°	////	////	02:06	22:01	////	////
68°	////	////	02:41	21:27	////	////
66°	////	01:25	03:05	21:04	22:39	////
64°	////	02:08	03:25	20:45	22:00	////
62°	////	02:35	03:40	20:30	21:33	////
60°	01:17	02:56	03:53	20:17	21:13	22:49
N 58°	01:55	03:13	04:04	20:06	20:57	22:13
56°	02:21	03:27	04:14	19:57	20:43	21:48
54°	02:41	03:39	04:22	19:48	20:31	21:29
52°	02:57	03:50	04:30	19:41	20:21	21:13
50°	03:10	03:59	04:37	19:34	20:12	21:00
45°	03:37	04:18	04:51	19:20	19:53	20:34
N 40°	03:57	04:33	05:03	19:08	19:38	20:14
35°	04:13	04:46	05:13	18:58	19:25	19:58
30°	04:26	04:57	05:22	18:49	19:15	19:45
20°	04:47	05:14	05:37	18:34	18:58	19:25
N 10°	05:03	05:28	05:50	18:21	18:43	19:09
0°	05:16	05:41	06:02	18:09	18:31	18:56
S 10°	05:27	05:53	06:14	17:57	18:19	18:45
20°	05:38	06:04	06:27	17:45	18:08	18:34
30°	05:48	06:17	06:42	17:31	17:56	18:24
35°	05:53	06:23	06:50	17:22	17:49	18:19
40°	05:58	06:31	06:59	17:13	17:42	18:14
45°	06:04	06:39	07:10	17:02	17:33	18:08
S 50°	06:10	06:49	07:23	16:49	17:24	18:02
52°	06:13	06:53	07:30	16:43	17:19	18:00
54°	06:15	06:58	07:36	16:36	17:15	17:57
56°	06:18	07:03	07:44	16:29	17:09	17:54
58°	06:22	07:09	07:52	16:20	17:04	17:51
S 60°	06:25	07:15	08:02	16:10	16:57	17:48

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	21:37	██	██	██
62°	██	21:11	20:56	██	23:08	· ·
60°	19:51	20:18	20:27	22:32	· ·	00:00
N 58°	19:10	19:46	20:05	23:14	· ·	00:32
56°	18:41	19:22	19:47	23:42	· ·	00:55
54°	18:19	19:03	19:32	· ·	00:04	01:15
52°	18:01	18:46	19:18	· ·	00:22	01:31
50°	17:46	18:32	19:07	· ·	00:37	01:45
45°	17:15	18:03	18:42	00:14	01:08	02:13
N 40°	16:51	17:41	18:23	00:38	01:32	02:35
35°	16:31	17:22	18:06	00:58	01:52	02:53
30°	16:14	17:06	17:52	01:14	02:09	03:09
20°	15:45	16:38	17:28	01:43	02:37	03:35
N 10°	15:21	16:15	17:07	02:07	03:02	03:58
0°	14:58	15:53	16:47	02:30	03:24	04:19
S 10°	14:35	15:31	16:28	02:53	03:47	04:40
20°	14:11	15:07	16:06	03:17	04:11	05:03
30°	13:42	14:40	15:42	03:45	04:39	05:28
35°	13:25	14:23	15:27	04:02	04:56	05:44
40°	13:05	14:04	15:10	04:22	05:15	06:01
45°	12:41	13:41	14:50	04:46	05:39	06:22
S 50°	12:11	13:11	14:24	05:16	06:09	06:49
52°	11:55	12:57	14:12	05:32	06:23	07:02
54°	11:37	12:40	13:58	05:49	06:41	07:16
56°	11:16	12:19	13:41	06:11	07:01	07:33
58°	10:48	11:54	13:21	06:39	07:27	07:54
S 60°	10:08	11:18	12:55	07:18	08:03	08:20

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	81-94%
05	06:04	06:01	12:06	21:11	08:44	
06	05:57	05:54	12:06	22:06	09:38	
07	05:50	05:46	12:06	23:00	10:33	

August 08, 09, 10 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	316°45.45	216°55.91	N21°58.53	135°57.63	N00°13.95	212°26.10	N22°42.86	314°31.88	S01°39.21			Alpheratz	357°34.02 29°13.91
1	331°47.91	231°55.22	58.46	150°58.67	13.30	227°28.01	42.81	329°34.44	39.26			Ankaa	353°6.36 -42°9.73
2	346°50.37	246°54.53	58.39	165°59.72	12.66	242°29.91	42.76	344°37.00	39.31			Schedar	349°30.17 56°40.53
3	1°52.84	261°53.84	•• 58.32	181°07.76	•• 12.01	257°31.81	•• 42.72	359°39.55	•• 39.36			Diphda	348°46.60 -17°50.56
4	16°55.30	276°53.15	58.26	196°1.81	11.36	272°33.71	42.67	14°42.11	39.42			Achernar	335°19.58 -57°6.05
5	31°57.77	291°52.47	58.18	211°2.86	10.71	287°35.62	42.62	29°44.66	39.47			Hamal	327°50.56 23°35.01
6	47°02.23	306°51.78	N21°58.11	226°3.90	N00°10.07	302°37.52	N22°42.58	44°47.22	S01°39.52			Polaris	313°47.94 89°22.00
7	62°26.69	321°51.09	58.04	241°4.95	9.42	317°39.42	42.53	59°49.78	39.57			Acamar	315°11.38 -40°11.78
8	77°5.16	336°50.40	57.97	256°5.99	8.77	332°41.33	42.48	74°52.33	39.62			Menkar	314°5.63 4°11.52
9	92°7.62	351°49.71	•• 57.89	271°7.04	•• 8.12	347°43.23	•• 42.43	89°54.89	•• 39.67			Mirfak	308°27.61 49°56.96
10	107°10.09	6°49.02	57.82	286°8.08	7.48	2°45.13	42.39	104°57.45	39.72			Aldebaran	290°39.19 16°33.68
11	122°12.55	21°48.33	57.74	301°9.13	6.83	17°47.04	42.34	120°0.00	39.77			Rigel	281°3.57 -8°10.15
12	137°15.02	36°47.65	N21°57.66	316°10.17	N00°6.18	32°48.94	N22°42.29	135°2.56	S01°39.82			Capella	280°21.42 46°1.30
13	152°17.48	51°46.96	57.59	331°11.22	5.53	47°50.84	42.24	150°5.12	39.87			Bellatrix	278°22.54 6°22.47
14	167°19.94	66°46.27	57.51	346°12.26	4.88	62°52.75	42.19	165°7.67	39.92			Elnath	278°1.46 28°37.71
15	182°22.41	81°45.58	•• 57.43	1°13.31	•• 4.24	77°54.65	•• 42.15	180°10.23	•• 39.97			Alnilam	275°37.43 -1°11.00
16	197°24.87	96°44.89	57.34	16°14.35	3.59	92°56.56	42.10	195°12.79	40.02			Betelgeuse	270°51.77 7°24.80
17	212°27.34	111°44.20	57.26	31°15.40	2.94	107°58.46	42.05	210°15.35	40.07			Canopus	263°52.60 -52°42.27
18	227°29.80	126°43.51	N21°57.18	46°16.44	N00°2.29	123°03.36	N22°42.00	225°17.90	S01°40.12			Sirius	258°26.08 -16°44.89
19	242°32.26	141°42.82	57.09	61°17.48	1.64	138°2.27	41.96	240°20.46	40.18			Adhara	255°5.80 -29°02.00
20	257°34.73	156°42.13	57.01	76°18.53	1.00	153°4.17	41.91	255°23.02	40.23			Procyon	244°50.62 5°9.66
21	272°37.19	171°41.44	•• 56.92	91°19.57	N00°0.35	168°6.08	•• 41.86	270°25.58	•• 40.28			Pollux	243°17.05 27°57.89
22	287°39.66	186°40.75	56.83	106°20.62	S00°0.30	183°7.98	41.81	285°28.14	40.33			Avior	234°15.20 -59°35.35
23	302°42.12	201°40.06	56.74	121°21.66	0.95	198°9.89	41.77	300°30.70	40.38			Suhail	222°46.41 -43°32.07
Mer.pass. 02:52		ν-0.7' d-0.1' m-3.98		ν1.0' d-0.6' m1.61		ν1.9' d-0.0' m-1.93		ν2.6' d0.1' m0.76					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	317°44.59	216°39.37	N21°56.65	136°22.70	S00°1.60	213°11.79	N22°41.72	315°33.25	S01°40.43			Miaplacidus	221°39.17 -69°49.28
1	332°47.05	231°38.68	56.56	151°23.75	2.25	228°13.70	41.67	330°35.81	40.48			Alphard	217°47.60 -8°46.09
2	347°49.51	246°37.99	56.47	166°24.79	2.89	243°15.60	41.62	345°38.37	40.54			Regulus	207°34.23 11°50.63
3	2°51.98	261°37.30	•• 56.38	181°25.83	•• 3.54	258°17.51	•• 41.57	0°40.93	•• 40.59			Dubhe	193°40.95 61°36.95
4	17°54.44	276°36.61	56.28	196°26.88	4.19	273°19.41	41.53	15°43.49	40.64			Denebola	182°24.68 14°25.86
5	32°56.91	291°35.92	56.19	211°27.92	4.84	288°21.32	41.48	30°46.05	40.69			Gienah	175°43.30 -17°41.06
6	47°59.37	306°35.23	N21°56.09	226°28.96	S00°5.49	303°23.23	N22°41.43	45°48.61	S01°40.74			Acrux	173°0.03 -63°14.67
7	63°18.83	321°34.53	56.00	241°30.01	6.14	318°25.13	41.38	60°51.17	40.79			Gacrux	171°51.48 -57°15.59
8	78°4.30	336°33.84	55.90	256°31.05	6.78	333°27.04	41.33	75°53.73	40.85			Alioth	166°12.80 55°49.50
9	93°6.76	351°33.15	•• 55.80	271°32.09	•• 7.43	348°28.94	•• 41.29	90°56.29	•• 40.90			Spica	158°21.91 -11°17.69
10	108°9.23	6°32.46	55.70	286°33.13	8.08	3°30.85	41.24	105°58.85	40.95			Alkaid	152°51.74 49°11.37
11	123°11.69	21°31.77	55.60	301°34.18	8.73	18°32.75	41.19	121°14.41	41.00			Hadar	148°35.47 -60°30.04
12	138°14.15	36°31.08	N21°55.49	316°35.22	S00°9.38	33°34.66	N22°41.14	136°39.97	S01°41.05			Menkent	147°57.13 -36°29.89
13	153°16.62	51°30.39	55.39	331°36.26	10.03	48°36.57	41.09	151°6.53	41.11			Arcturus	145°47.51 19°31.10
14	168°19.08	66°29.69	55.29	346°37.30	10.68	63°38.47	41.05	166°9.09	41.16			Rigil Kent.	139°39.70 -60°56.72
15	183°21.55	81°29.00	•• 55.18	1°38.35	•• 11.32	78°40.38	•• 41.00	181°11.65	•• 41.21			Kochab	137°19.80 74°3.26
16	198°24.01	96°28.31	55.08	16°39.39	11.97	93°42.29	40.95	196°14.21	41.26			Zuben'ubi	136°55.48 -16°8.92
17	213°26.48	111°27.62	54.97	31°40.43	12.62	108°44.19	40.90	211°16.77	41.31			Alphecca	126°3.25 26°37.89
18	228°28.94	126°26.93	N21°54.86	46°41.47	S00°13.27	123°46.10	N22°40.85	226°19.33	S01°41.37			Antares	112°15.08 -26°29.39
19	243°31.40	141°26.23	54.75	61°42.51	13.92	138°48.01	40.81	241°21.89	41.42			Atria	107°8.57 -69°4.63
20	258°33.87	156°25.54	54.64	76°43.55	14.57	153°49.92	40.76	256°24.46	41.47			Sabik	102°2.02 -15°45.39
21	273°36.33	171°24.85	•• 54.53	91°44.60	•• 15.22	168°51.82	•• 40.71	271°27.02	•• 41.52			Shaula	96°9.43 -37°7.42
22	288°38.80	186°24.16	54.41	106°45.64	15.87	183°53.73	40.66	286°29.58	41.58			Rasalhague	95°57.87 12°32.59
23	303°41.26	201°23.47	54.30	121°46.68	16.52	198°55.64	40.61	301°32.14	41.63			Eltanin	90°41.58 51°29.30
Mer.pass. 02:49		ν-0.7' d-0.1' m-3.98		ν1.0' d0.6' m1.61		ν1.9' d-0.0' m-1.93		ν2.6' d0.1' m0.76					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	318°43.72	216°22.77	N21°54.19	136°47.72	S00°17.17	213°57.55	N22°40.56	316°34.70	S01°41.68			Kaus Aust.	83°31.54 -34°22.38
1	333°46.19	231°22.08	54.07	151°48.76	17.81	228°59.45	40.52	331°37.27	41.73			Vega	80°32.55 38°48.58
2	348°48.65	246°21.39	53.95	166°49.80	18.46	244°1.36	40.47	346°39.83	41.79			Nunki	75°46.82 -26°15.88
3	3°51.12	261°20.69	•• 53.84	181°50.84	•• 19.11	259°3.27	•• 40.42	1°42.39	•• 41.84			Altair	61°59.16 8°56.25
4	18°53.58	276°20.00	53.72	196°51.88	19.76	274°5.18	40.37	16°44.95	41.89			Peacock	53°4.34 -56°39.12
5	33°56.04	291°19.31	53.60	211°52.92	20.41	289°7.09	40.32	31°47.51	41.95			Deneb	49°25.01 45°22.36
6	48°58.51	306°18.61	N21°53.48	226°53.96	S00°21.06	304°8.99	N22°40.27	46°50.08	S01°42.00			Enif	33°37.99 9°59.63
7	64°09.97	321°17.92	53.35	241°55.00	21.71	319°10.90	40.22	61°52.64	42.05			Al Na'ir	27°31.82 -46°50.06
8	79°3.44	336°17.23	53.23	256°56.05	22.36	334°12.81	40.18	76°55.20	42.11			Fomalhaut	15°13.63 -29°29.01
9	94°5.90	351°16.53	•• 53.11	271°57.09	•• 23.01	349°14.72	•• 40.13	91°57.77	•• 42.16			Scheat	13°44.41 28°13.33
10	109°8.36	6°15.84	52.98	286°58.13	23.66	4°16.63	40.08	107°03.33	42.21			Markab	13°29.12 15°20.65
11	124°10.83	21°15.15	52.85	301°59.17									


h		Sun		Moon			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		178°34.37	N16°7.31	14°25.35	8.9'	S24°9.23	-8.9' 56.8'
1		193°34.45	6.60	28°53.22	8.9'	24°0.29	-9.1' 56.8'
2		208°34.53	5.89	43°21.14	9.0'	23°51.21	-9.2' 56.8'
3		223°34.62	· · 5.18	57°49.11	9.0'	23°42.00	-9.4' 56.9'
4		238°34.70	4.47	72°17.13	9.1'	23°32.64	-9.5' 56.9'
5		253°34.78	3.76	86°45.19	9.1'	23°23.15	-9.6' 56.9'
6		268°34.87	N16°3.04	101°13.31	9.2'	S23°13.53	-9.8' 56.9'
7		283°34.95	2.33	115°41.47	9.2'	23°3.77	-9.9' 57.0'
8		298°35.04	1.62	130°9.68	9.3'	22°53.88	-10.0' 57.0'
9		313°35.12	· · 0.90	144°37.95	9.3'	22°43.86	-10.2' 57.0'
10		328°35.21	16°0.19	159°6.26	9.4'	22°33.70	-10.3' 57.1'
11		343°35.29	15°59.48	173°34.62	9.4'	22°23.42	-10.4' 57.1'
12		358°35.38	N15°58.76	188°3.04	9.5'	S22°13.00	-10.5' 57.1'
13		13°35.46	58.04	202°31.51	9.5'	22°2.46	-10.7' 57.1'
14		28°35.55	57.33	217°0.03	9.6'	21°51.79	-10.8' 57.2'
15		43°35.64	· · 56.61	231°28.60	9.6'	21°41.00	-10.9' 57.2'
16		58°35.72	55.89	245°57.23	9.7'	21°30.08	-11.0' 57.2'
17		73°35.81	55.18	260°25.91	9.7'	21°19.03	-11.2' 57.2'
18		88°35.90	N15°54.46	274°54.64	9.8'	S21°7.86	-11.3' 57.3'
19		103°35.99	53.74	289°23.43	9.8'	20°56.58	-11.4' 57.3'
20		118°36.07	53.02	303°52.27	9.9'	20°45.17	-11.5' 57.3'
21		133°36.16	· · 52.30	318°21.17	9.9'	20°33.64	-11.6' 57.3'
22		148°36.25	51.58	332°50.11	10.0'	20°21.99	-11.8' 57.4'
23		163°36.34	50.86	347°19.12	10.1'	20°10.22	-11.9' 57.4'
		SD = 15.8' $d = -0.7'$		SD = 15.5'			

Sat		GHA	Dec	GHA	ν	Dec	d HP
0		178°36.43	N15°50.14	1°48.17	10.1'	S19°58.34	-12.0' 57.4'
1		193°36.52	49.42	16°17.28	10.2'	19°46.34	-12.1' 57.4'
2		208°36.61	48.70	30°46.44	10.2'	19°34.23	-12.2' 57.5'
3		223°36.69	· · 47.98	45°15.66	10.3'	19°22.01	-12.3' 57.5'
4		238°36.78	47.26	59°44.93	10.3'	19°9.67	-12.4' 57.5'
5		253°36.87	46.53	74°14.26	10.4'	18°57.23	-12.6' 57.5'
6		268°36.96	N15°45.81	88°43.64	10.4'	S18°44.67	-12.7' 57.6'
7		283°37.06	45.09	103°13.07	10.5'	18°32.01	-12.8' 57.6'
8		298°37.15	44.36	117°42.55	10.5'	18°19.24	-12.9' 57.6'
9		313°37.24	· · 43.64	132°12.09	10.6'	18°6.36	-13.0' 57.6'
10		328°37.33	42.92	146°41.68	10.6'	17°53.38	-13.1' 57.7'
11		343°37.42	42.19	161°11.33	10.7'	17°40.30	-13.2' 57.7'
12		358°37.51	N15°41.46	175°41.02	10.7'	S17°27.11	-13.3' 57.7'
13		13°37.60	40.74	190°10.77	10.8'	17°13.83	-13.4' 57.7'
14		28°37.70	40.01	204°40.57	10.8'	17°0.44	-13.5' 57.8'
15		43°37.79	· · 39.28	219°10.42	10.9'	16°46.96	-13.6' 57.8'
16		58°37.88	38.56	233°40.32	11.0'	16°33.38	-13.7' 57.8'
17		73°37.97	37.83	248°10.27	11.0'	16°19.70	-13.8' 57.8'
18		88°38.07	N15°37.10	262°40.27	11.0'	S16°5.93	-13.9' 57.9'
19		103°38.16	36.37	277°10.32	11.1'	15°52.07	-14.0' 57.9'
20		118°38.25	35.64	291°40.41	11.1'	15°38.12	-14.0' 57.9'
21		133°38.35	· · 34.91	306°10.56	11.2'	15°24.07	-14.1' 57.9'
22		148°38.44	34.18	320°40.75	11.2'	15°9.94	-14.2' 58.0'
23		163°38.54	33.45	335°11.00	11.3'	14°55.72	-14.3' 58.0'
		SD = 15.8' $d = -0.7'$		SD = 15.7'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		178°38.63	N15°32.72	349°41.28	11.3'	S14°41.41	-14.4' 58.0'
1		193°38.73	31.99	4°11.62	11.4'	14°27.02	-14.5' 58.0'
2		208°38.82	31.26	18°42.00	11.4'	14°12.54	-14.6' 58.1'
3		223°38.92	· · 30.53	33°12.42	11.5'	13°57.99	-14.6' 58.1'
4		238°39.01	29.79	47°42.89	11.5'	13°43.35	-14.7' 58.1'
5		253°39.11	29.06	62°13.40	11.6'	13°28.63	-14.8' 58.1'
6		268°39.21	N15°28.33	76°43.95	11.6'	S13°13.83	-14.9' 58.1'
7		283°39.30	27.59	91°14.55	11.6'	12°58.96	-14.9' 58.2'
8		298°39.40	26.86	105°45.18	11.7'	12°44.01	-15.0' 58.2'
9		313°39.50	· · 26.12	120°15.86	11.7'	12°28.99	-15.1' 58.2'
10		328°39.59	25.39	134°46.58	11.8'	12°13.89	-15.2' 58.2'
11		343°39.69	24.65	149°17.33	11.8'	11°58.73	-15.2' 58.2'
12		358°39.79	N15°23.92	163°48.12	11.8'	S11°43.49	-15.3' 58.3'
13		13°39.89	23.18	178°18.95	11.9'	11°28.19	-15.4' 58.3'
14		28°39.98	22.44	192°49.82	11.9'	11°12.81	-15.4' 58.3'
15		43°40.08	· · 21.71	207°20.72	11.9'	10°57.38	-15.5' 58.3'
16		58°40.18	20.97	221°51.66	12.0'	10°41.87	-15.6' 58.4'
17		73°40.28	20.23	236°22.63	12.0'	10°26.31	-15.6' 58.4'
18		88°40.38	N15°19.49	250°53.63	12.0'	S10°10.68	-15.7' 58.4'
19		103°40.48	18.75	265°24.67	12.1'	09°55.00	-15.7' 58.4'
20		118°40.58	18.01	279°55.73	12.1'	09°39.25	-15.8' 58.4'
21		133°40.68	· · 17.27	294°26.83	12.1'	09°23.45	-15.9' 58.4'
22		148°40.78	16.53	308°57.95	12.2'	09°7.59	-15.9' 58.5'
23		163°40.88	15.79	323°29.10	12.2'	08°51.68	-16.0' 58.5'
		SD = 15.8' $d = -0.7'$		SD = 15.8'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	01:37	22:25	////	////
N 70°	////	////	02:24	21:42	////	////
68°	////	00:35	02:54	21:13	23:18	////
66°	////	01:47	03:17	20:52	22:18	////
64°	////	02:22	03:34	20:35	21:45	////
62°	00:32	02:46	03:48	20:21	21:22	23:23
60°	01:36	03:06	04:00	20:09	21:03	22:30
N 58°	02:08	03:21	04:11	19:59	20:48	22:00
56°	02:31	03:34	04:20	19:50	20:35	21:38
54°	02:49	03:45	04:28	19:42	20:24	21:20
52°	03:04	03:55	04:35	19:35	20:14	21:06
50°	03:16	04:04	04:41	19:29	20:06	20:53
45°	03:41	04:22	04:55	19:15	19:48	20:28
N 40°	04:00	04:36	05:06	19:04	19:34	20:10
35°	04:16	04:48	05:16	18:55	19:22	19:55
30°	04:28	04:58	05:24	18:47	19:12	19:42
20°	04:48	05:15	05:38	18:33	18:56	19:23
N 10°	05:03	05:29	05:51	18:20	18:42	19:08
0°	05:16	05:41	06:02	18:09	18:30	18:55
S 10°	05:26	05:52	06:13	17:58	18:19	18:45
20°	05:36	06:03	06:25	17:46	18:09	18:35
30°	05:46	06:14	06:39	17:32	17:57	18:26
35°	05:50	06:20	06:47	17:25	17:51	18:21
40°	05:55	06:27	06:56	17:16	17:44	18:16
45°	06:00	06:35	07:06	17:06	17:36	18:11
S 50°	06:06	06:44	07:18	16:53	17:28	18:06
52°	06:08	06:48	07:24	16:47	17:24	18:04
54°	06:10	06:53	07:31	16:41	17:19	18:01
56°	06:13	06:57	07:38	16:34	17:14	17:59
58°	06:16	07:03	07:46	16:26	17:09	17:56
S 60°	06:19	07:09	07:55	16:17	17:03	17:53

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	■	22:25	21:26	■	■	03:28
N 70°	■	21:53	21:12	■	■	03:58
68°	22:18	21:29	21:01	■	01:46	04:20
66°	21:38	21:10	20:51	■	02:25	04:37
64°	21:10	20:54	20:43	00:35	02:52	04:51
62°	20:48	20:42	20:36	01:16	03:13	05:03
60°	20:30	20:31	20:30	01:44	03:30	05:13
N 58°	20:15	20:21	20:25	02:05	03:44	05:21
56°	20:02	20:13	20:20	02:23	03:56	05:29
54°	19:51	20:05	20:16	02:38	04:06	05:35
52°	19:41	19:58	20:12	02:50	04:15	05:41
50°	19:32	19:52	20:08	03:02	04:23	05:46
45°	19:14	19:39	20:00	03:25	04:41	05:58
N 40°	18:58	19:28	19:54	03:44	04:55	06:07
35°	18:45	19:18	19:48	03:59	05:07	06:15
30°	18:33	19:10	19:43	04:12	05:17	06:22
20°	18:14	18:56	19:34	04:35	05:35	06:34
N 10°	17:56	18:43	19:27	04:55	05:50	06:45
0°	17:40	18:31	19:20	05:13	06:05	06:54
S 10°	17:24	18:19	19:12	05:31	06:19	07:04
20°	17:06	18:06	19:05	05:50	06:34	07:14
30°	16:46	17:51	18:56	06:12	06:51	07:26
35°	16:34	17:43	18:51	06:25	07:01	07:32
40°	16:21	17:33	18:45	06:40	07:12	07:40
45°	16:04	17:21	18:38	06:57	07:25	07:48
S 50°	15:44	17:07	18:30	07:19	07:41	07:59
52°	15:35	17:00	18:26	07:29	07:48	08:03
54°	15:24	16:53	18:21	07:40	07:57	08:09
56°	15:12	16:45	18:17	07:53	08:06	08:14
58°	14:57	16:35	18:11	08:08	08:16	08:21
S 60°	14:40	16:24	18:06	08:26	08:28	08:28

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-99%
08	05:43	05:38	12:06	23:53	11:27	
09	05:34	05:30	12:05	—:—	12:18	
10	05:25	05:21	12:05	00:43	13:07	

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.98	N15°15.05	338°0.28	12.2'	S08°35.72	-16.0'	58.5'
1	193°41.08	14.31	352°31.49	12.2'	08°19.70	-16.1'	58.5'
2	208°41.18	13.57	7°2.72	12.3'	08°3.63	-16.1'	58.5'
3	223°41.28	· · 12.83	21°33.97	12.3'	07°47.52	-16.2'	58.6'
4	238°41.38	12.08	36°5.25	12.3'	07°31.35	-16.2'	58.6'
5	253°41.49	11.34	50°36.55	12.3'	07°15.15	-16.3'	58.6'
6	268°41.59	N15°10.60	65°7.87	12.3'	S06°58.89	-16.3'	58.6'
7	283°41.69	9.85	79°39.21	12.4'	06°42.60	-16.3'	58.6'
8	298°41.79	9.11	94°10.57	12.4'	06°26.26	-16.4'	58.6'
9	313°41.90	· · 8.36	108°41.94	12.4'	06°9.89	-16.4'	58.7'
10	328°42.00	7.62	123°13.33	12.4'	05°53.47	-16.5'	58.7'
11	343°42.10	6.87	137°44.74	12.4'	05°37.02	-16.5'	58.7'
12	358°42.21	N15°6.13	152°16.16	12.4'	S05°20.53	-16.5'	58.7'
13	13°42.31	5.38	166°47.60	12.4'	05°4.01	-16.6'	58.7'
14	28°42.41	4.63	181°19.04	12.5'	04°47.45	-16.6'	58.7'
15	43°42.52	· · 3.88	195°50.50	12.5'	04°30.87	-16.6'	58.8'
16	58°42.62	3.14	210°21.97	12.5'	04°14.25	-16.6'	58.8'
17	73°42.73	2.39	224°53.44	12.5'	03°57.61	-16.7'	58.8'
18	88°42.83	N15°1.64	239°24.92	12.5'	S03°40.94	-16.7'	58.8'
19	103°42.94	0.89	253°56.41	12.5'	03°24.24	-16.7'	58.8'
20	118°43.04	15°0.14	268°27.90	12.5'	03°7.52	-16.7'	58.8'
21	133°43.15	14°59.39	282°59.40	12.5'	02°50.78	-16.8'	58.8'
22	148°43.25	58.64	297°30.90	12.5'	02°34.02	-16.8'	58.9'
23	163°43.36	57.89	312°2.40	12.5'	02°17.24	-16.8'	58.9'
SD = 15.8' d = -0.7'			SD = 16.0'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.47	N14°57.14	326°33.90	12.5'	S02°0.44	-16.8'	58.9'
1	193°43.57	56.39	341°5.40	12.5'	01°43.62	-16.8'	58.9'
2	208°43.68	55.63	355°36.89	12.5'	01°26.79	-16.8'	58.9'
3	223°43.79	· · 54.88	10°8.39	12.5'	01°9.95	-16.9'	58.9'
4	238°43.90	54.13	24°39.88	12.5'	00°53.09	-16.9'	58.9'
5	253°44.00	53.38	39°11.36	12.5'	00°36.22	-16.9'	58.9'
6	268°44.11	N14°52.62	53°42.83	12.5'	S00°19.35	-16.9'	59.0'
7	283°44.22	51.87	68°14.30	12.5'	S00°2.47	-16.9'	59.0'
8	298°44.33	51.11	82°45.75	12.4'	N00°14.42	16.9'	59.0'
9	313°44.44	· · 50.36	97°17.20	12.4'	00°31.32	16.9'	59.0'
10	328°44.54	49.60	111°48.63	12.4'	00°48.21	16.9'	59.0'
11	343°44.65	48.85	126°20.05	12.4'	01°5.11	16.9'	59.0'
12	358°44.76	N14°48.09	140°51.45	12.4'	N01°22.01	16.9'	59.0'
13	13°44.87	47.34	155°22.84	12.4'	01°38.90	16.9'	59.0'
14	28°44.98	46.58	169°54.21	12.4'	01°55.80	16.9'	59.1'
15	43°45.09	· · 45.82	184°25.56	12.3'	02°12.68	16.9'	59.1'
16	58°45.20	45.06	198°56.89	12.3'	02°29.57	16.9'	59.1'
17	73°45.31	44.30	213°28.20	12.3'	02°46.44	16.9'	59.1'
18	88°45.42	N14°43.55	227°59.49	12.3'	N03°3.31	16.9'	59.1'
19	103°45.53	42.79	242°30.75	12.2'	03°20.16	16.8'	59.1'
20	118°45.65	42.03	257°1.99	12.2'	03°37.00	16.8'	59.1'
21	133°45.76	· · 41.27	271°33.20	12.2'	03°53.83	16.8'	59.1'
22	148°45.87	40.51	286°4.39	12.2'	04°10.64	16.8'	59.1'
23	163°45.98	39.75	300°35.54	12.1'	04°27.44	16.8'	59.1'
SD = 15.8' d = -0.8'			SD = 16.1'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.09	N14°38.99	315°6.67	12.1'	N04°44.21	16.8'	59.1'
1	193°46.20	38.22	329°37.76	12.1'	05°0.97	16.7'	59.2'
2	208°46.32	37.46	344°8.82	12.0'	05°17.71	16.7'	59.2'
3	223°46.43	· · 36.70	358°39.84	12.0'	05°34.42	16.7'	59.2'
4	238°46.54	35.94	13°10.83	12.0'	05°51.11	16.7'	59.2'
5	253°46.66	35.17	27°41.79	11.9'	06°7.77	16.6'	59.2'
6	268°46.77	N14°34.41	42°12.70	11.9'	N06°24.40	16.6'	59.2'
7	283°46.88	33.65	56°43.58	11.8'	06°41.01	16.6'	59.2'
8	298°47.00	32.88	71°14.41	11.8'	06°57.58	16.5'	59.2'
9	313°47.11	· · 32.12	85°45.21	11.8'	07°14.12	16.5'	59.2'
10	328°47.23	31.35	100°15.96	11.7'	07°30.63	16.5'	59.2'
11	343°47.34	30.59	114°46.67	11.7'	07°47.10	16.4'	59.2'
12	358°47.45	N14°29.82	129°17.33	11.6'	N08°3.53	16.4'	59.2'
13	13°47.57	29.05	143°47.94	11.6'	08°19.93	16.4'	59.2'
14	28°47.68	28.29	158°18.51	11.5'	08°36.29	16.3'	59.2'
15	43°47.80	· · 27.52	172°49.02	11.5'	08°52.60	16.3'	59.2'
16	58°47.92	26.75	187°19.49	11.4'	09°8.87	16.2'	59.2'
17	73°48.03	25.98	201°49.90	11.4'	09°25.09	16.2'	59.3'
18	88°48.15	N14°25.22	216°20.26	11.3'	N09°41.27	16.1'	59.3'
19	103°48.26	24.45	230°50.57	11.3'	09°57.40	16.1'	59.3'
20	118°48.38	23.68	245°20.82	11.2'	10°13.48	16.0'	59.3'
21	133°48.50	· · 22.91	259°51.02	11.1'	10°29.51	16.0'	59.3'
22	148°48.62	22.14	274°21.16	11.1'	10°45.48	15.9'	59.3'
23	163°48.73	21.37	288°51.23	11.0'	11°1.40	15.9'	59.3'
SD = 15.8' d = -0.8'			SD = 16.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	02:04	22:00	////	////
N 70°	////	////	02:42	21:24	////	////
68°	////	01:19	03:08	20:59	22:43	////
66°	////	02:06	03:27	20:40	21:59	////
64°	////	02:35	03:43	20:24	21:31	////
62°	01:10	02:57	03:56	20:12	21:10	22:52
60°	01:53	03:14	04:07	20:01	20:53	22:13
N 58°	02:20	03:29	04:17	19:51	20:39	21:47
56°	02:40	03:41	04:25	19:43	20:27	21:27
54°	02:57	03:52	04:33	19:36	20:17	21:11
52°	03:10	04:01	04:39	19:29	20:08	20:58
50°	03:22	04:09	04:45	19:24	20:00	20:46
45°	03:46	04:26	04:58	19:11	19:43	20:23
N 40°	04:04	04:40	05:09	19:00	19:30	20:05
35°	04:18	04:51	05:18	18:52	19:19	19:51
30°	04:30	05:00	05:26	18:44	19:09	19:39
20°	04:49	05:16	05:39	18:31	18:54	19:21
N 10°	05:04	05:29	05:51	18:19	18:41	19:06
0°	05:15	05:40	06:02	18:08	18:30	18:55
S 10°	05:26	05:51	06:12	17:58	18:20	18:45
20°	05:35	06:01	06:24	17:47	18:09	18:36
30°	05:43	06:12	06:36	17:34	17:59	18:27
35°	05:48	06:17	06:44	17:27	17:53	18:23
40°	05:52	06:24	06:52	17:19	17:47	18:19
45°	05:56	06:31	07:02	17:09	17:40	18:14
S 50°	06:01	06:39	07:13	16:58	17:32	18:10
52°	06:03	06:43	07:19	16:52	17:28	18:08
54°	06:05	06:47	07:24	16:46	17:24	18:06
56°	06:07	06:51	07:31	16:40	17:20	18:04
58°	06:09	06:56	07:38	16:32	17:15	18:02
S 60°	06:12	07:01	07:47	16:24	17:10	17:59

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	20:46	20:09	19:27	06:10	08:33	10:58
N 70°	20:42	20:13	19:42	06:21	08:33	10:46
68°	20:38	20:17	19:54	06:30	08:32	10:36
66°	20:35	20:20	20:05	06:37	08:32	10:28
64°	20:33	20:23	20:13	06:43	08:32	10:22
62°	20:31	20:26	20:21	06:48	08:32	10:16
60°	20:29	20:28	20:27	06:53	08:31	10:11
N 58°	20:27	20:30	20:33	06:57	08:31	10:07
56°	20:26	20:32	20:38	07:00	08:31	10:03
54°	20:25	20:33	20:42	07:03	08:31	10:00
52°	20:23	20:35	20:47	07:06	08:31	09:57
50°	20:22	20:36	20:50	07:09	08:31	09:54
45°	20:20	20:39	20:59	07:14	08:31	09:48
N 40°	20:18	20:41	21:06	07:19	08:30	09:43
35°	20:16	20:43	21:12	07:23	08:30	09:38
30°	20:14	20:45	21:17	07:26	08:30	09:35
20°	20:12	20:48	21:27	07:32	08:30	09:28
N 10°	20:09	20:51	21:35	07:37	08:30	09:22
0°	20:07	20:54	21:43	07:42	08:29	09:17
S 10°	20:05	20:57	21:51	07:47	08:29	09:12
20°	20:02	21:00	21:59	07:52	08:29	09:06
30°	20:00	21:04	22:09	07:58	08:28	08:59
35°	19:58	21:06	22:15	08:01	08:28	08:56
40°	19:56	21:08	22:21	08:04	08:28	08:52
45°	19:54	21:11	22:29	08:09	08:28	08:47
S 50°	19:52	21:14	22:38	08:13	08:27	08:41
52°	19:51	21:16	22:42	08:16	08:27	08:38
54°	19:49	21:17	22:47	08:18	08:27	08:36
56°	19:48	21:19	22:52	08:21	08:27	08:32
58°	19:46	21:21	22:58	08:24	08:26	08:29
S 60°	19:45	21:24	23:05	08:27	08:26	08:25

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
11	05:16	05:11	12:05	01:31	13:55	
12	05:06	05:01	12:05	02:18	14:42	
13	04:56	04:50	12:05	03:06	15:30	

August 14, 15, 16 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	322°40.27		215°15.99	N21°38.31	138°27.14	S01°19.61	217°1.22	N22°35.82	320°41.27	S01°46.99		Alpheratz	357°33.99 29°13.93
1	337°42.74		230°15.30	38.09	153°28.17	20.26	232°3.14	35.77	335°43.85	47.04		Ankaa	353°6.33 -42°9.73
2	352°45.20		245°14.60	37.88	168°29.20	20.91	247°5.06	35.72	350°46.42	47.10		Schedar	349°30.12 56°40.55
3	7°47.67		260°13.90	•• 37.66	183°30.23	•• 21.56	262°6.97	•• 35.67	5°49.00	•• 47.16		Diphda	348°46.57 -17°50.55
4	22°50.13		275°13.20	37.44	198°31.26	22.22	277°8.89	35.62	20°51.57	47.22		Achernar	335°19.52 -57°6.05
5	37°52.59		290°12.51	37.22	213°32.29	22.87	292°10.81	35.57	35°54.15	47.28		Hamal	327°50.52 23°35.02
6	52°55.06		305°11.81	N21°37.00	228°33.32	S01°23.52	307°12.73	N22°35.52	50°56.73	S01°47.33		Polaris	313°44.94 89°22.01
7	67°57.52		320°11.11	36.77	243°34.35	24.17	322°14.65	35.47	65°59.30	47.39		Acamar	315°11.33 -40°11.77
8	82°59.99		335°10.41	36.55	258°35.38	24.82	337°16.57	35.42	81°1.88	47.45		Menkar	314°5.59 4°11.53
9	98°2.45		350°9.72	•• 36.33	273°36.41	•• 25.48	352°18.49	•• 35.37	96°4.45	•• 47.51		Mirfak	308°27.55 49°56.97
10	113°4.91		5°9.02	36.10	288°37.44	26.13	7°20.41	35.32	111°7.03	47.57		Aldebaran	290°39.15 16°33.66
11	128°7.38		20°8.32	35.87	303°38.47	26.78	22°22.33	35.27	126°9.60	47.62		Rigel	281°3.54 -8°10.13
12	143°9.84		35°7.62	N21°35.65	318°39.50	S01°27.43	37°24.25	N22°35.22	141°12.18	S01°47.68		Capella	280°21.37 46°1.30
13	158°12.31		50°6.93	35.42	333°40.53	28.08	52°26.17	35.17	156°14.76	47.74		Bellatrix	278°22.50 6°22.48
14	173°14.77		65°6.23	35.19	348°41.55	28.74	67°28.09	35.12	171°17.33	47.80		Elnath	278°1.42 28°37.71
15	188°17.23		80°5.53	•• 34.96	3°42.58	•• 29.39	82°30.02	•• 35.06	186°19.91	•• 47.86		Alnilam	275°37.40 -1°10.99
16	203°19.70		95°4.84	34.73	18°43.61	30.04	97°31.94	35.01	201°22.49	47.92		Betelgeuse	270°51.74 7°24.81
17	218°22.16		110°4.14	34.49	33°44.64	30.69	112°33.86	34.96	216°25.06	47.98		Canopus	263°52.56 -52°42.24
18	233°24.63		125°3.44	N21°34.26	48°45.67	S01°31.34	127°35.78	N22°34.91	231°27.64	S01°48.03		Sirius	258°26.05 -16°44.88
19	248°27.09		140°2.74	34.03	63°46.69	32.00	142°37.70	34.86	246°30.22	48.09		Adhara	255°5.77 -29°0.18
20	263°29.56		155°2.05	33.79	78°47.72	32.65	157°39.62	34.81	261°32.80	48.15		Procyon	244°50.60 5°9.66
21	278°32.02		170°1.35	•• 33.55	93°48.75	•• 33.30	172°41.54	•• 34.76	276°35.37	•• 48.21		Pollux	243°17.02 27°57.89
22	293°34.48		185°0.65	33.31	108°49.78	33.95	187°43.46	34.71	291°37.95	48.27		Avior	234°15.18 -59°35.32
23	308°36.95		199°59.95	33.08	123°50.80	34.60	202°45.39	34.66	306°40.53	48.33		Suhail	222°46.40 -43°32.04
Mer.pass. 02:29		ν-0.7' d-0.2' m-3.97		ν1.0' d0.7' m1.62		ν1.9' d-0.1' m-1.94		ν2.6' d0.1' m0.73					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	323°39.41		214°59.26	N21°32.84	138°51.83	S01°35.26	217°47.31	N22°34.61	321°43.11	S01°48.39		Miaplacidus	221°39.16 -69°49.25
1	338°41.88		229°58.56	32.59	153°52.86	35.91	232°49.23	34.56	336°45.68	48.44		Alphard	217°47.59 -8°46.07
2	353°44.34		244°57.86	32.35	168°53.89	36.56	247°51.15	34.51	351°48.26	48.50		Regulus	207°34.22 11°50.63
3	8°46.80		259°57.17	•• 32.11	183°54.91	•• 37.21	262°53.07	•• 34.45	6°50.84	•• 48.56		Dubhe	193°40.96 61°36.92
4	23°49.27		274°56.47	31.86	198°55.94	37.87	277°55.00	34.40	21°53.42	48.62		Denebola	182°24.70 14°25.86
5	38°51.73		289°55.77	31.62	213°56.97	38.52	292°56.92	34.35	36°56.00	48.68		Gienah	175°43.32 -17°41.04
6	53°54.20		304°55.07	N21°31.37	228°57.99	S01°39.17	307°58.84	N22°34.30	51°58.57	S01°48.74		Acrux	173°0.08 -63°14.65
7	68°56.66		319°54.38	31.13	243°59.02	39.82	323°0.76	34.25	67°1.15	48.80		Gacrux	171°51.52 -57°15.57
8	83°59.12		334°53.68	30.88	259°0.04	40.48	338°2.69	34.20	82°3.73	48.86		Alioth	166°12.84 55°49.48
9	99°1.59		349°52.98	•• 30.63	274°1.07	•• 41.13	353°4.61	•• 34.15	97°6.31	•• 48.92		Spica	158°21.93 -11°17.69
10	114°4.05		4°52.29	30.38	289°2.10	41.78	8°6.53	34.10	112°8.89	48.98		Alkaid	152°51.78 49°11.37
11	129°6.52		19°51.59	30.13	304°3.12	42.43	23°8.46	34.05	127°11.47	49.04		Hadar	148°35.53 -60°30.03
12	144°8.98		34°50.89	N21°29.87	319°4.15	S01°43.09	38°10.38	N22°34.00	142°14.05	S01°49.10		Menkent	147°57.16 -36°29.88
13	159°11.45		49°50.19	29.62	334°5.17	43.74	53°12.30	33.95	157°16.63	49.16		Arcturus	145°47.54 19°3.10
14	174°13.91		64°49.50	29.36	349°6.20	44.39	68°14.23	33.89	172°19.21	49.22		Rigil Kent.	139°39.77 -60°56.71
15	189°16.37		79°48.80	•• 29.11	4°7.22	•• 45.04	83°16.15	•• 33.84	187°21.79	•• 49.27		Kochab	137°19.91 74°3.26
16	204°18.84		94°48.10	28.85	19°8.25	45.70	98°18.07	33.79	202°24.37	49.33		Zuben'ubi	136°55.50 -16°8.91
17	219°21.30		109°47.41	28.59	34°9.27	46.35	113°20.00	33.74	217°26.95	49.39		Alphecca	126°3.28 26°37.89
18	234°23.77		124°46.71	N21°28.34	49°10.30	S01°47.00	128°21.92	N22°33.69	232°29.53	S01°49.45		Antares	112°15.11 -26°29.39
19	249°26.23		139°46.01	28.08	64°11.32	47.65	143°23.85	33.64	247°32.11	49.51		Atria	107°8.65 -69°4.64
20	264°28.69		154°45.32	27.81	79°12.35	48.31	158°25.77	33.59	262°34.69	49.57		Sabik	102°2.05 -15°45.39
21	279°31.16		169°44.62	•• 27.55	94°13.37	•• 48.96	173°27.69	•• 33.54	277°37.27	•• 49.63		Shaula	96°9.46 -37°7.42
22	294°33.62		184°43.92	27.29	109°14.40	49.61	188°29.62	33.48	292°39.85	49.69		Rasalhague	95°57.90 12°32.60
23	309°36.09		199°43.23	27.03	124°15.42	50.27	203°31.54	33.43	307°42.43	49.75		Eltanin	90°41.62 51°29.32
Mer.pass. 02:25		ν-0.7' d-0.2' m-3.97		ν1.0' d0.7' m1.62		ν1.9' d-0.1' m-1.94		ν2.6' d0.1' m0.73					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	324°38.55		214°42.53	N21°26.76	139°16.45	S01°50.92	218°33.47	N22°33.38	322°45.01	S01°49.81		Kaus Aust.	83°31.56 -34°22.38
1	339°41.01		229°41.83	26.49	154°17.47	51.57	233°35.39	33.33	337°47.59	49.87		Vega	80°32.57 38°48.60
2	354°43.48		244°41.14	26.23	169°18.49	52.22	248°37.32	33.28	352°50.17	49.93		Nunki	75°46.84 -26°15.88
3	9°45.94		259°40.44	•• 25.96	184°19.52	•• 52.88	263°39.24	•• 33.23	7°52.75	•• 49.99		Altair	61°59.17 8°56.27
4	24°48.41		274°39.74	25.69	199°20.54	53.53	278°41.17	33.18	22°55.33	50.05		Peacock	53°4.34 -56°39.14
5	39°50.87		289°39.05	25.42	214°21.57	54.18	293°43.09	33.13	37°57.92	50.11		Deneb	49°25.02 45°22.39
6	54°53.34		304°38.35	N21°25.15	229°22.59	S01°54.83	308°45.02	N22°33.07	53°0.50	S01°50.17		Enif	33°37.98 9°59.65
7	69°55.80		319°37.65	24.87	244°23.61	55.49	323°46.95	33.02	68°3.08	50.23		Al Na'ir	27°31.80 -46°50.07
8	84°58.26		334°36.96	24.60	259°24.64	56.14	338°48.87	32.97	83°5.66	50.29		Fomalhaut	15°13.61 -29°29.01
9	100°0.73		349°36.26	•• 24.33	274°25.66	•• 56.79	353°50.80	•• 32.92	98°8.24	•• 50.36		Scheat	13°44.39 28°13.35
10	115°3.19		4°35.56	24.05	289°26.68								

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.85	N14°20.60	303°21.25	11.0'	N11°17.26	15.8'	59.3'
1	193°48.97	19.83	317°51.21	10.9'	11°33.07	15.7'	59.3'
2	208°49.09	19.06	332°21.11	10.8'	11°48.81	15.7'	59.3'
3	223°49.20	· · 18.28	346°50.94	10.8'	12°4.50	15.6'	59.3'
4	238°49.32	17.51	1°20.70	10.7'	12°20.12	15.6'	59.3'
5	253°49.44	16.74	15°50.40	10.6'	12°35.68	15.5'	59.3'
6	268°49.56	N14°15.96	30°20.04	10.6'	N12°51.17	15.4'	59.3'
7	283°49.68	15.19	44°49.60	10.5'	13°6.59	15.4'	59.3'
8	298°49.80	14.42	59°19.10	10.4'	13°21.94	15.3'	59.3'
9	313°49.92	· · 13.64	73°48.53	10.4'	13°37.22	15.2'	59.3'
10	328°50.04	12.87	88°17.89	10.3'	13°52.43	15.1'	59.3'
11	343°50.16	12.09	102°47.17	10.2'	14°7.57	15.1'	59.3'
12	358°50.28	N14°11.32	117°16.38	10.1'	N14°22.63	15.0'	59.3'
13	13°50.40	10.54	131°45.52	10.1'	14°37.61	14.9'	59.3'
14	28°50.52	9.77	146°14.58	10.0'	14°52.51	14.8'	59.3'
15	43°50.64	· · 8.99	160°43.57	9.9'	15°7.33	14.7'	59.3'
16	58°50.76	8.21	175°12.48	9.8'	15°22.07	14.7'	59.3'
17	73°50.88	7.43	189°41.31	9.8'	15°36.72	14.6'	59.3'
18	88°51.01	N14°6.66	204°10.06	9.7'	N15°51.29	14.5'	59.3'
19	103°51.13	5.88	218°38.74	9.6'	16°5.77	14.4'	59.3'
20	118°51.25	5.10	233°7.33	9.5'	16°20.16	14.3'	59.3'
21	133°51.37	· · 4.32	247°35.84	9.4'	16°34.46	14.2'	59.3'
22	148°51.49	3.54	262°4.27	9.3'	16°48.67	14.1'	59.3'
23	163°51.62	2.76	276°32.62	9.3'	17°2.78	14.0'	59.3'
SD = 15.8' d = -0.8'			SD = 16.2'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.74	N14°1.98	291°0.89	9.2'	N17°16.80	13.9'	59.3'
1	193°51.86	1.20	305°29.07	9.1'	17°30.72	13.8'	59.3'
2	208°51.99	14°0.42	319°57.16	9.0'	17°44.54	13.7'	59.3'
3	223°52.11	13°59.64	334°25.17	8.9'	17°58.26	13.6'	59.3'
4	238°52.23	58.85	348°53.10	8.8'	18°11.87	13.5'	59.3'
5	253°52.36	58.07	3°20.93	8.8'	18°25.39	13.4'	59.3'
6	268°52.48	N13°57.29	17°48.69	8.7'	N18°38.79	13.3'	59.3'
7	283°52.61	56.51	32°16.35	8.6'	18°52.09	13.2'	59.3'
8	298°52.73	55.72	46°43.92	8.5'	19°5.28	13.1'	59.3'
9	313°52.86	· · 54.94	61°11.41	8.4'	19°18.36	13.0'	59.3'
10	328°52.98	54.16	75°38.81	8.3'	19°31.32	12.9'	59.3'
11	343°53.11	53.37	90°6.11	8.2'	19°44.17	12.7'	59.3'
12	358°53.23	N13°52.59	104°33.33	8.1'	N19°56.91	12.6'	59.3'
13	13°53.36	51.80	119°0.46	8.0'	20°9.52	12.5'	59.3'
14	28°53.48	51.02	133°27.50	7.9'	20°22.02	12.4'	59.3'
15	43°53.61	· · 50.23	147°54.44	7.9'	20°34.40	12.3'	59.3'
16	58°53.74	49.44	162°21.30	7.8'	20°46.65	12.1'	59.3'
17	73°53.86	48.66	176°48.06	7.7'	20°58.78	12.0'	59.3'
18	88°53.99	N13°47.87	191°14.74	7.6'	N21°10.78	11.9'	59.3'
19	103°54.12	47.08	205°41.32	7.5'	21°22.66	11.7'	59.3'
20	118°54.25	46.29	220°7.81	7.4'	21°34.40	11.6'	59.3'
21	133°54.37	· · 45.50	234°34.21	7.3'	21°46.02	11.5'	59.2'
22	148°54.50	44.72	249°0.52	7.2'	21°57.50	11.3'	59.2'
23	163°54.63	43.93	263°26.73	7.1'	22°8.85	11.2'	59.2'
SD = 15.8' d = -0.8'			SD = 16.2'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.76	N13°43.14	277°52.86	7.0'	N22°20.07	11.1'	59.2'
1	193°54.89	42.35	292°18.89	6.9'	22°31.14	10.9'	59.2'
2	208°55.01	41.56	306°44.84	6.9'	22°42.08	10.8'	59.2'
3	223°55.14	· · 40.77	321°10.69	6.8'	22°52.88	10.7'	59.2'
4	238°55.27	39.98	335°36.45	6.7'	23°3.54	10.5'	59.2'
5	253°55.40	39.18	350°2.13	6.6'	23°14.05	10.4'	59.2'
6	268°55.53	N13°38.39	4°27.71	6.5'	N23°24.42	10.2'	59.2'
7	283°55.66	37.60	18°53.21	6.4'	23°34.64	10.1'	59.2'
8	298°55.79	36.81	33°18.61	6.3'	23°44.71	9.9'	59.2'
9	313°55.92	· · 36.01	47°43.93	6.2'	23°54.63	9.8'	59.2'
10	328°56.05	35.22	62°9.16	6.1'	24°4.41	9.6'	59.2'
11	343°56.18	34.43	76°34.31	6.1'	24°14.03	9.5'	59.2'
12	358°56.31	N13°33.63	90°59.37	6.0'	N24°23.49	9.3'	59.2'
13	13°56.44	32.84	105°24.34	5.9'	24°32.80	9.2'	59.2'
14	28°56.58	32.04	119°49.23	5.8'	24°41.96	9.0'	59.2'
15	43°56.71	· · 31.25	134°14.04	5.7'	24°50.95	8.8'	59.2'
16	58°56.84	30.45	148°38.76	5.6'	24°59.79	8.7'	59.1'
17	73°56.97	29.66	163°3.40	5.6'	25°8.46	8.5'	59.1'
18	88°57.10	N13°28.86	177°27.97	5.5'	N25°16.98	8.3'	59.1'
19	103°57.24	28.06	191°52.45	5.4'	25°25.33	8.2'	59.1'
20	118°57.37	27.27	206°16.85	5.3'	25°33.51	8.0'	59.1'
21	133°57.50	· · 26.47	220°41.18	5.3'	25°41.53	7.9'	59.1'
22	148°57.63	25.67	235°5.43	5.2'	25°49.38	7.7'	59.1'
23	163°57.77	24.87	249°29.61	5.1'	25°57.06	7.5'	59.1'
SD = 15.8' d = -0.8'			SD = 16.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	02:26	21:37	////	////
N 70°	////	////	02:58	21:07	23:25	////
68°	////	01:45	03:20	20:45	22:17	////
66°	////	02:22	03:38	20:28	21:42	////
64°	////	02:48	03:53	20:14	21:18	23:30
62°	01:33	03:07	04:05	20:02	20:59	22:30
60°	02:07	03:23	04:15	19:52	20:43	21:58
N 58°	02:31	03:37	04:24	19:44	20:30	21:35
56°	02:49	03:48	04:31	19:36	20:19	21:17
54°	03:04	03:58	04:38	19:30	20:10	21:02
52°	03:17	04:06	04:44	19:23	20:01	20:50
50°	03:28	04:14	04:50	19:18	19:54	20:39
45°	03:51	04:30	05:02	19:06	19:38	20:17
N 40°	04:08	04:43	05:12	18:56	19:25	20:00
35°	04:21	04:53	05:20	18:48	19:15	19:47
30°	04:32	05:02	05:27	18:41	19:06	19:36
20°	04:50	05:17	05:40	18:29	18:51	19:18
N 10°	05:04	05:29	05:51	18:18	18:39	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:25	05:49	06:11	17:58	18:20	18:44
20°	05:33	05:59	06:22	17:48	18:10	18:36
30°	05:41	06:09	06:33	17:36	18:00	18:29
35°	05:44	06:14	06:40	17:29	17:55	18:25
40°	05:48	06:20	06:48	17:21	17:49	18:21
45°	05:52	06:27	06:57	17:12	17:43	18:18
S 50°	05:56	06:34	07:08	17:02	17:36	18:14
52°	05:58	06:37	07:13	16:57	17:32	18:12
54°	05:59	06:41	07:18	16:51	17:29	18:10
56°	06:01	06:45	07:24	16:45	17:25	18:09
58°	06:03	06:49	07:31	16:39	17:21	18:07
S 60°	06:05	06:54	07:39	16:31	17:16	18:05

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	18:22	<input type="checkbox"/>	<input type="checkbox"/>	13:50	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	18:59	<input type="checkbox"/>	<input type="checkbox"/>	13:15	<input type="checkbox"/>	<input type="checkbox"/>
68°	19:25	18:25	<input type="checkbox"/>	12:51	15:43	<input type="checkbox"/>
66°	19:45	19:14	<input type="checkbox"/>	12:32	14:55	<input type="checkbox"/>
64°	20:02	19:46	19:10	12:17	14:24	16:59
62°	20:15	20:09	20:02	12:05	14:02	16:08
60°	20:27	20:28	20:34	11:55	13:43	15:37
N 58°	20:37	20:44	20:58	11:46	13:28	15:13
56°	20:46	20:58	21:17	11:38	13:16	14:55
54°	20:54	21:10	21:34	11:31	13:04	14:39
52°	21:01	21:20	21:48	11:24	12:55	14:25
50°	21:08	21:30	22:00	11:19	12:46	14:13
45°	21:22	21:50	22:26	11:07	12:27	13:49
N 40°	21:33	22:06	22:46	10:57	12:12	13:29
35°	21:43	22:20	23:03	10:48	12:00	13:13
30°	21:52	22:32	23:18	10:41	11:49	12:59
20°	22:07	22:53	23:44	10:28	11:30	12:35
N 10°	22:21	23:11	· · ·	10:17	11:14	12:14
0°	22:34	23:28	· · ·	10:06	10:59	11:55
S 10°	22:46	23:45	· · ·	09:56	10:44	11:36
20°	23:00	· · ·	00:04	09:45	10:28	11:16
30°	23:16	· · ·	00:25	09:33	10:10	10:52
35°	23:25	· · ·	00:38	09:25	09:59	10:39
40°	23:36	· · ·	00:53	09:17	09:47	10:23
45°	23:49	· · ·	01:10	09:08	09:33	10:04
S 50°	· · ·	00:04	01:32	08:57	09:16	09:41
52°	· · ·	00:12	01:43	08:51	09:08	09:30
54°	· · ·	00:20	01:55	08:46	08:59	09:18
56°	· · ·	00:29	02:08	08:39	08:49	09:03
58°	· · ·	00:39	02:24	08:32	08:37	08:46
S 60°	· · ·	00:51	02:44	08:24	08:24	08:26

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-53%
14	04:45	04:39	12:05	03:54	16:20	
15	04:33	04:27	12:04	04:46	17:13	
16	04:21	04:15	12:04	05:41	18:11	

Aries			Venus			Mars			Jupiter			Saturn		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	325°37.69	214°25.82	N21°20.08	139°40.99	S02°6.59	219°19.70	N22°32.15	323°46.99	S01°51.27					
1	340°40.15	229°25.12	19.79	154°42.01	7.24	234°21.63	32.09	338°49.57	51.33					
2	355°42.62	244°24.43	19.50	169°43.03	7.90	249°23.56	32.04	353°52.16	51.39					
3	10°45.08	259°23.73	•• 19.21	184°44.05	•• 8.55	264°25.49	•• 31.99	8°54.74	•• 51.45					
4	25°47.55	274°23.04	18.91	199°45.07	9.20	279°27.42	31.94	23°57.32	51.51					
5	40°50.01	289°22.34	18.62	214°46.09	9.86	294°29.34	31.89	38°59.91	51.57					
6	55°52.48	304°21.65	N21°18.32	229°47.11	S02°10.51	309°31.27	N22°31.84	54°2.49	S01°51.64					
7	70°54.94	319°20.95	18.02	244°48.13	11.16	324°33.20	31.78	69°5.08	51.70					
8	85°57.40	334°20.26	17.73	259°49.15	11.82	339°35.13	31.73	84°7.66	51.76					
9	100°59.87	349°19.56	•• 17.43	274°50.17	•• 12.47	354°37.06	•• 31.68	99°10.25	•• 51.82					
10	116°2.33	4°18.87	17.13	289°51.19	13.12	9°38.99	31.63	114°12.83	51.88					
11	131°4.80	19°18.17	16.82	304°52.21	13.78	24°40.92	31.58	129°15.42	51.94					
12	146°7.26	34°17.48	N21°16.52	319°53.23	S02°14.43	39°42.85	N22°31.53	144°18.00	S01°52.00					
13	161°9.73	49°16.78	16.22	334°54.25	15.08	54°44.78	31.47	159°20.59	52.07					
14	176°12.19	64°16.09	15.91	349°55.27	15.74	69°46.71	31.42	174°23.17	52.13					
15	191°14.65	79°15.39	•• 15.61	4°56.29	•• 16.39	84°48.64	•• 31.37	189°25.76	•• 52.19					
16	206°17.12	94°14.70	15.30	19°57.31	17.04	99°50.57	31.32	204°28.34	52.25					
17	221°19.58	109°14.00	14.99	34°58.33	17.70	114°52.50	31.27	219°30.93	52.31					
18	236°22.05	124°13.31	N21°14.69	49°59.35	S02°18.35	129°54.43	N22°31.21	234°33.52	S01°52.38					
19	251°24.51	139°12.61	14.38	65°0.37	19.00	144°56.36	31.16	249°36.10	52.44					
20	266°26.97	154°11.92	14.06	80°1.38	19.66	159°58.29	31.11	264°38.69	52.50					
21	281°29.44	169°11.22	•• 13.75	95°2.40	•• 20.31	175°0.22	•• 31.06	279°41.28	•• 52.56					
22	296°31.90	184°10.53	13.44	110°3.42	20.96	190°2.15	31.01	294°43.86	52.62					
23	311°34.37	199°9.83	13.13	125°4.44	21.62	205°4.08	30.95	309°46.45	52.69					
Mer.pass. 02:17			ν-0.7' d-0.3' m-3.97			ν1.0' d0.7' m1.62			ν1.9' d-0.1' m-1.95			ν2.6' d0.1' m0.72		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	326°36.83	214°9.14	N21°12.81	140°5.46	S02°22.27	220°6.01	N22°30.90	324°49.03	S01°52.75					
1	341°39.30	229°8.45	12.49	155°6.47	22.93	235°7.94	30.85	339°51.62	52.81					
2	356°41.76	244°7.75	12.18	170°7.49	23.58	250°9.87	30.80	354°54.21	52.87					
3	11°44.22	259°7.06	•• 11.86	185°8.51	•• 24.23	265°11.81	•• 30.75	9°56.80	•• 52.94					
4	26°46.69	274°6.36	11.54	200°9.53	24.89	280°13.74	30.69	24°59.38	53.00					

Aug 17 Sun	SHA	Mer.pass
Venus	248° 48.13	09:43
Mars	174° 3.30	14:40
Jupiter	253° 42.01	09:21
Saturn	358° 9.30	02:24

Aug 18 Mon	SHA	Mer.pass
Venus	247° 32.31	09:44
Mars	173° 28.63	14:39
Jupiter	253° 29.18	09:18
Saturn	358° 12.20	02:20

Aug 19 Tue	SHA	Mer.pass
Venus	246° 16.53	09:45
Mars	172° 53.88	14:37
Jupiter	253° 16.43	09:15
Saturn	358° 15.18	02:16

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun				Moon				
Sun	GHA	Dec			GHA	ν	Dec	d	HP
0	178°57.90	N13°24.07			263°53.71	5.0'	N26°4.57	7.3'	59.1'
1	193°58.03	23.28			278°17.74	5.0'	26°11.92	7.2'	59.1'
2	208°58.17	22.48			292°41.70	4.9'	26°19.08	7.0'	59.1'
3	223°58.30	· · 21.68			307°5.59	4.8'	26°26.08	6.8'	59.1'
4	238°58.44	20.88			321°29.42	4.8'	26°32.90	6.6'	59.1'
5	253°58.57	20.08			335°53.17	4.7'	26°39.54	6.5'	59.0'
6	268°58.71	N13°19.27			350°16.87	4.6'	N26°46.01	6.3'	59.0'
7	283°58.84	18.47			4°40.50	4.6'	26°52.30	6.1'	59.0'
8	298°58.98	17.67			19°4.07	4.5'	26°58.41	5.9'	59.0'
9	313°59.11	· · 16.87			33°27.58	4.5'	27°4.35	5.8'	59.0'
10	328°59.25	16.07			47°51.03	4.4'	27°10.10	5.6'	59.0'
11	343°59.38	15.26			62°14.43	4.3'	27°15.67	5.4'	59.0'
12	358°59.52	N13°14.46			76°37.78	4.3'	N27°21.05	5.2'	59.0'
13	13°59.65	13.66			91°1.07	4.2'	27°26.26	5.0'	59.0'
14	28°59.79	12.85			105°24.32	4.2'	27°31.28	4.8'	59.0'
15	43°59.93	· · 12.05			119°47.51	4.2'	27°36.11	4.6'	59.0'
16	59°0.06	11.25			134°10.66	4.1'	27°40.76	4.5'	58.9'
17	74°0.20	10.44			148°33.77	4.1'	27°45.22	4.3'	58.9'
18	89°0.34	N13°9.64			162°56.84	4.0'	N27°49.49	4.1'	58.9'
19	104°0.48	8.83			177°19.87	4.0'	27°53.58	3.9'	58.9'
20	119°0.61	8.02			191°42.86	4.0'	27°57.48	3.7'	58.9'
21	134°0.75	· · 7.22			206°5.81	3.9'	28°1.19	3.5'	58.9'
22	149°0.89	6.41			220°28.74	3.9'	28°4.71	3.3'	58.9'
23	164°1.03	5.60			234°51.63	3.9'	28°8.04	3.1'	58.9'
SD = 15.8'				$d = -0.8'$	SD = 16.1'				

Mon	GHA	Dec			GHA	ν	Dec	d	HP
0	179°1.17	N13°4.80			249°14.50	3.8'	N28°11.18	2.9'	58.9'
1	194°1.31	3.99			263°37.34	3.8'	28°14.12	2.8'	58.8'
2	209°1.44	3.18			278°0.16	3.8'	28°16.88	2.6'	58.8'
3	224°1.58	· · 2.37			292°22.96	3.8'	28°19.44	2.4'	58.8'
4	239°1.72	1.56			306°45.74	3.8'	28°21.82	2.2'	58.8'
5	254°1.86	13°0.75			321°8.51	3.8'	28°24.00	2.0'	58.8'
6	269°2.00	N12°59.94			335°31.26	3.7'	N28°25.98	1.8'	58.8'
7	284°2.14	59.13			349°54.01	3.7'	28°27.78	1.6'	58.8'
8	299°2.28	58.32			4°16.74	3.7'	28°29.38	1.4'	58.8'
9	314°2.42	· · 57.51			18°39.47	3.7'	28°30.79	1.2'	58.8'
10	329°2.56	56.70			33°2.20	3.7'	28°32.00	1.0'	58.7'
11	344°2.70	55.89			47°24.93	3.7'	28°33.03	0.8'	58.7'
12	359°2.85	N12°55.08			61°47.66	3.7'	N28°33.85	0.6'	58.7'
13	14°2.99	54.27			76°10.39	3.7'	28°34.49	0.4'	58.7'
14	29°3.13	53.45			90°33.13	3.8'	28°34.93	0.2'	58.7'
15	44°3.27	· · 52.64			104°55.88	3.8'	28°35.18	0.1'	58.7'
16	59°3.41	51.83			119°18.65	3.8'	28°35.24	-0.1'	58.7'
17	74°3.55	51.01			133°41.43	3.8'	28°35.10	-0.3'	58.7'
18	89°3.70	N12°50.20			148°4.23	3.8'	N28°34.77	-0.5'	58.6'
19	104°3.84	49.39			162°27.05	3.8'	28°34.25	-0.7'	58.6'
20	119°3.98	48.57			176°49.89	3.9'	28°33.54	-0.9'	58.6'
21	134°4.12	· · 47.76			191°12.75	3.9'	28°32.64	-1.1'	58.6'
22	149°4.27	46.94			205°35.65	3.9'	28°31.54	-1.3'	58.6'
23	164°4.41	46.13			219°58.57	4.0'	28°30.26	-1.5'	58.6'
SD = 15.8'				$d = -0.8'$	SD = 16.1'				

Tue	GHA	Dec			GHA	ν	Dec	d	HP
0	179°4.55	N12°45.31			234°21.53	4.0'	N28°28.78	-1.7'	58.6'
1	194°4.70	44.49			248°44.52	4.0'	28°27.12	-1.9'	58.5'
2	209°4.84	43.68			263°7.55	4.1'	28°25.26	-2.0'	58.5'
3	224°4.99	· · 42.86			277°30.62	4.1'	28°23.22	-2.2'	58.5'
4	239°5.13	42.04			291°53.74	4.2'	28°20.99	-2.4'	58.5'
5	254°5.27	41.22			306°16.90	4.2'	28°18.57	-2.6'	58.5'
6	269°5.42	N12°40.41			320°40.10	4.3'	N28°15.97	-2.8'	58.5'
7	284°5.56	39.59			335°3.36	4.3'	28°13.18	-3.0'	58.5'
8	299°5.71	38.77			349°26.67	4.4'	28°10.20	-3.2'	58.4'
9	314°5.85	· · 37.95			3°50.03	4.4'	28°7.05	-3.3'	58.4'
10	329°6.00	37.13			18°13.45	4.5'	28°3.70	-3.5'	58.4'
11	344°6.15	36.31			32°36.93	4.5'	28°0.18	-3.7'	58.4'
12	359°6.29	N12°35.49			47°0.47	4.6'	N27°56.47	-3.9'	58.4'
13	14°6.44	34.67			61°24.07	4.7'	27°52.59	-4.1'	58.4'
14	29°6.58	33.85			75°47.74	4.7'	27°48.52	-4.2'	58.4'
15	44°6.73	· · 33.03			90°11.47	4.8'	27°44.28	-4.4'	58.3'
16	59°6.88	32.21			104°35.27	4.9'	27°39.85	-4.6'	58.3'
17	74°7.02	31.38			118°59.15	4.9'	27°35.26	-4.8'	58.3'
18	89°7.17	N12°30.56			133°23.09	5.0'	N27°30.48	-4.9'	58.3'
19	104°7.32	29.74			147°47.12	5.1'	27°25.53	-5.1'	58.3'
20	119°7.47	28.92			162°11.22	5.2'	27°20.41	-5.3'	58.3'
21	134°7.61	· · 28.09			176°35.39	5.3'	27°15.12	-5.5'	58.2'
22	149°7.76	27.27			190°59.65	5.3'	27°9.65	-5.6'	58.2'
23	164°7.91	26.44			205°23.99	5.4'	27°4.02	-5.8'	58.2'
SD = 15.8'				$d = -0.8'$	SD = 16.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	02:46	21:17	////	////
N 70°	////	01:16	03:13	20:51	22:41	////
68°	////	02:07	03:33	20:32	21:56	////
66°	////	02:37	03:49	20:16	21:26	////
64°	01:07	03:00	04:02	20:04	21:05	22:52
62°	01:52	03:18	04:13	19:53	20:48	22:11
60°	02:20	03:32	04:22	19:44	20:33	21:44
N 58°	02:41	03:44	04:30	19:36	20:22	21:24
56°	02:58	03:55	04:37	19:29	20:11	21:07
54°	03:12	04:04	04:44	19:23	20:02	20:54
52°	03:24	04:12	04:49	19:17	19:55	20:42
50°	03:34	04:19	04:54	19:12	19:48	20:32
45°	03:55	04:34	05:05	19:01	19:33	20:11
N 40°	04:11	04:46	05:15	18:52	19:21	19:56
35°	04:24	04:56	05:22	18:45	19:11	19:43
30°	04:35	05:04	05:29	18:38	19:03	19:32
20°	04:51	05:18	05:41	18:26	18:49	19:16
N 10°	05:04	05:29	05:51	18:16	18:38	19:03
0°	05:15	05:39	06:00	18:07	18:28	18:53
S 10°	05:23	05:48	06:10	17:58	18:19	18:44
20°	05:31	05:57	06:19	17:48	18:11	18:37
30°	05:38	06:06	06:31	17:37	18:02	18:30
35°	05:41	06:11	06:37	17:31	17:57	18:27
40°	05:44	06:16	06:44	17:24	17:52	18:24
45°	05:48	06:22	06:52	17:16	17:46	18:21
S 50°	05:51	06:29	07:02	17:06	17:40	18:18
52°	05:52	06:32	07:07	17:02	17:37	18:16
54°	05:54	06:35	07:12	16:57	17:34	18:15
56°	05:55	06:38	07:17	16:51	17:30	18:14
58°	05:56	06:42	07:24	16:45	17:26	18:12
S 60°	05:58	06:47	07:31	16:38	17:22	18:11

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
68°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
66°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
64°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
62°	19:43	<div></div>	22:24	18:34	<div></div>	20:12
60°	20:50	21:39	23:13	17:27	18:48	19:22
N 58°	21:25	22:19	23:44	16:52	18:08	18:51
56°	21:51	22:47	16:27	17:40	18:28
54°	22:11	23:09	16:07	17:19	18:08
52°	22:28	23:27	15:50	17:01	17:52
50°	22:43	23:42	15:35	16:45	17:38
45°	23:13	00:13	15:06	16:14	17:09
N 40°	23:36	00:37	14:43	15:50	16:47
35°	23:56	00:57	14:24	15:30	16:28
30°	00:12	01:13	14:08	15:13	16:12
20°	00:40	01:42	13:41	14:45	15:44
N 10°	00:06	01:05	02:07	13:17	14:20	15:21
0°	00:26	01:27	02:29	12:55	13:57	14:59
S 10°	00:47	01:50	02:52	12:33	13:34	14:36
20°	01:09	02:15	03:17	12:10	13:09	14:12
30°	01:35	02:43	03:45	11:43	12:40	13:44
35°	01:51	03:00	04:02	11:26	12:23	13:28
40°	02:09	03:20	04:22	11:08	12:03	13:08
45°	02:30	03:44	04:46	10:45	11:39	12:45
S 50°	02:58	04:15	05:17	10:17	11:08	12:15
52°	03:12	04:31	05:32	10:03	10:52	12:00
54°	03:27	04:49	05:50	09:47	10:34	11:42
56°	03:46	05:11	06:11	09:28	10:11	11:21
58°	04:09	05:40	06:38	09:05	09:43	10:54
S 60°	04:39	06:22	07:17	08:34	09:01	10:15

August 20, 21, 22 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	328°35.11	213°35.92	N20°56.48	140°54.16	S02°53.66	221°38.86	N22°28.39	326°53.34	S01°55.79			Alpheratz	357°33.94 29°13.96
1	343°37.58	228°35.23		56.11	155°55.17	54.31	236°40.80	28.33	341°55.93	55.85		Ankaa	353°6.28 -42°9.74
2	358°40.04	243°34.54		55.74	170°56.18	54.97	251°42.74	28.28	356°58.52	55.92		Schedar	349°30.05 56°40.59
3	13°42.51	258°33.85	•• 55.38	185°57.20	•• 55.62	266°44.68	•• 28.23	12°1.12	•• 55.98			Diphda	348°46.52 -17°50.54
4	28°44.97	273°33.16		55.01	200°58.21	56.27	281°46.61	28.17	27°3.71	56.05		Achernar	335°19.45 -57°6.05
5	43°47.43	288°32.47		54.64	215°59.22	56.93	296°48.55	28.12	42°6.30	56.11		Hamal	327°50.46 23°35.04
6	58°49.90	303°31.79	N20°54.27	231°0.23	S02°57.58	311°50.49	N22°28.07	57°8.89	S01°56.18			Polaris	313°41.34 89°22.02
7	73°52.36	318°31.10		53.90	246°1.24	58.24	326°52.43	28.02	72°11.49	56.24		Acamar	315°11.27 -40°11.76
8	88°54.83	333°30.41		53.52	261°2.25	58.89	341°54.37	27.96	87°14.08	56.30		Menkar	314°5.54 4°11.55
9	103°57.29	348°29.72	•• 53.15	276°3.26	02°59.54	356°56.31	•• 27.91	102°16.67	•• 56.37			Mirfak	308°27.47 49°56.98
10	118°59.75	3°29.03		52.78	291°4.27	03°0.20	11°58.25	27.86	117°19.27	56.43		Aldebaran	290°39.09 16°33.70
11	134°2.22	18°28.34		52.40	306°5.28	0.85	27°0.19	27.81	132°21.86	56.50		Rigel	281°3.48 -8°10.12
12	149°4.68	33°27.65	N20°52.02	321°6.29	S03°1.51	42°2.12	N22°27.75	147°24.46	S01°56.56			Capella	280°21.29 46°1.30
13	164°7.15	48°26.97		51.65	336°7.30	2.16	57°4.06	27.70	162°27.05	56.63		Bellatrix	278°22.45 6°22.49
14	179°9.61	63°26.28		51.27	351°8.31	2.82	72°6.00	27.65	177°29.64	56.69		Elnath	278°1.36 28°37.72
15	194°12.08	78°25.59	•• 50.89		6°9.32	•• 3.47	87°7.94	•• 27.59	192°32.24	•• 56.76		Alnilam	275°37.35 -1°10.98
16	209°14.54	93°24.90		50.51	21°10.33	4.12	102°9.88	27.54	207°34.83	56.82		Betelgeuse	270°51.69 7°24.81
17	224°17.00	108°24.21		50.12	36°11.34	4.78	117°11.82	27.49	222°37.43	56.89		Canopus	263°52.50 -52°42.22
18	239°19.47	123°23.53	N20°49.74	51°12.34	S03°5.43	132°13.76	N22°27.43	237°40.02	S01°56.95			Sirius	258°26.01 -16°44.87
19	254°21.93	138°22.84		49.36	66°13.35	6.09	147°15.70	27.38	252°42.62	57.02		Adhara	255°5.73 -29°0.17
20	269°24.40	153°22.15		48.97	81°14.36	6.74	162°17.64	27.33	267°45.21	57.08		Procyon	244°50.56 5°9.67
21	284°26.86	168°21.46	•• 48.59		96°15.37	•• 7.40	177°19.58	•• 27.28	282°47.80	•• 57.15		Pollux	243°16.98 27°57.88
22	299°29.32	183°20.78		48.20	111°16.38	8.05	192°21.53	27.22	297°50.40	57.22		Avior	234°15.14 -59°35.29
23	314°31.79	198°20.09		47.81	126°17.39	8.70	207°23.47	27.17	312°52.99	57.28		Suhail	222°46.38 -43°32.02
Mer.pass. 02:05		ν-0.7' d-0.4' m-3.96		ν1.0' d0.7' m1.62		ν1.9' d-0.1' m-1.96		ν2.6' d0.1' m0.71		Miaplacidus			221°39.14 -69°49.22
										Alphard			217°47.57 -8°46.07
										Regulus			207°34.20 11°50.62
										Dubhe			193°40.96 61°36.89
										Denebola			182°24.69 14°25.85
										Gienah			175°43.32 -17°41.04
										Acrux			173°0.10 -63°14.63
										Gacrux			171°51.54 -57°15.55
										Alioth			166°12.86 55°49.46
										Spica			158°21.94 -11°17.68
										Alkaid			152°51.81 49°11.35
										Hadar			148°35.56 -60°30.02
										Menkent			147°57.17 -36°29.88
										Arcturus			145°47.55 19°3.09
										Rigel Kent.			139°39.80 -60°56.71
										Kochab			137°20.03 74°3.24
										Zuben'ubi			136°55.51 -16°8.91
										Alphecca			126°3.30 26°37.89
										Antares			112°15.12 -26°29.39
										Atria			107°8.69 -69°4.65
										Sabik			102°2.06 -15°45.39
										Shaula			96°9.47 -37°7.43
										Rasalhague			95°57.91 12°32.61
										Eltanin			90°41.66 51°29.34
										Kaus Aust.			83°31.56 -34°22.39
										Vega			80°32.59 38°48.63
										Nunki			75°46.84 -26°15.88
										Altair			61°59.16 8°56.28
										Peacock			53°4.33 -56°39.16
										Deneb			49°25.02 45°22.43
										Enif			33°37.96 9°59.67
										Al Na'ir			27°31.77 -46°50.09
										Fomalhaut			15°13.58 -29°29.01
										Scheat			13°44.36 28°13.38
										Markab			13°29.07 15°20.69
										Aug 20 Wed			SHA Mer.pass
										Venus			245°0.81 09:46
										Mars			172°19.05 14:35
										Jupiter			253°3.75 09:12
										Saturn			358°18.22 02:12
										Aug 21 Thu			SHA Mer.pass
										Venus			243°45.15 09:47
										Mars			171°44.14 14:34
										Jupiter			252°51.15 09:09
										Saturn			358°21.34 02:08
										Aug 22 Fri			SHA Mer.pass
										Venus			242°29.57 09:48
										Mars			171°9.16 14:32
										Jupiter			252°38.64 09:06
										Saturn			358°24.52 02:04
										Horizontal parallax			
										Venus:			0.1
										Mars:			0.1
Mer.pass. 01:57		ν-0.7' d-0.4' m-3.96		ν1.0' d0.7' m1.62		ν1.9' d-0.1' m-1.96		ν2.6' d0.1' m0.70					

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°8.06	N12°25.62	219°48.42	5.5'	N26°58.22	-6.0'	58.2'
1	194°8.21	24.80	234°12.92	5.6'	26°52.25	-6.1'	58.2'
2	209°8.36	23.97	248°37.52	5.7'	26°46.12	-6.3'	58.2'
3	224°8.51	· · 23.14	263°2.20	5.8'	26°39.82	-6.5'	58.1'
4	239°8.65	22.32	277°26.98	5.9'	26°33.35	-6.6'	58.1'
5	254°8.80	21.49	291°51.84	6.0'	26°26.73	-6.8'	58.1'
6	269°8.95	N12°20.67	306°16.80	6.1'	N26°19.95	-6.9'	58.1'
7	284°9.10	19.84	320°41.85	6.1'	26°13.01	-7.1'	58.1'
8	299°9.25	19.01	335°7.00	6.2'	26°5.91	-7.3'	58.1'
9	314°9.40	· · 18.19	349°32.24	6.3'	25°58.65	-7.4'	58.0'
10	329°9.55	17.36	3°57.58	6.4'	25°51.24	-7.6'	58.0'
11	344°9.70	16.53	18°23.02	6.5'	25°43.68	-7.7'	58.0'
12	359°9.86	N12°15.70	32°48.56	6.6'	N25°35.96	-7.9'	58.0'
13	14°10.01	14.87	47°14.20	6.7'	25°28.10	-8.0'	58.0'
14	29°10.16	14.04	61°39.94	6.8'	25°20.09	-8.2'	58.0'
15	44°10.31	· · 13.21	76°5.78	6.9'	25°11.93	-8.3'	57.9'
16	59°10.46	12.38	90°31.72	7.0'	25°3.62	-8.4'	57.9'
17	74°10.61	11.55	104°57.77	7.2'	24°55.17	-8.6'	57.9'
18	89°10.76	N12°10.72	119°23.93	7.3'	N24°46.58	-8.7'	57.9'
19	104°10.92	9.89	133°50.19	7.4'	24°37.85	-8.9'	57.9'
20	119°11.07	9.06	148°16.55	7.5'	24°28.98	-9.0'	57.8'
21	134°11.22	· · 8.23	162°43.03	7.6'	24°19.97	-9.1'	57.8'
22	149°11.37	7.40	177°9.61	7.7'	24°10.83	-9.3'	57.8'
23	164°11.53	6.57	191°36.30	7.8'	24°1.55	-9.4'	57.8'
SD = 15.8'		$d = -0.8'$	SD = 15.9'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.68	N12°5.73	206°3.09	7.9'	N23°52.14	-9.5'	57.8'
1	194°11.83	4.90	220°30.00	8.0'	23°42.60	-9.7'	57.7'
2	209°11.99	4.07	234°57.01	8.1'	23°32.93	-9.8'	57.7'
3	224°12.14	· · 3.23	249°24.13	8.2'	23°23.13	-9.9'	57.7'
4	239°12.30	2.40	263°51.37	8.3'	23°13.21	-10.0'	57.7'
5	254°12.45	1.56	278°18.71	8.5'	23°3.16	-10.2'	57.7'
6	269°12.60	N12°0.73	292°46.16	8.6'	N22°52.99	-10.3'	57.6'
7	284°12.76	11°59.90	307°13.72	8.7'	22°42.70	-10.4'	57.6'
8	299°12.91	59.06	321°41.40	8.8'	22°32.29	-10.5'	57.6'
9	314°13.07	· · 58.22	336°9.18	8.9'	22°21.76	-10.6'	57.6'
10	329°13.22	57.39	350°37.08	9.0'	22°11.11	-10.8'	57.6'
11	344°13.38	56.55	5°5.08	9.1'	22°0.35	-10.9'	57.5'
12	359°13.53	N11°55.72	19°33.19	9.2'	N21°49.48	-11.0'	57.5'
13	14°13.69	54.88	34°1.42	9.3'	21°38.50	-11.1'	57.5'
14	29°13.85	54.04	48°29.75	9.4'	21°27.41	-11.2'	57.5'
15	44°14.00	· · 53.20	62°58.20	9.6'	21°16.21	-11.3'	57.5'
16	59°14.16	52.37	77°26.75	9.7'	21°4.90	-11.4'	57.4'
17	74°14.31	51.53	91°55.42	9.8'	20°53.49	-11.5'	57.4'
18	89°14.47	N11°50.69	106°24.19	9.9'	N20°41.98	-11.6'	57.4'
19	104°14.63	49.85	120°53.07	10.0'	20°30.37	-11.7'	57.4'
20	119°14.79	49.01	135°22.06	10.1'	20°18.66	-11.8'	57.4'
21	134°14.94	· · 48.17	149°51.16	10.2'	20°6.85	-11.9'	57.3'
22	149°15.10	47.33	164°20.37	10.3'	19°54.94	-12.0'	57.3'
23	164°15.26	46.49	178°49.68	10.4'	19°42.94	-12.1'	57.3'
SD = 15.8'		$d = -0.8'$	SD = 15.8'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.42	N11°45.65	193°19.10	10.5'	N19°30.85	-12.2'	57.3'
1	194°15.57	44.81	207°48.63	10.6'	19°18.66	-12.3'	57.2'
2	209°15.73	43.97	222°18.26	10.7'	19°6.39	-12.4'	57.2'
3	224°15.89	· · 43.13	236°48.00	10.8'	18°54.03	-12.4'	57.2'
4	239°16.05	42.29	251°17.84	10.9'	18°41.58	-12.5'	57.2'
5	254°16.21	41.45	265°47.79	11.1'	18°29.05	-12.6'	57.2'
6	269°16.37	N11°40.60	280°17.84	11.2'	N18°16.43	-12.7'	57.1'
7	284°16.53	39.76	294°47.99	11.3'	18°3.74	-12.8'	57.1'
8	299°16.69	38.92	309°18.25	11.4'	17°50.96	-12.9'	57.1'
9	314°16.85	· · 38.07	323°48.60	11.5'	17°38.11	-12.9'	57.1'
10	329°17.01	37.23	338°19.06	11.6'	17°25.17	-13.0'	57.0'
11	344°17.17	36.39	352°49.62	11.7'	17°12.17	-13.1'	57.0'
12	359°17.33	N11°35.54	7°20.27	11.8'	N16°59.09	-13.2'	57.0'
13	14°17.49	34.70	21°51.03	11.9'	16°45.93	-13.2'	57.0'
14	29°17.65	33.85	36°21.88	11.9'	16°32.71	-13.3'	57.0'
15	44°17.81	· · 33.01	50°52.83	12.0'	16°19.42	-13.4'	56.9'
16	59°17.97	32.16	65°23.87	12.1'	16°6.06	-13.4'	56.9'
17	74°18.13	31.32	79°55.01	12.2'	15°52.64	-13.5'	56.9'
18	89°18.29	N11°30.47	94°26.25	12.3'	N15°39.15	-13.6'	56.9'
19	104°18.45	29.62	108°57.58	12.4'	15°25.59	-13.6'	56.8'
20	119°18.61	28.78	123°29.00	12.5'	15°11.98	-13.7'	56.8'
21	134°18.78	· · 27.93	138°0.51	12.6'	14°58.30	-13.7'	56.8'
22	149°18.94	27.08	152°32.11	12.7'	14°44.57	-13.8'	56.8'
23	164°19.10	26.23	167°3.80	12.8'	14°30.78	-13.8'	56.7'
SD = 15.8'		$d = -0.8'$	SD = 15.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	////	03:04	20:58	23:25	////
N 70°	////	01:47	03:27	20:36	22:12	////
68°	////	02:25	03:45	20:18	21:36	////
66°	////	02:51	03:59	20:05	21:11	23:30
64°	01:33	03:11	04:11	19:53	20:52	22:26
62°	02:08	03:27	04:21	19:44	20:36	21:54
60°	02:33	03:40	04:29	19:35	20:24	21:30
N 58°	02:51	03:52	04:37	19:28	20:13	21:12
56°	03:07	04:01	04:43	19:22	20:03	20:57
54°	03:19	04:10	04:49	19:16	19:55	20:45
52°	03:30	04:17	04:54	19:11	19:48	20:34
50°	03:40	04:24	04:59	19:06	19:41	20:25
45°	03:59	04:38	05:09	18:56	19:28	20:06
N 40°	04:15	04:49	05:17	18:48	19:16	19:51
35°	04:27	04:58	05:25	18:41	19:07	19:39
30°	04:37	05:06	05:31	18:35	19:00	19:29
20°	04:52	05:19	05:42	18:24	18:47	19:13
N 10°	05:04	05:30	05:51	18:15	18:36	19:02
0°	05:14	05:39	06:00	18:06	18:28	18:52
S 10°	05:22	05:47	06:08	17:58	18:19	18:44
20°	05:29	05:55	06:17	17:49	18:12	18:37
30°	05:35	06:03	06:27	17:39	18:04	18:32
35°	05:38	06:07	06:33	17:33	17:59	18:29
40°	05:40	06:12	06:40	17:27	17:55	18:26
45°	05:43	06:17	06:47	17:19	17:50	18:24
S 50°	05:46	06:23	06:56	17:11	17:44	18:22
52°	05:46	06:26	07:01	17:06	17:41	18:21
54°	05:47	06:29	07:05	17:02	17:38	18:20
56°	05:48	06:32	07:10	16:57	17:35	18:19
58°	05:49	06:35	07:16	16:51	17:32	18:18
S 60°	05:50	06:39	07:22	16:45	17:29	18:17

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	21:25
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	00:07	<input type="checkbox"/>	22:23	20:55
68°	<input type="checkbox"/>	<input type="checkbox"/>	01:12	<input type="checkbox"/>	21:17	20:33
66°	<input type="checkbox"/>	<input type="checkbox"/>	01:47	<input type="checkbox"/>	20:40	20:15
64°	23:58	· · ·	02:12	20:38	20:14	20:00
62°	· · ·	00:36	02:32	20:00	19:53	19:48
60°	· · ·	01:02	02:48	19:33	19:37	19:37
N 58°	· · ·	01:22	03:01	19:12	19:22	19:28
56°	00:07	01:39	03:13	18:54	19:10	19:20
54°	00:26	01:54	03:23	18:40	18:59	19:13
52°	00:42	02:06	03:32	18:27	18:50	19:06
50°	00:56	02:17	03:40	18:15	18:41	19:00
45°	01:24	02:40	03:56	17:51	18:23	18:47
N 40°	01:46	02:58	04:10	17:32	18:08	18:37
35°	02:04	03:13	04:22	17:16	17:55	18:27
30°	02:19	03:26	04:32	17:02	17:44	18:19
20°	02:46	03:49	04:49	16:38	17:24	18:05
N 10°	03:09	04:08	05:04	16:17	17:07	17:53
0°	03:30	04:26	05:18	15:57	16:51	17:41
S 10°	03:51	04:44	05:32	15:37	16:35	17:29
20°	04:13	05:03	05:47	15:16	16:18	17:17
30°	04:39	05:25	06:03	14:51	15:58	17:02
35°	04:55	05:38	06:13	14:37	15:46	16:53
40°	05:12	05:53	06:24	14:20	15:33	16:44
45°	05:34	06:10	06:37	13:59	15:16	16:32
S 50°	06:01	06:31	06:53	13:33	14:56	16:18
52°	06:14	06:41	07:00	13:21	14:47	16:11
54°	06:29	06:53	07:09	13:06	14:36	16:04
56°	06:46	07:06	07:18	12:49	14:24	15:56
58°	07:07	07:21	07:28	12:29	14:09	15:46
S 60°	07:34	07:39	07:40	12:02	13:52	15:36

Day	Sun		Mer. Pass	Moon		Age 27-29 12-2%
	Eqn. of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
20	03:28	03:21	12:03	09:44	22:12	
21	03:13	03:06	12:03	10:39	23:05	
22	02:58	02:51	12:03	11:30	23:53	

August 23, 24, 25 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	331°32.53		212°46.61	N20°27.56	142°6.62	S03°40.76	223°58.74	N22°24.56	330°0.29	S02°0.53
1	346°34.99		227°45.93	27.12	157°7.62	41.42	239°0.69	24.50	345°2.89	0.60
2	1°37.46		242°45.25	26.68	172°8.62	42.07	254°2.64	24.45	0°5.49	0.67
3	16°39.92		257°44.57	•• 26.24	187°9.63	•• 42.73	269°4.59	•• 24.40	15°8.09	•• 0.74
4	31°42.39		272°43.89	25.79	202°10.63	43.38	284°6.54	24.34	30°10.69	0.80
5	46°44.85		287°43.21	25.35	217°11.63	44.03	299°8.49	24.29	45°13.29	0.87
6	61°47.32		302°42.53	N20°24.91	232°12.63	S03°44.69	314°10.44	N22°24.23	60°15.89	S02°0.94
7	76°49.78		317°41.85	24.46	247°13.63	45.34	329°12.38	24.18	75°18.49	1.01
8	91°52.24		332°41.18	24.02	262°14.63	46.00	344°14.33	24.13	90°21.10	1.07
9	106°54.71		347°40.50	•• 23.57	277°15.63	•• 46.65	359°16.28	•• 24.07	105°23.70	•• 1.14
10	121°57.17		2°39.82	23.12	292°16.63	47.31	14°18.23	24.02	120°26.30	1.21
11	136°59.64		17°39.14	22.67	307°17.63	47.96	29°20.18	23.97	135°28.90	1.28
12	152°2.10		32°38.46	N20°22.23	322°18.63	S03°48.61	44°22.13	N22°23.91	150°31.50	S02°1.35
13	167°4.56		47°37.79	21.77	337°19.63	49.27	59°24.08	23.86	165°34.10	1.41
14	182°7.03		62°37.11	21.32	352°20.63	49.92	74°26.03	23.81	180°36.71	1.48
15	197°9.49		77°36.43	•• 20.87	7°21.63	•• 50.58	89°27.98	•• 23.75	195°39.31	•• 1.55
16	212°11.96		92°35.76	20.42	22°22.62	51.23	104°29.93	23.70	210°41.91	1.62
17	227°14.42		107°35.08	19.96	37°23.62	51.89	119°31.88	23.64	225°44.51	1.69
18	242°16.88		122°34.40	N20°19.51	52°24.62	S03°52.54	134°33.83	N22°23.59	240°47.11	S02°1.75
19	257°19.35		137°33.73	19.05	67°25.62	53.19	149°35.79	23.54	255°49.72	1.82
20	272°21.81		152°33.05	18.59	82°26.62	53.85	164°37.74	23.48	270°52.32	1.89
21	287°24.28		167°32.37	•• 18.13	97°27.62	•• 54.50	179°39.69	•• 23.43	285°54.92	•• 1.96
22	302°26.74		182°31.70	17.67	112°28.62	55.16	194°41.64	23.37	300°57.53	2.03
23	317°29.20		197°31.02	17.21	127°29.61	55.81	209°43.59	23.32	316°0.13	2.09
Mer.pass. 01:54		ν-0.7' d-0.4' m-3.96		ν1.0' d0.7' m1.62		ν1.9' d-0.1' m-1.96		ν2.6' d0.1' m0.69		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°31.67		212°30.35	N20°16.75	142°30.61	S03°56.47	224°45.54	N22°23.27	331°2.73	S02°2.16
1	347°34.13		227°29.67	16.29	157°31.61	57.12	239°47.49	23.21	346°5.33	2.23
2	2°36.60		242°29.00	15.82	172°32.61	57.77	254°49.45	23.16	1°7.94	2.30
3	17°39.06		257°28.32	•• 15.36	187°33.60	•• 58.43	269°51.40	•• 23.11	16°10.54	•• 2.37
4	32°41.52		272°27.65	14.89	202°34.60	59.08	284°53.35	23.05	31°13.14	2.44
5	47°43.99		287°26.97	14.43	217°35.60	03°59.74	299°55.30	23.00	46°15.75	2.51
6	62°46.45		302°26.30	N20°13.96	232°36.60	S04°0.39	314°57.25	N22°22.94	61°18.35	S02°2.57
7	77°48.92		317°25.62	13.49	247°37.59	1.04	329°59.21	22.89	76°20.96	2.64
8	92°51.38		332°24.95	13.02	262°38.59	1.70	345°1.16	22.84	91°23.56	2.71
9	107°53.84		347°24.28	•• 12.55	277°39.59	•• 2.35	0°3.11	•• 22.78	106°26.16	•• 2.78
10	122°56.31		2°23.60	12.08	292°40.58	3.01	15°5.07	22.73	121°28.77	2.85
11	137°58.77		17°22.93	11.61	307°41.58	3.66	30°7.02	22.67	136°31.37	2.92
12	153°1.24		32°22.26	N20°11.13	322°42.57	S04°4.31	45°8.97	N22°22.62	151°33.98	S02°2.99
13	168°3.70		47°21.58	10.66	337°43.57	4.97	60°10.93	22.57	166°36.58	3.05
14	183°6.16		62°20.91	10.18	352°44.57	5.62	75°12.88	22.51	181°39.18	3.12
15	198°8.63		77°20.24	•• 9.70	7°45.56	•• 6.28	90°14.83	•• 22.46	196°41.79	•• 3.19
16	213°11.09		92°19.57	9.23	22°46.56	6.93	105°16.79	22.40	211°44.39	3.26
17	228°13.56		107°18.89	8.75	37°47.55	7.59	120°18.74	22.35	226°47.00	3.33
18	243°16.02		122°18.22	N20°8.27	52°48.55	S04°8.24	135°20.70	N22°22.30	241°49.60	S02°3.40
19	258°18.49		137°17.55	7.79	67°49.54	8.89	150°22.65	22.24	256°52.21	3.47
20	273°20.95		152°16.88	7.31	82°50.54	9.55	165°24.61	22.19	271°54.81	3.54
21	288°23.41		167°16.21	•• 6.82	97°51.53	•• 10.20	180°26.56	•• 22.13	286°57.42	•• 3.61
22	303°25.88		182°15.54	6.34	112°52.53	10.86	195°28.52	22.08	302°0.02	3.68
23	318°28.34		197°14.86	5.86	127°53.52	11.51	210°30.47	22.02	317°2.63	3.74
Mer.pass. 01:50		ν-0.7' d-0.5' m-3.96		ν1.0' d0.7' m1.62		ν2.0' d-0.1' m-1.97		ν2.6' d0.1' m0.69		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	333°30.81		212°14.19	N20°5.37	142°54.52	S04°12.16	225°32.43	N22°21.97	332°5.23	S02°3.81
1	348°33.27		227°13.52	4.88	157°55.51	12.82	240°34.38	21.92	347°7.84	3.88
2	3°35.73		242°12.85	4.40	172°56.51	13.47	255°36.34	21.86	2°10.45	3.95
3	18°38.20		257°12.18	•• 3.91	187°57.50	•• 14.13	270°38.29	•• 21.81	17°13.05	•• 4.02
4	33°40.66		272°11.51	3.42	202°58.49	14.78	285°40.25	21.75	32°15.66	4.09
5	48°43.13		287°10.84	2.93	217°59.49	15.43	300°42.20	21.70	47°18.26	4.16
6	63°45.59		302°10.17	N20°2.44	233°0.48	S04°16.09	315°44.16	N22°21.65	62°20.87	S02°4.23
7	78°48.05		317°9.50	1.94	248°1.47	16.74	330°46.12	21.59	77°23.48	4.30
8	93°50.52		332°8.83	1.45	263°2.47	17.39	345°48.07	21.54	92°26.08	4.37
9	108°52.98		347°8.17	•• 0.96	278°3.46	•• 18.05	0°50.03	•• 21.48	107°28.69	•• 4.44
10	123°55.45		2°7.50	0.46	293°4.45	18.70	15°51.99	21.43	122°31.29	4.51
11	138°57.91		17°6.83	19°59.96	308°5.45	19.36	30°53.94	21.38	137°33.90	4.58
12	154°0.37		32°5.16	N19°59.47	323°6.44	S04°20.01	45°55.90	N22°21.32	152°36.51	S02°4.65
13	169°2.84		47°5.49	58.97	338°7.43	20.66	60°57.86	21.27	167°39.11	4.72
14	184°5.30		62°4.82	58.47	353°8.42	21.32	75°59.82	21.21	182°41.72	4.79
15	199°7.77		77°4.16	•• 57.97	8°9.42	•• 21.97	91°1.77	•• 21.16	197°44.33	•• 4.86
16	214°10.23		92°3.49	57.47	23°10.41	22.63	106°3.73	21.10	212°46.94	4.93
17	229°12.69		107°2.82	56.96	38°11.40	23.28	121°5.69	21.05	227°49.54	5.00
18	244°15.16		122°2.15	N19°56.46	53°12.39	S04°23.93	136°7.65	N22°21.00	242°52.15	S02°5.07
19	259°17.62		137°1.49	55.96	68°13.38	24.59	151°9.61	20.94	257°54.76	5.14
20	274°20.09		152°0.82	55.45	83°14.37	25.24	166°11.56	20.89	272°57.37	5.21
21	289°22.55		167°0.15	•• 54.94	98°15.37	•• 25.90	181°13.52	•• 20.83	287°59.97	•• 5.28
22	304°25.01		181°59.49	54.44	113°16.36	26.55	196°15.48	20.78	303°2.58	5.35
23	319°27.48		196°58.82	53.93	128°17.35	27.20	211°17.44	20.72	318°5.19	5.42
Mer.pass. 01:46		ν-0.7' d-0.5' m-3.95		ν1.0' d0.7' m1.62		ν2.0' d-0.1' m-1.97		ν2.6' d0.1' m0.68		

	SHA	Dec
Alpheratz	357°33.93	29°13.97
Ankaa	353°6.26	-42°9.74
Schedar	349°30.03	56°40.60
Diphda	348°46.51	-17°50.54
Achernar	335°19.42	-57°6.06
Hamal	327°50.44	23°35.05
Polaris	313°39.92	89°22.03
Acamar	315°11.25	-40°11.76
Menkar	314°5.52	4°11.56
Mirfak	308°27.44	49°56.99
Aldebaran	290°39.07	16°33.70
Rigel	281°3.46	-8°10.12
Capella	280°21.26	46°1.30
Bellatrix	278°22.43	6°22.49
Elnath	278°1.34	28°37.72
Alnilam	275°37.32	-1°10.97
Betelgeuse	270°51.67	7°24.82
Canopus	263°52.48	-52°42.21
Sirius	258°25.99	-16°44.86
Adhara	255°5.71	-29°0.15
Procyon	244°50.54	5°9.67
Pollux	243°16.96	27°57.88
Avior	234°15.13	-59°35.28
Suhail	222°46.37	-43°32.01
Miaplacidus	221°39.14	-69°49.20
Alphard	217°47.56	-8°46.06
Regulus	207°34.21	11°50.62
Dubhe	193°40.96	61°36.88
Denebola	182°24.69	14°25.85
Gienah	175°43.32	-17°41.03
Acrux	173°0.12	-63°14.62
Gacrux	171°51.56	-57°15.54
Alioth	166°12.87	55°49.45
Spica	158°21.95	-11°17.68
Alkaid	152°51.82	49°11.34
Hadar	148°35.59	-60°30.01
Menkent	147°57.19	-36°29.87
Arcturus	145°47.56	19°3.09
Rigel Kent.	139°39.83	-60°56.70
Kochab	137°20.08	74°3.23
Zuben'ubi	136°55.53	-16°8.91
Alphecca	126°3.32	26°37.89
Antares	112°15.13	-26°29.39
Atria	107°8.73	-69°4.65
Sabik	102°2.07	-15°45.39
Shaula	96°9.48	-37°7.43
Rasalhague	95°57.92	12°32.62
Eltanin	90°41.68	51°29.34
Kaus Aust.	83°31.57	-34°22.39
Vega	80°32.60	38°48.63
Nunki	75°46.85	-26°15.89
Altair	61°59.17	8°56.29
Peacock	53°4.33	-56°39.17
Deneb	49°25.03	45°22.44
Enif	33°37.96	9°59.68
Al Na'ir	27°31.76	-46°50.10
Fomalhaut	15°13.56	-29°29.02
Scheat	13°44.35	28°13.39
Markab	13°29.06	15°20.70

Aug 23 Sat	SHA	Mer.pass
Venus	241°14.08	09:49
Mars	170°34.09	14:31
Jupiter	252°26.21	09:03
Saturn	358°27.76	02:00

Aug 24 Sun	SHA	Mer.pass
Venus	239°58.68	09:50
Mars	169°58.94	14:29
Jupiter	252°13.87	09:00
Saturn	358°31.06	01:55

Aug 25 Mon	SHA	Mer.pass
Venus	238°43.39	09:51
Mars	169°23.71	14:27
Jupiter	252°1.62	08:57
Saturn	358°34.43	01:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°19.26	N11°25.39	181°35.59	12.9'	N14°16.94	-13.9'	56.7'
1	194°19.43	24.54	196°7.45	13.0'	14°3.04	-14.0'	56.7'
2	209°19.59	23.69	210°39.41	13.0'	13°49.08	-14.0'	56.7'
3	224°19.75	· · 22.84	225°11.45	13.1'	13°35.08	-14.1'	56.7'
4	239°19.91	21.99	239°43.58	13.2'	13°21.03	-14.1'	56.6'
5	254°20.08	21.14	254°15.79	13.3'	13°6.92	-14.1'	56.6'
6	269°20.24	N11°20.29	268°48.08	13.4'	N12°52.78	-14.2'	56.6'
7	284°20.41	19.44	283°20.45	13.5'	12°38.58	-14.2'	56.6'
8	299°20.57	18.59	297°52.91	13.5'	12°24.34	-14.3'	56.5'
9	314°20.73	· · 17.74	312°25.44	13.6'	12°10.06	-14.3'	56.5'
10	329°20.90	16.89	326°58.06	13.7'	11°55.73	-14.4'	56.5'
11	344°21.06	16.04	341°30.75	13.8'	11°41.37	-14.4'	56.5'
12	359°21.23	N11°15.19	356°3.52	13.8'	N11°26.96	-14.4'	56.4'
13	14°21.39	14.33	10°36.36	13.9'	11°12.52	-14.5'	56.4'
14	29°21.56	13.48	25°9.28	14.0'	10°58.04	-14.5'	56.4'
15	44°21.72	· · 12.63	39°42.27	14.1'	10°43.53	-14.5'	56.4'
16	59°21.89	11.78	54°15.33	14.1'	10°28.98	-14.6'	56.3'
17	74°22.05	10.92	68°48.46	14.2'	10°14.40	-14.6'	56.3'
18	89°22.22	N11°10.07	83°21.66	14.3'	N09°59.79	-14.6'	56.3'
19	104°22.39	9.21	97°54.94	14.3'	09°45.15	-14.7'	56.3'
20	119°22.55	8.36	112°28.28	14.4'	09°30.48	-14.7'	56.3'
21	134°22.72	· · 7.51	127°1.68	14.5'	09°15.78	-14.7'	56.2'
22	149°22.89	6.65	141°35.15	14.5'	09°1.05	-14.8'	56.2'
23	164°23.05	5.80	156°8.69	14.6'	08°46.30	-14.8'	56.2'
SD = 15.8'			SD = 15.5'				
d = -0.8'							

Sun	GHA		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.22	N11°4.94	170°42.29	14.7'	N08°31.53	-14.8'	56.2'
1	194°23.39	4.08	185°15.95	14.7'	08°16.73	-14.8'	56.1'
2	209°23.55	3.23	199°49.67	14.8'	08°1.91	-14.8'	56.1'
3	224°23.72	· · 2.37	214°23.45	14.8'	07°47.07	-14.9'	56.1'
4	239°23.89	1.51	228°57.29	14.9'	07°32.21	-14.9'	56.1'
5	254°24.06	11°0.66	243°31.19	15.0'	07°17.34	-14.9'	56.0'
6	269°24.23	N10°59.80	258°5.14	15.0'	N07°2.44	-14.9'	56.0'
7	284°24.39	58.94	272°39.15	15.1'	06°47.53	-14.9'	56.0'
8	299°24.56	58.09	287°13.22	15.1'	06°32.61	-14.9'	56.0'
9	314°24.73	· · 57.23	301°47.33	15.2'	06°17.67	-15.0'	56.0'
10	329°24.90	56.37	316°21.50	15.2'	06°2.72	-15.0'	55.9'
11	344°25.07	55.51	330°55.72	15.3'	05°47.75	-15.0'	55.9'
12	359°25.24	N10°54.65	345°29.99	15.3'	N05°32.78	-15.0'	55.9'
13	14°25.41	53.79	0°4.30	15.4'	05°17.80	-15.0'	55.9'
14	29°25.58	52.93	14°38.67	15.4'	05°2.81	-15.0'	55.8'
15	44°25.75	· · 52.07	29°13.08	15.5'	04°47.81	-15.0'	55.8'
16	59°25.92	51.21	43°47.53	15.5'	04°32.80	-15.0'	55.8'
17	74°26.09	50.35	58°22.03	15.5'	04°17.80	-15.0'	55.8'
18	89°26.26	N10°49.49	72°56.57	15.6'	N04°2.78	-15.0'	55.7'
19	104°26.43	48.63	87°31.15	15.6'	03°47.77	-15.0'	55.7'
20	119°26.60	47.77	102°5.77	15.7'	03°32.75	-15.0'	55.7'
21	134°26.77	· · 46.90	116°40.43	15.7'	03°17.73	-15.0'	55.7'
22	149°26.94	46.04	131°15.13	15.7'	03°2.71	-15.0'	55.7'
23	164°27.11	45.18	145°49.87	15.8'	02°47.69	-15.0'	55.6'
SD = 15.8'			SD = 15.3'				
d = -0.9'							

Mon	GHA		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.28	N10°44.32	160°24.64	15.8'	N02°32.67	-15.0'	55.6'
1	194°27.45	43.45	174°59.45	15.8'	02°17.66	-15.0'	55.6'
2	209°27.63	42.59	189°34.29	15.9'	02°2.65	-15.0'	55.6'
3	224°27.80	· · 41.73	204°9.16	15.9'	01°47.64	-15.0'	55.5'
4	239°27.97	40.86	218°44.06	15.9'	01°32.64	-15.0'	55.5'
5	254°28.14	40.00	233°18.99	16.0'	01°17.65	-15.0'	55.5'
6	269°28.31	N10°39.14	247°53.96	16.0'	N01°2.66	-15.0'	55.5'
7	284°28.49	38.27	262°28.95	16.0'	00°47.69	-15.0'	55.5'
8	299°28.66	37.41	277°3.96	16.0'	00°32.72	-15.0'	55.4'
9	314°28.83	· · 36.54	291°39.00	16.1'	00°17.76	-14.9'	55.4'
10	329°29.01	35.68	306°14.07	16.1'	N00°2.82	-14.9'	55.4'
11	344°29.18	34.81	320°49.16	16.1'	S00°12.11	14.9'	55.4'
12	359°29.35	N10°33.94	335°24.27	16.1'	S00°27.03	14.9'	55.3'
13	14°29.53	33.08	349°59.40	16.2'	00°41.94	14.9'	55.3'
14	29°29.70	32.21	4°34.55	16.2'	00°56.83	14.9'	55.3'
15	44°29.87	· · 31.34	19°9.73	16.2'	01°11.71	14.9'	55.3'
16	59°30.05	30.48	33°44.91	16.2'	01°26.56	14.8'	55.3'
17	74°30.22	29.61	48°20.12	16.2'	01°41.40	14.8'	55.2'
18	89°30.40	N10°28.74	62°55.34	16.2'	S01°56.23	14.8'	55.2'
19	104°30.57	27.87	77°30.58	16.2'	02°11.03	14.8'	55.2'
20	119°30.75	27.00	92°5.82	16.3'	02°25.81	14.8'	55.2'
21	134°30.92	· · 26.13	106°41.08	16.3'	02°40.58	14.7'	55.2'
22	149°31.10	25.27	121°16.36	16.3'	02°55.32	14.7'	55.1'
23	164°31.27	24.40	135°51.64	16.3'	03°10.03	14.7'	55.1'
SD = 15.8'			SD = 15.2'				
d = -0.9'							

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	01:18	03:21	20:40	22:35	////
N 70°	////	02:11	03:41	20:20	21:48	////
68°	////	02:42	03:57	20:05	21:18	////
66°	01:07	03:05	04:09	19:53	20:57	22:47
64°	01:54	03:22	04:20	19:43	20:39	22:05
62°	02:23	03:37	04:29	19:34	20:25	21:38
60°	02:44	03:49	04:36	19:27	20:14	21:18
N 58°	03:01	03:59	04:43	19:20	20:04	21:01
56°	03:15	04:08	04:49	19:14	19:55	20:48
54°	03:27	04:16	04:54	19:09	19:48	20:36
52°	03:37	04:23	04:59	19:05	19:41	20:26
50°	03:46	04:29	05:03	19:00	19:35	20:17
45°	04:04	04:42	05:13	18:51	19:22	20:00
N 40°	04:18	04:52	05:20	18:44	19:12	19:46
35°	04:29	05:01	05:27	18:37	19:03	19:35
30°	04:39	05:08	05:33	18:32	18:56	19:25
20°	04:53	05:20	05:43	18:22	18:44	19:11
N 10°	05:05	05:30	05:51	18:13	18:35	19:00
0°	05:13	05:38	05:59	18:06	18:27	18:51
S 10°	05:21	05:45	06:07	17:58	18:19	18:44
20°	05:27	05:53	06:15	17:50	18:12	18:38
30°	05:32	06:00	06:24	17:41	18:05	18:33
35°	05:34	06:04	06:29	17:36	18:01	18:31
40°	05:36	06:08	06:35	17:30	17:57	18:29
45°	05:38	06:12	06:42	17:23	17:53	18:27
S 50°	05:40	06:17	06:50	17:15	17:48	18:26
52°	05:41	06:20	06:54	17:11	17:46	18:25
54°	05:41	06:22	06:58	17:07	17:43	18:25
56°	05:42	06:25	07:03	17:03	17:41	18:24
58°	05:42	06:28	07:08	16:58	17:38	18:24
S 60°	05:42	06:31	07:14	16:52	17:35	18:23

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	02:48	05:16	07:23	20:32	19:54	19:21
N 70°	03:16	05:27	07:24	20:18	19:50	19:24
68°	03:37	05:36	07:25	20:07	19:46	19:27
66°	03:53	05:43	07:26	19:57	19:43	19:29
64°	04:06	05:49	07:26	19:49	19:40	19:31
62°	04:17	05:55	07:27	19:43	19:38	19:33
60°	04:27	05:59	07:27	19:37	19:35	19:34
N 58°	04:35	06:03	07:27	19:31	19:34	19:35
56°	04:42	06:07	07:28	19:27	19:32	19:36
54°	04:48	06:10	07:28	19:22	19:30	19:37
52°	04:54	06:13	07:28	19:19	19:29	19:38
50°	04:59	06:15	07:28	19:15	19:28	19:39
45°	05:10	06:21	07:29	19:07	19:25	19:41
N 40°	05:19	06:26	07:29	19:01	19:22	19:43
35°	05:27	06:30	07:30	18:55	19:20	19:44
30°	05:34	06:33	07:30	18:50	19:19	19:45
20°	05:46	06:39	07:30	18:42	19:15	19:47
N 10°	05:56	06:45	07:31	18:34	19:12	19:49
0°	06:05	06:50	07:31	18:27	19:10	19:51
S 10°	06:15	06:55	07:32	18:20	19:07	19:53
20°	06:25	07:00	07:32	18:12	19:04	19:55
30°	06:36	07:06	07:33	18:03	19:01	19:57
35°	06:43	07:09	07:33	17:58	18:59	19:58
40°	06:51	07:13	07:34	17:52	18:56	19:59
45°	06:59	07:18	07:34	17:45	18:54	20:01
S 50°	07:10	07:23	07:35	17:36	18:51	20:03
52°	07:14	07:25	07:35	17:32	18:49	20:04
54°	07:20	07:28	07:35	17:28	18:48	20:05
56°	07:25	07:31	07:36	17:23	18:46	20:06
58°	07:32	07:34	07:36	17:18	18:44	20:07
S 60°	07:39	07:38	07:36	17:12	18:42	20:08

August 26, 27, 28 UT (Tue., Wed., Thu.)

h	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	334°29.94	211°58.16	N19°53.42	143°18.34	S04°27.86	226°19.40	N22°20.67	333°7.80	S02°5.49	<div>Alpheratz 357°33.92 29°13.98</div> <div>Ankaa 353°6.24 -42°9.75</div> <div>Schedar 349°30.01 56°40.62</div> <div>Diphda 348°46.49 -17°50.54</div> <div>Achernar 335°19.39 -57°6.07</div> <div>Hamal 327°50.43 23°35.06</div> <div>Polaris 313°38.48 89°22.04</div> <div>Acamar 315°11.23 -40°11.76</div> <div>Menkar 314°5.50 4°11.56</div> <div>Mirfak 308°27.41 49°57.00</div> <div>Aldebaran 290°39.05 16°33.71</div> <div>Rigel 281°3.45 -8°10.11</div> <div>Capella 280°21.24 46°1.30</div> <div>Bellatrix 278°22.41 6°22.50</div> <div>Elnath 278°1.32 28°37.72</div> <div>Alnilam 275°37.31 -1°10.97</div> <div>Betelgeuse 270°51.65 7°24.82</div> <div>Canopus 263°52.45 -52°42.20</div> <div>Sirius 258°25.98 -16°44.85</div> <div>Adhara 255°5.70 -29°0.15</div> <div>Procyon 244°50.53 5°9.67</div> <div>Pollux 243°16.95 27°57.87</div> <div>Avior 234°15.12 -59°35.26</div> <div>Suhail 222°46.37 -43°31.99</div> <div>Miaplacidus 221°39.13 -69°49.19</div> <div>Alphard 217°47.56 -8°46.06</div> <div>Regulus 207°34.20 11°50.62</div> <div>Dubhe 193°40.96 61°36.86</div> <div>Denebola 182°24.70 14°25.85</div> <div>Gienah 175°43.33 -17°41.02</div> <div>Acrux 173°0.14 -63°14.61</div> <div>Gacrux 171°51.57 -57°15.53</div> <div>Alioth 166°12.89 55°49.44</div> <div>Spica 158°21.96 -11°17.68</div> <div>Alkaid 152°51.84 49°11.33</div> <div>Hadar 148°35.62 -60°30.00</div> <div>Menkent 147°57.21 -36°29.86</div> <div>Arcturus 145°47.58 19°3.09</div> <div>Rigel Kent. 139°39.87 -60°56.70</div> <div>Kochab 137°20.13 74°3.23</div> <div>Zuben'ubi 136°55.54 -16°8.90</div> <div>Alphecca 126°3.34 26°37.89</div> <div>Antares 112°15.15 -26°29.39</div> <div>Atria 107°8.78 -69°4.66</div> <div>Sabik 102°2.08 -15°45.39</div> <div>Shaula 96°9.50 -37°7.43</div> <div>Rasalhague 95°57.93 12°32.62</div> <div>Eltanin 90°41.70 51°29.35</div> <div>Kaus Aust. 83°31.59 -34°22.40</div> <div>Vega 80°32.62 38°48.64</div> <div>Nunki 75°46.86 -26°15.89</div> <div>Altair 61°59.18 8°56.29</div> <div>Peacock 53°4.35 -56°39.18</div> <div>Deneb 49°25.04 45°22.45</div> <div>Enif 33°37.96 9°59.68</div> <div>Al Na'ir 27°31.76 -46°50.11</div> <div>Fomalhaut 15°13.56 -29°29.02</div> <div>Scheat 13°44.35 28°13.40</div> <div>Markab 13°29.06 15°20.71</div>								
1	349°32.41	226°57.49	52.91	158°19.33	28.51	241°21.36	20.62	348°10.40	5.56									
2	4°34.87	241°56.82	52.40	173°20.32	29.16	256°23.32	20.56	3°13.01	5.63									
3	19°37.33	256°56.16	•• 51.89	188°21.31	•• 29.82	271°25.28	•• 20.51	18°15.62	•• 5.70									
4	34°39.80	271°55.49	51.37	203°22.30	30.47	286°27.24	20.45	33°18.23	5.77									
5	49°42.26	286°54.83	50.86	218°23.29	31.13	301°29.20	20.40	48°20.84	5.84									
6	64°44.73	301°54.16	N19°50.34	233°24.28	S04°31.78	316°31.16	N22°20.34	63°23.45	S02°5.91									
7	79°47.19	316°53.50	49.83	248°25.27	32.43	331°33.12	20.29	78°26.05	5.98									
8	94°49.65	331°52.84	49.31	263°26.26	33.09	346°35.08	20.23	93°28.66	6.05									
9	109°52.12	346°52.17	•• 48.79	278°27.25	•• 33.74	1°37.04	•• 20.18	108°31.27	•• 6.12									
10	124°54.58	1°51.51	48.27	293°28.24	34.39	16°39.00	20.13	123°33.88	6.19									
11	139°57.05	16°50.84	47.75	308°29.23	35.05	31°40.96	20.07	138°36.49	6.26									
12	154°59.51	31°50.18	N19°47.23	323°30.22	S04°35.70	46°42.92	N22°20.02	153°39.10	S02°6.33									
13	170°1.97	46°49.52	46.71	338°31.21	36.35	61°44.88	19.96	168°41.71	6.40									
14	185°4.44	61°48.86	46.19	353°32.19	37.01	76°46.84	19.91	183°44.32	6.47									
15	200°6.90	76°48.19	•• 45.66	8°33.18	•• 37.66	91°48.80	•• 19.85	198°46.93	•• 6.54									
16	215°9.37	91°47.53	45.14	23°34.17	38.31	106°50.76	19.80	213°49.54	6.61									
17	230°11.83	106°46.87	44.61	38°35.16	38.97	121°52.73	19.74	228°52.14	6.68									
18	245°14.29	121°46.21	N19°44.09	53°36.15	S04°39.62	136°54.69	N22°19.69	243°54.75	S02°6.75									
19	260°16.76	136°45.54	43.56	68°37.14	40.28	151°56.65	19.64	258°57.36	6.82									
20	275°19.22	151°44.88	43.03	83°38.12	40.93	166°58.61	19.58	273°59.97	6.89									
21	290°21.69	166°44.22	•• 42.50	98°39.11	•• 41.58	182°0.57	•• 19.53	289°2.58	•• 6.96									
22	305°24.15	181°43.56	41.97	113°40.10	42.24	197°2.54	19.47	304°5.19	7.04									
23	320°26.61	196°42.90	41.44	128°41.09	42.89	212°4.50	19.42	319°7.80	7.11									
Mer.pass. 01:42			ν-0.7' d-0.5' m-3.95			ν1.0' d0.7' m1.62			ν2.0' d-0.1' m-1.97			ν2.6' d0.1' m0.68						
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec									
0	335°29.08	211°42.24	N19°40.91	143°42.07	S04°43.54	227°6.46	N22°19.36	334°10.41	S02°7.18									
1	350°31.54	226°41.58	40.37	158°43.06	44.20	242°8.43	19.31	349°13.02	7.25									
2	5°34.01	241°40.92	39.84	173°44.05	44.85	257°10.39	19.25	4°15.63	7.32									
3	20°36.47	256°40.26	•• 39.30	188°45.03	•• 45.50	272°12.35	•• 19.20	19°18.25	•• 7.39									
4	35°38.94	271°39.60	38.76	203°46.02	46.16	287°14.31	19.14	34°20.86	7.46									
5	50°41.40	286°38.94	38.23	218°47.01	46.81	302°16.28	19.09	49°23.47	7.53									
6	65°43.86	301°38.28	N19°37.69	233°47.99	S04°47.46	317°18.24	N22°19.04	64°26.08	S02°7.60									
7	80°46.33	316°37.62	37.15	248°48.98	48.12	332°20.21	18.98	79°28.69	7.67									
8	95°48.79	331°36.96	36.61	263°49.97	48.77	347°22.17	18.93	94°31.30	7.75									
9	110°51.26	346°36.30	•• 36.07	278°50.95	•• 49.42	2°24.13	•• 18.87	109°33.91	•• 7.82									
10	125°53.72	1°35.65	35.52	293°51.94	50.08	17°26.10	18.82	124°36.52	7.89									
11	140°56.18	16°34.99	34.98	308°52.92	50.73	32°28.06	18.76	139°39.13	7.96									
12	155°58.65	31°34.33	N19°34.44	323°53.91	S04°51.38	47°30.03	N22°18.71	154°41.74	S02°8.03									
13	171°1.11	46°33.67	33.89	338°54.89	52.04	62°31.99	18.65	169°44.36	8.10									
14	186°3.58	61°33.01	33.35	353°55.88	52.69	77°33.96	18.60	184°46.97	8.17									
15	201°6.04	76°32.36	•• 32.80	8°56.86	•• 53.34	92°35.92	•• 18.54	199°49.58	•• 8.24									
16	216°8.50	91°31.70	32.25	23°57.85	54.00	107°37.89	18.49	214°52.19	8.32									
17	231°10.97	106°31.04	31.70	38°58.83	54.65	122°39.85	18.43	229°54.80	8.39									
18	246°13.43	121°30.39	N19°31.15	53°59.82	S04°55.30	137°41.82	N22°18.38	244°57.41	S02°8.46									
19	261°15.90	136°29.73	30.60	69°0.80	55.95	152°43.79	18.33	260°0.03	8.53									
20	276°18.36	151°29.07	30.05	84°1.79	56.61	167°45.75	18.27	275°2.64	8.60									
21	291°20.82	166°28.42	•• 29.50	99°2.77	•• 57.26	182°47.72	•• 18.22	290°5.25	•• 8.67									
22	306°23.29	181°27.76	28.94	114°3.75	57.91	197°49.68	18.16	305°7.86	8.74									
23	321°25.75	196°27.11	28.39	129°4.74	58.57	212°51.65	18.11	320°10.47	8.82									
Mer.pass. 01:38			ν-0.7' d-0.5' m-3.95			ν1.0' d0.7' m1.62			ν2.0' d-0.1' m-1.98			ν2.6' d0.1' m0.67						
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec									
0	336°28.22	211°26.45	N19°27.83	144°5.72	S04°59.22	227°53.62	N22°18.05	335°13.09	S02°8.89									
1	351°30.68	226°25.80	27.27	159°6.70	04°59.87	242°55.58	18.00	350°15.70	8.96									
2	6°33.14	241°25.14	26.72	174°7.69	05°0.53	257°57.55	17.94	5°18.31	9.03									
3	21°35.61	256°24.49	•• 26.16	189°8.67	•• 1.18	272°59.52	•• 17.89	20°20.92	•• 9.10									
4	36°38.07	271°23.84	25.60	204°9.65	1.83	288°1.49	17.83	35°23.54	9.17									
5	51°40.54	286°23.18	25.04	219°10.64	2.48	303°3.45	17.78	50°26.15	9.25									
6	66°43.00	301°22.53	N19°24.48	234°11.62	S05°3.14	318°5.42	N22°17.72	65°28.76	S02°9.32									
7	81°45.46	316°21.87	23.91	249°12.60	3.79	333°7.39	17.67	80°31.38	9.39									
8	96°47.93	331°21.22	23.35	264°13.58	4.44	348°9.36	17.61	95°33.99	9.46									
9	111°50.39	346°20.57	•• 22.78	279°14.57	•• 5.10	3°11.33	•• 17.56	110°36.60	•• 9.53									
10	126°52.86	1°19.92	22.22	294°15.55	5.75	18°13.29	17.50	125°39.22	9.61									
11	141°55.32	16°19.26	21.65	309°16.53	6.40	33°15.26	17.45	140°41.83	9.68									
12	156°57.79	31°18.61	N19°21.09	324°17.51	S05°7.05	48°17.23	N22°17.40	155°44.44	S02°9.75									
13	172°0.25	46°17.96	20.52	339°18.49	7.71	63°19.20	17.34	170°47.06	9.82									
14	187°2.71	61°17.31	19.95	354°19.47	8.36	78°21.17	17.29	185°49.67	9.89									
15	202°5.18	76°16.66	•• 19.38	9°20.46	•• 9.01	93°23.14	•• 17.23	200°52.28	•• 9.97									
16	217°7.64	91°16.01	18.81	24°21.44	9.67	108°25.11	17.18											

h		Sun		Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.45	N10°23.53	150°26.93	16.3'	S03°24.73	14.7'	55.1'
1	194°31.63	22.66	165°2.23	16.3'	03°39.40	14.6'	55.1'
2	209°31.80	21.79	179°37.53	16.3'	03°54.04	14.6'	55.1'
3	224°31.98	20.92	194°12.84	16.3'	04°8.66	14.6'	55.0'
4	239°32.15	20.05	208°48.16	16.3'	04°23.25	14.6'	55.0'
5	254°32.33	19.17	223°23.47	16.3'	04°37.82	14.5'	55.0'
6	269°32.51	N10°18.30	237°58.79	16.3'	S04°52.35	14.5'	55.0'
7	284°32.68	17.43	252°34.12	16.3'	05°6.86	14.5'	55.0'
8	299°32.86	16.56	267°9.44	16.3'	05°21.34	14.4'	54.9'
9	314°33.04	15.69	281°44.76	16.3'	05°35.78	14.4'	54.9'
10	329°33.22	14.81	296°20.08	16.3'	05°50.20	14.4'	54.9'
11	344°33.39	13.94	310°55.40	16.3'	06°4.58	14.3'	54.9'
12	359°33.57	N10°13.07	325°30.71	16.3'	S06°18.93	14.3'	54.9'
13	14°33.75	12.20	340°6.02	16.3'	06°33.24	14.3'	54.9'
14	29°33.93	11.32	354°41.32	16.3'	06°47.52	14.2'	54.8'
15	44°34.11	10.45	9°16.61	16.3'	07°1.77	14.2'	54.8'
16	59°34.28	9.57	23°51.90	16.3'	07°15.98	14.2'	54.8'
17	74°34.46	8.70	38°27.18	16.3'	07°30.15	14.1'	54.8'
18	89°34.64	N10°7.82	53°2.44	16.3'	S07°44.28	14.1'	54.8'
19	104°34.82	6.95	67°37.70	16.2'	07°58.38	14.1'	54.7'
20	119°35.00	6.07	82°12.94	16.2'	08°12.43	14.0'	54.7'
21	134°35.18	5.20	96°48.18	16.2'	08°26.45	14.0'	54.7'
22	149°35.36	4.32	111°23.39	16.2'	08°40.42	13.9'	54.7'
23	164°35.54	3.45	125°58.59	16.2'	08°54.36	13.9'	54.7'
SD = 15.8' $d = -0.9'$			SD = 15.0'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.72	N10°2.57	140°33.78	16.2'	S09°8.25	13.8'	54.7'
1	194°35.90	1.69	155°8.94	16.1'	09°22.09	13.8'	54.7'
2	209°36.08	10°0.82	169°44.09	16.1'	09°35.90	13.8'	54.6'
3	224°36.26	09°59.94	184°19.22	16.1'	09°49.66	13.7'	54.6'
4	239°36.44	59.06	198°54.33	16.1'	10°3.37	13.7'	54.6'
5	254°36.62	58.19	213°29.42	16.1'	10°17.04	13.6'	54.6'
6	269°36.80	N09°57.31	228°4.49	16.0'	S10°30.66	13.6'	54.6'
7	284°36.98	56.43	242°39.53	16.0'	10°44.24	13.5'	54.6'
8	299°37.16	55.55	257°14.55	16.0'	10°57.76	13.5'	54.5'
9	314°37.34	54.67	271°49.54	16.0'	11°11.24	13.4'	54.5'
10	329°37.52	53.79	286°24.51	15.9'	11°24.66	13.4'	54.5'
11	344°37.71	52.91	300°59.45	15.9'	11°38.04	13.3'	54.5'
12	359°37.89	N09°52.03	315°34.36	15.9'	S11°51.36	13.3'	54.5'
13	14°38.07	51.15	330°9.25	15.9'	12°4.64	13.2'	54.5'
14	29°38.25	50.27	344°44.10	15.8'	12°17.86	13.2'	54.5'
15	44°38.43	49.39	359°18.93	15.8'	12°31.02	13.1'	54.5'
16	59°38.62	48.51	13°53.72	15.8'	12°44.14	13.1'	54.4'
17	74°38.80	47.63	28°28.48	15.7'	12°57.19	13.0'	54.4'
18	89°38.98	N09°46.75	43°3.20	15.7'	S13°10.20	12.9'	54.4'
19	104°39.17	45.87	57°37.89	15.7'	13°23.14	12.9'	54.4'
20	119°39.35	44.99	72°12.55	15.6'	13°36.03	12.8'	54.4'
21	134°39.53	44.11	86°47.17	15.6'	13°48.86	12.8'	54.4'
22	149°39.72	43.22	101°21.75	15.5'	14°1.63	12.7'	54.4'
23	164°39.90	42.34	115°56.30	15.5'	14°14.34	12.7'	54.4'
SD = 15.8' $d = -0.9'$			SD = 14.9'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.08	N09°41.46	130°30.80	15.5'	S14°26.99	12.6'	54.3'
1	194°40.27	40.57	145°5.27	15.4'	14°39.58	12.5'	54.3'
2	209°40.45	39.69	159°39.69	15.4'	14°52.11	12.5'	54.3'
3	224°40.64	38.81	174°14.08	15.3'	15°4.58	12.4'	54.3'
4	239°40.82	37.92	188°48.42	15.3'	15°16.98	12.3'	54.3'
5	254°41.00	37.04	203°22.72	15.3'	15°29.32	12.3'	54.3'
6	269°41.19	N09°36.15	217°56.97	15.2'	S15°41.60	12.2'	54.3'
7	284°41.37	35.27	232°31.18	15.2'	15°53.81	12.1'	54.3'
8	299°41.56	34.39	247°5.35	15.1'	16°5.95	12.1'	54.3'
9	314°41.74	33.50	261°39.46	15.1'	16°18.03	12.0'	54.3'
10	329°41.93	32.61	276°13.53	15.0'	16°30.04	11.9'	54.3'
11	344°42.12	31.73	290°47.56	15.0'	16°41.98	11.9'	54.2'
12	359°42.30	N09°30.84	305°21.53	14.9'	S16°53.85	11.8'	54.2'
13	14°42.49	29.96	319°55.46	14.9'	17°5.65	11.7'	54.2'
14	29°42.67	29.07	334°29.33	14.8'	17°17.38	11.7'	54.2'
15	44°42.86	28.18	349°3.15	14.8'	17°29.04	11.6'	54.2'
16	59°43.05	27.30	3°36.93	14.7'	17°40.62	11.5'	54.2'
17	74°43.23	26.41	18°10.64	14.7'	17°52.14	11.4'	54.2'
18	89°43.42	N09°25.52	32°44.31	14.6'	S18°3.58	11.4'	54.2'
19	104°43.61	24.63	47°17.92	14.6'	18°14.94	11.3'	54.2'
20	119°43.79	23.75	61°51.48	14.5'	18°26.23	11.2'	54.2'
21	134°43.98	22.86	76°24.98	14.4'	18°37.45	11.1'	54.2'
22	149°44.17	21.97	90°58.43	14.4'	18°48.59	11.1'	54.2'
23	164°44.36	21.08	105°31.82	14.3'	18°59.65	11.0'	54.2'
SD = 15.8' $d = -0.9'$			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	01:52	03:37	20:22	22:03	////
N 70°	////	02:31	03:54	20:05	21:27	////
68°	////	02:57	04:08	19:52	21:02	23:23
66°	01:36	03:17	04:19	19:41	20:42	22:20
64°	02:12	03:33	04:29	19:32	20:27	21:47
62°	02:36	03:46	04:37	19:25	20:15	21:23
60°	02:55	03:57	04:44	19:18	20:04	21:05
N 58°	03:10	04:06	04:50	19:12	19:55	20:50
56°	03:23	04:14	04:55	19:07	19:47	20:38
54°	03:34	04:22	05:00	19:02	19:40	20:27
52°	03:43	04:28	05:04	18:58	19:34	20:18
50°	03:51	04:34	05:08	18:54	19:28	20:10
45°	04:08	04:45	05:16	18:46	19:17	19:54
N 40°	04:21	04:55	05:23	18:39	19:07	19:41
35°	04:32	05:03	05:29	18:33	18:59	19:30
30°	04:41	05:10	05:34	18:28	18:53	19:22
20°	04:54	05:21	05:43	18:19	18:42	19:08
N 10°	05:05	05:30	05:51	18:12	18:33	18:58
0°	05:13	05:37	05:58	18:05	18:26	18:50
S 10°	05:19	05:44	06:05	17:58	18:19	18:44
20°	05:25	05:50	06:13	17:51	18:13	18:39
30°	05:29	05:57	06:21	17:42	18:07	18:35
35°	05:31	06:00	06:26	17:38	18:03	18:33
40°	05:32	06:04	06:31	17:33	18:00	18:31
45°	05:33	06:07	06:37	17:27	17:56	18:30
S 50°	05:34	06:12	06:44	17:19	17:52	18:30
52°	05:34	06:14	06:48	17:16	17:50	18:29
54°	05:35	06:16	06:51	17:12	17:48	18:29
56°	05:35	06:18	06:56	17:08	17:46	18:29
58°	05:35	06:20	07:00	17:04	17:44	18:30
S 60°	05:34	06:23	07:05	16:59	17:42	18:30

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	09:27	11:38	14:50	18:46	18:02	16:19
N 70°	09:18	11:16	13:37	18:58	18:26	17:34
68°	09:11	11:00	13:00	19:07	18:44	18:12
66°	09:05	10:46	12:34	19:15	18:59	18:39
64°	09:00	10:35	12:15	19:22	19:12	19:00
62°	08:56	10:26	11:59	19:27	19:22	19:16
60°	08:52	10:18	11:46	19:33	19:31	19:31
N 58°	08:49	10:11	11:34	19:37	19:39	19:43
56°	08:46	10:05	11:25	19:41	19:46	19:53
54°	08:44	10:00	11:16	19:45	19:53	20:03
52°	08:42	09:55	11:08	19:48	19:58	20:11
50°	08:40	09:50	11:01	19:51	20:04	20:19
45°	08:35	09:41	10:47	19:57	20:15	20:35
N 40°	08:31	09:33	10:35	20:03	20:24	20:48
35°	08:28	09:26	10:24	20:08	20:32	20:59
30°	08:25	09:20	10:16	20:12	20:39	21:09
20°	08:20	09:10	10:00	20:19	20:52	21:26
N 10°	08:16	09:01	09:47	20:26	21:03	21:41
0°	08:12	08:53	09:35	20:32	21:13	21:56
S 10°	08:08	08:45	09:23	20:38	21:23	22:10
20°	08:04	08:36	09:10	20:44	21:34	22:25
30°	07:59	08:26	08:55	20:52	21:47	22:43
35°	07:57	08:21	08:46	20:56	21:54	22:53
40°	07:54	08:14	08:37	21:01	22:03	23:05
45°	07:50	08:07	08:25	21:07	22:12	23:19
S 50°	07:46	07:58	08:12	21:14	22:24	23:36
52°	07:44	07:54	08:06	21:17	22:30	23:44
54°	07:42	07:50	07:59	21:20	22:36	23:53
56°	07:40	07:45	07:51	21:24	22:43
58°	07:38	07:40	07:42	21:29	22:51
S 60°	07:35	07:33	07:33	21:33	23:00

Day	Sun		Mer. Pass hh:mm	Moon		Age 3-5 8-21%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	

August 29, 30, 31 UT (Fri., Sat., Sun.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	337°27.35		211°10.81	N19°14.20	144°29.28	S05°14.89	228°40.87	N22°16.74	336°15.81	S02°10.62
1	352°29.82		226°10.16	13.62	159°30.26	15.54	243°42.84	16.68	351°18.43	10.69
2	7°32.28		241°9.51	13.04	174°31.24	16.19	258°44.81	16.63	6°21.04	10.76
3	22°34.75		256°8.86	•• 12.46	189°32.22	•• 16.84	273°46.78	•• 16.57	21°23.66	•• 10.83
4	37°37.21		271°8.21	11.88	204°33.20	17.50	288°48.75	16.52	36°26.27	10.90
5	52°39.67		286°7.56	11.29	219°34.18	18.15	303°50.72	16.46	51°28.89	10.98
6	67°42.14		301°6.92	N19°10.71	234°35.16	S05°18.80	318°52.69	N22°16.41	66°31.50	S02°11.05
7	82°44.60		316°6.27	10.12	249°36.13	19.45	333°54.67	16.35	81°34.12	11.12
8	97°47.07		331°5.62	9.54	264°37.11	20.11	348°56.64	16.30	96°36.73	11.20
9	112°49.53		346°4.97	•• 8.95	279°38.09	•• 20.76	3°58.61	•• 16.24	111°39.35	•• 11.27
10	127°52.00		1°4.33	8.36	294°39.07	21.41	19°0.58	16.19	126°41.96	11.34
11	142°54.46		16°3.68	7.77	309°40.05	22.06	34°2.56	16.13	141°44.58	11.41
12	157°56.92		31°3.03	N19°7.18	324°41.03	S05°22.72	49°4.53	N22°16.08	156°47.20	S02°11.49
13	172°59.39		46°2.39	6.59	339°42.00	23.37	64°6.50	16.02	171°49.81	11.56
14	188°1.85		61°1.74	6.00	354°42.98	24.02	79°8.47	15.97	186°52.43	11.63
15	203°4.32		76°1.10	•• 5.41	9°43.96	•• 24.67	94°10.45	•• 15.91	201°55.04	•• 11.70
16	218°6.78		91°0.45	4.81	24°44.94	25.32	109°12.42	15.86	216°57.66	11.78
17	233°9.24		105°59.81	4.22	39°45.91	25.98	124°14.39	15.80	232°0.27	11.85
18	248°11.71		120°59.16	N19°3.62	54°46.89	S05°26.63	139°16.37	N22°15.75	247°2.89	S02°11.92
19	263°14.17		135°58.52	3.03	69°47.87	27.28	154°18.34	15.69	262°5.51	12.00
20	278°16.64		150°57.88	2.43	84°48.84	27.93	169°20.31	15.64	277°8.12	12.07
21	293°19.10		165°57.23	•• 1.83	99°49.82	•• 28.58	184°22.29	•• 15.58	292°10.74	•• 12.14
22	308°21.56		180°56.59	1.23	114°50.80	29.24	199°24.26	15.53	307°13.36	12.21
23	323°24.03		195°55.94	0.63	129°51.77	29.89	214°26.24	15.47	322°15.97	12.29
Mer.pass. 01:30		ν-0.6' d-0.6' m-3.95		ν1.0' d0.7' m1.62		ν2.0' d-0.1' m-1.98		ν2.6' d0.1' m0.66		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	338°26.49		210°55.30	N19°0.03	144°52.75	S05°30.54	229°28.21	N22°15.42	337°18.59	S02°12.36
1	353°28.96		225°54.66	18°59.43	159°53.73	31.19	244°30.19	15.36	352°21.21	12.43
2	8°31.42		240°54.02	58.82	174°54.70	31.84	259°32.16	15.31	7°23.82	12.51
3	23°33.89		255°53.37	•• 58.22	189°55.68	•• 32.50	274°34.14	•• 15.25	22°26.44	•• 12.58
4	38°36.35		270°52.73	57.61	204°56.65	33.15	289°36.11	15.20	37°29.06	12.65
5	53°38.81		285°52.09	57.01	219°57.63	33.80	304°38.09	15.14	52°31.67	12.73
6	68°41.28		300°51.45	N18°56.40	234°58.60	S05°34.45	319°40.06	N22°15.09	67°34.29	S02°12.80
7	83°43.74		315°50.81	55.79	249°59.58	35.10	334°42.04	15.03	82°36.91	12.87
8	98°46.21		330°50.17	55.18	265°0.55	35.76	349°44.01	14.98	97°39.53	12.95
9	113°48.67		345°49.53	•• 54.57	280°1.53	•• 36.41	4°45.99	•• 14.92	112°42.14	•• 13.02
10	128°51.13		0°48.89	53.96	295°2.50	37.06	19°47.97	14.87	127°44.76	13.09
11	143°53.60		15°48.25	53.35	310°3.48	37.71	34°49.94	14.81	142°47.38	13.17
12	158°56.06		30°47.61	N18°52.74	325°4.45	S05°38.36	49°51.92	N22°14.76	157°50.00	S02°13.24
13	173°58.53		45°46.97	52.12	340°5.43	39.01	64°53.90	14.70	172°52.61	13.31
14	189°0.99		60°46.33	51.51	355°6.40	39.67	79°55.87	14.65	187°55.23	13.39
15	204°3.45		75°45.69	•• 50.89	10°7.37	•• 40.32	94°57.85	•• 14.59	202°57.85	•• 13.46
16	219°5.92		90°45.05	50.28	25°8.35	40.97	109°59.83	14.54	218°0.47	13.53
17	234°8.38		105°44.41	49.66	40°9.32	41.62	125°1.81	14.48	233°3.09	13.61
18	249°10.85		120°43.77	N18°49.04	55°10.29	S05°42.27	140°3.78	N22°14.43	248°5.70	S02°13.68
19	264°13.31		135°43.13	48.42	70°11.27	42.92	155°5.76	14.37	263°8.32	13.75
20	279°15.78		150°42.50	47.80	85°12.24	43.57	170°7.74	14.32	278°10.94	13.83
21	294°18.24		165°41.86	•• 47.18	100°13.21	•• 44.23	185°9.72	•• 14.26	293°13.56	•• 13.90
22	309°20.70		180°41.22	46.56	115°14.18	44.88	200°11.70	14.21	308°16.18	13.97
23	324°23.17		195°40.58	45.94	130°15.16	45.53	215°13.67	14.15	323°18.80	14.05
Mer.pass. 01:26		ν-0.6' d-0.6' m-3.95		ν1.0' d0.7' m1.62		ν2.0' d-0.1' m-1.99		ν2.6' d0.1' m0.66		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	339°25.63		210°39.95	N18°45.31	145°16.13	S05°46.18	230°15.65	N22°14.10	338°21.42	S02°14.12
1	354°28.10		225°39.31	44.69	160°17.10	46.83	245°17.63	14.04	353°24.03	14.19
2	9°30.56		240°38.68	44.06	175°18.07	47.48	260°19.61	13.99	8°26.65	14.27
3	24°33.02		255°38.04	•• 43.44	190°19.05	•• 48.13	275°21.59	•• 13.93	23°29.27	•• 14.34
4	39°35.49		270°37.40	42.81	205°20.02	48.78	290°23.57	13.88	38°31.89	14.42
5	54°37.95		285°36.77	42.18	220°20.99	49.44	305°25.55	13.82	53°34.51	14.49
6	69°40.42		300°36.13	N18°41.55	235°21.96	S05°50.09	320°27.53	N22°13.77	68°37.13	S02°14.56
7	84°42.88		315°35.50	40.92	250°22.93	50.74	335°29.51	13.71	83°39.75	14.64
8	99°45.35		330°34.86	40.29	265°23.90	51.39	350°31.49	13.66	98°42.37	14.71
9	114°47.81		345°34.23	•• 39.66	280°24.87	•• 52.04	5°33.47	•• 13.60	113°44.99	•• 14.79
10	129°50.27		0°33.60	39.02	295°25.84	52.69	20°35.45	13.55	128°47.61	14.86
11	144°52.74		15°32.96	38.39	310°26.81	53.34	35°37.43	13.49	143°50.23	14.93
12	159°55.20		30°32.33	N18°37.76	325°27.78	S05°53.99	50°39.41	N22°13.44	158°52.85	S02°15.01
13	174°57.67		45°31.70	37.12	340°28.76	54.64	65°41.39	13.38	173°55.47	15.08
14	190°0.13		60°31.06	36.48	355°29.73	55.30	80°43.37	13.33	188°58.09	15.16
15	205°2.59		75°30.43	•• 35.85	10°30.70	•• 55.95	95°45.35	•• 13.27	204°0.71	•• 15.23
16	220°5.06		90°29.80	35.21	25°31.66	56.60	110°47.34	13.22	219°3.33	15.30
17	235°7.52		105°29.17	34.57	40°32.63	57.25	125°49.32	13.16	234°5.95	15.38
18	250°9.99		120°28.53	N18°33.93	55°33.60	S05°57.90	140°51.30	N22°13.11	249°8.57	S02°15.45
19	265°12.45		135°27.90	33.29	70°34.57	58.55	155°53.28	13.05	264°11.19	15.53
20	280°14.91		150°27.27	32.64	85°35.54	59.20	170°55.26	13.00	279°13.81	15.60
21	295°17.38		165°26.64	•• 32.00	100°36.51	05°59.85	185°57.25	•• 12.94	294°16.43	•• 15.67
22	310°19.84		180°26.01	31.36	115°37.48	06°0.50	200°59.23	12.89	309°19.05	15.75
23	325°22.31		195°25.38	30.71	130°38.45	1.15	216°1.21	12.83	324°21.67	15.82
Mer.pass. 01:22		ν-0.6' d-0.6' m-3.95		ν1.0' d0.7' m1.62		ν2.0' d-0.1' m-1.99		ν2.6' d0.1' m0.66		

Stars		
	SHA	Dec
Alpheratz	357°33.91	29°13.99
Ankaa	353°6.23	-42°9.75
Schedar	349°29.99	56°40.63
Diphda	348°46.48	-17°50.54
Achernar	335°19.37	-57°6.07
Hamal	327°50.41	23°35.07
Polaris	313°36.84	89°22.04
Acamar	315°11.20	-40°11.76
Menkar	314°5.48	4°11.56
Mirfak	308°27.38	49°57.00
Aldebaran	290°39.03	16°33.71
Rigel	281°3.43	-8°10.11
Capella	280°21.21	46°1.30
Bellatrix	278°22.39	6°22.50
Elnath	278°1.29	28°37.72
Alnilam	275°37.29	-1°10.96
Betelgeuse	270°51.63	7°24.82
Canopus	263°52.43	-52°42.19
Sirius	258°25.96	-16°44.85
Adhara	255°5.68	-29°0.14
Procyon	244°50.52	5°9.67
Pollux	243°16.93	27°57.87
Avior	234°15.09	-59°35.25
Suhail	222°46.36	-43°31.98
Miaplacidus	221°39.11	-69°49.17
Alphard	217°47.55	-8°46.05
Regulus	207°34.20	11°50.62
Dubhe	193°40.97	61°36.85
Denebola	182°24.70	14°25.84
Gienah	175°43.34	-17°41.02
Acrux	173°0.16	-63°14.59
Gacrux	171°51.58	-57°15.51
Alioth	166°12.91	55°49.42
Spica	158°21.97	-11°17.67
Alkaid	152°51.86	49°11.33
Hadar	148°35.64	-60°29.99
Menkent	147°57.22	-36°29.86
Arcturus	145°47.59	19°3.09
Rigel Kent.	139°39.89	-60°56.69
Kochab	137°20.19	74°3.22
Zuben'ubi	136°55.56	-16°8.90
Alphecca	126°3.35	26°37.89
Antares	112°15.17	-26°29.38
Atria	107°8.82	-69°4.66
Sabik	102°2.10	-15°45.39
Shaula	96°9.52	-37°7.43
Rasalhague	95°57.95	12°32.62
Eltanin	90°41.73	51°29.36
Kaus Aust.	83°31.60	-34°22.40
Vega	80°32.64	38°48.65
Nunki	75°46.87	-26°15.89
Altair	61°59.19	8°56.30
Peacock	53°4.36	-56°39.19
Deneb	49°25.05	45°22.47
Enif	33°37.96	9°59.69
Al Na'ir	27°31.76	-46°50.11
Fomalhaut	15°13.55	-29°29.03
Scheat	13°44.34	28°13.42
Markab	13°29.05	15°20.72
Aug 29 Fri	SHA	Mer.pass
Venus	233°43.45	09:56
Mars	167°1.93	14:21
Jupiter	251°13.51	08:44
Saturn	358°48.46	01:35
Aug 30 Sat	SHA	Mer.pass
Venus	232°28.81	09:57
Mars	166°26.26	14:20
Jupiter	251°1.72	08:41
Saturn	358°52.10	01:30
Aug 31 Sun	SHA	Mer.pass
Venus	231°14.32	09:58
Mars	165°50.50	14:18
Jupiter	250°50.02	08:38
Saturn	358°55.78	01:26
Horizontal parallax		
Venus:		0.1
Mars:		0.1

h		Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°44.54	N09°20.19	120°5.15	14.3'	S19°10.63	10.9'	54.2'	
1	194°44.73	19.30	134°38.43	14.2'	19°21.53	10.8'	54.2'	
2	209°44.92	18.41	149°11.64	14.2'	19°32.35	10.7'	54.2'	
3	224°45.11	· · 17.52	163°44.80	14.1'	19°43.09	10.7'	54.2'	
4	239°45.30	16.63	178°17.90	14.0'	19°53.75	10.6'	54.1'	
5	254°45.48	15.74	192°50.93	14.0'	20°4.33	10.5'	54.1'	
6	269°45.67	N09°14.85	207°23.91	13.9'	S20°14.82	10.4'	54.1'	
7	284°45.86	13.96	221°56.82	13.9'	20°25.23	10.3'	54.1'	
8	299°46.05	13.07	236°29.68	13.8'	20°35.56	10.2'	54.1'	
9	314°46.24	· · 12.18	251°2.47	13.7'	20°45.80	10.2'	54.1'	
10	329°46.43	11.29	265°35.19	13.7'	20°55.95	10.1'	54.1'	
11	344°46.62	10.39	280°7.86	13.6'	21°6.02	10.0'	54.1'	
12	359°46.81	N09°9.50	294°40.46	13.5'	S21°16.00	9.9'	54.1'	
13	14°47.00	8.61	309°12.99	13.5'	21°25.89	9.8'	54.1'	
14	29°47.19	7.72	323°45.46	13.4'	21°35.69	9.7'	54.1'	
15	44°47.38	· · 6.82	338°17.87	13.3'	21°45.40	9.6'	54.1'	
16	59°47.57	5.93	352°50.21	13.3'	21°55.02	9.5'	54.1'	
17	74°47.76	5.04	7°22.48	13.2'	22°4.54	9.4'	54.1'	
18	89°47.95	N09°4.14	21°54.68	13.1'	S22°13.98	9.3'	54.1'	
19	104°48.14	3.25	36°26.82	13.1'	22°23.32	9.2'	54.1'	
20	119°48.33	2.36	50°58.90	13.0'	22°32.56	9.2'	54.1'	
21	134°48.52	· · 1.46	65°30.90	12.9'	22°41.71	9.1'	54.1'	
22	149°48.71	09°0.57	80°2.84	12.9'	22°50.77	9.0'	54.1'	
23	164°48.90	08°59.67	94°34.70	12.8'	22°59.73	8.9'	54.1'	
SD = 15.8'		$d = -0.9'$	SD = 14.8'					
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°49.09	N08°58.78	109°6.50	12.7'	S23°8.59	8.8'	54.1'	
1	194°49.28	57.88	123°38.23	12.7'	23°17.35	8.7'	54.1'	
2	209°49.48	56.99	138°9.90	12.6'	23°26.01	8.6'	54.1'	
3	224°49.67	· · 56.09	152°41.49	12.5'	23°34.57	8.5'	54.1'	
4	239°49.86	55.20	167°13.01	12.5'	23°43.03	8.4'	54.2'	
5	254°50.05	54.30	181°44.46	12.4'	23°51.39	8.3'	54.2'	
6	269°50.24	N08°53.40	196°15.85	12.3'	S23°59.64	8.2'	54.2'	
7	284°50.44	52.51	210°47.16	12.2'	24°7.79	8.0'	54.2'	
8	299°50.63	51.61	225°18.40	12.2'	24°15.84	7.9'	54.2'	
9	314°50.82	· · 50.71	239°49.58	12.1'	24°23.78	7.8'	54.2'	
10	329°51.01	49.81	254°20.68	12.0'	24°31.62	7.7'	54.2'	
11	344°51.21	48.92	268°51.71	12.0'	24°39.35	7.6'	54.2'	
12	359°51.40	N08°48.02	283°22.67	11.9'	S24°46.97	7.5'	54.2'	
13	14°51.59	47.12	297°53.57	11.8'	24°54.48	7.4'	54.2'	
14	29°51.79	46.22	312°24.39	11.8'	25°1.89	7.3'	54.2'	
15	44°51.98	· · 45.32	326°55.14	11.7'	25°9.18	7.2'	54.2'	
16	59°52.18	44.42	341°25.82	11.6'	25°16.36	7.1'	54.2'	
17	74°52.37	43.52	355°56.43	11.5'	25°23.43	7.0'	54.2'	
18	89°52.56	N08°42.62	10°26.97	11.5'	S25°30.39	6.8'	54.2'	
19	104°52.76	41.73	24°57.44	11.4'	25°37.23	6.7'	54.2'	
20	119°52.95	40.83	39°27.84	11.3'	25°43.96	6.6'	54.2'	
21	134°53.15	· · 39.92	53°58.17	11.3'	25°50.58	6.5'	54.3'	
22	149°53.34	39.02	68°28.44	11.2'	25°57.08	6.4'	54.3'	
23	164°53.54	38.12	82°58.63	11.1'	26°3.46	6.3'	54.3'	
SD = 15.8'		$d = -0.9'$	SD = 14.8'					
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	179°53.73	N08°37.22	97°28.75	11.1'	S26°9.72	6.1'	54.3'	
1	194°53.93	36.32	111°58.81	11.0'	26°15.86	6.0'	54.3'	
2	209°54.12	35.42	126°28.79	10.9'	26°21.89	5.9'	54.3'	
3	224°54.32	· · 34.52	140°58.71	10.9'	26°27.80	5.8'	54.3'	
4	239°54.51	33.62	155°28.57	10.8'	26°33.58	5.7'	54.3'	
5	254°54.71	32.72	169°58.35	10.7'	26°39.24	5.5'	54.3'	
6	269°54.90	N08°31.81	184°28.07	10.7'	S26°44.78	5.4'	54.3'	
7	284°55.10	30.91	198°57.72	10.6'	26°50.20	5.3'	54.4'	
8	299°55.29	30.01	213°27.30	10.5'	26°55.49	5.2'	54.4'	
9	314°55.49	· · 29.10	227°56.82	10.5'	27°0.66	5.0'	54.4'	
10	329°55.69	28.20	242°26.28	10.4'	27°5.71	4.9'	54.4'	
11	344°55.88	27.30	256°55.67	10.3'	27°10.62	4.8'	54.4'	
12	359°56.08	N08°26.39	271°24.99	10.3'	S27°15.41	4.7'	54.4'	
13	14°56.28	25.49	285°54.25	10.2'	27°20.07	4.5'	54.4'	
14	29°56.47	24.59	300°23.45	10.1'	27°24.60	4.4'	54.4'	
15	44°56.67	· · 23.68	314°52.59	10.1'	27°29.01	4.3'	54.5'	
16	59°56.87	22.78	329°21.67	10.0'	27°33.28	4.1'	54.5'	
17	74°57.06	21.87	343°50.68	10.0'	27°37.42	4.0'	54.5'	
18	89°57.26	N08°20.97	358°19.64	9.9'	S27°41.43	3.9'	54.5'	
19	104°57.46	20.06	12°48.53	9.8'	27°45.31	3.7'	54.5'	
20	119°57.66	19.16	27°17.37	9.8'	27°49.05	3.6'	54.5'	
21	134°57.86	· · 18.25	41°46.15	9.7'	27°52.66	3.5'	54.6'	
22	149°58.05	17.35	56°14.87	9.7'	27°56.14	3.3'	54.6'	
23	164°58.25	16.44	70°43.54	9.6'	27°59.48	3.2'	54.6'	
SD = 15.8'		$d = -0.9'$	SD = 14.8'					

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	02:18	03:52	20:05	21:37	////
N 70°	////	02:49	04:07	19:51	21:07	////
68°	01:12	03:12	04:19	19:39	20:46	22:39
66°	01:58	03:29	04:29	19:30	20:29	21:57
64°	02:27	03:44	04:38	19:22	20:15	21:30
62°	02:48	03:55	04:45	19:15	20:04	21:09
60°	03:05	04:05	04:51	19:09	19:54	20:53
N 58°	03:19	04:14	04:56	19:04	19:46	20:40
56°	03:31	04:21	05:01	18:59	19:39	20:29
54°	03:41	04:27	05:05	18:55	19:32	20:19
52°	03:49	04:33	05:09	18:51	19:27	20:10
50°	03:57	04:38	05:12	18:48	19:22	20:03
45°	04:13	04:49	05:20	18:41	19:11	19:47
N 40°	04:25	04:58	05:26	18:34	19:02	19:35
35°	04:35	05:05	05:31	18:29	18:55	19:26
30°	04:43	05:12	05:36	18:25	18:49	19:18
20°	04:55	05:22	05:44	18:17	18:39	19:05
N 10°	05:05	05:30	05:51	18:10	18:31	18:56
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:58	18:19	18:43
20°	05:22	05:48	06:10	17:51	18:14	18:39
30°	05:26	05:53	06:17	17:44	18:08	18:36
35°	05:27	05:56	06:22	17:40	18:05	18:35
40°	05:28	05:59	06:26	17:35	18:03	18:34
45°	05:28	06:02	06:32	17:30	18:00	18:34
S 50°	05:28	06:06	06:38	17:24	17:56	18:34
52°	05:28	06:07	06:41	17:21	17:55	18:34
54°	05:28	06:09	06:44	17:18	17:53	18:34
56°	05:28	06:10	06:48	17:14	17:52	18:35
58°	05:27	06:12	06:52	17:10	17:50	18:35
S 60°	05:26	06:14	06:56	17:06	17:48	18:36

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	14:42	■	■	18:03	■	■
64°	14:04	16:22	■	18:42	18:01	■
62°	13:37	15:24	17:33	19:10	19:01	18:36
60°	13:17	14:51	16:25	19:31	19:34	19:44
N 58°	13:00	14:26	15:50	19:49	19:59	20:19
56°	12:46	14:07	15:25	20:03	20:19	20:45
54°	12:33	13:51	15:05	20:16	20:36	21:05
52°	12:23	13:37	14:48	20:27	20:50	21:22
50°	12:13	13:25	14:33	20:37	21:02	21:37
45°	11:53	13:00	14:04	20:58	21:28	22:06
N 40°	11:37	12:40	13:41	21:16	21:49	22:30
35°	11:24	12:23	13:23	21:30	22:06	22:49
30°	11:12	12:09	13:07	21:43	22:21	23:05
20°	10:52	11:45	12:39	22:04	22:46	23:33
N 10°	10:35	11:24	12:16	22:23	23:08	23:57
0°	10:19	11:05	11:55	22:41	23:29	· · ·
S 10°	10:03	10:46	11:33	22:58	23:49	· · ·
20°	09:46	10:26	11:10	23:17	· · ·	00:11
30°	09:26	10:02	10:43	23:39	· · ·	00:37
35°	09:15	09:48	10:28	23:52	· · ·	00:52
40°	09:02	09:33	10:09	· · ·	00:07	01:10
45°	08:47	09:14	09:48	· · ·	00:25	01:31
S 50°	08:29	08:50	09:20	· · ·	00:48	01:58
52°	08:20	08:39	09:06	· · ·	00:58	02:11
54°	08:10	08:27	08:51	· · ·	01:10	02:26
56°	07:59	08:12	08:32	00:03	01:24	02:44
58°	07:47	07:55	08:10	00:15	01:41	03:06
S 60°	07:33	07:35	07:41	00:29	02:01	03:35

Day	Sun		Mer. Pass hh:mm	Moon		Age 6-8 29-48%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
29	01:02	00:53	12:01	16:30	04:07	

September 01, 02, 03 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	340°24.77		210°24.75	N18°30.06	145°39.42	S06°1.80	231°3.19	N22°12.78	339°24.29	S02°15.90
1	355°27.24		225°24.12	29.42	160°40.39	2.45	246°5.18	12.72	354°26.91	15.97
2	10°29.70		240°23.49	28.77	175°41.35	3.10	261°7.16	12.67	9°29.53	16.05
3	25°32.16		255°22.86	· · 28.12	190°42.32	· · 3.75	276°9.14	· · 12.61	24°32.15	· · 16.12
4	40°34.63		270°22.23	27.47	205°43.29	4.40	291°11.13	12.56	39°34.77	16.19
5	55°37.09		285°21.60	26.82	220°44.26	5.05	306°13.11	12.50	54°37.39	16.27
6	70°39.56		300°20.98	N18°26.17	235°45.22	S06°5.71	321°15.09	N22°12.45	69°40.01	S02°16.34
7	85°42.02		315°20.35	25.52	250°46.19	6.36	336°17.08	12.39	84°42.64	16.42
8	100°44.48		330°19.72	24.86	265°47.16	7.01	351°19.06	12.34	99°45.26	16.49
9	115°46.95		345°19.09	· · 24.21	280°48.13	· · 7.66	6°21.05	· · 12.28	114°47.88	· · 16.57
10	130°49.41		0°18.47	23.56	295°49.09	8.31	21°23.03	12.23	129°50.50	16.64
11	145°51.88		15°17.84	22.90	310°50.06	8.96	36°25.02	12.17	144°53.12	16.72
12	160°54.34		30°17.21	N18°22.24	325°51.03	S06°9.61	51°27.00	N22°12.12	159°55.74	S02°16.79
13	175°56.81		45°16.59	21.59	340°51.99	10.26	66°28.99	12.06	174°58.36	16.87
14	190°59.27		60°15.96	20.93	355°52.96	10.91	81°30.97	12.01	190°0.99	16.94
15	206°1.73		75°15.33	· · 20.27	10°53.92	· · 11.56	96°32.96	· · 11.95	205°3.61	· · 17.01
16	221°4.20		90°14.71	19.61	25°54.89	12.21	111°34.94	11.90	220°6.23	17.09
17	236°6.66		105°14.08	18.95	40°55.86	12.86	126°36.93	11.84	235°8.85	17.16
18	251°9.13		120°13.46	N18°18.28	55°56.82	S06°13.51	141°38.91	N22°11.79	250°11.47	S02°17.24
19	266°11.59		135°12.83	17.62	70°57.79	14.16	156°40.90	11.73	265°14.10	17.31
20	281°14.05		150°12.21	16.96	85°58.75	14.81	171°42.89	11.67	280°16.72	17.39
21	296°16.52		165°11.58	· · 16.29	100°59.72	· · 15.46	186°44.87	· · 11.62	295°19.34	· · 17.46
22	311°18.98		180°10.96	15.62	116°0.68	16.11	201°46.86	11.56	310°21.96	17.54
23	326°21.45		195°10.34	14.96	131°1.65	16.76	216°48.85	11.51	325°24.59	17.61
Mer.pass. 01:18										
ν-0.6' d-0.6' m-3.95										
ν1.0' d0.7' m1.62										
ν2.0' d-0.1' m-1.99										
ν2.6' d0.1' m0.65										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	341°23.91		210°9.71	N18°14.29	146°2.61	S06°17.41	231°50.83	N22°11.45	340°27.21	S02°17.69
1	356°26.38		225°9.09	13.62	161°3.58	18.06	246°52.82	11.40	355°29.83	17.76
2	11°28.84		240°8.47	12.95	176°4.54	18.71	261°54.81	11.34	10°32.45	17.84
3	26°31.30		255°7.85	· · 12.28	191°5.50	· · 19.36	276°56.79	· · 11.29	25°35.08	· · 17.91
4	41°33.77		270°7.22	11.61	206°6.47	20.01	291°58.78	11.23	40°37.70	17.99
5	56°36.23		285°6.60	10.94	221°7.43	20.65	307°0.77	11.18	55°40.32	18.06
6	71°38.70		300°5.98	N18°10.27	236°8.40	S06°21.30	322°2.76	N22°11.12	70°42.94	S02°18.14
7	86°41.16		315°5.36	9.59	251°9.36	21.95	337°4.75	11.07	85°45.57	18.21
8	101°43.62		330°4.74	8.92	266°10.32	22.60	352°6.73	11.01	100°48.19	18.29
9	116°46.09		345°4.12	· · 8.24	281°11.28	· · 23.25	7°8.72	· · 10.96	115°50.81	· · 18.36
10	131°48.55		0°3.50	7.56	296°12.25	23.90	22°10.71	10.90	130°53.44	18.44
11	146°51.02		15°2.88	6.89	311°13.21	24.55	37°12.70	10.85	145°56.06	18.51
12	161°53.48		30°2.26	N18°6.21	326°14.17	S06°25.20	52°14.69	N22°10.79	160°58.68	S02°18.59
13	176°55.95		45°1.64	5.53	341°15.14	25.85	67°16.68	10.74	176°1.31	18.66
14	191°58.41		60°1.02	4.85	356°16.10	26.50	82°18.67	10.68	191°3.93	18.74
15	207°0.87		75°0.40	· · 4.17	11°17.06	· · 27.15	97°20.66	· · 10.63	206°6.55	· · 18.81
16	222°3.34		89°59.78	3.49	26°18.02	27.80	112°22.65	10.57	221°9.18	18.89
17	237°5.80		104°59.16	2.80	41°18.98	28.45	127°24.64	10.52	236°11.80	18.96
18	252°8.27		119°58.54	N18°2.12	56°19.95	S06°29.10	142°26.63	N22°10.46	251°14.43	S02°19.04
19	267°10.73		134°57.93	1.43	71°20.91	29.75	157°28.62	10.41	266°17.05	19.11
20	282°13.19		149°57.31	0.75	86°21.87	30.39	172°30.61	10.35	281°19.67	19.19
21	297°15.66		164°56.69	18°0.06	101°22.83	· · 31.04	187°32.60	· · 10.30	296°22.30	· · 19.27
22	312°18.12		179°56.08	17°59.37	116°23.79	31.69	202°34.59	10.24	311°24.92	19.34
23	327°20.59		194°55.46	58.69	131°24.75	32.34	217°36.58	10.19	326°27.55	19.42
Mer.pass. 01:14										
ν-0.6' d-0.7' m-3.95										
ν1.0' d0.6' m1.62										
ν2.0' d-0.1' m-2.00										
ν2.6' d0.1' m0.65										
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	342°23.05		209°54.84	N17°58.00	146°25.71	S06°32.99	232°38.57	N22°10.13	341°30.17	S02°19.49
1	357°25.52		224°54.23	57.31	161°26.67	33.64	247°40.56	10.08	356°32.79	19.57
2	12°27.98		239°53.61	56.62	176°27.63	34.29	262°42.56	10.02	11°35.42	19.64
3	27°30.44		254°53.00	· · 55.92	191°28.59	· · 34.94	277°44.55	· · 9.97	26°38.04	· · 19.72
4	42°32.91		269°52.38	55.23	206°29.55	35.59	292°46.54	9.91	41°40.67	19.79
5	57°35.37		284°51.77	54.54	221°30.51	36.23	307°48.53	9.85	56°43.29	19.87
6	72°37.84		299°51.15	N17°53.84	236°31.47	S06°36.88	322°50.52	N22°9.80	71°45.92	S02°19.94
7	87°40.30		314°50.54	53.15	251°32.43	37.53	337°52.52	9.74	86°48.54	20.02
8	102°42.76		329°49.92	52.45	266°33.39	38.18	352°54.51	9.69	101°51.17	20.10
9	117°45.23		344°49.31	· · 51.75	281°34.35	· · 38.83	7°56.50	· · 9.63	116°53.79	· · 20.17
10	132°47.69		359°48.70	51.06	296°35.31	39.48	22°58.50	9.58	131°56.42	20.25
11	147°50.16		14°48.08	50.36	311°36.27	40.12	38°0.49	9.52	146°59.04	20.32
12	162°52.62		29°47.47	N17°49.66	326°37.23	S06°40.77	53°2.48	N22°9.47	162°1.67	S02°20.40
13	177°55.09		44°46.86	48.96	341°38.18	41.42	68°4.48	9.41	177°4.29	20.47
14	192°57.55		59°46.25	48.26	356°39.14	42.07	83°6.47	9.36	192°6.92	20.55
15	208°0.01		74°45.63	· · 47.55	11°40.10	· · 42.72	98°8.46	· · 9.30	207°9.54	· · 20.63
16	223°2.48		89°45.02	46.85	26°41.06	43.37	113°10.46	9.25	222°12.17	20.70
17	238°4.94		104°44.41	46.15	41°42.02	44.01	128°12.45	9.19	237°14.79	20.78
18	253°7.41		119°43.80	N17°45.44	56°42.97	S06°44.66	143°14.45	N22°9.14	252°17.42	S02°20.85
19	268°9.87		134°43.19	44.73	71°43.93	45.31	158°16.44	9.08	267°20.04	20.93
20	283°12.33		149°42.58	44.03	86°44.89	45.96	173°18.44	9.03	282°22.67	21.00
21	298°14.80		164°41.97	· · 43.32	101°45.84	· · 46.61	188°20.43	· · 8.97	297°25.30	· · 21.08
22	313°17.26		179°41.36	42.61	116°46.80	47.26	203°22.43	8.92	312°27.92	21.16
23	328°19.73		194°40.75	41.90	131°47.76	47.90	218°24.42	8.86	327°30.55	21.23
Mer.pass. 01:10										
ν-0.6' d-0.7' m-3.94										
ν1.0' d0.6' m1.62										
ν2.0' d-0.1' m-2.00										
ν2.6' d0.1' m0.64										

	Stars	
	SHA	Dec
Alpheratz	357°33.89	29°14.01
Ankaa	353°6.21	-42°9.76
Schedar	349°29.96	56°40.65
Diphda	348°46.46	-17°50.54
Achernar	335°19.34	-57°6.08
Hamal	327°50.38	23°35.08
Polaris	313°35.13	89°22.05
Acamar	315°11.18	-40°11.77
Menkar	314°5.46	4°11.57
Mirfak	308°27.34	49°57.01
Aldebaran	290°39.00	16°33.71
Rigel	281°3.40	-8°10.11
Capella	280°21.17	46°1.29
Bellatrix	278°22.37	6°22.50
Elnath	278°1.26	28°37.72
Alnilam	275°37.26	-1°10.96
Betelgeuse	270°51.61	7°24.83
Canopus	263°52.40	-52°42.19
Sirius	258°25.94	-16°44.84
Adhara	255°5.66	-29°0.14
Procyon	244°50.49	5°9.67
Pollux	243°16.91	27°57.86
Avior	234°15.07	-59°35.24
Suhail	222°46.34	-43°31.97
Miaplacidus	221°39.08	-69°49.16
Alphard	217°47.53	-8°46.05

h		Sun			Moon			
Mon		GHA	Dec		GHA	ν	Dec	d HP
0		179°58.45	N08°15.53		85°12.15	9.6'	S28°2.68	3.1' 54.6'
1		194°58.65	14.63		99°40.71	9.5'	28°5.75	2.9' 54.6'
2		209°58.85	13.72		114°9.21	9.5'	28°8.68	2.8' 54.6'
3		224°59.05	· · 12.81		128°37.66	9.4'	28°11.48	2.7' 54.7'
4		239°59.24	11.90		143°6.06	9.3'	28°14.13	2.5' 54.7'
5		254°59.44	11.00		157°34.40	9.3'	28°16.65	2.4' 54.7'
6		269°59.64	N08°10.09		172°2.70	9.2'	S28°19.02	2.2' 54.7'
7		284°59.84	9.18		186°30.95	9.2'	28°21.26	2.1' 54.7'
8		300°0.04	8.27		200°59.15	9.2'	28°23.35	2.0' 54.7'
9		315°0.24	· · 7.36		215°27.31	9.1'	28°25.30	1.8' 54.8'
10		330°0.44	6.46		229°55.42	9.1'	28°27.11	1.7' 54.8'
11		345°0.64	5.55		244°23.48	9.0'	28°28.78	1.5' 54.8'
12		0°0.84	N08°4.64		258°51.50	9.0'	S28°30.31	1.4' 54.8'
13		15°1.04	3.73		273°19.48	8.9'	28°31.69	1.2' 54.8'
14		30°1.24	2.82		287°47.42	8.9'	28°32.92	1.1' 54.9'
15		45°1.44	· · 1.91		302°15.31	8.9'	28°34.01	0.9' 54.9'
16		60°1.64	1.00		316°43.17	8.8'	28°34.96	0.8' 54.9'
17		75°1.84	08°0.09		331°10.99	8.8'	28°35.76	0.7' 54.9'
18		90°2.04	N07°59.18		345°38.77	8.7'	S28°36.42	0.5' 54.9'
19		105°2.24	58.27		0°6.52	8.7'	28°36.92	0.4' 55.0'
20		120°2.44	57.36		14°34.24	8.7'	28°37.28	0.2' 55.0'
21		135°2.64	· · 56.45		29°1.92	8.6'	28°37.50	0.1' 55.0'
22		150°2.84	55.53		43°29.57	8.6'	28°37.56	-0.1' 55.0'
23		165°3.05	54.62		57°57.19	8.6'	28°37.48	-0.2' 55.1'
		SD = 15.8' $d = -0.9'$			SD = 14.9'			
Tue		GHA	Dec		GHA	ν	Dec	d HP
0		180°3.25	N07°53.71		72°24.78	8.6'	S28°37.24	-0.4' 55.1'
1		195°3.45	52.80		86°52.34	8.5'	28°36.86	-0.5' 55.1'
2		210°3.65	51.89		101°19.87	8.5'	28°36.33	-0.7' 55.1'
3		225°3.85	· · 50.97		115°47.38	8.5'	28°35.65	-0.8' 55.2'
4		240°4.05	50.06		130°14.87	8.5'	28°34.82	-1.0' 55.2'
5		255°4.26	49.15		144°42.33	8.4'	28°33.84	-1.1' 55.2'
6		270°4.46	N07°48.24		159°9.78	8.4'	S28°32.70	-1.3' 55.2'
7		285°4.66	47.32		173°37.20	8.4'	28°31.42	-1.4' 55.3'
8		300°4.86	46.41		188°4.60	8.4'	28°29.98	-1.6' 55.3'
9		315°5.07	· · 45.50		202°31.99	8.4'	28°28.40	-1.7' 55.3'
10		330°5.27	44.58		216°59.36	8.4'	28°26.66	-1.9' 55.3'
11		345°5.47	43.67		231°26.72	8.3'	28°24.77	-2.0' 55.4'
12		0°5.67	N07°42.75		245°54.06	8.3'	S28°22.73	-2.2' 55.4'
13		15°5.88	41.84		260°21.39	8.3'	28°20.53	-2.3' 55.4'
14		30°6.08	40.92		274°48.71	8.3'	28°18.19	-2.5' 55.4'
15		45°6.28	· · 40.01		289°16.03	8.3'	28°15.69	-2.7' 55.5'
16		60°6.49	39.09		303°43.33	8.3'	28°13.03	-2.8' 55.5'
17		75°6.69	38.18		318°10.63	8.3'	28°10.23	-3.0' 55.5'
18		90°6.89	N07°37.26		332°37.92	8.3'	S28°7.27	-3.1' 55.5'
19		105°7.10	36.35		347°5.21	8.3'	28°4.16	-3.3' 55.6'
20		120°7.30	35.43		1°32.49	8.3'	28°0.90	-3.4' 55.6'
21		135°7.51	· · 34.52		15°59.77	8.3'	27°57.48	-3.6' 55.6'
22		150°7.71	33.60		30°27.06	8.3'	27°53.91	-3.7' 55.7'
23		165°7.91	32.68		44°54.34	8.3'	27°50.19	-3.9' 55.7'
		SD = 15.8' $d = -0.9'$			SD = 15.0'			
Wed		GHA	Dec		GHA	ν	Dec	d HP
0		180°8.12	N07°31.77		59°21.63	8.3'	S27°46.32	-4.0' 55.7'
1		195°8.32	30.85		73°48.93	8.3'	27°42.29	-4.2' 55.7'
2		210°8.53	29.93		88°16.22	8.3'	27°38.11	-4.3' 55.8'
3		225°8.73	· · 29.01		102°43.53	8.3'	27°33.78	-4.5' 55.8'
4		240°8.94	28.10		117°10.84	8.3'	27°29.29	-4.6' 55.8'
5		255°9.14	27.18		131°38.16	8.3'	27°24.66	-4.8' 55.9'
6		270°9.35	N07°26.26		146°5.49	8.3'	S27°19.87	-4.9' 55.9'
7		285°9.55	25.34		160°32.83	8.4'	27°14.92	-5.1' 55.9'
8		300°9.76	24.42		175°0.19	8.4'	27°9.83	-5.2' 55.9'
9		315°9.96	· · 23.50		189°27.56	8.4'	27°4.59	-5.4' 56.0'
10		330°10.17	22.59		203°54.94	8.4'	26°59.19	-5.5' 56.0'
11		345°10.38	21.67		218°22.34	8.4'	26°53.64	-5.7' 56.0'
12		0°10.58	N07°20.75		232°49.76	8.4'	S26°47.95	-5.8' 56.1'
13		15°10.79	19.83		247°17.19	8.5'	26°42.10	-6.0' 56.1'
14		30°10.99	18.91		261°44.65	8.5'	26°36.10	-6.1' 56.1'
15		45°11.20	· · 17.99		276°12.13	8.5'	26°29.95	-6.3' 56.2'
16		60°11.41	17.07		290°39.62	8.5'	26°23.65	-6.4' 56.2'
17		75°11.61	16.15		305°7.14	8.5'	26°17.20	-6.6' 56.2'
18		90°11.82	N07°15.23		319°34.69	8.6'	S26°10.61	-6.7' 56.2'
19		105°12.03	14.31		334°2.26	8.6'	26°3.86	-6.9' 56.3'
20		120°12.23	13.39		348°29.85	8.6'	25°56.97	-7.0' 56.3'
21		135°12.44	· · 12.46		2°57.47	8.6'	25°49.93	-7.2' 56.3'
22		150°12.65	11.54		17°25.12	8.7'	25°42.75	-7.3' 56.4'
23		165°12.85	10.62		31°52.80	8.7'	25°35.41	-7.5' 56.4'
		SD = 15.8' $d = -0.9'$			SD = 15.2'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	02:40	04:07	19:48	21:14	////
N 70°	00:24	03:06	04:20	19:36	20:49	23:10
68°	01:42	03:26	04:31	19:26	20:30	22:10
66°	02:17	03:41	04:39	19:18	20:15	21:37
64°	02:41	03:54	04:46	19:11	20:03	21:14
62°	03:00	04:04	04:52	19:05	19:53	20:56
60°	03:15	04:13	04:58	19:00	19:44	20:42
N 58°	03:28	04:21	05:02	18:55	19:37	20:30
56°	03:38	04:27	05:07	18:51	19:30	20:19
54°	03:47	04:33	05:10	18:48	19:25	20:10
52°	03:55	04:38	05:14	18:44	19:20	20:02
50°	04:02	04:43	05:17	18:41	19:15	19:56
45°	04:17	04:53	05:23	18:35	19:05	19:41
N 40°	04:28	05:01	05:29	18:30	18:57	19:30
35°	04:37	05:08	05:34	18:25	18:51	19:21
30°	04:45	05:13	05:38	18:21	18:45	19:14
20°	04:56	05:22	05:45	18:14	18:37	19:03
N 10°	05:05	05:30	05:51	18:08	18:30	18:54
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:16	05:41	06:02	17:58	18:19	18:43
20°	05:20	05:45	06:08	17:52	18:14	18:40
30°	05:22	05:50	06:14	17:46	18:10	18:38
35°	05:23	05:52	06:18	17:42	18:08	18:37
40°	05:23	05:55	06:22	17:38	18:05	18:37
45°	05:23	05:57	06:26	17:34	18:03	18:37
S 50°	05:22	06:00	06:32	17:28	18:01	18:38
52°	05:22	06:01	06:35	17:26	18:00	18:39
54°	05:21	06:02	06:37	17:23	17:58	18:39
56°	05:20	06:03	06:40	17:20	17:57	18:40
58°	05:19	06:04	06:44	17:16	17:56	18:41
S 60°	05:18	06:06	06:48	17:13	17:55	18:43

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	20:40	██	██	21:05
62°	██	██	19:14	██	██	22:31
60°	17:43	18:23	18:37	20:16	21:28	23:07
N 58°	17:00	17:46	18:11	20:59	22:05	23:33
56°	16:31	17:19	17:50	21:27	22:31	23:53
54°	16:09	16:58	17:33	21:50	22:52	· · ·
52°	15:51	16:41	17:18	22:08	23:10	· · ·
50°	15:35	16:26	17:05	22:24	23:24	· · ·
45°	15:04	15:56	16:38	22:55	23:54	· · ·
N 40°	14:40	15:32	16:17	23:19	· · ·	00:18
35°	14:20	15:12	15:59	23:39	· · ·	00:37
30°	14:03	14:56	15:44	23:56	· · ·	00:53
20°	13:34	14:27	15:18	· · ·	00:25	01:21
N 10°	13:10	14:03	14:56	· · ·	00:50	01:45
0°	12:47	13:41	14:35	00:19	01:13	02:07
S 10°	12:24	13:18	14:14	00:42	01:35	02:29
20°	11:59	12:54	13:51	01:06	02:00	02:52
30°	11:31	12:25	13:25	01:34	02:29	03:19
35°	11:14	12:08	13:09	01:50	02:45	03:35
40°	10:55	11:49	12:51	02:10	03:05	03:54
45°	10:31	11:25	12:29	02:33	03:29	04:16
S 50°	10:00	10:54	12:02	03:04	04:00	04:45
52°	09:45	10:39	11:48	03:19	04:15	04:59
54°	09:28	10:21	11:32	03:36	04:33	05:15
56°	09:06	10:00	11:14	03:57	04:55	05:34
58°	08:39	09:32	10:51	04:24	05:23	05:57
S 60°	08:01	08:52	10:20	05:02	06:02	06:28

Day	Sun		Mer. Pass	Moon		Age 9-11 57-76%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
01	00:06	00:03	12:00	19:00	06:33	
02	00:13	00:23	12:00	19:54	07:26	
03	00:32	00:42	11:59	20:48	08:21	

September 04, 05, 06 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°22.19		209°40.14	N17°41.19	146°48.72	S06°48.55	233°26.42	N22°8.81	342°33.17	S02°21.31
1	358°24.66		224°39.53	40.48	161°49.67	49.20	248°28.41	8.75	357°35.80	21.38
2	13°27.12		239°38.92	39.77	176°50.63	49.85	263°30.41	8.70	12°38.43	21.46
3	28°29.58		254°38.31	· · 39.06	191°51.58	· · 50.49	278°32.40	· · 8.64	27°41.05	· · 21.54
4	43°32.05		269°37.71	38.34	206°52.54	51.14	293°34.40	8.59	42°43.68	21.61
5	58°34.51		284°37.10	37.63	221°53.50	51.79	308°36.40	8.53	57°46.30	21.69
6	73°36.98		299°36.49	N17°36.91	236°54.45	S06°52.44	323°38.39	N22°8.48	72°48.93	S02°21.76
7	88°39.44		314°35.88	36.20	251°55.41	53.08	338°40.39	8.42	87°51.56	21.84
8	103°41.90		329°35.28	35.48	266°56.36	53.73	353°42.39	8.37	102°54.18	21.92
9	118°44.37		344°34.67	· · 34.76	281°57.32	· · 54.38	8°44.38	· · 8.31	117°56.81	· · 21.99
10	133°46.83		359°34.07	34.04	296°58.27	55.03	23°46.38	8.26	132°59.44	22.07
11	148°49.30		14°33.46	33.32	311°59.23	55.67	38°48.38	8.20	148°2.06	22.15
12	163°51.76		29°32.85	N17°32.60	327°0.18	S06°56.32	53°50.38	N22°8.15	163°4.69	S02°22.22
13	178°54.23		44°32.25	31.88	342°1.13	56.97	68°52.38	8.09	178°7.32	22.30
14	193°56.69		59°31.64	31.16	357°2.09	57.62	83°54.37	8.04	193°9.94	22.37
15	208°59.15		74°31.04	· · 30.43	12°3.04	· · 58.26	98°56.37	· · 7.98	208°12.57	· · 22.45
16	224°1.62		89°30.44	29.71	27°4.00	58.91	113°58.37	7.93	223°15.20	22.53
17	239°4.08		104°29.83	28.98	42°4.95	06°59.56	129°0.37	7.87	238°17.82	22.60
18	254°6.55		119°29.23	N17°28.26	57°5.90	S07°0.21	144°2.37	N22°7.82	253°20.45	S02°22.68
19	269°9.01		134°28.62	27.53	72°6.86	0.85	159°4.37	7.76	268°23.08	22.76
20	284°11.47		149°28.02	26.80	87°7.81	1.50	174°6.37	7.71	283°25.71	22.83
21	299°13.94		164°27.42	· · 26.07	102°8.76	· · 2.15	189°8.37	· · 7.65	298°28.33	· · 22.91
22	314°16.40		179°26.82	25.34	117°9.72	2.79	204°10.36	7.59	313°30.96	22.98
23	329°18.87		194°26.21	24.61	132°10.67	3.44	219°12.36	7.54	328°33.59	23.06
Mer.pass. 01:06		ν-0.6' d-0.7' m-3.94		ν1.0' d0.6' m1.62		ν2.0' d-0.1' m-2.00		ν2.6' d0.1' m0.64		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°21.33		209°25.61	N17°23.88	147°11.62	S07°4.09	234°14.36	N22°7.48	343°36.22	S02°23.14
1	359°23.79		224°25.01	23.15	162°12.57	4.73	249°16.36	7.43	358°38.84	23.21
2	14°26.26		239°24.41	22.42	177°13.53	5.38	264°18.36	7.37	13°41.47	23.29
3	29°28.72		254°23.81	· · 21.68	192°14.48	· · 6.03	279°20.37	· · 7.32	28°44.10	· · 23.37
4	44°31.19		269°23.21	20.95	207°15.43	6.67	294°22.37	7.26	43°46.73	23.44
5	59°33.65		284°22.61	20.21	222°16.38	7.32	309°24.37	7.21	58°49.35	23.52
6	74°36.12		299°22.01	N17°19.48	237°17.33	S07°7.97	324°26.37	N22°7.15	73°51.98	S02°23.60
7	89°38.58		314°21.41	18.74	252°18.28	8.61	339°28.37	7.10	88°54.61	23.67
8	104°41.04		329°20.81	18.00	267°19.24	9.26	354°30.37	7.04	103°57.24	23.75
9	119°43.51		344°20.21	· · 17.26	282°20.19	· · 9.91	9°32.37	· · 6.99	118°59.87	· · 23.83
10	134°45.97		359°19.61	16.52	297°21.14	10.55	24°34.37	6.93	134°2.49	23.90
11	149°48.44		14°19.01	15.78	312°22.09	11.20	39°36.38	6.88	149°5.12	23.98
12	164°50.90		29°18.41	N17°15.04	327°23.04	S07°11.85	54°38.38	N22°6.82	164°7.75	S02°24.06
13	179°53.36		44°17.81	14.30	342°23.99	12.49	69°40.38	6.77	179°10.38	24.13
14	194°55.83		59°17.22	13.56	357°24.94	13.14	84°42.38	6.71	194°13.01	24.21
15	209°58.29		74°16.62	· · 12.81	12°25.89	· · 13.78	99°44.39	· · 6.66	209°15.64	· · 24.29
16	225°0.76		89°16.02	12.07	27°26.84	14.43	114°46.39	6.60	224°18.27	24.36
17	240°3.22		104°15.43	11.32	42°27.79	15.08	129°48.39	6.55	239°20.89	24.44
18	255°5.68		119°14.83	N17°10.58	57°28.74	S07°15.72	144°50.39	N22°6.49	254°23.52	S02°24.52
19	270°8.15		134°14.23	9.83	72°29.69	16.37	159°52.40	6.44	269°26.15	24.59
20	285°10.61		149°13.64	9.08	87°30.63	17.01	174°54.40	6.38	284°28.78	24.67
21	300°13.08		164°13.04	· · 8.33	102°31.58	· · 17.66	189°56.41	· · 6.33	299°31.41	· · 24.75
22	315°15.54		179°12.45	7.58	117°32.53	18.30	204°58.41	6.27	314°34.04	24.82
23	330°18.01		194°11.85	6.83	132°33.48	18.95	220°0.41	6.22	329°36.67	24.90
Mer.pass. 01:02		ν-0.6' d-0.7' m-3.94		ν1.0' d0.6' m1.62		ν2.0' d-0.1' m-2.01		ν2.6' d0.1' m0.64		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	345°20.47		209°11.26	N17°6.08	147°34.43	S07°19.60	235°2.42	N22°6.16	344°39.30	S02°24.98
1	0°22.93		224°10.66	5.33	162°35.38	20.24	250°4.42	6.11	359°41.93	25.05
2	15°25.40		239°10.07	4.57	177°36.33	20.89	265°6.43	6.05	14°44.55	25.13
3	30°27.86		254°9.48	· · 3.82	192°37.27	· · 21.53	280°8.43	· · 6.00	29°47.18	· · 25.21
4	45°30.33		269°8.88	3.06	207°38.22	22.18	295°10.44	5.94	44°49.81	25.28
5	60°32.79		284°8.29	2.31	222°39.17	22.82	310°12.44	5.89	59°52.44	25.36
6	75°35.25		299°7.70	N17°1.55	237°40.12	S07°23.47	325°14.45	N22°5.83	74°55.07	S02°25.44
7	90°37.72		314°7.10	0.79	252°41.06	24.11	340°16.45	5.78	89°57.70	25.52
8	105°40.18		329°6.51	17°0.04	267°42.01	24.76	355°18.46	5.72	105°0.33	25.59
9	120°42.65		344°5.92	16°59.28	282°42.96	· · 25.41	10°20.47	· · 5.67	120°2.96	· · 25.67
10	135°45.11		359°5.33	58.52	297°43.90	26.05	25°22.47	5.61	135°5.59	25.75
11	150°47.57		14°4.74	57.76	312°44.85	26.70	40°24.48	5.56	150°8.22	25.82
12	165°50.04		29°4.15	N16°56.99	327°45.80	S07°27.34	55°26.48	N22°5.50	165°10.85	S02°25.90
13	180°52.50		44°3.56	56.23	342°46.74	27.99	70°28.49	5.45	180°13.48	25.98
14	195°54.97		59°2.97	55.47	357°47.69	28.63	85°30.50	5.39	195°16.11	26.06
15	210°57.43		74°2.38	· · 54.70	12°48.63	· · 29.28	100°32.51	· · 5.34	210°18.74	· · 26.13
16	225°59.89		89°1.79	53.94	27°49.58	29.92	115°34.51	5.28	225°21.37	26.21
17	241°2.36		104°1.20	53.17	42°50.52	30.56	130°36.52	5.23	240°24.00	26.29
18	256°4.82		119°0.61	N16°52.41	57°51.47	S07°31.21	145°38.53	N22°5.17	255°26.63	S02°26.36
19	271°7.29		134°0.02	51.64	72°52.41	31.85	160°40.54	5.12	270°29.26	26.44
20	286°9.75		148°59.43	50.87	87°53.36	32.50	175°42.54	5.06	285°31.89	26.52
21	301°12.21		163°58.84	· · 50.10	102°54.30	· · 33.14	190°44.55	· · 5.01	300°34.52	· · 26.60
22	316°14.68		178°58.26	49.33	117°55.25	33.79	205°46.56	4.95	315°37.15	26.67
23	331°17.14		193°57.67	48.56	132°56.19	34.43	220°48.57	4.90	330°39.78	26.75
Mer.pass. 00:58		ν-0.6' d-0.8' m-3.94		ν0.9' d0.6' m1.62		ν2.0' d-0.1' m-2.01		ν2.6' d0.1' m0.63		

Stars		
	SHA	Dec
Alpheratz	357°33.88	29°14.02
Ankaa	353°6.19	-42°9.76
Schedar	349°29.94	56°40.67
Diphda	348°46.45	-17°50.54
Achernar	335°19.31	-57°6.08
Hamal	327°50.36	23°35.09
Polaris	313°33.60	89°22.06
Acamar	315°11.15	-40°11.76
Menkar	314°5.43	4°11.58
Mirfak	308°27.31	49°57.02
Aldebaran	290°38.97	16°33.72
Rigel	281°3.38	-8°10.10
Capella	280°21.14	46°1.30
Bellatrix	278°22.34	6°22.50
Elnath	278°1.23	28°37.72
Alnilam	275°37.24	-1°10.96
Betelgeuse	270°51.58	7°24.83
Canopus	263°52.37	-52°42.18
Sirius	258°25.91	-16°44.84
Adhara	255°5.63	-29°0.13
Procyon	244°50.47	5°9.67
Pollux	243°16.88	27°57.86
Avior	234°15.05	-59°35.23
Suhail	222°46.32	-43°31.96
Miaplacidus	221°39.07	-69°49.15
Alphard	217°47.52	-8°46.05
Regulus	207°34.17	11°50.61
Dubhe	193°40.95	61°36.81
Denebola	182°24.69	14°25.83
Gienah	175°43.33	-17°41.01
Acrux	173°0.17	-63°14.57
Gacrux	171°51.60	-57°15.49
Alioth	166°12.92	55°49.40
Spica	158°21.97	-11°17.67
Alkaid	152°51.88	49°11.30
Hadar	148°35.67	-60°29.98
Menkent	147°57.23	-36°29.85
Arcturus	145°47.60	19°3.08
Rigel Kent.	139°39.93	-60°56.68
Kochab	137°20.30	74°3.20
Zuben'ubi	136°55.57	-16°8.90
Alphecca	126°3.37	26°37.89
Antares	112°15.19	-26°29.38
Atria	107°8.88	-69°4.66
Sabik	102°2.11	-15°45.39
Shaula	96°9.54	-37°7.44
Rasalhague	95°57.97	12°32.63
Eltanin	90°41.77	51°29.37
Kaus Aust.	83°31.62	-34°22.40
Vega	80°32.67	38°48.66
Nunki	75°46.88	-26°15.89
Altair	61°59.19	8°56.31
Peacock	53°4.37	-56°39.21
Deneb	49°25.06	45°22.49
Enif	33°37.95	9°59.71
Al Na'ir	27°31.74	-46°50.13
Fomalhaut	15°13.53	-29°29.03
Scheat	13°44.32	28°13.44
Markab	13°29.03	15°20.74
Sep 04 Thu	SHA	Mer.pass
Venus	226°17.95	10:02
Mars	163°26.52	14:12
Jupiter	250°4.23	08:25
Saturn	359°10.98	01:10
Sep 05 Fri	SHA	Mer.pass
Venus	225°4.28	10:03
Mars	162°50.29	14:10
Jupiter	249°53.03	08:22
Saturn	359°14.89	01:05
Sep 06 Sat	SHA	Mer.pass
Venus	223°50.79	10:04
Mars	162°13.96	14:09
Jupiter	249°41.95	08:19
Saturn	359°18.83	01:01
Horizontal parallax		
	Venus:	0.1
	Mars:	0.1

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°13.06	N07°9.70	46°20.51	8.7'	S25°27.93	-7.6'	56.4'
1	195°13.27	8.78	60°48.24	8.8'	25°20.31	-7.8'	56.5'
2	210°13.48	7.86	75°16.01	8.8'	25°12.54	-7.9'	56.5'
3	225°13.68	· · 6.93	89°43.81	8.8'	25°4.62	-8.1'	56.5'
4	240°13.89	6.01	104°11.64	8.9'	24°56.57	-8.2'	56.6'
5	255°14.10	5.09	118°39.51	8.9'	24°48.36	-8.3'	56.6'
6	270°14.31	N07°4.17	133°7.41	8.9'	S24°40.02	-8.5'	56.6'
7	285°14.51	3.24	147°35.35	9.0'	24°31.53	-8.6'	56.7'
8	300°14.72	2.32	162°3.32	9.0'	24°22.90	-8.8'	56.7'
9	315°14.93	· · 1.40	176°31.33	9.0'	24°14.14	-8.9'	56.7'
10	330°15.14	07°0.47	190°59.37	9.1'	24°5.23	-9.0'	56.8'
11	345°15.35	06°59.55	205°27.45	9.1'	23°56.18	-9.2'	56.8'
12	0°15.56	N06°58.62	219°55.57	9.2'	S23°46.99	-9.3'	56.8'
13	15°15.76	57.70	234°23.73	9.2'	23°37.67	-9.5'	56.9'
14	30°15.97	56.78	248°51.93	9.2'	23°28.20	-9.6'	56.9'
15	45°16.18	· · 55.85	263°20.16	9.3'	23°18.60	-9.7'	56.9'
16	60°16.39	54.93	277°48.44	9.3'	23°8.87	-9.9'	57.0'
17	75°16.60	54.00	292°16.76	9.4'	22°59.00	-10.0'	57.0'
18	90°16.81	N06°53.08	306°45.12	9.4'	S22°48.99	-10.1'	57.0'
19	105°17.02	52.15	321°13.52	9.4'	22°38.86	-10.3'	57.1'
20	120°17.23	51.22	335°41.96	9.5'	22°28.59	-10.4'	57.1'
21	135°17.44	· · 50.30	350°10.45	9.5'	22°18.18	-10.5'	57.1'
22	150°17.65	49.37	4°38.97	9.6'	22°7.65	-10.7'	57.2'
23	165°17.86	48.45	19°7.54	9.6'	21°56.99	-10.8'	57.2'
SD = 15.9'		d = -0.9'	SD = 15.4'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.07	N06°47.52	33°36.15	9.7'	S21°46.20	-10.9'	57.2'
1	195°18.28	46.59	48°4.81	9.7'	21°35.27	-11.0'	57.3'
2	210°18.49	45.67	62°33.51	9.7'	21°24.23	-11.2'	57.3'
3	225°18.70	· · 44.74	77°2.25	9.8'	21°13.05	-11.3'	57.3'
4	240°18.91	43.81	91°31.04	9.8'	21°1.75	-11.4'	57.4'
5	255°19.12	42.89	105°59.87	9.9'	20°50.33	-11.5'	57.4'
6	270°19.33	N06°41.96	120°28.74	9.9'	S20°38.78	-11.7'	57.4'
7	285°19.54	41.03	134°57.66	10.0'	20°27.11	-11.8'	57.5'
8	300°19.75	40.10	149°26.62	10.0'	20°15.32	-11.9'	57.5'
9	315°19.96	· · 39.17	163°55.62	10.0'	20°3.41	-12.0'	57.5'
10	330°20.17	38.25	178°24.67	10.1'	19°51.37	-12.2'	57.6'
11	345°20.38	37.32	192°53.76	10.1'	19°39.22	-12.3'	57.6'
12	0°20.59	N06°36.39	207°22.90	10.2'	S19°26.96	-12.4'	57.6'
13	15°20.80	35.46	221°52.08	10.2'	19°14.57	-12.5'	57.7'
14	30°21.01	34.53	236°21.30	10.3'	19°2.07	-12.6'	57.7'
15	45°21.23	· · 33.60	250°50.57	10.3'	18°49.46	-12.7'	57.7'
16	60°21.44	32.67	265°19.88	10.4'	18°36.73	-12.8'	57.8'
17	75°21.65	31.74	279°49.23	10.4'	18°23.89	-13.0'	57.8'
18	90°21.86	N06°30.81	294°18.63	10.4'	S18°10.94	-13.1'	57.8'
19	105°22.07	29.88	308°48.07	10.5'	17°57.88	-13.2'	57.9'
20	120°22.28	28.95	323°17.55	10.5'	17°44.71	-13.3'	57.9'
21	135°22.50	· · 28.02	337°47.07	10.6'	17°31.44	-13.4'	57.9'
22	150°22.71	27.09	352°16.64	10.6'	17°18.05	-13.5'	58.0'
23	165°22.92	26.16	6°46.24	10.6'	17°4.57	-13.6'	58.0'
SD = 15.9'		d = -0.9'	SD = 15.6'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.13	N06°25.23	21°15.89	10.7'	S16°50.98	-13.7'	58.0'
1	195°23.34	24.30	35°45.58	10.7'	16°37.28	-13.8'	58.1'
2	210°23.56	23.37	50°15.30	10.8'	16°23.49	-13.9'	58.1'
3	225°23.77	· · 22.44	64°45.07	10.8'	16°9.59	-14.0'	58.1'
4	240°23.98	21.51	79°14.88	10.8'	15°55.59	-14.1'	58.2'
5	255°24.19	20.57	93°44.72	10.9'	15°41.50	-14.2'	58.2'
6	270°24.41	N06°19.64	108°14.60	10.9'	S15°27.31	-14.3'	58.2'
7	285°24.62	18.71	122°44.53	11.0'	15°13.03	-14.4'	58.3'
8	300°24.83	17.78	137°14.48	11.0'	14°58.65	-14.5'	58.3'
9	315°25.05	· · 16.85	151°44.48	11.0'	14°44.17	-14.6'	58.3'
10	330°25.26	15.91	166°14.51	11.1'	14°29.61	-14.7'	58.4'
11	345°25.47	14.98	180°44.58	11.1'	14°14.96	-14.7'	58.4'
12	0°25.68	N06°14.05	195°14.68	11.1'	S14°0.21	-14.8'	58.4'
13	15°25.90	13.11	209°44.81	11.2'	13°45.38	-14.9'	58.4'
14	30°26.11	12.18	224°14.98	11.2'	13°30.47	-15.0'	58.5'
15	45°26.33	· · 11.25	238°45.18	11.2'	13°15.47	-15.1'	58.5'
16	60°26.54	10.31	253°15.42	11.3'	13°0.38	-15.2'	58.5'
17	75°26.75	9.38	267°45.68	11.3'	12°45.21	-15.2'	58.6'
18	90°26.97	N06°8.45	282°15.98	11.3'	S12°29.96	-15.3'	58.6'
19	105°27.18	7.51	296°46.30	11.4'	12°14.64	-15.4'	58.6'
20	120°27.39	6.58	311°16.66	11.4'	11°59.23	-15.5'	58.7'
21	135°27.61	· · 5.64	325°47.04	11.4'	11°43.75	-15.6'	58.7'
22	150°27.82	4.71	340°17.45	11.4'	11°28.19	-15.6'	58.7'
23	165°28.04	3.77	354°47.89	11.5'	11°12.56	-15.7'	58.7'
SD = 15.9'		d = -0.9'	SD = 15.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	////	03:00	04:22	19:32	20:53	////
N 70°	01:20	03:22	04:33	19:22	20:32	22:27
68°	02:05	03:39	04:42	19:13	20:15	21:46
66°	02:34	03:52	04:49	19:06	20:02	21:19
64°	02:55	04:03	04:55	19:00	19:51	20:59
62°	03:11	04:13	05:00	18:55	19:42	20:43
60°	03:25	04:21	05:05	18:51	19:35	20:30
N 58°	03:36	04:28	05:09	18:47	19:28	20:19
56°	03:45	04:34	05:12	18:44	19:22	20:10
54°	03:54	04:39	05:16	18:40	19:17	20:02
52°	04:01	04:44	05:19	18:38	19:12	19:55
50°	04:08	04:48	05:21	18:35	19:08	19:48
45°	04:21	04:57	05:27	18:29	18:59	19:35
N 40°	04:31	05:04	05:32	18:25	18:52	19:25
35°	04:40	05:10	05:36	18:21	18:47	19:17
30°	04:47	05:15	05:39	18:18	18:42	19:10
20°	04:57	05:23	05:45	18:12	18:34	19:00
N 10°	05:05	05:29	05:51	18:07	18:28	18:52
0°	05:10	05:35	05:55	18:02	18:23	18:47
S 10°	05:14	05:39	06:00	17:57	18:18	18:43
20°	05:17	05:43	06:05	17:53	18:15	18:40
30°	05:19	05:46	06:10	17:47	18:11	18:39
35°	05:19	05:48	06:13	17:44	18:10	18:39
40°	05:19	05:50	06:17	17:41	18:08	18:39
45°	05:18	05:52	06:21	17:37	18:06	18:40
S 50°	05:16	05:53	06:26	17:32	18:05	18:42
52°	05:15	05:54	06:28	17:30	18:04	18:43
54°	05:14	05:55	06:30	17:28	18:04	18:44
56°	05:13	05:56	06:33	17:26	18:03	18:46
58°	05:11	05:56	06:36	17:23	18:02	18:48
S 60°	05:09	05:57	06:39	17:20	18:01	18:50

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	■	21:36	20:01	■	23:53	· · ·
N 70°	■	20:34	19:40	■	■	00:53
68°	■	19:59	19:24	■	■	01:27
66°	20:13	19:33	19:11	23:23	· · ·	01:51
64°	19:32	19:13	19:00	· · ·	00:04	02:10
62°	19:04	18:57	18:51	· · ·	00:31	02:25
60°	18:42	18:43	18:43	· · ·	00:53	02:38
N 58°	18:24	18:31	18:35	· · ·	01:10	02:49
56°	18:09	18:21	18:29	· · ·	01:24	02:58
54°	17:56	18:11	18:23	00:10	01:37	03:06
52°	17:44	18:03	18:18	00:25	01:48	03:14
50°	17:34	17:56	18:13	00:37	01:57	03:20
45°	17:12	17:40	18:03	01:03	02:18	03:35
N 40°	16:55	17:27	17:55	01:23	02:34	03:46
35°	16:40	17:16	17:47	01:40	02:47	03:56
30°	16:27	17:06	17:41	01:55	02:59	04:05
20°	16:05	16:49	17:29	02:20	03:20	04:19
N 10°	15:46	16:34	17:19	02:41	03:37	04:32
0°	15:28	16:20	17:10	03:01	03:53	04:44
S 10°	15:10	16:06	17:00	03:20	04:09	04:56
20°	14:51	15:51	16:50	03:41	04:26	05:08
30°	14:28	15:33	16:39	04:05	04:46	05:22
35°	14:15	15:23	16:32	04:19	04:57	05:30
40°	14:00	15:11	16:24	04:35	05:10	05:40
45°	13:42	14:58	16:15	04:55	05:25	05:50
S 50°	13:19	14:41	16:04	05:18	05:44	06:03
52°	13:08	14:33	15:59	05:30	05:52	06:09
54°	12:55	14:24	15:53	05:43	06:02	06:16
56°	12:41	14:14	15:47	05:58	06:13	06:23
58°	12:24	14:02	15:40	06:15	06:25	06:31
S 60°	12:03	13:48	15:32	06:37	06:40	06:40

Day	Sun		Mer. Pass	Moon		Age 12-14 84-96%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
04	00:52	01:02	11:59	21:41	09:14	
05	01:12	01:22	11:59	22:32	10:07	
06	01:33	01:43	11:58	23:22	10:57	

September 07, 08, 09 UT (Sun., Mon., Tue.)


h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	346°19.61		208°57.08	N16°47.79	147°57.14	S07°35.08	235°50.58	N22°4.84	345°42.41	S02°26.83
1	1°22.07		223°56.50	47.01	162°58.08	35.72	250°52.59	4.79	0°45.04	26.90
2	16°24.54		238°55.91	46.24	177°59.02	36.37	265°54.60	4.73	15°47.67	26.98
3	31°27.00		253°55.32	· · 45.47	192°59.97	· · 37.01	280°56.61	· · 4.68	30°50.30	· · 27.06
4	46°29.46		268°54.74	44.69	208°0.91	37.65	295°58.62	4.62	45°52.93	27.14
5	61°31.93		283°54.15	43.92	223°1.85	38.30	311°0.63	4.57	60°55.57	27.21
6	76°34.39		298°53.57	N16°43.14	238°2.80	S07°38.94	326°2.64	N22°4.51	75°58.20	S02°27.29
7	91°36.86		313°52.98	42.36	253°3.74	39.59	341°4.65	4.46	91°0.83	27.37
8	106°39.32		328°52.40	41.58	268°4.68	40.23	356°6.66	4.40	106°3.46	27.45
9	121°41.78		343°51.81	· · 40.80	283°5.62	· · 40.87	11°8.67	· · 4.35	121°6.09	· · 27.52
10	136°44.25		358°51.23	40.02	298°6.57	41.52	26°10.68	4.29	136°8.72	27.60
11	151°46.71		13°50.64	39.24	313°7.51	42.16	41°12.69	4.24	151°11.35	27.68
12	166°49.18		28°50.06	N16°38.46	328°8.45	S07°42.81	56°14.70	N22°4.18	166°13.98	S02°27.76
13	181°51.64		43°49.48	37.68	343°9.39	43.45	71°16.71	4.13	181°16.61	27.83
14	196°54.10		58°48.90	36.89	358°10.33	44.09	86°18.72	4.07	196°19.24	27.91
15	211°56.57		73°48.31	· · 36.11	13°11.28	· · 44.74	101°20.73	· · 4.02	211°21.88	· · 27.99
16	226°59.03		88°47.73	35.33	28°12.22	45.38	116°22.75	3.96	226°24.51	28.07
17	242°1.50		103°47.15	34.54	43°13.16	46.02	131°24.76	3.91	241°27.14	28.14
18	257°3.96		118°46.57	N16°33.75	58°14.10	S07°46.67	146°26.77	N22°3.85	256°29.77	S02°28.22
19	272°6.42		133°45.99	32.97	73°15.04	47.31	161°28.78	3.80	271°32.40	28.30
20	287°8.89		148°45.41	32.18	88°15.98	47.95	176°30.80	3.75	286°35.03	28.38
21	302°11.35		163°44.83	· · 31.39	103°16.92	· · 48.60	191°32.81	· · 3.69	301°37.67	· · 28.45
22	317°13.82		178°44.25	30.60	118°17.86	49.24	206°34.82	3.64	316°40.30	28.53
23	332°16.28		193°43.67	29.81	133°18.80	49.88	221°36.84	3.58	331°42.93	28.61
Mer.pass. 00:55		ν-0.6' d-0.8' m-3.94		ν0.9' d0.6' m1.62		ν2.0' d-0.1' m-2.01		ν2.6' d0.1' m0.63		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	347°18.74		208°43.09	N16°29.02	148°19.74	S07°50.53	236°38.85	N22°3.53	346°45.56	S02°28.69
1	2°21.21		223°42.51	28.22	163°20.68	51.17	251°40.86	3.47	1°48.19	28.76
2	17°23.67		238°41.93	27.43	178°21.62	51.81	266°42.88	3.42	16°50.82	28.84
3	32°26.14		253°41.35	· · 26.64	193°22.56	· · 52.46	281°44.89	· · 3.36	31°53.46	· · 28.92
4	47°28.60		268°40.77	25.84	208°23.50	53.10	296°46.90	3.31	46°56.09	29.00
5	62°31.06		283°40.19	25.05	223°24.44	53.74	311°48.92	3.25	61°58.72	29.08
6	77°33.53		298°39.61	N16°24.25	238°25.37	S07°54.38	326°50.93	N22°3.20	77°1.35	S02°29.15
7	92°35.99		313°39.04	23.45	253°26.31	55.03	341°52.95	3.14	92°3.99	29.23
8	107°38.46		328°38.46	22.65	268°27.25	55.67	356°54.96	3.09	107°6.62	29.31
9	122°40.92		343°37.88	· · 21.85	283°28.19	· · 56.31	11°56.98	· · 3.03	122°9.25	· · 29.39
10	137°43.38		358°37.31	21.05	298°29.13	56.96	26°58.99	2.98	137°11.88	29.46
11	152°45.85		13°36.73	20.25	313°30.07	57.60	42°1.01	2.92	152°14.52	29.54
12	167°48.31		28°36.16	N16°19.45	328°31.00	S07°58.24	57°3.02	N22°2.87	167°17.15	S02°29.62
13	182°50.78		43°35.58	18.65	343°31.94	58.88	72°5.04	2.81	182°19.78	29.70
14	197°53.24		58°35.00	17.85	358°32.88	07°59.53	87°7.06	2.76	197°22.41	29.78
15	212°55.70		73°34.43	· · 17.04	13°33.81	08°0.17	102°9.07	· · 2.70	212°25.05	· · 29.85
16	227°58.17		88°33.86	16.24	28°34.75	0.81	117°11.09	2.65	227°27.68	29.93
17	243°0.63		103°33.28	15.43	43°35.69	1.45	132°13.11	2.59	242°30.31	30.01
18	258°3.10		118°32.71	N16°14.63	58°36.62	S08°2.09	147°15.12	N22°2.54	257°32.94	S02°30.09
19	273°5.56		133°32.13	13.82	73°37.56	2.74	162°17.14	2.48	272°35.58	30.17
20	288°8.02		148°31.56	13.01	88°38.50	3.38	177°19.16	2.43	287°38.21	30.24
21	303°10.49		163°30.99	· · 12.20	103°39.43	· · 4.02	192°21.18	· · 2.37	302°40.84	· · 30.32
22	318°12.95		178°30.41	11.39	118°40.37	4.66	207°23.19	2.32	317°43.48	30.40
23	333°15.42		193°29.84	10.58	133°41.30	5.30	222°25.21	2.26	332°46.11	30.48
Mer.pass. 00:51		ν-0.6' d-0.8' m-3.94		ν0.9' d0.6' m1.62		ν2.0' d-0.1' m-2.02		ν2.6' d0.1' m0.63		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	348°17.88		208°29.27	N16°9.77	148°42.24	S08°5.95	237°27.23	N22°2.21	347°48.74	S02°30.56
1	3°20.34		223°28.70	8.96	163°43.18	6.59	252°29.25	2.16	2°51.38	30.63
2	18°22.81		238°28.13	8.15	178°44.11	7.23	267°31.27	2.10	17°54.01	30.71
3	33°25.27		253°27.56	· · 7.34	193°45.04	· · 7.87	282°33.28	· · 2.05	32°56.64	· · 30.79
4	48°27.74		268°26.99	6.52	208°45.98	8.51	297°35.30	1.99	47°59.28	30.87
5	63°30.20		283°26.41	5.71	223°46.91	9.15	312°37.32	1.94	63°1.91	30.95
6	78°32.66		298°25.84	N16°4.89	238°47.85	S08°9.79	327°39.34	N22°1.88	78°4.54	S02°31.02
7	93°35.13		313°25.27	4.07	253°48.78	10.44	342°41.36	1.83	93°7.18	31.10
8	108°37.59		328°24.71	3.26	268°49.72	11.08	357°43.38	1.77	108°9.81	31.18
9	123°40.06		343°24.14	· · 2.44	283°50.65	· · 11.72	12°45.40	· · 1.72	123°12.44	· · 31.26
10	138°42.52		358°23.57	1.62	298°51.58	12.36	27°47.42	1.66	138°15.08	31.34
11	153°44.98		13°23.00	0.80	313°52.52	13.00	42°49.44	1.61	153°17.71	31.41
12	168°47.45		28°22.43	N15°59.98	328°53.45	S08°13.64	57°51.46	N22°1.55	168°20.34	S02°31.49
13	183°49.91		43°21.86	15°59.16	343°54.38	14.28	72°53.48	1.50	183°22.98	31.57
14	198°52.38		58°21.29	58.33	358°55.32	14.92	87°55.50	1.44	198°25.61	31.65
15	213°54.84		73°20.73	· · 57.51	13°56.25	· · 15.56	102°57.52	· · 1.39	213°28.25	· · 31.73
16	228°57.30		88°20.16	56.69	28°57.18	16.21	117°59.54	1.33	228°30.88	31.80
17	243°59.77		103°19.59	55.86	43°58.11	16.85	133°1.57	1.28	243°33.51	31.88
18	259°2.23		118°19.03	N15°55.04	58°59.05	S08°17.49	148°3.59	N22°1.22	258°36.15	S02°31.96
19	274°4.70		133°18.46	54.21	73°59.98	18.13	163°5.61	1.17	273°38.78	32.04
20	289°7.16		148°17.90	53.38	89°0.91	18.77	178°7.63	1.12	288°41.42	32.12
21	304°9.63		163°17.33	· · 52.56	104°1.84	· · 19.41	193°9.65	· · 1.06	303°44.05	· · 32.20
22	319°12.09		178°16.77	51.73	119°2.77	20.05	208°11.68	1.01	318°46.68	32.27
23	334°14.55		193°16.20	50.90	134°3.70	20.69	223°13.70	0.95	333°49.32	32.35
Mer.pass. 00:47		ν-0.6' d-0.8' m-3.94		ν0.9' d0.6' m1.61		ν2.0' d-0.1' m-2.02		ν2.6' d0.1' m0.62		

Stars		
	SHA	Dec
Alpheratz	357°33.87	29°14.03
Ankaa	353°6.18	-42°9.77
Schedar	349°29.93	56°40.68
Diphda	348°46.43	-17°50.54
Achernar	335°19.29	-57°6.09
Hamal	327°50.34	23°35.10
Polaris	313°32.32	89°22.08
Acamar	315°11.13	-40°11.77
Menkar	314°5.41	4°11.58
Mirfak	308°27.28	49°57.03
Aldebaran	290°38.95	16°33.72
Rigel	281°3.36	-8°10.10
Capella	280°21.11	46°1.30
Bellatrix	278°22.32	6°22.51
Elnath	278°1.21	28°37.73
Alnilam	275°37.22	-1°10.95
Betelgeuse	270°51.56	7°24.83
Canopus	263°52.34	-52°42.17
Sirius	258°25.89	-16°44.83
Adhara	255°5.61	-29°0.12
Procyon	244°50.46	5°9.67
Pollux	243°16.86	27°57.86
Avior	234°15.03	-59°35.21
Suhail	222°46.31	-43°31.95
Miaplacidus	221°39.05	-69°49.13
Alphard	217°47.51	-8°46.04
Regulus	207°34.16	11°50.61
Dubhe	193°40.94	61°36.80
Denebola	182°24.69	14°25.83
Gienah	175°43.34	-17°41.01
Acrux	173°0.19	-63°14.56
Gacrux	171°51.61	-57°15.48
Alioth	166°12.93	55°49.38
Spica	158°21.98	-11°17.67
Alkaid	152°51.89	49°11.29
Hadar	148°35.70	-60°29.97
Menkent	147°57.25	-36°29.84
Arcturus	145°47.61	19°3.07
Rigel Kent.	139°39.96	-60°56.67
Kochab	137°20.35	74°3.19
Zuben'ubi	136°55.58	-16°8.90
Alphecca	126°3.39	26°37.88
Antares	112°15.20	-26°29.38
Atria	107°8.92	-69°4.66
Sabik	102°2.13	-15°45.39
Shaula	96°9.55	-37°7.44
Rasalhague	95°57.98	12°32.63
Eltanin	90°41.80	51°29.37
Kaus Aust.	83°31.63	-34°22.41
Vega	80°32.68	38°48.67
Nunki	75°46.90	-26°15.90
Altair	61°59.20	8°56.31
Peacock	53°4.38	-56°39.22
Deneb	49°25.07	45°22.50
Enif	33°37.95	9°59.71
Al Na'ir	27°31.74	-46°50.14
Fomalhaut	15°13.53	-29°29.04
Scheat	13°44.32	28°13.45
Markab	13°29.03	15°20.75
Sep 07 Sun	SHA	Mer.pass
Venus	222°37.47	10:05
Mars	161°37.53	14:07
Jupiter	249°30.97	08:16
Saturn	359°22.80	00:57
Sep 08 Mon	SHA	Mer.pass
Venus	221°24.34	10:06
Mars	161°1.00	14:06
Jupiter	249°20.10	08:12
Saturn	359°26.82	00:53
Sep 09 Tue	SHA	Mer.pass
Venus	220°11.39	10:06
Mars	160°24.36	14:04
Jupiter	249°9.35	08:09
Saturn	359°30.86	00:49
Horizontal parallax		
	Venus:	0.1
	Mars:	0.1

h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.25	N06°2.84	9°18.35	11.5'	S10°56.86	-15.8'	58.8'
1	195°28.47	1.90	23°48.84	11.5'	10°41.08	-15.8'	58.8'
2	210°28.68	0.97	38°19.35	11.5'	10°25.24	-15.9'	58.8'
3	225°28.89	06°0.03	52°49.89	11.6'	10°9.32	-16.0'	58.9'
4	240°29.11	05°59.10	67°20.45	11.6'	09°53.34	-16.0'	58.9'
5	255°29.32	58.16	81°51.03	11.6'	09°37.30	-16.1'	58.9'
6	270°29.54	N05°57.22	96°21.63	11.6'	S09°21.19	-16.2'	58.9'
7	285°29.75	56.29	110°52.25	11.6'	09°5.02	-16.2'	59.0'
8	300°29.97	55.35	125°22.89	11.7'	08°48.79	-16.3'	59.0'
9	315°30.18	· · 54.41	139°53.55	11.7'	08°32.49	-16.3'	59.0'
10	330°30.40	53.48	154°24.22	11.7'	08°16.15	-16.4'	59.0'
11	345°30.61	52.54	168°54.91	11.7'	07°59.74	-16.5'	59.1'
12	0°30.83	N05°51.60	183°25.62	11.7'	S07°43.28	-16.5'	59.1'
13	15°31.04	50.67	197°56.34	11.7'	07°26.77	-16.6'	59.1'
14	30°31.26	49.73	212°27.07	11.7'	07°10.20	-16.6'	59.1'
15	45°31.48	· · 48.79	226°57.82	11.8'	06°53.59	-16.7'	59.2'
16	60°31.69	47.85	241°28.57	11.8'	06°36.92	-16.7'	59.2'
17	75°31.91	46.92	255°59.34	11.8'	06°20.21	-16.8'	59.2'
18	90°32.12	N05°45.98	270°30.11	11.8'	S06°3.45	-16.8'	59.2'
19	105°32.34	45.04	285°0.89	11.8'	05°46.65	-16.8'	59.3'
20	120°32.55	44.10	299°31.68	11.8'	05°29.81	-16.9'	59.3'
21	135°32.77	· · 43.16	314°2.47	11.8'	05°12.92	-16.9'	59.3'
22	150°32.99	42.22	328°33.27	11.8'	04°56.00	-17.0'	59.3'
23	165°33.20	41.28	343°4.07	11.8'	04°39.04	-17.0'	59.4'
SD = 15.9' $d = -0.9'$			SD = 16.0'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°33.42	N05°40.35	357°34.87	11.8'	S04°22.04	-17.0'	59.4'
1	195°33.64	39.41	12°5.68	11.8'	04°5.01	-17.1'	59.4'
2	210°33.85	38.47	26°36.48	11.8'	03°47.95	-17.1'	59.4'
3	225°34.07	· · 37.53	41°7.28	11.8'	03°30.85	-17.1'	59.4'
4	240°34.28	36.59	55°38.08	11.8'	03°13.73	-17.2'	59.5'
5	255°34.50	35.65	70°8.88	11.8'	02°56.57	-17.2'	59.5'
6	270°34.72	N05°34.71	84°39.67	11.8'	S02°39.39	-17.2'	59.5'
7	285°34.93	33.77	99°10.46	11.8'	02°22.19	-17.2'	59.5'
8	300°35.15	32.83	113°41.24	11.8'	02°4.96	-17.2'	59.5'
9	315°35.37	· · 31.89	128°12.01	11.8'	01°47.72	-17.3'	59.6'
10	330°35.59	30.95	142°42.78	11.8'	01°30.45	-17.3'	59.6'
11	345°35.80	30.00	157°13.53	11.7'	01°13.16	-17.3'	59.6'
12	0°36.02	N05°29.06	171°44.27	11.7'	S00°55.86	-17.3'	59.6'
13	15°36.24	28.12	186°15.00	11.7'	00°38.54	-17.3'	59.6'
14	30°36.45	27.18	200°45.71	11.7'	00°21.21	-17.3'	59.6'
15	45°36.67	· · 26.24	215°16.41	11.7'	S00°3.87	-17.4'	59.7'
16	60°36.89	25.30	229°47.09	11.7'	N00°13.48	17.4'	59.7'
17	75°37.11	24.36	244°17.75	11.6'	00°30.84	17.4'	59.7'
18	90°37.32	N05°23.41	258°48.40	11.6'	N00°48.20	17.4'	59.7'
19	105°37.54	22.47	273°19.03	11.6'	01°5.57	17.4'	59.7'
20	120°37.76	21.53	287°49.63	11.6'	01°22.94	17.4'	59.7'
21	135°37.98	· · 20.59	302°20.21	11.6'	01°40.31	17.4'	59.8'
22	150°38.19	19.64	316°50.77	11.5'	01°57.68	17.4'	59.8'
23	165°38.41	18.70	331°21.30	11.5'	02°15.05	17.4'	59.8'
SD = 15.9' $d = -0.9'$			SD = 16.2'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.63	N05°17.76	345°51.81	11.5'	N02°32.42	17.4'	59.8'
1	195°38.85	16.82	0°22.29	11.5'	02°49.78	17.4'	59.8'
2	210°39.07	15.87	14°52.74	11.4'	03°7.13	17.3'	59.8'
3	225°39.28	· · 14.93	29°23.16	11.4'	03°24.47	17.3'	59.8'
4	240°39.50	13.99	43°53.55	11.4'	03°41.80	17.3'	59.8'
5	255°39.72	13.04	58°23.91	11.3'	03°59.11	17.3'	59.9'
6	270°39.94	N05°12.10	72°54.23	11.3'	N04°16.42	17.3'	59.9'
7	285°40.16	11.15	87°24.52	11.3'	04°33.70	17.3'	59.9'
8	300°40.38	10.21	101°54.78	11.2'	04°50.97	17.2'	59.9'
9	315°40.59	· · 9.26	116°25.00	11.2'	05°8.21	17.2'	59.9'
10	330°40.81	8.32	130°55.17	11.1'	05°25.44	17.2'	59.9'
11	345°41.03	7.38	145°25.31	11.1'	05°42.64	17.2'	59.9'
12	0°41.25	N05°6.43	159°55.41	11.1'	N05°59.81	17.1'	59.9'
13	15°41.47	5.49	174°25.47	11.0'	06°16.96	17.1'	59.9'
14	30°41.69	4.54	188°55.48	11.0'	06°34.08	17.1'	59.9'
15	45°41.91	· · 3.60	203°25.45	10.9'	06°51.16	17.1'	60.0'
16	60°42.13	2.65	217°55.37	10.9'	07°8.22	17.0'	60.0'
17	75°42.34	1.70	232°25.25	10.8'	07°25.24	17.0'	60.0'
18	90°42.56	N05°0.76	246°55.08	10.8'	N07°42.22	16.9'	60.0'
19	105°42.78	04°59.81	261°24.86	10.7'	07°59.16	16.9'	60.0'
20	120°43.00	58.87	275°54.59	10.7'	08°16.07	16.9'	60.0'
21	135°43.22	· · 57.92	290°24.27	10.6'	08°32.93	16.8'	60.0'
22	150°43.44	56.97	304°53.90	10.6'	08°49.74	16.8'	60.0'
23	165°43.66	56.03	319°23.47	10.5'	09°6.52	16.7'	60.0'
SD = 15.9' $d = -0.9'$			SD = 16.3'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	00:42	03:18	04:36	19:16	20:33	22:54
N 70°	01:50	03:37	04:45	19:08	20:15	21:58
68°	02:25	03:51	04:52	19:01	20:01	21:26
66°	02:49	04:03	04:58	18:55	19:49	21:03
64°	03:07	04:13	05:04	18:50	19:40	20:45
62°	03:22	04:21	05:08	18:46	19:32	20:31
60°	03:34	04:28	05:12	18:42	19:25	20:19
N 58°	03:44	04:35	05:15	18:39	19:19	20:09
56°	03:53	04:40	05:18	18:36	19:14	20:01
54°	04:00	04:45	05:21	18:33	19:09	19:53
52°	04:07	04:49	05:23	18:31	19:05	19:47
50°	04:13	04:53	05:26	18:29	19:01	19:41
45°	04:25	05:01	05:30	18:24	18:54	19:29
N 40°	04:35	05:07	05:34	18:20	18:47	19:20
35°	04:42	05:12	05:38	18:17	18:42	19:12
30°	04:48	05:17	05:41	18:14	18:38	19:06
20°	04:58	05:24	05:46	18:09	18:31	18:57
N 10°	05:05	05:29	05:50	18:05	18:26	18:50
0°	05:09	05:34	05:54	18:01	18:22	18:46
S 10°	05:13	05:37	05:58	17:57	18:18	18:43
20°	05:15	05:40	06:02	17:53	18:15	18:41
30°	05:15	05:43	06:07	17:49	18:13	18:41
35°	05:15	05:44	06:09	17:46	18:12	18:41
40°	05:14	05:45	06:12	17:44	18:11	18:42
45°	05:12	05:46	06:15	17:41	18:10	18:44
S 50°	05:10	05:47	06:19	17:37	18:09	18:47
52°	05:08	05:47	06:21	17:35	18:09	18:48
54°	05:07	05:48	06:23	17:33	18:09	18:50
56°	05:05	05:48	06:25	17:31	18:08	18:52
58°	05:03	05:48	06:27	17:29	18:08	18:54
S 60°	05:00	05:48	06:30	17:27	18:08	18:56

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	19:14	18:36	17:56	03:14	05:45	08:12
N 70°	19:06	18:37	18:07	03:32	05:49	08:05
68°	19:00	18:38	18:16	03:45	05:53	07:59
66°	18:54	18:39	18:23	03:57	05:56	07:54
64°	18:49	18:39	18:29	04:06	05:58	07:50
62°	18:45	18:40	18:35	04:14	06:00	07:47
60°	18:42	18:40	18:39	04:20	06:02	07:44
N 58°	18:38	18:41	18:44	04:26	06:03	07:41
56°	18:35	18:41	18:47	04:32	06:05	07:39
54°	18:33	18:42	18:51	04:36	06:06	07:37
52°	18:30	18:42	18:54	04:40	06:07	07:35
50°	18:28	18:42	18:57	04:44	06:08	07:33
45°	18:24	18:43	19:03	04:52	06:10	07:29
N 40°	18:20	18:44	19:08	04:59	06:12	07:26
35°	18:16	18:44	19:13	05:05	06:14	07:23
30°	18:13	18:45	19:17	05:10	06:15	07:21
20°	18:08	18:45	19:24	05:19	06:18	07:17
N 10°	18:03	18:46	19:30	05:26	06:20	07:13
0°	17:59	18:47	19:36	05:33	06:21	07:10
S 10°	17:54	18:48	19:42	05:40	06:23	07:07
20°	17:49	18:49	19:49	05:47	06:25	07:03
30°	17:44	18:50	19:56	05:56	06:27	06:59
35°	17:41	18:50	20:01	06:00	06:29	06:57
40°	17:37	18:51	20:06	06:06	06:30	06:54
45°	17:33	18:52	20:11	06:12	06:32	06:51
S 50°	17:28	18:53	20:18	06:19	06:33	06:47
52°	17:26	18:53	20:22	06:22	06:34	06:46
54°	17:23	18:53	20:25	06:26	06:35	06:44
56°	17:20	18:54	20:29	06:30	06:36	06:42
58°	17:17	18:55	20:34	06:35	06:37	06:40
S 60°	17:14	18:55	20:39	06:40	06:39	06:37

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%
07	01:53	02:03	11:58	—:—	11:46	
08	02:14	02:24	11:58	00:10	12:34	
09	02:35	02:45	11:57	00:58	13:23	

September 10, 11, 12 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	349°17.02		208°15.64	N15°50.07	149°4.63	S08°21.33	238°15.72	N22°0.90	348°51.95	S02°32.43	Alpheratz	357°33.86 29°14.04
1	4°19.48		223°15.07	49.24	164°5.56	21.97	253°17.74	0.84	3°54.59	32.51	Ankaa	353°6.17 -42°9.78
2	19°21.95		238°14.51	48.41	179°6.49	22.61	268°19.77	0.79	18°57.22	32.59	Schedar	349°29.92 56°40.70
3	34°24.41		253°13.94	· · 47.57	194°7.42	· · 23.25	283°21.79	· · 0.73	33°59.86	· · 32.67	Diphda	348°46.43 -17°50.54
4	49°26.87		268°13.38	46.74	209°8.35	23.89	298°23.81	0.68	49°2.49	32.74	Achernar	335°19.27 -57°6.10
5	64°29.34		283°12.82	45.91	224°9.28	24.53	313°25.84	0.62	64°5.13	32.82	Hamal	327°50.33 23°35.10
6	79°31.80		298°12.26	N15°45.07	239°10.21	S08°25.17	328°27.86	N22°0.57	79°7.76	S02°32.90	Polaris	313°30.93 89°22.08
7	94°34.27		313°11.69	44.23	254°11.14	25.81	343°29.89	0.51	94°10.39	32.98	Acamar	315°11.11 -40°11.77
8	109°36.73		328°11.13	43.40	269°12.07	26.45	358°31.91	0.46	109°13.03	33.06	Menkar	314°5.40 4°11.58
9	124°39.19		343°10.57	· · 42.56	284°13.00	· · 27.09	13°33.93	· · 0.41	124°15.66	· · 33.14	Mirfak	308°27.25 49°57.03
10	139°41.66		358°10.01	41.72	299°13.93	27.73	28°35.96	0.35	139°18.30	33.21	Aldebaran	290°38.93 16°33.72
11	154°44.12		13°9.45	40.88	314°14.86	28.37	43°37.98	0.30	154°20.93	33.29	Rigel	281°3.34 -8°10.10
12	169°46.59		28°8.89	N15°40.04	329°15.79	S08°29.01	58°40.01	N22°0.24	169°23.57	S02°33.37	Capella	280°21.08 46°1.30
13	184°49.05		43°8.33	39.20	344°16.72	29.65	73°42.03	0.19	184°26.20	33.45	Bellatrix	278°22.30 6°22.51
14	199°51.51		58°7.77	38.36	359°17.65	30.29	88°44.06	0.13	199°28.84	33.53	Elnath	278°1.19 28°37.73
15	214°53.98		73°7.21	· · 37.52	14°18.57	· · 30.93	103°46.09	· · 0.08	214°31.47	· · 33.61	Alnilam	275°37.20 -1°10.95
16	229°56.44		88°6.65	36.68	29°19.50	31.57	118°48.11	0.02	229°34.11	33.68	Betelgeuse	270°51.55 7°24.83
17	244°58.91		103°6.09	35.84	44°20.43	32.21	133°50.14	21°59.97	244°36.74	33.76	Canopus	263°52.31 -52°42.16
18	260°1.37		118°5.53	N15°34.99	59°21.36	S08°32.84	148°52.16	N21°59.91	259°39.38	S02°33.84	Sirius	258°25.88 -16°44.83
19	275°3.83		133°4.97	34.15	74°22.28	33.48	163°54.19	59.86	274°42.01	33.92	Adhara	255°5.60 -29°0.12
20	290°6.30		148°4.41	33.30	89°23.21	34.12	178°56.22	59.81	289°44.65	34.00	Procyon	244°50.44 5°9.67
21	305°8.76		163°3.86	· · 32.45	104°24.14	· · 34.76	193°58.24	· · 59.75	304°47.28	· · 34.08	Pollux	243°16.85 27°57.85
22	320°11.23		178°3.30	31.61	119°25.07	35.40	209°0.27	59.70	319°49.92	34.15	Avior	234°15.01 -59°35.20
23	335°13.69		193°2.74	30.76	134°25.99	36.04	224°2.30	59.64	334°52.56	34.23	Suhail	222°46.30 -43°31.94
Mer.pass. 00:43		ν-0.6' d-0.8' m-3.94		ν0.9' d0.6' m1.61		ν2.0' d-0.1' m-2.02		ν2.6' d0.1' m0.62				
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	350°16.15		208°2.18	N15°29.91	149°26.92	S08°36.68	239°4.33	N21°59.59	349°55.19	S02°34.31	Miaplacidus	221°39.02 -69°49.12
1	5°18.62		223°1.63	29.06	164°27.84	37.32	254°6.35	59.53	4°57.83	34.39	Alphard	217°47.50 -8°46.04
2	20°21.08		238°1.07	28.21	179°28.77	37.96	269°8.38	59.48	20°0.46	34.47	Regulus	207°34.16 11°50.60
3	35°23.55		253°0.52	· · 27.36	194°29.70	· · 38.59	284°10.41	· · 59.42	35°3.10	· · 34.55	Dubhe	193°40.94 61°36.78
4	50°26.01		267°59.96	26.51	209°30.62	39.23	299°12.44	59.37	50°5.73	34.63	Denebola	182°24.70 14°25.83
5	65°28.48		282°59.40	25.65	224°31.55	39.87	314°14.47	59.31	65°8.37	34.70	Gienah	175°43.34 -17°41.00
6	80°30.94		297°58.85	N15°24.80	239°32.47	S08°40.51	329°16.49	N21°59.26	80°11.00	S02°34.78	Acrux	173°0.20 -63°14.54
7	95°33.40		312°58.30	23.95	254°33.40	41.15	344°18.52	59.21	95°13.64	34.86	Gacrux	171°51.62 -57°15.47
8	110°35.87		327°57.74	23.09	269°34.32	41.79	359°20.55	59.15	110°16.28	34.94	Alioth	166°12.95 55°49.37
9	125°38.33		342°57.19	· · 22.23	284°35.25	· · 42.43	14°22.58	· · 59.10	125°18.91	· · 35.02	Spica	158°21.99 -11°17.66
10	140°40.80		357°56.63	21.38	299°36.17	43.06	29°24.61	59.04	140°21.55	35.10	Alkaid	152°51.91 49°11.28
11	155°43.26		12°56.08	20.52	314°37.09	43.70	44°26.64	58.99	155°24.18	35.18	Hadar	148°35.72 -60°29.96
12	170°45.72		27°55.53	N15°19.66	329°38.02	S08°44.34	59°28.67	N21°58.93	170°26.82	S02°35.25	Menkent	147°57.26 -36°29.83
13	185°48.19		42°54.97	18.80	344°38.94	44.98	74°30.70	58.88	185°29.46	35.33	Arcturus	145°47.63 19°3.07
14	200°50.65		57°54.42	17.94	359°39.87	45.62	89°32.73	58.82	200°32.09	35.41	Rigil Kent.	139°39.98 -60°56.66
15	215°53.12		72°53.87	· · 17.08	14°40.79	· · 46.25	104°34.76	· · 58.77	215°34.73	· · 35.49	Kochab	137°20.40 74°3.18
16	230°55.58		87°53.32	16.22	29°41.71	46.89	119°36.79	58.72	230°37.36	35.57	Zuben'ubi	136°55.59 -16°8.89
17	245°58.04		102°52.77	15.36	44°42.64	47.53	134°38.82	58.66	245°40.00	35.65	Alphecca	126°3.41 26°37.88
18	261°0.51		117°52.22	N15°14.50	59°43.56	S08°48.17	149°40.85	N21°58.61	260°42.64	S02°35.73	Antares	112°15.22 -26°29.38
19	276°2.97		132°51.66	13.63	74°44.48	48.80	164°42.89	58.55	275°45.27	35.80	Atria	107°8.97 -69°4.66
20	291°5.44		147°51.11	12.77	89°45.40	49.44	179°44.92	58.50	290°47.91	35.88	Sabik	102°2.15 -15°45.39
21	306°7.90		162°50.56	· · 11.90	104°46.33	· · 50.08	194°46.95	· · 58.44	305°50.55	· · 35.96	Shaula	96°9.57 -37°7.44
22	321°10.36		177°50.01	11.04	119°47.25	50.72	209°48.98	58.39	320°53.18	36.04	Rasalhague	95°58.00 12°32.63
23	336°12.83		192°49.46	10.17	134°48.17	51.35	224°51.01	58.34	335°55.82	36.12	Eltanin	90°41.82 51°29.37
Mer.pass. 00:39		ν-0.6' d-0.8' m-3.94		ν0.9' d0.6' m1.61		ν2.0' d-0.1' m-2.03		ν2.6' d0.1' m0.61				
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	351°15.29		207°48.91	N15°9.31	149°49.09	S08°51.99	239°53.05	N21°58.28	350°58.46	S02°36.20	Kaus Aust.	83°31.65 -34°22.41
1	6°17.76		222°48.37	8.44	164°50.01	52.63	254°55.08	58.23	6°1.09	36.28	Vega	80°32.70 38°48.67
2	21°20.22		237°47.82	7.57	179°50.93	53.27	269°57.11	58.17	21°3.73	36.36	Nunki	75°46.91 -26°15.90
3	36°22.69		252°47.27	· · 6.70	194°51.86	· · 53.90	284°59.14	· · 58.12	36°6.37	· · 36.43	Altair	61°59.22 8°56.31
4	51°25.15		267°46.72	5.83	209°52.78	54.54	300°1.18	58.06	51°9.00	36.51	Peacock	53°4.40 -56°39.23
5	66°27.61		282°46.17	4.96	224°53.70	55.18	315°3.21	58.01	66°11.64	36.59	Deneb	49°25.09 45°22.52
6	81°30.08		297°45.63	N15°4.09	239°54.62	S08°55.81	330°5.24	N21°57.96	81°14.28	S02°36.67	Enif	33°37.96 9°59.72
7	96°32.54		312°45.08	3.21	254°55.54	56.45	345°7.28	57.90	96°16.91	36.75	Al Na'ir	27°31.75 -46°50.15
8	111°35.01		327°44.53	2.34	269°56.46	57.09	0°9.31	57.85	111°19.55	36.83	Fomalhaut	15°13.53 -29°29.05
9	126°37.47		342°43.99	· · 1.47	284°57.38	· · 57.72	15°11.35	· · 57.79	126°22.19	· · 36.91	Scheat	13°44.32 28°13.46
10	141°39.93		357°43.44	15°0.59	299°58.30	58.36	30°13.38	57.74	141°24.82	36.99	Markab	13°29.03 15°20.75
11	156°42.40		12°42.89	14°59.72	314°59.22	59.00	45°15.41	57.68	156°27.46	37.06		

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.88	N04°55.08	333°52.99	10.5'	N09°23.24	16.7'	60.0'
1	195°44.10	54.13	348°22.45	10.4'	09°39.92	16.6'	60.0'
2	210°44.32	53.19	2°51.86	10.3'	09°56.54	16.6'	60.0'
3	225°44.54	· · 52.24	17°21.21	10.3'	10°13.11	16.5'	60.0'
4	240°44.76	51.29	31°50.49	10.2'	10°29.62	16.5'	60.0'
5	255°44.98	50.35	46°19.72	10.2'	10°46.08	16.4'	60.0'
6	270°45.20	N04°49.40	60°48.89	10.1'	N11°2.48	16.3'	60.0'
7	285°45.42	48.45	75°18.00	10.0'	11°18.82	16.3'	60.0'
8	300°45.63	47.50	89°47.04	10.0'	11°35.10	16.2'	60.0'
9	315°45.85	· · 46.56	104°16.02	9.9'	11°51.31	16.1'	60.0'
10	330°46.07	45.61	118°44.93	9.8'	12°7.46	16.1'	60.0'
11	345°46.29	44.66	133°13.77	9.8'	12°23.53	16.0'	60.0'
12	0°46.51	N04°43.71	147°42.55	9.7'	N12°39.54	15.9'	60.0'
13	15°46.73	42.76	162°11.26	9.6'	12°55.48	15.9'	60.0'
14	30°46.95	41.81	176°39.91	9.6'	13°11.34	15.8'	60.0'
15	45°47.17	· · 40.86	191°8.48	9.5'	13°27.13	15.7'	60.0'
16	60°47.39	39.92	205°36.98	9.4'	13°42.84	15.6'	60.0'
17	75°47.61	38.97	220°5.41	9.4'	13°58.47	15.5'	60.0'
18	90°47.84	N04°38.02	234°33.77	9.3'	N14°14.02	15.5'	60.0'
19	105°48.06	37.07	249°2.05	9.2'	14°29.49	15.4'	60.0'
20	120°48.28	36.12	263°30.26	9.1'	14°44.87	15.3'	60.0'
21	135°48.50	· · 35.17	277°58.39	9.1'	15°0.16	15.2'	60.0'
22	150°48.72	34.22	292°26.45	9.0'	15°15.37	15.1'	60.0'
23	165°48.94	33.27	306°54.43	8.9'	15°30.48	15.0'	60.0'
SD = 15.9' d = -0.9'			SD = 16.4'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.16	N04°32.32	321°22.34	8.8'	N15°45.51	14.9'	60.0'
1	195°49.38	31.37	335°50.16	8.7'	16°0.44	14.8'	60.0'
2	210°49.60	30.42	350°17.91	8.7'	16°15.27	14.7'	60.0'
3	225°49.82	· · 29.47	4°45.58	8.6'	16°30.01	14.6'	60.0'
4	240°50.04	28.52	19°13.17	8.5'	16°44.64	14.5'	60.0'
5	255°50.26	27.57	33°40.68	8.4'	16°59.18	14.4'	60.0'
6	270°50.48	N04°26.62	48°8.10	8.3'	N17°13.61	14.3'	60.0'
7	285°50.70	25.66	62°35.45	8.3'	17°27.94	14.2'	60.0'
8	300°50.92	24.71	77°2.71	8.2'	17°42.16	14.1'	60.0'
9	315°51.14	· · 23.76	91°29.89	8.1'	17°56.27	14.0'	60.0'
10	330°51.37	22.81	105°56.99	8.0'	18°10.27	13.9'	60.0'
11	345°51.59	21.86	120°24.01	7.9'	18°24.16	13.8'	60.0'
12	0°51.81	N04°20.91	134°50.94	7.8'	N18°37.93	13.7'	59.9'
13	15°52.03	19.96	149°17.78	7.8'	18°51.59	13.5'	59.9'
14	30°52.25	19.00	163°44.55	7.7'	19°5.13	13.4'	59.9'
15	45°52.47	· · 18.05	178°11.23	7.6'	19°18.55	13.3'	59.9'
16	60°52.69	17.10	192°37.82	7.5'	19°31.85	13.2'	59.9'
17	75°52.91	16.15	207°4.33	7.4'	19°45.02	13.1'	59.9'
18	90°53.13	N04°15.19	221°30.75	7.3'	N19°58.08	12.9'	59.9'
19	105°53.36	14.24	235°57.09	7.3'	20°11.00	12.8'	59.9'
20	120°53.58	13.29	250°23.34	7.2'	20°23.80	12.7'	59.9'
21	135°53.80	· · 12.34	264°49.51	7.1'	20°36.46	12.5'	59.9'
22	150°54.02	11.38	279°15.59	7.0'	20°49.00	12.4'	59.9'
23	165°54.24	10.43	293°41.59	6.9'	21°1.40	12.3'	59.8'
SD = 15.9' d = -1.0'			SD = 16.4'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.46	N04°9.48	308°7.50	6.8'	N21°13.66	12.1'	59.8'
1	195°54.68	8.52	322°33.33	6.7'	21°25.79	12.0'	59.8'
2	210°54.91	7.57	336°59.07	6.7'	21°37.78	11.9'	59.8'
3	225°55.13	· · 6.61	351°24.73	6.6'	21°49.64	11.7'	59.8'
4	240°55.35	5.66	5°50.31	6.5'	22°1.34	11.6'	59.8'
5	255°55.57	4.71	20°15.80	6.4'	22°12.91	11.4'	59.8'
6	270°55.79	N04°3.75	34°41.20	6.3'	N22°24.33	11.3'	59.8'
7	285°56.01	2.80	49°6.53	6.2'	22°35.61	11.1'	59.7'
8	300°56.24	1.84	63°31.77	6.2'	22°46.73	11.0'	59.7'
9	315°56.46	04°0.89	77°56.93	6.1'	22°57.71	10.8'	59.7'
10	330°56.68	03°59.94	92°22.00	6.0'	23°8.53	10.7'	59.7'
11	345°56.90	58.98	106°47.00	5.9'	23°19.21	10.5'	59.7'
12	0°57.12	N03°58.03	121°11.92	5.8'	N23°29.72	10.4'	59.7'
13	15°57.34	57.07	135°36.75	5.8'	23°40.09	10.2'	59.7'
14	30°57.57	56.12	150°1.51	5.7'	23°50.29	10.0'	59.7'
15	45°57.79	· · 55.16	164°26.19	5.6'	24°0.34	9.9'	59.6'
16	60°58.01	54.20	178°50.79	5.5'	24°10.22	9.7'	59.6'
17	75°58.23	53.25	193°15.32	5.5'	24°19.95	9.6'	59.6'
18	90°58.45	N03°52.29	207°39.77	5.4'	N24°29.51	9.4'	59.6'
19	105°58.68	51.34	222°4.15	5.3'	24°38.91	9.2'	59.6'
20	120°58.90	50.38	236°28.45	5.2'	24°48.14	9.1'	59.6'
21	135°59.12	· · 49.43	250°52.68	5.2'	24°57.21	8.9'	59.5'
22	150°59.34	48.47	265°16.84	5.1'	25°6.10	8.7'	59.5'
23	165°59.57	47.51	279°40.93	5.0'	25°14.83	8.6'	59.5'
SD = 15.9' d = -1.0'			SD = 16.3'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	01:30	03:35	04:50	19:00	20:14	22:13
N 70°	02:14	03:51	04:57	18:53	19:59	21:33
68°	02:42	04:04	05:03	18:48	19:47	21:07
66°	03:02	04:14	05:08	18:43	19:37	20:47
64°	03:19	04:23	05:12	18:39	19:28	20:32
62°	03:32	04:30	05:16	18:36	19:21	20:19
60°	03:42	04:36	05:19	18:33	19:15	20:08
N 58°	03:52	04:41	05:22	18:30	19:10	19:59
56°	04:00	04:46	05:24	18:28	19:06	19:52
54°	04:06	04:50	05:26	18:26	19:02	19:45
52°	04:13	04:54	05:28	18:24	18:58	19:39
50°	04:18	04:57	05:30	18:22	18:55	19:34
45°	04:29	05:04	05:34	18:18	18:48	19:23
N 40°	04:38	05:10	05:37	18:15	18:42	19:15
35°	04:45	05:15	05:40	18:12	18:38	19:08
30°	04:50	05:18	05:42	18:10	18:34	19:02
20°	04:59	05:24	05:47	18:06	18:28	18:54
N 10°	05:05	05:29	05:50	18:03	18:24	18:48
0°	05:09	05:33	05:53	18:00	18:21	18:45
S 10°	05:11	05:35	05:56	17:57	18:18	18:42
20°	05:12	05:38	06:00	17:54	18:16	18:41
30°	05:11	05:39	06:03	17:50	18:14	18:42
35°	05:11	05:40	06:05	17:49	18:14	18:43
40°	05:09	05:40	06:07	17:46	18:14	18:45
45°	05:07	05:40	06:10	17:44	18:13	18:47
S 50°	05:03	05:41	06:13	17:41	18:14	18:51
52°	05:01	05:40	06:14	17:40	18:14	18:53
54°	04:59	05:40	06:15	17:39	18:14	18:55
56°	04:57	05:40	06:17	17:37	18:14	18:57
58°	04:54	05:40	06:19	17:35	18:15	19:00
S 60°	04:51	05:39	06:21	17:34	18:15	19:04

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	17:03			10:54		
N 70°	17:29	16:08		10:30	13:44	
68°	17:49	17:04		10:13	12:49	
66°	18:05	17:39		09:58	12:17	
64°	18:18	18:04	17:38	09:47	11:53	14:18
62°	18:29	18:23	18:16	09:37	11:34	13:40
60°	18:39	18:40	18:43	09:29	11:19	13:14
N 58°	18:47	18:54	19:05	09:22	11:06	12:53
56°	18:55	19:06	19:22	09:15	10:55	12:37
54°	19:02	19:16	19:37	09:10	10:45	12:22
52°	19:08	19:26	19:50	09:04	10:37	12:10
50°	19:13	19:34	20:02	09:00	10:29	11:59
45°	19:25	19:52	20:26	08:50	10:13	11:36
N 40°	19:35	20:07	20:45	08:42	09:59	11:18
35°	19:44	20:19	21:01	08:35	09:48	11:02
30°	19:52	20:31	21:15	08:29	09:38	10:49
20°	20:05	20:50	21:40	08:18	09:21	10:27
N 10°	20:17	21:06	22:01	08:09	09:07	10:07
0°	20:28	21:22	22:20	08:00	08:53	09:49
S 10°	20:39	21:38	22:40	07:52	08:40	09:32
20°	20:51	21:55	23:02	07:43	08:25	09:12
30°	21:05	22:15	23:27	07:32	08:09	08:50
35°	21:13	22:27	23:41	07:26	07:59	08:38
40°	21:22	22:40	23:58	07:20	07:49	08:23
45°	21:33	22:56	· · ·	07:12	07:36	08:06
S 50°	21:46	23:16	· · ·	07:03	07:21	07:44
52°	21:53	23:26	· · ·	06:58	07:14	07:34
54°	22:00	23:37	· · ·	06:54	07:06	07:23
56°	22:07	23:49	· · ·	06:49	06:57	07:10
58°	22:16	· · ·	00:03	06:43	06:47	06:55
S 60°	22:26	· · ·	00:20	06:36	06:36	06:37

Day	Sun		Mer. Pass hh:mm	Moon		Age 18-20 93-77%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
10	02:56	03:06	11:57	01:48	14:14	
11	03:17	03:27	11:57	02:40	15:08	
12	03:38	03:48	11:56	03:36	16:05	

September 13, 14, 15 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	352°14.43	207°35.83	N14°48.27	150°11.15	S09°7.26	240°41.88	N21°56.98	352°1.74	S02°38.09	Alpheratz	357°33.85 29°14.05
1	7°16.90	222°35.29	47.38	165°12.07	7.90	255°43.92	56.93	7°4.38	38.17	Ankaa	353°6.16 -42°9.79
2	22°19.36	237°34.75	46.49	180°12.99	8.54	270°45.96	56.87	22°7.02	38.25	Schedar	349°29.89 56°40.71
3	37°21.82	252°34.20	· · 45.61	195°13.90	· · 9.17	285°48.00	· · 56.82	37°9.66	· · 38.33	Diphda	348°46.41 -17°50.54
4	52°24.29	267°33.66	44.72	210°14.82	9.81	300°50.03	56.76	52°12.29	38.40	Achernar	335°19.25 -57°6.11
5	67°26.75	282°33.12	43.83	225°15.74	10.44	315°52.07	56.71	67°14.93	38.48	Hamal	327°50.31 23°35.11
6	82°29.22	297°32.58	N14°42.94	240°16.65	S09°11.08	330°54.11	N21°56.66	82°17.57	S02°38.56	Polaris	313°29.24 89°22.09
7	97°31.68	312°32.04	42.05	255°17.57	11.71	345°56.15	56.60	97°20.21	38.64	Acamar	315°11.08 -40°11.78
8	112°34.15	327°31.51	41.16	270°18.48	12.35	0°58.19	56.55	112°22.84	38.72	Menkar	314°5.38 4°11.59
9	127°36.61	342°30.97	· · 40.27	285°19.40	· · 12.98	16°0'23	· · 56.49	127°25.48	· · 38.80	Mirfak	308°27.22 49°57.04
10	142°39.07	357°30.43	39.38	300°20.31	13.62	31°2.27	56.44	142°28.12	38.88	Aldebaran	290°38.91 16°33.73
11	157°41.54	12°29.89	38.48	315°21.23	14.25	46°4.31	56.39	157°30.76	38.96	Rigel	281°3.31 -8°10.10
12	172°44.00	27°29.35	N14°37.59	330°22.14	S09°14.89	61°6.35	N21°56.33	172°33.40	S02°39.04	Capella	280°21.05 46°1.30
13	187°46.47	42°28.81	36.69	345°23.06	15.52	76°8.39	56.28	187°36.03	39.11	Bellatrix	278°22.28 6°22.51
14	202°48.93	57°28.28	35.80	0°23.97	16.16	91°10.43	56.22	202°38.67	39.19	Elnath	278°1.16 28°37.73
15	217°51.40	72°27.74	· · 34.90	15°24.88	· · 16.79	106°12.47	· · 56.17	217°41.31	· · 39.27	Alnilam	275°37.18 -1°10.95
16	232°53.86	87°27.20	34.00	30°25.80	17.42	121°14.51	56.12	232°43.95	39.35	Betelgeuse	270°51.52 7°24.83
17	247°56.32	102°26.67	33.11	45°26.71	18.06	136°16.55	56.06	247°46.59	39.43	Canopus	263°52.28 -52°42.16
18	262°58.79	117°26.13	N14°32.21	60°27.62	S09°18.69	151°18.59	N21°56.01	262°49.22	S02°39.51	Sirius	258°25.85 -16°44.83
19	278°1.25	132°25.60	31.31	75°28.54	19.33	166°20.63	55.95	277°51.86	39.59	Adhara	255°5.57 -29°0.11
20	293°3.72	147°25.06	30.41	90°29.45	19.96	181°22.67	55.90	292°54.50	39.67	Procyon	244°50.42 5°9.67
21	308°6.18	162°24.53	· · 29.51	105°30.36	· · 20.60	196°24.71	· · 55.85	307°57.14	· · 39.75	Pollux	243°16.82 27°57.85
22	323°8.64	177°23.99	28.61	120°31.28	21.23	211°26.75	55.79	322°59.78	39.82	Avior	234°14.98 -59°35.20
23	338°11.11	192°23.46	27.71	135°32.19	21.86	226°28.80	55.74	338°2.41	39.90	Suhail	222°46.28 -43°31.93
Mer.pass. 00:31		ν-0.5' d-0.9' m-3.94		ν0.9' d0.6' m1.61		ν2.0' d-0.1' m-2.04		ν2.6' d0.1' m0.61		Miaplacidus	221°38.99 -69°49.11
										Alphard	217°47.49 -8°46.04
										Regulus	207°34.14 11°50.60
										Dubhe	193°40.94 61°36.76
										Denebola	182°24.69 14°25.82
										Gienah	175°43.34 -17°41.00
										Acrux	173°0.20 -63°14.53
										Gacrux	171°51.61 -57°15.46
										Alioth	166°12.95 55°49.36
										Spica	158°21.99 -11°17.66
										Alkaid	152°51.92 49°11.27
										Hadar	148°35.73 -60°29.95
										Menkent	147°57.26 -36°29.83
										Arcturus	145°47.63 19°3.06
										Rigil Kent.	139°39.99 -60°56.65
										Kochab	137°20.46 74°3.17
										Zuben'ubi	136°55.60 -16°8.89
										Alphecca	126°3.42 26°37.88
										Antares	112°15.23 -26°29.38
										Atria	107°9.00 -69°4.65
										Sabik	102°2.15 -15°45.38
										Shaula	96°9.58 -37°7.43
										Rasalhague	95°58.01 12°32.63
										Eltanin	90°41.85 51°29.38
										Kaus Aust.	83°31.66 -34°22.41
										Vega	80°32.72 38°48.68
										Nunki	75°46.92 -26°15.90
										Altair	61°59.22 8°56.32
										Peacock	53°4.41 -56°39.24
										Deneb	49°25.10 45°22.53
										Enif	33°37.96 9°59.72
										Al Na'ir	27°31.75 -46°50.16
										Fomalhaut	15°13.52 -29°29.05
										Scheat	13°44.32 28°13.48
										Markab	13°29.02 15°20.76
										Sep 13 Sat	
										Venus	215°21.40 10:10
										Mars	157°56.72 13:58
										Jupiter	248°27.45 07:56
										Saturn	359°47.31 00:32
										Sep 14 Sun	
										Venus	214°9.35 10:11
										Mars	157°19.53 13:57
										Jupiter	248°17.27 07:53
										Saturn	359°51.48 00:28
										Sep 15 Mon	
										Venus	212°57.49 10:12
										Mars	156°42.22 13:55
										Jupiter	248°7.20 07:50
										Saturn	359°55.67 00:23
										Horizontal parallax	
										Venus:	0.1
										Mars:	0.1
Mer.pass. 00:23		ν-0.5' d-0.9' m-3.93		ν0.9' d0.6' m1.61		ν2.0' d-0.1' m-2.05		ν2.6' d0.1' m0.60			


h		Sun			Moon			
Sat		GHA	Dec		GHA	ν	Dec	d HP
0		180°59.79	N03°46.56		294°4.95	5.0'	N25°23.39	8.4' 59.5'
1		196°0.01	45.60		308°28.91	4.9'	25°31.78	8.2' 59.5'
2		211°0.23	44.64		322°52.80	4.8'	25°39.99	8.0' 59.5'
3		226°0.45	· · 43.69		337°16.62	4.8'	25°48.03	7.9' 59.4'
4		241°0.68	42.73		351°40.39	4.7'	25°55.89	7.7' 59.4'
5		256°0.90	41.77		6°4.09	4.6'	26°3.58	7.5' 59.4'
6		271°1.12	N03°40.82		20°27.73	4.6'	N26°11.09	7.3' 59.4'
7		286°1.34	39.86		34°51.31	4.5'	26°18.42	7.2' 59.4'
8		301°1.57	38.90		49°14.83	4.5'	26°25.57	7.0' 59.4'
9		316°1.79	· · 37.94		63°38.30	4.4'	26°32.54	6.8' 59.3'
10		331°2.01	36.99		78°1.72	4.4'	26°39.33	6.6' 59.3'
11		346°2.23	36.03		92°25.08	4.3'	26°45.94	6.4' 59.3'
12		1°2.46	N03°35.07		106°48.40	4.3'	N26°52.36	6.2' 59.3'
13		16°2.68	34.11		121°11.67	4.2'	26°58.60	6.1' 59.3'
14		31°2.90	33.16		135°34.89	4.2'	27°4.65	5.9' 59.3'
15		46°3.12	· · 32.20		149°58.07	4.1'	27°10.52	5.7' 59.2'
16		61°3.35	31.24		164°21.20	4.1'	27°16.21	5.5' 59.2'
17		76°3.57	30.28		178°44.30	4.1'	27°21.70	5.3' 59.2'
18		91°3.79	N03°29.32		193°7.35	4.0'	N27°27.01	5.1' 59.2'
19		106°4.01	28.36		207°30.38	4.0'	27°32.13	4.9' 59.2'
20		121°4.24	27.40		221°53.36	4.0'	27°37.06	4.7' 59.1'
21		136°4.46	· · 26.45		236°16.32	3.9'	27°41.80	4.6' 59.1'
22		151°4.68	25.49		250°39.25	3.9'	27°46.35	4.4' 59.1'
23		166°4.90	24.53		265°2.14	3.9'	27°50.71	4.2' 59.1'
		SD = 15.9' d = -1.0'			SD = 16.2'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	181°5.13	N03°23.57		279°25.02	3.9'	N27°54.88	4.0' 59.1'
1	196°5.35	22.61		293°47.87	3.8'	27°58.86	3.8' 59.0'
2	211°5.57	21.65		308°10.70	3.8'	28°2.64	3.6' 59.0'
3	226°5.80	· · 20.69		322°33.51	3.8'	28°6.24	3.4' 59.0'
4	241°6.02	19.73		336°56.31	3.8'	28°9.64	3.2' 59.0'
5	256°6.24	18.77		351°19.09	3.8'	28°12.85	3.0' 59.0'
6	271°6.46	N03°17.81		5°41.86	3.8'	N28°15.86	2.8' 58.9'
7	286°6.69	16.85		20°4.63	3.8'	28°18.69	2.6' 58.9'
8	301°6.91	15.89		34°27.38	3.8'	28°21.31	2.4' 58.9'
9	316°7.13	· · 14.93		48°50.14	3.8'	28°23.75	2.2' 58.9'
10	331°7.36	13.97		63°12.89	3.8'	28°25.99	2.0' 58.9'
11	346°7.58	13.01		77°35.64	3.8'	28°28.04	1.9' 58.8'
12	1°7.80	N03°12.05		91°58.39	3.8'	N28°29.89	1.7' 58.8'
13	16°8.02	11.09		106°21.16	3.8'	28°31.55	1.5' 58.8'
14	31°8.25	10.13		120°43.92	3.8'	28°33.02	1.3' 58.8'
15	46°8.47	· · 9.17		135°6.70	3.8'	28°34.30	1.1' 58.8'
16	61°8.69	8.21		149°29.50	3.8'	28°35.38	0.9' 58.7'
17	76°8.92	7.25		163°52.31	3.8'	28°36.27	0.7' 58.7'
18	91°9.14	N03°6.28		178°15.13	3.8'	N28°36.96	0.5' 58.7'
19	106°9.36	5.32		192°37.98	3.9'	28°37.46	0.3' 58.7'
20	121°9.59	4.36		207°0.85	3.9'	28°37.77	0.1' 58.7'
21	136°9.81	· · 3.40		221°23.75	3.9'	28°37.89	-0.1' 58.6'
22	151°10.03	2.44		235°46.67	4.0'	28°37.82	-0.3' 58.6'
23	166°10.25	1.48		250°9.63	4.0'	28°37.56	-0.5' 58.6'
		SD = 15.9' d = -1.0'		SD = 16.1'			

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	181°10.48	N03°0.52		264°32.61	4.0'	N28°37.10	-0.6' 58.6'
1	196°10.70	02°59.55		278°55.63	4.1'	28°36.46	-0.8' 58.5'
2	211°10.92	58.59		293°18.69	4.1'	28°35.63	-1.0' 58.5'
3	226°11.15	· · 57.63		307°41.79	4.1'	28°34.60	-1.2' 58.5'
4	241°11.37	56.67		322°4.93	4.2'	28°33.39	-1.4' 58.5'
5	256°11.59	55.70		336°28.11	4.2'	28°31.99	-1.6' 58.5'
6	271°11.82	N02°54.74		350°51.35	4.3'	N28°30.41	-1.8' 58.4'
7	286°12.04	53.78		5°14.63	4.3'	28°28.64	-2.0' 58.4'
8	301°12.26	52.82		19°37.96	4.4'	28°26.68	-2.1' 58.4'
9	316°12.48	· · 51.85		34°1.34	4.4'	28°24.53	-2.3' 58.4'
10	331°12.71	50.89		48°24.78	4.5'	28°22.21	-2.5' 58.4'
11	346°12.93	49.93		62°48.28	4.6'	28°19.70	-2.7' 58.3'
12	1°13.15	N02°48.97		77°11.83	4.6'	N28°17.01	-2.9' 58.3'
13	16°13.38	48.00		91°35.45	4.7'	28°14.13	-3.1' 58.3'
14	31°13.60	47.04		105°59.13	4.7'	28°11.08	-3.2' 58.3'
15	46°13.82	· · 46.08		120°22.88	4.8'	28°7.85	-3.4' 58.2'
16	61°14.05	45.11		134°46.70	4.9'	28°4.43	-3.6' 58.2'
17	76°14.27	44.15		149°10.58	5.0'	28°0.84	-3.8' 58.2'
18	91°14.49	N02°43.19		163°34.54	5.0'	N27°57.08	-3.9' 58.2'
19	106°14.72	42.22		177°58.56	5.1'	27°53.13	-4.1' 58.2'
20	121°14.94	41.26		192°22.67	5.2'	27°49.02	-4.3' 58.1'
21	136°15.16	· · 40.30		206°46.85	5.3'	27°44.73	-4.5' 58.1'
22	151°15.39	39.33		221°11.11	5.3'	27°40.27	-4.6' 58.1'
23	166°15.61	38.37		235°35.45	5.4'	27°35.63	-4.8' 58.1'
		SD = 15.9' d = -1.0'		SD = 16.0'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	02:01	03:51	05:04	18:45	19:56	21:43
N 70°	02:34	04:05	05:09	18:39	19:43	21:12
68°	02:58	04:15	05:14	18:35	19:33	20:49
66°	03:16	04:24	05:17	18:32	19:24	20:32
64°	03:30	04:32	05:21	18:29	19:17	20:18
62°	03:41	04:38	05:23	18:26	19:11	20:07
60°	03:51	04:43	05:26	18:24	19:06	19:58
N 58°	03:59	04:48	05:28	18:22	19:01	19:50
56°	04:06	04:52	05:30	18:20	18:57	19:43
54°	04:13	04:56	05:32	18:18	18:54	19:37
52°	04:18	04:59	05:33	18:17	18:51	19:31
50°	04:23	05:02	05:35	18:15	18:48	19:27
45°	04:33	05:08	05:38	18:13	18:42	19:17
N 40°	04:41	05:13	05:40	18:10	18:37	19:09
35°	04:47	05:17	05:42	18:08	18:34	19:03
30°	04:52	05:20	05:44	18:06	18:30	18:58
20°	04:59	05:25	05:47	18:03	18:26	18:51
N 10°	05:04	05:29	05:50	18:01	18:22	18:46
0°	05:08	05:32	05:52	17:59	18:19	18:43
S 10°	05:09	05:34	05:55	17:57	18:18	18:42
20°	05:09	05:35	05:57	17:54	18:16	18:42
30°	05:08	05:35	05:59	17:52	18:16	18:44
35°	05:06	05:36	06:01	17:51	18:16	18:45
40°	05:04	05:35	06:02	17:49	18:16	18:48
45°	05:01	05:35	06:04	17:48	18:17	18:51
S 50°	04:57	05:34	06:06	17:46	18:18	18:56
52°	04:54	05:34	06:07	17:45	18:18	18:58
54°	04:52	05:33	06:08	17:44	18:19	19:00
56°	04:49	05:32	06:09	17:43	18:20	19:03
58°	04:46	05:31	06:10	17:42	18:21	19:07
S 60°	04:42	05:30	06:12	17:40	18:22	19:11

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62°	18:03	<input type="checkbox"/>	19:47	16:00	<input type="checkbox"/>	18:36
60°	18:55	19:31	20:53	15:09	16:43	17:29
N 58°	19:27	20:11	21:27	14:37	16:02	16:54
56°	19:51	20:39	21:52	14:14	15:35	16:29
54°	20:10	21:01	22:13	13:55	15:13	16:09
52°	20:27	21:19	22:29	13:39	14:55	15:51
50°	20:41	21:35	22:44	13:25	14:39	15:37
45°	21:10	22:06	23:13	12:56	14:08	15:07
N 40°	21:32	22:30	23:36	12:34	13:44	14:44
35°	21:51	22:50	23:55	12:16	13:24	14:24
30°	22:08	23:07	· · ·	12:00	13:07	14:08
20°	22:35	23:36	· · ·	11:33	12:39	13:40
N 10°	22:59	· · ·	00:00	11:10	12:14	13:15
0°	23:21	· · ·	00:23	10:49	11:51	12:53
S 10°	23:44	· · ·	00:46	10:28	11:28	12:30
20°	· · ·	00:08	01:11	10:05	11:04	12:06
30°	· · ·	00:36	01:40	09:39	10:35	11:37
35°	· · ·	00:53	01:57	09:23	10:18	11:20
40°	· · ·	01:12	02:17	09:06	09:58	11:00
45°	00:19	01:36	02:42	08:44	09:34	10:36
S 50°	00:45	02:07	03:13	08:17	09:03	10:05
52°	00:58	02:22	03:29	08:04	08:48	09:50
54°	01:13	02:40	03:47	07:49	08:30	09:31
56°	01:30	03:01	04:09	07:31	08:08	09:09
58°	01:51	03:29	04:38	07:09	07:40	08:41
S 60°	02:18	04:08	05:20	06:42	07:00	07:59

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm		21-23 66-44%
13	03:59	04:10	11:56	04:35	17:05		
14	04:21	04:31	11:55	05:36	18:07		
15	04:42	04:53	11:55	06:38	19:08		

September 16, 17, 18 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°11.85		206°57.66	N13°42.64	151°16.64	S09°52.83	243°9.11	N21°53.12	355°11.73	S02°43.78
1	10°14.32		221°57.14	41.71	166°17.54	53.46	258°11.17	53.06	10°14.37	43.86
2	25°16.78		236°56.62	40.77	181°18.45	54.09	273°13.22	53.01	25°17.01	43.94
3	40°19.25		251°56.10	· · 39.83	196°19.35	· · 54.72	288°15.27	· · 52.96	40°19.65	· · 44.01
4	55°21.71		266°55.58	38.89	211°20.25	55.35	303°17.33	52.90	55°22.29	44.09
5	70°24.17		281°55.07	37.95	226°21.15	55.98	318°19.38	52.85	70°24.93	44.17
6	85°26.64		296°54.55	N13°37.01	241°22.05	S09°56.61	333°21.43	N21°52.80	85°27.57	S02°44.25
7	100°29.10		311°54.03	36.07	256°22.95	57.24	348°23.49	52.74	100°30.21	44.33
8	115°31.57		326°53.52	35.13	271°23.85	57.87	3°25.54	52.69	115°32.85	44.41
9	130°34.03		341°53.00	· · 34.19	286°24.75	· · 58.50	18°27.60	· · 52.64	130°35.49	· · 44.49
10	145°36.50		356°52.48	33.24	301°25.65	59.13	33°29.65	52.59	145°38.13	44.57
11	160°38.96		11°51.97	32.30	316°26.55	09°59.76	48°31.71	52.53	160°40.77	44.65
12	175°41.42		26°51.45	N13°31.35	331°27.45	S10°0.39	63°33.76	N21°52.48	175°43.41	S02°44.73
13	190°43.89		41°50.94	30.41	346°28.35	1.02	78°35.82	52.43	190°46.05	44.81
14	205°46.35		56°50.42	29.46	1°29.25	1.65	93°37.87	52.37	205°48.69	44.89
15	220°48.82		71°49.91	· · 28.52	16°30.15	· · 2.28	108°39.93	· · 52.32	220°51.33	· · 44.96
16	235°51.28		86°49.39	27.57	31°31.05	2.90	123°41.98	52.27	235°53.97	45.04
17	250°53.74		101°48.88	26.62	46°31.95	3.53	138°44.04	52.21	250°56.61	45.12
18	265°56.21		116°48.37	N13°25.67	61°32.85	S10°4.16	153°46.10	N21°52.16	265°59.25	S02°45.20
19	280°58.67		131°47.85	24.72	76°33.75	4.79	168°48.15	52.11	281°1.89	45.28
20	296°1.14		146°47.34	23.77	91°34.64	5.42	183°50.21	52.06	296°4.53	45.36
21	311°3.60		161°46.83	· · 22.82	106°35.54	· · 6.05	198°52.27	· · 52.00	311°7.17	· · 45.44
22	326°6.07		176°46.32	21.87	121°36.44	6.67	213°54.32	51.95	326°9.81	45.52
23	341°8.53		191°45.80	20.92	136°37.34	7.30	228°56.38	51.90	341°12.45	45.60
Mer.pass. 00:19		ν-0.5' d-0.9' m-3.93		ν0.9' d0.6' m1.60		ν2.1' d-0.1' m-2.05		ν2.6' d0.1' m0.60		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°10.99		206°45.29	N13°19.97	151°38.23	S10°7.93	243°58.44	N21°51.84	356°15.09	S02°45.68
1	11°13.46		221°44.78	19.01	166°39.13	8.56	259°0.50	51.79	11°17.73	45.76
2	26°15.92		236°44.27	18.06	181°40.03	9.19	274°2.56	51.74	26°20.37	45.84
3	41°18.39		251°43.76	· · 17.11	196°40.92	· · 9.82	289°4.61	· · 51.69	41°23.01	· · 45.91
4	56°20.85		266°43.25	16.15	211°41.82	10.44	304°6.67	51.63	56°25.65	45.99
5	71°23.31		281°42.74	15.19	226°42.72	11.07	319°8.73	51.58	71°28.29	46.07
6	86°25.78		296°42.23	N13°14.24	241°43.61	S10°11.70	334°10.79	N21°51.53	86°30.93	S02°46.15
7	101°28.24		311°41.72	13.28	256°44.51	12.33	349°12.85	51.47	101°33.57	46.23
8	116°30.71		326°41.21	12.32	271°45.40	12.95	4°14.91	51.42	116°36.21	46.31
9	131°33.17		341°40.70	· · 11.36	286°46.30	· · 13.58	19°16.97	· · 51.37	131°38.85	· · 46.39
10	146°35.64		356°40.19	10.41	301°47.19	14.21	34°19.03	51.32	146°41.49	46.47
11	161°38.10		11°39.69	9.45	316°48.09	14.83	49°21.09	51.26	161°44.13	46.55
12	176°40.56		26°39.18	N13°8.48	331°48.98	S10°15.46	64°23.15	N21°51.21	176°46.77	S02°46.63
13	191°43.03		41°38.67	7.52	346°49.88	16.09	79°25.21	51.16	191°49.41	46.71
14	206°45.49		56°38.16	6.56	1°50.77	16.72	94°27.27	51.11	206°52.05	46.78
15	221°47.96		71°37.66	· · 5.60	16°51.67	· · 17.34	109°29.33	· · 51.05	221°54.70	· · 46.86
16	236°50.42		86°37.15	4.64	31°52.56	17.97	124°31.39	51.00	236°57.34	46.94
17	251°52.88		101°36.64	3.67	46°53.45	18.60	139°33.45	50.95	251°59.98	47.02
18	266°55.35		116°36.14	N13°2.71	61°54.35	S10°19.22	154°35.52	N21°50.89	267°2.62	S02°47.10
19	281°57.81		131°35.63	1.74	76°55.24	19.85	169°37.58	50.84	282°5.26	47.18
20	297°0.28		146°35.13	13°0.78	91°56.13	20.48	184°39.64	50.79	297°7.90	47.26
21	312°2.74		161°34.62	12°59.81	106°57.03	· · 21.10	199°41.70	· · 50.74	312°10.54	· · 47.34
22	327°5.20		176°34.12	58.84	121°57.92	21.73	214°43.77	50.68	327°13.18	47.42
23	342°7.67		191°33.61	57.88	136°58.81	22.35	229°45.83	50.63	342°15.82	47.50
Mer.pass. 00:15		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.60		ν2.1' d-0.1' m-2.05		ν2.6' d0.1' m0.59		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	357°10.13		206°33.11	N12°56.91	151°59.70	S10°22.98	244°47.89	N21°50.58	357°18.46	S02°47.58
1	12°12.60		221°32.60	55.94	167°0.60	23.61	259°49.95	50.53	12°21.10	47.65
2	27°15.06		236°32.10	54.97	182°1.49	24.23	274°52.02	50.47	27°23.74	47.73
3	42°17.53		251°31.60	· · 54.00	197°2.38	· · 24.86	289°54.08	· · 50.42	42°26.38	· · 47.81
4	57°19.99		266°31.09	53.03	212°3.27	25.48	304°56.15	50.37	57°29.03	47.89
5	72°22.45		281°30.59	52.06	227°4.16	26.11	319°58.21	50.32	72°31.67	47.97
6	87°24.92		296°30.09	N12°51.08	242°5.05	S10°26.73	335°0.27	N21°50.27	87°34.31	S02°48.05
7	102°27.38		311°29.59	50.11	257°5.94	27.36	350°2.34	50.21	102°36.95	48.13
8	117°29.85		326°29.09	49.14	272°6.83	27.98	5°4.40	50.16	117°39.59	48.21
9	132°32.31		341°28.58	· · 48.16	287°7.72	· · 28.61	20°6.47	· · 50.11	132°42.23	· · 48.29
10	147°34.77		356°28.08	47.19	302°8.61	29.24	35°8.53	50.06	147°44.87	48.37
11	162°37.24		11°27.58	46.21	317°9.50	29.86	50°10.60	50.00	162°47.51	48.45
12	177°39.70		26°27.08	N12°45.24	332°10.39	S10°30.48	65°12.66	N21°49.95	177°50.15	S02°48.52
13	192°42.17		41°26.58	44.26	347°11.28	31.11	80°14.73	49.90	192°52.79	48.60
14	207°44.63		56°26.08	43.28	2°12.17	31.73	95°16.80	49.85	207°55.43	48.68
15	222°47.09		71°25.58	· · 42.31	17°13.06	· · 32.36	110°18.86	· · 49.79	222°58.08	· · 48.76
16	237°49.56		86°25.08	41.33	32°13.95	32.98	125°20.93	49.74	238°0.72	48.84
17	252°52.02		101°24.58	40.35	47°14.84	33.61	140°23.00	49.69	253°3.36	48.92
18	267°54.49		116°24.09	N12°39.37	62°15.73	S10°34.23	155°25.06	N21°49.64	268°6.00	S02°49.00
19	282°56.95		131°23.59	38.39	77°16.61	34.86	170°27.13	49.59	283°8.64	49.08
20	297°59.41		146°23.09	37.41	92°17.50	35.48	185°29.20	49.53	298°11.28	49.16
21	313°1.88		161°22.59	· · 36.43	107°18.39	· · 36.10	200°31.27	· · 49.48	313°13.92	· · 49.24
22	328°4.34		176°22.09	35.44	122°19.28	36.73	215°33.33	49.43	328°16.56	49.32
23	343°6.81		191°21.60	34.46	137°20.16	37.35	230°35.40	49.38	343°19.20	49.39
Mer.pass. 00:11		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.60		ν2.1' d-0.1' m-2.06		ν2.6' d0.1' m0.59		

Stars		
	SHA	Dec
Alpheratz	357°33.84	29°14.07
Ankaa	353°6.14	-42°9.79
Schedar	349°29.87	56°40.73
Diphda	348°46.40	-17°50.54
Achernar	335°19.22	-57°6.12
Hamal	327°50.29	23°35.12
Polaris	313°27.71	89°22.11
Acamar	315°11.06	-40°11.78
Menkar	314°5.35	4°11.59
Mirfak	308°27.18	49°57.05
Aldebaran	290°38.88	16°33.73
Rigel	281°3.29	-8°10.09
Capella	280°21.01	46°1.30
Bellatrix	278°22.25	6°22.51
Elnath	278°1.13	28°37.73
Alnilam	275°37.15	-1°10.95
Betelgeuse	270°51.49	7°24.83
Canopus	263°52.25	-52°42.16
Sirius	258°25.83	-16°44.83
Adhara	255°5.55	-29°0.11
Procyon	244°50.39	5°9.67
Pollux	243°16.79	27°57.84
Avior	234°14.95	-59°35.19
Suhail	222°46.26	-43°31.93
Miaplacidus	221°38.96	-69°49.10
Alphard	217°47.47	-8°46.04
Regulus	207°34.13	11°50.59
Dubhe	193°40.92	61°36.75
Denebola	182°24.68	14°25.81
Gienah	175°43.33	-17°41.00
Acrux	173°0.19	-63°14.52
Gacrux	171°51.61	-57°15.45
Alioth	166°12.95	55°49.34
Spica	158°21.99	-11°17.66
Alkaid	152°51.93	49°11.26
Hadar	148°35.74	-60°29.94
Menkent	147°57.27	-36°29.82
Arcturus	145°47.64	19°3.06
Rigel Kent.	139°40.01	-60°56.64
Kochab	137°20.50	74°3.16
Zuben'ubi	136°55.60	-16°8.89
Alphecca	126°3.43	26°37.87
Antares	112°15.23	-26°29.38
Atria	107°9.02	-69°4.65
Sabik	102°2.16	-15°45.38
Shaula	96°9.59	-37°7.44
Rasalhague	95°58.02	12°32.63
Eltanin	90°41.87	51°29.38
Kaus Aust.	83°31.67	-34°22.41
Vega	80°32.74	38°48.68
Nunki	75°46.93	-26°15.90
Altair	61°59.23	8°56.32
Peacock	53°4.42	-56°39.24
Deneb	49°25.11	45°22.54
Enif	33°37.96	9°59.73
Al Na'ir	27°31.75	-46°50.17
Fomalhaut	15°13.52	-29°29.05
Scheat	13°44.31	28°13.49
Markab	13°29.01	15°20.77

Sep 16 Tue	SHA	Mer.pass
Venus	211°45.80	10:13
Mars	156°4.79	13:54
Jupiter	247°57.26	07:46
Saturn	359°59.87	00:19

Sep 17 Wed	SHA	Mer.pass
Venus	210°34.30	10:13
Mars	155°27.24	13:53
Jupiter	247°47.45	07:43
Saturn	0°4.09	00:15

Sep 18 Thu	SHA	Mer.pass
Venus	209°22.98	10:14
Mars	154°49.57	13:51
Jupiter	247°37.76	07:40
Saturn	0°8.33	00:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.0901 sec ΔT = TT-UT1 = +69.0939 sec

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		181°15.83	N02°37.40	249°59.87	5.5'	N27°30.83	-5.0' 58.0'
1		196°16.05	36.44	264°24.37	5.6'	27°25.86	-5.1' 58.0'
2		211°16.28	35.47	278°48.96	5.7'	27°20.72	-5.3' 58.0'
3		226°16.50	· · 34.51	293°13.63	5.8'	27°15.42	-5.5' 58.0'
4		241°16.72	33.55	307°38.40	5.9'	27°9.95	-5.6' 58.0'
5		256°16.95	32.58	322°3.25	5.9'	27°4.31	-5.8' 57.9'
6		271°17.17	N02°31.62	336°28.19	6.0'	N26°58.52	-6.0' 57.9'
7		286°17.39	30.65	350°53.22	6.1'	26°52.56	-6.1' 57.9'
8		301°17.62	29.69	5°18.35	6.2'	26°46.44	-6.3' 57.9'
9		316°17.84	· · 28.72	19°43.57	6.3'	26°40.17	-6.4' 57.8'
10		331°18.06	27.76	34°8.89	6.4'	26°33.74	-6.6' 57.8'
11		346°18.29	26.79	48°34.30	6.5'	26°27.15	-6.7' 57.8'
12		1°18.51	N02°25.83	62°59.81	6.6'	N26°20.41	-6.9' 57.8'
13		16°18.73	24.86	77°25.42	6.7'	26°13.52	-7.0' 57.8'
14		31°18.96	23.90	91°51.13	6.8'	26°6.47	-7.2' 57.7'
15		46°19.18	· · 22.93	106°16.93	6.9'	25°59.27	-7.3' 57.7'
16		61°19.40	21.97	120°42.84	7.0'	25°51.93	-7.5' 57.7'
17		76°19.62	21.00	135°8.85	7.1'	25°44.44	-7.6' 57.7'
18		91°19.85	N02°20.03	149°34.97	7.2'	N25°36.80	-7.8' 57.7'
19		106°20.07	19.07	164°1.18	7.3'	25°29.02	-7.9' 57.6'
20		121°20.29	18.10	178°27.50	7.4'	25°21.10	-8.1' 57.6'
21		136°20.52	· · 17.14	192°53.93	7.5'	25°13.04	-8.2' 57.6'
22		151°20.74	16.17	207°20.46	7.6'	25°4.84	-8.3' 57.6'
23		166°20.96	15.20	221°47.10	7.7'	24°56.49	-8.5' 57.5'
		SD = 15.9' d = -1.0'		SD = 15.8'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		181°21.19	N02°14.24	236°13.84	7.8'	N24°48.02	-8.6' 57.5'
1		196°21.41	13.27	250°40.69	8.0'	24°39.40	-8.7' 57.5'
2		211°21.63	12.31	265°7.65	8.1'	24°30.66	-8.9' 57.5'
3		226°21.86	· · 11.34	279°34.71	8.2'	24°21.78	-9.0' 57.5'
4		241°22.08	10.37	294°1.88	8.3'	24°12.77	-9.1' 57.4'
5		256°22.30	9.41	308°29.16	8.4'	24°3.64	-9.3' 57.4'
6		271°22.52	N02°8.44	322°56.55	8.5'	N23°54.37	-9.4' 57.4'
7		286°22.75	7.47	337°24.05	8.6'	23°44.98	-9.5' 57.4'
8		301°22.97	6.51	351°51.65	8.7'	23°35.47	-9.6' 57.3'
9		316°23.19	· · 5.54	6°19.36	8.8'	23°25.83	-9.8' 57.3'
10		331°23.42	4.57	20°47.19	8.9'	23°16.07	-9.9' 57.3'
11		346°23.64	3.60	35°15.12	9.0'	23°6.20	-10.0' 57.3'
12		1°23.86	N02°2.64	49°43.16	9.1'	N22°56.20	-10.1' 57.3'
13		16°24.09	1.67	64°11.30	9.3'	22°46.09	-10.2' 57.2'
14		31°24.31	02°0.70	78°39.56	9.4'	22°35.86	-10.3' 57.2'
15		46°24.53	01°59.74	93°7.92	9.5'	22°25.52	-10.5' 57.2'
16		61°24.75	58.77	107°36.40	9.6'	22°15.07	-10.6' 57.2'
17		76°24.98	57.80	122°4.98	9.7'	22°4.51	-10.7' 57.1'
18		91°25.20	N01°56.83	136°33.67	9.8'	N21°53.84	-10.8' 57.1'
19		106°25.42	55.87	151°2.46	9.9'	21°43.06	-10.9' 57.1'
20		121°25.65	54.90	165°31.37	10.0'	21°32.18	-11.0' 57.1'
21		136°25.87	· · 53.93	180°0.38	10.1'	21°21.19	-11.1' 57.1'
22		151°26.09	52.96	194°29.50	10.2'	21°10.10	-11.2' 57.0'
23		166°26.31	51.99	208°58.72	10.3'	20°58.91	-11.3' 57.0'
		SD = 15.9' d = -1.0'		SD = 15.7'			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		181°26.54	N01°51.03	223°28.05	10.4'	N20°47.62	-11.4' 57.0'
1		196°26.76	50.06	237°57.48	10.5'	20°36.23	-11.5' 57.0'
2		211°26.98	49.09	252°27.02	10.6'	20°24.75	-11.6' 57.0'
3		226°27.21	· · 48.12	266°56.66	10.7'	20°13.17	-11.7' 56.9'
4		241°27.43	47.15	281°26.41	10.9'	20°1.49	-11.8' 56.9'
5		256°27.65	46.19	295°56.26	11.0'	19°49.73	-11.9' 56.9'
6		271°27.87	N01°45.22	310°26.22	11.1'	N19°37.87	-11.9' 56.9'
7		286°28.10	44.25	324°56.27	11.2'	19°25.93	-12.0' 56.8'
8		301°28.32	43.28	339°26.43	11.3'	19°13.90	-12.1' 56.8'
9		316°28.54	· · 42.31	353°56.68	11.4'	19°1.78	-12.2' 56.8'
10		331°28.76	41.34	8°27.04	11.5'	18°49.58	-12.3' 56.8'
11		346°28.99	40.37	22°57.50	11.6'	18°37.30	-12.4' 56.8'
12		1°29.21	N01°39.40	37°28.05	11.7'	N18°24.93	-12.4' 56.7'
13		16°29.43	38.44	51°58.71	11.8'	18°12.48	-12.5' 56.7'
14		31°29.65	37.47	66°29.46	11.8'	17°59.96	-12.6' 56.7'
15		46°29.88	· · 36.50	81°0.31	11.9'	17°47.35	-12.7' 56.7'
16		61°30.10	35.53	95°31.25	12.0'	17°34.68	-12.8' 56.7'
17		76°30.32	34.56	110°2.29	12.1'	17°21.92	-12.8' 56.6'
18		91°30.54	N01°33.59	124°33.42	12.2'	N17°9.10	-12.9' 56.6'
19		106°30.77	32.62	139°4.64	12.3'	16°56.20	-13.0' 56.6'
20		121°30.99	31.65	153°35.96	12.4'	16°43.23	-13.0' 56.6'
21		136°31.21	· · 30.68	168°7.37	12.5'	16°30.20	-13.1' 56.5'
22		151°31.43	29.71	182°38.87	12.6'	16°17.09	-13.2' 56.5'
23		166°31.66	28.74	197°10.46	12.7'	16°3.92	-13.2' 56.5'
		SD = 15.9' d = -1.0'		SD = 15.5'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	02:25	04:06	05:17	18:29	19:39	21:17
N 70°	02:53	04:18	05:21	18:25	19:28	20:52
68°	03:12	04:27	05:24	18:22	19:19	20:33
66°	03:28	04:35	05:27	18:20	19:12	20:18
64°	03:40	04:41	05:29	18:18	19:06	20:06
62°	03:51	04:46	05:31	18:16	19:01	19:56
60°	03:59	04:51	05:33	18:14	18:56	19:47
N 58°	04:07	04:55	05:34	18:13	18:53	19:40
56°	04:13	04:58	05:36	18:12	18:49	19:34
54°	04:19	05:01	05:37	18:11	18:46	19:29
52°	04:24	05:04	05:38	18:10	18:44	19:24
50°	04:28	05:07	05:39	18:09	18:41	19:20
45°	04:37	05:12	05:41	18:07	18:36	19:11
N 40°	04:44	05:16	05:43	18:05	18:32	19:04
35°	04:49	05:19	05:44	18:04	18:29	18:59
30°	04:54	05:22	05:46	18:03	18:27	18:55
20°	05:00	05:26	05:48	18:01	18:23	18:48
N 10°	05:04	05:29	05:50	17:59	18:20	18:44
0°	05:06	05:30	05:51	17:58	18:18	18:42
S 10°	05:07	05:32	05:53	17:56	18:17	18:42
20°	05:07	05:32	05:54	17:55	18:17	18:43
30°	05:04	05:32	05:56	17:54	18:18	18:45
35°	05:02	05:31	05:56	17:53	18:18	18:48
40°	04:59	05:30	05:57	17:52	18:19	18:51
45°	04:55	05:29	05:58	17:51	18:20	18:55
S 50°	04:50	05:27	06:00	17:50	18:22	19:00
52°	04:47	05:27	06:00	17:50	18:23	19:03
54°	04:44	05:26	06:01	17:49	18:24	19:06
56°	04:41	05:24	06:01	17:49	18:26	19:09
58°	04:37	05:23	06:02	17:48	18:27	19:13
S 60°	04:32	05:21	06:03	17:47	18:29	19:18

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	<div></div>	<div></div>	23:52	<div></div>	<div></div>	20:11
N 70°	<div></div>	<div></div>		<div></div>	<div></div>	19:27
68°	<div></div>	22:15	· · ·	<div></div>	20:02	18:57
66°	<div></div>	23:10	· · ·	<div></div>	19:07	18:35
64°	21:15	23:42	· · ·	19:09	18:33	18:17
62°	22:07	· · ·	00:06	18:16	18:08	18:02
60°	22:39	· · ·	00:25	17:44	17:49	17:50
N 58°	23:02	· · ·	00:40	17:20	17:32	17:39
56°	23:21	· · ·	00:53	17:00	17:18	17:30
54°	23:37	· · ·	01:05	16:44	17:06	17:21
52°	23:51	· · ·	01:15	16:30	16:56	17:13
50°	· · ·	00:03	01:24	16:18	16:46	17:07
45°	· · ·	00:27	01:43	15:52	16:26	16:52
N 40°	· · ·	00:47	01:58	15:32	16:09	16:40
35°	· · ·	01:03	02:11	15:14	15:55	16:29
30°	00:11	01:17	02:22	15:00	15:43	16:20
20°	00:39	01:41	02:41	14:34	15:22	16:04
N 10°	01:02	02:02	02:58	14:12	15:04	15:50
0°	01:24	02:21	03:13	13:52	14:46	15:37
S 10°	01:46	02:40	03:29	13:31	14:29	15:23
20°	02:09	03:00	03:45	13:09	14:10	15:09
30°	02:36	03:24	04:04	12:43	13:49	14:52
35°	02:52	03:37	04:14	12:27	13:36	14:43
40°	03:11	03:53	04:27	12:09	13:21	14:32
45°	03:33	04:12	04:41	11:48	13:03	14:18
S 50°	04:01	04:35	04:59	11:20	12:41	14:02
52°	04:15	04:46	05:07	11:07	12:31	13:55
54°	04:31	04:59	05:16	10:51	12:19	13:46
56°	04:50	05:13	05:27	10:32	12:05	13:36
58°	05:14	05:30	05:39	10:10	11:48	13:25
S 60°	05:44	05:51	05:52	09:40	11:29	13:13

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 33-15%
16	05:03	05:14	11:55	07:38	20:06	
17	05:25	05:35	11:54	08:34	21:00	
18	05:46	05:57	11:54	09:25	21:49	

September 19, 20, 21 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	358°9.27	206°21.10	N12°33.48	152°21.05	S10°37.98	245°37.47	N21°49.33	358°21.85	S02°49.47			Alpheratz	357°33.83 29°14.08
1	13°11.73	221°20.60	32.49	167°21.94	38.60	260°39.54	49.27	13°24.49	49.55			Ankaa	353°6.13 -42°9.80
2	28°14.20	236°20.11	31.51	182°22.82	39.22	275°41.61	49.22	28°27.13	49.63			Schedar	349°29.86 56°40.75
3	43°16.66	251°19.61	· · 30.52	197°23.71	· · 39.85	290°43.68	· · 49.17	43°29.77	· · 49.71			Diphda	348°46.39 -17°50.55
4	58°19.13	266°19.12	29.54	212°24.60	40.47	305°45.75	49.12	58°32.41	49.79			Achernar	335°19.20 -57°6.13
5	73°21.59	281°18.62	28.55	227°25.48	41.09	320°47.82	49.06	73°35.05	49.87			Hamal	327°50.27 23°35.13
6	88°24.06	296°18.12	N12°27.56	242°26.37	S10°41.72	335°49.89	N21°49.01	88°37.69	S02°49.95			Polaris	313°26.50 89°22.12
7	103°26.52	311°17.63	26.57	257°27.25	42.34	350°51.96	48.96	103°40.33	50.03			Acamar	315°11.04 -40°11.78
8	118°28.98	326°17.14	25.59	272°28.14	42.96	5°54.03	48.91	118°42.98	50.11			Menkar	314°5.33 4°11.60
9	133°31.45	341°16.64	· · 24.60	287°29.02	· · 43.59	20°56.10	· · 48.86	133°45.62	· · 50.19			Mirfak	308°27.15 49°57.06
10	148°33.91	356°16.15	23.61	302°29.91	44.21	35°58.17	48.81	148°48.26	50.26			Aldebaran	290°38.85 16°33.74
11	163°36.38	11°15.65	22.62	317°30.79	44.83	51°0.24	48.75	163°50.90	50.34			Rigel	281°3.26 -8°10.09
12	178°38.84	26°15.16	N12°21.62	332°31.68	S10°45.45	66°2.31	N21°48.70	178°53.54	S02°50.42			Capella	280°20.97 46°1.31
13	193°41.30	41°14.67	20.63	347°32.56	46.08	81°4.38	48.65	193°56.18	50.50			Bellatrix	278°22.23 6°22.51
14	208°43.77	56°14.18	19.64	2°33.45	46.70	96°6.45	48.60	208°58.82	50.58			Elnath	278°1.10 28°37.73
15	223°46.23	71°13.68	· · 18.65	17°34.33	· · 47.32	111°8.53	· · 48.55	224°1.46	· · 50.66			Alnilam	275°37.13 -1°10.95
16	238°48.70	86°13.19	17.65	32°35.21	47.94	126°10.60	48.49	239°4.11	50.74			Betelgeuse	270°51.47 7°24.84
17	253°51.16	101°12.70	16.66	47°36.10	48.57	141°12.67	48.44	254°6.75	50.82			Canopus	263°52.22 -52°42.15
18	268°53.62	116°12.21	N12°15.66	62°36.98	S10°49.19	156°14.74	N21°48.39	269°9.39	S02°50.90			Sirius	258°25.80 -16°44.82
19	283°56.09	131°11.72	14.67	77°37.86	49.81	171°16.82	48.34	284°12.03	50.97			Adhara	255°5.52 -29°0.11
20	298°58.55	146°11.23	13.67	92°38.75	50.43	186°18.89	48.29	299°14.67	51.05			Procyon	244°50.37 5°9.67
21	314°1.02	161°10.74	· · 12.68	107°39.63	· · 51.05	201°20.96	· · 48.24	314°17.31	· · 51.13			Pollux	243°16.77 27°57.84
22	329°3.48	176°10.24	11.68	122°40.51	51.68	216°23.04	48.18	329°19.95	51.21			Avior	234°14.92 -59°35.18
23	344°5.94	191°9.75	10.68	137°41.39	52.30	231°25.11	48.13	344°22.60	51.29			Suhail	222°46.24 -43°31.92
Mer.pass. 00:07		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.60		ν2.1' d-0.1' m-2.06		ν2.6' d0.1' m0.59					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	359°8.41	206°9.27	N12°9.68	152°42.27	S10°52.92	246°27.18	N21°48.08	359°25.24	S02°51.37				
1	14°10.87	221°8.78	8.68	167°43.16	53.54	261°29.26	48.03	14°27.88	51.45				
2	29°13.34	236°8.29	7.68	182°44.04	54.16	276°31.33	47.98	29°30.52	51.53				
3	44°15.80	251°7.80	· · 6.68	197°44.92	· · 54.78	291°33.41	· · 47.93	44°33.16	· · 51.61				
4	59°18.26	266°7.31	5.68	212°45.80	55.40	306°35.48	47.87	59°35.80	51.69				
5	74°20.73	281°6.82	4.68	227°46.68	56.02	321°37.56	47.82	74°38.44	51.76				
6	89°23.19	296°6.33	N12°3.68	242°47.56	S10°56.65	336°39.63	N21°47.77	89°41.09	S02°51.84				
7	104°25.66	311°5.85	2.68	257°48.44	57.27	351°41.71	47.72	104°43.73	51.92				
8	119°28.12	326°5.36	1.67	272°49.32	57.89	6°43.78	47.67	119°46.37	52.00				
9	134°30.58	341°4.87	12°0.67	287°50.20	· · 58.51	21°45.86	· · 47.62	134°49.01	· · 52.08				
10	149°33.05	356°4.38	11°59.67	302°51.08	59.13	36°47.94	47.56	149°51.65	52.16				
11	164°35.51	11°3.90	58.66	317°51.96	10°59.75	51°50.01	47.51	164°54.29	52.24				
12	179°37.98	26°3.41	N11°57.65	332°52.84	S11°0.37	66°52.09	N21°47.46	179°56.94	S02°52.32				
13	194°40.44	41°2.93	56.65	347°53.72	0.99	81°54.17	47.41	194°59.58	52.40				
14	209°42.90	56°2.44	55.64	2°54.60	1.61	96°56.24	47.36	210°2.22	52.47				
15	224°45.37	71°1.96	· · 54.63	17°55.48	· · 2.23	111°58.32	· · 47.31	225°4.86	· · 52.55				
16	239°47.83	86°1.47	53.63	32°56.35	2.85	127°0.40	47.26	240°7.50	52.63				
17	254°50.30	101°0.99	52.62	47°57.23	3.47	142°2.48	47.20	255°10.14	52.71				
18	269°52.76	116°0.50	N11°51.61	62°58.11	S11°4.09	157°4.55	N21°47.15	270°12.79	S02°52.79				
19	284°55.23	131°0.02	50.60	77°58.99	4.71	172°6.63	47.10	285°15.43	52.87				
20	299°57.69	145°59.53	49.59	92°59.86	5.33	187°8.71	47.05	300°18.07	52.95				
21	315°0.15	160°59.05	· · 48.58	108°0.74	· · 5.95	202°10.79	· · 47.00	315°20.71	· · 53.03				
22	330°2.62	175°58.57	47.56	123°1.62	6.57	217°12.87	46.95	330°23.35	53.10				
23	345°5.08	190°58.08	46.55	138°2.50	7.19	232°14.95	46.90	345°25.99	53.18				
Mer.pass. 23:59		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.60		ν2.1' d-0.1' m-2.07		ν2.6' d0.1' m0.58					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	0°7.55	205°57.60	N11°45.54	153°3.37	S11°7.80	247°17.03	N21°46.85	0°28.63	S02°53.26				
1	15°10.01	220°57.12	44.53	168°4.25	8.42	262°19.11	46.79	15°31.28	53.34				
2	30°12.47	235°56.64	43.51	183°5.12	9.04	277°21.19	46.74	30°33.92	53.42				
3	45°14.94	250°56.16	· · 42.50	198°6.00	· · 9.66	292°23.27	· · 46.69	45°36.56	· · 53.50				
4	60°17.40	265°55.67	41.48	213°6.88	10.28	307°25.35	46.64	60°39.20	53.58				
5	75°19.87	280°55.19	40.47	228°7.75	10.90	322°27.43	46.59	75°41.84	53.66				
6	90°22.33	295°54.71	N11°39.45	243°8.63	S11°11.52	337°29.51	N21°46.54	90°44.48	S02°53.73				
7	105°24.79	310°54.23	38.43	258°9.50	12.14	352°31.59	46.49	105°47.13	53.81				
8	120°27.26	325°53.75	37.42	273°10.38	12.75	7°33.67	46.44	120°49.77	53.89				
9	135°29.72	340°53.27	· · 36.40	288°11.25	· · 13.37	22°35.75	· · 46.39	135°52.41	· · 53.97				
10	150°32.19	355°52.79	35.38	303°12.13	13.99	37°37.84	46.33	150°55.05	54.05				
11	165°34.65	10°52.31	34.36	318°13.00	14.61	52°39.92	46.28	165°57.69	54.13				
12	180°37.11	25°51.83	N11°33.34	333°13.87	S11°15.23	67°42.00	N21°46.23	181°0.33	S02°54.21				
13	195°39.58	40°51.35	32.32	348°14.75	15.84	82°44.08	46.18	196°2.98	54.29				
14	210°42.04	55°50.88	31.30	3°15.62	16.46	97°46.17	46.13	211°5.62	54.36				
15	225°44.51	70°50.40	· · 30.28	18°16.49	· · 17.08	112°48.25	· · 46.08	226°8.26	· · 54.44				
16	240°46.97	85°49.92	29.25	33°17.37	17.70	127°50.33	46.03	241°10.90	54.52				
17	255°49.43	100°49.44	28.23	48°18.24	18.31	142°52.42	45.98	256°13.54	54.60				
18	270°51.90	115°48.96	N11°27.21	63°19.11	S11°18.93	157°54.50	N21°45.93	271°16.18	S02°54.68				
19	285°54.36	130°48.49	26.18	78°19.98	19.55	172°56.58	45.88	286°18.83	54.76				
20	300°56.83	145°48.01	25.16	93°20.86	20.16	187°58.67	45.83	301°21.47	54.84				
21	315°59.29	160°47.53	· · 24.14	108°21.73	· · 20.78	203°0.75	· · 45.77	316°24.11	· · 54.91				
22	331°1.75	175°47.06	23.11	123°22.60	21.40	218°2.84	45.72	331°26.75	54.99				
23	346°4.22	190°46.58	22.08	138°23.47	22.01	233°4.92	45.67	346°29.39	55.07				
Mer.pass. 23:56		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.59		ν2.1' d-0.1' m-2.07		ν2.6' d0.1' m0.58					
											SHA		Dec
											Alpheratz	357°33.83 29°14.08	
											Ankaa	353°6.13 -42°9.80	
											Schedar	349°29.86 56°40.75	
											Diphda	348°46.39 -17°50.55	
											Achernar	335°19.20 -57°6.13	
											Hamal	327°50.27 23°35.13	
											Polaris	313°26.50 89°22.12	
											Acamar	315°11.04 -40°11.78	
											Menkar	314°5.33 4°11.60	
											Mirfak	308°27.15 49°57.06	
											Aldebaran	290°38.85 16°33.74	
											Rigel	281°3.26 -8°10.09	
											Capella	280°20.97 46°1.31	
											Bellatrix	278°22.23 6°22.51	
											Elnath	278°1.10 28°37.73	
											Alnilam	275°37.13 -1°10.95	
											Betelgeuse	270°51.47 7°24.84	
											Canopus	263°52.22 -52°42.15	
											Sirius	258°25.80 -16°44.82	
											Adhara	255°5.52 -29°0.11	
											Procyon	244°50.37 5°9.67	
											Pollux	243°16.77 27°57.84	
											Avior	234°14.92 -59°35.18	
											Suhail	222°46.24 -43°31.92	
											Miaplacidus	221°38.93 -69°49.08	
											Alphard	217°47.45 -8°46.04	
											Regulus	207°34.11 11°50.59	
											Dubhe	193°40.90 61°36.73	
											Denebola	182°24.68 14°25.81	
											Gienah	175°43.33 -17°40.99	
											Acrux	173°0.20 -63°14.51	
											Gacrux	171°51.62 -57°15.43	
											Alioth	166°12.96 55°49.32	
											Spica	158°21.99 -11°17.66	
											Alkaid	152°51.94 49°11.24	
											Hadar	148°35.75 -60°29.93	
											Menkent	147°57.27 -36°29.82	
											Arcturus	145°47.64 19°3.05	
											Rigel Kent.	139°40.03 -60°56.63	
											Kochab	137°20.54 74°3.14	

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri							
0	181°31.88	N01°27.77	211°42.14	12.8'	N15°50.69	-13.3'	56.5'
1	196°32.10	26.80	226°13.90	12.9'	15°37.39	-13.4'	56.5'
2	211°32.32	25.83	240°45.75	12.9'	15°24.03	-13.4'	56.4'
3	226°32.55	· · 24.86	255°17.69	13.0'	15°10.61	-13.5'	56.4'
4	241°32.77	23.89	269°49.72	13.1'	14°57.14	-13.5'	56.4'
5	256°32.99	22.92	284°21.83	13.2'	14°43.60	-13.6'	56.4'
6	271°33.21	N01°21.95	298°54.02	13.3'	N14°30.00	-13.6'	56.4'
7	286°33.43	20.98	313°26.29	13.4'	14°16.36	-13.7'	56.3'
8	301°33.66	20.01	327°58.64	13.4'	14°2.65	-13.8'	56.3'
9	316°33.88	· · 19.04	342°31.08	13.5'	13°48.90	-13.8'	56.3'
10	331°34.10	18.07	357°3.59	13.6'	13°35.09	-13.9'	56.3'
11	346°34.32	17.10	11°36.18	13.7'	13°21.23	-13.9'	56.3'
12	1°34.54	N01°16.13	26°8.85	13.7'	N13°7.33	-14.0'	56.2'
13	16°34.77	15.16	40°41.60	13.8'	12°53.37	-14.0'	56.2'
14	31°34.99	14.19	55°14.42	13.9'	12°39.37	-14.0'	56.2'
15	46°35.21	· · 13.22	69°47.31	14.0'	12°25.33	-14.1'	56.2'
16	61°35.43	12.25	84°20.28	14.0'	12°11.24	-14.1'	56.1'
17	76°35.65	11.28	98°53.31	14.1'	11°57.11	-14.2'	56.1'
18	91°35.88	N01°10.31	113°26.42	14.2'	N11°42.93	-14.2'	56.1'
19	106°36.10	9.34	127°59.60	14.2'	11°28.72	-14.3'	56.1'
20	121°36.32	8.37	142°32.85	14.3'	11°14.47	-14.3'	56.1'
21	136°36.54	· · 7.40	157°6.17	14.4'	11°0.18	-14.3'	56.0'
22	151°36.76	6.43	171°39.55	14.4'	10°45.85	-14.4'	56.0'
23	166°36.99	5.46	186°12.99	14.5'	10°31.49	-14.4'	56.0'
SD = 15.9' d = -1.0'			SD = 15.4'				
Sat							
0	181°37.21	N01°4.49	200°46.50	14.6'	N10°17.09	-14.4'	56.0'
1	196°37.43	3.51	215°20.08	14.6'	10°2.66	-14.5'	56.0'
2	211°37.65	2.54	229°53.72	14.7'	09°48.20	-14.5'	55.9'
3	226°37.87	· · 1.57	244°27.41	14.8'	09°33.71	-14.5'	55.9'
4	241°38.09	01°0.60	259°1.17	14.8'	09°19.19	-14.6'	55.9'
5	256°38.32	00°59.63	273°34.99	14.9'	09°4.64	-14.6'	55.9'
6	271°38.54	N00°58.66	288°8.86	14.9'	N08°50.06	-14.6'	55.9'
7	286°38.76	57.69	302°42.79	15.0'	08°35.46	-14.6'	55.8'
8	301°38.98	56.72	317°16.78	15.0'	08°20.83	-14.7'	55.8'
9	316°39.20	· · 55.74	331°50.82	15.1'	08°6.17	-14.7'	55.8'
10	331°39.42	54.77	346°24.91	15.1'	07°51.50	-14.7'	55.8'
11	346°39.64	53.80	0°59.06	15.2'	07°36.80	-14.7'	55.8'
12	1°39.87	N00°52.83	15°33.25	15.2'	N07°22.08	-14.7'	55.7'
13	16°40.09	51.86	30°7.50	15.3'	07°7.34	-14.8'	55.7'
14	31°40.31	50.89	44°41.80	15.3'	06°52.58	-14.8'	55.7'
15	46°40.53	· · 49.91	59°16.14	15.4'	06°37.81	-14.8'	55.7'
16	61°40.75	48.94	73°50.53	15.4'	06°23.02	-14.8'	55.7'
17	76°40.97	47.97	88°24.97	15.5'	06°8.21	-14.8'	55.6'
18	91°41.19	N00°47.00	102°59.45	15.5'	N05°53.39	-14.8'	55.6'
19	106°41.41	46.03	117°33.97	15.6'	05°38.56	-14.8'	55.6'
20	121°41.63	45.06	132°8.54	15.6'	05°23.71	-14.9'	55.6'
21	136°41.86	· · 44.08	146°43.14	15.6'	05°8.85	-14.9'	55.6'
22	151°42.08	43.11	161°17.79	15.7'	04°53.98	-14.9'	55.6'
23	166°42.30	42.14	175°52.48	15.7'	04°39.11	-14.9'	55.5'
SD = 15.9' d = -1.0'			SD = 15.3'				
Sun							
0	181°42.52	N00°41.17	190°27.20	15.8'	N04°24.22	-14.9'	55.5'
1	196°42.74	40.20	205°1.96	15.8'	04°9.33	-14.9'	55.5'
2	211°42.96	39.22	219°36.76	15.8'	03°54.43	-14.9'	55.5'
3	226°43.18	· · 38.25	234°11.59	15.9'	03°39.53	-14.9'	55.5'
4	241°43.40	37.28	248°46.45	15.9'	03°24.62	-14.9'	55.4'
5	256°43.62	36.31	263°21.35	15.9'	03°9.71	-14.9'	55.4'
6	271°43.84	N00°35.33	277°56.28	16.0'	N02°54.79	-14.9'	55.4'
7	286°44.06	34.36	292°31.23	16.0'	02°39.88	-14.9'	55.4'
8	301°44.28	33.39	307°6.22	16.0'	02°24.96	-14.9'	55.4'
9	316°44.51	· · 32.42	321°41.23	16.0'	02°10.04	-14.9'	55.3'
10	331°44.73	31.45	336°16.28	16.1'	01°55.13	-14.9'	55.3'
11	346°44.95	30.47	350°51.34	16.1'	01°40.22	-14.9'	55.3'
12	1°45.17	N00°29.50	5°26.43	16.1'	N01°25.31	-14.9'	55.3'
13	16°45.39	28.53	20°1.55	16.1'	01°10.41	-14.9'	55.3'
14	31°45.61	27.56	34°36.69	16.2'	00°55.51	-14.9'	55.3'
15	46°45.83	· · 26.58	49°11.85	16.2'	00°40.62	-14.9'	55.2'
16	61°46.05	25.61	63°47.03	16.2'	00°25.73	-14.9'	55.2'
17	76°46.27	24.64	78°22.23	16.2'	N00°10.86	-14.9'	55.2'
18	91°46.49	N00°23.66	92°57.44	16.2'	S00°4.01	14.9'	55.2'
19	106°46.71	22.69	107°32.68	16.3'	00°18.87	14.8'	55.2'
20	121°46.93	21.72	122°7.93	16.3'	00°33.72	14.8'	55.1'
21	136°47.15	· · 20.75	136°43.20	16.3'	00°48.55	14.8'	55.1'
22	151°47.37	19.77	151°18.48	16.3'	01°3.38	14.8'	55.1'
23	166°47.59	18.80	165°53.77	16.3'	01°18.18	14.8'	55.1'
SD = 15.9' d = -1.0'			SD = 15.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	02:47	04:21	05:31	18:14	19:22	20:55
N 70°	03:09	04:31	05:33	18:12	19:13	20:33
68°	03:26	04:38	05:35	18:10	19:06	20:17
66°	03:40	04:45	05:36	18:08	19:00	20:04
64°	03:51	04:50	05:38	18:07	18:55	19:54
62°	04:00	04:54	05:39	18:06	18:51	19:45
60°	04:07	04:58	05:40	18:05	18:47	19:37
N 58°	04:14	05:01	05:41	18:05	18:44	19:31
56°	04:20	05:04	05:42	18:04	18:41	19:25
54°	04:25	05:07	05:42	18:03	18:39	19:21
52°	04:29	05:09	05:43	18:03	18:36	19:16
50°	04:33	05:11	05:44	18:02	18:34	19:13
45°	04:41	05:15	05:45	18:01	18:30	19:05
N 40°	04:47	05:19	05:46	18:00	18:27	18:59
35°	04:52	05:21	05:47	18:00	18:25	18:54
30°	04:56	05:23	05:47	17:59	18:23	18:51
20°	05:01	05:26	05:48	17:58	18:20	18:46
N 10°	05:04	05:28	05:49	17:57	18:18	18:43
0°	05:05	05:29	05:50	17:57	18:17	18:41
S 10°	05:05	05:30	05:51	17:56	18:17	18:41
20°	05:04	05:29	05:51	17:56	18:18	18:43
30°	05:00	05:28	05:52	17:55	18:19	18:47
35°	04:58	05:27	05:52	17:55	18:20	18:50
40°	04:54	05:25	05:52	17:55	18:22	18:54
45°	04:49	05:23	05:53	17:55	18:24	18:58
S 50°	04:43	05:21	05:53	17:55	18:27	19:05
52°	04:40	05:19	05:53	17:55	18:28	19:08
54°	04:36	05:18	05:53	17:55	18:30	19:12
56°	04:33	05:16	05:53	17:55	18:32	19:16
58°	04:28	05:14	05:53	17:55	18:34	19:20
S 60°	04:23	05:12	05:54	17:54	18:36	19:26

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	· · ·	02:37	04:48	19:01	18:20	17:46
N 70°	00:34	02:53	04:52	18:43	18:12	17:47
68°	01:02	03:05	04:56	18:28	18:06	17:47
66°	01:23	03:16	04:59	18:16	18:01	17:47
64°	01:39	03:24	05:02	18:06	17:56	17:47
62°	01:53	03:31	05:04	17:57	17:52	17:47
60°	02:04	03:37	05:06	17:49	17:48	17:47
N 58°	02:14	03:43	05:07	17:43	17:45	17:47
56°	02:23	03:48	05:09	17:37	17:42	17:47
54°	02:30	03:52	05:10	17:32	17:40	17:47
52°	02:37	03:56	05:12	17:27	17:38	17:47
50°	02:43	03:59	05:13	17:22	17:35	17:47
45°	02:56	04:07	05:15	17:13	17:31	17:47
N 40°	03:07	04:13	05:17	17:05	17:27	17:47
35°	03:16	04:19	05:19	16:58	17:23	17:47
30°	03:24	04:24	05:21	16:52	17:20	17:47
20°	03:38	04:32	05:23	16:41	17:15	17:47
N 10°	03:50	04:39	05:26	16:32	17:11	17:47
0°	04:01	04:46	05:28	16:23	17:06	17:47
S 10°	04:12	04:52	05:30	16:14	17:02	17:47
20°	04:24	04:59	05:32	16:04	16:57	17:47
30°	04:38	05:08	05:35	15:53	16:51	17:47
35°	04:45	05:12	05:37	15:47	16:48	17:47
40°	04:54	05:17	05:38	15:39	16:44	17:47
45°	05:04	05:23	05:40	15:31	16:40	17:47
S 50°	05:17	05:31	05:43	15:20	16:35	17:47
52°	05:22	05:34	05:44	15:15	16:33	17:47
54°	05:28	05:37	05:45	15:10	16:30	17:47
56°	05:35	05:41	05:46	15:04	16:27	17:47
58°	05:43	05:46	05:48	14:57	16:24	17:47
S 60°	05:52	05:51	05:49	14:49	16:20	17:47

Day	Sun		Mer. Pass hh:mm	Moon		Age 27-0 8-1%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
19	06:08	06:18	11:54	10:12	22:34	
20	06:29	06:39	11:53	10:56	23:17	
21	06:50	07:01	11:53	11:38	23:58	

September 22, 23, 24 UT (Mon., Tue., Wed.)


h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	1°6.68		205°46.11	N11°21.06	153°24.34	S11°22.63	248°7.01	N21°45.62	1°32.04	S02°55.15
1	16°9.15		220°45.63	20.03	168°25.21	23.25	263°9.09	45.57	16°34.68	55.23
2	31°11.61		235°45.16	19.00	183°26.08	23.86	278°11.18	45.52	31°37.32	55.31
3	46°14.07		250°44.68	· · 17.97	198°26.96	· · 24.48	293°13.27	· · 45.47	46°39.96	· · 55.39
4	61°16.54		265°44.21	16.94	213°27.83	25.10	308°15.35	45.42	61°42.60	55.46
5	76°19.00		280°43.73	15.91	228°28.70	25.71	323°17.44	45.37	76°45.24	55.54
6	91°21.47		295°43.26	N11°14.88	243°29.57	S11°26.33	338°19.52	N21°45.32	91°47.89	S02°55.62
7	106°23.93		310°42.78	13.85	258°30.44	26.94	353°21.61	45.27	106°50.53	55.70
8	121°26.39		325°42.31	12.82	273°31.30	27.56	8°23.70	45.22	121°53.17	55.78
9	136°28.86		340°41.84	· · 11.79	288°32.17	· · 28.18	23°25.79	· · 45.17	136°55.81	· · 55.86
10	151°31.32		355°41.36	10.76	303°33.04	28.79	38°27.87	45.12	151°58.45	55.93
11	166°33.79		10°40.89	9.72	318°33.91	29.41	53°29.96	45.07	167°1.09	56.01
12	181°36.25		25°40.42	N11°8.69	333°34.78	S11°30.02	68°32.05	N21°45.01	182°3.74	S02°56.09
13	196°38.71		40°39.95	7.66	348°35.65	30.64	83°34.14	44.96	197°6.38	56.17
14	211°41.18		55°39.48	6.62	3°36.52	31.25	98°36.23	44.91	212°9.02	56.25
15	226°43.64		70°39.00	· · 5.59	18°37.38	· · 31.87	113°38.31	· · 44.86	227°11.66	· · 56.33
16	241°46.11		85°38.53	4.55	33°38.25	32.48	128°40.40	44.81	242°14.30	56.41
17	256°48.57		100°38.06	3.51	48°39.12	33.10	143°42.49	44.76	257°16.94	56.48
18	271°51.03		115°37.59	N11°2.48	63°39.99	S11°33.71	158°44.58	N21°44.71	272°19.59	S02°56.56
19	286°53.50		130°37.12	1.44	78°40.85	34.33	173°46.67	44.66	287°22.23	56.64
20	301°55.96		145°36.65	11°0.40	93°41.72	34.94	188°48.76	44.61	302°24.87	56.72
21	316°58.43		160°36.18	10°59.36	108°42.59	· · 35.55	203°50.85	· · 44.56	317°27.51	· · 56.80
22	332°0.89		175°35.71	58.32	123°43.45	36.17	218°52.94	44.51	332°30.15	56.88
23	347°3.35		190°35.24	57.28	138°44.32	36.78	233°55.03	44.46	347°32.79	56.95
Mer.pass. 23:52		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.59		ν2.1' d-0.1' m-2.08		ν2.6' d0.1' m0.58		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	2°5.82		205°34.77	N10°56.24	153°45.19	S11°37.40	248°57.12	N21°44.41	2°35.44	S02°57.03
1	17°8.28		220°34.31	55.20	168°46.05	38.01	263°59.22	44.36	17°38.08	57.11
2	32°10.75		235°33.84	54.16	183°46.92	38.62	279°1.31	44.31	32°40.72	57.19
3	47°13.21		250°33.37	· · 53.12	198°47.78	· · 39.24	294°3.40	· · 44.26	47°43.36	· · 57.27
4	62°15.67		265°32.90	52.08	213°48.65	39.85	309°5.49	44.21	62°46.00	57.34
5	77°18.14		280°32.43	51.04	228°49.51	40.46	324°7.58	44.16	77°48.64	57.42
6	92°20.60		295°31.97	N10°49.99	243°50.38	S11°41.08	339°9.68	N21°44.11	92°51.29	S02°57.50
7	107°23.07		310°31.50	48.95	258°51.24	41.69	354°11.77	44.06	107°53.93	57.58
8	122°25.53		325°31.03	47.90	273°52.10	42.30	9°13.86	44.01	122°56.57	57.66
9	137°27.99		340°30.57	· · 46.86	288°52.97	· · 42.92	24°15.95	· · 43.96	137°59.21	· · 57.74
10	152°30.46		355°30.10	45.81	303°53.83	43.53	39°18.05	43.91	153°1.85	57.81
11	167°32.92		10°29.63	44.77	318°54.70	44.14	54°20.14	43.86	168°4.49	57.89
12	182°35.39		25°29.17	N10°43.72	333°55.56	S11°44.76	69°22.24	N21°43.81	183°7.14	S02°57.97
13	197°37.85		40°28.70	42.67	348°56.42	45.37	84°24.33	43.76	198°9.78	58.05
14	212°40.31		55°28.24	41.62	3°57.28	45.98	99°26.42	43.71	213°12.42	58.13
15	227°42.78		70°27.77	· · 40.58	18°58.15	· · 46.59	114°28.52	· · 43.66	228°15.06	· · 58.20
16	242°45.24		85°27.31	39.53	33°59.01	47.20	129°30.61	43.61	243°17.70	58.28
17	257°47.71		100°26.85	38.48	48°59.87	47.82	144°32.71	43.56	258°20.34	58.36
18	272°50.17		115°26.38	N10°37.43	64°0.73	S11°48.43	159°34.80	N21°43.51	273°22.99	S02°58.44
19	287°52.64		130°25.92	36.38	79°1.59	49.04	174°36.90	43.46	288°25.63	58.52
20	302°55.10		145°25.45	35.32	94°2.46	49.65	189°38.99	43.41	303°28.27	58.60
21	317°57.56		160°24.99	· · 34.27	109°3.32	· · 50.26	204°41.09	· · 43.36	318°30.91	· · 58.67
22	333°0.03		175°24.53	33.22	124°4.18	50.88	219°43.19	43.31	333°33.55	58.75
23	348°2.49		190°24.07	32.17	139°5.04	51.49	234°45.28	43.26	348°36.19	58.83
Mer.pass. 23:48		ν-0.5' d-1.0' m-3.93		ν0.9' d0.6' m1.59		ν2.1' d-0.1' m-2.08		ν2.6' d0.1' m0.59		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	3°4.96		205°23.60	N10°31.12	154°5.90	S11°52.10	249°47.38	N21°43.21	3°38.84	S02°58.91
1	18°7.42		220°23.14	30.06	169°6.76	52.71	264°49.48	43.16	18°41.48	58.99
2	33°9.88		235°22.68	29.01	184°7.62	53.32	279°51.57	43.11	33°44.12	59.06
3	48°12.35		250°22.22	· · 27.95	199°8.48	· · 53.93	294°53.67	· · 43.06	48°46.76	· · 59.14
4	63°14.81		265°21.76	26.90	214°9.34	54.54	309°55.77	43.01	63°49.40	59.22
5	78°17.28		280°21.30	25.84	229°10.20	55.15	324°57.87	42.96	78°52.04	59.30
6	93°19.74		295°20.83	N10°24.78	244°11.06	S11°55.76	339°59.97	N21°42.91	93°54.68	S02°59.37
7	108°22.20		310°20.37	23.73	259°11.92	56.37	355°2.06	42.86	108°57.33	59.45
8	123°24.67		325°19.91	22.67	274°12.77	56.98	10°4.16	42.81	123°59.97	59.53
9	138°27.13		340°19.45	· · 21.61	289°13.63	· · 57.59	25°6.26	· · 42.76	139°2.61	· · 59.61
10	153°29.60		355°18.99	20.55	304°14.49	58.20	40°8.36	42.71	154°5.25	59.69
11	168°32.06		10°18.54	19.49	319°15.35	58.81	55°10.46	42.66	169°7.89	59.76
12	183°34.52		25°18.08	N10°18.44	334°16.21	S11°59.42	70°12.56	N21°42.62	184°10.53	S02°59.84
13	198°36.99		40°17.62	17.37	349°17.06	12°0.03	85°14.66	42.57	199°13.18	02°59.92
14	213°39.45		55°17.16	16.31	4°17.92	0.64	100°16.76	42.52	214°15.82	03°0.00
15	228°41.92		70°16.70	· · 15.25	19°18.78	· · 1.25	115°18.86	· · 42.47	229°18.46	· · 0.07
16	243°44.38		85°16.24	14.19	34°19.64	1.86	130°20.96	42.42	244°21.10	0.15
17	258°46.84		100°15.78	13.13	49°20.49	2.47	145°23.06	42.37	259°23.74	0.23
18	273°49.31		115°15.33	N10°12.07	64°21.35	S12°3.08	160°25.16	N21°42.32	274°26.38	S03°0.31
19	288°51.77		130°14.87	11.00	79°22.20	3.69	175°27.27	42.27	289°29.02	0.39
20	303°54.24		145°14.41	9.94	94°23.06	4.30	190°29.37	42.22	304°31.66	0.46
21	318°56.70		160°13.96	· · 8.88	109°23.92	· · 4.91	205°31.47	· · 42.17	319°34.31	· · 0.54
22	333°59.16		175°13.50	7.81	124°24.77	5.52	220°33.57	42.12	334°36.95	0.62
23	349°1.63		190°13.04	6.75	139°25.63	6.12	235°35.67	42.07	349°39.59	0.70
Mer.pass. 23:44		ν-0.5' d-1.1' m-3.93		ν0.9' d0.6' m1.59		ν2.1' d-0.0' m-2.09		ν2.6' d0.1' m0.59		

	Stars	
	SHA	Dec
Alpheratz	357°33.83	29°14.09
Ankaa	353°6.13	-42°9.82
Schedar	349°29.86	56°40.76
Diphda	348°46.38	-17°50.55
Achernar	335°19.19	-57°6.14
Hamal	327°50.26	23°35.14
Polaris	313°25.35	89°22.14
Acamar	315°11.02	-40°11.79
Menkar	314°5.32	4°11.60
Mirfak	308°27.13	49°57.07
Aldebaran	290°38.84	16°33.74
Rigel	281°3.25	-8°10.09
Capella	280°20.95	46°1.31
Bellatrix	278°22.21	6°22.51
Elnath	278°1.08	28°37.73
Alnilam	275°37.11	-1°10.95
Betelgeuse	270°51.45	7°24.84
Canopus	263°52.19	-52°42.15
Sirius	258°25.79	-16°44.82
Adhara	255°5.50	-29°0.10
Procyon	244°50.36	5°9.67
Pollux	243°16.75	27°57.83
Avior	234°14.89	-59°35.17
Suhail	222°46.23	-43°31.91
Miaplacidus	221°38.90	-69°49.07
Alphard	217°47.44	-8°46.03
Regulus	207°34.11	11°50.58
Dubhe	193°40.89	61°36.71
Denebola	182°24.68	14°25.80
Gienah	175°43.33	-17°40.99
Acrux	173°0.21	-63°14.49
Gacrux	171°51.62	-57°15.42
Alioth	166°12.96	55°49.31
Spica	158°22.00	-11°17.66
Alkaid	152°51.95	49°11.23
Hadar	148°35.77	-60°29.92
Menkent	147°57.29	-36°29.81
Arcturus	145°47.65	19°3.04
Rigel Kent.	139°40.05	-60°56.62
Kochab	137°20.59	74°3.13
Zuben'ubi	136°55.62	-16°8.88
Alphecca	126°3.45	26°37.86
Antares	112°15.27	-26°29.37
Atria	107°9.11	-69°4.65
Sabik	102°2.19	-15°45.38
Shaula	96°9.63	-37°7.44
Rasalhague	95°58.05	12°32.63
Eltanin	90°41.92	51°29.38
Kaus Aust.	83°31.71	-34°22.41
Vega	80°32.78	38°48.69
Nunki	75°46.96	-26°15.91
Altair	61°59.25	8°56.33
Peacock	53°4.46	-56°39.26
Deneb	49°25.14	45°22.56
Enif	33°37.97	9°59.74</

h		Sun		Moon				
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		181°47.81	N00°17.83	180°29.07	16.3'	S01°32.98	14.8'	55.1'
1		196°48.03	16.85	195°4.39	16.3'	01°47.76	14.8'	55.1'
2		211°48.25	15.88	209°39.72	16.3'	02°2.52	14.7'	55.0'
3		226°48.47	· · 14.91	224°15.05	16.3'	02°17.27	14.7'	55.0'
4		241°48.69	13.94	238°50.39	16.3'	02°32.00	14.7'	55.0'
5		256°48.91	12.96	253°25.74	16.4'	02°46.71	14.7'	55.0'
6		271°49.13	N00°11.99	268°1.10	16.4'	S03°1.40	14.7'	55.0'
7		286°49.35	11.02	282°36.46	16.4'	03°16.07	14.6'	55.0'
8		301°49.57	10.04	297°11.82	16.4'	03°30.71	14.6'	54.9'
9		316°49.79	· · 9.07	311°47.19	16.4'	03°45.34	14.6'	54.9'
10		331°50.01	8.10	326°22.56	16.4'	03°59.94	14.6'	54.9'
11		346°50.22	7.12	340°57.92	16.4'	04°14.52	14.6'	54.9'
12		1°50.44	N00°6.15	355°33.29	16.4'	S04°29.08	14.5'	54.9'
13		16°50.66	5.18	10°8.66	16.4'	04°43.60	14.5'	54.9'
14		31°50.88	4.20	24°44.02	16.4'	04°58.11	14.5'	54.8'
15		46°51.10	· · 3.23	39°19.38	16.4'	05°12.58	14.4'	54.8'
16		61°51.32	2.26	53°54.74	16.4'	05°27.03	14.4'	54.8'
17		76°51.54	1.28	68°30.09	16.3'	05°41.44	14.4'	54.8'
18		91°51.76	N00°0.31	83°5.44	16.3'	S05°55.83	14.4'	54.8'
19		106°51.98	S00°0.66	97°40.78	16.3'	06°10.19	14.3'	54.8'
20		121°52.20	1.64	112°16.11	16.3'	06°24.51	14.3'	54.7'
21		136°52.42	· · 2.61	126°51.43	16.3'	06°38.80	14.3'	54.7'
22		151°52.63	3.58	141°26.74	16.3'	06°53.06	14.2'	54.7'
23		166°52.85	4.56	156°2.03	16.3'	07°7.29	14.2'	54.7'
SD = 15.9' d = -1.0'				SD = 15.0'				
Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		181°53.07	S00°5.53	170°37.32	16.3'	S07°21.48	14.2'	54.7'
1		196°53.29	6.50	185°12.60	16.3'	07°35.63	14.1'	54.7'
2		211°53.51	7.48	199°47.86	16.2'	07°49.75	14.1'	54.7'
3		226°53.73	· · 8.45	214°23.10	16.2'	08°3.83	14.0'	54.6'
4		241°53.95	9.42	228°58.33	16.2'	08°17.87	14.0'	54.6'
5		256°54.17	10.40	243°33.54	16.2'	08°31.88	14.0'	54.6'
6		271°54.38	S00°11.37	258°8.74	16.2'	S08°45.84	13.9'	54.6'
7		286°54.60	12.34	272°43.91	16.2'	08°59.77	13.9'	54.6'
8		301°54.82	13.32	287°19.07	16.1'	09°13.65	13.8'	54.6'
9		316°55.04	· · 14.29	301°54.20	16.1'	09°27.49	13.8'	54.6'
10		331°55.26	15.27	316°29.32	16.1'	09°41.28	13.8'	54.5'
11		346°55.48	16.24	331°4.41	16.1'	09°55.04	13.7'	54.5'
12		1°55.69	S00°17.21	345°39.48	16.0'	S10°8.74	13.7'	54.5'
13		16°55.91	18.19	0°14.52	16.0'	10°22.41	13.6'	54.5'
14		31°56.13	19.16	14°49.54	16.0'	10°36.02	13.6'	54.5'
15		46°56.35	· · 20.13	29°24.54	16.0'	10°49.59	13.5'	54.5'
16		61°56.57	21.11	43°59.50	15.9'	11°3.11	13.5'	54.5'
17		76°56.78	22.08	58°34.44	15.9'	11°16.59	13.4'	54.4'
18		91°57.00	S00°23.06	73°9.35	15.9'	S11°30.01	13.4'	54.4'
19		106°57.22	24.03	87°44.24	15.9'	11°43.38	13.3'	54.4'
20		121°57.44	25.00	102°19.09	15.8'	11°56.70	13.3'	54.4'
21		136°57.65	· · 25.98	116°53.91	15.8'	12°9.97	13.2'	54.4'
22		151°57.87	26.95	131°28.70	15.8'	12°23.19	13.2'	54.4'
23		166°58.09	27.92	146°3.45	15.7'	12°36.36	13.1'	54.4'
SD = 15.9' d = 1.0'				SD = 14.9'				
Wed		GHA	Dec	GHA	ν	Dec	d	HP
0		181°58.31	S00°28.90	160°38.17	15.7'	S12°49.47	13.1'	54.4'
1		196°58.52	29.87	175°12.86	15.7'	13°2.52	13.0'	54.4'
2		211°58.74	30.85	189°47.51	15.6'	13°15.52	12.9'	54.3'
3		226°58.96	· · 31.82	204°22.13	15.6'	13°28.46	12.9'	54.3'
4		241°59.18	32.79	218°56.71	15.5'	13°41.34	12.8'	54.3'
5		256°59.39	33.77	233°31.25	15.5'	13°54.17	12.8'	54.3'
6		271°59.61	S00°34.74	248°5.76	15.5'	S14°6.94	12.7'	54.3'
7		286°59.83	35.72	262°40.22	15.4'	14°19.64	12.6'	54.3'
8		302°0.04	36.69	277°14.65	15.4'	14°32.29	12.6'	54.3'
9		317°0.26	· · 37.66	291°49.03	15.3'	14°44.88	12.5'	54.3'
10		332°0.48	38.64	306°23.37	15.3'	14°57.40	12.5'	54.3'
11		347°0.69	39.61	320°57.67	15.3'	15°9.86	12.4'	54.2'
12		2°0.91	S00°40.59	335°31.93	15.2'	S15°22.25	12.3'	54.2'
13		17°1.13	41.56	350°6.15	15.2'	15°34.58	12.3'	54.2'
14		32°1.34	42.53	4°40.32	15.1'	15°46.85	12.2'	54.2'
15		47°1.56	· · 43.51	19°14.44	15.1'	15°59.05	12.1'	54.2'
16		62°1.78	44.48	33°48.52	15.0'	16°11.18	12.1'	54.2'
17		77°1.99	45.45	48°22.55	15.0'	16°23.25	12.0'	54.2'
18		92°2.21	S00°46.43	62°56.54	14.9'	S16°35.24	11.9'	54.2'
19		107°2.43	47.40	77°30.48	14.9'	16°47.17	11.9'	54.2'
20		122°2.64	48.38	92°4.37	14.8'	16°59.02	11.8'	54.2'
21		137°2.86	· · 49.35	106°38.21	14.8'	17°10.81	11.7'	54.2'
22		152°3.07	50.32	121°12.00	14.7'	17°22.52	11.6'	54.1'
23		167°3.29	51.30	135°45.74	14.7'	17°34.16	11.6'	54.1'
SD = 15.9' d = 1.0'				SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:06	04:36	05:44	17:58	19:06	20:34
N 70°	03:25	04:43	05:45	17:58	18:59	20:16
68°	03:39	04:49	05:45	17:57	18:53	20:02
66°	03:51	04:54	05:46	17:57	18:48	19:51
64°	04:01	04:59	05:46	17:57	18:44	19:42
62°	04:09	05:02	05:47	17:56	18:41	19:34
60°	04:15	05:05	05:47	17:56	18:38	19:27
N 58°	04:21	05:08	05:47	17:56	18:35	19:22
56°	04:26	05:10	05:48	17:56	18:33	19:17
54°	04:31	05:12	05:48	17:56	18:31	19:13
52°	04:34	05:14	05:48	17:56	18:29	19:09
50°	04:38	05:16	05:48	17:56	18:28	19:06
45°	04:45	05:19	05:48	17:55	18:25	18:59
N 40°	04:50	05:22	05:49	17:55	18:22	18:54
35°	04:54	05:24	05:49	17:55	18:20	18:50
30°	04:57	05:25	05:49	17:55	18:19	18:47
20°	05:02	05:27	05:49	17:55	18:17	18:43
N 10°	05:04	05:28	05:49	17:55	18:16	18:41
0°	05:04	05:28	05:49	17:56	18:16	18:40
S 10°	05:04	05:28	05:49	17:56	18:17	18:41
20°	05:01	05:27	05:49	17:56	18:18	18:44
30°	04:56	05:24	05:48	17:57	18:21	18:49
35°	04:53	05:23	05:48	17:57	18:23	18:52
40°	04:49	05:20	05:47	17:58	18:25	18:57
45°	04:43	05:18	05:47	17:58	18:28	19:02
S 50°	04:36	05:14	05:46	17:59	18:32	19:10
52°	04:33	05:12	05:46	18:00	18:33	19:13
54°	04:29	05:10	05:46	18:00	18:35	19:17
56°	04:24	05:08	05:45	18:00	18:38	19:22
58°	04:19	05:06	05:45	18:01	18:40	19:27
S 60°	04:13	05:03	05:44	18:02	18:43	19:34

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	06:51	08:57	11:28	17:13	16:34	15:31
N 70°	06:46	08:41	10:49	17:21	16:52	16:11
68°	06:42	08:29	10:23	17:27	17:06	16:39
66°	06:39	08:19	10:03	17:33	17:18	17:00
64°	06:36	08:10	09:47	17:38	17:28	17:17
62°	06:34	08:03	09:34	17:42	17:37	17:31
60°	06:31	07:57	09:23	17:45	17:44	17:43
N 58°	06:30	07:51	09:14	17:49	17:51	17:54
56°	06:28	07:46	09:06	17:51	17:56	18:03
54°	06:27	07:42	08:58	17:54	18:02	18:11
52°	06:25	07:38	08:52	17:56	18:06	18:18
50°	06:24	07:35	08:46	17:59	18:11	18:25
45°	06:22	07:27	08:33	18:03	18:20	18:39
N 40°	06:19	07:21	08:23	18:07	18:28	18:51
35°	06:18	07:16	08:14	18:11	18:35	19:01
30°	06:16	07:11	08:06	18:14	18:41	19:10
20°	06:13	07:03	07:53	18:19	18:51	19:25
N 10°	06:11	06:56	07:41	18:24	19:00	19:38
0°	06:09	06:49	07:31	18:28	19:09	19:51
S 10°	06:06	06:43	07:20	18:32	19:18	20:04
20°	06:04	06:36	07:09	18:37	19:27	20:17
30°	06:01	06:28	06:56	18:43	19:38	20:33
35°	06:00	06:23	06:48	18:46	19:44	20:42
40°	05:58	06:18	06:40	18:49	19:51	20:53
45°	05:56	06:13	06:30	18:53	19:59	21:05
S 50°	05:54	06:06	06:19	18:58	20:09	21:20
52°	05:53	06:03	06:13	19:00	20:14	21:27
54°	05:52	05:59	06:07	19:03	20:19	21:35
56°	05:51	05:55	06:01	19:06	20:24	21:44
58°	05:49	05:51	05:53	19:09	20:31	21:54
S 60°	05:48	05:46	05:45	19:12	20:38	22:06

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 1-3 0-5%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
22	07:11	07:22	11:53	12:18	--:-	
23	07:32	07:43	11:52	12:59	00:39	
24	07:53	08:04	11:52	13:41	01:20	

September 25, 26, 27 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	4°4.09		205°12.59	N10°5.68	154°26.48	S12°6.73	250°37.78	N21°42.02	4°42.23	S03°0.77
1	19°6.56		220°12.13	4.61	169°27.34	7.34	265°39.88	41.97	19°44.87	0.85
2	34°9.02		235°11.68	3.55	184°28.19	7.95	280°41.98	41.93	34°47.51	0.93
3	49°11.48		250°11.22	•• 2.48	199°29.05	•• 8.56	295°44.09	•• 41.88	49°50.15	•• 1.01
4	64°13.95		265°10.77	1.41	214°29.90	9.17	310°46.19	41.83	64°52.80	1.08
5	79°16.41		280°10.31	10°0.34	229°30.75	9.77	325°48.29	41.78	79°55.44	1.16
6	94°18.88		295°9.86	N09°59.27	244°31.61	S12°10.38	340°50.40	N21°41.73	94°58.08	S03°1.24
7	109°21.34		310°9.40	58.21	259°32.46	10.99	355°52.50	41.68	110°0.72	1.32
8	124°23.81		325°8.95	57.14	274°33.31	11.60	10°54.61	41.63	125°3.36	1.39
9	139°26.27		340°8.50	•• 56.06	289°34.17	•• 12.20	25°56.71	•• 41.58	140°6.00	•• 1.47
10	154°28.73		355°8.04	54.99	304°35.02	12.81	40°58.82	41.53	155°8.64	1.55
11	169°31.20		10°7.59	53.92	319°35.87	13.42	56°0.92	41.48	170°11.28	1.63
12	184°33.66		25°7.14	N09°52.85	334°36.72	S12°14.02	71°3.03	N21°41.44	185°13.93	S03°1.70
13	199°36.13		40°6.68	51.78	349°37.58	14.63	86°5.13	41.39	200°16.57	1.78
14	214°38.59		55°6.23	50.71	4°38.43	15.24	101°7.24	41.34	215°19.21	1.86
15	229°41.05		70°5.78	•• 49.63	19°39.28	•• 15.85	116°9.35	•• 41.29	230°21.85	•• 1.94
16	244°43.52		85°5.33	48.56	34°40.13	16.45	131°11.45	41.24	245°24.49	2.01
17	259°45.98		100°4.88	47.48	49°40.98	17.06	146°13.56	41.19	260°27.13	2.09
18	274°48.45		115°4.42	N09°46.41	64°41.83	S12°17.66	161°15.67	N21°41.14	275°29.77	S03°2.17
19	289°50.91		130°3.97	45.33	79°42.68	18.27	176°17.77	41.09	290°32.41	2.25
20	304°53.37		145°3.52	44.26	94°43.53	18.88	191°19.88	41.05	305°35.05	2.32
21	319°55.84		160°3.07	•• 43.18	109°44.38	•• 19.48	206°21.99	•• 41.00	320°37.70	•• 2.40
22	334°58.30		175°2.62	42.10	124°45.23	20.09	221°24.10	40.95	335°40.34	2.48
23	350°0.77		190°2.17	41.03	139°46.08	20.69	236°26.21	40.90	350°42.98	2.55
Mer.pass.	23:40		ν-0.5' d-1.1' m-3.93		ν0.9' d0.6' m1.59		ν2.1' d-0.0' m-2.09		ν2.6' d0.1' m0.59	

Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°3.23		205°1.72	N09°39.95	154°46.93	S12°21.30	251°28.31	N21°40.85	5°45.62	S03°2.63
1	20°5.69		220°1.27	38.87	169°47.78	21.90	266°30.42	40.80	20°48.26	2.71
2	35°8.16		235°0.82	37.79	184°48.63	22.51	281°32.53	40.75	35°50.90	2.79
3	50°10.62		250°0.37	•• 36.71	199°49.48	•• 23.12	296°34.64	•• 40.71	50°53.54	•• 2.86
4	65°13.09		264°59.93	35.63	214°50.33	23.72	311°36.75	40.66	65°56.18	2.94
5	80°15.55		279°59.48	34.55	229°51.18	24.33	326°38.86	40.61	80°58.82	3.02
6	95°18.02		294°59.03	N09°33.47	244°52.03	S12°24.93	341°40.97	N21°40.56	96°1.46	S03°3.09
7	110°20.48		309°58.58	32.39	259°52.87	25.53	356°43.08	40.51	111°4.11	3.17
8	125°22.94		324°58.13	31.31	274°53.72	26.14	11°45.19	40.46	126°6.75	3.25
9	140°25.41		339°57.69	•• 30.23	289°54.57	•• 26.74	26°47.30	•• 40.41	141°9.39	•• 3.33
10	155°27.87		354°57.24	29.14	304°55.42	27.35	41°49.41	40.37	156°12.03	3.40
11	170°30.34		9°56.79	28.06	319°56.26	27.95	56°51.53	40.32	171°14.67	3.48
12	185°32.80		24°56.34	N09°26.98	334°57.11	S12°28.56	71°53.64	N21°40.27	186°17.31	S03°3.56
13	200°35.26		39°55.90	25.89	349°57.96	29.16	86°55.75	40.22	201°19.95	3.63
14	215°37.73		54°55.45	24.81	4°58.80	29.76	101°57.86	40.17	216°22.59	3.71
15	230°40.19		69°55.01	•• 23.72	19°59.65	•• 30.37	116°59.97	•• 40.13	231°25.23	•• 3.79
16	245°42.66		84°54.56	22.64	35°0.50	30.97	132°2.09	40.08	246°27.87	3.86
17	260°45.12		99°54.11	21.55	50°1.34	31.57	147°4.20	40.03	261°30.51	3.94
18	275°47.58		114°53.67	N09°20.47	65°2.19	S12°32.18	162°6.31	N21°39.98	276°33.15	S03°4.02
19	290°50.05		129°53.22	19.38	80°3.03	32.78	177°8.43	39.93	291°35.80	4.10
20	305°52.51		144°52.78	18.29	95°3.88	33.38	192°10.54	39.88	306°38.44	4.17
21	320°54.98		159°52.33	•• 17.20	110°4.72	•• 33.99	207°12.65	•• 39.84	321°41.08	•• 4.25
22	335°57.44		174°51.89	16.11	125°5.57	34.59	222°14.77	39.79	336°43.72	4.33
23	350°59.91		189°51.45	15.03	140°6.41	35.19	237°16.88	39.74	351°46.36	4.40
Mer.pass.	23:36		ν-0.4' d-1.1' m-3.93		ν0.8' d0.6' m1.58		ν2.1' d-0.0' m-2.10		ν2.6' d0.1' m0.60	

Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°2.37		204°51.00	N09°13.94	155°7.25	S12°35.79	252°19.00	N21°39.69	6°49.00	S03°4.48
1	21°4.83		219°50.56	12.85	170°8.10	36.40	267°21.11	39.64	21°51.64	4.56
2	36°7.30		234°50.12	11.76	185°8.94	37.00	282°23.23	39.60	36°54.28	4.63
3	51°9.76		249°49.67	•• 10.66	200°9.78	•• 37.60	297°25.34	•• 39.55	51°56.92	•• 4.71
4	66°12.23		264°49.23	9.57	215°10.63	38.20	312°27.46	39.50	66°59.56	4.79
5	81°14.69		279°48.79	8.48	230°11.47	38.81	327°29.57	39.45	82°2.20	4.86
6	96°17.15		294°48.34	N09°7.39	245°12.31	S12°39.41	342°31.69	N21°39.41	97°4.84	S03°4.94
7	111°19.62		309°47.90	6.30	260°13.16	40.01	357°33.81	39.36	112°7.48	5.02
8	126°22.08		324°47.46	5.20	275°14.00	40.61	12°35.92	39.31	127°10.12	5.09
9	141°24.55		339°47.02	•• 4.11	290°14.84	•• 41.21	27°38.04	•• 39.26	142°12.76	•• 5.17
10	156°27.01		354°46.58	3.02	305°15.68	41.81	42°40.16	39.21	157°15.40	5.25
11	171°29.47		9°46.14	1.92	320°16.52	42.41	57°42.27	39.17	172°18.04	5.32
12	186°31.94		24°45.70	N09°0.83	335°17.36	S12°43.02	72°44.39	N21°39.12	187°20.68	S03°5.40
13	201°34.40		39°45.25	08°59.73	350°18.21	43.62	87°46.51	39.07	202°23.32	5.48
14	216°36.87		54°44.81	58.63	5°19.05	44.22	102°48.63	39.02	217°25.96	5.55
15	231°39.33		69°44.37	•• 57.54	20°19.89	•• 44.82	117°50.75	•• 38.98	232°28.61	•• 5.63
16	246°41.80		84°43.93	56.44	35°20.73	45.42	132°52.86	38.93	247°31.25	5.70
17	261°44.26		99°43.49	55.34	50°21.57	46.02	147°54.98	38.88	262°33.89	5.78
18	276°46.72		114°43.05	N08°54.25	65°22.41	S12°46.62	162°57.10	N21°38.83	277°36.53	S03°5.86
19	291°49.19		129°42.62	53.15	80°23.25	47.22	177°59.22	38.79	292°39.17	5.93
20	306°51.65		144°42.18	52.05	95°24.09	47.82	193°1.34	38.74	307°41.81	6.01
21	321°54.12		159°41.74	•• 50.95	110°24.92	•• 48.42	208°3.46	•• 38.69	322°44.45	•• 6.09
22	336°56.58		174°41.30	49.85	125°25.76	49.02	223°5.58	38.64	337°47.09	6.16
23	351°59.04		189°40.86	48.75	140°26.60	49.62	238°7.70	38.60	352°49.73	6.24
Mer.pass.	23:32		ν-0.4' d-1.1' m-3.93		ν0.8' d0.6' m1.58		ν2.1' d-0.0' m-2.10		ν2.6' d0.1' m0.60	

Stars		
	SHA	Dec
Alpheratz	357°33.83	29°14.10
Ankaa	353°6.12	-42°9.83
Schedar	349°29.85	56°40.78
Diphda	348°46.38	-17°50.56
Achernar	335°19.17	-57°6.16
Hamal	327°50.25	23°35.14
Polaris	313°24.02	89°22.15
Acamar	315°11.00	-40°11.80
Menkar	314°5.31	4°11.60
Mirfak	308°27.11	49°57.08
Aldebaran	290°38.82	16°33.74
Rigel	281°3.23	-8°10.09
Capella	280°20.92	46°1.31
Bellatrix	278°22.19	6°22.51
Elnath	278°1.06	28°37.73
Alnilam	275°37.09	-1°10.95
Betelgeuse	270°51.43	7°24.83
Canopus	263°52.16	-52°42.15
Sirius	258°25.77	-16°44.83
Adhara	255°5.48	-29°0.10
Procyon	244°50.34	5°9.67
Pollux	243°16.73	27°57.83
Avior	234°14.86	-59°35.16
Suhail	222°46.21	-43°31.90
Miaplacidus	221°38.86	-69°49.06
Alphard	217°47.43	-8°46.03
Regulus	207°34.10	11°50.58
Dubhe	193°40.88	61°36.70
Denebola	182°24.68	14°25.80
Gienah	175°43.33	-17°40.98
Acrux	173°0.20	-63°14.48
Gacrux	171°51.62	-57°15.40
Alioth	166°12.97	55°49.29
Spica	158°22.00	-11°17.65
Alkaid	152°51.96	49°11.22
Hadar	148°35.78	-60°29.90
Menkent	147°57.29	-36°29.80
Arcturus	145°47.66	19°3.04
Rigil Kent.	139°40.07	-60°56.61
Kochab	137°20.63	74°3.12
Zuben'ubi	136°55.63	-16°8.88
Alphecca	126°3.47	26°37.86
Antares	112°15.28	-26°29.37
Atria	107°9.15	-69°4.64
Sabik	102°2.21	-15°45.38
Shaula	96°9.65	-37°7.43
Rasalhague	95°58.07	12°32.63
Eltanin	90°41.95	51°29.38
Kaus Aust.	83°31.72	-34°22.41
Vega	80°32.80	38°48.69
Nunki	75°46.97	-26°15.91
Altair	61°59.27	8°56.33
Peacock	53°4.48	-56°39.27
Deneb	49°25.16	45°22.57
Enif	33°37.98	9°59.74
Al Na'ir	27°31.77	-46°50.20
Fomalhaut	15°13.52	-29°29.07
Scheat	13°44.32	28°13.52
Markab	13°29.02	15°20.79

Sep 25 Thu	SHA	Mer.pass
Venus	201°8.49	10:19
Mars	150°22.39	13:41
Jupiter	246°33.68	07:16
Saturn	0°38.14	23:37

Sep 26 Fri	SHA	Mer.pass
Venus	199°58.49	10:20
Mars	149°43.70	13:40
Jupiter	246°25.08	07:13
Saturn	0°42.39	23:33


Sep 27 Sat	SHA	Mer.pass
Venus	198°48.63	10:21
Mars	149°4.88	13:39
Jupiter	246°16.63	07:10
Saturn	0°46.63	23:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h		Sun		Moon				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		182°3.51	S00°52.27	150°19.43	14.6'	S17°45.72	11.5'	54.1'
1		197°3.72	53.25	164°53.07	14.6'	17°57.22	11.4'	54.1'
2		212°3.94	54.22	179°26.65	14.5'	18°8.63	11.3'	54.1'
3		227°4.15	· · 55.19	194°0.19	14.5'	18°19.97	11.3'	54.1'
4		242°4.37	56.17	208°33.67	14.4'	18°31.24	11.2'	54.1'
5		257°4.58	57.14	223°7.09	14.4'	18°42.42	11.1'	54.1'
6		272°4.80	S00°58.12	237°40.47	14.3'	S18°53.53	11.0'	54.1'
7		287°5.01	00°59.09	252°13.78	14.3'	19°4.56	10.9'	54.1'
8		302°5.23	01°0.06	266°47.04	14.2'	19°15.51	10.9'	54.1'
9		317°5.44	· · 1.04	281°20.25	14.1'	19°26.38	10.8'	54.1'
10		332°5.66	2.01	295°53.40	14.1'	19°37.17	10.7'	54.1'
11		347°5.88	2.99	310°26.49	14.0'	19°47.87	10.6'	54.1'
12		2°6.09	S01°3.96	324°59.53	14.0'	S19°58.49	10.5'	54.1'
13		17°6.31	4.93	339°32.50	13.9'	20°9.03	10.5'	54.0'
14		32°6.52	5.91	354°5.42	13.9'	20°19.48	10.4'	54.0'
15		47°6.73	· · 6.88	8°38.28	13.8'	20°29.85	10.3'	54.0'
16		62°6.95	7.85	23°11.08	13.7'	20°40.13	10.2'	54.0'
17		77°7.16	8.83	37°43.82	13.7'	20°50.32	10.1'	54.0'
18		92°7.38	S01°9.80	52°16.50	13.6'	S21°0.42	10.0'	54.0'
19		107°7.59	10.78	66°49.12	13.6'	21°10.44	9.9'	54.0'
20		122°7.81	11.75	81°21.68	13.5'	21°20.37	9.8'	54.0'
21		137°8.02	· · 12.72	95°54.18	13.4'	21°30.20	9.7'	54.0'
22		152°8.24	13.70	110°26.62	13.4'	21°39.94	9.7'	54.0'
23		167°8.45	14.67	124°59.00	13.3'	21°49.60	9.6'	54.0'
		SD = 15.9'		$d = 1.0'$		SD = 14.8'		
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		182°8.66	S01°15.65	139°31.31	13.3'	S21°59.16	9.5'	54.0'
1		197°8.88	16.62	154°3.56	13.2'	22°8.62	9.4'	54.0'
2		212°9.09	17.59	168°35.75	13.1'	22°17.99	9.3'	54.0'
3		227°9.31	· · 18.57	183°7.88	13.1'	22°27.27	9.2'	54.0'
4		242°9.52	19.54	197°39.95	13.0'	22°36.45	9.1'	54.0'
5		257°9.73	20.51	212°11.95	12.9'	22°45.53	9.0'	54.0'
6		272°9.95	S01°21.49	226°43.88	12.9'	S22°54.51	8.9'	54.0'
7		287°10.16	22.46	241°15.76	12.8'	23°3.40	8.8'	54.0'
8		302°10.38	23.43	255°47.57	12.7'	23°12.19	8.7'	54.0'
9		317°10.59	· · 24.41	270°19.32	12.7'	23°20.87	8.6'	54.0'
10		332°10.80	25.38	284°51.00	12.6'	23°29.46	8.5'	54.0'
11		347°11.02	26.36	299°22.62	12.6'	23°37.94	8.4'	54.0'
12		2°11.23	S01°27.33	313°54.18	12.5'	S23°46.32	8.3'	54.0'
13		17°11.44	28.30	328°25.67	12.4'	23°54.60	8.2'	54.0'
14		32°11.65	29.28	342°57.10	12.4'	24°2.78	8.1'	54.0'
15		47°11.87	· · 30.25	357°28.46	12.3'	24°10.85	8.0'	54.0'
16		62°12.08	31.22	11°59.76	12.2'	24°18.81	7.9'	54.0'
17		77°12.29	32.20	26°30.99	12.2'	24°26.67	7.7'	54.0'
18		92°12.51	S01°33.17	41°2.17	12.1'	S24°34.41	7.6'	54.0'
19		107°12.72	34.14	55°33.27	12.0'	24°42.06	7.5'	54.0'
20		122°12.93	35.12	70°4.32	12.0'	24°49.59	7.4'	54.0'
21		137°13.14	· · 36.09	84°35.30	11.9'	24°57.01	7.3'	54.0'
22		152°13.36	37.06	99°6.21	11.9'	25°4.32	7.2'	54.0'
23		167°13.57	38.04	113°37.07	11.8'	25°11.52	7.1'	54.0'
		SD = 15.9'		$d = 1.0'$		SD = 14.7'		
Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		182°13.78	S01°39.01	128°7.86	11.7'	S25°18.61	7.0'	54.0'
1		197°13.99	39.98	142°38.58	11.7'	25°25.59	6.9'	54.0'
2		212°14.21	40.96	157°9.25	11.6'	25°32.45	6.7'	54.0'
3		227°14.42	· · 41.93	171°39.85	11.5'	25°39.20	6.6'	54.0'
4		242°14.63	42.90	186°10.39	11.5'	25°45.84	6.5'	54.0'
5		257°14.84	43.88	200°40.86	11.4'	25°52.35	6.4'	54.0'
6		272°15.05	S01°44.85	215°11.28	11.4'	S25°58.76	6.3'	54.0'
7		287°15.26	45.82	229°41.63	11.3'	26°5.04	6.2'	54.1'
8		302°15.48	46.80	244°11.93	11.2'	26°11.21	6.0'	54.1'
9		317°15.69	· · 47.77	258°42.16	11.2'	26°17.25	5.9'	54.1'
10		332°15.90	48.74	273°12.33	11.1'	26°23.18	5.8'	54.1'
11		347°16.11	49.72	287°42.44	11.1'	26°28.99	5.7'	54.1'
12		2°16.32	S01°50.69	302°12.49	11.0'	S26°34.68	5.6'	54.1'
13		17°16.53	51.66	316°42.49	10.9'	26°40.24	5.4'	54.1'
14		32°16.74	52.64	331°12.42	10.9'	26°45.69	5.3'	54.1'
15		47°16.95	· · 53.61	345°42.30	10.8'	26°51.01	5.2'	54.1'
16		62°17.16	54.58	0°12.12	10.8'	26°56.21	5.1'	54.1'
17		77°17.38	55.55	14°41.88	10.7'	27°1.28	4.9'	54.1'
18		92°17.59	S01°56.53	29°11.58	10.6'	S27°6.23	4.8'	54.1'
19		107°17.80	57.50	43°41.23	10.6'	27°11.05	4.7'	54.1'
20		122°18.01	58.47	58°10.83	10.5'	27°15.74	4.6'	54.1'
21		137°18.22	01°59.45	72°40.37	10.5'	27°20.31	4.4'	54.2'
22		152°18.43	02°0.42	87°9.85	10.4'	27°24.75	4.3'	54.2'
23		167°18.64	1.39	101°39.29	10.4'	27°29.07	4.2'	54.2'
		SD = 15.9'		$d = 1.0'$		SD = 14.7'		

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:23	04:50	05:57	17:43	18:50	20:15
N 70°	03:39	04:56	05:57	17:44	18:44	20:00
68°	03:52	05:00	05:56	17:45	18:40	19:48
66°	04:02	05:04	05:55	17:45	18:36	19:38
64°	04:10	05:07	05:55	17:46	18:33	19:30
62°	04:17	05:10	05:54	17:47	18:31	19:23
60°	04:23	05:13	05:54	17:47	18:28	19:18
N 58°	04:28	05:15	05:54	17:48	18:27	19:13
56°	04:33	05:16	05:53	17:48	18:25	19:09
54°	04:36	05:18	05:53	17:48	18:23	19:05
52°	04:40	05:19	05:53	17:49	18:22	19:02
50°	04:43	05:20	05:53	17:49	18:21	18:59
45°	04:49	05:23	05:52	17:50	18:19	18:53
N 40°	04:53	05:25	05:52	17:50	18:17	18:49
35°	04:56	05:26	05:51	17:51	18:16	18:45
30°	04:59	05:27	05:51	17:51	18:15	18:43
20°	05:02	05:28	05:50	17:52	18:14	18:40
N 10°	05:04	05:28	05:49	17:53	18:14	18:39
0°	05:03	05:27	05:48	17:54	18:15	18:39
S 10°	05:02	05:26	05:47	17:56	18:17	18:41
20°	04:58	05:24	05:46	17:57	18:19	18:45
30°	04:53	05:20	05:44	17:59	18:23	18:50
35°	04:49	05:18	05:43	18:00	18:25	18:55
40°	04:44	05:15	05:42	18:01	18:28	19:00
45°	04:37	05:12	05:41	18:02	18:31	19:06
S 50°	04:29	05:07	05:40	18:04	18:36	19:15
52°	04:25	05:05	05:39	18:05	18:38	19:19
54°	04:21	05:03	05:38	18:05	18:41	19:23
56°	04:15	05:00	05:37	18:06	18:44	19:29
58°	04:10	04:57	05:36	18:07	18:47	19:35
S 60°	04:03	04:54	05:35	18:09	18:51	19:42

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	12:43	■	■	15:49	■	■
66°	12:01	■	■	16:33	■	■
64°	11:32	13:33	■	17:02	16:37	■
62°	11:10	12:53	14:48	17:25	17:17	17:04
60°	10:53	12:26	14:00	17:43	17:45	17:52
N 58°	10:39	12:05	13:30	17:58	18:07	18:22
56°	10:26	11:48	13:07	18:11	18:24	18:46
54°	10:15	11:33	12:48	18:23	18:40	19:04
52°	10:06	11:20	12:33	18:33	18:53	19:20
50°	09:58	11:09	12:19	18:42	19:04	19:34
45°	09:40	10:46	11:52	19:01	19:28	20:03
N 40°	09:25	10:28	11:30	19:17	19:48	20:25
35°	09:13	10:12	11:12	19:30	20:04	20:43
30°	09:02	09:59	10:56	19:42	20:18	20:59
20°	08:44	09:37	10:30	20:01	20:42	21:26
N 10°	08:28	09:17	10:08	20:19	21:03	21:50
0°	08:14	08:59	09:47	20:35	21:22	22:11
S 10°	07:59	08:41	09:26	20:52	21:41	22:33
20°	07:44	08:22	09:04	21:09	22:02	22:56
30°	07:26	08:00	08:39	21:30	22:27	23:24
35°	07:16	07:47	08:24	21:42	22:41	23:40
40°	07:04	07:32	08:06	21:55	22:58	23:59
45°	06:51	07:15	07:46	22:12	23:18	· · ·
S 50°	06:34	06:54	07:20	22:32	23:43	· · ·
52°	06:26	06:43	07:07	22:42	23:55	· · ·
54°	06:18	06:32	06:53	22:53	· · ·	00:10
56°	06:08	06:19	06:36	23:05	· · ·	00:26
58°	05:57	06:04	06:16	23:20	· · ·	00:46
S 60°	05:45	05:46	05:50	23:37	· · ·	01:10

Day	Sun			Moon		
	Eqn. of Time		Mer. Pass hh:mm	Mer.Pass.		Age 4-6 9-23%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
25	08:14	08:24	11:52	14:24	02:02	
26	08:35	08:45	11:51	15:10	02:47	
27	08:55	09:05	11:51	15:59	03:34	

September 28, 29, 30 UT (Sun., Mon., Tue.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	7°1.51	204°40.42	N08°47.65	155°27.44	S12°50.22	253°9.82	N21°38.55	7°52.37	S03°6.32						
1	22°3.97	219°39.98	46.55	170°28.28	50.82	268°11.94	38.50	22°55.01	6.39						
2	37°6.44	234°39.55	45.45	185°29.12	51.42	283°14.07	38.46	37°57.65	6.47						
3	52°8.90	249°39.11	· · 44.35	200°29.95	· · 52.01	298°16.19	· · 38.41	53°0.29	· · 6.54						
4	67°11.37	264°38.67	43.24	215°30.79	52.61	313°18.31	38.36	68°2.93	6.62						
5	82°13.83	279°38.23	42.14	230°31.63	53.21	328°20.43	38.31	83°5.57	6.70						
6	97°16.29	294°37.80	N08°41.04	245°32.47	S12°53.81	343°22.55	N21°38.27	98°8.21	S03°6.77						
7	112°18.76	309°37.36	39.93	260°33.30	54.41	358°24.68	38.22	113°10.85	6.85						
8	127°21.22	324°36.93	38.83	275°34.14	55.01	13°26.80	38.17	128°13.49	6.93						
9	142°23.69	339°36.49	· · 37.72	290°34.98	· · 55.61	28°28.92	· · 38.13	143°16.13	· · 7.00						
10	157°26.15	354°36.05	36.62	305°35.81	56.20	43°31.05	38.08	158°18.77	7.08						
11	172°28.61	9°35.62	35.51	320°36.65	56.80	58°33.17	38.03	173°21.41	7.15						
12	187°31.08	24°35.18	N08°34.41	335°37.48	S12°57.40	73°35.29	N21°37.98	188°24.05	S03°7.23						
13	202°33.54	39°34.75	33.30	350°38.32	58.00	88°37.42	37.94	203°26.69	7.31						
14	217°36.01	54°34.31	32.20	5°39.15	58.59	103°39.54	37.89	218°29.33	7.38						
15	232°38.47	69°33.88	· · 31.09	20°39.99	· · 59.19	118°41.67	· · 37.84	233°31.97	· · 7.46						
16	247°40.94	84°33.44	29.98	35°40.82	12°59.79	133°43.79	37.80	248°34.60	7.53						
17	262°43.40	99°33.01	28.87	50°41.66	13°0.39	148°45.92	37.75	263°37.24	7.61						
18	277°45.86	114°32.57	N08°27.76	65°42.49	S13°0.98	163°48.04	N21°37.70	278°39.88	S03°7.69						
19	292°48.33	129°32.14	26.65	80°43.33	1.58	178°50.17	37.66	293°42.52	7.76						
20	307°50.79	144°31.71	25.55	95°44.16	2.18	193°52.29	37.61	308°45.16	7.84						
21	322°53.26	159°31.27	· · 24.44	110°44.99	· · 2.77	208°54.42	· · 37.56	323°47.80	· · 7.91						
22	337°55.72	174°30.84	23.33	125°45.83	3.37	223°56.55	37.52	338°50.44	7.99						
23	352°58.18	189°30.41	22.21	140°46.66	3.97	238°58.67	37.47	353°53.08	8.06						
Mer.pass. 23:28			ν-0.4' d-1.1' m-3.93			ν0.8' d0.6' m1.58			ν2.1' d-0.0' m-2.11			ν2.6' d0.1' m0.60			
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°0.65	204°29.98	N08°21.10	155°47.49	S13°4.56	254°0.80	N21°37.42	8°55.72	S03°8.14						
1	23°3.11	219°29.54	19.99	170°48.33	5.16	269°2.93	37.38	23°58.36	8.22						
2	38°5.58	234°29.11	18.88	185°49.16	5.75	284°5.05	37.33	39°1.00	8.29						
3	53°8.04	249°28.68	· · 17.77	200°49.99	· · 6.35	299°7.18	· · 37.28	54°3.64	· · 8.37						
4	68°10.51	264°28.25	16.65	215°50.82	6.95	314°9.31	37.24	69°6.28	8.44						
5	83°12.97	279°27.82	15.54	230°51.65	7.54	329°11.44	37.19	84°8.92	8.52						
6	98°15.43	294°27.38	N08°14.43	245°52.48	S13°8.14	344°13.57	N21°37.14	99°11.56	S03°8.59						
7	113°17.90	309°26.95	13.31	260°53.32	8.73	359°15.69	37.10	114°14.20	8.67						
8	128°20.36	324°26.52	12.20	275°54.15	9.33	14°17.82	37.05	129°16.84	8.75						
9	143°22.83	339°26.09	· · 11.08	290°54.98	· · 9.92	29°19.95	· · 37.00	144°19.48	· · 8.82						
10	158°25.29	354°25.66	9.97	305°55.81	10.52	44°22.08	36.96	159°22.11	8.90						
11	173°27.75	9°25.23	8.85	320°56.64	11.11	59°24.21	36.91	174°24.75	8.97						
12	188°30.22	24°24.80	N08°7.74	335°57.47	S13°11.71	74°26.34	N21°36.87	189°27.39	S03°9.05						
13	203°32.68	39°24.37	6.62	350°58.30	12.30	89°28.47	36.82	204°30.03	9.12						
14	218°35.15	54°23.94	5.50	5°59.13	12.90	104°30.60	36.77	219°32.67	9.20						
15	233°37.61	69°23.51	· · 4.38	20°59.96	· · 13.49	119°32.73	· · 36.73	234°35.31	· · 9.27						
16	248°40.07	84°23.08	3.27	36°0.79	14.08	134°34.86	36.68	249°37.95	9.35						
17	263°42.54	99°22.65	2.15	51°1.61	14.68	149°37.00	36.64	264°40.59	9.42						
18	278°45.00	114°22.22	N08°1.03	66°2.44	S13°15.27	164°39.13	N21°36.59	279°43.23	S03°9.50						
19	293°47.47	129°21.80	07°59.91	81°3.27	15.86	179°41.26	36.54	294°45.87	9.57						
20	308°49.93	144°21.37	58.79	96°4.10	16.46	194°43.39	36.50	309°48.50	9.65						
21	323°52.40	159°20.94	· · 57.67	111°4.93	· · 17.05	209°45.52	· · 36.45	324°51.14	· · 9.73						
22	338°54.86	174°20.51	56.55	126°5.76	17.64	224°47.66	36.41	339°53.78	9.80						
23	353°57.32	189°20.08	55.43	141°6.58	18.24	239°49.79	36.36	354°56.42	9.88						
Mer.pass. 23:24			ν-0.4' d-1.1' m-3.93			ν0.8' d0.6' m1.58			ν2.1' d-0.0' m-2.11			ν2.6' d0.1' m0.61			
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°59.79	204°19.66	N07°54.31	156°7.41	S13°18.83	254°51.92	N21°36.31	9°59.06	S03°9.95						
1	24°2.25	219°19.23	53.19	171°8.24	19.42	269°54.06	36.27	25°1.70	10.03						
2	39°4.72	234°18.80	52.06	186°9.06	20.02	284°56.19	36.22	40°4.34	10.10						
3	54°7.18	249°18.37	· · 50.94	201°9.89	· · 20.61	299°58.32	· · 36.18	55°6.98	· · 10.18						
4	69°9.64	264°17.95	49.82	216°10.72	21.20	315°0.46	36.13	70°9.61	10.25						
5	84°12.11	279°17.52	48.70	231°11.54	21.79	330°2.59	36.08	85°12.25	10.33						
6	99°14.57	294°17.09	N07°47.57	246°12.37	S13°22.38	345°4.73	N21°36.04	100°14.89	S03°10.40						
7	114°17.04	309°16.67	46.45	261°13.19	22.98	0°6.86	35.99	115°17.53	10.48						
8	129°19.50	324°16.24	45.32	276°14.02	23.57	15°9.00	35.95	130°20.17	10.55						
9	144°21.97	339°15.82	· · 44.20	291°14.84	· · 24.16	30°11.13	· · 35.90	145°22.81	· · 10.63						
10	159°24.43	354°15.39	43.07	306°15.67	24.75	45°13.27	35.86	160°25.45	10.70						
11	174°26.89	9°14.97	41.95	321°16.49	25.34	60°15.41	35.81	175°28.08	10.78						
12	189°29.36	24°14.54	N07°40.82	336°17.32	S13°25.93	75°17.54	N21°35.76	190°30.72	S03°10.85						
13	204°31.82	39°14.12	39.69	351°18.14	26.52	90°19.68	35.72	205°33.36	10.93						
14	219°34.29	54°13.69	38.57	6°18.97	27.12	105°21.81	35.67	220°36.00	11.00						
15	234°36.75	69°13.27	· · 37.44	21°19.79	· · 27.71	120°23.95	· · 35.63	235°38.64	· · 11.08						
16	249°39.21	84°12.84	36.31	36°20.61	28.30	135°26.09	35.58	250°41.28	11.15						
17	264°41.68	99°12.42	35.18	51°21.44	28.89	150°28.23	35.54	265°43.91	11.23						
18	279°44.14	114°12.00	N07°34.06	66°22.26	S13°29.48	165°30.36	N21°35.49	280°46.55	S03°11.30						
19	294°46.61	129°11.57	32.93	81°23.08	30.07	180°32.50	35.45	295°49.19	11.38						
20	309°49.07	144°11.15	31.80	96°23.90	30.66	195°34.64	35.40	310°51.83	11.45						
21	324°51.54	159°10.72	· · 30.67	111°24.73	· · 31.25	210°36.78	· · 35.36	325°54.47	· · 11.52						
22	339°54.00	174°10.30	29.54	126°25.55	31.84	225°38.92	35.31	340°57.10	11.60						
23	354°56.46	189°9.88	28.41	141°26.37	32.43	240°41.06	35.27	355°59.74	11.67						
Mer.pass. 23:20			ν-0.4' d-1.1' m-3.93			ν0.8' d0.6' m1.57			ν2.1' d-0.0' m-2.12			ν2.6' d0.1' m0.61			

Stars		
	SHA	Dec
Alpheratz	357°33.82	29°14.11
Ankaa	353°6.12	-42°9.84
Schedar	349°29.83	56°40.80
Diphda	348°46.37	-17°50.56
Achernar	335°19.16	-57°6.17
Hamal	327°50.23	23°35.15
Polaris	313°22.62	89°22.16
Acamar	315°10.98	-40°11.81
Menkar	314°5.29	4°11.60
Mirfak	308°27.07	49°57.09
Aldebaran	290°38.79	16°33.74
Rigel	281°3.20	-8°10.10
Capella	280°20.89	46°1.31
Bellatrix	278°22.16	6°22.51
Elnath	278°1.03	28°37.73
Alnilam	275°37.06	-1°10.95
Betelgeuse	270°51.41	7°24.83
Canopus	263°52.13	-52°42.15
Sirius	258°25.74	-16°44.83
Adhara	255°5.46	-29°0.10
Procyon	244°50.31	5°9.66
Pollux	243°16.70	27°57.82
Avior	234°14.83	-59°35.16
Suhail	222°46.18	-43°31.90
Miaplacidus	221°38.82	-69°49.05
Alphard	217°47.41	-8°46.04
Regulus	207°34.08	11°50.57
Dubhe	193°40.87	61°36.68
Denebola	182°24.67	14°25.79
Gienah	175°43.32	-17°40.98
Acrux	173°0.20	-63°14.46
Gacrux	171°51.61	-57°15.39
Alioth	166°12.97	55°49.28
Spica	158°22.00	-11°17.65
Alkaid	152°51.97	49°11.21
Hadar	148°35.79	-60°29.89
Menkent	147°57.29	-36°29.79
Arcturus	145°47.66	19°3.03
Rigel Kent.	139°40.08	-60°56.60
Kochab	137°20.68	74°3.10
Zuben'ubi	136°55.64	-16°8.88
Alphecca	126°3.48	26°37.85
Antares	112°15.29	-26°29.37
Atria	107°9.18	-69°4.63
Sabik	102°2.22	-15°45.38
Shaula	96°9.66	-37°7.43
Rasalhague	95°58.08	12°32.63
Eltanin	90°41.98	51°29.38
Kaus Aust.	83°31.74	-34°22.41
Vega	80°32.81	38°48.69
Nunki	75°46.99	-26°15.91
Altair	61°59.28	8°56.33
Peacock	53°4.50	-56°39.27
Deneb	49°25.17	45°22.58
Enif	33°37.98	9°59.75
Al Na'ir	27°31.78	-46°50.21
Fomalhaut	15°13.52	-29°29.08
Scheat	13°44.31	28°13.53
Markab	13°29.01	15°20.80
Sep 28 Sun	SHA	Mer.pass
Venus	197°38.91	10:22
Mars	148°25.93	13:37
Jupiter	246°8.32	07:06
Saturn	0°50.86	23:24
Sep 29 Mon	SHA	Mer.pass
Venus	196°29.33	10:22
Mars	147°46.84	13:36
Jupiter	246°0.15	07:03
Saturn	0°55.07	23:20
Sep 30 Tue	SHA	Mer.pass
Venus	195°19.87	10:23
Mars	147°7.62	13:35
Jupiter	245°52.13	07:00
Saturn	0°59.27	23:16
Horizontal parallax		
Venus:		0.1
Mars:		0.1

h		Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°18.85	S02°2.36	116°8.67	10.3'	S27°33.25	4.1'	54.2'	
1	197°19.06	3.34	130°37.99	10.3'	27°37.31	3.9'	54.2'	
2	212°19.27	4.31	145°7.27	10.2'	27°41.23	3.8'	54.2'	
3	227°19.48	· · 5.28	159°36.50	10.2'	27°45.02	3.7'	54.2'	
4	242°19.69	6.25	174°5.67	10.1'	27°48.69	3.5'	54.2'	
5	257°19.90	7.23	188°34.80	10.1'	27°52.22	3.4'	54.2'	
6	272°20.11	S02°8.20	203°3.88	10.0'	S27°55.61	3.3'	54.3'	
7	287°20.32	9.17	217°32.91	10.0'	27°58.88	3.1'	54.3'	
8	302°20.53	10.14	232°1.90	9.9'	28°2.01	3.0'	54.3'	
9	317°20.74	· · 11.12	246°30.84	9.9'	28°5.01	2.9'	54.3'	
10	332°20.94	12.09	260°59.74	9.9'	28°7.87	2.7'	54.3'	
11	347°21.15	13.06	275°28.59	9.8'	28°10.60	2.6'	54.3'	
12	2°21.36	S02°14.03	289°57.40	9.8'	S28°13.19	2.5'	54.3'	
13	17°21.57	15.01	304°26.17	9.7'	28°15.64	2.3'	54.3'	
14	32°21.78	15.98	318°54.90	9.7'	28°17.96	2.2'	54.4'	
15	47°21.99	· · 16.95	333°23.58	9.6'	28°20.14	2.0'	54.4'	
16	62°22.20	17.92	347°52.23	9.6'	28°22.18	1.9'	54.4'	
17	77°22.41	18.90	2°20.84	9.6'	28°24.09	1.8'	54.4'	
18	92°22.61	S02°19.87	16°49.41	9.5'	S28°25.85	1.6'	54.4'	
19	107°22.82	20.84	31°17.95	9.5'	28°27.48	1.5'	54.4'	
20	122°23.03	21.81	45°46.45	9.5'	28°28.96	1.3'	54.4'	
21	137°23.24	· · 22.78	60°14.92	9.4'	28°30.31	1.2'	54.5'	
22	152°23.45	23.75	74°43.36	9.4'	28°31.52	1.1'	54.5'	
23	167°23.65	24.73	89°11.76	9.4'	28°32.58	0.9'	54.5'	
SD = 16.0' $d = 1.0'$			SD = 14.8'					

Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°23.86	S02°25.70	103°40.13	9.3'	S28°33.51	0.8'	54.5'	
1	197°24.07	26.67	118°8.47	9.3'	28°34.29	0.6'	54.5'	
2	212°24.28	27.64	132°36.79	9.3'	28°34.93	0.5'	54.6'	
3	227°24.49	· · 28.61	147°5.08	9.3'	28°35.43	0.4'	54.6'	
4	242°24.69	29.59	161°33.34	9.2'	28°35.78	0.2'	54.6'	
5	257°24.90	30.56	176°1.57	9.2'	28°36.00	0.1'	54.6'	
6	272°25.11	S02°31.53	190°29.78	9.2'	S28°36.07	-0.1'	54.6'	
7	287°25.31	32.50	204°57.97	9.2'	28°35.99	-0.2'	54.6'	
8	302°25.52	33.47	219°26.14	9.1'	28°35.78	-0.4'	54.7'	
9	317°25.73	· · 34.44	233°54.29	9.1'	28°35.41	-0.5'	54.7'	
10	332°25.93	35.41	248°22.41	9.1'	28°34.91	-0.7'	54.7'	
11	347°26.14	36.39	262°50.52	9.1'	28°34.26	-0.8'	54.7'	
12	2°26.35	S02°37.36	277°18.61	9.1'	S28°33.46	-0.9'	54.7'	
13	17°26.55	38.33	291°46.69	9.1'	28°32.52	-1.1'	54.8'	
14	32°26.76	39.30	306°14.75	9.0'	28°31.43	-1.2'	54.8'	
15	47°26.97	· · 40.27	320°42.80	9.0'	28°30.20	-1.4'	54.8'	
16	62°27.17	41.24	335°10.83	9.0'	28°28.83	-1.5'	54.8'	
17	77°27.38	42.21	349°38.86	9.0'	28°27.30	-1.7'	54.9'	
18	92°27.59	S02°43.18	4°6.87	9.0'	S28°25.63	-1.8'	54.9'	
19	107°27.79	44.15	18°34.87	9.0'	28°23.82	-2.0'	54.9'	
20	122°28.00	45.12	33°2.87	9.0'	28°21.86	-2.1'	54.9'	
21	137°28.20	· · 46.10	47°30.86	9.0'	28°19.75	-2.3'	54.9'	
22	152°28.41	47.07	61°58.85	9.0'	28°17.50	-2.4'	55.0'	
23	167°28.61	48.04	76°26.83	9.0'	28°15.10	-2.5'	55.0'	
SD = 16.0' $d = 1.0'$			SD = 14.9'					

Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0	182°28.82	S02°49.01	90°54.80	9.0'	S28°12.55	-2.7'	55.0'	
1	197°29.02	49.98	105°22.78	9.0'	28°9.86	-2.8'	55.0'	
2	212°29.23	50.95	119°50.75	9.0'	28°7.02	-3.0'	55.1'	
3	227°29.43	· · 51.92	134°18.73	9.0'	28°4.04	-3.1'	55.1'	
4	242°29.64	52.89	148°46.70	9.0'	28°0.91	-3.3'	55.1'	
5	257°29.84	53.86	163°14.68	9.0'	27°57.63	-3.4'	55.1'	
6	272°30.05	S02°54.83	177°42.66	9.0'	S27°54.20	-3.6'	55.2'	
7	287°30.25	55.80	192°10.65	9.0'	27°50.63	-3.7'	55.2'	
8	302°30.46	56.77	206°38.64	9.0'	27°46.92	-3.9'	55.2'	
9	317°30.66	· · 57.74	221°6.64	9.0'	27°43.05	-4.0'	55.2'	
10	332°30.87	58.71	235°34.65	9.0'	27°39.05	-4.2'	55.3'	
11	347°31.07	02°59.68	250°2.66	9.0'	27°34.89	-4.3'	55.3'	
12	2°31.27	S03°0.65	264°30.69	9.0'	S27°30.59	-4.4'	55.3'	
13	17°31.48	1.62	278°58.73	9.0'	27°26.14	-4.6'	55.3'	
14	32°31.68	2.59	293°26.78	9.1'	27°21.55	-4.7'	55.4'	
15	47°31.88	· · 3.56	307°54.84	9.1'	27°16.81	-4.9'	55.4'	
16	62°32.09	4.53	322°22.91	9.1'	27°11.93	-5.0'	55.4'	
17	77°32.29	5.50	336°51.01	9.1'	27°6.90	-5.2'	55.5'	
18	92°32.49	S03°6.47	351°19.11	9.1'	S27°1.73	-5.3'	55.5'	
19	107°32.70	7.44	5°47.24	9.1'	26°56.41	-5.5'	55.5'	
20	122°32.90	8.41	20°15.38	9.2'	26°50.95	-5.6'	55.5'	
21	137°33.10	· · 9.38	34°43.54	9.2'	26°45.35	-5.7'	55.6'	
22	152°33.31	10.35	49°11.72	9.2'	26°39.60	-5.9'	55.6'	
23	167°33.51	11.32	63°39.92	9.2'	26°33.71	-6.0'	55.6'	
SD = 16.0' $d = 1.0'$			SD = 15.0'					

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:40	05:03	06:11	17:27	18:34	19:57
N 70°	03:53	05:08	06:08	17:30	18:30	19:44
68°	04:04	05:11	06:06	17:32	18:27	19:34
66°	04:13	05:14	06:05	17:34	18:25	19:25
64°	04:20	05:16	06:03	17:35	18:23	19:19
62°	04:26	05:18	06:02	17:37	18:21	19:13
60°	04:31	05:20	06:01	17:38	18:19	19:08
N 58°	04:35	05:21	06:00	17:39	18:18	19:04
56°	04:39	05:22	05:59	17:40	18:17	19:00
54°	04:42	05:23	05:59	17:41	18:16	18:57
52°	04:45	05:24	05:58	17:42	18:15	18:54
50°	04:47	05:25	05:57	17:42	18:15	18:52
45°	04:52	05:26	05:56	17:44	18:13	18:47
N 40°	04:56	05:27	05:54	17:45	18:12	18:44
35°	04:59	05:28	05:53	17:47	18:12	18:41
30°	05:01	05:28	05:52	17:48	18:12	18:39
20°	05:03	05:28	05:50	17:50	18:12	18:37
N 10°	05:03	05:28	05:49	17:52	18:13	18:37
0°	05:02	05:26	05:47	17:53	18:14	18:38
S 10°	05:00	05:24	05:45	17:55	18:16	18:41
20°	04:55	05:21	05:43	17:58	18:20	18:45
30°	04:49	05:17	05:41	18:00	18:24	18:52
35°	04:44	05:14	05:39	18:02	18:27	18:57
40°	04:39	05:10	05:38	18:04	18:31	19:03
45°	04:31	05:06	05:36	18:06	18:35	19:10
S 50°	04:22	05:01	05:33	18:08	18:41	19:20
52°	04:18	04:58	05:32	18:10	18:44	19:24
54°	04:13	04:55	05:31	18:11	18:47	19:29
56°	04:07	04:52	05:29	18:12	18:50	19:35
58°	04:00	04:48	05:28	18:14	18:54	19:42
S 60°	03:53	04:44	05:26	18:16	18:58	19:50

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	██	██	██	██
62°	██	██	17:33	██	██	19:46
60°	15:26	16:22	16:44	18:12	19:06	20:34
N 58°	14:46	15:41	16:14	18:52	19:46	21:05
56°	14:18	15:13	15:50	19:20	20:14	21:28
54°	13:57	14:51	15:31	19:42	20:36	21:47
52°	13:39	14:33	15:15	20:00	20:54	22:02
50°	13:23	14:18	15:01	20:15	21:09	22:16
45°	12:53	13:47	14:33	20:46	21:40	22:44
N 40°	12:29	13:23	14:10	21:10	22:04	23:06
35°	12:09	13:03	13:52	21:30	22:24	23:24
30°	11:53	12:46	13:36	21:47	22:41	23:39
20°	11:24	12:18	13:08	22:16	23:09	· · ·
N 10°	11:00	11:53	12:45	22:40	23:33	· · ·
0°	10:38	11:30	12:23	23:03	23:56	· · ·
S 10°	10:15	11:07	12:01	23:26	· · ·	00:18
20°	09:51	10:43	11:38	23:50	· · ·	00:42
30°	09:23	10:14	11:11	· · ·	00:19	01:10
35°	09:07	09:57	10:54	· · ·	00:36	01:27
40°	08:48	09:38	10:36	· · ·	00:55	01:46
45°	08:25	09:14	10:13	00:21	01:19	02:09
S 50°	07:55	08:43	09:43	00:51	01:50	02:39
52°	07:40	08:27	09:29	01:05	02:06	02:54
54°	07:23	08:09	09:12	01:22	02:24	03:11
56°	07:03	07:47	08:52	01:42	02:45	03:31
58°	06:38	07:19	08:27	02:07	03:13	03:57
S 60°	06:03	06:39	07:52	02:41	03:54	04:32

Day	Sun			Moon		
	Eqn. of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	7-9 31-50%
28	09:15	09:25	11:51	16:50	04:24	
29	09:35	09:45	11:50	17:43	05:16	
30	09:55	10:05	11:50	18:36	06:09	

	Sun			Moon				
Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	182°33.71	S03°12.29		78°8.14	9.2'	S26°27.67	-6.2'	55.7'
1	197°33.91	13.26		92°36.38	9.3'	26°21.50	-6.3'	55.7'
2	212°34.12	14.22		107°4.65	9.3'	26°15.17	-6.5'	55.7'
3	227°34.32	· · 15.19		121°32.94	9.3'	26°8.71	-6.6'	55.8'
4	242°34.52	16.16		136°1.25	9.3'	26°2.11	-6.7'	55.8'
5	257°34.72	17.13		150°29.59	9.4'	25°55.36	-6.9'	55.8'
6	272°34.92	S03°18.10		164°57.95	9.4'	S25°48.48	-7.0'	55.9'
7	287°35.13	19.07		179°26.34	9.4'	25°41.45	-7.2'	55.9'
8	302°35.33	20.04		193°54.76	9.4'	25°34.28	-7.3'	55.9'
9	317°35.53	· · 21.01		208°23.21	9.5'	25°26.97	-7.4'	56.0'
10	332°35.73	21.97		222°51.68	9.5'	25°19.53	-7.6'	56.0'
11	347°35.93	22.94		237°20.19	9.5'	25°11.94	-7.7'	56.0'
12	2°36.13	S03°23.91		251°48.72	9.6'	S25°4.22	-7.9'	56.0'
13	17°36.33	24.88		266°17.29	9.6'	24°56.35	-8.0'	56.1'
14	32°36.54	25.85		280°45.88	9.6'	24°48.35	-8.1'	56.1'
15	47°36.74	· · 26.82		295°14.51	9.7'	24°40.22	-8.3'	56.1'
16	62°36.94	27.78		309°43.16	9.7'	24°31.95	-8.4'	56.2'
17	77°37.14	28.75		324°11.85	9.7'	24°23.54	-8.5'	56.2'
18	92°37.34	S03°29.72		338°40.58	9.8'	S24°14.99	-8.7'	56.3'
19	107°37.54	30.69		353°9.33	9.8'	24°6.31	-8.8'	56.3'
20	122°37.74	31.66		7°38.12	9.8'	23°57.50	-8.9'	56.3'
21	137°37.94	· · 32.62		22°6.95	9.9'	23°48.55	-9.1'	56.4'
22	152°38.14	33.59		36°35.80	9.9'	23°39.47	-9.2'	56.4'
23	167°38.34	34.56		51°4.70	9.9'	23°30.26	-9.3'	56.4'
SD = 16.0'			d = 1.0'	SD = 15.2'				
Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	182°38.54	S03°35.53		65°33.62	10.0'	S23°20.92	-9.5'	56.5'
1	197°38.74	36.50		80°2.59	10.0'	23°11.44	-9.6'	56.5'
2	212°38.94	37.46		94°31.58	10.0'	23°1.84	-9.7'	56.5'
3	227°39.14	· · 38.43		109°0.62	10.1'	22°52.10	-9.9'	56.6'
4	242°39.33	39.40		123°29.69	10.1'	22°42.23	-10.0'	56.6'
5	257°39.53	40.36		137°58.79	10.1'	22°32.24	-10.1'	56.6'
6	272°39.73	S03°41.33		152°27.93	10.2'	S22°22.12	-10.2'	56.7'
7	287°39.93	42.30		166°57.11	10.2'	22°11.87	-10.4'	56.7'
8	302°40.13	43.27		181°26.32	10.3'	22°1.50	-10.5'	56.7'
9	317°40.33	· · 44.23		195°55.57	10.3'	21°50.99	-10.6'	56.8'
10	332°40.53	45.20		210°24.86	10.3'	21°40.37	-10.8'	56.8'
11	347°40.72	46.17		224°54.19	10.4'	21°29.62	-10.9'	56.9'
12	2°40.92	S03°47.13		239°23.55	10.4'	S21°18.74	-11.0'	56.9'
13	17°41.12	48.10		253°52.94	10.4'	21°7.75	-11.1'	56.9'
14	32°41.32	49.07		268°22.37	10.5'	20°56.63	-11.2'	57.0'
15	47°41.52	· · 50.03		282°51.84	10.5'	20°45.39	-11.4'	57.0'
16	62°41.71	51.00		297°21.35	10.5'	20°34.03	-11.5'	57.0'
17	77°41.91	51.96		311°50.89	10.6'	20°22.55	-11.6'	57.1'
18	92°42.11	S03°52.93		326°20.47	10.6'	S20°10.95	-11.7'	57.1'
19	107°42.31	53.90		340°50.08	10.6'	19°59.23	-11.8'	57.2'
20	122°42.50	54.86		355°19.73	10.7'	19°47.40	-12.0'	57.2'
21	137°42.70	· · 55.83		9°49.42	10.7'	19°35.45	-12.1'	57.2'
22	152°42.90	56.79		24°19.14	10.8'	19°23.38	-12.2'	57.3'
23	167°43.09	57.76		38°48.90	10.8'	19°11.20	-12.3'	57.3'
SD = 16.0'			d = 1.0'	SD = 15.4'				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	182°43.29	S03°58.73		53°18.69	10.8'	S18°58.91	-12.4'	57.4'
1	197°43.49	03°59.69		67°48.51	10.9'	18°46.50	-12.5'	57.4'
2	212°43.68	04°0.66		82°18.37	10.9'	18°33.98	-12.6'	57.4'
3	227°43.88	· · 1.62		96°48.26	10.9'	18°21.35	-12.7'	57.5'
4	242°44.07	2.59		111°18.19	11.0'	18°8.61	-12.8'	57.5'
5	257°44.27	3.55		125°48.15	11.0'	17°55.76	-13.0'	57.5'
6	272°44.46	S04°4.52		140°18.14	11.0'	S17°42.80	-13.1'	57.6'
7	287°44.66	5.48		154°48.16	11.1'	17°29.74	-13.2'	57.6'
8	302°44.86	6.45		169°18.22	11.1'	17°16.57	-13.3'	57.7'
9	317°45.05	· · 7.41		183°48.31	11.1'	17°3.29	-13.4'	57.7'
10	332°45.25	8.38		198°18.43	11.1'	16°49.91	-13.5'	57.7'
11	347°45.44	9.34		212°48.57	11.2'	16°36.43	-13.6'	57.8'
12	2°45.64	S04°10.31		227°18.75	11.2'	S16°22.84	-13.7'	57.8'
13	17°45.83	11.27		241°48.96	11.2'	16°9.16	-13.8'	57.9'
14	32°46.03	12.24		256°19.20	11.3'	15°55.37	-13.9'	57.9'
15	47°46.22	· · 13.20		270°49.46	11.3'	15°41.48	-14.0'	57.9'
16	62°46.41	14.17		285°19.75	11.3'	15°27.50	-14.1'	58.0'
17	77°46.61	15.13		299°50.07	11.3'	15°13.42	-14.2'	58.0'
18	92°46.80	S04°16.09		314°20.42	11.4'	S14°59.24	-14.3'	58.1'
19	107°47.00	17.06		328°50.79	11.4'	14°44.97	-14.4'	58.1'
20	122°47.19	18.02		343°21.18	11.4'	14°30.60	-14.5'	58.1'
21	137°47.38	· · 18.99		357°51.61	11.4'	14°16.14	-14.6'	58.2'
22	152°47.58	19.95		12°22.05	11.5'	14°1.59	-14.6'	58.2'
23	167°47.77	20.91		26°52.52	11.5'	13°46.95	-14.7'	58.2'
SD = 16.0'			d = 1.0'	SD = 15.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:55	05:17	06:24	17:12	18:19	19:40
N 70°	04:07	05:20	06:20	17:16	18:17	19:29
68°	04:16	05:22	06:17	17:20	18:15	19:20
66°	04:23	05:23	06:14	17:22	18:13	19:13
64°	04:29	05:25	06:12	17:25	18:12	19:08
62°	04:34	05:26	06:10	17:27	18:11	19:03
60°	04:38	05:27	06:08	17:29	18:10	18:59
N 58°	04:42	05:28	06:07	17:31	18:10	18:55
56°	04:45	05:28	06:05	17:32	18:09	18:52
54°	04:48	05:29	06:04	17:33	18:09	18:50
52°	04:50	05:29	06:03	17:35	18:08	18:47
50°	04:52	05:30	06:02	17:36	18:08	18:45
45°	04:56	05:30	05:59	17:38	18:08	18:42
N 40°	04:59	05:30	05:57	17:41	18:07	18:39
35°	05:01	05:30	05:56	17:42	18:08	18:37
30°	05:02	05:30	05:54	17:44	18:08	18:36
20°	05:04	05:29	05:51	17:47	18:09	18:35
N 10°	05:03	05:28	05:49	17:50	18:11	18:35
0°	05:01	05:25	05:46	17:53	18:13	18:37
S 10°	04:58	05:22	05:43	17:55	18:16	18:41
20°	04:53	05:18	05:40	17:58	18:20	18:46
30°	04:45	05:13	05:37	18:02	18:26	18:54
35°	04:40	05:10	05:35	18:04	18:30	19:00
40°	04:33	05:05	05:33	18:07	18:34	19:06
45°	04:25	05:00	05:30	18:09	18:39	19:14
S 50°	04:15	04:54	05:27	18:13	18:46	19:25
52°	04:10	04:51	05:25	18:15	18:49	19:30
54°	04:04	04:48	05:23	18:16	18:52	19:36
56°	03:58	04:44	05:21	18:18	18:56	19:42
58°	03:51	04:40	05:19	18:20	19:01	19:50
S 60°	03:42	04:35	05:17	18:23	19:06	19:59

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	■	■	18:45	■	■	■
N 70°	■	19:58	18:14	■	21:01	· ·
68°	■	18:38	17:51	■	22:20	· ·
66°	■	18:00	17:33	■	22:57	· ·
64°	17:58	17:32	17:18	21:11	23:23	· ·
62°	17:19	17:11	17:05	21:49	23:43	· ·
60°	16:52	16:54	16:54	22:16	23:59	· ·
N 58°	16:30	16:40	16:45	22:36	· ·	00:13
56°	16:13	16:27	16:37	22:54	· ·	00:24
54°	15:58	16:16	16:29	23:08	· ·	00:35
52°	15:45	16:06	16:23	23:20	· ·	00:44
50°	15:33	15:58	16:17	23:32	· ·	00:52
45°	15:09	15:39	16:04	23:54	· ·	01:09
N 40°	14:50	15:24	15:53	· ·	00:13	01:23
35°	14:34	15:11	15:44	· ·	00:28	01:35
30°	14:20	15:00	15:36	· ·	00:41	01:45
20°	13:56	14:40	15:21	00:05	01:04	02:02
N 10°	13:35	14:23	15:09	00:28	01:23	02:17
0°	13:16	14:07	14:57	00:49	01:41	02:31
S 10°	12:56	13:51	14:45	01:09	01:59	02:45
20°	12:35	13:34	14:33	01:32	02:17	03:00
30°	12:11	13:14	14:18	01:57	02:39	03:17
35°	11:57	13:02	14:10	02:12	02:52	03:26
40°	11:40	12:49	14:00	02:30	03:06	03:37
45°	11:20	12:33	13:49	02:50	03:23	03:50
S 50°	10:55	12:13	13:35	03:16	03:44	04:06
52°	10:43	12:04	13:28	03:29	03:54	04:13
54°	10:29	11:53	13:21	03:44	04:06	04:21
56°	10:12	11:41	13:13	04:00	04:18	04:30
58°	09:53	11:27	13:04	04:20	04:33	04:40
S 60°	09:28	11:10	12:53	04:46	04:50	04:52

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 10-12 60-79%
	00 ^h	12 ^h		Upper hh:mm	Lower hh:mm	
	mm:ss	mm:ss				
01	10:15	10:25	11:50	19:28	07:02	
02	10:34	10:44	11:49	20:19	07:54	
03	10:53	11:03	11:49	21:09	08:44	

October 04, 05, 06 UT (Sat., Sun., Mon.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	12°56.34	203°39.51	N06°4.87	157°25.70	S14°15.06	258°17.94	N21°32.06	14°12.21	S03°17.05					Alpheratz	357°33.81 29°14.13		
1	27°58.81	218°39.10	3.71	172°26.51	15.64	273°20.10	32.01	29°14.84	17.12					Ankaa	353°6.10 -42°9.86		
2	43°1.27	233°38.69	2.55	187°27.31	16.22	288°22.26	31.97	44°17.48	17.19					Schedar	349°29.82 56°40.83		
3	58°3.74	248°38.28	•• 1.39	202°28.11	•• 16.80	303°24.42	•• 31.93	59°20.11	•• 17.27					Diphda	348°46.36 -17°50.57		
4	73°6.20	263°37.87	06°0.23	217°28.92	17.37	318°26.58	31.88	74°22.75	17.34					Achernar	335°19.13 -57°6.19		
5	88°8.66	278°37.46	05°59.08	232°29.72	17.95	333°28.74	31.84	89°25.38	17.41					Hamal	327°50.20 23°35.17		
6	103°11.13	293°37.05	N05°57.92	247°30.52	S14°18.53	348°30.90	N21°31.80	104°28.02	S03°17.48					Polaris	313°20.46 89°22.19		
7	118°13.59	308°36.64	56.76	262°31.32	19.11	3°33.06	31.76	119°30.65	17.56					Acamar	315°10.95 -40°11.82		
8	133°16.06	323°36.23	55.60	277°32.13	19.68	18°35.22	31.71	134°33.29	17.63					Menkar	314°5.25 4°11.60		
9	148°18.52	338°35.83	•• 54.44	292°32.93	•• 20.26	33°37.39	•• 31.67	149°35.92	•• 17.70					Mirfak	308°27.02 49°57.11		
10	163°20.98	353°35.42	53.28	307°33.73	20.84	48°39.55	31.63	164°38.56	17.77					Aldebaran	290°38.75 16°33.75		
11	178°23.45	8°35.01	52.12	322°34.53	21.41	63°41.71	31.59	179°41.19	17.85					Rigel	281°3.16 -8°10.10		
12	193°25.91	23°34.60	N05°50.96	337°35.33	S14°21.99	78°43.87	N21°31.55	194°43.83	S03°17.92					Capella	280°20.82 46°1.32		
13	208°28.38	38°34.19	49.79	352°36.13	22.57	93°46.03	31.50	209°46.46	17.99					Bellatrix	278°22.12 6°22.51		
14	223°30.84	53°33.79	48.63	7°36.93	23.14	108°48.20	31.46	224°49.09	18.06					Elnath	278°0.98 28°37.74		
15	238°33.31	68°33.38	•• 47.47	22°37.73	•• 23.72	123°50.36	•• 31.42	239°51.73	•• 18.13					Alnilam	275°37.02 -1°10.95		
16	253°35.77	83°32.97	46.31	37°38.53	24.29	138°52.52	31.38	254°54.36	18.21					Betelgeuse	270°51.36 7°24.83		
17	268°38.23	98°32.56	45.15	52°39.33	24.87	153°54.69	31.33	269°57.00	18.28					Canopus	263°52.07 -52°42.15		
18	283°40.70	113°32.16	N05°43.98	67°40.13	S14°25.45	168°56.85	N21°31.29	284°59.63	S03°18.35					Sirius	258°25.70 -16°44.83		
19	298°43.16	128°31.75	42.82	82°40.93	26.02	183°59.01	31.25	300°2.27	18.42					Adhara	255°5.41 -29°0.10		
20	313°45.63	143°31.34	41.66	97°41.73	26.60	199°1.18	31.21	315°4.90	18.49					Procyon	244°50.27 5°9.66		
21	328°48.09	158°30.94	•• 40.49	112°42.53	•• 27.17	214°3.34	•• 31.17	330°7.53	•• 18.57					Pollux	243°16.65 27°57.81		
22	343°50.55	173°30.53	39.33	127°43.33	27.75	229°5.51	31.12	345°10.17	18.64					Avior	234°14.76 -59°35.14		
23	358°53.02	188°30.12	38.16	142°44.13	28.32	244°7.67	31.08	0°12.80	18.71					Suhail	222°46.14 -43°31.88		
Mer.pass. 23:04			ν-0.4' d-1.2' m-3.92			ν0.8' d0.6' m1.56			ν2.2' d-0.0' m-2.14			ν2.6' d0.1' m0.63					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	13°55.48	203°29.72	N05°37.00	157°44.93	S14°28.90	259°9.84	N21°31.04	15°15.43	S03°18.78					Denebola	182°24.65 14°25.77		
1	28°57.95	218°29.31	35.83	172°45.72	29.47	274°12.00	31.00	30°18.07	18.85					Gienah	175°43.31 -17°40.98		
2	44°0.41	233°28.90	34.67	187°46.52	30.05	289°14.17	30.96	45°20.70	18.93					Acrux	173°0.18 -26°33.44		
3	59°2.87	248°28.50	•• 33.50	202°47.32	•• 30.62	304°16.34	•• 30.91	60°23.34	•• 19.00					Gacrux	171°51.60 -57°15.37		
4	74°5.34	263°28.09	32.34	217°48.12	31.19	319°18.50	30.87	75°25.97	19.07					Alioth	166°12.96 55°49.24		
5	89°7.80	278°27.69	31.17	232°48.91	31.77	334°20.67	30.83	90°28.60	19.14					Spica	158°21.99 -11°17.66		
6	104°10.27	293°27.28	N05°30.00	247°49.71	S14°32.34	349°22.84	N21°30.79	105°31.24	S03°19.21					Alkaid	152°51.97 49°11.17		
7	119°12.73	308°26.88	28.84	262°50.51	32.91	4°25.00	30.75	120°33.87	19.28					Hadar	148°35.80 -60°29.87		
8	134°15.19	323°26.47	27.67	277°51.30	33.49	19°27.17	30.71	135°36.50	19.36					Menkent	147°57.30 -36°29.78		
9	149°17.66	338°26.07	•• 26.50	292°52.10	•• 34.06	34°29.34	•• 30.66	150°39.14	•• 19.43					Arcturus	145°47.67 19°3.01		
10	164°20.12	353°25.66	25.33	307°52.89	34.63	49°31.51	30.62	165°41.77	19.50					Rigil Kent.	139°40.10 -60°56.58		
11	179°22.59	8°25.26	24.16	322°53.69	35.21	64°33.68	30.58	180°44.40	19.57					Kochab	137°20.74 74°3.07		
12	194°25.05	23°24.85	N05°23.00	337°54.48	S14°35.78	79°35.84	N21°30.54	195°47.04	S03°19.64					Zuben'ubi	136°55.64 -16°8.88		
13	209°27.51	38°24.45	21.83	352°55.28	36.35	94°38.01	30.50	210°49.67	19.71					Alphecca	126°3.49 26°37.83		
14	224°29.98	53°24.04	20.66	7°56.07	36.92	109°40.18	30.46	225°52.30	19.78					Antares	112°15.31 -26°29.36		
15	239°32.44	68°23.64	•• 19.49	22°56.87	•• 37.50	124°42.35	•• 30.41	240°54.94	•• 19.86					Atria	107°9.25 -69°4.62		
16	254°34.91	83°23.23	18.32	37°57.66	38.07	139°44.52	30.37	255°57.57	19.93					Sabik	102°2.24 -15°45.38		
17	269°37.37	98°22.83	17.15	52°58.46	38.64	154°46.69	30.33	271°0.20	20.00					Shaula	96°9.69 -37°7.43		
18	284°39.83	113°22.43	N05°15.98	67°59.25	S14°39.21	169°48.86	N21°30.29	286°2.83	S03°20.07					Rasalhague	95°58.10 12°32.62		
19	299°42.30	128°22.02	14.81	83°0.04	39.78	184°51.03	30.25	301°5.47	20.14					Eltanin	90°42.03 51°29.37		
20	314°44.76	143°21.62	13.64	98°0.84	40.35	199°53.20	30.21	316°8.10	20.21					Kaus Aust.	83°31.76 -34°22.41		
21	329°47.23	158°21.22	•• 12.46	113°1.63	•• 40.92	214°55.38	•• 30.17	331°10.73	•• 20.28					Vega	80°32.85 38°48.69		
22	344°49.69	173°20.81	11.29	128°2.42	41.50	229°57.55	30.13	346°13.37	20.36					Nunki	75°47.01 -26°15.91		
23	359°52.15	188°20.41	10.12	143°3.21	42.07	244°59.72	30.08	1°16.00	20.43					Altair	61°59.30 8°56.33		
Mer.pass. 23:01			ν-0.4' d-1.2' m-3.92			ν0.8' d0.6' m1.56			ν2.2' d-0.0' m-2.15			ν2.6' d0.1' m0.63					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	14°54.62	203°20.01	N05°8.95	158°4.01	S14°42.64	260°1.89	N21°30.04	16°18.63	S03°20.50					Oct 04 Sat	SHA	Mer.pass	
1	29°57.08	218°19.60	7.78	173°4.80	43.21	275°4.06	30.00	31°21.26	20.57					Venus	190°43.16 10:26		
2	44°59.55	233°19.20	6.60	188°5.59	43.78	290°6.24	29.96	46°23.90	20.64					Mars	144°29.36 13:30		
3	60°2.01	248°18.80	•• 5.43	203°6.38	•• 44.35	305°8.41	•• 29.92	61°26.53	•• 20.71					Jupiter	245°21.60 06:46		
4	75°4.47	263°18.40	4.26	218°7.17	44.92	320°10.58	29.88	76°29.16	20.78					Saturn	1°15.87 22:59		
5	90°6.94	278°17.99	3.08	233°7.96	45.49	335°12.76	29.84	91°31.79	20.85								
6	105°9.40	293°17.59	N05°1.91	248°8.75	S14°46.06	350°14.93	N21°29.80	106°34.42	S03°20.92								
7	120°11.87	308°17.19	05°0.74	263°9.54	46.63	5°17.10	29.76	121°37.06	20.99								
8	135°14.33	323°16.7															

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	182°47.96	S04°21.88	41°23.00	11.5'	S13°32.22	-14.8'	58.3'
1	197°48.16	22.84	55°53.51	11.5'	13°17.40	-14.9'	58.3'
2	212°48.35	23.80	70°24.04	11.6'	13°2.49	-15.0'	58.4'
3	227°48.54	· · 24.77	84°54.59	11.6'	12°47.50	-15.1'	58.4'
4	242°48.73	25.73	99°25.16	11.6'	12°32.43	-15.2'	58.4'
5	257°48.93	26.69	113°55.75	11.6'	12°17.27	-15.2'	58.5'
6	272°49.12	S04°27.66	128°26.35	11.6'	S12°2.02	-15.3'	58.5'
7	287°49.31	28.62	142°56.98	11.6'	11°46.70	-15.4'	58.6'
8	302°49.50	29.58	157°27.61	11.7'	11°31.30	-15.5'	58.6'
9	317°49.69	· · 30.54	171°58.26	11.7'	11°15.82	-15.6'	58.6'
10	332°49.89	31.51	186°28.93	11.7'	11°0.26	-15.6'	58.7'
11	347°50.08	32.47	200°59.61	11.7'	10°44.62	-15.7'	58.7'
12	2°50.27	S04°33.43	215°30.30	11.7'	S10°28.91	-15.8'	58.7'
13	17°50.46	34.39	230°1.00	11.7'	10°13.13	-15.9'	58.8'
14	32°50.65	35.36	244°31.71	11.7'	09°57.27	-15.9'	58.8'
15	47°50.84	· · 36.32	259°2.43	11.7'	09°41.34	-16.0'	58.9'
16	62°51.03	37.28	273°33.16	11.7'	09°25.35	-16.1'	58.9'
17	77°51.22	38.24	288°3.89	11.7'	09°9.28	-16.1'	58.9'
18	92°51.41	S04°39.20	302°34.63	11.7'	S08°53.15	-16.2'	59.0'
19	107°51.60	40.17	317°5.38	11.8'	08°36.95	-16.3'	59.0'
20	122°51.79	41.13	331°36.13	11.8'	08°20.69	-16.3'	59.0'
21	137°51.98	· · 42.09	346°6.88	11.8'	08°4.37	-16.4'	59.1'
22	152°52.17	43.05	0°37.64	11.8'	07°47.98	-16.4'	59.1'
23	167°52.36	44.01	15°8.40	11.8'	07°31.53	-16.5'	59.1'
SD = 16.0'			SD = 15.9'				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°52.55	S04°44.97	29°39.15	11.8'	S07°15.03	-16.6'	59.2'
1	197°52.74	45.93	44°9.91	11.8'	06°58.47	-16.6'	59.2'
2	212°52.93	46.89	58°40.66	11.8'	06°41.85	-16.7'	59.2'
3	227°53.12	· · 47.86	73°11.41	11.7'	06°25.18	-16.7'	59.3'
4	242°53.31	48.82	87°42.16	11.7'	06°8.45	-16.8'	59.3'
5	257°53.50	49.78	102°12.90	11.7'	05°51.68	-16.8'	59.4'
6	272°53.69	S04°50.74	116°43.63	11.7'	S05°34.85	-16.9'	59.4'
7	287°53.87	51.70	131°14.36	11.7'	05°17.97	-16.9'	59.4'
8	302°54.06	52.66	145°45.08	11.7'	05°1.05	-17.0'	59.5'
9	317°54.25	· · 53.62	160°15.78	11.7'	04°44.08	-17.0'	59.5'
10	332°54.44	54.58	174°46.48	11.7'	04°27.07	-17.1'	59.5'
11	347°54.63	55.54	189°17.16	11.7'	04°10.02	-17.1'	59.6'
12	2°54.81	S04°56.50	203°47.83	11.7'	S03°52.93	-17.1'	59.6'
13	17°55.00	57.46	218°18.49	11.6'	03°35.79	-17.2'	59.6'
14	32°55.19	58.42	232°49.13	11.6'	03°18.62	-17.2'	59.6'
15	47°55.38	04°59.38	247°19.75	11.6'	03°1.41	-17.2'	59.7'
16	62°55.56	05°0.34	261°50.35	11.6'	02°44.17	-17.3'	59.7'
17	77°55.75	1.30	276°20.94	11.6'	02°26.90	-17.3'	59.7'
18	92°55.94	S05°2.26	290°51.50	11.5'	S02°9.59	-17.3'	59.8'
19	107°56.12	3.21	305°22.04	11.5'	01°52.26	-17.4'	59.8'
20	122°56.31	4.17	319°52.56	11.5'	01°34.90	-17.4'	59.8'
21	137°56.49	· · 5.13	334°23.05	11.5'	01°17.51	-17.4'	59.9'
22	152°56.68	6.09	348°53.52	11.4'	01°0.10	-17.4'	59.9'
23	167°56.87	7.05	3°23.96	11.4'	00°42.66	-17.5'	59.9'
SD = 16.0'			SD = 16.1'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°57.05	S05°8.01	17°54.37	11.4'	S00°25.20	-17.5'	60.0'
1	197°57.24	8.97	32°24.76	11.4'	S00°7.73	-17.5'	60.0'
2	212°57.42	9.93	46°55.11	11.3'	N00°9.77	17.5'	60.0'
3	227°57.61	· · 10.88	61°25.43	11.3'	00°27.27	17.5'	60.0'
4	242°57.79	11.84	75°55.72	11.3'	00°44.80	17.5'	60.1'
5	257°57.98	12.80	90°25.97	11.2'	01°2.33	17.5'	60.1'
6	272°58.16	S05°13.76	104°56.19	11.2'	N01°19.88	17.6'	60.1'
7	287°58.35	14.72	119°26.37	11.1'	01°37.43	17.6'	60.1'
8	302°58.53	15.67	133°56.52	11.1'	01°54.99	17.6'	60.2'
9	317°58.71	· · 16.63	148°26.62	11.1'	02°12.56	17.6'	60.2'
10	332°58.90	17.59	162°56.69	11.0'	02°30.13	17.6'	60.2'
11	347°59.08	18.55	177°26.71	11.0'	02°47.70	17.6'	60.2'
12	2°59.27	S05°19.50	191°56.69	10.9'	N03°5.27	17.6'	60.3'
13	17°59.45	20.46	206°26.62	10.9'	03°22.84	17.6'	60.3'
14	32°59.63	21.42	220°56.51	10.8'	03°40.40	17.6'	60.3'
15	47°59.82	· · 22.37	235°26.35	10.8'	03°57.96	17.5'	60.3'
16	63°0.00	23.33	249°56.14	10.7'	04°15.50	17.5'	60.4'
17	78°0.18	24.29	264°25.89	10.7'	04°33.04	17.5'	60.4'
18	93°0.36	S05°25.24	278°55.58	10.6'	N04°50.57	17.5'	60.4'
19	108°0.55	26.20	293°25.22	10.6'	05°8.08	17.5'	60.4'
20	123°0.73	27.16	307°54.81	10.5'	05°25.58	17.5'	60.4'
21	138°0.91	· · 28.11	322°24.34	10.5'	05°43.06	17.5'	60.5'
22	153°1.09	29.07	336°53.82	10.4'	06°0.52	17.4'	60.5'
23	168°1.27	30.02	351°23.25	10.4'	06°17.95	17.4'	60.5'
SD = 16.0'			SD = 16.4'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:10	05:30	06:38	16:57	18:04	19:23
N 70°	04:20	05:31	06:32	17:02	18:03	19:14
68°	04:27	05:32	06:28	17:07	18:02	19:07
66°	04:33	05:33	06:24	17:11	18:02	19:02
64°	04:38	05:33	06:21	17:14	18:02	18:57
62°	04:42	05:34	06:18	17:17	18:01	18:53
60°	04:46	05:34	06:15	17:20	18:01	18:50
N 58°	04:49	05:34	06:13	17:22	18:01	18:47
56°	04:51	05:34	06:11	17:24	18:01	18:44
54°	04:53	05:34	06:10	17:26	18:01	18:42
52°	04:55	05:34	06:08	17:28	18:01	18:40
50°	04:57	05:34	06:06	17:29	18:02	18:39
48°	05:00	05:34	06:03	17:33	18:02	18:36
N 40°	05:02	05:33	06:00	17:36	18:03	18:34
38°	05:03	05:33	05:58	17:38	18:03	18:33
36°	05:04	05:32	05:56	17:40	18:04	18:32
34°	05:04	05:30	05:52	17:44	18:07	18:32
N 10°	05:03	05:27	05:48	17:48	18:09	18:34
0°	05:00	05:24	05:45	17:52	18:12	18:36
S 10°	04:56	05:21	05:42	17:55	18:16	18:41
20°	04:50	05:16	05:38	17:59	18:21	18:47
30°	04:41	05:09	05:33	18:04	18:28	18:56
35°	04:35	05:05	05:31	18:07	18:32	19:02
40°	04:28	05:00	05:28	18:10	18:37	19:09
45°	04:19	04:55	05:24	18:13	18:43	19:18
S 50°	04:08	04:47	05:20	18:18	18:51	19:30
52°	04:02	04:44	05:18	18:20	18:54	19:36
54°	03:56	04:40	05:16	18:22	18:58	19:42
56°	03:49	04:36	05:14	18:24	19:03	19:49
58°	03:41	04:31	05:11	18:27	19:08	19:58
S 60°	03:31	04:25	05:08	18:30	19:13	20:08

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	17:47	17:07	16:29	00:01	02:42	05:10
N 70°	17:34	17:03	16:34	00:29	02:53	05:09
68°	17:23	17:01	16:39	00:51	03:01	05:07
66°	17:14	16:58	16:43	01:07	03:08	05:07
64°	17:06	16:56	16:46	01:21	03:13	05:06
62°	17:00	16:54	16:49	01:32	03:18	05:05
60°	16:54	16:53	16:52	01:41	03:23	05:04
N 58°	16:49	16:51	16:54	01:50	03:26	05:04
56°	16:44	16:50	16:56	01:57	03:30	05:04
54°	16:40	16:49	16:58	02:03	03:32	05:03
52°	16:36	16:48	17:00	02:09	03:35	05:03
50°	16:33	16:47	17:02	02:14	03:38	05:02
48°	16:25	16:45	17:05	02:25	03:43	05:02
N 40°	16:19	16:43	17:08	02:34	03:47	05:01
38°	16:13	16:42	17:11	02:42	03:51	05:00
36°	16:09	16:41	17:13	02:49	03:54	05:00
34°	16:00	16:38	17:17	03:01	04:00	04:59
N 10°	15:53	16:36	17:20	03:11	04:04	04:58
0°	15:46	16:34	17:24	03:20	04:09	04:58
S 10°	15:39	16:33	17:27	03:30	04:13	04:57
20°	15:31	16:31	17:31	03:40	04:18	04:56
30°	15:23	16:28	17:35	03:51	04:23	04:55
35°	15:18	16:27	17:38	03:57	04:26	04:54
40°	15:12	16:26	17:40	04:05	04:30	04:54
45°	15:06	16:24	17:44	04:13	04:33	04:53
S 50°	14:58	16:22	17:48	04:23	04:38	04:52
52°	14:54	16:21	17:50	04:28	04:40	04:52
54°	14:50	16:20	17:52	04:33	04:42	04:51
56°	14:45	16:19	17:54	04:38	04:45	04:51
58°	14:40	16:17	17:56	04:45	04:48	04:50
S 60°	14:35	16:16	17:59	04:52	04:51	04:50

Day	Sun		Mer. Pass	Moon		Age 13-15 87-98%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
04	11:12	11:21	11:49	21:57	09:33	
05	11:30	11:39	11:48	22:46	10:22	
06	11:48	11:57	11:48	23:36	11:11	

October 07, 08, 09 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	15°53.75	203°10.37	N04°40.73	158°22.94	S14°56.28	260°54.11	N21°29.07	17°21.80	S03°22.19			Alpheratz	357°33.82 29°14.13
1	30°56.22	218°9.97	39.55	173°23.73	56.85	275°56.28	29.03	32°24.43	22.26			Ankaa	353°6.11 -42°9.87
2	45°58.68	233°9.57	38.37	188°24.51	57.41	290°58.46	28.99	47°27.06	22.33			Schedar	349°29.82 56°40.84
3	61°1.15	248°9.17	· · 37.19	203°25.30	· · 57.98	306°0.64	· · 28.95	62°29.69	· · 22.40			Diphda	348°46.36 -17°50.57
4	76°3.61	263°8.77	36.01	218°26.08	58.55	321°2.82	28.91	77°32.32	22.47			Achernar	335°19.12 -57°6.21
5	91°6.07	278°8.37	34.83	233°26.87	59.11	336°5.00	28.87	92°34.95	22.54			Hamal	327°50.19 23°35.17
6	106°8.54	293°7.97	N04°33.65	248°27.65	S14°59.68	351°7.18	N21°28.83	107°37.58	S03°22.61			Polaris	313°19.50 89°22.21
7	121°11.00	308°7.57	32.47	263°28.44	15°0.24	6°9.37	28.79	122°40.21	22.68			Acamar	315°10.93 -40°11.83
8	136°13.47	323°7.17	31.29	278°29.22	0.81	21°11.55	28.75	137°42.84	22.75			Menkar	314°5.24 4°11.60
9	151°15.93	338°6.77	· · 30.11	293°30.01	· · 1.37	36°13.73	· · 28.71	152°45.47	· · 22.82			Mirfak	308°27.00 49°57.12
10	166°18.40	353°6.37	28.93	308°30.79	1.94	51°15.91	28.67	167°48.10	22.89			Aldebaran	290°38.73 16°33.75
11	181°20.86	8°5.97	27.74	323°31.57	2.50	66°18.09	28.63	182°50.73	22.96			Rigel	281°3.14 -8°10.10
12	196°23.32	23°5.58	N04°26.56	338°32.36	S15°3.07	81°20.27	N21°28.59	197°53.37	S03°23.03			Capella	280°20.80 46°1.33
13	211°25.79	38°5.18	25.38	353°33.14	3.63	96°22.46	28.55	212°56.00	23.10			Bellatrix	278°22.10 6°22.51
14	226°28.25	53°4.78	24.20	8°33.92	4.20	111°24.64	28.51	227°58.63	23.17			Elnath	278°0.96 28°37.74
15	241°30.72	68°4.38	· · 23.01	23°34.70	· · 4.76	126°26.82	· · 28.47	243°1.26	· · 23.24			Alnilam	275°37.00 -1°10.95
16	256°33.18	83°3.98	21.83	38°35.49	5.32	141°29.00	28.43	258°3.89	23.31			Betelgeuse	270°51.34 7°24.83
17	271°35.64	98°3.58	20.65	53°36.27	5.89	156°31.19	28.39	273°6.52	23.38			Canopus	263°52.04 -52°42.16
18	286°38.11	113°3.18	N04°19.46	68°37.05	S15°6.45	171°33.37	N21°28.35	288°9.15	S03°23.45			Sirius	258°25.68 -16°44.83
19	301°40.57	128°2.79	18.28	83°37.83	7.01	186°35.56	28.31	303°11.78	23.52			Adhara	255°5.39 -29°0.11
20	316°43.04	143°2.39	17.09	98°38.61	7.58	201°37.74	28.27	318°14.41	23.59			Procyon	244°50.25 5°9.66
21	331°45.50	158°1.99	· · 15.91	113°39.39	· · 8.14	216°39.93	· · 28.23	333°17.04	· · 23.66			Pollux	243°16.63 27°57.81
22	346°47.96	173°1.59	14.72	128°40.17	8.70	231°42.11	28.19	348°19.67	23.73			Avior	234°14.73 -59°35.14
23	1°50.43	188°1.19	13.54	143°40.95	9.27	246°44.30	28.15	3°22.30	23.80			Suhail	222°46.12 -43°31.88
Mer.pass. 22:53		ν-0.4' d-1.2' m-3.92		ν0.8' d0.6' m1.55		ν2.2' d-0.0' m-2.16		ν2.6' d0.1' m0.64					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	16°52.89	203°0.80	N04°12.35	158°41.73	S15°9.83	261°46.48	N21°28.11	18°24.93	S03°23.87			Miaplacidus	221°38.70 -69°49.03
1	31°55.36	218°0.40	11.17	173°42.51	10.39	276°48.67	28.07	33°27.56	23.94			Alphard	217°47.36 -8°46.04
2	46°57.82	233°0.00	9.98	188°43.29	10.95	291°50.85	28.03	48°30.19	24.01			Regulus	207°34.03 11°50.56
3	62°0.28	247°59.60	· · 8.80	203°44.07	· · 11.51	306°53.04	· · 27.99	63°32.82	· · 24.08			Dubhe	193°40.80 61°36.63
4	77°2.75	262°59.21	7.61	218°44.85	12.08	321°55.23	27.96	78°35.45	24.15			Denebola	182°24.64 14°25.76
5	92°5.21	277°58.81	6.42	233°45.63	12.64	336°57.41	27.92	93°38.08	24.22			Gienah	175°43.30 -17°40.97
6	107°7.68	292°58.41	N04°5.24	248°46.41	S15°13.20	351°59.60	N21°27.88	108°40.70	S03°24.28			Acrux	173°0.18 -63°14.43
7	122°10.14	307°58.02	4.05	263°47.19	13.76	7°1.79	27.84	123°43.33	24.35			Gacrux	171°51.60 -57°15.36
8	137°12.60	322°57.62	2.86	278°47.97	14.32	22°3.98	27.80	138°45.96	24.42			Alioth	166°12.97 55°49.22
9	152°15.07	337°57.22	· · 1.67	293°48.74	· · 14.88	37°6.16	· · 27.76	153°48.59	· · 24.49			Spica	158°21.99 -11°17.65
10	167°17.53	352°56.83	04°0.49	308°49.52	15.44	52°8.35	27.72	168°51.22	24.56			Alkaid	152°51.98 49°11.16
11	182°20.00	7°56.43	03°59.30	323°50.30	16.00	67°10.54	27.68	183°53.85	24.63			Hadar	148°35.81 -60°29.86
12	197°22.46	22°56.03	N03°58.11	338°51.07	S15°16.56	82°12.73	N21°27.64	198°56.48	S03°24.70			Menkent	147°57.31 -36°29.77
13	212°24.92	37°55.64	56.92	353°51.85	17.12	97°14.92	27.60	213°59.11	24.77			Arcturus	145°47.68 19°3.01
14	227°27.39	52°55.24	55.73	8°52.63	17.68	112°17.11	27.57	229°1.74	24.84			Rigil Kent.	139°40.12 -60°56.57
15	242°29.85	67°54.84	· · 54.54	23°53.40	· · 18.24	127°19.30	· · 27.53	244°4.37	· · 24.91			Kochab	137°20.78 74°3.05
16	257°32.32	82°54.45	53.35	38°54.18	18.80	142°21.49	27.49	259°7.00	24.97			Zuben'ubi	136°55.65 -16°8.87
17	272°34.78	97°54.05	52.16	53°54.96	19.36	157°23.68	27.45	274°9.62	25.04			Alphecca	126°3.51 26°37.82
18	287°37.25	112°53.65	N03°50.97	68°55.73	S15°19.92	172°25.87	N21°27.41	289°12.25	S03°25.11			Antares	112°15.32 -26°29.36
19	302°39.71	127°53.26	49.78	83°56.51	20.48	187°28.06	27.37	304°14.88	25.18			Atria	107°9.29 -69°4.62
20	317°42.17	142°52.86	48.59	98°57.28	21.04	202°30.25	27.33	319°17.51	25.25			Sabik	102°2.25 -15°45.38
21	332°44.64	157°52.47	· · 47.40	113°58.06	· · 21.60	217°32.45	· · 27.29	334°20.14	· · 25.32			Shaula	96°9.71 -37°7.43
22	347°47.10	172°52.07	46.21	128°58.83	22.16	232°34.64	27.26	349°22.77	25.39			Rasalhague	95°58.12 12°32.62
23	2°49.57	187°51.68	45.02	143°59.60	22.72	247°36.83	27.22	4°25.40	25.45			Eltanin	90°42.05 51°29.37
Mer.pass. 22:49		ν-0.4' d-1.2' m-3.92		ν0.8' d0.6' m1.55		ν2.2' d-0.0' m-2.16		ν2.6' d0.1' m0.65					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	17°52.03	202°51.28	N03°43.83	159°0.38	S15°23.27	262°39.02	N21°27.18	19°28.02	S03°25.52			Kaus Aust.	83°31.78 -34°22.41
1	32°54.49	217°50.88	42.64	174°1.15	23.83	277°41.21	27.14	34°30.65	25.59			Vega	80°32.87 38°48.69
2	47°56.96	232°50.49	41.45	189°1.93	24.39	292°43.41	27.10	49°33.28	25.66			Nunki	75°47.03 -26°15.91
3	62°59.42	247°50.09	· · 40.26	204°2.70	· · 24.95	307°45.60	· · 27.06	64°35.91	· · 25.73			Altair	61°59.31 8°56.33
4	78°1.89	262°49.70	39.06	219°3.47	25.50	322°47.79	27.03	79°38.54	25.80			Peacock	53°4.56 -56°39.29
5	93°4.35	277°49.30	37.87	234°4.24	26.06	337°49.99	26.99	94°41.16	25.87			Deneb	49°25.23 45°22.60
6	108°6.81	292°48.91	N03°36.68	249°5.02	S15°26.62	352°52.18	N21°26.95	109°43.79	S03°25.93			Enif	33°38.01 9°59.75
7	123°9.28	307°48.51	35.49	264°5.79	27.18	7°54.38	26.91	124°46.42	26.00			Al Na'ir	27°31.81 -46°50.23
8	138°11.74	322°48.12	34.29	279°6.56	27.73	22°56.57	26.87	139°49.05	26.07			Fomalhaut	15°13.53 -29°29.10
9	153°14.21	337°47.72	· · 33.10	294°7.33	· · 28.29	37°58.77	· · 26.84	154°51.68	· · 26.14			Scheat	13°44.33 28°13.55
10	168°16.67	352°47.33	31.91	309°8.10	28.85	53°0.96							

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue							
0	183°1.46	S05°30.98	5°52.61	10.3'	N06°35.37	17.4'	60.5'
1	198°1.64	31.94	20°21.91	10.2'	06°52.75	17.4'	60.5'
2	213°1.82	32.89	34°51.16	10.2'	07°10.11	17.3'	60.6'
3	228°2.00	· · 33.85	49°20.34	10.1'	07°27.44	17.3'	60.6'
4	243°2.18	34.80	63°49.46	10.1'	07°44.74	17.3'	60.6'
5	258°2.36	35.76	78°18.52	10.0'	08°2.00	17.2'	60.6'
6	273°2.54	S05°36.71	92°47.51	9.9'	N08°19.23	17.2'	60.6'
7	288°2.72	37.67	107°16.43	9.9'	08°36.42	17.1'	60.6'
8	303°2.90	38.62	121°45.29	9.8'	08°53.57	17.1'	60.7'
9	318°3.08	· · 39.58	136°14.08	9.7'	09°10.67	17.1'	60.7'
10	333°3.26	40.53	150°42.80	9.6'	09°27.73	17.0'	60.7'
11	348°3.44	41.49	165°11.45	9.6'	09°44.75	17.0'	60.7'
12	3°3.62	S05°42.44	179°40.03	9.5'	N10°1.71	16.9'	60.7'
13	18°3.80	43.39	194°8.53	9.4'	10°18.63	16.9'	60.7'
14	33°3.98	44.35	208°36.96	9.4'	10°35.49	16.8'	60.7'
15	48°4.16	· · 45.30	223°5.31	9.3'	10°52.30	16.8'	60.7'
16	63°4.34	46.26	237°33.59	9.2'	11°9.05	16.7'	60.8'
17	78°4.51	47.21	252°1.80	9.1'	11°25.74	16.6'	60.8'
18	93°4.69	S05°48.16	266°29.92	9.0'	N11°42.37	16.6'	60.8'
19	108°4.87	49.12	280°57.96	9.0'	11°58.94	16.5'	60.8'
20	123°5.05	50.07	295°25.93	8.9'	12°15.44	16.4'	60.8'
21	138°5.23	· · 51.02	309°53.81	8.8'	12°31.87	16.4'	60.8'
22	153°5.40	51.98	324°21.62	8.7'	12°48.24	16.3'	60.8'
23	168°5.58	52.93	338°49.34	8.6'	13°4.53	16.2'	60.8'
SD = 16.0'			SD = 16.5'				
$d = 1.0'$							

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°5.76	S05°53.88	353°16.97	8.6'	N13°20.74	16.1'	60.8'
1	198°5.94	54.83	7°44.52	8.5'	13°36.88	16.1'	60.8'
2	213°6.11	55.79	22°11.99	8.4'	13°52.94	16.0'	60.8'
3	228°6.29	· · 56.74	36°39.37	8.3'	14°8.92	15.9'	60.8'
4	243°6.46	57.69	51°6.66	8.2'	14°24.82	15.8'	60.8'
5	258°6.64	58.64	65°33.87	8.1'	14°40.63	15.7'	60.8'
6	273°6.82	S05°59.59	80°0.99	8.0'	N14°56.35	15.6'	60.9'
7	288°6.99	06°0.55	94°28.02	7.9'	15°11.98	15.5'	60.9'
8	303°7.17	1.50	108°54.96	7.8'	15°27.53	15.4'	60.9'
9	318°7.34	· · 2.45	123°21.80	7.8'	15°42.97	15.4'	60.9'
10	333°7.52	3.40	137°48.56	7.7'	15°58.32	15.3'	60.9'
11	348°7.69	4.35	152°15.23	7.6'	16°13.58	15.2'	60.9'
12	3°7.87	S06°5.30	166°41.81	7.5'	N16°28.73	15.0'	60.9'
13	18°8.04	6.25	181°8.29	7.4'	16°43.78	14.9'	60.9'
14	33°8.22	7.21	195°34.68	7.3'	16°58.72	14.8'	60.9'
15	48°8.39	· · 8.16	210°0.98	7.2'	17°13.56	14.7'	60.9'
16	63°8.57	9.11	224°27.18	7.1'	17°28.29	14.6'	60.9'
17	78°8.74	10.06	238°53.29	7.0'	17°42.90	14.5'	60.9'
18	93°8.91	S06°11.01	253°19.31	6.9'	N17°57.40	14.4'	60.9'
19	108°9.09	11.96	267°45.23	6.8'	18°11.79	14.3'	60.9'
20	123°9.26	12.91	282°11.05	6.7'	18°26.06	14.1'	60.9'
21	138°9.43	· · 13.86	296°36.78	6.6'	18°40.21	14.0'	60.8'
22	153°9.61	14.81	311°2.42	6.5'	18°54.23	13.9'	60.8'
23	168°9.78	15.76	325°27.96	6.4'	19°8.14	13.8'	60.8'
SD = 16.0'			SD = 16.6'				
$d = 1.0'$							

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°9.95	S06°16.71	339°53.41	6.4'	N19°21.91	13.6'	60.8'
1	198°10.12	17.66	354°18.76	6.3'	19°35.56	13.5'	60.8'
2	213°10.30	18.60	8°44.02	6.2'	19°49.07	13.4'	60.8'
3	228°10.47	· · 19.55	23°9.18	6.1'	20°2.46	13.2'	60.8'
4	243°10.64	20.50	37°34.25	6.0'	20°15.71	13.1'	60.8'
5	258°10.81	21.45	51°59.22	5.9'	20°28.82	13.0'	60.8'
6	273°10.98	S06°22.40	66°24.10	5.8'	N20°41.79	12.8'	60.8'
7	288°11.15	23.35	80°48.88	5.7'	20°54.62	12.7'	60.8'
8	303°11.33	24.30	95°13.58	5.6'	21°7.31	12.5'	60.8'
9	318°11.50	· · 25.25	109°38.17	5.5'	21°19.86	12.4'	60.8'
10	333°11.67	26.19	124°2.68	5.4'	21°32.26	12.2'	60.8'
11	348°11.84	27.14	138°27.09	5.3'	21°44.51	12.1'	60.7'
12	3°12.01	S06°28.09	152°51.41	5.2'	N21°56.61	11.9'	60.7'
13	18°12.18	29.04	167°15.64	5.1'	22°8.55	11.8'	60.7'
14	33°12.35	29.98	181°39.78	5.1'	22°20.35	11.6'	60.7'
15	48°12.52	· · 30.93	196°3.83	5.0'	22°31.98	11.5'	60.7'
16	63°12.69	31.88	210°27.79	4.9'	22°43.46	11.3'	60.7'
17	78°12.86	32.83	224°51.67	4.8'	22°54.78	11.2'	60.7'
18	93°13.02	S06°33.77	239°15.45	4.7'	N23°5.93	11.0'	60.7'
19	108°13.19	34.72	253°39.16	4.6'	23°16.93	10.8'	60.6'
20	123°13.36	35.67	268°2.77	4.5'	23°27.76	10.7'	60.6'
21	138°13.53	· · 36.61	282°26.30	4.4'	23°38.42	10.5'	60.6'
22	153°13.70	37.56	296°49.75	4.4'	23°48.91	10.3'	60.6'
23	168°13.87	38.51	311°13.12	4.3'	23°59.23	10.2'	60.6'
SD = 16.0'			SD = 16.6'				
$d = 0.9'$							

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:24	05:44	06:52	16:41	17:49	19:07
N 70°	04:32	05:43	06:45	16:49	17:50	19:00
68°	04:38	05:43	06:39	16:55	17:50	18:55
66°	04:43	05:42	06:34	17:00	17:51	18:50
64°	04:47	05:42	06:30	17:04	17:51	18:46
62°	04:50	05:41	06:26	17:08	17:52	18:43
60°	04:53	05:41	06:23	17:11	17:53	18:41
N 58°	04:55	05:41	06:20	17:14	17:53	18:38
56°	04:57	05:40	06:17	17:17	17:54	18:37
54°	04:59	05:40	06:15	17:19	17:54	18:35
52°	05:00	05:39	06:13	17:21	17:55	18:34
50°	05:01	05:39	06:11	17:23	17:55	18:33
45°	05:04	05:38	06:07	17:27	17:57	18:31
N 40°	05:05	05:36	06:03	17:31	17:58	18:29
35°	05:06	05:35	06:00	17:34	17:59	18:29
30°	05:06	05:34	05:58	17:37	18:01	18:29
20°	05:05	05:31	05:53	17:42	18:04	18:30
N 10°	05:03	05:27	05:48	17:46	18:08	18:32
0°	04:59	05:23	05:44	17:51	18:12	18:36
S 10°	04:54	05:19	05:40	17:55	18:16	18:41
20°	04:47	05:13	05:35	18:00	18:22	18:48
30°	04:37	05:06	05:30	18:06	18:30	18:58
35°	04:31	05:01	05:27	18:09	18:35	19:05
40°	04:23	04:56	05:23	18:13	18:40	19:13
45°	04:13	04:49	05:19	18:17	18:47	19:23
S 50°	04:01	04:41	05:14	18:22	18:56	19:36
52°	03:55	04:37	05:11	18:25	19:00	19:42
54°	03:48	04:32	05:09	18:28	19:04	19:49
56°	03:40	04:27	05:06	18:30	19:09	19:57
58°	03:31	04:22	05:03	18:34	19:15	20:06
S 60°	03:21	04:15	04:59	18:38	19:21	20:17

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	15:44	14:22	☐	07:44	11:00	☐
N 70°	16:01	15:10	☐	07:30	10:15	☐
68°	16:15	15:41	☐	07:19	09:45	☐
66°	16:26	16:05	15:24	07:09	09:23	12:04
64°	16:36	16:23	16:05	07:02	09:06	11:25
62°	16:44	16:39	16:33	06:55	08:52	10:58
60°	16:51	16:52	16:54	06:50	08:40	10:37
N 58°	16:58	17:03	17:12	06:45	08:30	10:20
56°	17:03	17:13	17:27	06:40	08:21	10:06
54°	17:09	17:22	17:40	06:36	08:13	09:54
52°	17:13	17:30	17:52	06:33	08:06	09:43
50°	17:17	17:37	18:02	06:30	08:00	09:33
45°	17:27	17:52	18:24	06:23	07:47	09:13
N 40°	17:34	18:05	18:41	06:17	07:36	08:57
35°	17:41	18:16	18:56	06:12	07:26	08:43
30°	17:47	18:25	19:09	06:08	07:18	08:31
20°	17:57	18:42	19:31	06:00	07:04	08:11
N 10°	18:07	18:56	19:51	05:54	06:52	07:54
0°	18:15	19:10	20:09	05:48	06:41	07:37
S 10°	18:24	19:24	20:27	05:42	06:29	07:21
20°	18:33	19:39	20:47	05:35	06:17	07:04
30°	18:44	19:56	21:10	05:28	06:04	06:44
35°	18:51	20:06	21:24	05:24	05:56	06:33
40°	18:58	20:18	21:40	05:19	05:47	06:20
45°	19:07	20:32	21:59	05:14	05:37	06:05
S 50°	19:17	20:49	22:22	05:07	05:24	05:46
52°	19:22	20:57	22:34	05:04	05:18	05:37
54°	19:27	21:06	22:47	05:01	05:12	05:27
56°	19:33	21:16	23:02	04:57	05:05	05:16
58°	19:40	21:28	23:20	04:53	04:57	05:04
S 60°	19:47	21:42	23:42	04:49	04:48	04:49

Day	Sun			Moon		
	Eqn.of	Time	Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	16-18

October 10, 11, 12 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	18°51.17	202°41.81	N03°15.17	159°18.87	S15°36.62	263°31.73	N21°26.27	20°31.08	S03°27.16			Alpheratz	357°33.81 29°14.14
1	33°53.63	217°41.42	13.98	174°19.64	37.17	278°33.93	26.23	35°33.71	27.22			Ankaa	353°6.11 -42°9.88
2	48°56.10	232°41.02	12.78	189°20.41	37.72	293°36.13	26.19	50°36.34	27.29			Schedar	349°29.81 56°40.86
3	63°58.56	247°40.63	•• 11.58	204°21.17	•• 38.28	308°38.33	•• 26.16	65°38.96	•• 27.36			Diphda	348°46.35 -17°50.58
4	79°1.03	262°40.23	10.38	219°21.94	38.83	323°40.53	26.12	80°41.59	27.43			Achernar	335°19.12 -57°6.22
5	94°3.49	277°39.84	9.19	234°22.71	39.38	338°42.73	26.08	95°44.22	27.49			Hamal	327°50.18 23°35.18
6	109°5.95	292°39.45	N03°7.99	249°23.47	S15°39.94	353°44.93	N21°26.04	110°46.84	S03°27.56			Polaris	313°18.22 89°22.22
7	124°8.42	307°39.05	6.79	264°24.24	40.49	8°47.13	26.01	125°49.47	27.63			Acamar	315°10.92 -40°11.84
8	139°10.88	322°38.66	5.59	279°25.01	41.04	23°49.33	25.97	140°52.09	27.69			Menkar	314°5.23 4°11.60
9	154°13.35	337°38.27	•• 4.39	294°25.77	•• 41.59	38°51.53	•• 25.93	155°54.72	•• 27.76			Mirfak	308°26.97 49°57.13
10	169°15.81	352°37.87	3.19	309°26.54	42.14	53°53.74	25.90	170°57.35	27.83			Aldebaran	290°38.71 16°33.74
11	184°18.28	7°37.48	1.99	324°27.30	42.70	68°55.94	25.86	185°59.97	27.90			Rigel	281°3.12 -8°10.10
12	199°20.74	22°37.09	N03°0.80	339°28.06	S15°43.25	83°58.14	N21°25.82	201°2.60	S03°27.96			Capella	280°20.76 46°1.33
13	214°23.20	37°36.70	02°59.60	354°28.83	43.80	99°0.35	25.78	216°5.22	28.03			Bellatrix	278°22.08 6°22.51
14	229°25.67	52°36.30	58.40	9°29.59	44.35	114°2.55	25.75	231°7.85	28.10			Elmath	278°0.93 28°37.74
15	244°28.13	67°35.91	•• 57.20	24°30.36	•• 44.90	129°4.75	•• 25.71	246°10.47	•• 28.16			Alnilam	275°36.98 -1°10.96
16	259°30.60	82°35.52	56.00	39°31.12	45.45	144°6.96	25.67	261°13.10	28.23			Betelgeuse	270°51.32 7°24.83
17	274°33.06	97°35.12	54.80	54°31.88	46.00	159°9.16	25.64	276°15.73	28.30			Canopus	263°52.01 -52°42.17
18	289°35.52	112°34.73	N02°53.60	69°32.65	S15°46.55	174°11.37	N21°25.60	291°18.35	S03°28.36			Sirius	258°25.65 -16°44.84
19	304°37.99	127°34.34	52.40	84°33.41	47.10	189°13.57	25.56	306°20.98	28.43			Adhara	255°5.36 -29°0.11
20	319°40.45	142°33.95	51.19	99°34.17	47.65	204°15.78	25.53	321°23.60	28.50			Procyon	244°50.23 5°9.65
21	334°42.92	157°33.55	•• 49.99	114°34.93	•• 48.20	219°17.98	•• 25.49	336°26.23	•• 28.57			Pollux	243°16.61 27°57.80
22	349°45.38	172°33.16	48.79	129°35.70	48.75	234°20.19	25.45	351°28.85	28.63			Avior	234°14.69 -59°35.14
23	4°47.85	187°32.77	47.59	144°36.46	49.30	249°22.39	25.42	6°31.48	28.70			Suhail	222°46.09 -43°31.88
Mer.pass. 22:41		ν-0.4' d-1.2' m-3.92		ν0.8' d0.6' m1.54		ν2.2' d-0.0' m-2.17		ν2.6' d0.1' m0.66					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	19°50.31	202°32.38	N02°46.39	159°37.22	S15°49.85	264°24.60	N21°25.38	21°34.10	S03°28.77				
1	34°52.77	217°31.98	45.19	174°37.98	50.40	279°26.81	25.34	36°36.73	28.83				
2	49°55.24	232°31.59	43.99	189°38.74	50.95	294°29.01	25.31	51°39.35	28.90				
3	64°57.70	247°31.20	•• 42.78	204°39.50	•• 51.50	309°31.22	•• 25.27	66°41.98	•• 28.96				
4	80°0.17	262°30.81	41.58	219°40.26	52.05	324°33.43	25.24	81°44.60	29.03				
5	95°2.63	277°30.41	40.38	234°41.02	52.60	339°35.64	25.20	96°47.23	29.10				
6	110°5.09	292°30.02	N02°39.18	249°41.78	S15°53.15	354°37.84	N21°25.16	111°49.85	S03°29.16				
7	125°7.56	307°29.63	37.97	264°42.54	53.69	9°40.05	25.13	126°52.48	29.23				
8	140°10.02	322°29.24	36.77	279°43.30	54.24	24°42.26	25.09	141°55.10	29.30				
9	155°12.49	337°28.85	•• 35.57	294°44.06	•• 54.79	39°44.47	•• 25.05	156°57.72	•• 29.36				
10	170°14.95	352°28.45	34.36	309°44.82	55.34	54°46.68	25.02	172°0.35	29.43				
11	185°17.42	7°28.06	33.16	324°45.58	55.88	69°48.89	24.98	187°2.97	29.49				
12	200°19.88	22°27.67	N02°31.96	339°46.33	S15°56.43	84°51.10	N21°24.95	202°5.60	S03°29.56				
13	215°22.34	37°27.28	30.75	354°47.09	56.98	99°53.31	24.91	217°8.22	29.63				
14	230°24.81	52°26.89	29.55	9°47.85	57.53	114°55.52	24.87	232°10.85	29.69				
15	245°27.27	67°26.49	•• 28.34	24°48.61	•• 58.07	129°57.73	•• 24.84	247°13.47	•• 29.76				
16	260°29.74	82°26.10	27.14	39°49.36	58.62	144°59.94	24.80	262°16.09	29.82				
17	275°32.20	97°25.71	25.93	54°50.12	59.16	160°2.15	24.77	277°18.72	29.89				
18	290°34.66	112°25.32	N02°24.73	69°50.88	S15°59.71	175°4.37	N21°24.73	292°21.34	S03°29.96				
19	305°37.13	127°24.93	23.52	84°51.63	16°0.26	190°6.58	24.70	307°23.96	30.02				
20	320°39.59	142°24.54	22.32	99°52.39	0.80	205°8.79	24.66	322°26.59	30.09				
21	335°42.06	157°24.14	•• 21.11	114°53.15	•• 1.35	220°11.00	•• 24.62	337°29.21	•• 30.15				
22	350°44.52	172°23.75	19.91	129°53.90	1.89	235°13.22	24.59	352°31.83	30.22				
23	5°46.99	187°23.36	18.70	144°54.66	2.44	250°15.43	24.55	7°34.46	30.29				
Mer.pass. 22:37		ν-0.4' d-1.2' m-3.92		ν0.8' d0.5' m1.54		ν2.2' d-0.0' m-2.18		ν2.6' d0.1' m0.66					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	20°49.45	202°22.97	N02°17.50	159°55.41	S16°2.98	265°17.64	N21°24.52	22°37.08	S03°30.35				
1	35°51.91	217°22.58	16.29	174°56.17	3.53	280°19.86	24.48	37°39.70	30.42				
2	50°54.38	232°22.19	15.08	189°56.92	4.07	295°22.07	24.45	52°42.33	30.48				
3	65°56.84	247°21.80	•• 13.88	204°57.67	•• 4.62	310°24.28	•• 24.41	67°44.95	•• 30.55				
4	80°59.31	262°21.40	12.67	219°58.43	5.16	325°26.50	24.38	82°47.57	30.61				
5	96°1.77	277°21.01	11.46	234°59.18	5.70	340°28.71	24.34	97°50.20	30.68				
6	111°4.24	292°20.62	N02°10.26	249°59.94	S16°6.25	355°30.93	N21°24.31	112°52.82	S03°30.74				
7	126°6.70	307°20.23	9.05	265°0.69	6.79	10°33.15	24.27	127°55.44	30.81				
8	141°9.16	322°19.84	7.84	280°1.44	7.33	25°35.36	24.24	142°58.06	30.87				
9	156°11.63	337°19.45	•• 6.63	295°2.19	•• 7.88	40°37.58	•• 24.20	158°0.69	•• 30.94				
10	171°14.09	352°19.06	5.43	310°2.95	8.42	55°39.79	24.17	173°3.31	31.00				
11	186°16.56	7°18.67	4.22	325°3.70	8.96	70°42.01	24.13	188°5.93	31.07				
12	201°19.02	22°18.27	N02°3.01	340°4.45	S16°9.51	85°44.23	N21°24.10	203°8.55	S03°31.13				
13	216°21.48	37°17.88	1.80	355°5.20	10.05	100°46.45	24.06	218°11.18	31.20				
14	231°23.95	52°17.49	02°0.59	10°5.95	10.59	115°48.66	24.03	233°13.80	31.26				
15	246°26.41	67°17.10	01°59.39	25°6.70	•• 11.13	130°50.88	•• 23.99	248°16.42	•• 31.33				
16	261°28.88	82°16.71	58.18	40°7.46	11.67	145°53.10	23.96	263°19.04	31.39				
17	276°31.34	97°16.32	56.97	55°8.21	12.22	160°55.32	23.92	278°21.66	31.46				
18	291°33.81	112°15.93	N01°55.76	70°8.96	S16°12.76	175°57.54	N21°23.89	293°24.29	S03°31.52				

h	Sun			Moon				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	183°14.03	S06°39.45		325°36.41	4.2'	N24°9.38	10.0'	60.6'
1	198°14.20	40.40		339°59.61	4.1'	24°19.36	9.8'	60.5'
2	213°14.37	41.34		354°22.74	4.1'	24°29.16	9.6'	60.5'
3	228°14.53	· · 42.29		8°45.80	4.0'	24°38.79	9.4'	60.5'
4	243°14.70	43.23		23°8.78	3.9'	24°48.24	9.3'	60.5'
5	258°14.87	44.18		37°31.68	3.8'	24°57.50	9.1'	60.5'
6	273°15.03	S06°45.12		51°54.52	3.8'	N25°6.59	8.9'	60.5'
7	288°15.20	46.07		66°17.28	3.7'	25°15.50	8.7'	60.4'
8	303°15.37	47.01		80°39.98	3.6'	25°24.22	8.5'	60.4'
9	318°15.53	· · 47.96		95°2.61	3.6'	25°32.76	8.4'	60.4'
10	333°15.70	48.90		109°25.17	3.5'	25°41.11	8.2'	60.4'
11	348°15.86	49.85		123°47.67	3.4'	25°49.27	8.0'	60.4'
12	3°16.03	S06°50.79		138°10.11	3.4'	N25°57.25	7.8'	60.3'
13	18°16.19	51.74		152°32.49	3.3'	26°5.03	7.6'	60.3'
14	33°16.36	52.68		166°54.82	3.3'	26°12.63	7.4'	60.3'
15	48°16.52	· · 53.62		181°17.09	3.2'	26°20.03	7.2'	60.3'
16	63°16.69	54.57		195°39.31	3.2'	26°27.24	7.0'	60.3'
17	78°16.85	55.51		210°1.48	3.1'	26°34.25	6.8'	60.2'
18	93°17.02	S06°56.45		224°23.59	3.1'	N26°41.07	6.6'	60.2'
19	108°17.18	57.40		238°45.67	3.0'	26°47.70	6.4'	60.2'
20	123°17.34	58.34		253°7.70	3.0'	26°54.12	6.2'	60.2'
21	138°17.51	06°59.28		267°29.68	2.9'	27°0.35	6.0'	60.1'
22	153°17.67	07°0.22		281°51.63	2.9'	27°6.38	5.8'	60.1'
23	168°17.83	1.17		296°13.55	2.9'	27°12.22	5.6'	60.1'
SD = 16.0'			$d = 0.9'$	SD = 16.5'				

Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	183°17.99	S07°2.11		310°35.42	2.8'	N27°17.85	5.4'	60.1'
1	198°18.16	3.05		324°57.27	2.8'	27°23.28	5.2'	60.0'
2	213°18.32	3.99		339°19.09	2.8'	27°28.51	5.0'	60.0'
3	228°18.48	· · 4.94		353°40.88	2.8'	27°33.54	4.8'	60.0'
4	243°18.64	5.88		8°2.65	2.7'	27°38.37	4.6'	60.0'
5	258°18.80	6.82		22°24.39	2.7'	27°42.99	4.4'	59.9'
6	273°18.96	S07°7.76		36°46.12	2.7'	N27°47.42	4.2'	59.9'
7	288°19.13	8.70		51°7.83	2.7'	27°51.63	4.0'	59.9'
8	303°19.29	9.64		65°29.53	2.7'	27°55.65	3.8'	59.9'
9	318°19.45	· · 10.58		79°51.22	2.7'	27°59.46	3.6'	59.8'
10	333°19.61	11.52		94°12.90	2.7'	28°3.07	3.4'	59.8'
11	348°19.77	12.46		108°34.57	2.7'	28°6.47	3.2'	59.8'
12	3°19.93	S07°13.40		122°56.25	2.7'	N28°9.67	3.0'	59.8'
13	18°20.09	14.34		137°17.92	2.7'	28°12.66	2.8'	59.7'
14	33°20.25	15.28		151°39.60	2.7'	28°15.45	2.6'	59.7'
15	48°20.41	· · 16.22		166°1.28	2.7'	28°18.03	2.4'	59.7'
16	63°20.57	17.16		180°22.97	2.7'	28°20.41	2.2'	59.6'
17	78°20.72	18.10		194°44.68	2.7'	28°22.59	2.0'	59.6'
18	93°20.88	S07°19.04		209°6.40	2.7'	N28°24.56	1.8'	59.6'
19	108°21.04	19.98		223°28.13	2.8'	28°26.32	1.6'	59.6'
20	123°21.20	20.92		237°49.89	2.8'	28°27.89	1.4'	59.5'
21	138°21.36	· · 21.86		252°11.67	2.8'	28°29.25	1.2'	59.5'
22	153°21.52	22.80		266°33.47	2.8'	28°30.40	1.0'	59.5'
23	168°21.67	23.74		280°55.30	2.9'	28°31.36	0.8'	59.4'
SD = 16.0'			$d = 0.9'$	SD = 16.4'				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	183°21.83	S07°24.68		295°17.17	2.9'	N28°32.11	0.5'	59.4'
1	198°21.99	25.61		309°39.07	2.9'	28°32.66	0.3'	59.4'
2	213°22.14	26.55		324°1.00	3.0'	28°33.01	0.1'	59.4'
3	228°22.30	· · 27.49		338°22.98	3.0'	28°33.16	-0.1'	59.3'
4	243°22.46	28.43		352°44.99	3.1'	28°33.10	-0.3'	59.3'
5	258°22.61	29.36		7°7.06	3.1'	28°32.85	-0.5'	59.3'
6	273°22.77	S07°30.30		21°29.17	3.2'	N28°32.40	-0.6'	59.2'
7	288°22.92	31.24		35°51.33	3.2'	28°31.75	-0.8'	59.2'
8	303°23.08	32.18		50°13.54	3.3'	28°30.91	-1.0'	59.2'
9	318°23.24	· · 33.11		64°35.80	3.3'	28°29.86	-1.2'	59.1'
10	333°23.39	34.05		78°58.13	3.4'	28°28.63	-1.4'	59.1'
11	348°23.54	34.99		93°20.51	3.4'	28°27.19	-1.6'	59.1'
12	3°23.70	S07°35.92		107°42.96	3.5'	N28°25.57	-1.8'	59.1'
13	18°23.85	36.86		122°5.47	3.6'	28°23.75	-2.0'	59.0'
14	33°24.01	37.79		136°28.05	3.6'	28°21.73	-2.2'	59.0'
15	48°24.16	· · 38.73		150°50.70	3.7'	28°19.53	-2.4'	59.0'
16	63°24.32	39.67		165°13.43	3.8'	28°17.14	-2.6'	58.9'
17	78°24.47	40.60		179°36.22	3.9'	28°14.56	-2.8'	58.9'
18	93°24.62	S07°41.54		193°59.09	4.0'	N28°11.79	-3.0'	58.9'
19	108°24.77	42.47		208°22.05	4.0'	28°8.83	-3.1'	58.8'
20	123°24.93	43.41		222°45.08	4.1'	28°5.69	-3.3'	58.8'
21	138°25.08	· · 44.34		237°8.19	4.2'	28°2.37	-3.5'	58.8'
22	153°25.23	45.27		251°31.39	4.3'	27°58.86	-3.7'	58.7'
23	168°25.38	46.21		265°54.68	4.4'	27°55.17	-3.9'	58.7'
SD = 16.0'			$d = 0.9'$	SD = 16.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:38	05:57	07:06	16:26	17:34	18:52
N 70°	04:44	05:55	06:57	16:35	17:36	18:47
68°	04:49	05:53	06:50	16:42	17:38	18:42
66°	04:52	05:52	06:44	16:48	17:40	18:39
64°	04:55	05:50	06:38	16:54	17:41	18:36
62°	04:58	05:49	06:34	16:58	17:43	18:34
60°	05:00	05:48	06:30	17:02	17:44	18:32
N 58°	05:02	05:47	06:27	17:06	17:45	18:30
56°	05:03	05:46	06:23	17:09	17:46	18:29
54°	05:04	05:45	06:21	17:12	17:47	18:28
52°	05:05	05:44	06:18	17:14	17:48	18:27
50°	05:06	05:43	06:16	17:17	17:49	18:26
48°	05:07	05:41	06:11	17:22	17:51	18:25
N 40°	05:08	05:39	06:06	17:26	17:53	18:25
38°	05:08	05:37	06:03	17:30	17:55	18:25
36°	05:08	05:35	05:59	17:33	17:58	18:25
34°	05:06	05:31	05:54	17:39	18:02	18:27
N 10°	05:03	05:27	05:48	17:45	18:06	18:30
0°	04:58	05:23	05:43	17:50	18:11	18:35
S 10°	04:52	05:17	05:38	17:55	18:16	18:41
20°	04:44	05:10	05:33	18:01	18:23	18:49
30°	04:34	05:02	05:26	18:08	18:32	19:00
35°	04:27	04:57	05:23	18:11	18:37	19:08
40°	04:18	04:51	05:18	18:16	18:43	19:16
45°	04:07	04:43	05:13	18:21	18:51	19:27
S 50°	03:54	04:34	05:07	18:27	19:01	19:41
52°	03:47	04:30	05:04	18:30	19:05	19:48
54°	03:39	04:25	05:01	18:33	19:10	19:56
56°	03:31	04:19	04:58	18:37	19:16	20:04
58°	03:21	04:13	04:54	18:41	19:22	20:15
S 60°	03:09	04:06	04:50	18:45	19:29	20:27

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62°	16:24	<input type="checkbox"/>	<input type="checkbox"/>	13:15	<input type="checkbox"/>	<input type="checkbox"/>
60°	17:03	17:28	18:37	12:37	14:25	15:30
N 58°	17:30	18:07	19:14	12:11	13:47	14:52
56°	17:51	18:34	19:41	11:50	13:21	14:26
54°	18:09	18:55	20:02	11:32	12:59	14:05
52°	18:24	19:13	20:19	11:17	12:42	13:47
50°	18:38	19:28	20:34	11:05	12:27	13:32
45°	19:05	19:58	21:04	10:38	11:56	13:01
N 40°	19:27	20:22	21:27	10:17	11:33	12:38
35°	19:45	20:42	21:47	10:00	11:13	12:18
30°	20:00	20:59	22:03	09:45	10:57	12:01
20°	20:27	21:28	22:31	09:20	10:28	11:33
N 10°	20:50	21:52	22:55	08:58	10:04	11:08
0°	21:11	22:15	23:18	08:38	09:42	10:45
S 10°	21:33	22:38	23:40	08:18	09:19	10:22
20°	21:56	23:03	· · ·	07:57	08:55	09:58
30°	22:23	23:32	· · ·	07:32	08:27	09:29
35°	22:39	23:49	· · ·	07:17	08:10	09:12
40°	22:58	· · ·	00:09	07:01	07:51	08:52
45°	23:21	· · ·	00:33	06:41	07:28	08:28
S 50°	23:50	· · ·	01:05	06:16	06:58	07:56
52°	· · ·	00:05	01:20	06:04	06:43	07:40
54°	· · ·	00:22	01:39	05:50	06:26	07:22
56°	· · ·	00:42	02:01	05:34	06:05	07:00
58°	· · ·	01:07	02:30	05:15	05:40	06:31
S 60°	· · ·	01:42	03:13	04:52	05:05	05:48

Day	Sun		Mer. Pass hh:mm
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October 13, 14, 15 UT (Mon., Tue., Wed.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	21°48.59	202°13.58	N01°48.50	160°13.45	S16°16.00	266°10.86	N21°23.68	23°40.02	S03°31.91	Alpheratz	357°33.80 29°14.16
1	36°51.06	217°13.19	47.29	175°14.20	16.54	281°13.08	23.65	38°42.64	31.98	Ankaa	353°6.10 -42°9.89
2	51°53.52	232°12.80	46.08	190°14.95	17.08	296°15.30	23.61	53°45.26	32.04	Schedar	349°29.80 56°40.88
3	66°55.98	247°12.41	· · 44.87	205°15.70	· · 17.62	311°17.52	· · 23.58	68°47.88	· · 32.11	Diphda	348°46.34 -17°50.58
4	81°58.45	262°12.02	43.66	220°16.44	18.16	326°19.74	23.54	83°50.50	32.17	Achernar	335°19.11 -57°6.23
5	97°0.91	277°11.63	42.45	235°17.19	18.70	341°21.96	23.51	98°53.12	32.23	Hamal	327°50.16 23°35.18
6	112°3.38	292°11.24	N01°41.24	250°17.94	S16°19.24	356°24.19	N21°23.47	113°55.74	S03°32.30	Polaris	313°17.07 89°22.24
7	127°5.84	307°10.85	40.03	265°18.68	19.78	11°26.41	23.44	128°58.36	32.36	Acamar	315°10.90 -40°11.85
8	142°8.30	322°10.46	38.82	280°19.43	20.32	26°28.63	23.41	144°0.98	32.43	Menkar	314°5.21 4°11.60
9	157°10.77	337°10.07	· · 37.61	295°20.18	· · 20.86	41°30.86	· · 23.37	159°3.61	· · 32.49	Mirfak	308°26.94 49°57.14
10	172°13.23	352°9.68	36.40	310°20.92	21.39	56°33.08	23.34	174°6.23	32.56	Aldebaran	290°38.68 16°33.75
11	187°15.70	7°9.29	35.18	325°21.67	21.93	71°35.30	23.30	189°8.85	32.62	Rigel	281°3.09 -8°10.11
12	202°18.16	22°8.89	N01°33.97	340°22.41	S16°22.47	86°37.53	N21°23.27	204°11.47	S03°32.68	Capella	280°20.72 46°1.33
13	217°20.63	37°8.50	32.76	355°23.16	23.01	101°39.75	23.24	219°14.09	32.75	Bellatrix	278°22.05 6°22.51
14	232°23.09	52°8.11	31.55	10°23.90	23.54	116°41.98	23.20	234°16.71	32.81	Elnath	278°0.90 28°37.74
15	247°25.55	67°7.72	· · 30.34	25°24.65	· · 24.08	131°44.20	· · 23.17	249°19.33	· · 32.88	Alnilam	275°36.95 -1°10.96
16	262°28.02	82°7.33	29.13	40°25.39	24.62	146°46.43	23.14	264°21.95	32.94	Betelgeuse	270°51.29 7°24.83
17	277°30.48	97°6.94	27.91	55°26.14	25.16	161°48.65	23.10	279°24.57	33.00	Canopus	263°51.97 -52°42.17
18	292°32.95	112°6.55	N01°26.70	70°26.88	S16°25.69	176°50.88	N21°23.07	294°27.19	S03°33.07	Sirius	258°25.62 -16°44.84
19	307°35.41	127°6.16	25.49	85°27.62	26.23	191°53.11	23.04	309°29.81	33.13	Adhara	255°5.33 -29°0.12
20	322°37.87	142°5.77	24.27	100°28.37	26.77	206°55.33	23.00	324°32.43	33.19	Procyon	244°50.20 5°9.64
21	337°40.34	157°5.38	· · 23.06	115°29.11	· · 27.30	221°57.56	· · 22.97	339°35.05	· · 33.26	Pollux	243°16.57 27°57.80
22	352°42.80	172°4.99	21.85	130°29.85	27.84	236°59.79	22.94	354°37.67	33.32	Avior	234°14.65 -59°35.14
23	7°45.27	187°4.60	20.64	145°30.60	28.37	252°2.02	22.90	9°40.29	33.39	Suhail	222°46.06 -43°31.88
Mer.pass. 22:29		ν-0.4' d-1.2' m-3.92		ν0.7' d0.5' m1.53		ν2.2' d-0.0' m-2.19		ν2.6' d0.1' m0.67		Miaplacidus 221°38.60 -69°49.02	
										Alphard 217°47.31 -8°46.05	
										Regulus 207°33.99 11°50.54	
										Dubhe 193°40.75 61°36.59	
										Denebola 182°24.61 14°25.74	
										Gienah 175°43.28 -17°40.98	
										Acrux 173°0.14 -63°14.40	
										Gacrux 171°51.56 -57°15.34	
										Alioth 166°12.95 55°49.19	
										Spica 158°21.98 -11°17.66	
										Alkaid 152°51.98 49°11.13	
										Hadar 148°35.80 -60°29.83	
										Menkent 147°57.29 -36°29.76	
										Arcturus 145°47.67 19°2.99	
										Rigil Kent. 139°40.11 -60°56.54	
										Kochab 137°20.84 74°3.02	
										Zuben'ubi 136°55.65 -16°8.87	
										Alphecca 126°3.52 26°37.81	
										Antares 112°15.33 -26°29.35	
										Atria 107°9.33 -69°4.60	
										Sabik 102°2.26 -15°45.38	
										Shaula 96°9.72 -37°7.42	
										Rasalhague 95°58.13 12°32.62	
										Eltanin 90°42.10 51°29.36	
										Kaus Aust. 83°31.80 -34°22.41	
										Vega 80°32.91 38°48.69	
										Nunki 75°47.04 -26°15.91	
										Altair 61°59.33 8°56.34	
										Peacock 53°4.60 -56°39.30	
										Deneb 49°25.26 45°22.61	
										Enif 33°38.02 9°59.76	
										Al Na'ir 27°31.82 -46°50.25	
										Fomalhaut 15°13.54 -29°29.11	
										Scheat 13°44.33 28°13.57	
										Markab 13°29.02 15°20.82	
								</			

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		183°25.54	S07°47.14	280°18.05	4.5'	N27°51.31	-4.0' 58.7'
1		198°25.69	48.08	294°41.52	4.6'	27°47.26	-4.2' 58.6'
2		213°25.84	49.01	309°5.07	4.7'	27°43.03	-4.4' 58.6'
3		228°25.99	· · 49.94	323°28.72	4.7'	27°38.63	-4.6' 58.6'
4		243°26.14	50.88	337°52.47	4.8'	27°34.06	-4.7' 58.6'
5		258°26.29	51.81	352°16.32	4.9'	27°29.31	-4.9' 58.5'
6		273°26.44	S07°52.74	6°40.26	5.0'	N27°24.38	-5.1' 58.5'
7		288°26.59	53.68	21°4.30	5.1'	27°19.29	-5.3' 58.5'
8		303°26.74	54.61	35°28.45	5.2'	27°14.03	-5.4' 58.4'
9		318°26.89	· · 55.54	49°52.69	5.4'	27°8.60	-5.6' 58.4'
10		333°27.04	56.47	64°17.05	5.5'	27°3.01	-5.8' 58.4'
11		348°27.19	57.41	78°41.51	5.6'	26°57.25	-5.9' 58.3'
12		3°27.34	S07°58.34	93°6.07	5.7'	N26°51.33	-6.1' 58.3'
13		18°27.49	07°59.27	107°30.75	5.8'	26°45.25	-6.2' 58.3'
14		33°27.63	08°0.20	121°55.53	5.9'	26°39.00	-6.4' 58.2'
15		48°27.78	· · 1.13	136°20.42	6.0'	26°32.60	-6.6' 58.2'
16		63°27.93	2.06	150°45.43	6.1'	26°26.04	-6.7' 58.2'
17		78°28.08	2.99	165°10.55	6.2'	26°19.33	-6.9' 58.1'
18		93°28.23	S08°3.92	179°35.78	6.3'	N26°12.47	-7.0' 58.1'
19		108°28.37	4.86	194°1.12	6.5'	26°5.45	-7.2' 58.1'
20		123°28.52	5.79	208°26.58	6.6'	25°58.28	-7.3' 58.1'
21		138°28.67	· · 6.72	222°52.16	6.7'	25°50.96	-7.5' 58.0'
22		153°28.81	7.65	237°17.85	6.8'	25°43.50	-7.6' 58.0'
23		168°28.96	8.58	251°43.66	6.9'	25°35.89	-7.8' 58.0'
		SD = 16.0' $d = 0.9'$		SD = 16.0'			

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		183°29.11	S08°9.50	266°9.58	7.0'	N25°28.14	-7.9' 57.9'
1		198°29.25	10.43	280°35.63	7.2'	25°20.24	-8.0' 57.9'
2		213°29.40	11.36	295°1.79	7.3'	25°12.21	-8.2' 57.9'
3		228°29.54	· · 12.29	309°28.07	7.4'	25°4.04	-8.3' 57.8'
4		243°29.69	13.22	323°54.48	7.5'	24°55.73	-8.4' 57.8'
5		258°29.83	14.15	338°21.00	7.6'	24°47.28	-8.6' 57.8'
6		273°29.98	S08°15.08	352°47.64	7.8'	N24°38.70	-8.7' 57.7'
7		288°30.12	16.01	7°14.40	7.9'	24°29.99	-8.8' 57.7'
8		303°30.27	16.93	21°41.28	8.0'	24°21.15	-9.0' 57.7'
9		318°30.41	· · 17.86	36°8.28	8.1'	24°12.18	-9.1' 57.6'
10		333°30.55	18.79	50°35.40	8.2'	24°3.09	-9.2' 57.6'
11		348°30.70	19.72	65°2.65	8.4'	23°53.87	-9.3' 57.6'
12		3°30.84	S08°20.64	79°30.01	8.5'	N23°44.52	-9.5' 57.6'
13		18°30.98	21.57	93°57.49	8.6'	23°35.05	-9.6' 57.5'
14		33°31.12	22.50	108°25.10	8.7'	23°25.47	-9.7' 57.5'
15		48°31.27	· · 23.42	122°52.82	8.8'	23°15.76	-9.8' 57.5'
16		63°31.41	24.35	137°20.66	9.0'	23°5.94	-9.9' 57.4'
17		78°31.55	25.28	151°48.63	9.1'	22°56.00	-10.1' 57.4'
18		93°31.69	S08°26.20	166°16.71	9.2'	N22°45.95	-10.2' 57.4'
19		108°31.83	27.13	180°44.92	9.3'	22°35.79	-10.3' 57.3'
20		123°31.97	28.05	195°13.24	9.4'	22°25.51	-10.4' 57.3'
21		138°32.12	· · 28.98	209°41.68	9.6'	22°15.13	-10.5' 57.3'
22		153°32.26	29.91	224°10.24	9.7'	22°4.64	-10.6' 57.3'
23		168°32.40	30.83	238°38.91	9.8'	21°54.04	-10.7' 57.2'
		SD = 16.0' $d = 0.9'$		SD = 15.8'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		183°32.54	S08°31.76	253°7.71	9.9'	N21°43.34	-10.8' 57.2'
1		198°32.68	32.68	267°36.62	10.0'	21°32.54	-10.9' 57.2'
2		213°32.82	33.60	282°5.64	10.1'	21°21.64	-11.0' 57.1'
3		228°32.96	· · 34.53	296°34.79	10.3'	21°10.64	-11.1' 57.1'
4		243°33.09	35.45	311°4.04	10.4'	20°59.54	-11.2' 57.1'
5		258°33.23	36.38	325°33.41	10.5'	20°48.34	-11.3' 57.1'
6		273°33.37	S08°37.30	340°2.90	10.6'	N20°37.05	-11.4' 57.0'
7		288°33.51	38.22	354°32.50	10.7'	20°25.67	-11.5' 57.0'
8		303°33.65	39.15	9°2.21	10.8'	20°14.20	-11.6' 57.0'
9		318°33.79	· · 40.07	23°32.03	10.9'	20°2.63	-11.7' 56.9'
10		333°33.92	40.99	38°1.97	11.0'	19°50.98	-11.7' 56.9'
11		348°34.06	41.91	52°32.01	11.2'	19°39.24	-11.8' 56.9'
12		3°34.20	S08°42.84	67°2.16	11.3'	N19°27.42	-11.9' 56.9'
13		18°34.33	43.76	81°32.43	11.4'	19°15.51	-12.0' 56.8'
14		33°34.47	44.68	96°2.79	11.5'	19°3.51	-12.1' 56.8'
15		48°34.61	· · 45.60	110°33.27	11.6'	18°51.44	-12.2' 56.8'
16		63°34.74	46.52	125°3.85	11.7'	18°39.29	-12.2' 56.7'
17		78°34.88	47.44	139°34.54	11.8'	18°27.06	-12.3' 56.7'
18		93°35.02	S08°48.37	154°5.33	11.9'	N18°14.75	-12.4' 56.7'
19		108°35.15	49.29	168°36.23	12.0'	18°2.37	-12.5' 56.7'
20		123°35.29	50.21	183°7.23	12.1'	17°49.91	-12.5' 56.6'
21		138°35.42	· · 51.13	197°38.32	12.2'	17°37.39	-12.6' 56.6'
22		153°35.55	52.05	212°9.52	12.3'	17°24.79	-12.7' 56.6'
23		168°35.69	52.97	226°40.82	12.4'	17°12.12	-12.7' 56.6'
		SD = 16.0' $d = 0.9'$		SD = 15.6'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:52	06:10	07:20	16:10	17:20	18:37
N 70°	04:56	06:07	07:10	16:21	17:23	18:34
68°	04:59	06:04	07:01	16:30	17:26	18:31
66°	05:02	06:01	06:53	16:37	17:29	18:28
64°	05:04	05:59	06:47	16:43	17:31	18:26
62°	05:06	05:57	06:42	16:49	17:34	18:25
60°	05:07	05:55	06:37	16:53	17:35	18:23
N 58°	05:08	05:54	06:33	16:58	17:37	18:22
56°	05:09	05:52	06:30	17:01	17:39	18:22
54°	05:10	05:51	06:26	17:05	17:40	18:21
52°	05:10	05:49	06:23	17:08	17:42	18:21
50°	05:11	05:48	06:21	17:11	17:43	18:20
45°	05:11	05:45	06:15	17:17	17:46	18:20
N 40°	05:11	05:42	06:10	17:22	17:49	18:20
35°	05:10	05:40	06:05	17:26	17:52	18:21
30°	05:09	05:37	06:01	17:30	17:54	18:22
20°	05:07	05:32	05:55	17:37	17:59	18:25
N 10°	05:03	05:27	05:48	17:43	18:04	18:29
0°	04:58	05:22	05:43	17:49	18:10	18:34
S 10°	04:51	05:15	05:37	17:55	18:17	18:41
20°	04:42	05:08	05:30	18:02	18:24	18:50
30°	04:30	04:59	05:23	18:09	18:34	19:03
35°	04:22	04:53	05:19	18:14	18:40	19:10
40°	04:13	04:46	05:14	18:19	18:47	19:20
45°	04:01	04:38	05:08	18:25	18:55	19:32
S 50°	03:46	04:27	05:01	18:32	19:06	19:47
52°	03:39	04:22	04:58	18:35	19:11	19:54
54°	03:31	04:17	04:54	18:39	19:16	20:03
56°	03:22	04:11	04:50	18:43	19:23	20:12
58°	03:11	04:04	04:46	18:47	19:30	20:24
S 60°	02:58	03:56	04:41	18:53	19:38	20:37

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	20:40	<input type="checkbox"/>	<input type="checkbox"/>	19:17
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	21:56	<input type="checkbox"/>	<input type="checkbox"/>	18:00
68°	<input type="checkbox"/>	<input type="checkbox"/>	22:33	<input type="checkbox"/>	<input type="checkbox"/>	17:21
66°	<input type="checkbox"/>	20:35	22:59	<input type="checkbox"/>	17:34	16:54
64°	<input type="checkbox"/>	21:17	23:18	<input type="checkbox"/>	16:51	16:33
62°	19:42	21:45	23:34	16:30	16:22	16:16
60°	20:20	22:07	23:48	15:52	15:59	16:02
N 58°	20:46	22:24	23:59	15:25	15:41	15:49
56°	21:07	22:39	· · ·	15:04	15:26	15:39
54°	21:24	22:52	· · ·	14:47	15:13	15:29
52°	21:39	23:03	· · ·	14:32	15:01	15:21
50°	21:51	23:13	· · ·	14:19	14:51	15:13
45°	22:17	23:33	· · ·	13:52	14:29	14:57
N 40°	22:38	23:50	· · ·	13:30	14:11	14:43
35°	22:55	· · ·	00:04	13:12	13:56	14:32
30°	23:10	· · ·	00:16	12:57	13:43	14:22
20°	23:35	· · ·	00:36	12:30	13:21	14:04
N 10°	23:57	· · ·	00:54	12:08	13:01	13:49
0°	· · ·	00:17	01:10	11:46	12:43	13:34
S 10°	· · ·	00:37	01:27	11:25	12:25	13:20
20°	00:04	00:58	01:44	11:02	12:05	13:04
30°	00:32	01:23	02:05	10:35	11:42	12:46
35°	00:48	01:37	02:16	10:19	11:28	12:35
40°	01:07	01:54	02:30	10:00	11:12	12:23
45°	01:31	02:13	02:45	09:38	10:53	12:09
S 50°	02:00	02:38	03:05	09:09	10:30	11:51
52°	02:15	02:50	03:14	08:55	10:18	11:42
54°	02:31	03:04	03:24	08:38	10:05	11:33
56°	02:51	03:19	03:35	08:18	09:50	11:22
58°	03:16	03:38	03:48	07:54	09:32	11:10
S 60°	03:50	04:01	04:04	07:20	09:10	10:55

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 22-24 59-37%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
13	13:42	13:49	11:46	05:32	18:02	
14	13:56	14:03	11:46	06:30	18:57	
15	14:10	14:17	11:46	07:23	19:47	

Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	24°46.01	201°45.45	N00°21.05	161°6.64	S16°54.37	268°51.55	N21°21.32	26°48.54	S03°36.45
1	39°48.47	216°45.06	19.83	176°7.37	54.89	283°53.79	21.29	41°51.16	36.51
2	54°50.94	231°44.67	18.61	191°8.10	55.42	298°56.04	21.26	56°53.77	36.57
3	69°53.40	246°44.28	•• 17.40	206°8.83	•• 55.94	313°58.28	•• 21.23	71°56.39	•• 36.63
4	84°55.87	261°43.89	16.18	221°9.56	56.47	329°0.52	21.20	86°59.00	36.69
5	99°58.33	276°43.50	14.96	236°10.28	56.99	344°2.77	21.17	102°1.62	36.75
6	115°0.79	291°43.10	N00°13.74	251°11.01	S16°57.52	359°5.01	N21°21.14	117°4.23	S03°36.81
7	130°3.26	306°42.71	12.52	266°11.74	58.04	14°7.26	21.11	132°6.85	36.87
8	145°5.72	321°42.32	11.30	281°12.47	58.57	29°9.50	21.08	147°9.46	36.93
9	160°8.19	336°41.93	•• 10.08	296°13.19	•• 59.09	44°11.75	•• 21.05	162°12.08	•• 37.00
10	175°10.65	351°41.54	8.86	311°13.92	16°59.61	59°13.99	21.02	177°14.69	37.06
11	190°13.11	6°41.15	7.64	326°14.65	17°0.14	74°16.24	20.99	192°17.30	37.11
12	205°15.58	21°40.75	N00°6.42	341°15.37	S17°0.66	89°18.49	N21°20.96	207°19.92	S03°37.11
13	220°18.04	36°40.36	5.20	356°16.10	1.18	104°20.73	20.92	222°22.53	37.24
14	235°20.51	51°39.97	3.98	11°16.82	1.70	119°22.98	20.89	237°25.15	37.30
15	250°22.97	66°39.58	•• 2.76	26°17.55	•• 2.23	134°25.23	•• 20.86	252°27.76	•• 37.36
16	265°25.43	81°39.19	1.55	41°18.27	2.75	149°27.48	20.83	267°30.37	37.42
17	280°27.90	96°38.80	N00°0.33	56°19.00	3.27	164°29.73	20.80	282°32.99	37.48
18	295°30.36	111°38.40	S00°0.89	71°19.72	S17°3.79	179°31.97	N21°20.77	297°35.60	S03°37.54
19	310°32.83	126°38.01	2.11	86°20.44	4.31	194°34.22	20.74	312°38.22	37.60
20	325°35.29	141°37.62	3.33	101°21.17	4.84	209°36.47	20.71	327°40.83	37.66
21	340°37.75	156°37.23	•• 4.55	116°21.89	•• 5.36	224°38.72	•• 20.68	342°43.44	•• 37.72
22	355°40.22	171°36.84	5.77	131°22.61	5.88	239°40.97	20.65	357°46.06	37.78
23	10°42.68	186°36.45	6.99	146°23.34	6.40	254°43.22	20.62	12°48.67	37.84
Mer.pass. 22:17		ν-0.4' d-1.2' m-3.92		ν0.7' d0.5' m1.52		ν2.2' d-0.0' m-2.21		ν2.6' d0.1' m0.68	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	25°45.15	201°36.05	S00°8.22	161°24.06	S17°6.92	269°45.47	N21°20.59	27°51.28	S03°37.90
1	40°47.61	216°35.66	9.44	176°24.78	7.44	284°47.72	20.56	42°53.90	37.96
2	55°50.08	231°35.27	10.66	191°25.50	7.96	299°49.97	20.53	57°56.51	38.02
3	70°52.54	246°34.88	•• 11.88	206°26.23	•• 8.48	314°52.22	•• 20.50	72°59.12	•• 38.08
4	85°55.00	261°34.48	13.10	221°26.95	9.00	329°54.48	20.47	88°1.73	38.14
5	100°57.47	276°34.09	14.32	236°27.67	9.52	344°56.73	20.44	103°4.35	38.20
6	115°59.93	291°33.70	S00°15.54	251°28.39	S17°10.04	359°58.98	N21°20.41	118°6.96	S03°38.26
7</									

Oct 16 Thu	SHA	Mer.pass
Venus	176°59.44	10:33
Mars	136°20.63	13:15
Jupiter	244°5.54	06:04
Saturn	2°2.53	22:09

Oct 17 Fri	SHA	Mer.pass
Venus	175°50.91	10:34
Mars	135°38.91	13:14
Jupiter	244°0.32	06:00
Saturn	2°6.14	22:05

Oct 18 Sat	SHA	Mer.pass
Venus	174°42.35	10:35
Mars	134°57.04	13:13
Jupiter	243°55.29	05:56
Saturn	2°9.69	22:01

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.82	S08°53.89	241°12.22	12.5'	N16°59.38	-12.8'	56.5'
1	198°35.96	54.81	255°43.71	12.6'	16°46.57	-12.9'	56.5'
2	213°36.09	55.73	270°15.30	12.7'	16°33.70	-12.9'	56.5'
3	228°36.22	· · 56.65	284°46.99	12.8'	16°20.77	-13.0'	56.4'
4	243°36.36	57.56	299°18.77	12.9'	16°7.77	-13.1'	56.4'
5	258°36.49	58.48	313°50.64	13.0'	15°54.71	-13.1'	56.4'
6	273°36.62	S08°59.40	328°22.61	13.1'	N15°41.59	-13.2'	56.4'
7	288°36.75	09°0.32	342°54.66	13.1'	15°28.41	-13.2'	56.3'
8	303°36.89	1.24	357°26.81	13.2'	15°15.18	-13.3'	56.3'
9	318°37.02	· · 2.15	11°59.04	13.3'	15°1.88	-13.3'	56.3'
10	333°37.15	3.07	26°31.36	13.4'	14°48.53	-13.4'	56.3'
11	348°37.28	3.99	41°3.77	13.5'	14°35.13	-13.5'	56.2'
12	3°37.41	S09°4.91	55°36.27	13.6'	N14°21.68	-13.5'	56.2'
13	18°37.54	5.82	70°8.84	13.7'	14°8.17	-13.6'	56.2'
14	33°37.67	6.74	84°41.51	13.7'	13°54.61	-13.6'	56.2'
15	48°37.80	· · 7.66	99°14.25	13.8'	13°41.01	-13.7'	56.1'
16	63°37.93	8.57	113°47.07	13.9'	13°27.35	-13.7'	56.1'
17	78°38.06	9.49	128°19.98	14.0'	13°13.65	-13.7'	56.1'
18	93°38.19	S09°10.40	142°52.96	14.1'	N12°59.90	-13.8'	56.1'
19	108°38.32	11.32	157°26.02	14.1'	12°46.11	-13.8'	56.0'
20	123°38.45	12.24	171°59.15	14.2'	12°32.28	-13.9'	56.0'
21	138°38.58	· · 13.15	186°32.36	14.3'	12°18.40	-13.9'	56.0'
22	153°38.71	14.07	201°5.65	14.4'	12°4.49	-14.0'	56.0'
23	168°38.83	14.98	215°39.01	14.4'	11°50.53	-14.0'	56.0'

SD = 16.0' $d = 0.9'$

SD = 15.4'

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°38.96	S09°15.89	230°12.43	14.5'	N11°36.53	-14.0'	55.9'
1	198°39.09	16.81	244°45.93	14.6'	11°22.50	-14.1'	55.9'
2	213°39.22	17.72	259°19.50	14.6'	11°8.43	-14.1'	55.9'
3	228°39.34	· · 18.64	273°53.14	14.7'	10°54.33	-14.1'	55.9'
4	243°39.47	19.55	288°26.84	14.8'	10°40.19	-14.2'	55.8'
5	258°39.60	20.46	303°0.61	14.8'	10°26.01	-14.2'	55.8'
6	273°39.72	S09°21.38	317°34.44	14.9'	N10°11.81	-14.2'	55.8'
7	288°39.85	22.29	332°8.33	15.0'	09°57.57	-14.3'	55.8'
8	303°39.97	23.20	346°42.29	15.0'	09°43.31	-14.3'	55.7'
9	318°40.10	· · 24.11	1°16.31	15.1'	09°29.01	-14.3'	55.7'
10	333°40.22	25.03	15°50.38	15.1'	09°14.69	-14.3'	55.7'
11	348°40.35	25.94	30°24.52	15.2'	09°0.34	-14.4'	55.7'
12	3°40.47	S09°26.85	44°58.71	15.2'	N08°45.97	-14.4'	55.7'
13	18°40.60	27.76	59°32.96	15.3'	08°31.57	-14.4'	55.6'
14	33°40.72	28.67	74°7.27	15.4'	08°17.14	-14.4'	55.6'
15	48°40.85	· · 29.58	88°41.62	15.4'	08°2.70	-14.5'	55.6'
16	63°40.97	30.49	103°16.03	15.5'	07°48.23	-14.5'	55.6'
17	78°41.09	31.40	117°50.49	15.5'	07°33.74	-14.5'	55.6'
18	93°41.22	S09°32.31	132°25.00	15.6'	N07°19.23	-14.5'	55.5'
19	108°41.34	33.22	146°59.56	15.6'	07°4.71	-14.5'	55.5'
20	123°41.46	34.13	161°34.17	15.7'	06°50.16	-14.6'	55.5'
21	138°41.58	· · 35.04	176°8.82	15.7'	06°35.60	-14.6'	55.5'
22	153°41.71	35.95	190°43.52	15.7'	06°21.02	-14.6'	55.4'
23	168°41.83	36.86	205°18.26	15.8'	06°6.43	-14.6'	55.4'

SD = 16.0' $d = 0.9'$

SD = 15.3'


Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°41.95	S09°37.77	219°53.05	15.8'	N05°51.82	-14.6'	55.4'
1	198°42.07	38.68	234°27.88	15.9'	05°37.20	-14.6'	55.4'
2	213°42.19	39.59	249°2.74	15.9'	05°22.57	-14.6'	55.4'
3	228°42.31	· · 40.49	263°37.65	15.9'	05°7.92	-14.7'	55.3'
4	243°42.43	41.40	278°12.60	16.0'	04°53.27	-14.7'	55.3'
5	258°42.55	42.31	292°47.58	16.0'	04°38.61	-14.7'	55.3'
6	273°42.67	S09°43.22	307°22.60	16.1'	N04°23.93	-14.7'	55.3'
7	288°42.79	44.12	321°57.65	16.1'	04°9.26	-14.7'	55.3'
8	303°42.91	45.03	336°32.74	16.1'	03°54.57	-14.7'	55.3'
9	318°43.03	· · 45.94	351°7.85	16.2'	03°39.88	-14.7'	55.2'
10	333°43.15	46.84	5°43.01	16.2'	03°25.18	-14.7'	55.2'
11	348°43.27	47.75	20°18.19	16.2'	03°10.48	-14.7'	55.2'
12	3°43.38	S09°48.66	34°53.40	16.2'	N02°55.78	-14.7'	55.2'
13	18°43.50	49.56	49°28.63	16.3'	02°41.07	-14.7'	55.2'
14	33°43.62	50.47	64°3.90	16.3'	02°26.37	-14.7'	55.1'
15	48°43.74	· · 51.37	78°39.19	16.3'	02°11.66	-14.7'	55.1'
16	63°43.85	52.28	93°14.50	16.3'	01°56.95	-14.7'	55.1'
17	78°43.97	53.18	107°49.84	16.4'	01°42.25	-14.7'	55.1'
18	93°44.09	S09°54.09	122°25.20	16.4'	N01°27.55	-14.7'	55.1'
19	108°44.20	54.99	137°0.58	16.4'	01°12.85	-14.7'	55.1'
20	123°44.32	55.89	151°35.98	16.4'	00°58.15	-14.7'	55.0'
21	138°44.43	· · 56.80	166°11.40	16.4'	00°43.46	-14.7'	55.0'
22	153°44.55	57.70	180°46.84	16.5'	00°28.77	-14.7'	55.0'
23	168°44.66	58.60	195°22.29	16.5'	00°14.10	-14.7'	55.0'

SD = 16.0' $d = 0.9'$

SD = 15.1'

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:05	06:23	07:35	15:54	17:05	18:23
N 70°	05:08	06:18	07:22	16:07	17:10	18:21
68°	05:10	06:14	07:12	16:17	17:15	18:19
66°	05:11	06:11	07:04	16:26	17:18	18:18
64°	05:12	06:07	06:56	16:33	17:22	18:17
62°	05:13	06:05	06:50	16:39	17:25	18:16
60°	05:14	06:02	06:45	16:45	17:27	18:15
N 58°	05:15	06:00	06:40	16:50	17:29	18:15
56°	05:15	05:58	06:36	16:54	17:32	18:15
54°	05:15	05:56	06:32	16:58	17:34	18:14
52°	05:15	05:54	06:29	17:01	17:35	18:14
50°	05:15	05:53	06:25	17:04	17:37	18:15
45°	05:15	05:49	06:18	17:11	17:41	18:15
N 40°	05:14	05:45	06:13	17:17	17:45	18:16
35°	05:13	05:42	06:08	17:22	17:48	18:17
30°	05:11	05:39	06:03	17:27	17:51	18:19
20°	05:08	05:33	05:56	17:35	17:57	18:23
N 10°	05:03	05:27	05:49	17:42	18:03	18:28
0°	04:57	05:21	05:42	17:49	18:10	18:34
S 10°	04:49	05:14	05:35	17:55	18:17	18:42
20°	04:39	05:06	05:28	18:03	18:25	18:52
30°	04:26	04:55	05:20	18:11	18:36	19:05
35°	04:18	04:49	05:15	18:16	18:42	19:13
40°	04:08	04:41	05:09	18:22	18:50	19:24
45°	03:55	04:32	05:03	18:29	18:59	19:36
S 50°	03:39	04:21	04:55	18:37	19:11	19:53
52°	03:31	04:15	04:51	18:41	19:16	20:01
54°	03:22	04:09	04:47	18:45	19:23	20:10
56°	03:12	04:03	04:43	18:49	19:29	20:21
58°	03:00	03:55	04:38	18:54	19:37	20:33
S 60°	02:46	03:46	04:32	19:00	19:46	20:47

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	· · ·	00:05	02:19	17:29	16:44	16:10
N 70°	· · ·	00:25	02:27	17:06	16:33	16:07
68°	· · ·	00:41	02:33	16:48	16:25	16:05
66°	· · ·	00:54	02:39	16:33	16:17	16:04
64°	· · ·	01:05	02:43	16:21	16:11	16:02
62°	· · ·	01:14	02:47	16:11	16:06	16:01
60°	· · ·	01:22	02:50	16:02	16:01	16:00
N 58°	· · ·	01:28	02:53	15:54	15:57	15:59
56°	00:09	01:34	02:55	15:47	15:53	15:58
54°	00:18	01:40	02:58	15:41	15:50	15:57
52°	00:25	01:44	03:00	15:35	15:47	15:56
50°	00:32	01:49	03:02	15:30	15:44	15:56
45°	00:47	01:58	03:06	15:19	15:38	15:54
N 40°	00:59	02:05	03:09	15:10	15:32	15:53
35°	01:09	02:12	03:12	15:02	15:28	15:52
30°	01:18	02:18	03:15	14:55	15:24	15:51
20°	01:34	02:28	03:19	14:42	15:17	15:49
N 10°	01:47	02:36	03:23	14:32	15:11	15:48
0°	01:59	02:44	03:27	14:21	15:05	15:46
S 10°	02:12	02:53	03:30	14:11	14:59	15:45
20°	02:25	03:01	03:34	14:00	14:53	15:43
30°	02:40	03:11	03:39	13:47	14:45	15:41
35°	02:49	03:16	03:41	13:40	14:41	15:40
40°	02:58	03:23	03:44	13:31	14:36	15:39
45°	03:10	03:30	03:47	13:21	14:31	15:38
S 50°	03:24	03:39	03:51	13:09	14:24	15:36
52°	03:30	03:43	03:53	13:04	14:21	15:35
54°	03:37	03:47	03:55	12:57	14:17	15:34
56°	03:45	03:52	03:57	12:50	14:14	15:33
58°	03:54	03:57	03:59	12:42	14:09	15:32
S 60°	04:04	04:03	04:02	12:33	14:04	15:31

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 25-27 27-11%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
16	14:23	14:30	11:46	08:11	20:33	
17	14:36	14:42	11:45	08:55	21:16	
18	14:48	14:54	11:45	09:36	21:57	

October 19, 20, 21 UT (Sun., Mon., Tue.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	27°43.42	201°17.17	S01°6.85	161°58.42	S17°31.64	271°33.86	N21°19.21	29°56.60	S03°40.73					Alpheratz	357°33.81 29°14.17		
1	42°45.89	216°16.78	8.07	176°59.13	32.15	286°36.13	19.19	44°59.21	40.79					Ankaa	353°6.11 -42°9.91		
2	57°48.35	231°16.38	9.29	191°59.84	32.66	301°38.39	19.16	60°1.82	40.85					Schedar	349°29.81 56°40.91		
3	72°50.81	246°15.99	•• 10.51	207°0.55	•• 33.17	316°40.66	•• 19.13	75°4.43	•• 40.91					Diphda	348°46.34 -17°50.59		
4	87°53.28	261°15.59	11.74	222°1.26	33.68	331°42.93	19.10	90°7.03	40.96					Achernar	335°19.10 -57°6.26		
5	102°55.74	276°15.20	12.96	237°1.97	34.19	346°45.19	19.08	105°9.64	41.02					Hamal	327°50.15 23°35.20		
6	117°58.21	291°14.80	S01°14.18	252°2.67	S17°34.69	1°47.46	N21°19.05	120°12.25	S03°41.08					Polaris	313°15.64 89°22.28		
7	133°0.67	306°14.41	15.40	267°3.38	35.20	16°49.73	19.02	135°14.86	41.14					Acamar	315°10.88 -40°11.87		
8	148°3.13	321°14.01	16.63	282°4.09	35.71	31°52.00	19.00	150°17.47	41.19					Menkar	314°5.19 4°11.60		
9	163°5.60	336°13.62	•• 17.85	297°4.79	•• 36.22	46°54.27	•• 18.97	165°20.07	•• 41.25					Mirfak	308°26.91 49°57.17		
10	178°8.06	351°13.22	19.07	312°5.50	36.73	61°56.53	18.94	180°22.68	41.31					Aldebaran	290°38.65 16°33.75		
11	193°10.53	6°12.82	20.29	327°6.21	37.23	76°58.80	18.91	195°25.29	41.37					Rigel	281°3.06 -8°10.11		
12	208°12.99	21°12.43	S01°21.52	342°6.91	S17°37.74	92°1.07	N21°18.89	210°27.90	S03°41.42					Capella	280°20.67 46°1.34		
13	223°15.45	36°12.03	22.74	357°7.62	38.25	107°3.34	18.86	225°30.50	41.48					Bellatrix	278°22.01 6°22.50		
14	238°17.92	51°11.64	23.96	12°8.33	38.75	122°5.61	18.83	240°33.11	41.54					Elnath	278°0.86 28°37.74		
15	253°20.38	66°11.24	•• 25.19	27°9.03	•• 39.26	137°7.88	•• 18.81	255°35.72	•• 41.59					Alnilam	275°36.91 -1°10.97		
16	268°22.85	81°10.84	26.41	42°9.74	39.77	152°10.15	18.78	270°38.32	41.65					Betelgeuse	270°51.25 7°24.82		
17	283°25.31	96°10.45	27.63	57°10.44	40.27	167°12.43	18.75	285°40.93	41.71					Canopus	263°51.91 -52°42.18		
18	298°27.77	111°10.05	S01°28.85	72°11.14	S17°40.78	182°14.70	N21°18.73	300°43.54	S03°41.76					Sirius	258°25.58 -16°44.85		
19	313°30.24	126°9.66	30.08	87°11.85	41.28	197°16.97	18.70	315°46.14	41.82					Adhara	255°5.29 -29°0.12		
20	328°32.70	141°9.26	31.30	102°12.55	41.79	212°19.24	18.67	330°48.75	41.88					Procyon	244°50.16 5°9.64		
21	343°35.17	156°8.86	•• 32.52	117°13.26	•• 42.29	227°21.51	•• 18.65	345°51.36	•• 41.93					Pollux	243°16.52 27°57.79		
22	358°37.63	171°8.47	33.74	132°13.96	42.80	242°23.79	18.62	0°53.96	41.99					Avior	234°14.59 -59°35.14		
23	13°40.09	186°8.07	34.97	147°14.66	43.30	257°26.06	18.59	15°56.57	42.05					Suhail	222°46.01 -43°31.87		
Mer.pass. 22:05			ν-0.4' d1.2' m-3.92			ν0.7' d0.5' m1.51			ν2.3' d-0.0' m-2.23			ν2.6' d0.1' m0.70			Miaplacidus 221°38.51 -69°49.01		
															Alphard 217°47.27 -8°46.05		
															Regulus 207°33.96 11°50.52		
															Dubhe 193°40.70 61°36.56		
															Denebola 182°24.59 14°25.73		
															Gienah 175°43.26 -17°40.97		
															Acrux 173°0.11 -63°14.38		
															Gacrux 171°51.54 -57°15.32		
															Alioth 166°12.94 55°49.15		
															Spica 158°21.97 -11°17.66		
															Alkaid 152°51.98 49°11.09		
															Hadar 148°35.80 -60°29.81		
															Menkent 147°57.29 -36°29.75		
															Arcturus 145°47.67 19°2.96		
															Rigel Kent. 139°40.13 -60°56.52		
															Kochab 137°20.89 74°2.98		
															Zuben'ubi 136°55.65 -16°8.87		
															Alphecca 126°3.53 26°37.79		
															Antares 112°15.35 -26°29.35		
															Atria 107°9.39 -69°4.58		
															Sabik 102°2.29 -15°45.38		
															Shaula 96°9.75 -37°7.42		
															Rasalhague 95°58.16 12°32.61		
															Eltanin 90°42.15 51°29.34		
															Kaus Aust. 83°31.83 -34°22.41		
															Vega 80°32.95 38°48.68		
															Nunki 75°47.08 -26°15.91		
															Altair 61°59.36 8°56.33		
															Peacock 53°4.65 -56°39.31		
															Deneb 49°25.31 45°22.62		
															Enif 33°38.04 9°59.76		
															Al Na'ir 27°31.85 -46°50.27		
															Fomalhaut 15°13.55 -29°29.13		
															Scheat 13°44.34 28°13.58		
															Markab 13°29.04 15°20.83		
Oct 19 Sun			SHA			Mer.pass											
			Venus 173°33.75			10:35											
			Mars 134°15.00			13:11											
			Jupiter 243°50.44			05:53											
			Saturn 2°13.18			21:56											
Oct 20 Mon			SHA			Mer.pass											
			Venus 172°25.11			10:36											
			Mars 133°32.81			13:10											
			Jupiter 243°45.77			05:49											
			Saturn 2°16.62			21:52											
Oct 21 Tue			SHA			Mer.pass											
			Venus 171°16.42			10:36											
			Mars 132°50.46			13:09											
			Jupiter 243°41.30			05:46											
			Saturn 2°19.99			21:48											
			Horizontal parallax														
			Venus: 0.1														
			Mars: 0.1														
Mer.pass. 21:58			ν-0.4' d1.2' m-3.92			ν0.7' d0.5' m1.50			ν2.3' d-0.0' m-2.24			ν2.6' d0.1' m0.71					

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Sun							
0	183°44.78	S09°59.51	209°57.76	16.5'	S00°0.58	14.7'	55.0'
1	198°44.89	10°0.41	224°33.25	16.5'	00°15.24	14.7'	54.9'
2	213°45.01	1.31	239°8.74	16.5'	00°29.89	14.6'	54.9'
3	228°45.12	· · 2.21	253°44.25	16.5'	00°44.54	14.6'	54.9'
4	243°45.24	3.11	268°19.78	16.5'	00°59.17	14.6'	54.9'
5	258°45.35	4.02	282°55.31	16.5'	01°13.79	14.6'	54.9'
6	273°45.46	S10°4.92	297°30.85	16.5'	S01°28.40	14.6'	54.9'
7	288°45.58	5.82	312°6.40	16.6'	01°43.00	14.6'	54.8'
8	303°45.69	6.72	326°41.95	16.6'	01°57.58	14.6'	54.8'
9	318°45.80	· · 7.62	341°17.51	16.6'	02°12.14	14.6'	54.8'
10	333°45.91	8.52	355°53.08	16.6'	02°26.70	14.5'	54.8'
11	348°46.02	9.42	10°28.65	16.6'	02°41.23	14.5'	54.8'
12	3°46.14	S10°10.32	25°4.22	16.6'	S02°55.75	14.5'	54.8'
13	18°46.25	11.22	39°39.80	16.6'	03°10.25	14.5'	54.8'
14	33°46.36	12.12	54°15.37	16.6'	03°24.73	14.5'	54.7'
15	48°46.47	· · 13.02	68°50.95	16.6'	03°39.19	14.4'	54.7'
16	63°46.58	13.92	83°26.52	16.6'	03°53.62	14.4'	54.7'
17	78°46.69	14.82	98°2.10	16.6'	04°8.04	14.4'	54.7'
18	93°46.80	S10°15.71	112°37.66	16.6'	S04°22.44	14.4'	54.7'
19	108°46.91	16.61	127°13.23	16.6'	04°36.81	14.3'	54.7'
20	123°47.02	17.51	141°48.78	16.6'	04°51.16	14.3'	54.7'
21	138°47.13	· · 18.41	156°24.34	16.5'	05°5.48	14.3'	54.6'
22	153°47.24	19.30	170°59.88	16.5'	05°19.78	14.3'	54.6'
23	168°47.34	20.20	185°35.42	16.5'	05°34.05	14.2'	54.6'
SD = 16.0'		$d = 0.9'$	SD = 15.0'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°47.45	S10°21.10	200°10.94	16.5'	S05°48.29	14.2'	54.6'
1	198°47.56	21.99	214°46.46	16.5'	06°2.51	14.2'	54.6'
2	213°47.67	22.89	229°21.96	16.5'	06°16.70	14.2'	54.6'
3	228°47.77	· · 23.79	243°57.46	16.5'	06°30.85	14.1'	54.6'
4	243°47.88	24.68	258°32.93	16.5'	06°44.98	14.1'	54.5'
5	258°47.99	25.58	273°8.40	16.4'	06°59.08	14.1'	54.5'
6	273°48.09	S10°26.47	287°43.85	16.4'	S07°13.14	14.0'	54.5'
7	288°48.20	27.37	302°19.28	16.4'	07°27.17	14.0'	54.5'
8	303°48.31	28.26	316°54.70	16.4'	07°41.17	14.0'	54.5'
9	318°48.41	· · 29.16	331°30.10	16.4'	07°55.13	13.9'	54.5'
10	333°48.52	30.05	346°5.48	16.4'	08°9.06	13.9'	54.5'
11	348°48.62	30.94	0°40.83	16.3'	08°22.95	13.9'	54.4'
12	3°48.73	S10°31.84	15°16.17	16.3'	S08°36.80	13.8'	54.4'
13	18°48.83	32.73	29°51.49	16.3'	08°50.62	13.8'	54.4'
14	33°48.94	33.62	44°26.78	16.3'	09°4.39	13.7'	54.4'
15	48°49.04	· · 34.52	59°2.05	16.2'	09°18.13	13.7'	54.4'
16	63°49.14	35.41	73°37.30	16.2'	09°31.83	13.7'	54.4'
17	78°49.25	36.30	88°12.52	16.2'	09°45.48	13.6'	54.4'
18	93°49.35	S10°37.19	102°47.71	16.2'	S09°59.10	13.6'	54.4'
19	108°49.45	38.08	117°22.88	16.1'	10°12.67	13.5'	54.4'
20	123°49.55	38.97	131°58.02	16.1'	10°26.20	13.5'	54.3'
21	138°49.66	· · 39.87	146°33.13	16.1'	10°39.68	13.4'	54.3'
22	153°49.76	40.76	161°8.21	16.0'	10°53.12	13.4'	54.3'
23	168°49.86	41.65	175°43.26	16.0'	11°6.51	13.3'	54.3'
SD = 16.1'		$d = 0.9'$	SD = 14.9'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.96	S10°42.54	190°18.28	16.0'	S11°19.86	13.3'	54.3'
1	198°50.06	43.43	204°53.26	16.0'	11°33.16	13.2'	54.3'
2	213°50.16	44.32	219°28.22	15.9'	11°46.41	13.2'	54.3'
3	228°50.26	· · 45.21	234°3.13	15.9'	11°59.61	13.2'	54.3'
4	243°50.36	46.09	248°38.02	15.8'	12°12.76	13.1'	54.3'
5	258°50.46	46.98	263°12.87	15.8'	12°25.86	13.0'	54.2'
6	273°50.56	S10°47.87	277°47.68	15.8'	S12°38.90	13.0'	54.2'
7	288°50.66	48.76	292°22.46	15.7'	12°51.90	12.9'	54.2'
8	303°50.76	49.65	306°57.19	15.7'	13°4.84	12.9'	54.2'
9	318°50.86	· · 50.54	321°31.89	15.7'	13°17.73	12.8'	54.2'
10	333°50.96	51.42	336°6.55	15.6'	13°30.56	12.8'	54.2'
11	348°51.06	52.31	350°41.17	15.6'	13°43.34	12.7'	54.2'
12	3°51.15	S10°53.20	5°15.75	15.5'	S13°56.06	12.7'	54.2'
13	18°51.25	54.08	19°50.28	15.5'	14°8.72	12.6'	54.2'
14	33°51.35	54.97	34°24.78	15.5'	14°21.32	12.5'	54.2'
15	48°51.45	· · 55.86	48°59.23	15.4'	14°33.87	12.5'	54.1'
16	63°51.54	56.74	63°33.64	15.4'	14°46.35	12.4'	54.1'
17	78°51.64	57.63	78°8.00	15.3'	14°58.77	12.4'	54.1'
18	93°51.74	S10°58.51	92°42.32	15.3'	S15°11.13	12.3'	54.1'
19	108°51.83	10°59.40	107°16.59	15.2'	15°23.43	12.2'	54.1'
20	123°51.93	11°0.28	121°50.81	15.2'	15°35.67	12.2'	54.1'
21	138°52.02	· · 1.17	136°24.99	15.1'	15°47.84	12.1'	54.1'
22	153°52.12	2.05	150°59.12	15.1'	15°59.95	12.0'	54.1'
23	168°52.21	2.93	165°33.20	15.0'	16°11.98	12.0'	54.1'
SD = 16.1'		$d = 0.9'$	SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:18	06:37	07:50	15:37	16:51	18:09
N 70°	05:19	06:30	07:35	15:52	16:58	18:08
68°	05:20	06:25	07:24	16:05	17:03	18:08
66°	05:20	06:20	07:14	16:14	17:08	18:07
64°	05:21	06:16	07:05	16:23	17:12	18:07
62°	05:21	06:12	06:58	16:30	17:16	18:07
60°	05:21	06:09	06:52	16:36	17:19	18:07
N 58°	05:21	06:06	06:47	16:42	17:22	18:07
56°	05:21	06:04	06:42	16:47	17:25	18:08
54°	05:20	06:02	06:38	16:51	17:27	18:08
52°	05:20	05:59	06:34	16:55	17:29	18:08
50°	05:20	05:57	06:30	16:59	17:31	18:09
45°	05:18	05:53	06:22	17:06	17:36	18:10
N 40°	05:17	05:48	06:16	17:13	17:40	18:12
35°	05:15	05:45	06:10	17:19	17:44	18:14
30°	05:13	05:41	06:05	17:24	17:48	18:16
20°	05:08	05:34	05:57	17:33	17:55	18:21
N 10°	05:03	05:27	05:49	17:41	18:02	18:27
0°	04:56	05:20	05:41	17:48	18:09	18:34
S 10°	04:48	05:13	05:34	17:56	18:17	18:42
20°	04:37	05:03	05:26	18:04	18:27	18:53
30°	04:23	04:52	05:16	18:14	18:38	19:07
35°	04:14	04:45	05:11	18:19	18:45	19:16
40°	04:03	04:37	05:05	18:25	18:54	19:28
45°	03:49	04:27	04:58	18:33	19:04	19:41
S 50°	03:32	04:14	04:49	18:42	19:16	19:59
52°	03:24	04:09	04:45	18:46	19:22	20:08
54°	03:14	04:02	04:40	18:51	19:29	20:18
56°	03:03	03:55	04:35	18:56	19:37	20:29
58°	02:50	03:46	04:30	19:01	19:45	20:43
S 60°	02:34	03:37	04:23	19:08	19:55	20:59

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	04:22	06:24	08:40	15:37	15:01	14:12
N 70°	04:20	06:13	08:13	15:42	15:15	14:41
68°	04:19	06:03	07:53	15:47	15:27	15:03
66°	04:18	05:56	07:38	15:50	15:36	15:20
64°	04:17	05:50	07:25	15:53	15:44	15:34
62°	04:16	05:44	07:14	15:56	15:51	15:46
60°	04:15	05:39	07:05	15:58	15:57	15:56
N 58°	04:15	05:35	06:57	16:00	16:02	16:05
56°	04:14	05:32	06:50	16:02	16:07	16:13
54°	04:13	05:28	06:44	16:04	16:11	16:20
52°	04:13	05:25	06:38	16:06	16:15	16:26
50°	04:13	05:23	06:33	16:07	16:19	16:32
45°	04:12	05:17	06:22	16:10	16:27	16:45
N 40°	04:11	05:12	06:13	16:13	16:33	16:55
35°	04:10	05:08	06:06	16:15	16:39	17:04
30°	04:10	05:04	05:59	16:17	16:44	17:12
20°	04:09	04:58	05:48	16:21	16:52	17:25
N 10°	04:08	04:53	05:38	16:24	17:00	17:37
0°	04:07	04:47	05:28	16:27	17:07	17:48
S 10°	04:07	04:42	05:19	16:29	17:14	18:00
20°	04:06	04:37	05:09	16:33	17:22	18:12
30°	04:05	04:31	04:58	16:36	17:31	18:26
35°	04:04	04:28	04:52	16:38	17:36	18:34
40°	04:04	04:24	04:45	16:40	17:42	18:43
45°	04:03	04:19	04:36	16:43	17:48	18:54
S 50°	04:03	04:14	04:27	16:46	17:57	19:07
52°	04:02	04:12	04:22	16:48	18:00	19:13
54°	04:02	04:09	04:17	16:50	18:04	19:20
56°	04:02	04:06	04:11	16:51	18:09	19:28
58°	04:01	04:03	04:05	16:53	18:14	19:37
S 60°	04:01	03:59	03:58	16:56	18:20	19:47

Day	Sun			Moon		
	Eqn. of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	28-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%
19	14:59	15:05	11:45	10:17	22:37	
20	15:10	15:15	11:45	10:57	23:18	
21	15:20	15:25	11:45	11:38	—:—	

October 22, 23, 24 UT (Wed., Thu., Fri.)

h	Aries			Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	30°40.83	200°48.51	S02°34.86	162°48.78	S18°7.74	274°17.84	N21°17.36	33°4.14	S03°44.75		
1	45°43.30	215°48.10	36.08	177°49.47	8.23	289°20.13	17.34	48°6.74	44.81		
2	60°45.76	230°47.70	37.30	192°50.16	8.72	304°22.42	17.32	63°9.34	44.86		
3	75°48.22	245°47.30	· · 38.52	207°50.84	· · 9.22	319°24.71	· · 17.29	78°11.94	· · 44.91		
4	90°50.69	260°46.90	39.74	222°51.53	9.71	334°27.00	17.27	93°14.54	44.97		
5	105°53.15	275°46.49	40.97	237°52.22	10.20	349°29.29	17.25	108°17.15	45.02		
6	120°55.62	290°46.09	S02°42.19	252°52.91	S18°10.69	4°31.58	N21°17.22	123°19.75	S03°45.07		
7	135°58.08	305°45.69	43.41	267°53.60	11.18	19°33.87	17.20	138°22.35	45.13		
8	151°0.55	320°45.29	44.63	282°54.28	11.67	34°36.16	17.18	153°24.95	45.18		
9	166°3.01	335°44.88	· · 45.85	297°54.97	· · 12.16	49°38.45	· · 17.15	168°27.55	· · 45.23		
10	181°5.47	350°44.48	47.07	312°55.66	12.65	64°40.75	17.13	183°30.15	45.29		
11	196°7.94	5°44.08	48.29	327°56.34	13.14	79°43.04	17.11	198°32.75	45.34		
12	211°10.40	20°43.67	S02°49.51	342°57.03	S18°13.63	94°45.33	N21°17.08	213°35.34	S03°45.39		
13	226°12.87	35°43.27	50.74	357°57.72	14.12	109°47.63	17.06	228°37.94	45.45		
14	241°15.33	50°42.87	51.96	12°58.40	14.61	124°49.92	17.04	243°40.54	45.50		
15	256°17.79	65°42.46	· · 53.18	27°59.09	· · 15.10	139°52.21	· · 17.01	258°43.14	· · 45.55		
16	271°20.26	80°42.06	54.40	42°59.77	15.59	154°54.51	16.99	273°45.74	45.61		
17	286°22.72	95°41.65	55.62	58°0.46	16.08	169°56.80	16.97	288°48.34	45.66		
18	301°25.19	110°41.25	S02°56.84	73°1.14	S18°16.57	184°59.10	N21°16.94	303°50.94	S03°45.71		
19	316°27.65	125°40.84	58.06	88°1.83	17.06	200°1.39	16.92	318°53.54	45.76		
20	331°30.11	140°40.44	02°59.28	103°2.51	17.55	215°3.69	16.90	333°56.14	45.82		
21	346°32.58	155°40.04	03°0.50	118°3.19	· · 18.03	230°5.99	· · 16.88	348°58.74	· · 45.87		
22	1°35.04	170°39.63	1.72	133°3.88	18.52	245°8.28	16.85	4°1.33	45.92		
23	16°37.51	185°39.23	2.94	148°4.56	19.01	260°10.58	16.83	19°3.93	45.97		
Mer.pass. 21:54			ν-0.4' d1.2' m-3.92			ν0.7' d0.5' m1.50			ν2.3' d-0.0' m-2.25		

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	31°39.97	200°38.82	S03°4.16	163°5.24	S18°19.50	275°12.88	N21°16.81	34°6.53	S03°46.03	
1	46°42.44	215°38.42	5.38	178°5.93	19.98	290°15.17	16.79	49°9.13	46.08	
2	61°44.90	230°38.01	6.60	193°6.61	20.47	305°17.47	16.76	64°11.73	46.13	
3	76°47.36	245°37.60	· · 7.82	208°7.29	· · 20.96	320°19.77	· · 16.74	79°14.33	· · 46.18	
4	91°49.83	260°37.20	9.04	223°7.97	21.44	335°22.07	16.72	94°16.92	46.24	
5	106°52.29	275°36.79	10.26	238°8.65	21.93	350°24.37	16.70	109°19.52	46.29	
6	121°54.76	290°36.39	S03°11.48	253°9.34	S18°22.41	5°26.66	N21°16.67	124°22.12	S03°46.34	
7	136°57.22	305°35.98	12.70	268°10.02	22.90	20°28.96	16.65	139°24.72	46.39	
8	151°59.68	320°35.57	13.92	283°10.70	23.38	35°31.26	16.63	154°27.31	46.45	
9	167°2.15	335°35.17	· · 15.14	298°11.38	· · 23.87	50°33.56	· · 16.61	169°29.91	· · 46.50	
10	182°4.61	350°34.76	16.36	313°12.06	24.35	65°35.86	16.59	184°32.51	46.55	
11	197°7.08	5°34.36	17.58	328°12.74	24.84	80°38.16	16.56	199°35.10	46.60	
12	212°9.54	20°33.95	S03°18.80	343°13.42	S18°25.32	95°40.47	N21°16.54	214°37.70	S03°46.65	
13	227°12.00	35°33.54	20.02	358°14.10	25.81	110°42.77	16.52	229°40.30	46.70	
14	242°14.47	50°33.13	21.24	13°14.78	26.29	125°45.07	16.50	244°42.90	46.76	
15	257°16.93	65°32.73	· · 22.46	28°15.46	· · 26.77	140°47.37	· · 16.48	259°45.49	· · 46.81	
16	272°19.40	80°32.32	23.68	43°16.13	27.26	155°49.67	16.45	274°48.09	46.86	
17	287°21.86	95°31.91	24.90	58°16.81	27.74	170°51.98	16.43	289°50.68	46.91	
18	302°24.33	110°31.50	S03°26.12	73°17.49	S18°28.22	185°54.28	N21°16.41	304°53.28	S03°46.96	
19	317°26.79	125°31.10	27.33	88°18.17	28.70	200°56.58	16.39	319°55.88	47.01	
20	332°29.25	140°30.69	28.55	103°18.85	29.19	215°58.89	16.37	334°58.47	47.07	
21	347°31.72	155°30.28	· · 29.77	118°19.52	· · 29.67	231°1.19	· · 16.35	350°1.07	· · 47.12	
22	2°34.18	170°29.87	30.99	133°20.20	30.15	246°3.49	16.33	5°3.66	47.17	
23	17°36.65	185°29.46	32.21	148°20.88	30.63	261°5.80	16.30	20°6.26	47.22	
Mer.pass. 21:50			ν-0.4' d1.2' m-3.92		ν0.7' d0.5' m1.50		ν2.3' d-0.0' m-2.26		ν2.6' d0.1' m0.72	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	32°39.11	200°29.06	S03°33.43	163°21.55	S18°31.11	276°8.10	N21°16.28	35°8.86	S03°47.27	
1	47°41.57	215°28.65	34.65	178°22.23	31.59	291°10.41	16.26	50°11.45	47.32	
2	62°44.04	230°28.24	35.86	193°22.90	32.07	306°12.71	16.24	65°14.05	47.37	
3	77°46.50	245°27.83	· · 37.08	208°23.58	· · 32.56	321°15.02	· · 16.22	80°16.64	· · 47.42	
4	92°48.97	260°27.42	38.30	223°24.26	33.04	336°17.33	16.20	95°19.24	47.47	
5	107°51.43	275°27.01	39.52	238°24.93	33.52	351°19.63	16.18	110°21.83	47.52	
6	122°53.89	290°26.60	S03°40.74	253°25.61	S18°34.00	6°21.94	N21°16.16	125°24.43	S03°47.58	
7	137°56.36	305°26.19	41.96	268°26.28	34.47	21°24.25	16.14	140°27.02	47.63	
8	152°58.82	320°25.78	43.17	283°26.95	34.95	36°26.56	16.11	155°29.62	47.68	
9	168°1.29	335°25.37	· · 44.39	298°27.63	· · 35.43	51°28.86	· · 16.09	170°32.21	· · 47.73	
10	183°3.75	350°24.96	45.61	313°28.30	35.91	66°31.17	16.07	185°34.80	47.78	
11	198°6.22	5°24.55	46.83	328°28.97	36.39	81°33.48	16.05	200°37.40	47.83	
12	213°8.68	20°24.14	S03°48.04	343°29.65	S18°36.87	96°35.79	N21°16.03	215°39.99	S03°47.88	
13	228°11.14	35°23.73	49.26	358°30.32	37.35	111°38.10	16.01	230°42.59	47.93	
14	243°13.61	50°23.32	50.48	13°30.99	37.82	126°40.41	15.99	245°45.18	47.98	
15	258°16.07	65°22.91	· · 51.69	28°31.66	· · 38.30	141°42.72	· · 15.97	260°47.77	· · 48.03	
16	273°18.54	80°22.50	52.91	43°32.34	38.78	156°45.03	15.95	275°50.37	48.08	
17	288°21.00	95°22.09	54.13	58°33.01	39.25	171°47.34	15.93	290°52.96	48.13	
18	303°23.46	110°21.67	S03°55.35	73°33.68	S18°39.73	186°49.65	N21°15.91	305°55.55	S03°48.18	
19	318°25.93	125°21.26	56.56	88°34.35	40.21	201°51.96	15.89	320°58.15	48.23	
20	333°28.39	140°20.85	57.78	103°35.02	40.68	216°54.27	15.87	336°0.74	48.28	
21	348°30.86	155°20.44	03°58.99	118°35.69	· · 41.16	231°56.59	· · 15.85	351°3.33	· · 48.33	
22	3°33.32	170°20.03	04°0.21	133°36.36	41.64	246°58.90	15.83	6°5.93	48.38	
23	18°35.79	185°19.61	1.43	148°37.03	42.11	262°1.21	15.81	21°8.52	48.43	
Mer.pass. 21:46			ν-0.4' d1.2' m-3.92		ν0.7' d0.5' m1.49		ν2.3' d-0.0' m-2.27		ν2.6' d0.1' m0.73	

	SHA	Dec
Alpheratz	357°33.81	29°14.18
Ankaa	353°6.11	-42°9.92
Schedar	349°29.81	56°40.92
Diphda	348°46.35	-17°50.60
Achernar	335°19.10	-57°6.28
Hamal	327°50.14	23°35.20
Polaris	313°14.82	89°22.29
Acamar	315°10.87	-40°11.89
Menkar	314°5.18	4°11.60
Mirfak	308°26.89	49°57.17
Aldebaran	290°38.63	16°33.75
Rigel	281°3.04	-8°10.12
Capella	280°20.65	46°1.35
Bellatrix	278°21.99	6°22.50
Elnath	278°0.84	28°37.74
Alnilam	275°36.89	-1°10.97
Betelgeuse	270°51.23	7°24.82
Canopus	263°51.89	-52°42.19
Sirius	258°25.56	-16°44.86
Adhara	255°5.27	-29°0.13
Procyon	244°50.14	5°9.63
Pollux	243°16.50	27°57.78
Avior	234°14.55	-59°35.14
Suhail	222°45.98	-43°31.87
Miaplacidus	221°38.46	-69°49.00
Alphard	217°47.26	-8°46.06
Regulus	207°33.94	11°50.52
Dubhe	193°40.68	61°36.55
Denebola	182°24.58	14°25.72
Gienah	175°43.25	-17°40.97
Acrux	173°0.09	-63°14.37
Gacrux	171°51.53	-57°15.30
Alioth	166°12.93	55°49.13
Spica	158°21.97	-11°17.66
Alkaid	152°51.98	49°11.08
Hadar	148°35.80	-60°29.80
Menkent	147°57.29	-36°29.74
Arcturus	145°47.67	19°2.96
Rigel Kent.	139°40.13	-60°56.51
Kochab	137°20.91	74°2.97
Zuben'ubi	136°55.66	-16°8.87
Alphecca	126°3.54	26°37.78
Antares	112°15.36	-26°29.35
Atria	107°9.42	-69°4.57
Sabik	102°2.30	-15°45.38
Shaula	96°9.77	-37°7.41
Rasalhague	95°58.17	12°32.60
Eltanin	90°42.17	51°29.34
Kaus Aust.	83°31.85	-34°22.41
Vega	80°32.96	38°48.67
Nunki	75°47.09	-26°15.91
Altair	61°59.38	8°56.33
Peacock	53°4.68	-56°39.31
Deneb	49°25.33	45°22.62
Enif	33°38.05	9°59.76
Al Na'ir	27°31.87	-46°50.27
Fomalhaut	15°13.57	-29°29.14
Scheat	13°44.35	28°13.59
Markab	13°29.05	15°20.83

Oct 22 Wed	SHA	Mer.pass
Venus	170°7.67	10:37

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.31	S11°3.82	180°7.23	15.0'	S16°23.96	11.9'	54.1'
1	198°52.40	4.70	194°41.21	14.9'	16°35.86	11.8'	54.1'
2	213°52.49	5.58	209°15.15	14.9'	16°47.70	11.8'	54.1'
3	228°52.59	6.47	223°49.03	14.8'	16°59.47	11.7'	54.0'
4	243°52.68	7.35	238°22.86	14.8'	17°11.17	11.6'	54.0'
5	258°52.77	8.23	252°56.63	14.7'	17°22.79	11.6'	54.0'
6	273°52.87	S11°9.11	267°30.36	14.7'	S17°34.35	11.5'	54.0'
7	288°52.96	9.99	282°4.03	14.6'	17°45.83	11.4'	54.0'
8	303°53.05	10.87	296°37.65	14.6'	17°57.24	11.3'	54.0'
9	318°53.14	11.75	311°11.21	14.5'	18°8.57	11.3'	54.0'
10	333°53.23	12.64	325°44.72	14.5'	18°19.83	11.2'	54.0'
11	348°53.32	13.52	340°18.17	14.4'	18°31.01	11.1'	54.0'
12	3°53.42	S11°14.40	354°51.57	14.3'	S18°42.11	11.0'	54.0'
13	18°53.51	15.27	9°24.91	14.3'	18°53.14	10.9'	54.0'
14	33°53.60	16.15	23°58.19	14.2'	19°4.09	10.9'	54.0'
15	48°53.69	17.03	38°31.42	14.2'	19°14.96	10.8'	54.0'
16	63°53.78	17.91	53°4.59	14.1'	19°25.75	10.7'	54.0'
17	78°53.87	18.79	67°37.70	14.1'	19°36.45	10.6'	54.0'
18	93°53.95	S11°19.67	82°10.76	14.0'	S19°47.08	10.5'	54.0'
19	108°54.04	20.55	96°43.75	13.9'	19°57.62	10.5'	54.0'
20	123°54.13	21.42	111°16.69	13.9'	20°8.08	10.4'	53.9'
21	138°54.22	22.30	125°49.57	13.8'	20°18.45	10.3'	53.9'
22	153°54.31	23.18	140°22.38	13.8'	20°28.74	10.2'	53.9'
23	168°54.39	24.05	154°55.14	13.7'	20°38.94	10.1'	53.9'
SD = 16.1'		$d = 0.9'$	SD = 14.7'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.48	S11°24.93	169°27.84	13.6'	S20°49.06	10.0'	53.9'
1	198°54.57	25.81	184°0.48	13.6'	20°59.08	9.9'	53.9'
2	213°54.66	26.68	198°33.05	13.5'	21°9.02	9.8'	53.9'
3	228°54.74	27.56	213°5.57	13.5'	21°18.87	9.8'	53.9'
4	243°54.83	28.43	227°38.02	13.4'	21°28.62	9.7'	53.9'
5	258°54.91	29.31	242°10.41	13.3'	21°38.29	9.6'	53.9'
6	273°55.00	S11°30.18	256°42.74	13.3'	S21°47.86	9.5'	53.9'
7	288°55.08	31.06	271°15.01	13.2'	21°57.34	9.4'	53.9'
8	303°55.17	31.93	285°47.22	13.1'	22°6.73	9.3'	53.9'
9	318°55.25	32.81	300°19.36	13.1'	22°16.02	9.2'	53.9'
10	333°55.34	33.68	314°51.44	13.0'	22°25.22	9.1'	53.9'
11	348°55.42	34.55	329°23.46	13.0'	22°34.31	9.0'	53.9'
12	3°55.51	S11°35.42	343°55.42	12.9'	S22°43.32	8.9'	53.9'
13	18°55.59	36.30	358°27.32	12.8'	22°52.22	8.8'	53.9'
14	33°55.67	37.17	12°59.15	12.8'	23°1.02	8.7'	53.9'
15	48°55.76	38.04	27°30.92	12.7'	23°9.73	8.6'	53.9'
16	63°55.84	38.91	42°2.62	12.6'	23°18.33	8.5'	53.9'
17	78°55.92	39.78	56°34.27	12.6'	23°26.83	8.4'	53.9'
18	93°56.00	S11°40.65	71°5.85	12.5'	S23°35.23	8.3'	53.9'
19	108°56.08	41.52	85°37.37	12.5'	23°43.53	8.2'	53.9'
20	123°56.16	42.40	100°8.83	12.4'	23°51.72	8.1'	53.9'
21	138°56.25	43.27	114°40.23	12.3'	23°59.81	8.0'	53.9'
22	153°56.33	44.13	129°11.56	12.3'	24°7.79	7.9'	53.9'
23	168°56.41	45.00	143°42.83	12.2'	24°15.67	7.8'	53.9'
SD = 16.1'		$d = 0.9'$	SD = 14.7'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.49	S11°45.87	158°14.04	12.1'	S24°23.44	7.7'	53.9'
1	198°56.57	46.74	172°45.19	12.1'	24°31.10	7.6'	53.9'
2	213°56.65	47.61	187°16.28	12.0'	24°38.65	7.4'	53.9'
3	228°56.73	48.48	201°47.30	12.0'	24°46.10	7.3'	53.9'
4	243°56.80	49.35	216°18.27	11.9'	24°53.43	7.2'	53.9'
5	258°56.88	50.21	230°49.17	11.8'	25°0.65	7.1'	53.9'
6	273°56.96	S11°51.08	245°20.02	11.8'	S25°7.76	7.0'	53.9'
7	288°57.04	51.95	259°50.80	11.7'	25°14.76	6.9'	53.9'
8	303°57.12	52.81	274°21.53	11.7'	25°21.64	6.8'	53.9'
9	318°57.19	53.68	288°52.19	11.6'	25°28.41	6.7'	53.9'
10	333°57.27	54.55	303°22.80	11.5'	25°35.07	6.5'	53.9'
11	348°57.35	55.41	317°53.35	11.5'	25°41.61	6.4'	53.9'
12	3°57.42	S11°56.28	332°23.84	11.4'	S25°48.03	6.3'	53.9'
13	18°57.50	57.14	346°54.27	11.4'	25°54.34	6.2'	53.9'
14	33°57.58	58.01	1°24.65	11.3'	26°0.53	6.1'	53.9'
15	48°57.65	58.87	15°54.96	11.3'	26°6.60	6.0'	53.9'
16	63°57.73	11°59.74	30°25.23	11.2'	26°12.55	5.8'	53.9'
17	78°57.80	12°0.60	44°55.44	11.2'	26°18.38	5.7'	53.9'
18	93°57.88	S12°1.46	59°25.59	11.1'	S26°24.09	5.6'	53.9'
19	108°57.95	2.33	73°55.69	11.0'	26°29.68	5.5'	53.9'
20	123°58.02	3.19	88°25.73	11.0'	26°35.15	5.3'	53.9'
21	138°58.10	4.05	102°55.72	10.9'	26°40.50	5.2'	53.9'
22	153°58.17	4.91	117°25.66	10.9'	26°45.72	5.1'	53.9'
23	168°58.24	5.77	131°55.55	10.8'	26°50.82	5.0'	53.9'
SD = 16.1'		$d = 0.9'$	SD = 14.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:30	06:50	08:06	15:21	16:37	17:56
N 70°	05:30	06:42	07:49	15:38	16:45	17:56
68°	05:30	06:35	07:35	15:52	16:52	17:57
66°	05:29	06:29	07:24	16:03	16:58	17:57
64°	05:29	06:24	07:15	16:13	17:03	17:58
62°	05:28	06:20	07:07	16:21	17:07	17:59
60°	05:28	06:16	07:00	16:28	17:11	18:00
N 58°	05:27	06:13	06:54	16:34	17:15	18:00
56°	05:26	06:10	06:48	16:39	17:18	18:01
54°	05:26	06:07	06:43	16:44	17:21	18:02
52°	05:25	06:04	06:39	16:49	17:23	18:03
50°	05:24	06:02	06:35	16:53	17:26	18:04
45°	05:22	05:56	06:26	17:02	17:32	18:06
N 40°	05:20	05:52	06:19	17:09	17:36	18:08
35°	05:18	05:47	06:13	17:15	17:41	18:11
30°	05:15	05:43	06:07	17:21	17:45	18:13
20°	05:09	05:35	05:58	17:31	17:53	18:19
N 10°	05:03	05:28	05:49	17:39	18:01	18:26
0°	04:55	05:20	05:41	17:48	18:09	18:33
S 10°	04:46	05:11	05:33	17:56	18:18	18:43
20°	04:35	05:01	05:24	18:05	18:28	18:54
30°	04:19	04:49	05:13	18:16	18:40	19:10
35°	04:10	04:41	05:07	18:22	18:48	19:20
40°	03:58	04:32	05:01	18:29	18:57	19:31
45°	03:44	04:21	04:53	18:37	19:08	19:46
S 50°	03:25	04:08	04:43	18:47	19:22	20:05
52°	03:16	04:02	04:38	18:51	19:28	20:15
54°	03:05	03:55	04:33	18:57	19:36	20:25
56°	02:53	03:47	04:28	19:02	19:44	20:38
58°	02:39	03:37	04:22	19:08	19:53	20:53
S 60°	02:21	03:27	04:15	19:16	20:04	21:11

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	■	■	■	■	■	■
N 70°	10:48	■	■	13:36	■	■
68°	09:59	■	■	14:26	■	■
66°	09:28	11:46	■	14:58	14:14	■
64°	09:06	10:58	■	15:22	15:03	■
62°	08:48	10:27	12:15	15:40	15:34	15:25
60°	08:33	10:04	11:38	15:56	15:58	16:03
N 58°	08:20	09:46	11:12	16:09	16:17	16:30
56°	08:10	09:31	10:51	16:21	16:33	16:51
54°	08:00	09:18	10:34	16:31	16:46	17:08
52°	07:52	09:06	10:19	16:40	16:58	17:23
50°	07:44	08:56	10:07	16:48	17:09	17:36
45°	07:28	08:35	09:41	17:06	17:31	18:03
N 40°	07:15	08:18	09:20	17:20	17:49	18:24
35°	07:04	08:04	09:03	17:32	18:04	18:42
30°	06:55	07:51	08:48	17:43	18:17	18:57
20°	06:38	07:30	08:24	18:01	18:40	19:23
N 10°	06:24	07:12	08:02	18:17	18:59	19:45
0°	06:11	06:55	07:42	18:32	19:18	20:06
S 10°	05:57	06:38	07:23	18:47	19:36	20:27
20°	05:44	06:21	07:02	19:03	19:56	20:50
30°	05:28	06:00	06:37	19:22	20:19	21:16
35°	05:18	05:48	06:23	19:33	20:32	21:31
40°	05:08	05:35	06:07	19:45	20:48	21:49
45°	04:56	05:19	05:47	20:00	21:07	22:11
S 50°	04:41	04:59	05:23	20:19	21:30	22:39
52°	04:34	04:50	05:11	20:28	21:42	22:53
54°	04:27	04:39	04:58	20:37	21:54	23:08
56°	04:18	04:28	04:42	20:48	22:09	23:27
58°	04:09	04:14	04:24	21:01	22:27	23:50
S 60°	03:58	03:59	04:02	21:16	22:49	...

Day	Sun			Moon	
	Eqn.of Time 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm
22	15:29	15:34	11:44	12:21	00:00
23	15:38	15:42	11:44	13:06	00:43
24	15:46	15:50	11:44	13:54	01:30

h Aries Venus M

<https://pypi.org/project/skyalmanac/>


h		Sun		Moon				
Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		183°58.32	S12°6.64	146°25.38	10.8'	S26°55.79	4.8'	53.9'
1		198°58.39	7.50	160°55.17	10.7'	27°0'6.4	4.7'	53.9'
2		213°58.46	8.36	175°24.90	10.7'	27°5'3.7	4.6'	53.9'
3		228°58.53	· · 9.22	189°54.59	10.6'	27°9'9.6	4.5'	54.0'
4		243°58.60	10.08	204°24.23	10.6'	27°14.43	4.3'	54.0'
5		258°58.68	10.94	218°53.82	10.5'	27°18.78	4.2'	54.0'
6		273°58.75	S12°11.80	233°23.36	10.5'	S27°22.99	4.1'	54.0'
7		288°58.82	12.66	247°52.86	10.5'	27°27.08	4.0'	54.0'
8		303°58.89	13.52	262°22.32	10.4'	27°31.03	3.8'	54.0'
9		318°58.96	· · 14.37	276°51.72	10.4'	27°34.86	3.7'	54.0'
10		333°59.03	15.23	291°21.09	10.3'	27°38.56	3.6'	54.0'
11		348°59.10	16.09	305°50.41	10.3'	27°42.13	3.4'	54.0'
12		3°59.17	S12°16.95	320°19.70	10.2'	S27°45.56	3.3'	54.0'
13		18°59.23	17.80	334°48.94	10.2'	27°48.87	3.2'	54.0'
14		33°59.30	18.66	349°18.14	10.2'	27°52.04	3.0'	54.0'
15		48°59.37	· · 19.52	3°47.30	10.1'	27°55.07	2.9'	54.0'
16		63°59.44	20.37	18°16.43	10.1'	27°57.98	2.8'	54.0'
17		78°59.51	21.23	32°45.52	10.1'	28°0'7.5	2.6'	54.1'
18		93°59.57	S12°22.09	47°14.57	10.0'	S28°3'39	2.5'	54.1'
19		108°59.64	22.94	61°43.59	10.0'	28°5'8.9	2.4'	54.1'
20		123°59.71	23.80	76°12.58	10.0'	28°8'2.6	2.2'	54.1'
21		138°59.77	· · 24.65	90°41.53	9.9'	28°10.49	2.1'	54.1'
22		153°59.84	25.50	105°10.45	9.9'	28°12.59	2.0'	54.1'
23		168°59.90	26.36	119°39.34	9.9'	28°14.55	1.8'	54.1'
		SD = 16.1' d = 0.9'		SD = 14.7'				

Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		183°59.97	S12°27.21	134°8.21	9.8'	S28°16.37	1.7'	54.1'
1		199°0'0.4	28.06	148°37.04	9.8'	28°18.06	1.6'	54.1'
2		214°0'10	28.92	163°5'8.5	9.8'	28°19.61	1.4'	54.1'
3		229°0'16	· · 29.77	177°34.63	9.8'	28°21.02	1.3'	54.1'
4		244°0'23	30.62	192°3'38	9.7'	28°22.30	1.1'	54.2'
5		259°0'29	31.47	206°32.11	9.7'	28°23.44	1.0'	54.2'
6		274°0'36	S12°32.33	221°0'8.2	9.7'	S28°24.43	0.9'	54.2'
7		289°0'42	33.18	235°29.51	9.7'	28°25.29	0.7'	54.2'
8		304°0'48	34.03	249°58.18	9.6'	28°26.01	0.6'	54.2'
9		319°0'54	· · 34.88	264°26.82	9.6'	28°26.60	0.4'	54.2'
10		334°0'61	35.73	278°55.45	9.6'	28°27.04	0.3'	54.2'
11		349°0'67	36.58	293°24.07	9.6'	28°27.34	0.2'	54.2'
12		4°0'7.3	S12°37.43	307°52.66	9.6'	S28°27.50	0.0'	54.3'
13		19°0'7.9	38.28	322°21.25	9.6'	28°27.53	-0.1'	54.3'
14		34°0'8.5	39.13	336°49.81	9.6'	28°27.41	-0.3'	54.3'
15		49°0'9.1	· · 39.97	351°18.37	9.5'	28°27.15	-0.4'	54.3'
16		64°0'9.7	40.82	5°46.92	9.5'	28°26.75	-0.5'	54.3'
17		79°1'0.3	41.67	20°15.45	9.5'	28°26.21	-0.7'	54.3'
18		94°1'0.9	S12°42.52	34°43.98	9.5'	S28°25.53	-0.8'	54.3'
19		109°1'1.5	43.36	49°12.50	9.5'	28°24.71	-1.0'	54.4'
20		124°1'2.1	44.21	63°41.01	9.5'	28°23.75	-1.1'	54.4'
21		139°1'2.7	· · 45.06	78°9'5.2	9.5'	28°22.65	-1.2'	54.4'
22		154°1'3.3	45.90	92°38.02	9.5'	28°21.41	-1.4'	54.4'
23		169°1'3.9	46.75	107°6'5.2	9.5'	28°20.02	-1.5'	54.4'
		SD = 16.1' d = 0.9'		SD = 14.8'				

Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		184°1.44	S12°47.59	121°35.02	9.5'	S28°18.50	-1.7'	54.4'
1		199°1'5.0	48.44	136°3'5.2	9.5'	28°16.83	-1.8'	54.5'
2		214°1'5.6	49.28	150°32.01	9.5'	28°15.02	-1.9'	54.5'
3		229°1'6.1	· · 50.13	165°0'5.1	9.5'	28°13.07	-2.1'	54.5'
4		244°1'6.7	50.97	179°29.02	9.5'	28°10.98	-2.2'	54.5'
5		259°1'7.3	51.82	193°57.52	9.5'	28°8'7.5	-2.4'	54.5'
6		274°1'7.8	S12°52.66	208°26.03	9.5'	S28°6'38	-2.5'	54.5'
7		289°1'8.4	53.50	222°54.55	9.5'	28°3'8.7	-2.7'	54.6'
8		304°1'8.9	54.34	237°23.08	9.5'	28°1'2.1	-2.8'	54.6'
9		319°1'9.5	· · 55.19	251°51.61	9.5'	27°58.42	-2.9'	54.6'
10		334°2'0.0	56.03	266°20.15	9.6'	27°55.48	-3.1'	54.6'
11		349°2'0.6	56.87	280°48.70	9.6'	27°52.41	-3.2'	54.6'
12		4°2'1.1	S12°57.71	295°17.27	9.6'	S27°49.19	-3.4'	54.6'
13		19°2'1.7	58.55	309°45.84	9.6'	27°45.84	-3.5'	54.7'
14		34°2'2.2	12°59.39	324°14.43	9.6'	27°42.34	-3.6'	54.7'
15		49°2'2.7	13°0'2.3	338°43.04	9.6'	27°38.71	-3.8'	54.7'
16		64°2'3.2	1.07	353°11.65	9.6'	27°34.93	-3.9'	54.7'
17		79°2'3.8	1.91	7°40.29	9.7'	27°31.01	-4.1'	54.7'
18		94°2'4.3	S13°2'7.5	22°8'9.4	9.7'	S27°26.96	-4.2'	54.8'
19		109°2'4.8	3.59	36°37.61	9.7'	27°22.77	-4.3'	54.8'
20		124°2'5.3	4.43	51°6'3.0	9.7'	27°18.43	-4.5'	54.8'
21		139°2'5.8	· · 5.27	65°35.01	9.7'	27°13.96	-4.6'	54.8'
22		154°2'6.3	6.10	80°3'7.5	9.8'	27°9'3.6	-4.7'	54.9'
23		169°2'6.8	6.94	94°32.50	9.8'	27°4'6.1	-4.9'	54.9'
		SD = 16.1' d = 0.8'		SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:43	07:03	08:23	15:04	16:23	17:43
N 70°	05:41	06:53	08:03	15:24	16:33	17:45
68°	05:40	06:45	07:47	15:39	16:41	17:46
66°	05:38	06:39	07:35	15:52	16:48	17:48
64°	05:37	06:33	07:24	16:03	16:54	17:49
62°	05:36	06:28	07:15	16:12	16:59	17:51
60°	05:35	06:23	07:07	16:20	17:03	17:52
N 58°	05:33	06:19	07:01	16:26	17:07	17:53
56°	05:32	06:16	06:55	16:32	17:11	17:55
54°	05:31	06:12	06:49	16:38	17:15	17:56
52°	05:30	06:09	06:44	16:43	17:18	17:57
50°	05:29	06:07	06:40	16:47	17:21	17:58
45°	05:26	06:00	06:30	16:57	17:27	18:01
N 40°	05:23	05:55	06:23	17:05	17:33	18:04
35°	05:20	05:50	06:16	17:12	17:38	18:07
30°	05:17	05:45	06:10	17:18	17:42	18:11
20°	05:10	05:36	05:59	17:29	17:51	18:17
N 10°	05:03	05:28	05:50	17:38	18:00	18:25
0°	04:55	05:19	05:41	17:47	18:09	18:33
S 10°	04:45	05:10	05:32	17:57	18:18	18:43
20°	04:32	04:59	05:22	18:06	18:29	18:56
30°	04:16	04:46	05:11	18:18	18:43	19:12
35°	04:06	04:37	05:04	18:25	18:51	19:23
40°	03:53	04:28	04:56	18:32	19:01	19:35
45°	03:38	04:16	04:48	18:41	19:13	19:51
S 50°	03:18	04:02	04:37	18:52	19:27	20:12
52°	03:08	03:55	04:32	18:57	19:34	20:22
54°	02:57	03:47	04:27	19:02	19:42	20:33
56°	02:43	03:39	04:21	19:09	19:51	20:47
58°	02:27	03:29	04:14	19:16	20:01	21:03
S 60°	02:08	03:17	04:06	19:24	20:13	21:24

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	██	██	██	██	██	██
N 70°	██	██	██	██	██	██
68°	██	██	██	██	██	██
66°	██	██	██	██	██	██
64°	██	██	██	██	██	██
62°	14:36	██	15:50	14:49	██	17:12
60°	13:07	14:15	14:48	16:18	16:58	18:14
N 58°	12:31	13:34	14:14	16:54	17:39	18:47
56°	12:05	13:06	13:49	17:20	18:07	19:12
54°	11:45	12:44	13:28	17:41	18:28	19:32
52°	11:28	12:26	13:12	17:58	18:46	19:49
50°	11:13	12:11	12:57	18:13	19:02	20:03
45°	10:43	11:40	12:28	18:43	19:33	20:32
N 40°	10:20	11:16	12:05	19:06	19:57	20:54
35°	10:01	10:56	11:46	19:26	20:16	21:13
30°	09:45	10:39	11:29	19:42	20:33	21:29
20°	09:17	10:11	11:02	20:10	21:02	21:56
N 10°	08:54	09:46	10:38	20:34	21:26	22:19
0°	08:32	09:23	10:16	20:57	21:49	22:41
S 10°	08:10	09:01	09:53	21:19	22:11	23:02
20°	07:47	08:36	09:30	21:43	22:36	23:25
30°	07:20	08:08	09:02	22:11	23:04	23:52
35°	07:04	07:51	08:45	22:28	23:20	· · ·
40°	06:45	07:32	08:26	22:47	23:40	· · ·
45°	06:23	07:08	08:03	23:11	· · ·	00:03
S 50°	05:55	06:37	07:33	23:41	· · ·	00:34
52°	05:41	06:22	07:18	23:56	· · ·	00:49
54°	05:25	06:05	07:01	· · ·	00:14	01:06
56°	05:06	05:43	06:40	· · ·	00:35	01:27
58°	04:42	05:16	06:13	· · ·	01:02	01:53
S 60°	04:12	04:38	05:37	00:20	01:41	02:30

Day	Sun			Moon		
	Eqn. of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	4-6 11-25%
25	15:53	15:57	11:44	14:44	02:19	
26	16:00	16:03	11:44	15:36	03:10	
27	16:06	16:08	11:44	16:28	04:02	

October 28, 29, 30 UT (Tue., Wed., Thu.)

	Aries			Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	36°35.67	199°49.01	S05°29.86	164°25.20	S19°16.11	279°50.96	N21°14.51	39°17.46	S03°51.89			Alpheratz	357°33.81 29°14.19	
1	51°38.13	214°48.59	31.07	179°25.85	16.56	294°53.30	14.49	54°20.05	51.94			Ankaa	353°6.12 -42°9.94	
2	66°40.60	229°48.16	32.27	194°26.50	17.02	309°55.63	14.48	69°22.63	51.99			Schedar	349°29.81 56°40.95	
3	81°43.06	244°47.73	•• 33.48	209°27.15	•• 17.47	324°57.97	•• 14.46	84°25.22	•• 52.03			Diphda	348°46.34 -17°50.61	
4	96°45.53	259°47.31	34.68	224°27.80	17.93	340°0.31	14.44	99°27.80	52.08			Achernar	335°19.10 -57°6.31	
5	111°47.99	274°46.88	35.89	239°28.45	18.38	355°2.65	14.43	114°30.38	52.12			Hamal	327°50.12 23°35.21	
6	126°50.45	289°46.45	S05°37.09	254°29.10	S19°18.84	10°4.99	N21°14.41	129°32.97	S03°52.17			Polaris	313°13.23 89°22.33	
7	141°52.92	304°46.02	38.30	269°29.74	19.29	25°7.33	14.40	144°35.55	52.21			Acamar	315°10.85 -40°11.91	
8	156°55.38	319°45.59	39.50	284°30.39	19.75	40°9.67	14.38	159°38.13	52.25			Menkar	314°5.15 4°11.60	
9	171°57.85	334°45.17	•• 40.70	299°31.04	•• 20.20	55°12.01	•• 14.37	174°40.71	•• 52.30			Mirfak	308°26.84 49°57.20	
10	187°0.31	349°44.74	41.91	314°31.69	20.65	70°14.35	14.35	189°43.30	52.34			Aldebaran	290°38.59 16°33.75	
11	202°2.78	4°44.31	43.11	329°32.33	21.11	85°16.69	14.34	204°45.88	52.39			Rigel	281°3.00 -8°10.13	
12	217°5.24	19°43.88	S05°44.32	344°32.98	S19°21.56	100°19.04	N21°14.32	219°48.46	S03°52.43			Capella	280°20.58 46°1.35	
13	232°7.70	34°43.45	45.52	359°33.63	22.01	115°21.38	14.31	234°51.04	52.48			Bellatrix	278°21.95 6°22.49	
14	247°10.17	49°43.02	46.72	14°34.27	22.47	130°23.72	14.29	249°53.62	52.52			Elnath	278°0.78 28°37.75	
15	262°12.63	64°42.59	•• 47.93	29°34.92	•• 22.92	145°26.06	•• 14.28	264°56.21	•• 52.57			Alnilam	275°36.85 -1°10.98	
16	277°15.10	79°42.16	49.13	44°35.56	23.37	160°28.41	14.26	279°58.79	52.61			Betelgeuse	270°51.18 7°24.81	
17	292°17.56	94°41.73	50.33	59°36.21	23.82	175°30.75	14.25	295°1.37	52.66			Canopus	263°51.82 -52°42.21	
18	307°20.02	109°41.30	S05°51.53	74°36.86	S19°24.27	190°33.09	N21°14.23	310°3.95	S03°52.70			Sirius	258°25.51 -16°44.87	
19	322°22.49	124°40.87	52.74	89°37.50	24.72	205°35.44	14.22	325°6.53	52.74			Adhara	255°5.21 -29°0.15	
20	337°24.95	139°40.44	53.94	104°38.14	25.17	220°37.78	14.20	340°9.11	52.79			Procyon	244°50.08 5°9.62	
21	352°27.42	154°40.01	•• 55.14	119°38.79	•• 25.62	235°40.13	•• 14.19	355°11.70	•• 52.83			Pollux	243°16.44 27°57.77	
22	7°29.88	169°39.57	56.34	134°39.43	26.07	250°42.47	14.17	10°14.28	52.88			Avior	234°14.47 -59°35.15	
23	22°32.35	184°39.14	57.54	149°40.08	26.52	265°44.82	14.16	25°16.86	52.92			Suhail	222°45.92 -43°31.88	
Mer.pass. 21:30				ν-0.4' d1.2' m-3.91		ν0.6' d0.5' m1.48		ν2.3' d-0.0' m-2.29		ν2.6' d0.0' m0.75				
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	37°34.81	199°38.71	S05°58.75	164°40.72	S19°26.97	280°47.16	N21°14.15	40°19.44	S03°52.96					
1	52°37.27	214°38.28	05°59.95	179°41.36	27.42	295°49.51	14.13	55°22.02	53.01					
2	67°39.74	229°37.85	06°1.15	194°42.01	27.87	310°51.86	14.12	70°24.60	53.05					
3	82°42.20	244°37.41	•• 2.35	209°42.65	•• 28.32	325°54.20	•• 14.10	85°27.18	•• 53.09					
4	97°44.67	259°36.98	3.55	224°43.29	28.77	340°56.55	14.09	100°29.76	53.14					
5	112°47.13	274°36.55	4.75	239°43.93	29.22	355°58.90	14.07	115°32.34	53.18					
6	127°49.59	289°36.11	S06°5.95	254°44.57	S19°29.66	11°1.24	N21°14.06	130°34.92	S03°53.22					
7	142°52.06	304°35.68	7.15	269°45.22	30.11	26°3.59	14.05	145°37.50	53.27					
8	157°54.52	319°35.25	8.35	284°45.86	30.56	41°5.94	14.03	160°40.08	53.31					
9	172°56.99	334°34.81	•• 9.55	299°46.50	•• 31.01	56°8.29	•• 14.02	175°42.66	•• 53.35					
10	187°59.45	349°34.38	10.75	314°47.14	31.45	71°10.64	14.01	190°45.24	53.40					
11	203°1.92	4°33.94	11.95	329°47.78	31.90	86°12.99	13.99	205°47.82	53.44					
12	218°4.38	19°33.51	S06°13.15	344°48.42	S19°32.35	101°15.34	N21°13.98	220°50.40	S03°53.48					
13	233°6.84	34°33.07	14.35	359°49.06	32.79	116°17.69	13.96	235°52.97	53.53					
14	248°9.31	49°32.64	15.54	14°49.70	33.24	131°20.04	13.95	250°55.55	53.57					
15	263°11.77	64°32.20	•• 16.74	29°50.34	•• 33.68	146°22.39	•• 13.94	265°58.13	•• 53.61					
16	278°14.24	79°31.77	17.94	44°50.98	34.13	161°24.74	13.92	281°0.71	53.65					
17	293°16.70	94°31.33	19.14	59°51.62	34.57	176°27.09	13.91	296°3.29	53.70					
18	308°19.16	109°30.90	S06°20.34	74°52.25	S19°35.02	191°29.45	N21°13.90	311°5.87	S03°53.74					
19	323°21.63	124°30.46	21.53	89°52.89	35.46	206°31.80	13.88	326°8.45	53.78					
20	338°24.09	139°30.02	22.73	104°53.53	35.91	221°34.15	13.87	341°11.02	53.83					
21	353°26.56	154°29.59	•• 23.93	119°54.17	•• 36.35	236°36.51	•• 13.86	356°13.60	•• 53.87					
22	8°29.02	169°29.15	25.12	134°54.81	36.79	251°38.86	13.84	11°16.18	53.91					
23	23°31.48	184°28.71	26.32	149°55.44	37.24	266°41.21	13.83	26°18.76	53.95					
Mer.pass. 21:26				ν-0.4' d1.2' m-3.91		ν0.6' d0.4' m1.47		ν2.3' d-0.0' m-2.30		ν2.6' d0.0' m0.75				
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	38°33.95	199°28.27	S06°27.52	164°56.08	S19°37.68	281°43.57	N21°13.82	41°21.34	S03°53.99					
1	53°36.41	214°27.84	28.71	179°56.72	38.12	296°45.92	13.81	56°23.91	54.04					
2	68°38.88	229°27.40	29.91	194°57.35	38.56	311°48.28	13.79	71°26.49	54.08					
3	83°41.34	244°26.96	•• 31.11	209°57.99	•• 39.01	326°50.63	•• 13.78	86°29.07	•• 54.12					
4	98°43.81	259°26.52	32.30	224°58.63	39.45	341°52.99	13.77	101°31.64	54.16					
5	113°46.27	274°26.08	33.50	239°59.26	39.89	356°55.34	13.76	116°34.22	54.20					
6	128°48.73	289°25.64	S06°34.69	254°59.90	S19°40.33	11°57.70	N21°13.74	131°36.80	S03°54.25					
7	143°51.20	304°25.20	35.89	270°0.53	40.77	27°0.06	13.73	146°39.37	54.29					
8	158°53.66	319°24.76	37.08	285°1.17	41.21	42°2.41	13.72	161°41.95	54.33					
9	173°56.13	334°24.32	•• 38.28	300°1.80	•• 41.65	57°4.77	•• 13.71	176°44.53	•• 54.37					
10	188°58.59	349°23.88	39.47	315°2.43	42.09	72°7.13	13.69	191°47.10	54.41					
11	204°1.05	4°23.44	40.66	330°3.07	42.53	87°9.48	13.68	206°49.68	54.46					
12	219°3.52	19°23.00	S06°41.86	345°3.70	S19°42.97	102°11.84	N21°13.67	221°52.26	S03°54.50					
13	234°5.98	34°22.56	43.05	0°4.34	43.41	117°14.20	13.66	236°54.83	54.54					
14	249°8.45	49°22.12	44.24	15°4.97	43.85	132°16.56	13.64	251°57.41	54.58					
15	264°10.91	64°21.68	•• 45.44	30°5.60	•• 44.29	147°18.92	•• 13.63	266°59.98	•• 54.62					
16	279°13.37	79°21.23	46.63	45°6.23	44.73	162°21.28	13.62	282°2.56	54.66					
17	294°15.84	94°20.79	47.82	60°6.87	45.17	177°23.64	13.61	297°5.13	54.70					
18	309°18.30	109°20.35	S06°49.01	75°7.50	S19°45.60	192°26.00	N21°13.60	312°7.71	S03°54.74					
19	324°20.77	124°19.91	50.21	90°8.13	46.04	207°28.36	13.58	327°10.28	54.79					
20	339°23.23	139°19.46	51.40	105°8.76	46.48	222°30.72	13.57	342°12.86	54.83					
21	354°25.70	154°19.02	•• 52.59	120°9.39	•• 46.92	237°33.08	•• 13.56	357°15.43	•• 54.87					
22	9°28.16	169°18.58	53.78	135°10.02	47.35	252°35.45	13.55	12°18.01	54.91					
23	24°30.62	184°18.13	54.97	150°10.65	47.79	267°37.81	13.54	27°20.58	54.95					
Mer.pass. 21:22				ν-0.4' d1.2' m-3.91		ν0.6' d0.4' m1.47		ν2.4' d-0.0' m-2.31		ν2.6' d0.0' m0.76				

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h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		184°2.73	S13°7.78	109°1.28	9.8'	S26°59.72	-5.0' 54.9'
1		199°2.78	8.61	123°30.08	9.8'	26°54.70	-5.2' 54.9'
2		214°2.83	9.45	137°58.90	9.8'	26°49.54	-5.3' 54.9'
3		229°2.88	•• 10.29	152°27.75	9.9'	26°44.25	-5.4' 55.0'
4		244°2.93	11.12	166°56.62	9.9'	26°38.82	-5.6' 55.0'
5		259°2.98	11.96	181°25.53	9.9'	26°33.25	-5.7' 55.0'
6		274°3.03	S13°12.79	195°54.45	10.0'	S26°27.55	-5.8' 55.0'
7		289°3.08	13.63	210°23.41	10.0'	26°21.71	-6.0' 55.1'
8		304°3.12	14.46	224°52.40	10.0'	26°15.73	-6.1' 55.1'
9		319°3.17	•• 15.29	239°21.41	10.0'	26°9.62	-6.2' 55.1'
10		334°3.22	16.13	253°50.46	10.1'	26°3.38	-6.4' 55.1'
11		349°3.26	16.96	268°19.54	10.1'	25°57.01	-6.5' 55.2'
12		4°3.31	S13°17.79	282°48.64	10.1'	S25°50.50	-6.6' 55.2'
13		19°3.36	18.62	297°17.78	10.2'	25°43.85	-6.8' 55.2'
14		34°3.40	19.46	311°46.96	10.2'	25°37.08	-6.9' 55.2'
15		49°3.45	•• 20.29	326°16.16	10.2'	25°30.17	-7.0' 55.3'
16		64°3.49	21.12	340°45.40	10.3'	25°23.14	-7.2' 55.3'
17		79°3.54	21.95	355°14.67	10.3'	25°15.97	-7.3' 55.3'
18		94°3.58	S13°22.78	9°43.98	10.3'	S25°8.67	-7.4' 55.4'
19		109°3.63	23.61	24°13.32	10.4'	25°1.24	-7.6' 55.4'
20		124°3.67	24.44	38°42.70	10.4'	24°53.68	-7.7' 55.4'
21		139°3.71	•• 25.27	53°12.12	10.4'	24°45.99	-7.8' 55.4'
22		154°3.76	26.10	67°41.57	10.5'	24°38.18	-7.9' 55.5'
23		169°3.80	26.92	82°11.05	10.5'	24°30.23	-8.1' 55.5'
		SD = 16.1' $d = 0.8'$		SD = 15.0'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		184°3.84	S13°27.75	96°40.58	10.6'	S24°22.16	-8.2' 55.5'
1		199°3.88	28.58	111°10.14	10.6'	24°13.96	-8.3' 55.5'
2		214°3.92	29.41	125°39.73	10.6'	24°5.64	-8.5' 55.6'
3		229°3.97	•• 30.24	140°9.37	10.7'	23°57.19	-8.6' 55.6'
4		244°4.01	31.06	154°39.04	10.7'	23°48.61	-8.7' 55.6'
5		259°4.05	31.89	169°8.75	10.7'	23°39.91	-8.8' 55.7'
6		274°4.09	S13°32.71	183°38.50	10.8'	S23°31.09	-8.9' 55.7'
7		289°4.13	33.54	198°8.29	10.8'	23°22.14	-9.1' 55.7'
8		304°4.17	34.36	212°38.12	10.9'	23°13.07	-9.2' 55.8'
9		319°4.21	•• 35.19	227°7.98	10.9'	23°3.88	-9.3' 55.8'
10		334°4.25	36.01	241°37.89	10.9'	22°54.57	-9.4' 55.8'
11		349°4.28	36.84	256°7.83	11.0'	22°45.13	-9.6' 55.9'
12		4°4.32	S13°37.66	270°37.81	11.0'	S22°35.58	-9.7' 55.9'
13		19°4.36	38.48	285°7.83	11.1'	22°25.90	-9.8' 55.9'
14		34°4.40	39.31	299°37.89	11.1'	22°16.11	-9.9' 55.9'
15		49°4.44	•• 40.13	314°7.98	11.1'	22°6.20	-10.0' 56.0'
16		64°4.47	40.95	328°38.12	11.2'	21°56.17	-10.1' 56.0'
17		79°4.51	41.77	343°8.29	11.2'	21°46.02	-10.3' 56.0'
18		94°4.55	S13°42.59	357°38.51	11.3'	S21°35.76	-10.4' 56.1'
19		109°4.58	43.42	12°8.76	11.3'	21°25.38	-10.5' 56.1'
20		124°4.62	44.24	26°39.05	11.3'	21°14.89	-10.6' 56.1'
21		139°4.65	•• 45.06	41°9.37	11.4'	21°4.28	-10.7' 56.2'
22		154°4.69	45.88	55°39.74	11.4'	20°53.56	-10.8' 56.2'
23		169°4.72	46.70	70°10.14	11.4'	20°42.72	-10.9' 56.2'
		SD = 16.1' $d = 0.8'$		SD = 15.1'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		184°4.76	S13°47.51	84°40.58	11.5'	S20°31.78	-11.1' 56.3'
1		199°4.79	48.33	99°11.06	11.5'	20°20.72	-11.2' 56.3'
2		214°4.83	49.15	113°41.57	11.6'	20°9.55	-11.3' 56.4'
3		229°4.86	•• 49.97	128°12.12	11.6'	19°58.27	-11.4' 56.4'
4		244°4.89	50.79	142°42.71	11.6'	19°46.88	-11.5' 56.4'
5		259°4.93	51.60	157°13.33	11.7'	19°35.39	-11.6' 56.5'
6		274°4.96	S13°52.42	171°43.99	11.7'	S19°23.78	-11.7' 56.5'
7		289°4.99	53.24	186°14.68	11.7'	19°12.07	-11.8' 56.5'
8		304°5.02	54.05	200°45.41	11.8'	19°0.25	-11.9' 56.6'
9		319°5.05	•• 54.87	215°16.17	11.8'	18°48.33	-12.0' 56.6'
10		334°5.09	55.68	229°46.97	11.8'	18°36.30	-12.1' 56.6'
11		349°5.12	56.50	244°17.79	11.9'	18°24.17	-12.2' 56.7'
12		4°5.15	S13°57.31	258°48.65	11.9'	S18°11.93	-12.3' 56.7'
13		19°5.18	58.13	273°19.55	11.9'	17°59.60	-12.4' 56.7'
14		34°5.21	58.94	287°50.47	12.0'	17°47.16	-12.5' 56.8'
15		49°5.24	13°59.75	302°21.43	12.0'	17°34.62	-12.6' 56.8'
16		64°5.27	14°0.57	316°52.41	12.0'	17°21.98	-12.7' 56.9'
17		79°5.29	1.38	331°23.43	12.0'	17°9.24	-12.8' 56.9'
18		94°5.32	S14°2.19	345°54.48	12.1'	S16°56.40	-12.9' 56.9'
19		109°5.35	3.00	0°25.55	12.1'	16°43.47	-13.0' 57.0'
20		124°5.38	3.81	14°56.65	12.1'	16°30.43	-13.1' 57.0'
21		139°5.41	•• 4.63	29°27.78	12.2'	16°17.31	-13.2' 57.1'
22		154°5.43	5.44	43°58.94	12.2'	16°4.08	-13.3' 57.1'
23		169°5.46	6.25	58°30.12	12.2'	15°50.77	-13.4' 57.1'
		SD = 16.1' $d = 0.8'$		SD = 15.3'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	05:55	07:17	08:40	14:46	16:09	17:30
N 70°	05:52	07:05	08:17	15:09	16:21	17:34
68°	05:50	06:56	07:59	15:27	16:30	17:36
66°	05:47	06:48	07:45	15:41	16:38	17:39
64°	05:45	06:41	07:33	15:53	16:45	17:41
62°	05:43	06:36	07:24	16:03	16:51	17:43
60°	05:41	06:30	07:15	16:11	16:56	17:45
N 58°	05:40	06:26	07:08	16:19	17:01	17:47
56°	05:38	06:22	07:01	16:26	17:05	17:49
54°	05:36	06:18	06:55	16:31	17:09	17:50
52°	05:35	06:14	06:50	16:37	17:12	17:52
50°	05:33	06:11	06:45	16:42	17:15	17:53
45°	05:30	06:04	06:35	16:52	17:23	17:57
N 40°	05:26	05:58	06:26	17:01	17:29	18:01
35°	05:23	05:52	06:18	17:09	17:35	18:04
30°	05:19	05:47	06:12	17:15	17:40	18:08
20°	05:12	05:38	06:00	17:27	17:50	18:16
N 10°	05:03	05:28	05:50	17:37	17:59	18:24
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:44	05:09	05:31	17:57	18:19	18:44
20°	04:30	04:57	05:20	18:08	18:31	18:58
30°	04:13	04:43	05:08	18:20	18:45	19:15
35°	04:02	04:34	05:01	18:27	18:54	19:26
40°	03:49	04:24	04:53	18:36	19:05	19:40
45°	03:32	04:11	04:43	18:45	19:17	19:56
S 50°	03:11	03:56	04:32	18:57	19:33	20:18
52°	03:00	03:48	04:26	19:02	19:40	20:29
54°	02:48	03:40	04:20	19:08	19:49	20:42
56°	02:33	03:31	04:14	19:15	19:58	20:56
58°	02:16	03:20	04:06	19:23	20:10	21:15
S 60°	01:54	03:07	03:58	19:31	20:22	21:37

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	■	■	17:42	■	■	20:39
N 70°	■	■	16:50	■	■	21:29
68°	■	17:35	16:17	■	19:01	22:00
66°	■	16:26	15:53	■	20:08	22:23
64°	16:27	15:50	15:34	18:23	20:44	22:41
62°	15:32	15:24	15:18	19:17	21:09	22:55
60°	14:59	15:04	15:05	19:49	21:28	23:07
N 58°	14:35	14:47	14:54	20:13	21:45	23:18
56°	14:15	14:32	14:44	20:32	21:58	23:27
54°	13:59	14:20	14:35	20:48	22:10	23:35
52°	13:45	14:09	14:27	21:02	22:21	23:42
50°	13:33	13:59	14:20	21:14	22:30	23:49
45°	13:07	13:38	14:04	21:38	22:49	•• ••
N 40°	12:47	13:22	13:52	21:58	23:05	•• ••
35°	12:29	13:07	13:41	22:14	23:18	•• ••
30°	12:15	12:55	13:31	22:28	23:30	•• ••
20°	11:50	12:34	13:15	22:52	23:49	•• ••
N 10°	11:28	12:15	13:00	23:13	•• ••	00:06
0°	11:07	11:58	12:47	23:32	•• ••	00:22
S 10°	10:47	11:40	12:33	23:51	•• ••	00:37
20°	10:25	11:22	12:19	•• ••	00:11	00:54
30°	10:00	11:00	12:02	•• ••	00:34	01:12
35°	09:45	10:47	11:52	00:07	00:48	01:23
40°	09:27	10:33	11:41	00:25	01:04	01:36
45°	09:06	10:15	11:27	00:47	01:22	01:50
S 50°	08:39	09:53	11:11	01:14	01:45	02:08
52°	08:26	09:42	11:03	01:28	01:56	02:17
54°	08:11	09:31	10:54	01:43	02:08	02:26
56°	07:53	09:17	10:45	02:01	02:23	02:36
58°	07:32	09:01	10:34	02:23	02:39	02:48
S 60°	07:04	08:42	10:21	02:51	02:59	03:02

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 34-53%
28	16:11	16:13	11:44	17:20	04:54	
29	16:15	16:17	11:44	18:10	05:45	
30	16:19	16:21	11:44	18:58	06:34	

Aries		Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	39°33.09	199°17.69	S06°56.16	165°11.28	S19°48.22	282°40.17	N21°13.53	42°23.16	S03°54.99
1	54°35.55	214°17.25	57.35	180°11.91	48.66	297°42.53	13.52	57°25.73	55.03
2	69°38.02	229°16.80	58.54	195°12.54	49.10	312°44.90	13.50	72°28.31	55.07
3	84°40.48	244°16.36	06°59.73	210°13.17	· · 49.53	327°47.26	· · 13.49	87°30.88	· · 55.11
4	99°42.94	259°15.91	07°0.92	225°13.80	49.97	342°49.62	13.48	102°33.45	55.15
5	114°45.41	274°15.47	2.11	240°14.43	50.40	357°51.99	13.47	117°36.03	55.19
6	129°47.87	289°15.02	S07°3.30	255°15.06	S19°50.83	12°54.35	N21°13.46	132°38.60	S03°55.23
7	144°50.34	304°14.58	4.49	270°15.69	51.27	27°56.72	13.45	147°41.17	55.27
8	159°52.80	319°14.13	5.68	285°16.32	51.70	42°59.08	13.44	162°43.75	55.31
9	174°55.26	334°13.68	· · 6.87	300°16.94	· · 52.14	58°1.45	· · 13.43	177°46.32	· · 55.35
10	189°57.73	349°13.24	8.06	315°17.57	52.57	73°3.81	13.42	192°48.89	55.39
11	205°0.19	4°12.79	9.25	330°18.20	53.00	88°6.18	13.40	207°51.47	55.43
12	220°2.66	19°12.34	S07°10.43	345°18.83	S19°53.43	103°8.55	N21°13.39	222°54.04	S03°55.47
13	235°5.12	34°11.89	11.62	0°19.45	53.87	118°10.91	13.38	237°56.61	55.51
14	250°7.58	49°11.45	12.81	15°20.08	54.30	133°13.28	13.37	252°59.18	55.55
15	265°10.05	64°11.00	· · 14.00	30°20.71	· · 54.73	148°15.65	· · 13.36	268°1.76	· · 55.59
16	280°12.51	79°10.55	15.18	45°21.33	55.16	163°18.02	13.35	283°4.33	55.63
17	295°14.98	94°10.10	16.37	60°21.96	55.59	178°20.39	13.34	298°6.90	55.67
18	310°17.44	109°9.65	S07°17.56	75°22.58	S19°56.02	193°22.75	N21°13.33	313°9.47	S03°55.71
19	325°19.91	124°9.20	18.74	90°23.21	56.45	208°25.12	13.32	328°12.04	55.75
20	340°22.37	139°8.75	19.93	105°23.83	56.89	223°27.49	13.31	343°14.62	55.79
21	355°24.83	154°8.31	· · 21.11	120°24.46	· · 57.32	238°29.86	· · 13.30	358°17.19	· · 55.83
22	10°27.30	169°7.86	22.30	135°25.08	57.74	253°32.23	13.29	13°19.76	55.87
23	25°29.76	184°7.40	23.48	150°25.71	58.17	268°34.60	13.28	28°22.33	55.91
Mer.pass. 21:18		ν-0.4' d1.2' m-3.91		ν0.6' d0.4' m1.46		ν2.4' d-0.0' m-2.31		ν2.6' d0.0' m0.76	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	40°32.23	199°6.95	S07°24.67	165°26.33	S19°58.60	283°36.97	N21°13.27	43°24.90	S03°55.95
1	55°34.69	214°6.50	25.85	180°26.95	59.03	298°39.35	13.26	58°27.47	55.99
2	70°37.15	229°6.05	27.04	195°27.58	59.46	313°41.72	13.25	73°30.04	56.03
3	85°39.62	244°5.60	· · 28.22	210°28.20	19°59.89	328°44.09	· · 13.24	88°32.61	· · 56.06
4	100°42.08	259°5.15	29.40	225°28.82	20°0.32	343°46.46	13.23	103°35.18	56.10
5	115°44.55	274°4.70	30.59	240°29.45	0.74	358°48.83	13.22	118°37.75	56.14
6	130°47.01	289°4.25	S07°31.77	255°30.07	S20°1.17	13°51.21	N21°13.21	133°40.32	S03°56.18

Oct 31 Fri	SHA	Mer.pass
Venus	159°44.60	10:43
Mars	125°38.20	12:59
Jupiter	243°7.08	05:09
Saturn	2°50.07	21:07

Nov 01 Sat	SHA	Mer.pass
Venus	158°34.73	10:44
Mars	124°54.11	12:58
Jupiter	243°4.75	05:05
Saturn	2°52.68	21:03

Nov 02 Sun	SHA	Mer.pass
Venus	157°24.69	10:45
Mars	124°9.86	12:57
Jupiter	243°2.62	05:01
Saturn	2°55.20	20:59

Horizontal parallax		
Venus:		0.1
Mars:		0.1

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	184°5.49	S14°7.06	73°1.33	12.2'	S15°37.36	-13.5'	57.2'
1	199°5.51	7.87	87°32.56	12.3'	15°23.85	-13.6'	57.2'
2	214°5.54	8.67	102°3.81	12.3'	15°10.26	-13.7'	57.2'
3	229°5.57	· · 9.48	116°35.09	12.3'	14°56.58	-13.8'	57.3'
4	244°5.59	10.29	131°6.39	12.3'	14°42.80	-13.9'	57.3'
5	259°5.62	11.10	145°37.72	12.3'	14°28.94	-14.0'	57.4'
6	274°5.64	S14°11.91	160°9.06	12.4'	S14°14.99	-14.0'	57.4'
7	289°5.66	12.71	174°40.42	12.4'	14°0.95	-14.1'	57.4'
8	304°5.69	13.52	189°11.80	12.4'	13°46.82	-14.2'	57.5'
9	319°5.71	· · 14.33	203°43.20	12.4'	13°32.61	-14.3'	57.5'
10	334°5.73	15.13	218°14.62	12.4'	13°18.32	-14.4'	57.6'
11	349°5.76	15.94	232°46.05	12.4'	13°3.94	-14.5'	57.6'
12	4°5.78	S14°16.74	247°17.50	12.5'	S12°49.48	-14.5'	57.6'
13	19°5.80	17.55	261°48.96	12.5'	12°34.94	-14.6'	57.7'
14	34°5.82	18.35	276°20.44	12.5'	12°20.32	-14.7'	57.7'
15	49°5.85	· · 19.15	290°51.93	12.5'	12°5.62	-14.8'	57.8'
16	64°5.87	19.96	305°23.43	12.5'	11°50.84	-14.9'	57.8'
17	79°5.89	20.76	319°54.94	12.5'	11°35.98	-14.9'	57.8'
18	94°5.91	S14°21.56	334°26.46	12.5'	S11°21.05	-15.0'	57.9'
19	109°5.93	22.37	348°57.99	12.5'	11°6.04	-15.1'	57.9'
20	124°5.95	23.17	3°29.53	12.5'	10°50.95	-15.2'	58.0'
21	139°5.97	· · 23.97	18°1.07	12.5'	10°35.79	-15.2'	58.0'
22	154°5.99	24.77	32°32.62	12.6'	10°20.56	-15.3'	58.0'
23	169°6.01	25.57	47°4.18	12.6'	10°5.26	-15.4'	58.1'

SD = 16.1' $d = 0.8'$

SD = 15.6'

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.02	S14°26.37	61°35.73	12.6'	S09°49.89	-15.4'	58.1'
1	199°6.04	27.17	76°7.29	12.6'	09°34.45	-15.5'	58.2'
2	214°6.06	27.97	90°38.85	12.6'	09°18.94	-15.6'	58.2'
3	229°6.08	· · 28.77	105°10.42	12.6'	09°3.36	-15.6'	58.3'
4	244°6.09	29.57	119°41.98	12.6'	08°47.72	-15.7'	58.3'
5	259°6.11	30.36	134°13.53	12.6'	08°32.01	-15.8'	58.3'
6	274°6.13	S14°31.16	148°45.09	12.6'	S08°16.24	-15.8'	58.4'
7	289°6.14	31.96	163°16.64	12.5'	08°0.41	-15.9'	58.4'
8	304°6.16	32.76	177°48.18	12.5'	07°44.51	-16.0'	58.5'
9	319°6.17	· · 33.55	192°19.72	12.5'	07°28.56	-16.0'	58.5'
10	334°6.19	34.35	206°51.25	12.5'	07°12.54	-16.1'	58.5'
11	349°6.20	35.14	221°22.78	12.5'	06°56.47	-16.1'	58.6'
12	4°6.22	S14°35.94	235°54.29	12.5'	S06°40.34	-16.2'	58.6'
13	19°6.23	36.73	250°25.79	12.5'	06°24.15	-16.2'	58.7'
14	34°6.25	37.53	264°57.27	12.5'	06°7.91	-16.3'	58.7'
15	49°6.26	· · 38.32	279°28.75	12.5'	05°51.62	-16.3'	58.7'
16	64°6.27	39.12	294°0.21	12.4'	05°35.27	-16.4'	58.8'
17	79°6.29	39.91	308°31.65	12.4'	05°18.88	-16.4'	58.8'
18	94°6.30	S14°40.70	323°3.07	12.4'	S05°2.43	-16.5'	58.9'
19	109°6.31	41.49	337°34.48	12.4'	04°45.94	-16.5'	58.9'
20	124°6.32	42.29	352°5.86	12.4'	04°29.40	-16.6'	58.9'
21	139°6.33	· · 43.08	6°37.23	12.3'	04°12.81	-16.6'	59.0'
22	154°6.34	43.87	21°8.57	12.3'	03°56.18	-16.7'	59.0'
23	169°6.35	44.66	35°39.89	12.3'	03°39.51	-16.7'	59.1'

SD = 16.1' $d = 0.8'$

SD = 15.9'


Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.36	S14°45.45	50°11.18	12.3'	S03°22.79	-16.8'	59.1'
1	199°6.37	46.24	64°42.44	12.2'	03°6.03	-16.8'	59.1'
2	214°6.38	47.03	79°13.68	12.2'	02°49.24	-16.8'	59.2'
3	229°6.39	· · 47.82	93°44.89	12.2'	02°32.41	-16.9'	59.2'
4	244°6.40	48.61	108°16.07	12.1'	02°15.54	-16.9'	59.3'
5	259°6.41	49.39	122°47.21	12.1'	01°58.64	-16.9'	59.3'
6	274°6.42	S14°50.18	137°18.33	12.1'	S01°41.70	-17.0'	59.3'
7	289°6.43	50.97	151°49.41	12.0'	01°24.74	-17.0'	59.4'
8	304°6.43	51.76	166°20.45	12.0'	01°7.74	-17.0'	59.4'
9	319°6.44	· · 52.54	180°51.45	12.0'	00°50.71	-17.1'	59.5'
10	334°6.45	53.33	195°22.42	11.9'	00°33.66	-17.1'	59.5'
11	349°6.46	54.11	209°53.35	11.9'	S00°16.58	-17.1'	59.5'
12	4°6.46	S14°54.90	224°24.23	11.8'	N00°0.53	17.1'	59.6'
13	19°6.47	55.68	238°55.08	11.8'	00°17.65	17.1'	59.6'
14	34°6.47	56.47	253°25.88	11.8'	00°34.80	17.2'	59.6'
15	49°6.48	· · 57.25	267°56.63	11.7'	00°51.97	17.2'	59.7'
16	64°6.48	58.04	282°27.34	11.7'	01°9.15	17.2'	59.7'
17	79°6.49	58.82	296°57.99	11.6'	01°26.35	17.2'	59.8'
18	94°6.49	S14°59.60	311°28.60	11.6'	N01°43.57	17.2'	59.8'
19	109°6.49	15°0.38	325°59.16	11.5'	02°0.80	17.2'	59.8'
20	124°6.50	1.17	340°29.67	11.5'	02°18.04	17.3'	59.9'
21	139°6.50	· · 1.95	355°0.12	11.4'	02°35.29	17.3'	59.9'
22	154°6.50	2.73	9°30.52	11.3'	02°52.55	17.3'	59.9'
23	169°6.51	3.51	24°0.86	11.3'	03°9.82	17.3'	60.0'

SD = 16.1' $d = 0.8'$

SD = 16.1'

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:07	07:30	08:58	14:27	15:55	17:18
N 70°	06:03	07:17	08:32	14:54	16:09	17:23
68°	05:59	07:06	08:12	15:14	16:19	17:27
66°	05:56	06:57	07:56	15:30	16:28	17:30
64°	05:53	06:50	07:43	15:43	16:36	17:33
62°	05:50	06:43	07:32	15:54	16:43	17:36
60°	05:48	06:37	07:23	16:04	16:49	17:38
N 58°	05:46	06:32	07:15	16:12	16:54	17:40
56°	05:44	06:28	07:07	16:19	16:59	17:43
54°	05:42	06:23	07:01	16:25	17:03	17:45
52°	05:40	06:20	06:55	16:31	17:07	17:47
50°	05:38	06:16	06:50	16:37	17:10	17:49
45°	05:33	06:08	06:39	16:48	17:19	17:53
N 40°	05:29	06:01	06:29	16:57	17:26	17:58
35°	05:25	05:55	06:21	17:06	17:32	18:02
30°	05:21	05:49	06:14	17:13	17:38	18:06
20°	05:13	05:39	06:02	17:25	17:48	18:14
N 10°	05:04	05:29	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:42	05:08	05:30	17:58	18:19	18:45
20°	04:28	04:55	05:18	18:09	18:32	18:59
30°	04:10	04:40	05:05	18:22	18:48	19:18
35°	03:58	04:31	04:58	18:30	18:57	19:30
40°	03:44	04:20	04:49	18:39	19:08	19:44
45°	03:27	04:06	04:39	18:49	19:22	20:02
S 50°	03:04	03:50	04:26	19:02	19:39	20:25
52°	02:52	03:42	04:20	19:08	19:47	20:37
54°	02:39	03:33	04:14	19:15	19:56	20:50
56°	02:23	03:23	04:07	19:22	20:06	21:06
58°	02:04	03:11	03:59	19:30	20:18	21:26
S 60°	01:39	02:57	03:49	19:39	20:32	21:53

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	16:21	15:37	15:00	23:41	· ·	02:07
N 70°	16:01	15:29	15:01	23:58	· ·	02:11
68°	15:46	15:22	15:01	· ·	00:11	02:15
66°	15:33	15:17	15:02	· ·	00:22	02:18
64°	15:22	15:12	15:03	· ·	00:31	02:20
62°	15:13	15:08	15:03	· ·	00:39	02:22
60°	15:05	15:04	15:03	· ·	00:45	02:24
N 58°	14:58	15:01	15:04	· ·	00:51	02:25
56°	14:52	14:58	15:04	· ·	00:56	02:27
54°	14:46	14:56	15:05	· ·	01:01	02:28
52°	14:41	14:53	15:05	· ·	01:05	02:29
50°	14:36	14:51	15:05	· ·	01:09	02:30
45°	14:26	14:46	15:06	00:02	01:17	02:33
N 40°	14:18	14:42	15:06	00:14	01:23	02:34
35°	14:11	14:39	15:07	00:23	01:29	02:36
30°	14:04	14:36	15:07	00:31	01:34	02:37
20°	13:53	14:31	15:08	00:46	01:42	02:40
N 10°	13:44	14:26	15:09	00:58	01:50	02:42
0°	13:34	14:21	15:09	01:10	01:57	02:44
S 10°	13:25	14:17	15:10	01:21	02:04	02:46
20°	13:15	14:12	15:11	01:33	02:11	02:48
30°	13:04	14:07	15:11	01:47	02:19	02:50
35°	12:57	14:04	15:12	01:55	02:24	02:51
40°	12:50	14:00	15:13	02:04	02:29	02:53
45°	12:41	13:56	15:13	02:14	02:35	02:54
S 50°	12:30	13:51	15:14	02:27	02:42	02:56
52°	12:25	13:49	15:15	02:32	02:45	02:57
54°	12:20	13:46	15:15	02:39	02:49	02:58
56°	12:14	13:44	15:15	02:46	02:53	02:59
58°	12:07	13:40	15:16	02:54	02:57	03:00
S 60°	11:59	13:37	15:17	03:03	03:02	03:01

Day	Sun			Moon	
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm Lower hh:mm	Age 10-12 64-83%
31	16:22	16:23	11:44	19:46 07:22	
01	16:24	16:25	11:44	20:33 08:09	
02	16:25	16:26	11:44	21:21 08:56	

November 03, 04, 05 UT (Mon., Tue., Wed.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	42°30.50	198°44.98	S08°21.21	165°55.96	S20°18.86	285°31.19	N21°12.86	45°28.15	S03°57.75	Alpheratz	357°33.83 29°14.20
1	57°32.96	213°44.52	22.38	180°56.57	19.27	300°33.58	12.85	60°30.72	57.79	Ankaa	353°6.13 -42°9.97
2	72°35.43	228°44.05	23.55	195°57.18	19.68	315°35.97	12.84	75°33.28	57.82	Schedar	349°29.83 56°40.97
3	87°37.89	243°43.59	· · 24.72	210°57.79	· · 20.10	330°38.36	· · 12.84	90°35.84	· · 57.86	Diphda	348°46.35 -17°50.63
4	102°40.36	258°43.12	25.89	225°58.40	20.51	345°40.74	12.83	105°38.41	57.89	Achernar	335°19.10 -57°6.34
5	117°42.82	273°42.65	27.06	240°59.01	20.93	0°43.13	12.82	120°40.97	57.93	Hamal	327°50.12 23°35.22
6	132°45.28	288°42.19	S08°28.23	255°59.62	S20°21.34	15°45.52	N21°12.82	135°43.53	S03°57.96	Polaris	313°12.48 89°22.36
7	147°47.75	303°41.72	29.40	271°0.23	21.75	30°47.91	12.81	150°46.10	58.00	Acamar	315°10.83 -40°11.94
8	162°50.21	318°41.25	30.56	286°0.83	22.16	45°50.30	12.80	165°48.66	58.04	Menkar	314°5.14 4°11.59
9	177°52.68	333°40.78	· · 31.73	301°1.44	· · 22.58	60°52.70	· · 12.80	180°51.22	· · 58.07	Mirfak	308°26.82 49°57.22
10	192°55.14	348°40.32	32.90	316°2.05	22.99	75°55.09	12.79	195°53.79	58.11	Aldebaran	290°38.56 16°33.75
11	207°57.60	3°39.85	34.07	331°2.66	23.40	90°57.48	12.78	210°56.35	58.14	Rigel	281°2.97 -8°10.15
12	223°0.07	18°39.38	S08°35.23	346°3.27	S20°23.81	105°59.87	N21°12.78	225°58.91	S03°58.18	Capella	280°20.54 46°1.37
13	238°2.53	33°38.91	36.40	1°3.87	24.22	121°2.26	12.77	241°1.48	58.21	Bellatrix	278°21.92 6°22.49
14	253°5.00	48°38.44	37.57	16°4.48	24.63	136°4.66	12.76	256°4.04	58.25	Elnath	278°0.75 28°37.75
15	268°7.46	63°37.97	· · 38.73	31°5.09	· · 25.04	151°7.05	· · 12.76	271°6.60	· · 58.28	Alnilam	275°36.81 -1°10.99
16	283°9.92	78°37.50	39.90	46°5.69	25.45	166°9.44	12.75	286°9.16	58.32	Betelgeuse	270°51.14 7°24.80
17	298°12.39	93°37.03	41.07	61°6.30	25.86	181°11.84	12.74	301°11.73	58.35	Canopus	263°51.77 -52°42.23
18	313°14.85	108°36.56	S08°42.23	76°6.91	S20°26.27	196°14.23	N21°12.74	316°14.29	S03°58.39	Sirius	258°25.47 -16°44.89
19	328°17.32	123°36.09	43.40	91°7.51	26.68	211°16.62	12.73	331°16.85	58.42	Adhara	255°5.17 -29°0.16
20	343°19.78	138°35.62	44.56	106°8.12	27.09	226°19.02	12.73	346°19.41	58.46	Procyon	244°50.04 5°9.61
21	358°22.25	153°35.15	· · 45.72	121°8.72	· · 27.50	241°21.41	· · 12.72	1°21.97	· · 58.49	Pollux	243°16.39 27°57.77
22	13°24.71	168°34.67	46.89	136°9.33	27.91	256°23.81	12.71	16°24.53	58.52	Avior	234°14.40 -59°35.15
23	28°27.17	183°34.20	48.05	151°9.93	28.32	271°26.21	12.71	31°27.09	58.56	Suhail	222°45.87 -43°31.89
Mer.pass. 21:06		ν-0.5' d1.2' m-3.91		ν0.6' d0.4' m1.45		ν2.4' d-0.0' m-2.34		ν2.6' d0.0' m0.78			
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	43°29.64	198°33.73	S08°49.22	166°10.54	S20°28.72	286°28.60	N21°12.70	46°29.66	S03°58.59	Dubhe	193°40.54 61°36.49
1	58°32.10	213°33.26	50.38	181°11.14	29.13	301°31.00	12.70	61°32.22	58.63	Denebola	182°24.51 14°25.68
2	73°34.57	228°32.78	51.54	196°11.74	29.54	316°33.40	12.69	76°34.78	58.66	Gienah	175°43.19 -17°40.98
3	88°37.03	243°32.31	· · 52.70	211°12.35	· · 29.94	331°35.79	· · 12.69	91°37.34	· · 58.70	Acrux	172°59.99 -63°14.33
4	103°39.49	258°31.84	53.87	226°12.95	30.35	346°38.19	12.68	106°39.90	58.73	Gacrux	171°51.44 -57°15.27
5	118°41.96	273°31.36	55.03	241°13.55	30.76	1°40.59	12.68	121°42.46	58.76	Alioth	166°12.87 55°49.06
6	133°44.42	288°30.89	S08°56.19	256°14.16	S20°31.16	16°42.99	N21°12.67	136°45.02	S03°58.80	Spica	158°21.93 -11°17.67
7	148°46.89	303°30.41	57.35	271°14.76	31.57	31°45.39	12.66	151°47.58	58.83	Alkaid	152°51.95 49°11.00
8	163°49.35	318°29.94	58.51	286°15.36	31.97	46°47.78	12.66	166°50.14	58.87	Hadar	148°35.75 -60°29.75
9	178°51.81	333°29.46	08°59.67	301°15.96	· · 32.38	61°50.18	· · 12.65	181°52.70	· · 58.90	Menkent	147°57.26 -36°29.72
10	193°54.28	348°28.98	09°0.83	316°16.56	32.78	76°52.58	12.65	196°55.26	58.93	Arcturus	145°47.65 19°2.91
11	208°56.74	3°28.51	1.99	331°17.17	33.19	91°54.98	12.64	211°57.82	58.97	Rigil Kent.	139°40.10 -60°56.46
12	223°59.21	18°28.03	S09°3.15	346°17.77	S20°33.59	106°57.38	N21°12.64	227°0.38	S03°59.00	Kochab	137°20.96 74°2.89
13	239°1.67	33°27.55	4.31	1°18.37	33.99	121°59.79	12.63	242°2.94	59.03	Zuben'ubi	136°55.64 -16°8.87
14	254°4.13	48°27.08	5.47	16°18.97	34.40	137°2.19	12.63	257°5.49	59.07	Alphecca	126°3.55 26°37.73
15	269°6.60	63°26.60	· · 6.63	31°19.57	· · 34.80	152°4.59	· · 12.62	272°8.05	· · 59.10	Antares	112°15.37 -26°29.34
16	284°9.06	78°26.12	7.78	46°20.17	35.20	167°6.99	12.62	287°10.61	59.13	Atria	107°9.49 -69°4.53
17	299°11.53	93°25.64	8.94	61°20.77	35.61	182°9.39	12.61	302°13.17	59.17	Sabik	102°2.32 -15°45.38
18	314°13.99	108°25.16	S09°10.10	76°21.37	S20°36.01	197°11.80	N21°12.61	317°15.73	S03°59.20	Shaula	96°9.80 -37°7.40
19	329°16.45	123°24.69	11.26	91°21.97	36.41	212°14.20	12.61	332°18.29	59.23	Rasalhague	95°58.20 12°32.58
20	344°18.92	138°24.21	12.41	106°22.57	36.81	227°16.60	12.60	347°20.85	59.27	Eltanin	90°42.25 51°29.30
21	359°21.38	153°23.73	· · 13.57	121°23.17	· · 37.21	242°19.01	· · 12.60	2°23.40	· · 59.30	Kaus Aust.	83°31.89 -34°22.40
22	14°23.85	168°23.25	14.72	136°23.76	37.61	257°21.41	12.59	17°25.96	59.33	Vega	80°33.03 38°48.65
23	29°26.31	183°22.77	15.88	151°24.36	38.01	272°23.81	12.59	32°28.52	59.37	Nunki	75°47.13 -26°15.91
Mer.pass. 21:03		ν-0.5' d1.2' m-3.91		ν0.6' d0.4' m1.44		ν2.4' d-0.0' m-2.34		ν2.6' d0.0' m0.78			
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	44°28.78	198°22.28	S09°17.03	166°24.96	S20°38.41	287°26.22	N21°12.58	47°31.08	S03°59.40	Altair	61°59.42 8°56.32
1	59°31.24	213°21.80	18.19	181°25.56	38.81	302°28.62	12.58	62°33.63	59.43	Peacock	53°4.77 -56°39.31
2	74°33.70	228°21.32	19.34	196°26.15	39.21	317°31.03	12.58	77°36.19	59.46	Deneb	49°25.41 45°22.62
3	89°36.17	243°20.84	· · 20.50	211°26.75	· · 39.61	332°33.43	· · 12.57	92°38.75	· · 59.50	Enif	33°38.09 9°59.76
4	104°38.63	258°20.36	21.65	226°27.35	40.01	347°35.84	12.57	107°41.31	59.53	Al Na'ir	27°31.93 -46°50.30
5	119°41.10	273°19.88	22.81	241°27.95	40.41	2°38.25	12.56	122°43.86	59.56	Fomalhaut	15°13.60 -29°29.16
6	134°43.56	288°19.39	S09°23.96	256°28.54	S20°40.81	17°40.65	N21°12.56	137°46.42	S03°59.59	Scheat	13°44.39 28°13.61
7	149°46.02	303°18.91	25.11	271°29.14	41.21	32°43.06	12.56	152°48.98	59.62	Markab	13°29.07 15°20.84
8	164°48.49	318°18.43	26.26	286°29.73	41.61	47°45.47	12.55	167°51.53	59.66		
9	179°50.95	333°17.94	· · 27.42	301°30.33	· · 42.00	62°47.88	· · 12.55	182°54.09	· · 59.69		
10	194°53.42	348°17.46	28.57	316°30.92	42.40	77°50.29	12.54	197°56.65	59.72		
11	209°55.88	3°16.97	29.72	331°31.52	42.80	92°52.69	12.54	212°59.20	59.75		
12	224°58.34	18°16.49	S09°30.87	346°32.11	S20°43.19	107°55.10	N21°12.5°				

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		184°6.51	S15°4.29	38°31.14	11.2'	N03°27.08	17.3' 60.0'
1		199°6.51	5.07	53°1.36	11.2'	03°44.36	17.3' 60.0'
2		214°6.51	5.85	67°31.52	11.1'	04°1.63	17.3' 60.1'
3		229°6.51	· · 6.63	82°1.63	11.0'	04°18.90	17.3' 60.1'
4		244°6.51	7.41	96°31.66	11.0'	04°36.17	17.3' 60.1'
5		259°6.51	8.18	111°1.63	10.9'	04°53.44	17.3' 60.2'
6		274°6.51	S15°8.96	125°31.54	10.8'	N05°10.70	17.3' 60.2'
7		289°6.51	9.74	140°1.38	10.8'	05°27.95	17.2' 60.2'
8		304°6.51	10.51	154°31.15	10.7'	05°45.19	17.2' 60.3'
9		319°6.51	· · 11.29	169°0.85	10.6'	06°2.42	17.2' 60.3'
10		334°6.51	12.07	183°30.48	10.6'	06°19.64	17.2' 60.3'
11		349°6.51	12.84	198°0.03	10.5'	06°36.84	17.2' 60.4'
12		4°6.51	S15°13.62	212°29.51	10.4'	N06°54.02	17.2' 60.4'
13		19°6.50	14.39	226°58.92	10.3'	07°11.18	17.1' 60.4'
14		34°6.50	15.17	241°28.24	10.2'	07°28.32	17.1' 60.5'
15		49°6.50	· · 15.94	255°57.49	10.2'	07°45.44	17.1' 60.5'
16		64°6.49	16.71	270°26.66	10.1'	08°2.53	17.1' 60.5'
17		79°6.49	17.49	284°55.75	10.0'	08°19.60	17.0' 60.6'
18		94°6.48	S15°18.26	299°24.76	9.9'	N08°36.63	17.0' 60.6'
19		109°6.48	19.03	313°53.68	9.8'	08°53.63	17.0' 60.6'
20		124°6.47	19.80	328°22.52	9.8'	09°10.60	16.9' 60.6'
21		139°6.47	· · 20.57	342°51.27	9.7'	09°27.54	16.9' 60.7'
22		154°6.46	21.34	357°19.93	9.6'	09°44.43	16.9' 60.7'
23		169°6.46	22.11	11°48.51	9.5'	10°1.29	16.8' 60.7'
		SD = 16.1' $d = 0.8'$		SD = 16.4'			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		184°6.45	S15°22.88	26°16.99	9.4'	N10°18.10	16.8' 60.7'
1		199°6.44	23.65	40°45.39	9.3'	10°34.87	16.7' 60.8'
2		214°6.44	24.42	55°13.69	9.2'	10°51.59	16.7' 60.8'
3		229°6.43	· · 25.19	69°41.90	9.1'	11°8.26	16.6' 60.8'
4		244°6.42	25.96	84°10.01	9.0'	11°24.88	16.6' 60.8'
5		259°6.41	26.72	98°38.03	8.9'	11°41.45	16.5' 60.9'
6		274°6.41	S15°27.49	113°5.96	8.8'	N11°57.96	16.5' 60.9'
7		289°6.40	28.26	127°33.78	8.7'	12°14.42	16.4' 60.9'
8		304°6.39	29.02	142°1.50	8.6'	12°30.81	16.3' 60.9'
9		319°6.38	· · 29.79	156°29.13	8.5'	12°47.14	16.3' 61.0'
10		334°6.37	30.56	170°56.65	8.4'	13°3.41	16.2' 61.0'
11		349°6.36	31.32	185°24.07	8.3'	13°19.61	16.1' 61.0'
12		4°6.35	S15°32.08	199°51.39	8.2'	N13°35.74	16.1' 61.0'
13		19°6.34	32.85	214°18.61	8.1'	13°51.80	16.0' 61.0'
14		34°6.32	33.61	228°45.72	8.0'	14°7.78	15.9' 61.1'
15		49°6.31	· · 34.38	243°12.72	7.9'	14°23.69	15.8' 61.1'
16		64°6.30	35.14	257°39.62	7.8'	14°39.52	15.7' 61.1'
17		79°6.29	35.90	272°6.41	7.7'	14°55.27	15.7' 61.1'
18		94°6.28	S15°36.66	286°33.09	7.6'	N15°10.94	15.6' 61.1'
19		109°6.26	37.42	300°59.66	7.5'	15°26.52	15.5' 61.1'
20		124°6.25	38.18	315°26.13	7.4'	15°42.01	15.4' 61.2'
21		139°6.23	· · 38.94	329°52.48	7.2'	15°57.41	15.3' 61.2'
22		154°6.22	39.70	344°18.72	7.1'	16°12.72	15.2' 61.2'
23		169°6.21	40.46	358°44.85	7.0'	16°27.93	15.1' 61.2'
		SD = 16.1' $d = 0.8'$		SD = 16.6'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		184°6.19	S15°41.22	13°10.87	6.9'	N16°43.04	15.0' 61.2'
1		199°6.18	41.98	27°36.77	6.8'	16°58.06	14.9' 61.2'
2		214°6.16	42.74	42°2.56	6.7'	17°12.97	14.8' 61.2'
3		229°6.14	· · 43.50	56°28.24	6.6'	17°27.78	14.7' 61.3'
4		244°6.13	44.25	70°53.81	6.4'	17°42.47	14.6' 61.3'
5		259°6.11	45.01	85°19.26	6.3'	17°57.06	14.5' 61.3'
6		274°6.09	S15°45.77	99°44.59	6.2'	N18°11.54	14.4' 61.3'
7		289°6.08	46.52	114°9.81	6.1'	18°25.90	14.2' 61.3'
8		304°6.06	47.28	128°34.91	6.0'	18°40.14	14.1' 61.3'
9		319°6.04	· · 48.03	142°59.90	5.9'	18°54.27	14.0' 61.3'
10		334°6.02	48.79	157°24.78	5.8'	19°8.27	13.9' 61.3'
11		349°6.00	49.54	171°49.54	5.6'	19°22.15	13.8' 61.3'
12		4°5.98	S15°50.30	186°14.18	5.5'	N19°35.90	13.6' 61.3'
13		19°5.96	51.05	200°38.71	5.4'	19°49.52	13.5' 61.3'
14		34°5.94	51.80	215°3.12	5.3'	20°3.00	13.4' 61.4'
15		49°5.92	· · 52.55	229°27.42	5.2'	20°16.36	13.2' 61.4'
16		64°5.90	53.31	243°51.60	5.1'	20°29.58	13.1' 61.4'
17		79°5.88	54.06	258°15.67	5.0'	20°42.66	12.9' 61.4'
18		94°5.86	S15°54.81	272°39.62	4.8'	N20°55.59	12.8' 61.4'
19		109°5.84	55.56	287°3.47	4.7'	21°8.39	12.6' 61.4'
20		124°5.82	56.31	301°27.19	4.6'	21°21.04	12.5' 61.4'
21		139°5.79	· · 57.06	315°50.81	4.5'	21°33.53	12.3' 61.4'
22		154°5.77	57.81	330°14.31	4.4'	21°45.88	12.2' 61.4'
23		169°5.75	58.56	344°37.70	4.3'	21°58.08	12.0' 61.4'
		SD = 16.1' $d = 0.8'$		SD = 16.7'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:19	07:44	09:18	14:08	15:42	17:07
N 70°	06:13	07:29	08:47	14:39	15:57	17:12
68°	06:09	07:17	08:24	15:02	16:09	17:17
66°	06:04	07:07	08:07	15:19	16:19	17:21
64°	06:01	06:58	07:53	15:34	16:28	17:25
62°	05:57	06:51	07:41	15:46	16:35	17:29
60°	05:54	06:44	07:30	15:56	16:42	17:32
N 58°	05:52	06:39	07:22	16:05	16:48	17:34
56°	05:49	06:34	07:14	16:13	16:53	17:37
54°	05:47	06:29	07:07	16:20	16:58	17:40
52°	05:44	06:25	07:01	16:26	17:02	17:42
50°	05:42	06:21	06:55	16:32	17:06	17:44
45°	05:37	06:12	06:43	16:44	17:15	17:50
N 40°	05:32	06:04	06:33	16:54	17:22	17:54
35°	05:28	05:58	06:24	17:03	17:29	17:59
30°	05:23	05:51	06:16	17:11	17:35	18:04
20°	05:14	05:40	06:03	17:24	17:47	18:13
N 10°	05:04	05:30	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:41	05:07	05:29	17:58	18:20	18:46
20°	04:26	04:54	05:17	18:11	18:34	19:01
30°	04:07	04:37	05:03	18:25	18:50	19:21
35°	03:55	04:28	04:55	18:33	19:00	19:33
40°	03:40	04:16	04:45	18:42	19:12	19:48
45°	03:22	04:02	04:34	18:54	19:26	20:07
S 50°	02:57	03:44	04:21	19:07	19:44	20:32
52°	02:45	03:36	04:15	19:14	19:53	20:44
54°	02:30	03:26	04:08	19:21	20:03	20:59
56°	02:13	03:15	04:00	19:28	20:14	21:17
58°	01:52	03:03	03:51	19:37	20:27	21:39
S 60°	01:22	02:48	03:41	19:48	20:42	22:10

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	14:21	13:27	☐	04:32	07:16	☐
N 70°	14:31	13:53	12:28	04:25	06:53	10:16
68°	14:40	14:13	13:28	04:20	06:35	09:18
66°	14:47	14:29	14:03	04:15	06:21	08:45
64°	14:53	14:42	14:28	04:11	06:10	08:21
62°	14:58	14:53	14:48	04:08	06:00	08:02
60°	15:03	15:03	15:05	04:05	05:52	07:46
N 58°	15:07	15:12	15:19	04:02	05:44	07:33
56°	15:11	15:19	15:31	04:00	05:38	07:22
54°	15:14	15:26	15:42	03:58	05:32	07:12
52°	15:17	15:32	15:51	03:56	05:27	07:03
50°	15:20	15:38	16:00	03:55	05:23	06:55
45°	15:26	15:50	16:18	03:51	05:13	06:39
N 40°	15:31	16:00	16:33	03:48	05:05	06:25
35°	15:36	16:08	16:46	03:45	04:58	06:14
30°	15:40	16:16	16:57	03:43	04:52	06:04
20°	15:47	16:29	17:17	03:39	04:41	05:47
N 10°	15:53	16:41	17:34	03:36	04:32	05:32
0°	15:59	16:52	17:50	03:32	04:23	05:19
S 10°	16:05	17:03	18:06	03:29	04:15	05:05
20°	16:11	17:15	18:23	03:26	04:06	04:51
30°	16:19	17:29	18:43	03:22	03:56	04:34
35°	16:23	17:37	18:55	03:19	03:50	04:24
40°	16:28	17:47	19:09	03:17	03:43	04:14
45°	16:33	17:58	19:25	03:14	03:35	04:01
S 50°	16:40	18:11	19:46	03:10	03:26	03:45
52°	16:44	18:17	19:55	03:09	03:22	03:38
54°	16:47	18:24	20:06	03:07	03:17	03:30
56°	16:51	18:32	20:19	03:05	03:12	03:22
58°	16:55	18:41	20:33	03:03	03:06	03:12
S 60°	17:00	18:51	20:51	03:01	03:00	03:00

Day	Sun		Mer. Pass	Moon		Age 13-15 91-99%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
03	16:26	16:26	11:44	22:11	09:45	
04	16:26	16:25	11:44	23:05	10:38	
05	16:25	16:24	11:44	--:--	11:34	

Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°27.91	198°10.64	S09°44.65	166°39.23	S20°47.93	288°24.04	N21°12.50	48°32.42	S04°0.16
1	60°30.38	213°10.15	45.80	181°39.82	48.32	303°26.45	12.50	63°34.97	0.19
2	75°32.84	228°9.66	46.94	196°40.41	48.71	318°28.87	12.49	78°37.52	0.22
3	90°35.31	243°9.17	· · 48.09	211°41.00	· · 49.10	333°31.28	· · 12.49	93°40.08	· · 0.26
4	105°37.77	258°8.68	49.23	226°41.59	49.50	348°33.70	12.49	108°42.63	0.29
5	120°40.24	273°8.19	50.38	241°42.18	49.89	3°36.11	12.49	123°45.18	0.32
6	135°42.70	288°7.70	S09°51.52	256°42.77	S20°50.28	18°38.53	N21°12.48	138°47.74	S04°0.35
7	150°45.16	303°7.20	52.67	271°43.36	50.67	33°40.94	12.48	153°50.29	0.38
8	165°47.63	318°6.71	53.81	286°43.95	51.06	48°43.36	12.48	168°52.84	0.41
9	180°50.09	333°6.22	· · 54.95	301°44.54	· · 51.45	63°45.78	· · 12.48	183°55.40	· · 0.44
10	195°52.56	348°5.73	56.09	316°45.13	51.84	78°48.19	12.48	198°57.95	0.47
11	210°55.02	3°5.23	57.24	331°45.72	52.23	93°50.61	12.47	214°0.50	0.50
12	225°57.48	18°4.74	S09°58.38	346°46.30	S20°52.62	108°53.03	N21°12.47	229°3.05	S04°0.53
13	240°59.95	33°4.25	09°59.52	1°46.89	53.01	123°55.44	12.47	244°5.61	0.56
14	256°2.41	48°3.75	10°0.66	16°47.48	53.39	138°57.86	12.47	259°8.16	0.59
15	271°4.88	63°3.26	· · 1.80	31°48.07	· · 53.78	154°0.28	· · 12.47	274°10.71	· · 0.62
16	286°7.34	78°2.76	2.94	46°48.65	54.17	169°2.70	12.46	289°13.26	0.65
17	301°9.81	93°2.27	4.08	61°49.24	54.56	184°5.12	12.46	304°15.81	0.68
18	316°12.27	108°1.77	S10°5.22	76°49.83	S20°54.94	199°7.54	N21°12.46	319°18.37	S04°0.71
19	331°14.73	123°1.27	6.36	91°50.41	55.33	214°9.96	12.46	334°20.92	0.74
20	346°17.20	138°0.78	7.50	106°51.00	55.72	229°12.38	12.46	349°23.47	0.77
21	1°19.66	153°0.28	· · 8.64	121°51.59	· · 56.10	244°14.80	· · 12.46	4°26.02	· · 0.80
22	16°22.13	167°59.78	9.78	136°52.17	56.49	259°17.22	12.45	19°28.57	0.83
23	31°24.59	182°59.28	10.91	151°52.76	56.87	274°19.64	12.45	34°31.12	0.86
Mer.pass. 20:55		ν-0.5' d1.1' m-3.91		ν0.6' d0.4' m1.43		ν2.4' d-0.0' m-2.36		ν2.6' d0.0' m0.79	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°27.06	197°58.79	S10°12.05	166°53.34	S20°57.26	289°22.07	N21°12.45	49°33.67	S04°0.89
1	61°29.52	212°58.29	13.19	181°53.93	57.65	304°24.49	12.45	64°36.22	0.92
2	76°31.98	227°57.79	14.32	196°54.51	58.03	319°26.91	12.45	79°38.77	0.95
3	91°34.45	242°57.29	· · 15.46	211°55.09	· · 58.41	334°29.33	· · 12.45	94°41.32	· · 0.97
4	106°36.91	257°56.79	16.60	226°55.68	58.80	349°31.76	12.45	109°43.87	1.00
5	121°39.38	272°56.29	17.73	241°56.26	59.18	4°34.18	12.45	124°46.42	1.03
6	136°41.84	287°55.79	S10°18.87	256°56.85	S20°59.56	19°36.61	N21°12.45	139°48.97	S04°1.06
7	151°44.30	302°55.29							

Nov 06 Thu	SHA	Mer.pass
Venus	152°42.73	10:48
Mars	121°11.31	12:53
Jupiter	242°56.12	04:46
Saturn	3°4.50	20:42

Nov 07 Fri	SHA	Mer.pass
Venus	151°31.73	10:48
Mars	120°26.29	12:52
Jupiter	242°55.01	04:42
Saturn	3°6.62	20:38

Nov 08 Sat	SHA	Mer.pass
Venus	150°20.52	10:49
Mars	119°41.10	12:51
Jupiter	242°54.10	04:38
Saturn	3°8.64	20:34

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.72	S15°59.30	359°0.99	4.2'	N22°10.12	11.9'	61.4'
1	199°5.70	16°0.05	13°24.16	4.1'	22°22.00	11.7'	61.4'
2	214°5.68	0.80	27°47.22	4.0'	22°33.73	11.6'	61.4'
3	229°5.65	· · 1.55	42°10.18	3.8'	22°45.29	11.4'	61.4'
4	244°5.63	2.29	56°33.03	3.7'	22°56.69	11.2'	61.4'
5	259°5.60	3.04	70°55.77	3.6'	23°7.92	11.1'	61.4'
6	274°5.58	S16°3.78	85°18.41	3.5'	N23°18.98	10.9'	61.4'
7	289°5.55	4.53	99°40.95	3.4'	23°29.88	10.7'	61.4'
8	304°5.52	5.27	114°3.38	3.3'	23°40.60	10.5'	61.3'
9	319°5.50	· · 6.02	128°25.71	3.2'	23°51.14	10.4'	61.3'
10	334°5.47	6.76	142°47.95	3.1'	24°1.51	10.2'	61.3'
11	349°5.44	7.50	157°10.09	3.0'	24°11.70	10.0'	61.3'
12	4°5.41	S16°8.25	171°32.13	2.9'	N24°21.71	9.8'	61.3'
13	19°5.38	8.99	185°54.08	2.9'	24°31.54	9.6'	61.3'
14	34°5.36	9.73	200°15.93	2.8'	24°41.19	9.5'	61.3'
15	49°5.33	· · 10.47	214°37.70	2.7'	24°50.64	9.3'	61.3'
16	64°5.30	11.21	228°59.38	2.6'	24°59.91	9.1'	61.3'
17	79°5.27	11.95	243°20.97	2.5'	25°9.00	8.9'	61.3'
18	94°5.24	S16°12.69	257°42.48	2.4'	N25°17.89	8.7'	61.3'
19	109°5.21	13.43	272°3.90	2.3'	25°26.58	8.5'	61.2'
20	124°5.18	14.17	286°25.24	2.3'	25°35.08	8.3'	61.2'
21	139°5.14	· · 14.91	300°46.51	2.2'	25°43.39	8.1'	61.2'
22	154°5.11	15.65	315°7.70	2.1'	25°51.50	7.9'	61.2'
23	169°5.08	16.39	329°28.82	2.0'	25°59.41	7.7'	61.2'
SD = 16.1'		$d = 0.7'$	SD = 16.7'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.05	S16°17.12	343°49.87	2.0'	N26°7.12	7.5'	61.2'
1	199°5.02	17.86	358°10.85	1.9'	26°14.62	7.3'	61.2'
2	214°4.98	18.59	12°31.76	1.9'	26°21.93	7.1'	61.2'
3	229°4.95	· · 19.33	26°52.61	1.8'	26°29.03	6.9'	61.1'
4	244°4.92	20.07	41°13.40	1.7'	26°35.92	6.7'	61.1'
5	259°4.88	20.80	55°34.14	1.7'	26°42.60	6.5'	61.1'
6	274°4.85	S16°21.53	69°54.81	1.6'	N26°49.08	6.3'	61.1'
7	289°4.81	22.27	84°15.44	1.6'	26°55.35	6.1'	61.1'
8	304°4.78	23.00	98°36.02	1.5'	27°1.41	5.8'	61.0'
9	319°4.74	· · 23.73	112°56.55	1.5'	27°7.26	5.6'	61.0'
10	334°4.70	24.47	127°17.04	1.5'	27°12.89	5.4'	61.0'
11	349°4.67	25.20	141°37.49	1.4'	27°18.31	5.2'	61.0'
12	4°4.63	S16°25.93	155°57.91	1.4'	N27°23.52	5.0'	61.0'
13	19°4.59	26.66	170°18.29	1.4'	27°28.52	4.8'	60.9'
14	34°4.56	27.39	184°38.64	1.3'	27°33.30	4.6'	60.9'
15	49°4.52	· · 28.12	198°58.96	1.3'	27°37.86	4.3'	60.9'
16	64°4.48	28.85	213°19.26	1.3'	27°42.21	4.1'	60.9'
17	79°4.44	29.58	227°39.54	1.3'	27°46.34	3.9'	60.9'
18	94°4.40	S16°30.31	241°59.80	1.2'	N27°50.25	3.7'	60.8'
19	109°4.36	31.04	256°20.05	1.2'	27°53.95	3.5'	60.8'
20	124°4.32	31.76	270°40.28	1.2'	27°57.42	3.3'	60.8'
21	139°4.28	· · 32.49	285°0.52	1.2'	28°0.68	3.0'	60.8'
22	154°4.24	33.22	299°20.74	1.2'	28°3.72	2.8'	60.7'
23	169°4.20	33.94	313°40.97	1.2'	28°6.55	2.6'	60.7'
SD = 16.1'		$d = 0.7'$	SD = 16.7'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°4.16	S16°34.67	328°1.20	1.2'	N28°9.15	2.4'	60.7'
1	199°4.12	35.39	342°21.43	1.2'	28°11.54	2.2'	60.7'
2	214°4.08	36.12	356°41.68	1.3'	28°13.71	1.9'	60.6'
3	229°4.04	· · 36.84	11°1.94	1.3'	28°15.65	1.7'	60.6'
4	244°3.99	37.57	25°22.22	1.3'	28°17.39	1.5'	60.6'
5	259°3.95	38.29	39°42.51	1.3'	28°18.90	1.3'	60.5'
6	274°3.91	S16°39.01	54°2.83	1.3'	N28°20.19	1.1'	60.5'
7	289°3.86	39.73	68°23.18	1.4'	28°21.27	0.9'	60.5'
8	304°3.82	40.46	82°43.56	1.4'	28°22.13	0.6'	60.5'
9	319°3.77	· · 41.18	97°3.97	1.4'	28°22.78	0.4'	60.4'
10	334°3.73	41.90	111°24.42	1.5'	28°23.21	0.2'	60.4'
11	349°3.68	42.62	125°44.91	1.5'	28°23.42	-0.0'	60.4'
12	4°3.64	S16°43.34	140°5.44	1.6'	N28°23.42	-0.2'	60.3'
13	19°3.59	44.06	154°26.02	1.6'	28°23.21	-0.4'	60.3'
14	34°3.55	44.78	168°46.65	1.7'	28°22.78	-0.6'	60.3'
15	49°3.50	· · 45.50	183°7.34	1.7'	28°22.14	-0.9'	60.3'
16	64°3.45	46.21	197°28.08	1.8'	28°21.29	-1.1'	60.2'
17	79°3.40	46.93	211°48.88	1.9'	28°20.23	-1.3'	60.2'
18	94°3.36	S16°47.65	226°9.74	1.9'	N28°18.96	-1.5'	60.2'
19	109°3.31	48.36	240°30.67	2.0'	28°17.48	-1.7'	60.1'
20	124°3.26	49.08	254°51.67	2.1'	28°15.79	-1.9'	60.1'
21	139°3.21	· · 49.79	269°12.74	2.1'	28°13.90	-2.1'	60.1'
22	154°3.16	50.51	283°33.89	2.2'	28°11.80	-2.3'	60.0'
23	169°3.11	51.22	297°55.11	2.3'	28°9.49	-2.5'	60.0'
SD = 16.1'		$d = 0.7'$	SD = 16.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:30	07:58	09:40	13:46	15:28	16:55
N 70°	06:24	07:41	09:03	14:23	15:45	17:02
68°	06:18	07:27	08:37	14:49	15:59	17:08
66°	06:13	07:16	08:18	15:08	16:10	17:13
64°	06:08	07:07	08:02	15:24	16:20	17:18
62°	06:04	06:58	07:49	15:37	16:28	17:22
60°	06:01	06:51	07:38	15:48	16:35	17:25
N 58°	05:58	06:45	07:29	15:58	16:42	17:29
56°	05:55	06:39	07:20	16:06	16:47	17:32
54°	05:52	06:34	07:13	16:14	16:52	17:35
52°	05:49	06:30	07:06	16:21	16:57	17:38
50°	05:47	06:25	07:00	16:27	17:01	17:40
48°	05:41	06:16	06:47	16:40	17:11	17:46
N 40°	05:35	06:08	06:36	16:51	17:19	17:52
35°	05:30	06:00	06:27	17:00	17:27	17:57
30°	05:25	05:54	06:19	17:08	17:33	18:02
20°	05:15	05:42	06:05	17:23	17:46	18:12
N 10°	05:05	05:30	05:52	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:41	05:06	05:28	17:59	18:21	18:47
20°	04:25	04:52	05:15	18:12	18:35	19:03
30°	04:05	04:35	05:01	18:27	18:53	19:23
35°	03:52	04:25	04:52	18:36	19:03	19:36
40°	03:36	04:12	04:42	18:46	19:16	19:52
45°	03:16	03:57	04:30	18:58	19:31	20:12
S 50°	02:50	03:39	04:16	19:12	19:50	20:39
52°	02:37	03:30	04:09	19:19	19:59	20:52
54°	02:22	03:19	04:02	19:27	20:09	21:08
56°	02:03	03:08	03:54	19:35	20:21	21:27
58°	01:39	02:54	03:44	19:45	20:35	21:53
S 60°	01:04	02:38	03:34	19:56	20:52	22:30

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64°	14:02	<input type="checkbox"/>	<input type="checkbox"/>	10:55	<input type="checkbox"/>	<input type="checkbox"/>
62°	14:43	14:33	<input type="checkbox"/>	10:15	12:42	<input type="checkbox"/>
60°	15:11	15:28	16:18	09:48	11:47	13:16
N 58°	15:33	16:01	16:57	09:26	11:15	12:38
56°	15:51	16:25	17:24	09:09	10:51	12:11
54°	16:06	16:45	17:45	08:54	10:31	11:50
52°	16:19	17:02	18:03	08:41	10:15	11:32
50°	16:31	17:16	18:18	08:30	10:01	11:17
45°	16:56	17:45	18:48	08:07	09:32	10:46
N 40°	17:15	18:08	19:12	07:48	09:09	10:22
35°	17:32	18:27	19:32	07:33	08:51	10:02
30°	17:46	18:44	19:49	07:19	08:35	09:46
20°	18:11	19:12	20:17	06:57	08:08	09:17
N 10°	18:32	19:36	20:41	06:37	07:45	08:52
0°	18:52	19:58	21:04	06:19	07:23	08:30
S 10°	19:12	20:21	21:27	06:01	07:02	08:07
20°	19:34	20:45	21:51	05:41	06:39	07:42
30°	19:59	21:13	22:20	05:19	06:12	07:13
35°	20:14	21:30	22:36	05:06	05:56	06:56
40°	20:32	21:50	22:56	04:51	05:38	06:37
45°	20:53	22:13	23:20	04:33	05:16	06:13
S 50°	21:20	22:44	23:50	04:11	04:48	05:42
52°	21:33	22:59	· · ·	04:01	04:35	05:26
54°	21:48	23:17	· · ·	03:49	04:20	05:08
56°	22:06	23:39	· · ·	03:36	04:01	04:46
58°	22:27	· · ·	00:07	03:21	03:39	04:18
S 60°	22:55	· · ·	00:47	03:03	03:11	03:38

Day	Sun		Mer. Pass hh:mm	Moon		Age 16-18 100-91%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
06	16:23	16:22	11:44	00:04	12:35	
07	16:20	16:19	11:44	01:08	13:41	
08	16:17	16:15	11:44	02:14	14:47	

November 09, 10, 11 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	48°25.34		197°34.42	S11°6.15	167°21.10	S21°15.37	291°18.74	N21°12.46	51°35.92	S04°2.21
1	63°27.80		212°33.90	7.27	182°21.67	15.74	306°21.18	12.47	66°38.47	2.24
2	78°30.27		227°33.38	8.39	197°22.25	16.11	321°23.62	12.47	81°41.01	2.27
3	93°32.73		242°32.86	· · 9.50	212°22.82	· · 16.48	336°26.06	· · 12.47	96°43.55	· · 2.29
4	108°35.20		257°32.35	10.62	227°23.39	16.85	351°28.50	12.47	111°46.10	2.32
5	123°37.66		272°31.83	11.73	242°23.96	17.22	6°30.94	12.47	126°48.64	2.34
6	138°40.12		287°31.31	S11°12.85	257°24.53	S21°17.59	21°33.38	N21°12.48	141°51.18	S04°2.37
7	153°42.59		302°30.79	13.96	272°25.10	17.95	36°35.83	12.48	156°53.72	2.40
8	168°45.05		317°30.27	15.07	287°25.67	18.32	51°38.27	12.48	171°56.26	2.42
9	183°47.52		332°29.75	· · 16.19	302°26.24	· · 18.69	66°40.71	· · 12.48	186°58.81	· · 2.45
10	198°49.98		347°29.23	17.30	317°26.81	19.05	81°43.15	12.49	202°1.35	2.47
11	213°52.44		2°28.70	18.41	332°27.38	19.42	96°45.60	12.49	217°3.89	2.50
12	228°54.91		17°28.18	S11°19.52	347°27.95	S21°19.79	111°48.04	N21°12.49	232°6.43	S04°2.52
13	243°57.37		32°27.66	20.64	2°28.51	20.15	126°50.48	12.49	247°8.97	2.55
14	258°59.84		47°27.14	21.75	17°29.08	20.52	141°52.93	12.50	262°11.51	2.57
15	274°2.30		62°26.61	· · 22.86	32°29.65	· · 20.88	156°55.37	· · 12.50	277°14.06	· · 2.60
16	289°4.77		77°26.09	23.97	47°30.22	21.25	171°57.82	12.50	292°16.60	2.62
17	304°7.23		92°25.57	25.08	62°30.79	21.61	187°0.26	12.50	307°19.14	2.65
18	319°9.69		107°25.04	S11°26.18	77°31.35	S21°21.97	202°2.71	N21°12.51	322°21.68	S04°2.67
19	334°12.16		122°24.52	27.29	92°31.92	22.34	217°5.15	12.51	337°24.22	2.70
20	349°14.62		137°23.99	28.40	107°32.49	22.70	232°7.60	12.51	352°26.76	2.72
21	4°17.09		152°23.47	· · 29.51	122°33.05	· · 23.06	247°10.05	· · 12.52	7°29.30	· · 2.75
22	19°19.55		167°22.94	30.62	137°33.62	23.43	262°12.49	12.52	22°31.84	2.77
23	34°22.02		182°22.41	31.72	152°34.19	23.79	277°14.94	12.52	37°34.38	2.79
Mer.pass. 20:43										
ν -0.5' d1.1' m-3.91										
ν 0.6' d0.4' m1.42										
ν 2.4' d0.0' m-2.38										
ν 2.5' d0.0' m0.81										

Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	49°24.48		197°21.89	S11°32.83	167°34.75	S21°24.15	292°17.39	N21°12.53	52°36.92	S04°2.82
1	64°26.94		212°21.36	33.93	182°35.32	24.51	307°19.84	12.53	67°39.46	2.84
2	79°29.41		227°20.83	35.04	197°35.88	24.87	322°22.29	12.53	82°42.00	2.87
3	94°31.87		242°20.30	· · 36.14	212°36.45	· · 25.23	337°24.74	· · 12.54	97°44.54	· · 2.89
4	109°34.34		257°19.78	37.25	227°37.01	25.59	352°27.19	12.54	112°47.08	2.92
5	124°36.80		272°19.25	38.35	242°37.58	25.95	7°29.64	12.54	127°49.62	2.94
6	139°39.26		287°18.72	S11°39.46	257°38.14	S21°26.31	22°32.09	N21°12.55	142°52.15	S04°2.96
7	154°41.73		302°18.19	40.56	272°38.70	26.67	37°34.54	12.55	157°54.69	2.99
8	169°44.19		317°17.66	41.66	287°39.27	27.03	52°36.99	12.55	172°57.23	3.01
9	184°46.66		332°17.13	· · 42.76	302°39.83	· · 27.39	67°39.44	· · 12.56	187°59.77	· · 3.03
10	199°49.12		347°16.60	43.87	317°40.39	27.75	82°41.89	12.56	203°2.31	3.06
11	214°51.59		2°16.06	44.97	332°40.96	28.11	97°44.34	12.57	218°4.85	3.08
12	229°54.05		17°15.53	S11°46.07	347°41.52	S21°28.47	112°46.79	N21°12.57	233°7.38	S04°3.11
13	244°56.51		32°15.00	47.17	2°42.08	28.82	127°49.25	12.57	248°9.92	3.13
14	259°58.98		47°14.47	48.27	17°42.64	29.18	142°51.70	12.58	263°12.46	3.15
15	275°1.44		62°13.93	· · 49.37	32°43.20	· · 29.54	157°54.15	· · 12.58	278°15.00	· · 3.18
16	290°3.91		77°13.40	50.46	47°43.77	29.89	172°56.61	12.59	293°17.53	3.20
17	305°6.37		92°12.87	51.56	62°44.33	30.25	187°59.06	12.59	308°20.07	3.22
18	320°8.84		107°12.33	S11°52.66	77°44.89	S21°30.61	203°1.52	N21°12.60	323°22.61	S04°3.24
19	335°11.30		122°11.80	53.76	92°45.45	30.96	218°3.97	12.60	338°25.14	3.27
20	350°13.76		137°11.26	54.85	107°46.01	31.32	233°6.43	12.61	353°27.68	3.29
21	5°16.23		152°10.73	· · 55.95	122°46.57	· · 31.67	248°8.88	· · 12.61	8°30.22	· · 3.31
22	20°18.69		167°10.19	57.05	137°47.13	32.03	263°11.34	12.62	23°32.75	3.34
23	35°21.16		182°9.65	58.14	152°47.69	32.38	278°13.79	12.62	38°35.29	3.36
Mer.pass. 20:39										
ν -0.5' d1.1' m-3.91										
ν 0.6' d0.4' m1.42										
ν 2.4' d0.0' m-2.39										
ν 2.5' d0.0' m0.81										

Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°23.62		197°9.12	S11°59.24	167°48.25	S21°32.73	293°16.25	N21°12.62	53°37.83	S04°3.38
1	65°26.08		212°8.58	12°0.33	182°48.81	33.09	308°18.71	12.63	68°40.36	3.40
2	80°28.55		227°8.04	1.42	197°49.36	33.44	323°21.16	12.63	83°42.90	3.43
3	95°31.01		242°7.50	· · 2.52	212°49.92	· · 33.79	338°23.62	· · 12.64	98°45.43	· · 3.45
4	110°33.48		257°6.96	3.61	227°50.48	34.15	353°26.08	12.64	113°47.97	3.47
5	125°35.94		272°6.42	4.70	242°51.04	34.50	8°28.54	12.65	128°50.50	3.49
6	140°38.41		287°5.88	S12°5.79	257°51.60	S21°34.85	23°31.00	N21°12.66	143°53.04	S04°3.52
7	155°40.87		302°5.34	6.88	272°52.15	35.20	38°33.46	12.66	158°55.57	3.54
8	170°43.33		317°4.80	7.98	287°52.71	35.55	53°35.92	12.67	173°58.11	3.56
9	185°45.80		332°4.26	· · 9.07	302°53.27	· · 35.90	68°38.38	· · 12.67	189°0.64	· · 3.58
10	200°48.26		347°3.72	10.16	317°53.83	36.25	83°40.84	12.68	204°3.18	3.60
11	215°50.73		2°3.18	11.24	332°54.38	36.60	98°43.30	12.68	219°5.71	3.63
12	230°53.19		17°2.64	S12°12.33	347°54.94	S21°36.95	113°45.76	N21°12.69	234°8.25	S04°3.65
13	245°55.65		32°2.09	13.42	2°55.49	37.30	128°48.22	12.69	249°10.78	3.67
14	260°58.12		47°1.55	14.51	17°56.05	37.65	143°50.68	12.70	264°13.31	3.69
15	276°0.58		62°1.01	· · 15.60	32°56.60	· · 38.00	158°53.14	· · 12.71	279°15.85	· · 3.71
16	291°3.05		77°0.46	16.68	47°57.16	38.35	173°55.61	12.71	294°18.38	3.73
17	306°5.51		91°59.92	17.77	62°57.71	38.70	188°58.07	12.72	309°20.91	3.76
18	321°7.97		106°59.37	S12°18.86	77°58.27	S21°39.04	204°0.53	N21°12.72	324°23.45	S04°3.78
19	336°10.44		121°58.83	19.94	92°58.82	39.39	219°3.00	12.73	339°25.98	3.80
20	351°12.90		136°58.28	21.03	107°59.38	39.74	234°5.46	12.74	354°28.51	3.82
21	6°15.37		151°57.74	· · 22.11	122°59.93	· · 40.09	249°7.92	· · 12.74	9°31.05	· · 3.84
22	21°17.83		166°57.19	23.19	138°0.48	40.43	264°10.39	12.75	24°33.58	3.86
23	36°20.30		181°56.64	24.28	153°1.04	40.78	279°12.85	12.75	39°36.11	3.88
Mer.pass. 20:35										
ν -0.5' d1.1' m-3.91										
ν 0.6' d0.4' m1.41										
ν 2.5' d0.0' m-2.39										
ν 2.5' d0.0' m0.82										

	SHA	Dec
Alpheratz	357°33.83	29°14.21
Ankaa	353°6.14	-42°9.98
Schedar	349°29.83	56°41.00
Diphda	348°46.35	-17°50.64
Achernar	335°19.12	-57°6.36
Hamal	327°50.10	23°35.23
Polaris	313°11.24	89°22.40
Acamar	315°10.82	-40°11.97
Menkar	314°5.11	4°11.59
Mirfak	308°26.78	49°57.24
Aldebaran	290°38.52	16°33.75
Rigel	281°2.92	-8°10.16
Capella	280°20.48	46°1.38
Bellatrix	278°21.87	6°22.48
Elnath	278°0.69	28°37.75
Alnilam	275°36.77	-1°11.01
Betelgeuse	270°51.10	7°24.79
Canopus	263°51.72	-52°42.26
Sirius	258°25.42	-16°44.91
Adhara	255°5.12	-29°0.18
Procyon	244°49.99	5°9.59
Pollux	243°16.33	27°57.75
Avior	234°14.32	-59°35.17
Suhail	222°45.80	-43°31.90
Miaplacidus	221°38.14	-69°49.01

h		Sun		Moon			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		184°3.06	S16°51.94	312°16.41	2.4'	N28°6.99	-2.7' 60.0'
1		199°3.01	52.65	326°37.80	2.5'	28°4.28	-2.9' 59.9'
2		214°2.96	53.36	340°59.27	2.6'	28°1.37	-3.1' 59.9'
3		229°2.91	· · 54.08	355°20.83	2.7'	27°58.27	-3.3' 59.9'
4		244°2.86	54.79	9°42.49	2.7'	27°54.96	-3.5' 59.8'
5		259°2.80	55.50	24°4.23	2.8'	27°51.46	-3.7' 59.8'
6		274°2.75	S16°56.21	38°26.07	2.9'	N27°47.77	-3.9' 59.7'
7		289°2.70	56.92	52°48.01	3.0'	27°43.88	-4.1' 59.7'
8		304°2.65	57.63	67°10.06	3.1'	27°39.80	-4.3' 59.7'
9		319°2.59	· · 58.34	81°32.20	3.2'	27°35.53	-4.5' 59.6'
10		334°2.54	59.05	95°54.45	3.4'	27°31.07	-4.6' 59.6'
11		349°2.48	16°59.76	110°16.80	3.5'	27°26.43	-4.8' 59.6'
12		4°2.43	S17°0.47	124°39.27	3.6'	N27°21.60	-5.0' 59.5'
13		19°2.37	1.17	139°1.85	3.7'	27°16.59	-5.2' 59.5'
14		34°2.32	1.88	153°24.53	3.8'	27°11.39	-5.4' 59.5'
15		49°2.26	· · 2.59	167°47.34	3.9'	27°6.02	-5.6' 59.4'
16		64°2.21	3.29	182°10.26	4.0'	27°0.47	-5.7' 59.4'
17		79°2.15	4.00	196°33.30	4.2'	26°54.74	-5.9' 59.3'
18		94°2.09	S17°4.70	210°56.46	4.3'	N26°48.84	-6.1' 59.3'
19		109°2.04	5.41	225°19.74	4.4'	26°42.77	-6.2' 59.3'
20		124°1.98	6.11	239°43.14	4.5'	26°36.52	-6.4' 59.2'
21		139°1.92	· · 6.82	254°6.67	4.7'	26°30.11	-6.6' 59.2'
22		154°1.86	7.52	268°30.32	4.8'	26°23.52	-6.7' 59.2'
23		169°1.80	8.22	282°54.10	4.9'	26°16.78	-6.9' 59.1'
		SD = 16.1' d = 0.7'		SD = 16.4'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		184°1.74	S17°8.92	297°18.01	5.0'	N26°9.87	-7.1' 59.1'
1		199°1.69	9.63	311°42.05	5.2'	26°2.80	-7.2' 59.0'
2		214°1.63	10.33	326°6.21	5.3'	25°55.57	-7.4' 59.0'
3		229°1.57	· · 11.03	340°30.51	5.4'	25°48.18	-7.5' 59.0'
4		244°1.50	11.73	354°54.94	5.6'	25°40.63	-7.7' 58.9'
5		259°1.44	12.43	9°19.50	5.7'	25°32.94	-7.8' 58.9'
6		274°1.38	S17°13.12	23°44.20	5.8'	N25°25.09	-8.0' 58.9'
7		289°1.32	13.82	38°9.03	6.0'	25°17.09	-8.1' 58.8'
8		304°1.26	14.52	52°34.00	6.1'	25°8.94	-8.3' 58.8'
9		319°1.20	· · 15.22	66°59.10	6.2'	25°0.65	-8.4' 58.7'
10		334°1.13	15.92	81°24.33	6.4'	24°52.22	-8.6' 58.7'
11		349°1.07	16.61	95°49.71	6.5'	24°43.64	-8.7' 58.7'
12		4°1.01	S17°17.31	110°15.22	6.6'	N24°34.92	-8.9' 58.6'
13		19°0.94	18.00	124°40.86	6.8'	24°26.07	-9.0' 58.6'
14		34°0.88	18.70	139°6.65	6.9'	24°17.08	-9.1' 58.5'
15		49°0.81	· · 19.39	153°32.57	7.1'	24°7.96	-9.3' 58.5'
16		64°0.75	20.09	167°58.63	7.2'	23°58.70	-9.4' 58.5'
17		79°0.68	20.78	182°24.82	7.3'	23°49.31	-9.5' 58.4'
18		94°0.62	S17°21.47	196°51.16	7.5'	N23°39.80	-9.6' 58.4'
19		109°0.55	22.16	211°17.63	7.6'	23°30.16	-9.8' 58.3'
20		124°0.48	22.86	225°44.24	7.7'	23°20.40	-9.9' 58.3'
21		139°0.42	· · 23.55	240°10.98	7.9'	23°10.51	-10.0' 58.3'
22		154°0.35	24.24	254°37.87	8.0'	23°0.50	-10.1' 58.2'
23		169°0.28	24.93	269°4.89	8.2'	22°50.38	-10.2' 58.2'
		SD = 16.1' d = 0.7'		SD = 16.1'			

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		184°0.21	S17°25.62	283°32.05	8.3'	N22°40.14	-10.4' 58.2'
1		199°0.14	26.31	297°59.34	8.4'	22°29.78	-10.5' 58.1'
2		214°0.07	27.00	312°26.77	8.6'	22°19.31	-10.6' 58.1'
3		229°0.01	· · 27.68	326°54.33	8.7'	22°8.73	-10.7' 58.0'
4		243°59.94	28.37	341°22.04	8.8'	21°58.05	-10.8' 58.0'
5		258°59.87	29.06	355°49.87	9.0'	21°47.25	-10.9' 58.0'
6		273°59.80	S17°29.75	10°17.84	9.1'	N21°36.35	-11.0' 57.9'
7		288°59.72	30.43	24°45.94	9.2'	21°25.35	-11.1' 57.9'
8		303°59.65	31.12	39°14.18	9.4'	21°14.24	-11.2' 57.8'
9		318°59.58	· · 31.80	53°42.54	9.5'	21°3.04	-11.3' 57.8'
10		333°59.51	32.49	68°11.04	9.6'	20°51.73	-11.4' 57.8'
11		348°59.44	33.17	82°39.67	9.8'	20°40.34	-11.5' 57.7'
12		3°59.36	S17°33.85	97°8.43	9.9'	N20°28.84	-11.6' 57.7'
13		18°59.29	34.54	111°37.32	10.0'	20°17.26	-11.7' 57.7'
14		33°59.22	35.22	126°6.34	10.1'	20°5.58	-11.8' 57.6'
15		48°59.14	· · 35.90	140°35.48	10.3'	19°53.82	-11.9' 57.6'
16		63°59.07	36.58	155°4.76	10.4'	19°41.96	-11.9' 57.5'
17		78°59.00	37.26	169°34.15	10.5'	19°30.02	-12.0' 57.5'
18		93°58.92	S17°37.94	184°3.67	10.6'	N19°18.00	-12.1' 57.5'
19		108°58.85	38.62	198°33.32	10.8'	19°5.90	-12.2' 57.4'
20		123°58.77	39.30	213°3.09	10.9'	18°53.71	-12.3' 57.4'
21		138°58.69	· · 39.98	227°32.98	11.0'	18°41.45	-12.3' 57.4'
22		153°58.62	40.66	242°2.99	11.1'	18°29.10	-12.4' 57.3'
23		168°58.54	41.34	256°33.12	11.2'	18°16.69	-12.5' 57.3'
		SD = 16.1' d = 0.7'		SD = 15.9'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:42	08:12	10:05	13:22	15:15	16:45
N 70°	06:34	07:53	09:20	14:07	15:34	16:53
68°	06:27	07:38	08:51	14:36	15:49	17:00
66°	06:21	07:25	08:29	14:58	16:02	17:06
64°	06:16	07:15	08:12	15:15	16:12	17:11
62°	06:11	07:06	07:58	15:29	16:21	17:16
60°	06:07	06:58	07:46	15:41	16:29	17:20
N 58°	06:03	06:51	07:36	15:52	16:36	17:24
56°	06:00	06:45	07:26	16:01	16:42	17:27
54°	05:57	06:40	07:19	16:09	16:48	17:30
52°	05:54	06:35	07:11	16:16	16:53	17:33
50°	05:51	06:30	07:05	16:22	16:57	17:36
45°	05:44	06:20	06:51	16:36	17:08	17:43
N 40°	05:38	06:11	06:40	16:48	17:17	17:49
35°	05:33	06:03	06:30	16:58	17:24	17:55
30°	05:27	05:56	06:21	17:06	17:32	18:00
20°	05:17	05:43	06:06	17:22	17:45	18:11
N 10°	05:06	05:31	05:53	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:23	04:51	05:14	18:14	18:37	19:05
30°	04:02	04:33	04:59	18:30	18:55	19:26
35°	03:49	04:22	04:49	18:39	19:07	19:40
40°	03:32	04:09	04:39	18:50	19:20	19:57
45°	03:12	03:53	04:27	19:02	19:36	20:18
S 50°	02:44	03:33	04:11	19:17	19:56	20:46
52°	02:30	03:24	04:04	19:25	20:05	21:00
54°	02:13	03:13	03:56	19:33	20:16	21:17
56°	01:52	03:01	03:48	19:42	20:29	21:39
58°	01:25	02:46	03:38	19:52	20:44	22:08
S 60°	00:40	02:28	03:26	20:04	21:02	22:57

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
N 70°	<div></div>	<div></div>	19:03	<div></div>	<div></div>	16:44
68°	<div></div>	<div></div>	19:59	<div></div>	<div></div>	15:47
66°	<div></div>	17:37	20:32	<div></div>	16:17	15:13
64°	<div></div>	18:44	20:55	<div></div>	15:09	14:48
62°	17:08	19:19	21:14	14:41	14:33	14:28
60°	17:54	19:44	21:30	13:55	14:07	14:11
N 58°	18:24	20:04	21:43	13:25	13:47	13:58
56°	18:47	20:21	21:54	13:01	13:30	13:46
54°	19:05	20:35	22:03	12:43	13:15	13:35
52°	19:21	20:47	22:12	12:27	13:02	13:26
50°	19:34	20:58	22:20	12:13	12:51	13:17
45°	20:02	21:20	22:36	11:44	12:28	12:59
N 40°	20:24	21:38	22:50	11:22	12:09	12:45
35°	20:42	21:53	23:01	11:03	11:53	12:32
30°	20:57	22:06	23:11	10:47	11:39	12:21
20°	21:23	22:28	23:28	10:20	11:15	12:02
N 10°	21:46	22:47	23:42	09:57	10:54	11:45
0°	22:07	23:04	23:56	09:35	10:35	11:30
S 10°	22:28	23:22	· · ·	09:13	10:16	11:14
20°	22:50	23:41	· · ·	08:49	09:55	10:57
30°	23:16	· · ·	00:02	08:21	09:30	10:37
35°	23:31	· · ·	00:15	08:04	09:16	10:26
40°	23:49	· · ·	00:29	07:45	08:59	10:12
45°	· · ·	00:10	00:47	07:22	08:39	09:57
S 50°	· · ·	00:36	01:08	06:52	08:13	09:37
52°	00:05	00:49	01:18	06:37	08:01	09:28
54°	00:23	01:04	01:29	06:19	07:46	09:17
56°	00:44	01:21	01:41	05:59	07:30	09:05
58°	01:11	01:42	01:56	05:32	07:10	08:51
S 60°	01:48	02:08	02:13	04:55	06:44	08:35

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 19-21 83-63%
09	16:12	16:10	11:44	03:19	15:51	
10	16:07	16:04	11:44	04:21	16:50	
11	16:01	15:57	11:44	05:17	17:43	

November 12, 13, 14 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	51°22.76		196°56.10	S12°25.36	168°1.59	S21°41.12	294°15.32	N21°12.76	54°38.64	S04°3.90
1	66°25.22		211°55.55	26.44	183°2.14	41.47	309°17.79	12.77	69°41.18	3.92
2	81°27.69		226°55.00	27.52	198°2.70	41.81	324°20.25	12.77	84°43.71	3.95
3	96°30.15		241°54.45	· · 28.60	213°3.25	· · 42.16	339°22.72	· · 12.78	99°46.24	· · 3.97
4	111°32.62		256°53.90	29.69	228°3.80	42.50	354°25.19	12.79	114°48.77	3.99
5	126°35.08		271°53.35	30.77	243°4.35	42.85	9°27.65	12.79	129°51.30	4.01
6	141°37.54		286°52.80	S12°31.85	258°4.90	S21°43.19	24°30.12	N21°12.80	144°53.83	S04°4.03
7	156°40.01		301°52.25	32.92	273°5.45	43.53	39°32.59	12.81	159°56.37	4.05
8	171°42.47		316°51.70	34.00	288°6.00	43.88	54°35.06	12.81	174°58.90	4.07
9	186°44.94		331°51.15	· · 35.08	303°6.55	· · 44.22	69°37.53	· · 12.82	190°1.43	· · 4.09
10	201°47.40		346°50.60	36.16	318°7.10	44.56	84°39.99	12.83	205°3.96	4.11
11	216°49.87		1°50.04	37.24	333°7.65	44.90	99°42.46	12.84	220°6.49	4.13
12	231°52.33		16°49.49	S12°38.31	348°8.20	S21°45.24	114°44.93	N21°12.84	235°9.02	S04°4.15
13	246°54.79		31°48.94	39.39	3°8.75	45.59	129°47.40	12.85	250°11.55	4.17
14	261°57.26		46°48.38	40.46	18°9.30	45.93	144°49.87	12.86	265°14.08	4.19
15	276°59.72		61°47.83	· · 41.54	33°9.85	· · 46.27	159°52.35	· · 12.86	280°16.61	· · 4.21
16	292°2.19		76°47.27	42.61	48°10.40	46.61	174°54.82	12.87	295°19.14	4.23
17	307°4.65		91°46.72	43.69	63°10.95	46.95	189°57.29	12.88	310°21.67	4.25
18	322°7.11		106°46.16	S12°44.76	78°11.50	S21°47.29	204°59.76	N21°12.89	325°24.20	S04°4.27
19	337°9.58		121°45.61	45.83	93°12.05	47.63	220°2.23	12.89	340°26.73	4.29
20	352°12.04		136°45.05	46.90	108°12.59	47.96	235°4.71	12.90	355°29.26	4.31
21	7°14.51		151°44.49	· · 47.98	123°13.14	· · 48.30	250°7.18	· · 12.91	10°31.79	· · 4.33
22	22°16.97		166°43.94	49.05	138°13.69	48.64	265°9.65	12.92	25°34.31	4.35
23	37°19.43		181°43.38	50.12	153°14.23	48.98	280°12.13	12.93	40°36.84	4.37
Mer.pass. 20:31			ν-0.5' d1.1' m-3.91		ν0.6' d0.3' m1.41		ν2.5' d0.0' m-2.40		ν2.5' d0.0' m0.82	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	52°21.90		196°42.82	S12°51.19	168°14.78	S21°49.32	295°14.60	N21°12.93	55°39.37	S04°4.38
1	67°24.36		211°42.26	52.26	183°15.33	49.65	310°17.08	12.94	70°41.90	4.40
2	82°26.83		226°41.70	53.33	198°15.87	49.99	325°19.55	12.95	85°44.43	4.42
3	97°29.29		241°41.14	· · 54.39	213°16.42	· · 50.33	340°22.03	· · 12.96	100°46.96	· · 4.44
4	112°31.75		256°40.58	55.46	228°16.97	50.66	355°24.50	12.97	115°49.48	4.46
5	127°34.22		271°40.02	56.53	243°17.51	51.00	10°26.98	12.97	130°52.01	4.48
6	142°36.68		286°39.46	S12°57.60	258°18.06	S21°51.33	25°29.45	N21°12.98	145°54.54	S04°4.50
7	157°39.15		301°38.90	58.66	273°18.60	51.67	40°31.93	12.99	160°57.07	4.52
8	172°41.61		316°38.34	12°59.73	288°19.14	52.00	55°34.41	13.00	175°59.59	4.54
9	187°44.08		331°37.78	13°0.79	303°19.69	· · 52.34	70°36.89	· · 13.01	191°2.12	· · 4.55
10	202°46.54		346°37.21	1.86	318°20.23	52.67	85°39.36	13.02	206°4.65	4.57
11	217°49.00		1°36.65	2.92	333°20.78	53.00	100°41.84	13.02	221°7.17	4.59
12	232°51.47		16°36.09	S13°3.99	348°21.32	S21°53.34	115°44.32	N21°13.03	236°9.70	S04°4.61
13	247°53.93		31°35.52	5.05	3°21.86	53.67	130°46.80	13.04	251°12.23	4.63
14	262°56.40		46°34.96	6.11	18°22.41	54.00	145°49.28	13.05	266°14.75	4.65
15	277°58.86		61°34.39	· · 7.17	33°22.95	· · 54.33	160°51.76	· · 13.06	281°17.28	· · 4.66
16	293°1.32		76°33.83	8.24	48°23.49	54.67	175°54.24	13.07	296°19.81	4.68
17	308°3.79		91°33.26	9.30	63°24.03	55.00	190°56.72	13.08	311°22.33	4.70
18	323°6.25		106°32.69	S13°10.36	78°24.58	S21°55.33	205°59.20	N21°13.09	326°24.86	S04°4.72
19	338°8.72		121°32.13	11.42	93°25.12	55.66	221°1.68	13.10	341°27.38	4.74
20	353°11.18		136°31.56	12.48	108°25.66	55.99	236°4.16	13.11	356°29.91	4.75
21	8°13.64		151°30.99	· · 13.53	123°26.20	· · 56.32	251°6.64	· · 13.11	11°32.43	· · 4.77
22	23°16.11		166°30.42	14.59	138°26.74	56.65	265°9.13	13.12	26°34.96	4.79
23	38°18.57		181°29.85	15.65	153°27.28	56.98	281°11.61	13.13	41°37.48	4.81
Mer.pass. 20:27			ν-0.6' d1.1' m-3.91		ν0.5' d0.3' m1.40		ν2.5' d0.0' m-2.41		ν2.5' d0.0' m0.83	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	53°21.04		196°29.28	S13°16.71	168°27.82	S21°57.31	296°14.09	N21°13.14	56°40.01	S04°4.82
1	68°23.50		211°28.72	17.76	183°28.36	57.64	311°16.58	13.15	71°42.53	4.84
2	83°25.96		226°28.14	18.82	198°28.90	57.96	326°19.06	13.16	86°45.06	4.86
3	98°28.43		241°27.57	· · 19.87	213°29.44	· · 58.29	341°21.54	· · 13.17	101°47.58	· · 4.88
4	113°30.89		256°27.00	20.93	228°29.98	58.62	356°24.03	13.18	116°50.11	4.89
5	128°33.36		271°26.43	21.98	243°30.52	58.95	11°26.51	13.19	131°52.63	4.91
6	143°35.82		286°25.86	S13°23.04	258°31.06	S21°59.27	26°29.00	N21°13.20	146°55.15	S04°4.93
7	158°38.28		301°25.29	24.09	273°31.60	59.60	41°31.48	13.21	161°57.68	4.94
8	173°40.75		316°24.71	25.14	288°32.14	21°59.93	56°33.97	13.22	177°0.20	4.96
9	188°43.21		331°24.14	· · 26.19	303°32.67	22°0.25	71°36.46	· · 13.23	192°2.72	· · 4.98
10	203°45.68		346°23.57	27.24	318°33.21	0.58	86°38.94	13.24	207°5.25	4.99
11	218°48.14		1°22.99	28.30	333°33.75	0.90	101°41.43	13.25	222°7.77	5.01
12	233°50.61		16°22.42	S13°29.35	348°34.29	S22°1.23	116°43.92	N21°13.26	237°10.29	S04°5.03
13	248°53.07		31°21.84	30.40	3°34.82	1.55	131°46.41	13.27	252°12.81	5.04
14	263°55.53		46°21.27	31.44	18°35.36	1.88	146°48.89	13.28	267°15.34	5.06
15	278°58.00		61°20.69	· · 32.49	33°35.90	· · 2.20	161°51.38	· · 13.29	282°17.86	· · 5.08
16	294°0.46		76°20.11	33.54	48°36.43	2.52	176°53.87	13.30	297°20.38	5.09
17	309°2.93		91°19.54	34.59	63°36.97	2.85	191°56.36	13.31	312°22.90	5.11
18	324°5.39		106°18.96	S13°35.63	78°37.51	S22°3.17	206°58.85	N21°13.32	327°25.43	S04°5.13
19	339°7.85		121°18.38	36.68	93°38.04	3.49	222°1.34	13.34	342°27.95	5.14
20	354°10.32		136°17.80	37.73	108°38.58	3.81	237°3.83	13.35	357°30.47	5.16
21	9°12.78		151°17.22	· · 38.77	123°39.11	· · 4.13	252°6.32	· · 13.36	12°32.99	· · 5.17
22	24°15.25		166°16.64	39.82	138°39.65	4.46	267°8.81	13.37	27°35.51	5.19
23	39°17.71		181°16.06	40.86	153°40.18	4.78	282°11.31	13.38	42°38.03	5.21
Mer.pass. 20:23			ν-0.6' d1.1' m-3.91		ν0.5' d0.3' m1.40		ν2.5' d0.0' m-2.42		ν2.5' d0.0' m0.83	

	SHA	Dec
Alpheratz	357°33.84	29°14.22
Ankaa	353°6.15	-42°9.99
Schedar	349°29.84	56°41.01
Diphda	348°46.35	-17°50.64
Achernar	335°19.12	-57°6.37
Hamal	327°50.09	23°35.23
Polaris	313°11.07	89°22.42
Acamar	315°10.81	-40°11.98
Menkar	314°5.10	4°11.59
Mirfak	308°26.76	49°57.25
Aldebaran	290°38.50	-16°33.75
Rigel	281°2.91	-8°10.17
Capella	280°20.45	46°1.39
Bellatrix	278°21.85	6°22.47
Elnath	278°0.67	28°37.75
Alnilam	275°36.75	-1°11.01
Betelgeuse	270°51.07	7°24.79
Canopus	263°51.69	-52°42.27
Sirius	258°25.40	-16°44.92
Adhara	255°5.10	-29°0.19
Procyon	244°49.96	5°9.58
Pollux	243°16.30	27°57.75
Avior	234°14.28	-59°35.18
Suhail	222°45.78	-43°31.91
Miaplacidus	221°38.09	-69°49.02
Alphard	217°47.08	-8°46.11
Regulus	207°33.77	11°50.45
Dubhe	193°40.42	61°36.44
Denebola	182°24.44	14°25.64
Gienah	175°43.12	-17°41.00
Acrux	172°59.88	-63°14.31
Gacrux	171°51.34	-57°15.26
Alioth	166°12.80	55°49.00
Spica	158°21.87	-11°17.69
Alkaid	152°51.91	49°10.95
Hadar	148°35.68	-60°29.73
Menkent	147°57.21	-36°29.71
Arcturus	145°47.62	19°2.87
Rigel Kent.	139°40.04	-60°56.43
Kochab	137°20.96	74°2.83
Zuben'ubi	136°55.61	-16°8.88
Alphecca	126°3.53	26°37.69
Antares	112°15.36	-26°29.33
Atria	107°9.49	-69°4.49
Sabik	102°2.31	-15°45.38
Shaula	96°9.80	-37°7.38
Rasalhague	95°58.21	12°32.56
Eltanin	90°42.30	51°29.27
Kaus Aust.	83°31.90	-34°22.39
Vega	80°33.06	38°48.62
Nunki	75°47.15	-26°15.91
Altair	61°59.44	8°56.31
Peacock	53°4.82	-56°39.31
Deneb	49°25.46	45°22.62
Enif	33°38.11	9°59.76
Al Na'ir	27°31.97	-46°50.31
Fomalhaut	15°13.62	-29°29.17
Scheat	13°44.40	2

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.46	S17°42.02	271°3.37	11.4'	N18°4.19	-12.6'	57.3'
1	198°58.39	42.69	285°33.74	11.5'	17°51.63	-12.6'	57.2'
2	213°58.31	43.37	300°4.22	11.6'	17°38.99	-12.7'	57.2'
3	228°58.23	· · 44.04	314°34.82	11.7'	17°26.29	-12.8'	57.1'
4	243°58.15	44.72	329°5.53	11.8'	17°13.51	-12.8'	57.1'
5	258°58.07	45.39	343°36.36	11.9'	17°0.67	-12.9'	57.1'
6	273°57.99	S17°46.07	358°7.29	12.0'	N16°47.76	-13.0'	57.0'
7	288°57.91	46.74	12°38.34	12.2'	16°34.80	-13.0'	57.0'
8	303°57.83	47.41	27°9.50	12.3'	16°21.76	-13.1'	57.0'
9	318°57.75	· · 48.09	41°40.76	12.4'	16°8.67	-13.2'	56.9'
10	333°57.67	48.76	56°12.14	12.5'	15°55.52	-13.2'	56.9'
11	348°57.59	49.43	70°43.61	12.6'	15°42.31	-13.3'	56.9'
12	3°57.51	S17°50.10	85°15.20	12.7'	N15°29.04	-13.3'	56.8'
13	18°57.42	50.77	99°46.88	12.8'	15°15.72	-13.4'	56.8'
14	33°57.34	51.44	114°18.67	12.9'	15°2.35	-13.4'	56.8'
15	48°57.26	· · 52.11	128°50.56	13.0'	14°48.92	-13.5'	56.7'
16	63°57.18	52.78	143°22.55	13.1'	14°35.44	-13.5'	56.7'
17	78°57.09	53.45	157°54.63	13.2'	14°21.91	-13.6'	56.7'
18	93°57.01	S17°54.11	172°26.81	13.3'	N14°8.34	-13.6'	56.6'
19	108°56.92	54.78	186°59.09	13.4'	13°54.71	-13.7'	56.6'
20	123°56.84	55.45	201°31.46	13.5'	13°41.04	-13.7'	56.6'
21	138°56.75	· · 56.11	216°3.93	13.6'	13°27.33	-13.8'	56.5'
22	153°56.67	56.78	230°36.48	13.6'	13°13.57	-13.8'	56.5'
23	168°56.58	57.44	245°9.13	13.7'	12°59.77	-13.8'	56.5'
SD = 16.1'		$d = 0.7'$	SD = 15.6'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.50	S17°58.11	259°41.86	13.8'	N12°45.93	-13.9'	56.4'
1	198°56.41	58.77	274°14.69	13.9'	12°32.05	-13.9'	56.4'
2	213°56.32	17°59.43	288°47.59	14.0'	12°18.13	-14.0'	56.4'
3	228°56.23	18°0.10	303°20.59	14.1'	12°4.18	-14.0'	56.3'
4	243°56.15	0.76	317°53.66	14.2'	11°50.19	-14.0'	56.3'
5	258°56.06	1.42	332°26.82	14.2'	11°36.16	-14.1'	56.3'
6	273°55.97	S18°2.08	347°0.06	14.3'	N11°22.10	-14.1'	56.2'
7	288°55.88	2.74	1°33.38	14.4'	11°8.01	-14.1'	56.2'
8	303°55.79	3.40	16°6.78	14.5'	10°53.88	-14.2'	56.2'
9	318°55.70	· · 4.06	30°40.25	14.5'	10°39.73	-14.2'	56.1'
10	333°55.61	4.72	45°13.80	14.6'	10°25.54	-14.2'	56.1'
11	348°55.52	5.38	59°47.42	14.7'	10°11.33	-14.2'	56.1'
12	3°55.43	S18°6.04	74°21.11	14.8'	N09°57.09	-14.3'	56.1'
13	18°55.34	6.69	88°54.88	14.8'	09°42.82	-14.3'	56.0'
14	33°55.25	7.35	103°28.71	14.9'	09°28.53	-14.3'	56.0'
15	48°55.16	· · 8.01	118°2.62	15.0'	09°14.21	-14.3'	56.0'
16	63°55.06	8.66	132°36.59	15.0'	08°59.87	-14.4'	55.9'
17	78°54.97	9.32	147°10.63	15.1'	08°45.51	-14.4'	55.9'
18	93°54.88	S18°9.97	161°44.73	15.2'	N08°31.13	-14.4'	55.9'
19	108°54.79	10.63	176°18.89	15.2'	08°16.73	-14.4'	55.8'
20	123°54.69	11.28	190°53.12	15.3'	08°2.31	-14.4'	55.8'
21	138°54.60	· · 11.93	205°27.40	15.3'	07°47.87	-14.5'	55.8'
22	153°54.50	12.59	220°1.75	15.4'	07°33.41	-14.5'	55.8'
23	168°54.41	13.24	234°36.15	15.5'	07°18.94	-14.5'	55.7'
SD = 16.2'		$d = 0.7'$	SD = 15.4'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.31	S18°13.89	249°10.61	15.5'	N07°4.45	-14.5'	55.7'
1	198°54.22	14.54	263°45.13	15.6'	06°49.95	-14.5'	55.7'
2	213°54.12	15.19	278°19.70	15.6'	06°35.43	-14.5'	55.7'
3	228°54.02	· · 15.84	292°54.32	15.7'	06°20.91	-14.5'	55.6'
4	243°53.93	16.49	307°28.99	15.7'	06°6.37	-14.5'	55.6'
5	258°53.83	17.14	322°3.71	15.8'	05°51.82	-14.6'	55.6'
6	273°53.73	S18°17.78	336°38.48	15.8'	N05°37.26	-14.6'	55.5'
7	288°53.63	18.43	351°13.30	15.9'	05°22.69	-14.6'	55.5'
8	303°53.54	19.08	5°48.16	15.9'	05°8.11	-14.6'	55.5'
9	318°53.44	· · 19.72	20°23.07	16.0'	04°53.53	-14.6'	55.5'
10	333°53.34	20.37	34°58.02	16.0'	04°38.94	-14.6'	55.4'
11	348°53.24	21.02	49°33.02	16.0'	04°24.34	-14.6'	55.4'
12	3°53.14	S18°21.66	64°8.05	16.1'	N04°9.74	-14.6'	55.4'
13	18°53.04	22.30	78°43.13	16.1'	03°55.14	-14.6'	55.4'
14	33°52.94	22.95	93°18.24	16.1'	03°40.54	-14.6'	55.3'
15	48°52.84	· · 23.59	107°53.39	16.2'	03°25.93	-14.6'	55.3'
16	63°52.74	24.23	122°28.57	16.2'	03°11.32	-14.6'	55.3'
17	78°52.63	24.87	137°3.79	16.3'	02°56.71	-14.6'	55.3'
18	93°52.53	S18°25.52	151°39.04	16.3'	N02°42.10	-14.6'	55.3'
19	108°52.43	26.16	166°14.33	16.3'	02°27.49	-14.6'	55.2'
20	123°52.33	26.80	180°49.64	16.3'	02°12.89	-14.6'	55.2'
21	138°52.22	· · 27.44	195°24.98	16.4'	01°58.29	-14.6'	55.2'
22	153°52.12	28.07	210°0.35	16.4'	01°43.69	-14.6'	55.2'
23	168°52.02	28.71	224°35.75	16.4'	01°29.09	-14.6'	55.1'
SD = 16.2'		$d = 0.7'$	SD = 15.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:53	08:26	10:36	12:52	15:02	16:34
N 70°	06:44	08:05	09:38	13:49	15:23	16:44
68°	06:36	07:48	09:05	14:23	15:40	16:52
66°	06:29	07:34	08:40	14:47	15:53	16:59
64°	06:23	07:23	08:22	15:06	16:05	17:04
62°	06:18	07:13	08:06	15:22	16:14	17:10
60°	06:13	07:05	07:53	15:34	16:23	17:14
N 58°	06:09	06:57	07:42	15:45	16:30	17:19
56°	06:05	06:51	07:33	15:55	16:37	17:23
54°	06:02	06:45	07:24	16:04	16:43	17:26
52°	05:58	06:39	07:17	16:11	16:49	17:30
50°	05:55	06:34	07:10	16:18	16:54	17:33
45°	05:48	06:23	06:55	16:33	17:05	17:40
N 40°	05:41	06:14	06:43	16:45	17:14	17:47
35°	05:35	06:06	06:33	16:56	17:22	17:53
30°	05:29	05:58	06:24	17:05	17:30	17:59
20°	05:18	05:45	06:08	17:21	17:44	18:10
N 10°	05:06	05:32	05:54	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:35
S 10°	04:39	05:05	05:28	18:01	18:23	18:49
20°	04:22	04:50	05:13	18:16	18:39	19:07
30°	04:00	04:31	04:57	18:32	18:58	19:29
35°	03:46	04:19	04:47	18:42	19:10	19:44
40°	03:29	04:06	04:36	18:53	19:23	20:01
45°	03:07	03:49	04:23	19:06	19:40	20:23
S 50°	02:38	03:28	04:07	19:22	20:01	20:53
52°	02:23	03:18	04:00	19:30	20:12	21:08
54°	02:04	03:07	03:51	19:39	20:23	21:27
56°	01:41	02:53	03:42	19:48	20:37	21:50
58°	01:09	02:38	03:31	19:59	20:53	22:24
S 60°	////	02:18	03:19	20:12	21:13	////

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	21:32	23:55	· · ·	15:57	15:06	14:30
N 70°	21:58	· · ·	00:05	15:28	14:53	14:26
68°	22:18	· · ·	00:14	15:06	14:42	14:22
66°	22:34	· · ·	00:21	14:49	14:33	14:19
64°	22:47	· · ·	00:27	14:35	14:25	14:16
62°	22:57	· · ·	00:32	14:23	14:18	14:14
60°	23:07	· · ·	00:37	14:13	14:12	14:12
N 58°	23:14	· · ·	00:41	14:04	14:07	14:10
56°	23:21	· · ·	00:44	13:56	14:03	14:08
54°	23:28	· · ·	00:47	13:49	13:58	14:06
52°	23:33	· · ·	00:50	13:42	13:55	14:05
50°	23:38	· · ·	00:52	13:36	13:51	14:04
45°	23:49	· · ·	00:58	13:24	13:44	14:01
N 40°	23:58	· · ·	01:03	13:13	13:37	13:59
35°	· · ·	00:06	01:07	13:04	13:32	13:57
30°	· · ·	00:12	01:10	12:56	13:27	13:55
20°	· · ·	00:24	01:16	12:43	13:19	13:52
N 10°	· · ·	00:34	01:21	12:31	13:11	13:49
0°	· · ·	00:43	01:26	12:19	13:04	13:46
S 10°	00:10	00:52	01:31	12:08	12:57	13:43
20°	00:24	01:02	01:36	11:55	12:49	13:40
30°	00:41	01:13	01:42	11:41	12:40	13:37
35°	00:50	01:20	01:46	11:32	12:35	13:35
40°	01:01	01:27	01:49	11:23	12:29	13:33
45°	01:14	01:36	01:54	11:12	12:23	13:30
S 50°	01:29	01:46	01:59	10:58	12:14	13:27
52°	01:37	01:50	02:01	10:51	12:10	13:26
54°	01:44	01:56	02:04	10:44	12:06	13:24
56°	01:53	02:01	02:07	10:36	12:02	13:22
58°	02:03	02:08	02:10	10:27	11:56	13:20
S 60°	02:15	02:15	02:14	10:17	11:50	13:18

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 22-24 53-32%
	00 ^h	12 ^h		Upper	Lower	
12	15:54	15:50	11:44	06:08	18:31	
13	15:46	15:42	11:44	06:54	19:15	
14	15:37	15:33	11:44	07:36	19:57	

November 15, 16, 17 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°20.17		196°15.48	S13°41.90	168°40.71	S22°5.10	297°13.80	N21°13.39	57°40.55	S04°5.22
1	69°22.64		211°14.90	42.94	183°41.25	5.42	312°16.29	13.40	72°43.07	5.24
2	84°25.10		226°14.32	43.99	198°41.78	5.74	327°18.78	13.41	87°45.59	5.25
3	99°27.57		241°13.74	· · 45.03	213°42.32	· · 6.06	342°21.28	· · 13.42	102°48.11	· · 5.27
4	114°30.03		256°13.16	46.07	228°42.85	6.38	357°23.77	13.43	117°50.63	5.28
5	129°32.49		271°12.57	47.11	243°43.38	6.69	12°26.26	13.45	132°53.15	5.30
6	144°34.96		286°11.99	S13°48.15	258°43.91	S22°7.01	27°28.76	N21°13.46	147°55.67	S04°5.31
7	159°37.42		301°11.41	49.19	273°44.45	7.33	42°31.25	13.47	162°58.19	5.33
8	174°39.89		316°10.82	50.23	288°44.98	7.65	57°33.75	13.48	178°0.71	5.34
9	189°42.35		331°10.24	· · 51.26	303°45.51	· · 7.97	72°36.24	· · 13.49	193°3.23	· · 5.36
10	204°44.81		346°9.65	52.30	318°46.04	8.28	87°38.74	13.50	208°5.75	5.37
11	219°47.28		1°9.07	53.34	333°46.57	8.60	102°41.23	13.51	223°8.27	5.39
12	234°49.74		16°8.48	S13°54.37	348°47.10	S22°8.91	117°43.73	N21°13.53	238°10.79	S04°5.40
13	249°52.21		31°7.89	55.41	3°47.64	9.23	132°46.23	13.54	253°13.31	5.42
14	264°54.67		46°7.31	56.45	18°48.17	9.55	147°48.72	13.55	268°15.83	5.43
15	279°57.13		61°6.72	· · 57.48	33°48.70	· · 9.86	162°51.22	· · 13.56	283°18.35	· · 5.45
16	294°59.60		76°6.13	58.51	48°49.23	10.18	177°53.72	13.57	298°20.86	5.46
17	310°2.06		91°5.54	13°59.55	63°49.76	10.49	192°56.22	13.59	313°23.38	5.48
18	325°4.53		106°4.95	S14°0.58	78°50.29	S22°10.80	207°58.71	N21°13.60	328°25.90	S04°5.49
19	340°6.99		121°4.36	1.61	93°50.82	11.12	223°1.21	13.61	343°28.42	5.51
20	355°9.46		136°3.77	2.64	108°51.34	11.43	238°3.71	13.62	358°30.94	5.52
21	10°11.92		151°3.18	· · 3.67	123°51.87	· · 11.74	253°6.21	· · 13.64	13°33.45	· · 5.53
22	25°14.38		166°2.59	4.70	138°52.40	12.06	268°8.71	13.65	28°35.97	5.55
23	40°16.85		181°2.00	5.73	153°52.93	12.37	283°11.21	13.66	43°38.49	5.56
Mer.pass. 20:19			ν-0.6' d1.0' m-3.91		ν0.5' d0.3' m1.39		ν2.5' d0.0' m-2.42		ν2.5' d0.0' m0.84	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	55°19.31		196°1.41	S14°6.76	168°53.46	S22°12.68	298°13.71	N21°13.67	58°41.00	S04°5.58
1	70°21.78		211°0.82	7.79	183°53.99	12.99	313°16.21	13.69	73°43.52	5.59
2	85°24.24		226°0.22	8.82	198°54.51	13.30	328°18.72	13.70	88°46.04	5.60
3	100°26.70		240°59.63	· · 9.84	213°55.04	· · 13.61	343°21.22	· · 13.71	103°48.55	· · 5.62
4	115°29.17		255°59.04	10.87	228°55.57	13.92	358°23.72	13.72	118°51.07	5.63
5	130°31.63		270°58.44	11.90	243°56.10	14.23	13°26.22	13.74	133°53.59	5.64
6	145°34.10		285°57.85	S14°12.92	258°56.62	S22°14.54	28°28.73	N21°13.75	148°56.10	S04°5.66
7	160°36.56		300°57.25	13.95	273°57.15	14.85	43°31.23	13.76	163°58.62	5.67
8	175°39.02		315°56.66	14.97	288°57.67	15.16	58°33.73	13.78	179°1.13	5.68
9	190°41.49		330°56.06	· · 15.99	303°58.20	· · 15.47	73°36.24	· · 13.79	194°3.65	· · 5.70
10	205°43.95		345°55.46	17.02	318°58.73	15.78	88°38.74	13.80	209°6.16	5.71
11	220°46.42		0°54.87	18.04	333°59.25	16.09	103°41.25	13.82	224°8.68	5.72
12	235°48.88		15°54.27	S14°19.06	348°59.78	S22°16.39	118°43.75	N21°13.83	239°11.19	S04°5.74
13	250°51.34		30°53.67	20.08	4°0.30	16.70	133°46.26	13.84	254°13.71	5.75
14	265°53.81		45°53.07	21.10	19°0.83	17.01	148°48.76	13.86	269°16.22	5.76
15	280°56.27		60°52.47	· · 22.12	34°1.35	· · 17.32	163°51.27	· · 13.87	284°18.74	· · 5.78
16	295°58.74		75°51.87	23.14	49°1.87	17.62	178°53.78	13.88	299°21.25	5.79
17	311°1.20		90°51.27	24.16	64°2.40	17.93	193°56.28	13.90	314°23.77	5.80
18	326°3.66		105°50.67	S14°25.18	79°2.92	S22°18.23	208°58.79	N21°13.91	329°26.28	S04°5.81
19	341°6.13		120°50.07	26.19	94°3.44	18.54	224°1.30	13.92	344°28.79	5.83
20	356°8.59		135°49.47	27.21	109°3.97	18.84	239°3.81	13.94	359°31.31	5.84
21	11°11.06		150°48.87	· · 28.23	124°4.49	· · 19.15	254°6.31	· · 13.95	14°33.82	· · 5.85
22	26°13.52		165°48.26	29.24	139°5.01	19.45	269°8.82	13.96	29°36.34	5.86
23	41°15.98		180°47.66	30.26	154°5.54	19.75	284°11.33	13.98	44°38.85	5.88
Mer.pass. 20:15			ν-0.6' d1.0' m-3.91		ν0.5' d0.3' m1.39		ν2.5' d0.0' m-2.43		ν2.5' d0.0' m0.85	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°18.45		195°47.06	S14°31.27	169°6.06	S22°20.06	299°13.84	N21°13.99	59°41.36	S04°5.89
1	71°20.91		210°46.45	32.28	184°6.58	20.36	314°16.35	14.01	74°43.87	5.90
2	86°23.38		225°45.85	33.30	199°7.10	20.66	329°18.86	14.02	89°46.39	5.91
3	101°25.84		240°45.24	· · 34.31	214°7.62	· · 20.96	344°21.37	· · 14.04	104°48.90	· · 5.92
4	116°28.31		255°44.64	35.32	229°8.14	21.27	359°23.88	14.05	119°51.41	5.94
5	131°30.77		270°44.03	36.33	244°8.66	21.57	14°26.40	14.06	134°53.92	5.95
6	146°33.23		285°43.43	S14°37.34	259°9.18	S22°21.87	29°28.91	N21°14.08	149°56.44	S04°5.96
7	161°35.70		300°42.82	38.35	274°9.71	22.17	44°31.42	14.09	164°58.95	5.97
8	176°38.16		315°42.21	39.36	289°10.23	22.47	59°33.93	14.11	180°1.46	5.98
9	191°40.63		330°41.60	· · 40.37	304°10.75	· · 22.77	74°36.45	· · 14.12	195°3.97	· · 5.99
10	206°43.09		345°41.00	41.38	319°11.26	23.07	89°38.96	14.14	210°6.48	6.01
11	221°45.55		0°40.39	42.38	334°11.78	23.37	104°41.47	14.15	225°8.99	6.02
12	236°48.02		15°39.78	S14°43.39	349°12.30	S22°23.67	119°43.99	N21°14.17	240°11.50	S04°6.03
13	251°50.48		30°39.17	44.39	4°12.82	23.96	134°46.50	14.18	255°14.02	6.04
14	266°52.95		45°38.56	45.40	19°13.34	24.26	149°49.02	14.20	270°16.53	6.05
15	281°55.41		60°37.95	· · 46.40	34°13.86	· · 24.56	164°51.53	· · 14.21	285°19.04	· · 6.06
16	296°57.87		75°37.33	47.41	49°14.38	24.86	179°54.05	14.23	300°21.55	6.07
17	312°0.34		90°36.72	48.41	64°14.89	25.15	194°56.56	14.24	315°24.06	6.08
18	327°2.80		105°36.11	S14°49.41	79°15.41	S22°25.45	209°59.08	N21°14.26	330°26.57	S04°6.09
19	342°5.27		120°35.50	50.42	94°15.93	25.75	225°1.59	14.27	345°29.08	6.10
20	357°7.73		135°34.88	51.42	109°16.45	26.04	240°4.11	14.29	0°31.59	6.12
21	12°10.19		150°34.27	· · 52.42	124°16.96	· · 26.34	255°6.63	· · 14.30	15°34.10	· · 6.13
22	27°12.66		165°33.66	53.42	139°17.48	26.63	270°9.15	14.32	30°36.61	6.14
23	42°15.12		180°33.04	54.42	154°18.00	26.93	285°11.66	14.33	45°39.12	6.15
Mer.pass. 20:11			ν-0.6' d1.0' m-3.91		ν0.5' d0.3' m1.38		ν2.5' d0.0' m-2.44		ν2.5' d0.0' m0.85	

Stars		
	SHA	Dec
Alpheratz	357°33.85	29°14.22
Ankaa	353°6.16	-42°10.01
Schedar	349°29.85	56°41.02
Diphda	348°46.36	-17°50.65
Achernar	335°19.13	-57°6.39
Hamal	327°50.09	23°35.24
Polaris	313°11.05	89°22.44
Acamar	315°10.81	-40°11.99
Menkar	314°5.10	4°11.58
Mirfak	308°26.76	49°57.26
Aldebaran	290°38.49	16°33.75
Rigel	281°2.90	-8°10.18
Capella	280°20.43	46°1.39
Bellatrix	278°21.84	6°22.47
Elnath	278°0.66	28°37.76
Alnilam	275°36.74	-1°11.02
Betelgeuse	270°51.06	7°24.79
Canopus	263°51.67	-52°42.28
Sirius	258°25.39	-16°44.93
Adhara	255°5.08	-29°0.20
Procyon	244°49.94	5°9.58
Pollux	243°16.28	27°57.75
Avior	234°14.25	-59°35.18
Suhail	222°45.75	-43°31.91
Miaplacidus	221°38.04	-69°49.02
Alphard	217°47.06	-8°46.11
Regulus	207°33.75	11°50.44
Dubhe	193°40.39	61°36.43
Denebola	182°24.43	14°25.63
Gienah	175°43.10	-17°41.00
Acrux	172°59.85	-63°14.31
Gacrux	171°51.32	-57°15.25
Alioth	166°12.78	55°48.99
Spica	158°21.86	-11°17.69
Alkaid	152°51.89	49°10.93
Hadar	148°35.67	-60°29.71
Menkent	147°57.20	-36°29.71
Arcturus	145°47.61	19°2.86
Rigel Kent.	139°40.03	-60°56.42
Kochab	137°20.96	74°2.81
Zuben'ubi	136°55.60	-16°8.88
Alphecca	126°3.53	26°37.67
Antares	112°15.36	-26°29.33
Atria	107°9.50	-69°4.48
Sabik	102°2.32	-15°45.38
Shaula	96°9.81	-37°7.38
Rasalhague	95°58.22	12°32.55
Eltanin	90°42.31	51°29.25
Kaus Aust.	83°31.91	-34°22.39
Vega	80°33.08	38°48.61
Nunki	75°47.16	-26°15.91
Altair	61°59.46	8°56.31
Peacock	53°4.84	-56°39.31
Deneb	49°25.48	45°22.62
Enif	33°38.13	9°59.76
Al Na'ir	27°31.99	-46°50.31
Fomalhaut	15°13.64	-29°29.18
Scheat	13°44.42	28°13.62
Markab	13°29.10	15°20.84
Nov 15 Sat	SHA	Mer.pass
Venus	141°55.31	10:55
Mars	114°20.54	12:45
Jupiter	242°53.62	04:10
Saturn	3°20.38	20:06
Nov 16 Sun	SHA	Mer.pass
Venus	140°42.10	10:56
Mars	113°34.15	12:44
Jupiter	242°54.40	04:06
Saturn	3°21.69	20:02
Nov 17 Mon	SHA	Mer.pass
Venus	139°28.61	10:57
Mars	112°47.61	12:43
Jupiter	242°55.39	04:02
Saturn	3°22.91	19:58
Horizontal parallax		
Venus:	0.1	
Mars:	0.1	

h	Sun			Moon				
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	183°51.91	S18°29.35		239°11.18	16.4'	N01°14.51	-14.6'	55.1'
1	198°51.81	29.99		253°46.63	16.5'	00°59.92	-14.6'	55.1'
2	213°51.70	30.62		268°22.10	16.5'	00°45.35	-14.6'	55.1'
3	228°51.60	· · 31.26		282°57.59	16.5'	00°30.78	-14.6'	55.0'
4	243°51.49	31.90		297°33.11	16.5'	00°16.22	-14.5'	55.0'
5	258°51.38	32.53		312°8.64	16.6'	N00°1.67	-14.5'	55.0'
6	273°51.28	S18°33.17		326°44.19	16.6'	S00°12.87	14.5'	55.0'
7	288°51.17	33.80		341°19.76	16.6'	00°27.40	14.5'	55.0'
8	303°51.06	34.43		355°55.35	16.6'	00°41.91	14.5'	54.9'
9	318°50.96	· · 35.07		10°30.95	16.6'	00°56.42	14.5'	54.9'
10	333°50.85	35.70		25°6.56	16.6'	01°10.91	14.5'	54.9'
11	348°50.74	36.33		39°42.19	16.6'	01°25.39	14.5'	54.9'
12	3°50.63	S18°36.96		54°17.83	16.6'	S01°39.85	14.4'	54.9'
13	18°50.52	37.59		68°53.47	16.7'	01°54.30	14.4'	54.8'
14	33°50.41	38.22		83°29.13	16.7'	02°8.73	14.4'	54.8'
15	48°50.30	· · 38.85		98°4.80	16.7'	02°23.15	14.4'	54.8'
16	63°50.19	39.48		112°40.47	16.7'	02°37.54	14.4'	54.8'
17	78°50.08	40.11		127°16.14	16.7'	02°51.92	14.4'	54.8'
18	93°49.97	S18°40.73		141°51.82	16.7'	S03°6.28	14.3'	54.8'
19	108°49.86	41.36		156°27.51	16.7'	03°20.62	14.3'	54.7'
20	123°49.75	41.99		171°3.19	16.7'	03°34.94	14.3'	54.7'
21	138°49.64	· · 42.61		185°38.88	16.7'	03°49.24	14.3'	54.7'
22	153°49.52	43.24		200°14.57	16.7'	04°3.52	14.3'	54.7'
23	168°49.41	43.86		214°50.26	16.7'	04°17.77	14.2'	54.7'
SD = 16.2'			SD = 15.0'					
d = 0.6'								

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.30	S18°44.49	229°25.94	16.7'	S04°32.00	14.2'	54.6'
1	198°49.18	45.11	244°1.62	16.7'	04°46.21	14.2'	54.6'
2	213°49.07	45.73	258°37.30	16.7'	05°0.39	14.2'	54.6'
3	228°48.95	· · 46.36	273°12.97	16.7'	05°14.54	14.1'	54.6'
4	243°48.84	46.98	287°48.63	16.7'	05°28.67	14.1'	54.6'
5	258°48.73	47.60	302°24.29	16.6'	05°42.77	14.1'	54.6'
6	273°48.61	S18°48.22	316°59.93	16.6'	S05°56.84	14.0'	54.5'
7	288°48.49	48.84	331°35.57	16.6'	06°10.89	14.0'	54.5'
8	303°48.38	49.46	346°11.20	16.6'	06°24.90	14.0'	54.5'
9	318°48.26	· · 50.08	0°46.81	16.6'	06°38.89	14.0'	54.5'
10	333°48.14	50.70	15°22.41	16.6'	06°52.84	13.9'	54.5'
11	348°48.03	51.32	29°58.00	16.6'	07°6.76	13.9'	54.5'
12	3°47.91	S18°51.93	44°33.57	16.6'	S07°20.65	13.9'	54.5'
13	18°47.79	52.55	59°9.13	16.5'	07°34.51	13.8'	54.4'
14	33°47.67	53.17	73°44.66	16.5'	07°48.33	13.8'	54.4'
15	48°47.55	· · 53.78	88°20.18	16.5'	08°2.12	13.8'	54.4'
16	63°47.43	54.40	102°55.69	16.5'	08°15.87	13.7'	54.4'
17	78°47.32	55.01	117°31.17	16.5'	08°29.59	13.7'	54.4'
18	93°47.20	S18°55.62	132°6.63	16.4'	S08°43.27	13.6'	54.4'
19	108°47.07	56.24	146°42.06	16.4'	08°56.91	13.6'	54.4'
20	123°46.95	56.85	161°17.48	16.4'	09°10.51	13.6'	54.3'
21	138°46.83	· · 57.46	175°52.87	16.4'	09°24.07	13.5'	54.3'
22	153°46.71	58.07	190°28.24	16.3'	09°37.60	13.5'	54.3'
23	168°46.59	58.68	205°3.57	16.3'	09°51.08	13.4'	54.3'
SD = 16.2'			SD = 14.9'				
$d = 0.6'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°46.47	S18°59.29	219°38.89	16.3'	S10°4.52	13.4'	54.3'
1	198°46.35	18°59.90	234°14.17	16.3'	10°17.92	13.4'	54.3'
2	213°46.22	19°0.51	248°49.43	16.2'	10°31.28	13.3'	54.3'
3	228°46.10	· · 1.12	263°24.65	16.2'	10°44.59	13.3'	54.3'
4	243°45.98	1.73	277°59.85	16.2'	10°57.86	13.2'	54.2'
5	258°45.85	2.34	292°35.01	16.1'	11°11.08	13.2'	54.2'
6	273°45.73	S19°2.94	307°10.14	16.1'	S11°24.26	13.1'	54.2'
7	288°45.60	3.55	321°45.24	16.1'	11°37.39	13.1'	54.2'
8	303°45.48	4.15	336°20.31	16.0'	11°50.47	13.0'	54.2'
9	318°45.35	· · 4.76	350°55.33	16.0'	12°3.51	13.0'	54.2'
10	333°45.23	5.36	5°30.33	16.0'	12°16.49	12.9'	54.2'
11	348°45.10	5.97	20°5.28	15.9'	12°29.43	12.9'	54.2'
12	3°44.97	S19°6.57	34°40.20	15.9'	S12°42.31	12.8'	54.2'
13	18°44.85	7.17	49°15.08	15.8'	12°55.14	12.8'	54.1'
14	33°44.72	7.78	63°49.92	15.8'	13°7.93	12.7'	54.1'
15	48°44.59	· · 8.38	78°24.72	15.8'	13°20.65	12.7'	54.1'
16	63°44.46	8.98	92°59.48	15.7'	13°33.33	12.6'	54.1'
17	78°44.34	9.58	107°34.19	15.7'	13°45.94	12.6'	54.1'
18	93°44.21	S19°10.18	122°8.87	15.6'	S13°58.51	12.5'	54.1'
19	108°44.08	10.78	136°43.50	15.6'	14°11.01	12.4'	54.1'
20	123°43.95	11.37	151°18.08	15.5'	14°23.46	12.4'	54.1'
21	138°43.82	· · 11.97	165°52.62	15.5'	14°35.86	12.3'	54.1'
22	153°43.69	12.57	180°27.12	15.4'	14°48.19	12.3'	54.1'
23	168°43.56	13.17	195°1.57	15.4'	15°0.46	12.2'	54.1'
SD = 16.2'		$d = 0.6'$	SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:04	08:40	■	■	14:48	16:25
N 70°	06:53	08:16	09:58	13:31	15:12	16:35
68°	06:44	07:58	09:19	14:10	15:31	16:44
66°	06:37	07:43	08:52	14:37	15:45	16:52
64°	06:30	07:31	08:31	14:58	15:58	16:58
62°	06:25	07:21	08:15	15:14	16:08	17:04
60°	06:19	07:11	08:01	15:28	16:17	17:09
N 58°	06:15	07:04	07:49	15:40	16:25	17:14
56°	06:11	06:56	07:39	15:50	16:33	17:18
54°	06:07	06:50	07:30	15:59	16:39	17:22
52°	06:03	06:44	07:22	16:07	16:45	17:26
50°	05:59	06:39	07:15	16:14	16:50	17:30
45°	05:52	06:27	06:59	16:30	17:02	17:38
N 40°	05:45	06:17	06:46	16:43	17:12	17:45
35°	05:38	06:09	06:36	16:54	17:21	17:51
30°	05:32	06:01	06:26	17:03	17:29	17:58
20°	05:20	05:46	06:09	17:20	17:43	18:10
N 10°	05:07	05:33	05:55	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:36
S 10°	04:39	05:05	05:27	18:02	18:25	18:51
20°	04:21	04:49	05:13	18:17	18:41	19:09
30°	03:58	04:29	04:55	18:35	19:01	19:32
35°	03:43	04:17	04:45	18:45	19:13	19:47
40°	03:25	04:03	04:34	18:57	19:27	20:05
45°	03:02	03:46	04:20	19:10	19:45	20:28
S 50°	02:32	03:24	04:03	19:27	20:07	21:00
52°	02:15	03:13	03:55	19:36	20:18	21:16
54°	01:56	03:01	03:46	19:44	20:30	21:36
56°	01:30	02:47	03:36	19:55	20:45	22:03
58°	00:52	02:30	03:25	20:06	21:02	22:44
S 60°	////	02:09	03:12	20:20	21:24	////

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	01:58	03:59	06:07	13:58	13:25	12:42
N 70°	01:59	03:50	05:46	14:01	13:36	13:05
68°	02:00	03:44	05:30	14:04	13:45	13:23
66°	02:01	03:38	05:17	14:06	13:52	13:37
64°	02:01	03:33	05:07	14:08	13:59	13:49
62°	02:02	03:29	04:58	14:09	14:04	14:00
60°	02:02	03:26	04:50	14:10	14:09	14:09
N 58°	02:03	03:23	04:43	14:12	14:14	14:16
56°	02:03	03:20	04:37	14:13	14:18	14:23
54°	02:03	03:18	04:32	14:14	14:21	14:29
52°	02:03	03:15	04:27	14:15	14:24	14:35
50°	02:04	03:13	04:23	14:15	14:27	14:40
45°	02:04	03:09	04:14	14:17	14:33	14:51
N 40°	02:05	03:06	04:06	14:19	14:39	15:00
35°	02:05	03:02	04:00	14:20	14:43	15:08
30°	02:05	03:00	03:54	14:21	14:47	15:15
20°	02:06	02:55	03:44	14:23	14:54	15:27
N 10°	02:07	02:51	03:35	14:25	15:01	15:37
0°	02:07	02:47	03:27	14:26	15:06	15:47
S 10°	02:08	02:43	03:20	14:28	15:12	15:57
20°	02:08	02:39	03:11	14:30	15:19	16:08
30°	02:09	02:35	03:02	14:32	15:26	16:20
35°	02:09	02:32	02:56	14:33	15:30	16:28
40°	02:10	02:30	02:50	14:34	15:35	16:36
45°	02:10	02:26	02:43	14:36	15:40	16:45
S 50°	02:11	02:22	02:34	14:37	15:47	16:57
52°	02:11	02:21	02:31	14:38	15:50	17:02
54°	02:11	02:19	02:26	14:39	15:53	17:08
56°	02:12	02:16	02:22	14:40	15:57	17:15
58°	02:12	02:14	02:16	14:41	16:01	17:23
S 60°	02:13	02:11	02:10	14:43	16:06	17:31

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	25-27 23-9%
15	15:28	15:23	11:45	08:17	20:37	
16	15:17	15:12	11:45	08:57	21:17	
17	15:06	15:00	11:45	09:37	21:58	

November 18, 19, 20 UT (Tue., Wed., Thu.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	57°17.59	195°32.43	S14°55.42	169°18.51	S22°27.22	300°14.18	N21°14.35	60°41.62	S04°6.16			Alpheratz	357°33.86 29°14.22
1	72°20.05	210°31.81	56.41	184°19.03	27.52	315°16.70	14.37	75°44.13	6.17			Ankaa	353°6.18 -42°10.02
2	87°22.52	225°31.19	57.41	199°19.54	27.81	330°19.22	14.38	90°46.64	6.18			Schedar	349°29.87 56°41.03
3	102°24.98	240°30.58	•• 58.41	214°20.06	•• 28.10	345°21.74	•• 14.40	105°49.15	•• 6.19			Diphda	348°46.37 -17°50.66
4	117°27.44	255°29.96	14°59.40	229°20.57	28.39	0°24.26	14.41	120°51.66	6.20			Achernar	335°19.15 -57°6.41
5	132°29.91	270°29.34	15°0.40	244°21.09	28.69	15°26.78	14.43	135°54.17	6.21			Hamal	327°50.09 23°35.24
6	147°32.37	285°28.72	S15°1.39	259°21.60	S22°28.98	30°29.30	N21°14.44	150°56.68	S04°6.22			Polaris	313°10.92 89°22.46
7	162°34.84	300°28.10	2.39	274°22.12	29.27	45°31.82	14.46	165°59.18	6.23			Acamar	315°10.82 -40°12.01
8	177°37.30	315°27.48	3.38	289°22.63	29.56	60°34.34	14.48	181°1.69	6.24			Menkar	314°5.10 4°11.58
9	192°39.76	330°26.86	•• 4.37	304°23.15	•• 29.85	75°36.86	•• 14.49	196°4.20	•• 6.25			Mirfak	308°26.75 49°57.27
10	207°42.23	345°26.24	5.37	319°23.66	30.14	90°39.39	14.51	211°6.71	6.26			Aldebaran	290°38.48 16°33.75
11	222°44.69	0°25.62	6.36	334°24.17	30.43	105°41.91	14.53	226°9.21	6.27			Rigel	281°2.89 -8°10.19
12	237°47.16	15°25.00	S15°7.35	349°24.69	S22°30.72	120°44.43	N21°14.54	241°11.72	S04°6.28			Capella	280°20.42 46°1.40
13	252°49.62	30°24.38	8.34	4°25.20	31.01	135°46.96	14.56	256°14.23	6.28			Bellatrix	278°21.83 6°22.46
14	267°52.08	45°23.76	9.33	19°25.71	31.30	150°49.48	14.57	271°16.73	6.29			Elnath	278°0.64 28°37.76
15	282°54.55	60°23.14	•• 10.32	34°26.23	•• 31.59	165°52.00	•• 14.59	286°19.24	•• 6.30			Alnilam	275°36.73 -1°11.02
16	297°57.01	75°22.51	11.30	49°26.74	31.88	180°54.53	14.61	301°21.75	6.31			Betelgeuse	270°51.05 7°24.78
17	312°59.48	90°21.89	12.29	64°27.25	32.17	195°57.05	14.62	316°24.25	6.32			Canopus	263°51.65 -52°42.30
18	328°1.94	105°21.26	S15°13.28	79°27.76	S22°32.46	210°59.58	N21°14.64	331°26.76	S04°6.33			Sirius	258°25.37 -16°44.94
19	343°4.41	120°20.64	14.26	94°28.27	32.74	226°2.10	14.66	346°29.27	6.34			Adhara	255°5.06 -29°0.22
20	358°6.87	135°20.01	15.25	109°28.78	33.03	241°4.63	14.67	1°31.77	6.35			Procyon	244°49.92 5°9.57
21	13°9.33	150°19.39	•• 16.23	124°29.29	•• 33.32	256°7.15	•• 14.69	16°34.28	•• 6.36			Pollux	243°16.26 27°57.74
22	28°11.80	165°18.76	17.22	139°29.81	33.60	271°9.68	14.71	31°36.78	6.37			Avior	234°14.21 -59°35.20
23	43°14.26	180°18.14	18.20	154°30.32	33.89	286°12.21	14.73	46°39.29	6.37			Suhail	222°45.72 -43°31.92
Mer.pass. 20:08		ν-0.6' d1.0' m-3.91		ν0.5' d0.3' m1.38		ν2.5' d0.0' m-2.45		ν2.5' d0.0' m0.85					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	58°16.73	195°17.51	S15°19.18	169°30.83	S22°34.17	301°14.73	N21°14.74	61°41.79	S04°6.38			Regulus	207°33.73 11°50.43
1	73°19.19	210°16.88	20.17	184°31.34	34.46	316°17.26	14.76	76°44.30	6.39			Dubhe	193°40.35 61°36.42
2	88°21.65	225°16.25	21.15	199°31.85	34.74	331°19.79	14.78	91°46.80	6.40			Denebola	182°24.41 14°25.62
3	103°24.12	240°15.62	•• 22.13	214°32.36	•• 35.03	346°22.32	•• 14.79	106°49.31	•• 6.41			Gienah	175°43.09 -17°41.00
4	118°26.58	255°14.99	23.11	229°32.87	35.31	1°24.85	14.81	121°51.81	6.42			Acrux	172°59.81 -63°14.30
5	133°29.05	270°14.36	24.09	244°33.37	35.59	16°27.38	14.83	136°54.32	6.42			Gacrux	171°51.29 -57°15.25
6	148°31.51	285°13.73	S15°25.06	259°33.88	S22°35.88	31°29.91	N21°14.85	151°56.82	S04°6.43			Alioth	166°12.77 55°48.97
7	163°33.97	300°13.10	26.04	274°34.39	36.16	46°32.44	14.86	166°59.32	6.44			Spica	158°21.85 -11°17.70
8	178°36.44	315°12.47	27.02	289°34.90	36.44	61°34.97	14.88	182°1.83	6.45			Alkaid	152°51.88 49°10.91
9	193°38.90	330°11.84	•• 28.00	304°35.41	•• 36.72	76°37.50	•• 14.90	197°4.33	•• 6.46			Hadar	148°35.64 -60°29.70
10	208°41.37	345°11.21	28.97	319°35.92	37.01	91°40.03	14.92	212°6.83	6.46			Menkent	147°57.18 -36°29.70
11	223°43.83	0°10.57	29.95	334°36.42	37.29	106°42.56	14.94	227°9.34	6.47			Arcturus	145°47.60 19°2.85
12	238°46.30	15°9.94	S15°30.92	349°36.93	S22°37.57	121°45.09	N21°14.95	242°11.84	S04°6.48			Rigel Kent.	139°40.01 -60°56.41
13	253°48.76	30°9.31	31.90	4°37.44	37.85	136°47.62	14.97	257°14.34	6.49			Kochab	137°20.95 74°2.79
14	268°51.22	45°8.67	32.87	19°37.94	38.13	151°50.15	14.99	272°16.85	6.49			Zuben'ubi	136°55.59 -16°8.88
15	283°53.69	60°8.04	•• 33.84	34°38.45	•• 38.41	166°52.69	•• 15.01	287°19.35	•• 6.50			Alphecca	126°3.53 26°37.66
16	298°56.15	75°7.40	34.81	49°38.96	38.69	181°55.22	15.03	302°21.85	6.51			Antares	112°15.36 -26°29.33
17	313°58.62	90°6.77	35.78	64°39.46	38.97	196°57.75	15.04	317°24.35	6.52			Atria	107°9.51 -69°4.46
18	329°1.08	105°6.13	S15°36.75	79°39.97	S22°39.25	212°0.29	N21°15.06	332°26.86	S04°6.52			Sabik	102°2.32 -15°45.38
19	344°3.54	120°5.49	37.72	94°40.48	39.52	227°2.82	15.08	347°29.36	6.53			Shaula	96°9.81 -37°7.37
20	359°6.01	135°4.86	38.69	109°40.98	39.80	242°5.36	15.10	2°31.86	6.54			Rasalhague	95°58.22 12°32.54
21	14°8.47	150°4.22	•• 39.66	124°41.49	•• 40.08	257°7.89	•• 15.12	17°34.36	•• 6.54			Eltanin	90°42.33 51°29.24
22	29°10.94	165°3.58	40.63	139°41.99	40.36	272°10.43	15.14	32°36.86	6.55			Kaus Aust.	83°31.92 -34°22.38
23	44°13.40	180°2.94	41.59	154°42.50	40.63	287°12.96	15.15	47°39.36	6.56			Vega	80°33.09 38°48.60
Mer.pass. 20:04		ν-0.6' d1.0' m-3.91		ν0.5' d0.3' m1.37		ν2.5' d0.0' m-2.45		ν2.5' d0.0' m0.86					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	59°15.87	195°2.30	S15°42.56	169°43.00	S22°40.91	302°15.50	N21°15.17	62°41.86	S04°6.56			Nunki	75°47.17 -26°15.90
1	74°18.33	210°1.66	43.53	184°43.50	41.18	317°18.03	15.19	77°44.37	6.57			Altair	61°59.47 8°56.30
2	89°20.79	225°1.02	44.49	199°44.01	41.46	332°20.57	15.21	92°46.87	6.58			Peacock	53°4.87 -56°39.30
3	104°23.26	240°0.38	•• 45.46	214°44.51	•• 41.74	347°23.11	•• 15.23	107°49.37	•• 6.58			Deneb	49°25.50 55°22.61
4	119°25.72	254°59.74	46.42	229°45.02	42.01	2°25.65	15.25	122°51.87	6.59			Enif	33°38.14 9°59.75
5	134°28.19	269°59.10	47.38	244°45.52	42.28	17°28.18	15.27	137°54.37	6.60			Al Na'ir	27°32.01 -46°50.32
6	149°30.65	284°58.45	S15°48.34	259°46.02	S22°42.56	32°30.72	N21°15.29	152°56.87	S04°6.60			Fomalhaut	15°13.65 -29°29.19
7	164°33.11	299°57.81	49.30	274°46.53	42.83	47°33.26	15.30	167°59.37	6.61			Scheat	13°44.43 28°13.62
8	179°35.58	314°57.17	50.26	289°47.03	43.11	62°35.80	15.32	183°1.87	6.62			Markab	13°29.11 15°20.84
9	194°38.04	329°56.52	•• 51.22	304°47.53	•• 43.38	77°38.34	•• 15.34	198°4.37	•• 6.62				
10	209°40.51	344°55.88	52.18	319°48.03	43.65	92°40.88	15.36	213°6.87	6.63				
11	224°42.97	359°55.23	53.14	334°48.53	43.92	107°43.42	15.38	228°9.36	6.63				
12	239°45.44	14°54.59	S15°54.10	349°49.04	S22°44.20	122							

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		183°43.43	S19°13.76	209°35.97	15.4'	S15°12.68	12.2' 54.0'
1		198°43.30	14.36	224°10.32	15.3'	15°24.83	12.1' 54.0'
2		213°43.16	14.95	238°44.63	15.3'	15°36.92	12.0' 54.0'
3		228°43.03	· · 15.55	253°18.88	15.2'	15°48.94	12.0' 54.0'
4		243°42.90	16.14	267°53.09	15.2'	16°0.91	11.9' 54.0'
5		258°42.77	16.73	282°27.24	15.1'	16°12.81	11.8' 54.0'
6		273°42.63	S19°17.33	297°1.35	15.1'	S16°24.64	11.8' 54.0'
7		288°42.50	17.92	311°35.40	15.0'	16°36.41	11.7' 54.0'
8		303°42.37	18.51	326°9.40	14.9'	16°48.11	11.6' 54.0'
9		318°42.23	· · 19.10	340°43.34	14.9'	16°59.74	11.6' 54.0'
10		333°42.10	19.69	355°17.23	14.8'	17°11.30	11.5' 54.0'
11		348°41.96	20.28	9°51.07	14.8'	17°22.79	11.4' 54.0'
12		3°41.83	S19°20.87	24°24.85	14.7'	S17°34.22	11.4' 54.0'
13		18°41.69	21.46	38°58.58	14.7'	17°45.57	11.3' 54.0'
14		33°41.56	22.04	53°32.25	14.6'	17°56.85	11.2' 54.0'
15		48°41.42	· · 22.63	68°5.86	14.6'	18°8.06	11.1' 53.9'
16		63°41.28	23.22	82°39.41	14.5'	18°19.19	11.1' 53.9'
17		78°41.15	23.80	97°12.91	14.4'	18°30.25	11.0' 53.9'
18		93°41.01	S19°24.39	111°46.35	14.4'	S18°41.23	10.9' 53.9'
19		108°40.87	24.97	126°19.73	14.3'	18°52.14	10.8' 53.9'
20		123°40.73	25.56	140°53.05	14.3'	19°2.97	10.8' 53.9'
21		138°40.60	· · 26.14	155°26.32	14.2'	19°13.72	10.7' 53.9'
22		153°40.46	26.72	169°59.52	14.1'	19°24.39	10.6' 53.9'
23		168°40.32	27.30	184°32.66	14.1'	19°34.98	10.5' 53.9'
		SD = 16.2' d = 0.6'		SD = 14.7'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		183°40.18	S19°27.89	199°5.74	14.0'	S19°45.49	10.4' 53.9'
1		198°40.04	28.47	213°38.76	14.0'	19°55.92	10.3' 53.9'
2		213°39.90	29.05	228°11.71	13.9'	20°6.27	10.3' 53.9'
3		228°39.76	· · 29.63	242°44.61	13.8'	20°16.54	10.2' 53.9'
4		243°39.62	30.20	257°17.44	13.8'	20°26.72	10.1' 53.9'
5		258°39.47	30.78	271°50.21	13.7'	20°36.81	10.0' 53.9'
6		273°39.33	S19°31.36	286°22.92	13.6'	S20°46.82	9.9' 53.9'
7		288°39.19	31.94	300°55.56	13.6'	20°56.74	9.8' 53.9'
8		303°39.05	32.52	315°28.14	13.5'	21°6.57	9.7' 53.9'
9		318°38.91	· · 33.09	330°0.66	13.5'	21°16.32	9.7' 53.9'
10		333°38.76	33.67	344°33.11	13.4'	21°25.98	9.6' 53.9'
11		348°38.62	34.24	359°5.50	13.3'	21°35.54	9.5' 53.9'
12		3°38.47	S19°34.82	13°37.82	13.3'	S21°45.02	9.4' 53.9'
13		18°38.33	35.39	28°10.08	13.2'	21°54.40	9.3' 53.9'
14		33°38.19	35.96	42°42.27	13.1'	22°3.69	9.2' 53.9'
15		48°38.04	· · 36.53	57°14.40	13.1'	22°12.88	9.1' 53.9'
16		63°37.90	37.11	71°46.47	13.0'	22°21.98	9.0' 53.9'
17		78°37.75	37.68	86°18.47	12.9'	22°30.99	8.9' 53.9'
18		93°37.60	S19°38.25	100°50.40	12.9'	S22°39.90	8.8' 53.9'
19		108°37.46	38.82	115°22.27	12.8'	22°48.71	8.7' 53.9'
20		123°37.31	39.39	129°54.08	12.7'	22°57.42	8.6' 53.9'
21		138°37.16	· · 39.96	144°25.82	12.7'	23°6.04	8.5' 53.9'
22		153°37.02	40.52	158°57.50	12.6'	23°14.55	8.4' 53.9'
23		168°36.87	41.09	173°29.11	12.5'	23°22.96	8.3' 53.9'
		SD = 16.2' d = 0.6'		SD = 14.7'			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		183°36.72	S19°41.66	188°0.65	12.5'	S23°31.28	8.2' 53.9'
1		198°36.57	42.22	202°32.13	12.4'	23°39.49	8.1' 53.8'
2		213°36.42	42.79	217°3.55	12.4'	23°47.59	8.0' 53.8'
3		228°36.27	· · 43.35	231°34.90	12.3'	23°55.59	7.9' 53.8'
4		243°36.12	43.92	246°6.19	12.2'	24°3.49	7.8' 53.8'
5		258°35.98	44.48	260°37.41	12.2'	24°11.28	7.7' 53.8'
6		273°35.82	S19°45.04	275°8.57	12.1'	S24°18.97	7.6' 53.9'
7		288°35.67	45.61	289°39.67	12.0'	24°26.54	7.5' 53.9'
8		303°35.52	46.17	304°10.70	12.0'	24°34.01	7.4' 53.9'
9		318°35.37	· · 46.73	318°41.67	11.9'	24°41.37	7.2' 53.9'
10		333°35.22	47.29	333°12.58	11.8'	24°48.62	7.1' 53.9'
11		348°35.07	47.85	347°43.42	11.8'	24°55.76	7.0' 53.9'
12		3°34.92	S19°48.41	2°14.21	11.7'	S25°2.79	6.9' 53.9'
13		18°34.76	48.97	16°44.93	11.7'	25°9.70	6.8' 53.9'
14		33°34.61	49.53	31°15.59	11.6'	25°16.51	6.7' 53.9'
15		48°34.46	· · 50.08	45°46.19	11.5'	25°23.19	6.6' 53.9'
16		63°34.30	50.64	60°16.73	11.5'	25°29.77	6.5' 53.9'
17		78°34.15	51.20	74°47.20	11.4'	25°36.23	6.3' 53.9'
18		93°33.99	S19°51.75	89°17.63	11.4'	S25°42.57	6.2' 53.9'
19		108°33.84	52.31	103°47.99	11.3'	25°48.79	6.1' 53.9'
20		123°33.68	52.86	118°18.29	11.2'	25°54.90	6.0' 53.9'
21		138°33.53	· · 53.41	132°48.54	11.2'	26°0.89	5.9' 53.9'
22		153°33.37	53.97	147°18.72	11.1'	26°6.76	5.7' 53.9'
23		168°33.22	54.52	161°48.86	11.1'	26°12.51	5.6' 53.9'
		SD = 16.2' d = 0.6'		SD = 14.7'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:14	08:54	■	■	14:35	16:15
N 70°	07:02	08:28	10:20	13:10	15:02	16:27
68°	06:53	08:08	09:33	13:57	15:22	16:37
66°	06:44	07:52	09:03	14:27	15:38	16:46
64°	06:37	07:39	08:41	14:49	15:51	16:53
62°	06:31	07:28	08:23	15:07	16:03	16:59
60°	06:25	07:18	08:08	15:22	16:12	17:05
N 58°	06:20	07:09	07:56	15:34	16:21	17:10
56°	06:16	07:02	07:45	15:45	16:28	17:15
54°	06:11	06:55	07:36	15:55	16:35	17:19
52°	06:07	06:49	07:27	16:03	16:41	17:23
50°	06:04	06:43	07:19	16:11	16:47	17:27
45°	05:55	06:31	07:03	16:27	16:59	17:35
N 40°	05:48	06:21	06:50	16:41	17:10	17:43
35°	05:41	06:11	06:38	16:52	17:19	17:50
30°	05:34	06:03	06:28	17:02	17:28	17:57
20°	05:21	05:48	06:11	17:19	17:43	18:10
N 10°	05:08	05:34	05:56	17:35	17:57	18:23
0°	04:54	05:20	05:42	17:49	18:11	18:37
S 10°	04:39	05:05	05:27	18:04	18:26	18:52
20°	04:20	04:48	05:12	18:19	18:43	19:11
30°	03:56	04:28	04:54	18:37	19:04	19:35
35°	03:41	04:15	04:43	18:48	19:16	19:51
40°	03:22	04:00	04:31	19:00	19:31	20:10
45°	02:58	03:42	04:17	19:15	19:49	20:34
S 50°	02:26	03:19	03:59	19:32	20:13	21:07
52°	02:09	03:08	03:51	19:41	20:24	21:24
54°	01:47	02:55	03:42	19:50	20:37	21:46
56°	01:18	02:40	03:31	20:01	20:52	22:16
58°	00:29	02:22	03:19	20:13	21:11	23:12
S 60°	////	01:59	03:05	20:28	21:35	////

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	09:02	■	■	11:16	■	■
N 70°	08:02	■	■	12:17	■	■
68°	07:28	10:14	■	12:53	11:39	■
66°	07:03	09:06	■	13:19	12:47	■
64°	06:44	08:31	10:39	13:38	13:23	12:52
62°	06:29	08:06	09:50	13:55	13:49	13:43
60°	06:16	07:46	09:19	14:08	14:10	14:14
N 58°	06:05	07:30	08:55	14:20	14:27	14:38
56°	05:56	07:16	08:37	14:30	14:41	14:57
54°	05:48	07:04	08:21	14:40	14:53	15:13
52°	05:40	06:54	08:08	14:48	15:04	15:27
50°	05:33	06:45	07:56	14:55	15:14	15:39
45°	05:19	06:25	07:31	15:11	15:35	16:04
N 40°	05:07	06:10	07:12	15:24	15:51	16:25
35°	04:58	05:56	06:56	15:35	16:06	16:41
30°	04:49	05:45	06:42	15:45	16:18	16:56
20°	04:34	05:25	06:18	16:01	16:39	17:21
N 10°	04:21	05:09	05:58	16:16	16:58	17:42
0°	04:09	04:53	05:39	16:30	17:15	18:03
S 10°	03:57	04:37	05:20	16:44	17:32	18:23
20°	03:45	04:21	05:00	16:59	17:51	18:44
30°	03:30	04:02	04:37	17:16	18:12	19:10
35°	03:22	03:51	04:24	17:26	18:25	19:24
40°	03:12	03:38	04:08	17:37	18:40	19:42
45°	03:01	03:23	03:50	17:51	18:57	20:03
S 50°	02:48	03:05	03:27	18:08	19:19	20:29
52°	02:42	02:57	03:16	18:16	19:30	20:42
54°	02:35	02:47	03:04	18:24	19:41	20:57
56°	02:28	02:37	02:50	18:34	19:55	21:14
58°	02:20	02:25	02:33	18:46	20:11	21:35
S 60°	02:10	02:11	02:14	18:59	20:30	22:02

Day	Sun		Mer. Pass	Moon		Age 28-0 5-0%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
18	14:54	14:47	11:45	10:19	22:41	
19	14:41	14:34	11:45	11:04	23:27	
20	14:27	14:20	11:46	11:51	—:—	

November 21, 22, 23 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	60°15.01		194°46.80	S16°5.53	169°55.04	S22°47.43	303°16.47	N21°15.64	63°41.84	S04°6.70	Alpheratz	357°33.86 29°14.23	
1	75°17.47		209°46.15	6.48	184°55.54	47.69	318°19.02	15.66	78°44.34	6.71	Ankaa	353°6.19 -42°10.02	
2	90°19.93		224°45.50	7.43	199°56.03	47.96	333°21.56	15.68	93°46.83	6.71	Schedar	349°29.87 56°41.04	
3	105°22.40		239°44.85	· · 8.38	214°56.53	· · 48.23	348°24.11	· · 15.70	108°49.33	· · 6.72	Diphda	348°46.37 -17°50.66	
4	120°24.86		254°44.19	9.32	229°57.03	48.49	3°26.65	15.72	123°51.83	6.72	Achernar	335°19.16 -57°6.42	
5	135°27.33		269°43.54	10.27	244°57.53	48.76	18°29.20	15.74	138°54.32	6.73	Hamal	327°50.09 23°35.24	
6	150°29.79		284°42.88	S16°11.21	259°58.03	S22°49.02	33°31.75	N21°15.76	153°56.82	S04°6.73	Polaris	313°10.71 89°22.47	
7	165°32.25		299°42.23	12.16	274°58.52	49.29	48°34.29	15.78	168°59.31	6.73	Acamar	315°10.81 -40°12.02	
8	180°34.72		314°41.57	13.10	289°59.02	49.55	63°36.84	15.80	184°1.81	6.74	Menkar	314°5.09 4°11.57	
9	195°37.18		329°40.92	· · 14.04	304°59.52	· · 49.81	78°39.39	· · 15.82	199°4.31	· · 6.74	Mirfak	308°26.74 49°57.28	
10	210°39.65		344°40.26	14.98	320°0.01	50.08	93°41.94	15.84	214°6.80	6.75	Aldebaran	290°38.47 16°33.74	
11	225°42.11		359°39.60	15.93	335°0.51	50.34	108°44.49	15.86	229°9.30	6.75	Rigel	281°2.87 -8°10.20	
12	240°44.58		14°38.94	S16°16.87	350°1.01	S22°50.60	123°47.04	N21°15.89	244°11.79	S04°6.76	Capella	280°20.39 46°1.40	
13	255°47.04		29°38.29	17.81	5°1.50	50.86	138°49.59	15.91	259°14.29	6.76	Bellatrix	278°21.81 6°22.46	
14	270°49.50		44°37.63	18.74	20°2.00	51.13	153°52.14	15.93	274°16.78	6.76	Elnath	278°0.62 28°37.76	
15	285°51.97		59°36.97	· · 19.68	35°2.49	· · 51.39	168°54.69	· · 15.95	289°19.27	· · 6.77	Alnilam	275°36.71 -1°11.03	
16	300°54.43		74°36.31	20.62	50°2.99	51.65	183°57.24	15.97	304°21.77	6.77	Betelgeuse	270°51.03 7°24.77	
17	315°56.90		89°35.65	21.56	65°3.48	51.91	198°59.79	15.99	319°24.26	6.77	Canopus	263°51.63 -52°42.32	
18	330°59.36		104°34.99	S16°22.49	80°3.98	S22°52.17	214°2.34	N21°16.01	334°26.76	S04°6.78	Sirius	258°25.35 -16°44.95	
19	346°1.82		119°34.33	23.43	95°4.47	52.43	229°4.89	16.03	349°29.25	6.78	Adhara	255°5.04 -29°0.23	
20	1°4.29		134°33.66	24.36	110°4.97	52.69	244°7.44	16.05	4°31.74	6.78	Procyon	244°49.90 5°9.56	
21	16°6.75		149°33.00	· · 25.29	125°5.46	· · 52.95	259°10.00	· · 16.08	19°34.24	· · 6.79	Pollux	243°16.23 27°57.74	
22	31°9.22		164°32.34	26.23	140°5.95	53.21	274°12.55	16.10	34°36.73	6.79	Avior	234°14.17 -59°35.21	
23	46°11.68		179°31.68	27.16	155°6.45	53.47	289°15.10	16.12	49°39.22	6.79	Suhail	222°45.69 -43°31.93	
Mer.pass. 19:56			ν-0.7' d0.9' m-3.90		ν0.5' d0.3' m1.36		ν2.5' d0.0' m-2.47		ν2.5' d0.0' m0.87		Miaplacidus 221°37.93 -69°49.04		
											Alphard 217°47.01 -8°46.13		
											Regulus 207°33.70 11°50.42		
											Dubhe 193°40.31 61°36.41		
											Denebola 182°24.39 14°25.61		
											Gienah 175°43.06 -17°41.01		
											Acrux 172°59.77 -63°14.30		
											Gacrux 171°51.25 -57°15.24		
											Alioth 166°12.74 55°48.95		
											Spica 158°21.83 -11°17.70		
											Alkaid 152°51.87 49°10.90		
											Hadar 148°35.61 -60°29.70		
											Menkent 147°57.16 -36°29.70		
											Arcturus 145°47.59 19°2.83		
											Rigel Kent. 139°39.99 -60°56.40		
											Kochab 137°20.95 74°2.77		
											Zuben'ubi 136°55.58 -16°8.89		
											Alphecca 126°3.52 26°37.65		
											Antares 112°15.35 -26°29.32		
											Atria 107°9.50 -69°4.45		
											Sabik 102°2.32 -15°45.38		
											Shaula 96°9.81 -37°7.36		
											Rasalhague 95°58.22 12°32.54		
											Eltanin 90°42.34 51°29.23		
											Kaus Aust. 83°31.92 -34°22.38		
											Vega 80°33.10 38°48.59		
											Nunki 75°47.17 -26°15.90		
											Altair 61°59.47 8°56.30		
											Peacock 53°4.88 -56°39.30		
											Deneb 49°25.51 45°22.61		
											Enif 33°38.15 9°59.75		
											Al Na'ir 27°32.03 -46°50.32		
											Fomalhaut 15°13.66 -29°29.19		
											Scheat 13°44.44 28°13.62		
											Markab 13°29.12 15°20.84		
											Nov 21 Fri		
											SHA		
											Mer.pass		
											Venus 134°31.80 11:01		
											Mars 109°40.03 12:40		
											Jupiter 243°1.47 03:46		
											Saturn 3°26.83 19:42		
											Nov 22 Sat		
											SHA		
											Mer.pass		
											Venus 133°16.87 11:02		
											Mars 108°52.79 12:39		
											Jupiter 243°3.51 03:42		
											Saturn 3°27.57 19:38		
											Nov 23 Sun		
											SHA		
											Mer.pass		
											Venus 132°1.64 11:04		
											Mars 108°5.42 12:38		
											Jupiter 243°5.76 03:38		
											Saturn 3°28.21 19:34		
											Horizontal parallax		
											Venus: 0.1		
											Mars: 0.1		
Mer.pass. 19:48			ν-0.7' d0.9' m-3.90		ν0.5' d0.2' m1.35		ν2.6' d0.0' m-2.48		ν2.5' d0.0' m0.88				

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	183°33.06	S19°55.07	176°18.93	11.0'	S26°18.13	5.5'	53.9'
1	198°32.90	55.62	190°48.96	11.0'	26°23.64	5.4'	53.9'
2	213°32.75	56.17	205°18.92	10.9'	26°29.03	5.3'	53.9'
3	228°32.59	56.72	219°48.84	10.9'	26°34.29	5.1'	53.9'
4	243°32.43	57.27	234°18.70	10.8'	26°39.43	5.0'	53.9'
5	258°32.27	57.82	248°48.51	10.8'	26°44.44	4.9'	53.9'
6	273°32.11	S19°58.37	263°18.27	10.7'	S26°49.33	4.8'	53.9'
7	288°31.95	58.92	277°47.97	10.7'	26°54.10	4.6'	53.9'
8	303°31.80	19°59.46	292°17.63	10.6'	26°58.74	4.5'	53.9'
9	318°31.64	20°0.01	306°47.24	10.6'	27°3.25	4.4'	53.9'
10	333°31.48	0.55	321°16.80	10.5'	27°7.63	4.3'	53.9'
11	348°31.32	1.10	335°46.32	10.5'	27°11.89	4.1'	53.9'
12	3°31.15	S20°1.64	350°15.79	10.4'	S27°16.02	4.0'	53.9'
13	18°30.99	2.19	4°45.21	10.4'	27°20.02	3.9'	53.9'
14	33°30.83	2.73	19°14.59	10.3'	27°23.89	3.7'	53.9'
15	48°30.67	3.27	33°43.92	10.3'	27°27.63	3.6'	53.9'
16	63°30.51	3.81	48°13.22	10.3'	27°31.24	3.5'	54.0'
17	78°30.35	4.35	62°42.47	10.2'	27°34.72	3.3'	54.0'
18	93°30.18	S20°4.89	77°11.69	10.2'	S27°38.07	3.2'	54.0'
19	108°30.02	5.43	91°40.86	10.1'	27°41.28	3.1'	54.0'
20	123°29.86	5.97	106°10.00	10.1'	27°44.36	2.9'	54.0'
21	138°29.69	6.51	120°39.10	10.1'	27°47.31	2.8'	54.0'
22	153°29.53	7.05	135°8.16	10.0'	27°50.12	2.7'	54.0'
23	168°29.36	7.59	149°37.19	10.0'	27°52.81	2.5'	54.0'
SD = 16.2'			SD = 14.7'				

Sat	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.20	S20°8.12	164°6.18	10.0'	S27°55.35	2.4'	54.0'
1	198°29.03	8.66	178°35.15	9.9'	27°57.76	2.3'	54.0'
2	213°28.87	9.19	193°4.08	9.9'	28°0.04	2.1'	54.0'
3	228°28.70	9.73	207°32.98	9.9'	28°2.18	2.0'	54.0'
4	243°28.54	10.26	222°1.86	9.8'	28°4.19	1.9'	54.0'
5	258°28.37	10.80	236°30.70	9.8'	28°6.05	1.7'	54.0'
6	273°28.20	S20°11.33	250°59.52	9.8'	S28°7.78	1.6'	54.0'
7	288°28.04	11.86	265°28.32	9.8'	28°9.38	1.5'	54.1'
8	303°27.87	12.39	279°57.09	9.7'	28°10.84	1.3'	54.1'
9	318°27.70	12.92	294°25.84	9.7'	28°12.16	1.2'	54.1'
10	333°27.53	13.45	308°54.57	9.7'	28°13.34	1.0'	54.1'
11	348°27.36	13.98	323°23.27	9.7'	28°14.38	0.9'	54.1'
12	3°27.19	S20°14.51	337°51.96	9.7'	S28°15.28	0.8'	54.1'
13	18°27.03	15.04	352°20.63	9.7'	28°16.05	0.6'	54.1'
14	33°26.86	15.57	6°49.29	9.6'	28°16.68	0.5'	54.1'
15	48°26.69	16.09	21°17.93	9.6'	28°17.17	0.3'	54.1'
16	63°26.52	16.62	35°46.55	9.6'	28°17.51	0.2'	54.1'
17	78°26.34	17.14	50°15.16	9.6'	28°17.72	0.1'	54.1'
18	93°26.17	S20°17.67	64°43.77	9.6'	S28°17.79	-0.1'	54.2'
19	108°26.00	18.19	79°12.36	9.6'	28°17.72	-0.2'	54.2'
20	123°25.83	18.72	93°40.94	9.6'	28°17.52	-0.3'	54.2'
21	138°25.66	19.24	108°9.52	9.6'	28°17.17	-0.5'	54.2'
22	153°25.49	19.76	122°38.09	9.6'	28°16.68	-0.6'	54.2'
23	168°25.31	20.28	137°6.66	9.6'	28°16.05	-0.8'	54.2'
SD = 16.2'			SD = 14.7'				

Sun	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	183°25.14	S20°20.80	151°35.22	9.6'	S28°15.28	-0.9'	54.2'
1	198°24.97	21.33	166°3.78	9.6'	28°14.37	-1.0'	54.2'
2	213°24.79	21.84	180°32.34	9.6'	28°13.32	-1.2'	54.2'
3	228°24.62	22.36	195°0.90	9.6'	28°12.13	-1.3'	54.2'
4	243°24.45	22.88	209°29.47	9.6'	28°10.80	-1.5'	54.3'
5	258°24.27	23.40	223°58.03	9.6'	28°9.33	-1.6'	54.3'
6	273°24.10	S20°23.92	238°26.60	9.6'	S28°7.72	-1.7'	54.3'
7	288°23.92	24.43	252°55.18	9.6'	28°5.97	-1.9'	54.3'
8	303°23.75	24.95	267°23.76	9.6'	28°4.08	-2.0'	54.3'
9	318°23.57	25.46	281°52.35	9.6'	28°2.05	-2.2'	54.3'
10	333°23.39	25.98	296°20.95	9.6'	27°59.88	-2.3'	54.3'
11	348°23.22	26.49	310°49.56	9.6'	27°57.57	-2.4'	54.3'
12	3°23.04	S20°27.01	325°18.18	9.6'	S27°55.13	-2.6'	54.4'
13	18°22.86	27.52	339°46.82	9.6'	27°52.54	-2.7'	54.4'
14	33°22.68	28.03	354°15.47	9.7'	27°49.81	-2.9'	54.4'
15	48°22.51	28.54	8°44.13	9.7'	27°46.95	-3.0'	54.4'
16	63°22.33	29.05	23°12.82	9.7'	27°43.95	-3.1'	54.4'
17	78°22.15	29.56	37°41.52	9.7'	27°40.81	-3.3'	54.4'
18	93°21.97	S20°30.07	52°10.23	9.7'	S27°37.53	-3.4'	54.4'
19	108°21.79	30.58	66°38.97	9.8'	27°34.11	-3.6'	54.5'
20	123°21.61	31.09	81°7.73	9.8'	27°30.55	-3.7'	54.5'
21	138°21.43	31.59	95°36.51	9.8'	27°26.86	-3.8'	54.5'
22	153°21.25	32.10	110°5.32	9.8'	27°23.03	-4.0'	54.5'
23	168°21.07	32.61	124°34.14	9.9'	27°19.07	-4.1'	54.5'
SD = 16.2'			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:24	09:09	■	■	14:23	16:07
N 70°	07:11	08:39	10:47	12:44	14:52	16:20
68°	07:01	08:18	09:48	13:43	15:14	16:31
66°	06:52	08:00	09:15	14:17	15:31	16:40
64°	06:44	07:46	08:50	14:41	15:45	16:48
62°	06:37	07:34	08:31	15:01	15:57	16:55
60°	06:31	07:24	08:16	15:16	16:08	17:01
N 58°	06:25	07:15	08:02	15:29	16:17	17:06
56°	06:20	07:07	07:51	15:41	16:25	17:11
54°	06:16	07:00	07:41	15:51	16:32	17:16
52°	06:12	06:54	07:32	16:00	16:38	17:20
50°	06:08	06:48	07:24	16:08	16:44	17:24
45°	05:59	06:35	07:07	16:25	16:57	17:33
N 40°	05:51	06:24	06:53	16:39	17:08	17:41
35°	05:43	06:14	06:41	16:51	17:18	17:49
30°	05:36	06:05	06:31	17:01	17:27	17:56
20°	05:23	05:50	06:13	17:19	17:43	18:10
N 10°	05:09	05:35	05:57	17:35	17:57	18:23
0°	04:55	05:21	05:43	17:50	18:12	18:37
S 10°	04:39	05:05	05:28	18:05	18:27	18:54
20°	04:19	04:48	05:12	18:21	18:45	19:13
30°	03:55	04:26	04:53	18:40	19:06	19:38
35°	03:39	04:13	04:42	18:51	19:19	19:54
40°	03:19	03:58	04:29	19:03	19:35	20:14
45°	02:55	03:39	04:14	19:19	19:54	20:39
S 50°	02:20	03:15	03:56	19:37	20:18	21:14
52°	02:02	03:04	03:47	19:46	20:30	21:32
54°	01:39	02:50	03:38	19:56	20:44	21:56
56°	01:06	02:34	03:27	20:07	21:00	22:31
58°	///	02:15	03:14	20:20	21:20	///
S 60°	///	01:50	02:59	20:35	21:46	///

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	■	■	■
64°	■	■	■	■	■	■
62°	11:44	■	14:04	13:31	■	14:47
60°	10:50	12:05	12:48	14:26	14:57	16:03
N 58°	10:17	11:26	12:13	14:59	15:37	16:38
56°	09:53	10:59	11:47	15:23	16:04	17:04
54°	09:34	10:37	11:26	15:42	16:26	17:24
52°	09:18	10:20	11:09	15:59	16:43	17:41
50°	09:04	10:04	10:54	16:13	16:58	17:56
45°	08:35	09:34	10:25	16:42	17:29	18:25
N 40°	08:13	09:10	10:01	17:05	17:53	18:48
35°	07:55	08:51	09:42	17:24	18:12	19:07
30°	07:39	08:34	09:25	17:40	18:29	19:24
20°	07:12	08:06	08:58	18:07	18:57	19:51
N 10°	06:49	07:42	08:34	18:31	19:22	20:14
0°	06:28	07:19	08:11	18:53	19:44	20:36
S 10°	06:07	06:57	07:49	19:15	20:07	20:58
20°	05:44	06:33	07:25	19:38	20:31	21:21
30°	05:18	06:05	06:57	20:06	20:59	21:48
35°	05:03	05:48	06:40	20:22	21:16	22:04
40°	04:45	05:29	06:21	20:41	21:35	22:23
45°	04:23	05:06	05:58	21:04	21:59	22:45
S 50°	03:56	04:36	05:27	21:34	22:29	23:13
52°	03:43	04:21	05:13	21:48	22:44	23:27
54°	03:28	04:04	04:55	22:05	23:02	23:43
56°	03:11	03:44	04:34	22:26	23:23
58°	02:49	03:18	04:08	22:51	23:49
S 60°	02:22	02:42	03:30	23:26	00:27

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 1-3 1-7%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
21	14:12	14:05	11:46	12:40	00:15	
22	13:57	13:49	11:46	13:32	01:06	
23	13:41	13:32	11:46	14:24	01:58	

November 24, 25, 26 UT (Mon., Tue., Wed.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	63°12.43		193°58.54	S17°11.90	170°30.35	S23°5.65	306°20.65	N21°17.25	66°41.18	S04°6.85		Alpheratz	357°33.86 29°14.23
1	78°14.89		208°57.85	12.79	185°30.83	5.88	321°23.22	17.28	81°43.67	6.85		Ankaa	353°6.20 -42°10.03
2	93°17.36		223°57.16	13.68	200°31.32	6.12	336°25.79	17.30	96°46.15	6.85		Schedar	349°29.88 56°41.05
3	108°19.82		238°56.47	•• 14.58	215°31.80	•• 6.36	351°28.36	•• 17.33	111°48.64	•• 6.85		Diphda	348°46.37 -17°50.67
4	123°22.28		253°55.78	15.47	230°32.28	6.60	6°30.93	17.35	126°51.12	6.85		Achernar	335°19.17 -57°6.43
5	138°24.75		268°55.09	16.36	245°32.76	6.84	21°33.51	17.38	141°53.60	6.85		Hamal	327°50.09 23°35.25
6	153°27.21		283°54.39	S17°17.25	260°33.24	S23°7.07	36°36.08	N21°17.40	156°56.09	S04°6.85		Polaris	313°10.67 89°22.49
7	168°29.68		298°53.70	18.14	275°33.72	7.31	51°38.65	17.43	171°58.57	6.85		Acamar	315°10.81 -40°12.04
8	183°32.14		313°53.01	19.02	290°34.20	7.55	66°41.23	17.45	187°1.05	6.85		Menkar	314°5.08 4°11.57
9	198°34.60		328°52.31	•• 19.91	305°34.69	•• 7.78	81°43.80	•• 17.48	202°3.54	•• 6.85		Mirfak	308°26.72 49°57.29
10	213°37.07		343°51.62	20.80	320°35.17	8.02	96°46.37	17.50	217°6.02	6.84		Aldebaran	290°38.45 16°33.74
11	228°39.53		358°50.93	21.68	335°35.65	8.25	111°48.95	17.53	232°8.50	6.84		Rigel	281°2.85 -8°10.20
12	243°42.00		13°50.23	S17°22.57	350°36.13	S23°8.49	126°51.52	N21°17.55	247°10.99	S04°6.84		Capella	280°20.37 46°1.41
13	258°44.46		28°49.54	23.45	5°36.61	8.72	141°54.10	17.58	262°13.47	6.84		Bellatrix	278°21.79 6°22.45
14	273°46.93		43°48.84	24.34	20°37.08	8.95	156°56.68	17.60	277°15.95	6.84		Elnath	278°0.60 28°37.76
15	288°49.39		58°48.14	•• 25.22	35°37.56	•• 9.19	171°59.25	•• 17.63	292°18.43	•• 6.84		Alnilam	275°36.69 -1°11.04
16	303°51.85		73°47.45	26.10	50°38.04	9.42	187°1.83	17.66	307°20.92	6.83		Betelgeuse	270°51.01 7°24.77
17	318°54.32		88°46.75	26.98	65°38.52	9.65	202°4.41	17.68	322°23.40	6.83		Canopus	263°51.60 -52°42.33
18	333°56.78		103°46.05	S17°27.86	80°39.00	S23°9.88	217°6.98	N21°17.71	337°25.88	S04°6.83		Sirius	258°25.33 -16°44.96
19	348°59.25		118°45.35	28.74	95°39.48	10.11	232°9.56	17.73	352°28.36	6.83		Adhara	255°5.01 -29°0.24
20	4°1.71		133°44.65	29.62	110°39.96	10.35	247°12.14	17.76	7°30.84	6.83		Procyon	244°49.87 5°9.55
21	19°4.18		148°43.95	•• 30.50	125°40.43	•• 10.58	262°14.72	•• 17.78	22°33.32	•• 6.82		Pollux	243°16.20 27°57.73
22	34°6.64		163°43.25	31.37	140°40.91	10.81	277°17.30	17.81	37°35.81	6.82		Avior	234°14.14 -59°35.22
23	49°9.10		178°42.55	32.25	155°41.39	11.04	292°19.87	17.84	52°38.29	6.82		Suhail	222°45.66 -43°31.94
Mer.pass. 19:44			ν-0.7' d0.9' m-3.90		ν0.5' d0.2' m1.34		ν2.6' d0.0' m-2.49		ν2.5' d-0.0' m0.88				
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	64°11.57		193°41.85	S17°33.12	170°41.87	S23°11.27	307°22.45	N21°17.86	67°40.77	S04°6.82		Miaplacidus	221°37.88 -69°49.05
1	79°14.03		208°41.15	34.00	185°42.34	11.50	322°25.03	17.89	82°43.25	6.82		Alphard	217°46.99 -8°46.15
2	94°16.50		223°40.45	34.87	200°42.82	11.72	337°27.61	17.92	97°45.73	6.81		Regulus	207°33.67 11°50.41
3	109°18.96		238°39.74	•• 35.74	215°43.30	•• 11.95	352°30.19	•• 17.94	112°48.21	•• 6.81		Dubhe	193°40.27 61°36.39
4	124°21.42		253°39.04	36.61	230°43.77	12.18	7°32.78	17.97	127°50.69	6.81		Denebola	182°24.36 14°25.60
5	139°23.89		268°38.34	37.49	245°44.25	12.41	22°35.36	17.99	142°53.17	6.80		Gienah	175°43.03 -17°41.02
6	154°26.35		283°37.63	S17°38.36	260°44.73	S23°12.64	37°37.94	N21°18.02	157°55.65	S04°6.80		Acrux	172°59.72 -63°14.29
7	169°28.82		298°36.93	39.23	275°45.20	12.86	52°40.52	18.05	172°58.13	6.80		Gacrux	171°51.21 -57°15.24
8	184°31.28		313°36.22	40.09	290°45.68	13.09	67°43.10	18.07	188°0.61	6.80		Alioth	166°12.71 55°48.94
9	199°33.75		328°35.52	•• 40.96	305°46.15	•• 13.32	82°45.68	•• 18.10	203°3.09	•• 6.79		Spica	158°21.81 -11°17.71
10	214°36.21		343°34.81	41.83	320°46.63	13.54	97°48.27	18.13	218°5.56	6.79		Alkaid	152°51.84 49°10.88
11	229°38.67		358°34.10	42.69	335°47.10	13.77	112°50.85	18.15	233°8.04	6.79		Hadar	148°35.58 -60°29.69
12	244°41.14		13°33.40	S17°43.56	350°47.58	S23°13.99	127°53.43	N21°18.18	248°10.52	S04°6.78		Menkent	147°57.14 -36°29.70
13	259°43.60		28°32.69	44.42	5°48.05	14.22	142°56.02	18.21	263°13.00	6.78		Arcturus	145°47.57 19°2.82
14	274°46.07		43°31.98	45.29	20°48.53	14.44	157°58.60	18.23	278°15.48	6.78		Rigel Kent.	139°39.96 -60°56.39
15	289°48.53		58°31.27	•• 46.15	35°49.00	•• 14.66	173°1.19	•• 18.26	293°17.96	•• 6.77		Kochab	137°20.93 74°2.75
16	304°50.99		73°30.56	47.01	50°49.47	14.89	188°3.77	18.29	308°20.44	6.77		Zuben'ubi	136°55.56 -16°8.89
17	319°53.46		88°29.85	47.87	65°49.95	15.11	203°6.36	18.32	323°22.91	6.77		Alphecca	126°3.51 26°37.63
18	334°55.92		103°29.14	S17°48.73	80°50.42	S23°15.33	218°8.94	N21°18.34	338°25.39	S04°6.76		Antares	112°15.34 -26°29.32
19	349°58.39		118°28.43	49.59	95°50.90	15.55	233°11.53	18.37	353°27.87	6.76		Atria	107°9.49 -69°4.44
20	5°0.85		133°27.72	50.45	110°51.37	15.78	248°14.12	18.40	8°30.35	6.75		Sabik	102°2.31 -15°45.39
21	20°3.32		148°27.01	•• 51.31	125°51.84	•• 16.00	263°16.70	•• 18.42	23°32.82	•• 6.75		Shaula	96°9.80 -37°7.36
22	35°5.78		163°26.29	52.17	140°52.31	16.22	278°19.29	18.45	38°35.30	6.75		Rasalhague	95°58.22 12°32.53
23	50°8.24		178°25.58	53.02	155°52.79	16.44	293°21.88	18.48	53°37.78	6.74		Eltanin	90°42.35 51°29.21
Mer.pass. 19:40			ν-0.7' d0.9' m-3.90		ν0.5' d0.2' m1.34		ν2.6' d0.0' m-2.49		ν2.5' d-0.0' m0.89				
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	65°10.71		193°24.87	S17°53.88	170°53.26	S23°16.66	308°24.47	N21°18.51	68°40.25	S04°6.74		Kaus Aust.	83°31.92 -34°22.37
1	80°13.17		208°24.15	54.73	185°53.73	16.88	323°27.05	18.53	83°42.73	6.73		Vega	80°33.10 38°48.58
2	95°15.64		223°23.44	55.59	200°54.20	17.10	338°29.64	18.56	98°45.21	6.73		Nunki	75°47.17 -26°15.90
3	110°18.10		238°22.72	•• 56.44	215°54.67	•• 17.31	353°32.23	•• 18.59	113°47.68	•• 6.72		Altair	61°59.48 -8°56.30
4	125°20.56		253°22.01	57.29	230°55.15	17.53	8°34.82	18.62	128°50.16	6.72		Peacock	53°4.90 -56°39.29
5	140°23.03		268°21.29	58.14	245°55.62	17.75	23°37.41	18.65	143°52.63	6.72		Deneb	49°25.53 45°22.61
6	155°25.49		283°20.57	S17°58.99	260°56.09	S23°17.97	38°40.00	N21°18.67	158°55.11	S04°6.71		Enif	33°38.15 9°59.75
7	170°27.96		298°19.86	17°59.84	275°56.56	18.19	53°42.59	18.70	173°57.58	6.71		Al Na'ir	27°32.04 -46°50.32
8	185°30.42		313°19.14	18°0.69	290°57.03	18.40	68°45.18	18.73	189°0.06	6.70		Fomalhaut	15°13.67 -29°29.19
9	200°32.89		328°18.42	•• 1.54	305°57.50	•• 18.62	83°47.77	•• 18.76	204°2.53	•• 6.70		Scheat	13°44.45 28°13.63
10	215°35.35		343°17.70	2.38	320°57.97	18.83	98°50.37	18.79	219°5.01	6.69			

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		183°20.89	S20°33.11	139°3.00	9.9'	S27°14.97	-4.2' 54.5'
1		198°20.71	33.62	153°31.88	9.9'	27°10.73	-4.4' 54.5'
2		213°20.53	34.12	168°0.78	9.9'	27°6.35	-4.5' 54.6'
3		228°20.34	· · 34.62	182°29.72	10.0'	27°1.85	-4.6' 54.6'
4		243°20.16	35.12	196°58.68	10.0'	26°57.20	-4.8' 54.6'
5		258°19.98	35.63	211°27.68	10.0'	26°52.42	-4.9' 54.6'
6		273°19.80	S20°36.13	225°56.70	10.1'	S26°47.51	-5.0' 54.6'
7		288°19.61	36.63	240°25.76	10.1'	26°42.47	-5.2' 54.6'
8		303°19.43	37.13	254°54.85	10.1'	26°37.29	-5.3' 54.7'
9		318°19.25	· · 37.63	269°23.97	10.2'	26°31.97	-5.4' 54.7'
10		333°19.06	38.13	283°53.13	10.2'	26°26.53	-5.6' 54.7'
11		348°18.88	38.62	298°22.32	10.2'	26°20.95	-5.7' 54.7'
12		3°18.69	S20°39.12	312°51.55	10.3'	S26°15.25	-5.8' 54.7'
13		18°18.51	39.62	327°20.82	10.3'	26°9.41	-6.0' 54.7'
14		33°18.32	40.11	341°50.12	10.3'	26°3.44	-6.1' 54.8'
15		48°18.14	· · 40.61	356°19.46	10.4'	25°57.34	-6.2' 54.8'
16		63°17.95	41.10	10°48.84	10.4'	25°51.12	-6.4' 54.8'
17		78°17.76	41.60	25°18.26	10.5'	25°44.76	-6.5' 54.8'
18		93°17.58	S20°42.09	39°47.72	10.5'	S25°38.27	-6.6' 54.8'
19		108°17.39	42.58	54°17.22	10.5'	25°31.66	-6.7' 54.8'
20		123°17.20	43.07	68°46.76	10.6'	25°24.92	-6.9' 54.9'
21		138°17.01	· · 43.57	83°16.34	10.6'	25°18.06	-7.0' 54.9'
22		153°16.83	44.06	97°45.97	10.7'	25°11.06	-7.1' 54.9'
23		168°16.64	44.55	112°15.63	10.7'	25°3.95	-7.2' 54.9'
		SD = 16.2' $d = 0.5'$		SD = 14.9'			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		183°16.45	S20°45.04	126°45.34	10.8'	S24°56.71	-7.4' 54.9'
1		198°16.26	45.52	141°15.10	10.8'	24°49.34	-7.5' 55.0'
2		213°16.07	46.01	155°44.90	10.8'	24°41.85	-7.6' 55.0'
3		228°15.88	· · 46.50	170°14.74	10.9'	24°34.24	-7.7' 55.0'
4		243°15.69	46.99	184°44.63	10.9'	24°26.50	-7.9' 55.0'
5		258°15.50	47.47	199°14.56	11.0'	24°18.65	-8.0' 55.1'
6		273°15.31	S20°47.96	213°44.54	11.0'	S24°10.67	-8.1' 55.1'
7		288°15.12	48.44	228°14.57	11.1'	24°2.57	-8.2' 55.1'
8		303°14.93	48.92	242°44.64	11.1'	23°54.35	-8.3' 55.1'
9		318°14.74	· · 49.41	257°14.75	11.2'	23°46.02	-8.5' 55.1'
10		333°14.54	49.89	271°44.92	11.2'	23°37.56	-8.6' 55.2'
11		348°14.35	50.37	286°15.13	11.3'	23°28.99	-8.7' 55.2'
12		3°14.16	S20°50.85	300°45.38	11.3'	S23°20.30	-8.8' 55.2'
13		18°13.97	51.33	315°15.69	11.4'	23°11.49	-8.9' 55.2'
14		33°13.77	51.81	329°46.04	11.4'	23°2.57	-9.0' 55.2'
15		48°13.58	· · 52.29	344°16.44	11.4'	22°53.53	-9.2' 55.3'
16		63°13.39	52.77	358°46.88	11.5'	22°44.38	-9.3' 55.3'
17		78°13.19	53.25	13°17.38	11.5'	22°35.12	-9.4' 55.3'
18		93°13.00	S20°53.72	27°47.92	11.6'	S22°25.74	-9.5' 55.3'
19		108°12.80	54.20	42°18.50	11.6'	22°16.25	-9.6' 55.4'
20		123°12.61	54.68	56°49.14	11.7'	22°6.65	-9.7' 55.4'
21		138°12.41	· · 55.15	71°19.82	11.7'	21°56.94	-9.8' 55.4'
22		153°12.22	55.63	85°50.55	11.8'	21°47.12	-9.9' 55.4'
23		168°12.02	56.10	100°21.32	11.8'	21°37.19	-10.0' 55.5'
		SD = 16.2' $d = 0.5'$		SD = 15.0'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		183°11.82	S20°56.57	114°52.15	11.9'	S21°27.15	-10.1' 55.5'
1		198°11.63	57.04	129°23.02	11.9'	21°17.01	-10.3' 55.5'
2		213°11.43	57.52	143°53.93	12.0'	21°6.76	-10.4' 55.5'
3		228°11.23	· · 57.99	158°24.89	12.0'	20°56.40	-10.5' 55.6'
4		243°11.04	58.46	172°55.90	12.1'	20°45.93	-10.6' 55.6'
5		258°10.84	58.93	187°26.96	12.1'	20°35.36	-10.7' 55.6'
6		273°10.64	S20°59.40	201°58.05	12.1'	S20°24.69	-10.8' 55.6'
7		288°10.44	20°59.86	216°29.20	12.2'	20°13.92	-10.9' 55.7'
8		303°10.24	21°0.33	231°0.39	12.2'	20°3.04	-11.0' 55.7'
9		318°10.04	· · 0.80	245°31.62	12.3'	19°52.06	-11.1' 55.7'
10		333°9.84	1.26	260°2.90	12.3'	19°40.98	-11.2' 55.8'
11		348°9.64	1.73	274°34.22	12.4'	19°29.80	-11.3' 55.8'
12		3°9.44	S21°2.19	289°5.58	12.4'	S19°18.52	-11.4' 55.8'
13		18°9.24	2.66	303°36.99	12.4'	19°7.14	-11.5' 55.8'
14		33°9.04	3.12	318°8.44	12.5'	18°55.67	-11.6' 55.9'
15		48°8.84	· · 3.58	332°39.93	12.5'	18°44.09	-11.7' 55.9'
16		63°8.64	4.05	347°11.47	12.6'	18°32.43	-11.8' 55.9'
17		78°8.44	4.51	1°43.04	12.6'	18°20.66	-11.9' 55.9'
18		93°8.24	S21°4.97	16°14.65	12.7'	S18°8.80	-12.0' 56.0'
19		108°8.03	5.43	30°46.31	12.7'	17°56.85	-12.0' 56.0'
20		123°7.83	5.89	45°18.00	12.7'	17°44.81	-12.1' 56.0'
21		138°7.63	· · 6.35	59°49.73	12.8'	17°32.67	-12.2' 56.1'
22		153°7.43	6.80	74°21.50	12.8'	17°20.45	-12.3' 56.1'
23		168°7.22	7.26	88°53.31	12.8'	17°8.13	-12.4' 56.1'
		SD = 16.2' $d = 0.5'$		SD = 15.1'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:34	09:23	■	■	14:10	15:59
N 70°	07:20	08:51	■	■	14:43	16:13
68°	07:08	08:27	10:04	13:30	15:06	16:25
66°	06:58	08:09	09:26	14:08	15:25	16:35
64°	06:50	07:54	08:59	14:34	15:40	16:43
62°	06:43	07:41	08:39	14:54	15:53	16:51
60°	06:36	07:30	08:22	15:11	16:03	16:57
N 58°	06:30	07:21	08:09	15:25	16:13	17:03
56°	06:25	07:12	07:57	15:37	16:21	17:08
54°	06:20	07:05	07:46	15:47	16:29	17:13
52°	06:16	06:58	07:37	15:57	16:36	17:18
50°	06:12	06:52	07:29	16:05	16:42	17:22
45°	06:02	06:38	07:11	16:23	16:55	17:32
N 40°	05:53	06:27	06:56	16:37	17:07	17:40
35°	05:46	06:17	06:44	16:50	17:17	17:48
30°	05:38	06:08	06:33	17:00	17:26	17:56
20°	05:24	05:51	06:15	17:19	17:43	18:10
N 10°	05:10	05:36	05:59	17:35	17:58	18:24
0°	04:56	05:21	05:43	17:51	18:13	18:39
S 10°	04:39	05:05	05:28	18:06	18:29	18:55
20°	04:19	04:47	05:11	18:23	18:47	19:15
30°	03:53	04:25	04:52	18:42	19:09	19:41
35°	03:37	04:12	04:41	18:54	19:22	19:58
40°	03:17	03:56	04:28	19:07	19:38	20:18
45°	02:51	03:37	04:12	19:22	19:58	20:44
S 50°	02:15	03:12	03:53	19:42	20:23	21:20
52°	01:56	03:00	03:44	19:51	20:36	21:40
54°	01:30	02:45	03:34	20:01	20:50	22:06
56°	00:52	02:28	03:22	20:13	21:07	22:46
58°	////	02:07	03:09	20:27	21:29	////
S 60°	////	01:40	02:53	20:43	21:57	////

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	■	■	■	■	■	■
N 70°	■	■	15:26	■	■	18:40
68°	■	■	14:41	■	■	19:24
66°	■	14:53	14:11	■	17:31	19:53
64°	■	14:06	13:48	■	18:17	20:14
62°	13:43	13:35	13:29	16:56	18:47	20:32
60°	13:05	13:12	13:14	17:33	19:09	20:46
N 58°	12:39	12:53	13:01	17:59	19:27	20:58
56°	12:18	12:37	12:50	18:19	19:43	21:08
54°	12:01	12:24	12:40	18:36	19:56	21:18
52°	11:46	12:12	12:31	18:51	20:07	21:26
50°	11:33	12:02	12:23	19:03	20:17	21:33
45°	11:06	11:39	12:06	19:29	20:38	21:49
N 40°	10:45	11:22	11:53	19:50	20:55	22:01
35°	10:27	11:07	11:41	20:07	21:09	22:12
30°	10:12	10:53	11:30	20:22	21:21	22:21
20°	09:46	10:31	11:12	20:46	21:42	22:37
N 10°	09:24	10:12	10:56	21:08	22:00	22:51
0°	09:03	09:53	10:42	21:27	22:17	23:04
S 10°	08:42	09:35	10:27	21:47	22:33	23:17
20°	08:19	09:15	10:11	22:08	22:51	23:30
30°	07:53	08:52	09:52	22:32	23:11	23:46
35°	07:38	08:39	09:42	22:46	23:23	23:55
40°	07:20	08:23	09:29	23:03	23:36	· · ·
45°	06:58	08:05	09:15	23:22	23:52	· · ·
S 50°	06:30	07:41	08:56	23:47	· · ·	00:12
52°	06:17	07:30	08:48	23:58	· · ·	00:21
54°	06:01	07:17	08:38	· · ·	00:11	00:31
56°	05:43	07:03	08:27	00:02	00:27	00:42
58°	05:20	06:45	08:15	00:25	00:45	00:56
S 60°	04:50	06:24	08:00	00:55	01:07	01:11

Day	Sun		Mer. Pass hh:mm	Moon		Age 4-6 12-28%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
24	13:24	13:15	11:47	15:15	02:50	
25	13:06	12:57	11:47	16:05	03:40	
26	12:47	12:38	11:47	16:53	04:29	

November 27, 28, 29 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	66°9.85		193°7.58	S18°14.15	171°4.53	S23°21.82	309°26.68	N21°19.19	69°39.64	S04°6.61	Alpheratz	357°33.87	29°14.23
1	81°12.31		208°6.86	14.98	186°5.00	22.03	324°29.28	19.22	84°42.11	6.61	Ankaa	353°6.21	-42°10.04
2	96°14.78		223°6.13	15.82	201°5.46	22.23	339°31.88	19.24	99°44.59	6.60	Schedar	349°29.90	56°41.06
3	111°17.24		238°5.40	•• 16.65	216°5.93	•• 22.44	354°34.47	•• 19.27	114°47.06	•• 6.60	Diphda	348°46.38	-17°50.67
4	126°19.70		253°4.67	17.48	231°6.40	22.65	9°37.07	19.30	129°49.53	6.59	Achernar	335°19.18	-57°6.44
5	141°22.17		268°3.94	18.31	246°6.86	22.86	24°39.67	19.33	144°52.00	6.58	Hamal	327°50.09	23°35.25
6	156°24.63		283°3.22	S18°19.14	261°7.33	S23°23.07	39°42.27	N21°19.36	159°54.47	S04°6.58	Polaris	313°10.94	89°22.51
7	171°27.10		298°2.49	19.97	276°7.79	23.28	54°44.87	19.39	174°56.94	6.57	Acamar	315°10.81	-40°12.05
8	186°29.56		313°1.75	20.80	291°8.26	23.48	69°47.47	19.42	189°59.41	6.56	Menkar	314°5.08	4°11.57
9	201°32.02		328°1.02	•• 21.62	306°8.72	•• 23.69	84°50.07	•• 19.45	205°1.89	•• 6.56	Mirfak	308°26.72	49°57.30
10	216°34.49		343°0.29	22.45	321°9.19	23.90	99°52.67	19.48	220°4.36	6.55	Aldebaran	290°38.44	16°33.74
11	231°36.95		357°59.56	23.27	336°9.65	24.10	114°55.27	19.51	235°6.83	6.54	Rigel	281°2.84	-8°10.21
12	246°39.42		12°58.83	S18°24.10	351°10.12	S23°24.31	129°57.87	N21°19.54	250°9.30	S04°6.54	Capella	280°20.35	46°1.42
13	261°41.88		27°58.10	24.92	6°10.58	24.51	145°0.47	19.57	265°11.77	6.53	Bellatrix	278°21.78	6°22.45
14	276°44.35		42°57.36	25.75	21°11.05	24.72	160°3.07	19.60	280°14.24	6.52	Elnath	278°0.58	28°37.76
15	291°46.81		57°56.63	•• 26.57	36°11.51	•• 24.92	175°5.67	•• 19.63	295°16.71	•• 6.51	Alnilam	275°36.67	-1°11.04
16	306°49.27		72°55.89	27.39	51°11.98	25.12	190°8.27	19.66	310°19.18	6.51	Betelgeuse	270°50.99	7°24.76
17	321°51.74		87°55.16	28.21	66°12.44	25.33	205°10.88	19.69	325°21.65	6.50	Canopus	263°51.58	-52°42.35
18	336°54.20		102°54.42	S18°29.03	81°12.90	S23°25.53	220°13.48	N21°19.72	340°24.12	S04°6.49	Sirius	258°25.31	-16°44.97
19	351°56.67		117°53.69	29.85	96°13.37	25.73	235°16.08	19.75	355°26.59	6.48	Adhara	255°4.99	-29°0.26
20	6°59.13		132°52.95	30.66	111°13.83	25.93	250°18.68	19.78	10°29.05	6.48	Procyon	244°49.85	5°9.54
21	22°1.59		147°52.21	•• 31.48	126°14.29	•• 26.14	265°21.29	•• 19.81	25°31.52	•• 6.47	Pollux	243°16.18	27°57.73
22	37°4.06		162°51.48	32.30	141°14.76	26.34	280°23.89	19.84	40°33.99	6.46	Avior	234°14.11	-59°35.23
23	52°6.52		177°50.74	33.11	156°15.22	26.54	295°26.50	19.87	55°36.46	6.45	Suhail	222°45.63	-43°31.95
Mer.pass. 19:32		ν-0.7' d0.8' m-3.90		ν0.5' d0.2' m1.33		ν2.6' d0.0' m-2.51		ν2.5' d-0.0' m0.90					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	67°8.99		192°50.00	S18°33.92	171°15.68	S23°26.74	310°29.10	N21°19.90	70°38.93	S04°6.45	Miaplacidus	221°37.83	-69°49.05
1	82°11.45		207°49.26	34.74	186°16.14	26.94	325°31.71	19.93	85°41.40	6.44	Alphard	217°46.96	-8°46.15
2	97°13.91		222°48.52	35.55	201°16.61	27.14	340°34.31	19.96	100°43.87	6.43	Regulus	207°33.65	11°50.40
3	112°16.38		237°47.78	•• 36.36	216°17.07	•• 27.34	355°36.92	•• 19.99	115°46.33	•• 6.42	Dubhe	193°40.22	61°36.38
4	127°18.84		252°47.04	37.17	231°17.53	27.54	10°39.52	20.02	130°48.80	6.41	Denebola	182°24.33	14°25.58
5	142°21.31		267°46.30	37.98	246°17.99	27.73	25°42.13	20.05	145°51.27	6.41	Gienah	175°43.01	-17°41.03
6	157°23.77		282°45.56	S18°38.79	261°18.45	S23°27.93	40°44.74	N21°20.08	160°53.74	S04°6.40	Acrux	172°59.69	-63°14.29
7	172°26.23		297°44.82	39.60	276°18.91	28.13	55°47.35	20.11	175°56.20	6.39	Gacrux	171°51.18	-57°15.24
8	187°28.70		312°44.07	40.40	291°19.37	28.33	70°49.95	20.14	190°58.67	6.38	Alioth	166°12.68	55°48.92
9	202°31.16		327°43.33	•• 41.21	306°19.83	•• 28.52	85°52.56	•• 20.17	206°1.14	•• 6.37	Spica	158°21.79	-11°17.72
10	217°33.63		342°42.59	42.01	321°20.29	28.72	100°55.17	20.21	221°3.60	6.36	Alkaid	152°51.82	49°10.86
11	232°36.09		357°41.84	42.82	336°20.75	28.92	115°57.78	20.24	236°6.07	6.36	Hadar	148°35.55	-60°29.68
12	247°38.56		12°41.10	S18°43.62	351°21.21	S23°29.11	131°0.39	N21°20.27	251°8.54	S04°6.35	Menkent	147°57.12	-36°29.70
13	262°41.02		27°40.35	44.42	6°21.67	29.31	146°3.00	20.30	266°11.00	6.34	Arcturus	145°47.55	19°2.80
14	277°43.48		42°39.61	45.23	21°22.13	29.50	161°5.61	20.33	281°13.47	6.33	Rigel Kent.	139°39.93	-60°56.38
15	292°45.95		57°38.86	•• 46.03	36°22.59	•• 29.70	176°8.22	•• 20.36	296°15.93	•• 6.32	Kochab	137°20.90	74°2.73
16	307°48.41		72°38.11	46.83	51°23.05	29.89	191°10.83	20.39	311°18.40	6.31	Zuben'ubi	136°55.54	-16°8.90
17	322°50.88		87°37.36	47.62	66°23.51	30.08	206°13.44	20.42	326°20.87	6.30	Alphecca	126°3.50	26°37.62
18	337°53.34		102°36.62	S18°48.42	81°23.97	S23°30.28	221°16.05	N21°20.45	341°23.33	S04°6.29	Antares	112°15.33	-26°29.32
19	352°55.80		117°35.87	49.22	96°24.43	30.47	236°18.66	20.49	356°25.80	6.28	Atria	107°9.48	-69°4.42
20	7°58.27		132°35.12	50.02	111°24.89	30.66	251°21.27	20.52	11°28.26	6.27	Sabik	102°2.30	-15°45.39
21	23°0.73		147°34.37	•• 50.81	126°25.35	•• 30.85	266°23.88	•• 20.55	26°30.73	•• 6.26	Shaula	96°9.80	-37°7.36
22	38°3.20		162°33.62	51.60	141°25.80	31.04	281°26.50	20.58	41°33.19	6.26	Rasalhague	95°58.22	12°32.51
23	53°5.66		177°32.87	52.40	156°26.26	31.23	296°29.11	20.61	56°35.65	6.25	Eltanin	90°42.35	51°29.20
Mer.pass. 19:28		ν-0.7' d0.8' m-3.90		ν0.5' d0.2' m1.32		ν2.6' d0.0' m-2.52		ν2.5' d-0.0' m0.90					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	68°8.12		192°32.12	S18°53.19	171°26.72	S23°31.42	311°31.72	N21°20.64	71°38.12	S04°6.24	Nov 27 Thu	SHA	Mer.pass
1	83°10.59		207°31.37	53.98	186°27.18	31.61	326°34.33	20.68	86°40.58	6.23	Venus	126°57.74	11:08
2	98°13.05		222°30.62	54.77	201°27.63	31.80	341°36.95	20.71	101°43.05	6.22	Mars	104°54.68	12:35
3	113°15.52		237°29.86	•• 55.56	216°28.09	•• 31.99	356°39.56	•• 20.74	116°45.51	•• 6.21	Jupiter	243°16.84	03:22
4	128°17.98		252°29.11	56.35	231°28.55	32.18	11°42.18	20.77	131°47.97	6.20	Saturn	3°29.79	19:18
5	143°20.44		267°28.36	57.14	246°29.00	32.37	26°44.79	20.80	146°50.44	6.19			
6	158°22.91		282°27.60	S18°57.93	261°29.46	S23°32.56	41°47.41	N21°20.84	161°52.90	S04°6.18			
7	173°25.37		297°26.85	58.71	276°29.92	32.75	56°50.02	20.87	176°55.36	6.17			
8	188°27.84		312°26.09	18°59.50	291°30.37	32.93	71°52.64	20.90	191°57.83	6.16			
9	203°30.30		327°25.34	19°0.28	306°30.83	•• 33.12	86°55.25	•• 20.93	207°0.29	•• 6.15			
10	218°32.77		342°24.58	1.07	321°31.28	33.31	101°57.87	20.96	222°2.75	6.14			
11	233°35.23		357°23.82	1.85	336°31.74	33.49	117°0.49	21.00	237°5.21	6.13			
12	248°37.69		12°23.07	S19°2.63	351°32.20	S23°33.68	132°3.11	N21°21.03	252°7.68	S04°6.11			
13	263°												

h		Sun		Moon			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		183°7.02	S21°7.72	103°25.15	12.9'	S16°55.72	-12.5' 56.2'
1		198°6.81	8.17	117°57.04	12.9'	16°43.22	-12.6' 56.2'
2		213°6.61	8.63	132°28.95	13.0'	16°30.64	-12.7' 56.2'
3		228°6.40	· · 9.08	147°0.90	13.0'	16°17.97	-12.8' 56.2'
4		243°6.20	9.54	161°32.89	13.0'	16°5.21	-12.8' 56.3'
5		258°5.99	9.99	176°4.90	13.0'	15°52.37	-12.9' 56.3'
6		273°5.79	S21°10.44	190°36.95	13.1'	S15°39.44	-13.0' 56.3'
7		288°5.58	10.89	205°9.03	13.1'	15°26.43	-13.1' 56.4'
8		303°5.38	11.34	219°41.15	13.1'	15°13.33	-13.2' 56.4'
9		318°5.17	· · 11.79	234°13.29	13.2'	15°0.15	-13.3' 56.4'
10		333°4.96	12.24	248°45.46	13.2'	14°46.90	-13.3' 56.5'
11		348°4.76	12.69	263°17.66	13.2'	14°33.56	-13.4' 56.5'
12		3°4.55	S21°13.14	277°49.89	13.3'	S14°20.14	-13.5' 56.5'
13		18°4.34	13.59	292°22.14	13.3'	14°6.64	-13.6' 56.6'
14		33°4.13	14.03	306°54.42	13.3'	13°53.06	-13.7' 56.6'
15		48°3.92	· · 14.48	321°26.73	13.3'	13°39.41	-13.7' 56.6'
16		63°3.72	14.93	335°59.06	13.4'	13°25.68	-13.8' 56.7'
17		78°3.51	15.37	350°31.41	13.4'	13°11.88	-13.9' 56.7'
18		93°3.30	S21°15.81	5°3.79	13.4'	S12°58.00	-14.0' 56.7'
19		108°3.09	16.26	19°36.18	13.4'	12°44.04	-14.0' 56.8'
20		123°2.88	16.70	34°8.60	13.4'	12°30.02	-14.1' 56.8'
21		138°2.67	· · 17.14	48°41.03	13.5'	12°15.92	-14.2' 56.8'
22		153°2.46	17.58	63°13.49	13.5'	12°1.75	-14.2' 56.9'
23		168°2.25	18.02	77°45.96	13.5'	11°47.51	-14.3' 56.9'
		SD = 16.2' $d = 0.5'$		SD = 15.3'			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		183°2.04	S21°18.46	92°18.44	13.5'	S11°33.20	-14.4' 56.9'
1		198°1.83	18.90	106°50.94	13.5'	11°18.83	-14.4' 57.0'
2		213°1.61	19.34	121°23.46	13.5'	11°4.38	-14.5' 57.0'
3		228°1.40	· · 19.78	135°55.99	13.5'	10°49.87	-14.6' 57.0'
4		243°1.19	20.22	150°28.53	13.6'	10°35.29	-14.6' 57.1'
5		258°0.98	20.65	165°1.08	13.6'	10°20.65	-14.7' 57.1'
6		273°0.76	S21°21.09	179°33.65	13.6'	S10°5.94	-14.8' 57.1'
7		288°0.55	21.52	194°6.22	13.6'	09°51.17	-14.8' 57.2'
8		303°0.34	21.96	208°38.79	13.6'	09°36.34	-14.9' 57.2'
9		318°0.12	· · 22.39	223°11.38	13.6'	09°21.45	-15.0' 57.2'
10		332°59.91	22.82	237°43.97	13.6'	09°6.50	-15.0' 57.3'
11		347°59.70	23.25	252°16.56	13.6'	08°51.48	-15.1' 57.3'
12		2°59.48	S21°23.69	266°49.16	13.6'	S08°36.41	-15.1' 57.4'
13		17°59.27	24.12	281°21.76	13.6'	08°21.28	-15.2' 57.4'
14		32°59.05	24.55	295°54.36	13.6'	08°6.10	-15.2' 57.4'
15		47°58.84	· · 24.98	310°26.96	13.6'	07°50.86	-15.3' 57.5'
16		62°58.62	25.40	324°59.56	13.6'	07°35.56	-15.3' 57.5'
17		77°58.40	25.83	339°32.15	13.6'	07°20.21	-15.4' 57.5'
18		92°58.19	S21°26.26	354°4.74	13.6'	S07°4.81	-15.5' 57.6'
19		107°57.97	26.68	8°37.32	13.6'	06°49.36	-15.5' 57.6'
20		122°57.75	27.11	23°9.90	13.6'	06°33.85	-15.6' 57.6'
21		137°57.54	· · 27.54	37°42.47	13.6'	06°18.30	-15.6' 57.7'
22		152°57.32	27.96	52°15.03	13.6'	06°2.70	-15.7' 57.7'
23		167°57.10	28.38	66°47.58	13.5'	05°47.05	-15.7' 57.8'
		SD = 16.2' $d = 0.4'$		SD = 15.5'			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		182°56.88	S21°28.81	81°20.12	13.5'	S05°31.35	-15.7' 57.8'
1		197°56.67	29.23	95°52.65	13.5'	05°15.61	-15.8' 57.8'
2		212°56.45	29.65	110°25.16	13.5'	04°59.82	-15.8' 57.9'
3		227°56.23	· · 30.07	124°57.65	13.5'	04°43.99	-15.9' 57.9'
4		242°56.01	30.49	139°30.13	13.5'	04°28.11	-15.9' 57.9'
5		257°55.79	30.91	154°2.59	13.4'	04°12.20	-16.0' 58.0'
6		272°55.57	S21°31.33	168°35.03	13.4'	S03°56.24	-16.0' 58.0'
7		287°55.35	31.75	183°7.45	13.4'	03°40.25	-16.0' 58.1'
8		302°55.13	32.16	197°39.85	13.4'	03°24.22	-16.1' 58.1'
9		317°54.91	· · 32.58	212°12.22	13.3'	03°8.15	-16.1' 58.1'
10		332°54.69	33.00	226°44.57	13.3'	02°52.04	-16.1' 58.2'
11		347°54.47	33.41	241°16.89	13.3'	02°35.90	-16.2' 58.2'
12		2°54.24	S21°33.82	255°49.19	13.3'	S02°19.73	-16.2' 58.2'
13		17°54.02	34.24	270°21.45	13.2'	02°3.52	-16.2' 58.3'
14		32°53.80	34.65	284°53.68	13.2'	01°47.28	-16.3' 58.3'
15		47°53.58	· · 35.06	299°25.89	13.2'	01°31.01	-16.3' 58.4'
16		62°53.36	35.47	313°58.05	13.1'	01°14.72	-16.3' 58.4'
17		77°53.13	35.89	328°30.19	13.1'	00°58.39	-16.4' 58.4'
18		92°52.91	S21°36.30	343°2.29	13.1'	S00°42.04	-16.4' 58.5'
19		107°52.69	36.70	357°34.34	13.0'	00°25.66	-16.4' 58.5'
20		122°52.46	37.11	12°6.37	13.0'	S00°9.26	-16.4' 58.6'
21		137°52.24	· · 37.52	26°38.35	12.9'	N00°7.16	16.4' 58.6'
22		152°52.01	37.93	41°10.28	12.9'	00°23.60	16.5' 58.6'
23		167°51.79	38.33	55°42.18	12.8'	00°40.07	16.5' 58.7'
		SD = 16.2' $d = 0.4'$		SD = 15.8'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:43	09:37	■	■	13:58	15:52
N 70°	07:28	09:01	■	■	14:34	16:07
68°	07:15	08:36	10:20	13:15	14:59	16:20
66°	07:05	08:16	09:37	13:59	15:19	16:30
64°	06:56	08:00	09:08	14:27	15:35	16:39
62°	06:48	07:47	08:47	14:49	15:48	16:47
60°	06:41	07:36	08:29	15:06	16:00	16:54
N 58°	06:35	07:26	08:15	15:21	16:10	17:00
56°	06:30	07:17	08:02	15:34	16:19	17:06
54°	06:24	07:09	07:51	15:45	16:26	17:11
52°	06:20	07:02	07:42	15:54	16:33	17:16
50°	06:15	06:56	07:33	16:03	16:40	17:20
45°	06:05	06:42	07:15	16:21	16:54	17:31
N 40°	05:56	06:30	07:00	16:36	17:06	17:39
35°	05:48	06:19	06:47	16:49	17:16	17:48
30°	05:41	06:10	06:36	17:00	17:26	17:55
20°	05:26	05:53	06:17	17:19	17:43	18:10
N 10°	05:12	05:38	06:00	17:36	17:58	18:24
0°	04:56	05:22	05:44	17:52	18:14	18:40
S 10°	04:39	05:06	05:29	18:08	18:30	18:57
20°	04:19	04:47	05:11	18:25	18:49	19:18
30°	03:52	04:25	04:52	18:45	19:12	19:44
35°	03:36	04:11	04:40	18:57	19:25	20:01
40°	03:15	03:55	04:26	19:10	19:42	20:22
45°	02:48	03:35	04:10	19:26	20:02	20:49
S 50°	02:11	03:09	03:51	19:46	20:28	21:27
52°	01:50	02:56	03:41	19:56	20:41	21:48
54°	01:22	02:41	03:31	20:06	20:56	22:17
56°	00:37	02:23	03:18	20:19	21:15	23:05
58°	////	02:01	03:04	20:33	21:37	////
S 60°	////	01:31	02:48	20:50	22:08	////

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	14:51	14:02	13:25	20:55	23:20	· · ·
N 70°	14:25	13:50	13:22	21:18	23:29	· · ·
68°	14:05	13:41	13:20	21:36	23:36	· · ·
66°	13:49	13:33	13:18	21:51	23:42	· · ·
64°	13:36	13:26	13:17	22:02	23:47	· · ·
62°	13:24	13:20	13:15	22:12	23:51	· · ·
60°	13:15	13:15	13:14	22:21	23:55	· · ·
N 58°	13:06	13:10	13:13	22:28	23:58	· · ·
56°	12:59	13:06	13:12	22:34	· · ·	00:01
54°	12:52	13:02	13:11	22:40	· · ·	00:03
52°	12:46	12:59	13:10	22:45	· · ·	00:06
50°	12:41	12:56	13:09	22:50	· · ·	00:08
45°	12:29	12:49	13:08	23:00	· · ·	00:12
N 40°	12:19	12:43	13:06	23:08	· · ·	00:16
35°	12:11	12:38	13:05	23:15	· · ·	00:19
30°	12:03	12:34	13:04	23:22	· · ·	00:22
20°	11:50	12:27	13:02	23:32	· · ·	00:27
N 10°	11:39	12:20	13:01	23:41	· · ·	00:31
0°	11:28	12:14	12:59	23:50	· · ·	00:35
S 10°	11:17	12:07	12:58	23:58	· · ·	00:39
20°	11:06	12:01	12:56	· · ·	00:07	00:43
30°	10:53	11:53	12:54	· · ·	00:18	00:48
35°	10:45	11:49	12:53	· · ·	00:24	00:50
40°	10:36	11:43	12:52	00:05	00:30	00:53
45°	10:26	11:38	12:51	00:17	00:38	00:57
S 50°	10:13	11:30	12:49	00:31	00:47	01:01
52°	10:07	11:27	12:48	00:38	00:51	01:03
54°	10:01	11:24	12:47	00:45	00:56	01:05
56°	09:53	11:20	12:47	00:53	01:01	01:07
58°	09:45	11:15	12:46	01:02	01:06	01:09
S 60°	09:36	11:10	12:44	01:13	01:13	01:12

Day	Sun		Mer. Pass hh:mm	Moon		Age 7-9 37-58%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
27	12:28	12:18	11:48	17:39	05:16	
28	12:08	11:58	11:48	18:24	06:02	
29	11:48	11:37	11:48	19:10	06:47	

November 30, 01, 02 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	69°7.26		192°13.94	S19°11.94	171°37.64	S23°35.87	312°34.54	N21°21.42	72°37.21	S04°5.98
1	84°9.73		207°13.18	12.71	186°38.10	36.05	327°37.16	21.46	87°39.67	5.97
2	99°12.19		222°12.41	13.47	201°38.55	36.23	342°39.78	21.49	102°42.13	5.96
3	114°14.65		237°11.65	•• 14.24	216°39.00	•• 36.41	357°42.41	•• 21.52	117°44.59	•• 5.95
4	129°17.12		252°10.88	15.01	231°39.45	36.59	12°45.03	21.55	132°47.05	5.94
5	144°19.58		267°10.12	15.77	246°39.91	36.77	27°47.65	21.59	147°49.51	5.92
6	159°22.05		282°9.35	S19°16.54	261°40.36	S23°36.95	42°50.27	N21°21.62	162°51.97	S04°5.91
7	174°24.51		297°8.58	17.30	276°40.81	37.12	57°52.90	21.65	177°54.43	5.90
8	189°26.97		312°7.82	18.07	291°41.26	37.30	72°55.52	21.69	192°56.88	5.89
9	204°29.44		327°7.05	•• 18.83	306°41.71	•• 37.48	87°58.15	•• 21.72	207°59.34	•• 5.88
10	219°31.90		342°6.28	19.59	321°42.16	37.65	103°0.77	21.76	223°1.80	5.86
11	234°34.37		357°5.51	20.35	336°42.62	37.83	118°3.40	21.79	238°4.26	5.85
12	249°36.83		12°4.74	S19°21.11	351°43.07	S23°38.00	133°6.02	N21°21.82	253°6.72	S04°5.84
13	264°39.30		27°3.97	21.87	6°43.52	38.18	148°8.65	21.86	268°9.18	5.83
14	279°41.76		42°3.20	22.63	21°43.97	38.35	163°11.27	21.89	283°11.63	5.81
15	294°44.22		57°2.43	•• 23.38	36°44.42	•• 38.53	178°13.90	•• 21.92	298°14.09	•• 5.80
16	309°46.69		72°1.66	24.14	51°44.87	38.70	193°16.53	21.96	313°16.55	5.79
17	324°49.15		87°0.89	24.89	66°45.32	38.88	208°19.15	21.99	328°19.01	5.78
18	339°51.62		102°0.11	S19°25.65	81°45.77	S23°39.05	223°21.78	N21°22.03	343°21.46	S04°5.76
19	354°54.08		116°59.34	26.40	96°46.22	39.22	238°24.41	22.06	358°23.92	5.75
20	9°56.54		131°58.57	27.15	111°46.67	39.39	253°27.04	22.09	13°26.38	5.74
21	24°59.01		146°57.79	•• 27.90	126°47.11	•• 39.57	268°29.67	•• 22.13	28°28.83	•• 5.72
22	40°1.47		161°57.02	28.65	141°47.56	39.74	283°32.30	22.16	43°31.29	5.71
23	55°3.94		176°56.24	29.40	156°48.01	39.91	298°34.92	22.20	58°33.75	5.70
Mer.pass. 19:20			ν-0.8' d0.8' m-3.90		ν0.5' d0.2' m1.31		ν2.6' d0.0' m-2.53		ν2.5' d-0.0' m0.91	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	70°6.40		191°55.47	S19°30.15	171°48.46	S23°40.08	313°37.55	N21°22.23	73°36.20	S04°5.68
1	85°8.86		206°54.69	30.90	186°48.91	40.25	328°40.18	22.27	88°38.66	5.67
2	100°11.33		221°53.92	31.64	201°49.36	40.42	343°42.81	22.30	103°41.11	5.66
3	115°13.79		236°53.14	•• 32.39	216°49.81	•• 40.59	358°45.44	•• 22.33	118°43.57	•• 5.64
4	130°16.26		251°52.36	33.13	231°50.25	40.75	13°48.08	22.37	133°46.02	5.63
5	145°18.72		266°51.58	33.88	246°50.70	40.92	28°50.71	22.40	148°48.48	5.62
6	160°21.18		281°50.81	S19°34.62	261°51.15	S23°41.09	43°53.34	N21°22.44	163°50.93	S04°5.60
7	175°23.65		296°50.03	35.36	276°51.60	41.26	58°55.97	22.47	178°53.39	5.59
8	190°26.11		311°49.25	36.10	291°52.04	41.43	73°58.60	22.51	193°55.84	5.58
9	205°28.58		326°48.47	•• 36.84	306°52.49	•• 41.59	89°1.23	•• 22.54	208°58.30	•• 5.56
10	220°31.04		341°47.69	37.58	321°52.94	41.76	104°3.87	22.58	224°0.75	5.55
11	235°33.50		356°46.91	38.32	336°53.38	41.92	119°6.50	22.61	239°3.21	5.53
12	250°35.97		11°46.12	S19°39.05	351°53.83	S23°42.09	134°9.13	N21°22.65	254°5.66	S04°5.52
13	265°38.43		26°45.34	39.79	6°54.28	42.25	149°11.77	22.68	269°8.11	5.51
14	280°40.90		41°44.56	40.52	21°54.72	42.42	164°14.40	22.72	284°10.57	5.49
15	295°43.36		56°43.78	•• 41.26	36°55.17	•• 42.58	179°17.04	•• 22.75	299°13.02	•• 5.48
16	310°45.83		71°42.99	41.99	51°55.61	42.75	194°19.67	22.79	314°15.47	5.46
17	325°48.29		86°42.21	42.72	66°56.06	42.91	209°22.31	22.82	329°17.93	5.45
18	340°50.75		101°41.42	S19°43.45	81°56.50	S23°43.07	224°24.94	N21°22.86	344°20.38	S04°5.43
19	355°53.22		116°40.64	44.18	96°56.95	43.23	239°27.58	22.89	359°22.83	5.42
20	10°55.68		131°39.85	44.91	111°57.39	43.40	254°30.22	22.93	14°25.29	5.40
21	25°58.15		146°39.07	•• 45.64	126°57.84	•• 43.56	269°32.85	•• 22.96	29°27.74	•• 5.39
22	41°0.61		161°38.28	46.37	141°58.28	43.72	284°35.49	23.00	44°30.19	5.37
23	56°3.07		176°37.49	47.09	156°58.73	43.88	299°38.13	23.04	59°32.64	5.36
Mer.pass. 19:16			ν-0.8' d0.7' m-3.90		ν0.4' d0.2' m1.31		ν2.6' d0.0' m-2.54		ν2.5' d-0.0' m0.91	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°5.54		191°36.71	S19°47.82	171°59.17	S23°44.04	314°40.76	N21°23.07	74°35.09	S04°5.34
1	86°8.00		206°35.92	48.54	186°59.61	44.20	329°43.40	23.11	89°37.55	5.33
2	101°10.47		221°35.13	49.26	202°0.06	44.36	344°46.04	23.14	104°40.00	5.31
3	116°12.93		236°34.34	•• 49.99	217°0.50	•• 44.52	359°48.68	•• 23.18	119°42.45	•• 5.30
4	131°15.39		251°33.55	50.71	232°0.95	44.68	14°51.32	23.21	134°44.90	5.28
5	146°17.86		266°32.76	51.43	247°1.39	44.84	29°53.96	23.25	149°47.35	5.27
6	161°20.32		281°31.97	S19°52.15	262°1.83	S23°44.99	44°56.60	N21°23.29	164°49.80	S04°5.25
7	176°22.79		296°31.18	52.87	277°2.27	45.15	59°59.24	23.32	179°52.25	5.24
8	191°25.25		311°30.39	53.58	292°2.72	45.31	75°1.88	23.36	194°54.70	5.22
9	206°27.72		326°29.59	•• 54.30	307°3.16	•• 45.46	90°4.52	•• 23.39	209°57.15	•• 5.20
10	221°30.18		341°28.80	55.02	322°3.60	45.62	105°7.16	23.43	224°59.60	5.19
11	236°32.64		356°28.01	55.73	337°4.04	45.77	120°9.80	23.47	240°2.05	5.17
12	251°35.11		11°27.21	S19°56.44	352°4.49	S23°45.93	135°12.44	N21°23.50	255°4.50	S04°5.16
13	266°37.57		26°26.42	57.16	7°4.93	46.08	150°15.08	23.54	270°6.95	5.14
14	281°40.04		41°25.63	57.87	22°5.37	46.24	165°17.72	23.57	285°9.40	5.13
15	296°42.50		56°24.83	•• 58.58	37°5.81	•• 46.39	180°20.37	•• 23.61	300°11.85	•• 5.11
16	311°44.96		71°24.03	19°59.29	52°6.25	46.55	195°23.01	23.65	315°14.30	5.09
17	326°47.43		86°23.24	20°0.00	67°6.69	46.70	210°25.65	23.68	330°16.75	5.08
18	341°49.89		101°22.44	S20°0.70	82°7.13	S23°46.85	225°28.30	N21°23.72	345°19.20	S04°5.06
19	356°52.36		116°21.65	1.41	97°7.58	47.00	240°30.94	23.76	0°21.65	5.04
20	11°54.82		131°20.85	2.12	112°8.02	47.16	255°33.58	23.79	15°24.10	5.03
21	26°57.29		146°20.05	•• 2.82	127°8.46	•• 47.31	270°36.23	•• 23.83	30°26.55	•• 5.01
22	41°59.75		161°19.25	3.52	142°8.90	47.46	285°38.87	23.87	45°28.99	4.99
23	57°2.21		176°18.45	4.23	157°9.34	47.61	300°41.52	23.90	60°31.44	4.98
Mer.pass. 19:12			ν-0.8' d0.7' m-3.90		ν0.4' d0.2' m1.30		ν2.6' d0.0' m-2.54		ν2.5' d-0.0' m0.92	

Stars		
	SHA	Dec
Alpheratz	357°33.89	29°14.23
Ankaa	353°6.22	-42°10.05
Schedar	349°29.92	56°41.07
Diphda	348°46.39	-17°50.68
Achernar	335°19.20	-57°6.45
Hamal	327°50.09	23°35.25
Polaris	313°11.32	89°22.53
Acamar	315°10.82	-40°12.06
Menkar	314°5.08	4°11.57
Mirfak	308°26.72	49°57.31
Aldebaran	290°38.44	16°33.74
Rigel	281°2.83	-8°10.22
Capella	280°20.34	46°1.43
Bellatrix	278°21.77	6°22.45
Elnath	278°0.57	28°37.76
Alnilam	275°36.67	-1°11.05
Betelgeuse	270°50.98	7°24.76
Canopus	263°51.57	-52°42.36
Sirius	258°25.30	-16°44.98
Adhara	255°4.98	-29°0.27
Procyon	244°49.83	5°9.54
Pollux	243°16.16	27°57.73
Avior	234°14.08	-59°35.24
Suhail	222°45.61	-43°31.96
Miaplacidus	221°37.78	-69°49.06
Alphard	217°46.94	-8°46.16
Regulus	207°33.63	11°50.40
Dubhe	193°40.18	61°36.38
Denebola	182°24.31	14°25.57
Gienah	175°42.99	-17°41.03
Acrux	172°59.65	-63°14.29
Gacrux	171°51.15	-57°15.24
Alioth	166°12.65	55°48.91
Spica	158°21.77	-11°17.72
Alkaid	152°51.80	49°10.84
Hadar	148°35.53	-60°29.68
Menkent	147°57.10	-36°29.70
Arcturus	145°47.54	19°2.79
Rigel Kent.	139°39.91	-60°56.38
Kochab	137°20.88	74°2.71
Zuben'ubi	136°55.53	-16°8.90
Alphecca	126°3.49	26°37.60
Antares	112°15.33	-26°29.32
Atria	107°9.48	-69°4.41
Sabik	102°2.30	-15°45.39
Shaula	96°9.80	-37°7.35
Rasalhague	95°58.22	12°32.50
Eltanin	90°42.36	51°29.18
Kaus Aust.	83°31.93	-34°22.37
Vega	80°33.12	38°48.55
Nunki	75°47.18	-26°15.90
Altair	61°59.49	8°56.28
Peacock	53°4.93	-56°39.28
Deneb	49°25.56	45°22.59
Enif	33°38.18	9°59.74
Al Na'ir	27°32.07	-46°50.32
Fomalhaut	15°13.69	-29°29.20
Scheat	13°44.47	28°13.62
Markab	13°29.15	15°20.84

Nov 30 Sun	SHA	Mer.pass
Venus	123°6.68	11:12
Mars	102°30.38	12:33
Jupiter	243°27.28	03:09
Saturn	3°29.95	19:06

Dec 01 Mon	SHA	Mer.pass
Venus	121°49.07	11:13
Mars	101°42.06	12:32
Jupiter	243°31.15	03:05
Saturn	3°29.80	19:02

Dec 02 Tue	SHA	Mer.pass
Venus	120°31.17	11:14
Mars	100°53.63	12:32
Jupiter	243°35.23	03:01
Saturn	3°29.56	18:59

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h		Sun		Moon			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		182°51.56	S21°38.74	70°14.03	12.8'	N00°56.55	16.5' 58.7'
1		197°51.34	39.15	84°45.83	12.8'	01°13.06	16.5' 58.7'
2		212°51.11	39.55	99°17.58	12.7'	01°29.58	16.5' 58.8'
3		227°50.89	· · 39.95	113°49.29	12.7'	01°46.11	16.5' 58.8'
4		242°50.66	40.36	128°20.95	12.6'	02°22.66	16.6' 58.9'
5		257°50.44	40.76	142°52.55	12.5'	02°19.22	16.6' 58.9'
6		272°50.21	S21°41.16	157°24.10	12.5'	N02°35.79	16.6' 58.9'
7		287°49.98	41.56	171°55.59	12.4'	02°52.37	16.6' 59.0'
8		302°49.76	41.96	186°27.03	12.4'	03°8.95	16.6' 59.0'
9		317°49.53	· · 42.36	200°58.41	12.3'	03°25.55	16.6' 59.0'
10		332°49.30	42.76	215°29.73	12.3'	03°42.15	16.6' 59.1'
11		347°49.07	43.16	230°0.98	12.2'	03°58.75	16.6' 59.1'
12		2°48.84	S21°43.55	244°32.18	12.1'	N04°15.36	16.6' 59.2'
13		17°48.62	43.95	259°3.31	12.1'	04°31.97	16.6' 59.2'
14		32°48.39	44.34	273°34.37	12.0'	04°48.57	16.6' 59.2'
15		47°48.16	· · 44.74	288°5.37	11.9'	05°5.18	16.6' 59.3'
16		62°47.93	45.13	302°36.30	11.9'	05°21.78	16.6' 59.3'
17		77°47.70	45.53	317°7.16	11.8'	05°38.37	16.6' 59.3'
18		92°47.47	S21°45.92	331°37.95	11.7'	N05°54.96	16.6' 59.4'
19		107°47.24	46.31	346°8.66	11.6'	06°11.54	16.6' 59.4'
20		122°47.01	46.70	0°39.30	11.6'	06°28.10	16.6' 59.5'
21		137°46.78	· · 47.09	15°9.86	11.5'	06°44.66	16.5' 59.5'
22		152°46.55	47.48	29°40.35	11.4'	07°1.21	16.5' 59.5'
23		167°46.32	47.87	44°10.76	11.3'	07°17.73	16.5' 59.6'
		SD = 16.2' d = 0.4'		SD = 16.0'			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		182°46.08	S21°48.26	58°41.08	11.2'	N07°34.24	16.5' 59.6'
1		197°45.85	48.65	73°11.33	11.2'	07°50.74	16.5' 59.6'
2		212°45.62	49.04	87°41.49	11.1'	08°7.21	16.5' 59.7'
3		227°45.39	· · 49.42	102°11.56	11.0'	08°23.66	16.4' 59.7'
4		242°45.16	49.81	116°41.55	10.9'	08°40.09	16.4' 59.7'
5		257°44.92	50.19	131°11.45	10.8'	08°56.49	16.4' 59.8'
6		272°44.69	S21°50.58	145°41.26	10.7'	N09°12.86	16.3' 59.8'
7		287°44.46	50.96	160°10.98	10.6'	09°29.20	16.3' 59.8'
8		302°44.22	51.34	174°40.61	10.5'	09°45.52	16.3' 59.9'
9		317°43.99	· · 51.72	189°10.15	10.4'	10°1.80	16.2' 59.9'
10		332°43.75	52.11	203°39.59	10.3'	10°18.04	16.2' 59.9'
11		347°43.52	52.49	218°8.93	10.2'	10°34.25	16.2' 60.0'
12		2°43.29	S21°52.87	232°38.17	10.1'	N10°50.42	16.1' 60.0'
13		17°43.05	53.24	247°7.32	10.0'	11°6.55	16.1' 60.0'
14		32°42.81	53.62	261°36.36	9.9'	11°22.63	16.0' 60.1'
15		47°42.58	· · 54.00	276°5.31	9.8'	11°38.68	16.0' 60.1'
16		62°42.34	54.38	290°34.15	9.7'	11°54.67	15.9' 60.1'
17		77°42.11	54.75	305°2.88	9.6'	12°10.62	15.9' 60.2'
18		92°41.87	S21°55.13	319°31.51	9.5'	N12°26.51	15.8' 60.2'
19		107°41.63	55.50	334°0.04	9.4'	12°42.35	15.8' 60.2'
20		122°41.40	55.88	348°28.45	9.3'	12°58.14	15.7' 60.3'
21		137°41.16	· · 56.25	2°56.75	9.2'	13°13.87	15.7' 60.3'
22		152°40.92	56.62	17°24.95	9.1'	13°29.54	15.6' 60.3'
23		167°40.69	56.99	31°53.03	9.0'	13°45.15	15.5' 60.4'
		SD = 16.2' d = 0.4'		SD = 16.3'			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		182°40.45	S21°57.36	46°21.00	8.9'	N14°0.70	15.5' 60.4'
1		197°40.21	57.74	60°48.85	8.7'	14°16.18	15.4' 60.4'
2		212°39.97	58.10	75°16.59	8.6'	14°31.60	15.3' 60.5'
3		227°39.73	· · 58.47	89°44.21	8.5'	14°46.94	15.3' 60.5'
4		242°39.49	58.84	104°11.72	8.4'	15°2.21	15.2' 60.5'
5		257°39.25	59.21	118°39.10	8.3'	15°17.41	15.1' 60.5'
6		272°39.01	S21°59.58	133°6.37	8.1'	N15°32.53	15.0' 60.6'
7		287°38.77	21°59.94	147°33.51	8.0'	15°47.57	15.0' 60.6'
8		302°38.53	22°0.31	162°0.54	7.9'	16°2.53	14.9' 60.6'
9		317°38.29	· · 0.67	176°27.44	7.8'	16°17.40	14.8' 60.6'
10		332°38.05	1.03	190°54.22	7.7'	16°32.20	14.7' 60.7'
11		347°37.81	1.40	205°20.87	7.5'	16°46.90	14.6' 60.7'
12		2°37.57	S22°1.76	219°47.40	7.4'	N17°1.51	14.5' 60.7'
13		17°37.33	2.12	234°13.80	7.3'	17°16.03	14.4' 60.7'
14		32°37.09	2.48	248°40.08	7.1'	17°30.45	14.3' 60.8'
15		47°36.85	· · 2.84	263°6.23	7.0'	17°44.78	14.2' 60.8'
16		62°36.60	3.20	277°32.25	6.9'	17°59.00	14.1' 60.8'
17		77°36.36	3.56	291°58.14	6.8'	18°13.13	14.0' 60.8'
18		92°36.12	S22°3.92	306°23.91	6.6'	N18°27.15	13.9' 60.9'
19		107°35.88	4.27	320°49.54	6.5'	18°41.06	13.8' 60.9'
20		122°35.63	4.63	335°15.05	6.4'	18°54.86	13.7' 60.9'
21		137°35.39	· · 4.98	349°40.42	6.2'	19°8.55	13.6' 60.9'
22		152°35.15	5.34	4°5.67	6.1'	19°22.13	13.5' 61.0'
23		167°34.90	5.69	18°30.78	6.0'	19°35.58	13.3' 61.0'
		SD = 16.2' d = 0.4'		SD = 16.5'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:52	09:51	■	■	13:46	15:46
N 70°	07:35	09:12	■	■	14:26	16:02
68°	07:22	08:44	10:38	13:00	14:53	16:16
66°	07:11	08:24	09:48	13:50	15:14	16:27
64°	07:02	08:07	09:17	14:21	15:31	16:36
62°	06:53	07:53	08:54	14:44	15:45	16:44
60°	06:46	07:41	08:35	15:02	15:57	16:52
N 58°	06:40	07:31	08:20	15:18	16:07	16:58
56°	06:34	07:22	08:07	15:31	16:16	17:04
54°	06:28	07:14	07:56	15:42	16:24	17:09
52°	06:23	07:06	07:46	15:52	16:32	17:14
50°	06:19	07:00	07:37	16:01	16:38	17:19
45°	06:08	06:45	07:18	16:20	16:53	17:30
N 40°	05:59	06:33	07:03	16:35	17:05	17:39
35°	05:51	06:22	06:50	16:48	17:16	17:47
30°	05:43	06:12	06:38	17:00	17:26	17:55
20°	05:28	05:55	06:19	17:19	17:43	18:10
N 10°	05:13	05:39	06:02	17:37	17:59	18:25
0°	04:57	05:23	05:45	17:53	18:15	18:41
S 10°	04:40	05:06	05:29	18:09	18:32	18:59
20°	04:19	04:47	05:12	18:27	18:51	19:20
30°	03:52	04:24	04:51	18:47	19:14	19:47
35°	03:34	04:10	04:39	18:59	19:28	20:04
40°	03:13	03:53	04:25	19:13	19:45	20:26
45°	02:46	03:33	04:09	19:30	20:06	20:53
S 50°	02:06	03:06	03:49	19:50	20:33	21:33
52°	01:44	02:53	03:39	20:00	20:46	21:56
54°	01:14	02:37	03:28	20:11	21:02	22:27
56°	00:15	02:18	03:15	20:24	21:21	23:36
58°	////	01:55	03:01	20:39	21:45	////
S 60°	////	01:22	02:43	20:56	22:19	////

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	12:50	12:07	10:53	01:37	04:03	07:09
N 70°	12:55	12:24	11:37	01:36	03:49	06:27
68°	13:00	12:38	12:06	01:34	03:38	05:59
66°	13:04	12:49	12:29	01:33	03:29	05:38
64°	13:08	12:58	12:47	01:32	03:22	05:22
62°	13:11	13:06	13:02	01:31	03:15	05:08
60°	13:13	13:13	13:14	01:30	03:10	04:57
N 58°	13:16	13:20	13:25	01:29	03:05	04:47
56°	13:18	13:25	13:35	01:29	03:01	04:38
54°	13:20	13:30	13:44	01:28	02:57	04:31
52°	13:22	13:35	13:51	01:28	02:53	04:24
50°	13:23	13:39	13:58	01:27	02:50	04:18
45°	13:27	13:48	14:13	01:26	02:43	04:05
N 40°	13:30	13:55	14:25	01:25	02:38	03:54
35°	13:32	14:02	14:36	01:25	02:33	03:45
30°	13:35	14:08	14:45	01:24	02:29	03:37
20°	13:39	14:18	15:02	01:23	02:21	03:23
N 10°	13:42	14:27	15:16	01:22	02:15	03:11
0°	13:46	14:35	15:29	01:21	02:09	03:00
S 10°	13:49	14:44	15:43	01:20	02:03	02:49
20°	13:53	14:53	15:58	01:19	01:57	02:38
30°	13:57	15:04	16:15	01:18	01:49	02:24
35°	14:00	15:10	16:25	01:17	01:45	02:17
40°	14:03	15:17	16:36	01:16	01:41	02:08
45°	14:06	15:26	16:49	01:15	01:35	01:58
S 50°	14:10	15:36	17:06	01:14	01:29	01:46
52°	14:12	15:40	17:14	01:14	01:26	01:40
54°	14:14	15:46	17:23	01:13	01:23	01:34
56°	14:16	15:51	17:33	01:13	01:19	01:27
58°	14:19	15:58	17:44	01:12	01:15	01:19
S 60°	14:22	16:05	17:57	01:11	01:11	01:11

Day	Sun		Mer. Pass	Moon		Age 10-12 68-87%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
30	11:26	11:15	11:49	19:57	07:33	
01	11:04	10:53	11:49	20:48	08:22	
02	10:42	10:30	11:49	21:43	09:15	

December 03, 04, 05 UT (Wed., Thu., Fri.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Wed		GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0		72°4.68		191°17.65	S20°4.93	172°9.78	S23°47.76	315°44.16	N21°23.94	75°33.89	S04°4.96	Alpheratz	357°33.89 29°14.23
1		87°7.14		206°16.85	5.63	187°10.22	47.91	330°46.81	23.98	90°36.34	4.94	Ankaa	353°6.24 -42°10.05
2		102°9.61		221°16.05	6.33	202°10.66	48.06	345°49.46	24.01	105°38.78	4.93	Schedar	349°29.93 56°41.07
3		117°12.07		236°15.25	· · 7.03	217°11.10	· · 48.21	0°52.10	· · 24.05	120°41.23	· · 4.91	Diphda	348°46.40 -17°50.69
4		132°14.53		251°14.45	7.73	232°11.53	48.35	15°54.75	24.09	135°43.68	4.89	Achernar	335°19.22 -57°6.46
5		147°17.00		266°13.65	8.42	247°11.97	48.50	30°57.40	24.13	150°46.13	4.87	Hamal	327°50.09 23°35.25
6		162°19.46		281°12.84	S20°9.12	262°12.41	S23°48.65	46°0.05	N21°24.16	165°48.57	S04°4.86	Polaris	313°11.44 89°22.54
7		177°21.93		296°12.04	9.81	277°12.85	48.80	61°2.69	24.20	180°51.02	4.84	Acamar	315°10.82 -40°12.08
8		192°24.39		311°11.24	10.51	292°13.29	48.94	76°5.34	24.24	195°53.47	4.82	Menkar	314°5.08 4°11.56
9		207°26.86		326°10.43	· · 11.20	307°13.73	· · 49.09	91°7.99	· · 24.27	210°55.91	· · 4.80	Mirfak	308°26.71 49°57.32
10		222°29.32		341°9.63	11.89	322°14.17	49.24	106°10.64	24.31	225°58.36	4.79	Aldebaran	290°38.43 16°33.74
11		237°31.78		356°8.82	12.58	337°14.60	49.38	121°13.29	24.35	241°0.80	4.77	Rigel	281°2.82 -8°10.23
12		252°34.25		11°8.02	S20°13.27	352°15.04	S23°49.53	136°15.94	N21°24.39	256°3.25	S04°4.75	Capella	280°20.32 46°1.43
13		267°36.71		26°7.21	13.96	7°15.48	49.67	151°18.59	24.42	271°5.69	4.73	Bellatrix	278°21.76 6°22.44
14		282°39.18		41°6.41	14.65	22°15.92	49.81	166°21.24	24.46	286°8.14	4.72	Elnath	278°0.56 28°37.76
15		297°41.64		56°5.60	· · 15.34	37°16.35	· · 49.96	181°23.89	· · 24.50	301°10.59	· · 4.70	Alnilam	275°36.65 -1°11.06
16		312°44.10		71°4.79	16.02	52°16.79	50.10	196°26.54	24.54	316°13.03	4.68	Betelgeuse	270°50.96 7°24.75
17		327°46.57		86°3.98	16.71	67°17.23	50.24	211°29.19	24.58	331°15.48	4.66	Canopus	263°51.55 -52°42.38
18		342°49.03		101°3.17	S20°17.39	82°17.67	S23°50.39	226°31.84	N21°24.61	346°17.92	S04°4.64	Sirius	258°25.28 -16°45.00
19		357°51.50		116°2.37	18.07	97°18.10	50.53	241°34.49	24.65	1°20.36	4.62	Adhara	255°4.96 -29°0.29
20		12°53.96		131°1.56	18.76	112°18.54	50.67	256°37.14	24.69	16°22.81	4.61	Procyon	244°49.81 5°9.53
21		27°56.43		146°0.75	· · 19.44	127°18.97	· · 50.81	271°39.80	· · 24.73	31°25.25	· · 4.59	Pollux	243°16.14 27°57.72
22		42°58.89		160°59.94	20.12	142°19.41	50.95	286°42.45	24.76	46°27.70	4.57	Avior	234°14.04 -59°35.26
23		58°1.35		175°59.12	20.79	157°19.85	51.09	301°45.10	24.80	61°30.14	4.55	Suhail	222°45.58 -43°31.98
Mer.pass. 19:09		ν-0.8' d0.7' m-3.90				ν0.4' d0.1' m1.29		ν2.6' d0.0' m-2.55		ν2.4' d-0.0' m0.92			
Thu		GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0		73°3.82		190°58.31	S20°21.47	172°20.28	S23°51.23	316°47.76	N21°24.84	76°32.58	S04°4.53	Dubhe	193°40.14 61°36.37
1		88°6.28		205°57.50	22.15	187°20.72	51.37	331°50.41	24.88	91°35.03	4.51	Denebola	182°24.29 14°25.56
2		103°8.75		220°56.69	22.83	202°21.15	51.51	346°53.06	24.92	106°37.47	4.49	Gienah	175°42.97 -17°41.04
3		118°11.21		235°55.88	· · 23.50	217°21.59	· · 51.65	1°55.72	· · 24.96	121°39.91	· · 4.48	Acrux	172°59.60 -63°14.29
4		133°13.68		250°55.06	24.17	232°22.02	51.79	16°58.37	24.99	136°42.36	4.46	Gacrux	171°51.11 -57°15.24
5		148°16.14		265°54.25	24.85	247°22.46	51.92	32°1.03	25.03	151°44.80	4.44	Alioth	166°12.63 55°48.89
6		163°18.60		280°53.43	S20°25.52	262°22.89	S23°52.06	47°3.68	N21°25.07	166°47.24	S04°4.42	Spica	158°21.75 -11°17.73
7		178°21.07		295°52.62	26.19	277°23.33	52.20	62°6.34	25.11	181°49.69	4.40	Alkaid	152°51.78 49°10.83
8		193°23.53		310°51.80	26.86	292°23.76	52.33	77°9.00	25.15	196°52.13	4.38	Hadar	148°35.49 -60°29.67
9		208°26.00		325°50.99	· · 27.53	307°24.20	· · 52.47	92°11.65	· · 25.19	211°54.57	· · 4.36	Menkent	147°57.08 -36°29.70
10		223°28.46		340°50.17	28.20	322°24.63	52.60	107°14.31	25.22	226°57.01	4.34	Arcturus	145°47.52 19°2.78
11		238°30.92		355°49.35	28.86	337°25.06	52.74	122°16.97	25.26	241°59.45	4.32	Rigel Kent.	139°39.88 -60°56.37
12		253°33.39		10°48.54	S20°29.53	352°25.50	S23°52.87	137°19.62	N21°25.30	257°1.90	S04°4.30	Kochab	137°20.86 74°2.70
13		268°35.85		25°47.72	30.19	7°25.93	53.01	152°22.28	25.34	272°4.34	4.28	Zuben'ubi	136°55.52 -16°8.90
14		283°38.32		40°46.90	30.86	22°26.36	53.14	167°24.94	25.38	287°6.78	4.26	Alphecca	126°3.48 26°37.59
15		298°40.78		55°46.08	· · 31.52	37°26.80	· · 53.27	182°27.60	· · 25.42	302°9.22	· · 4.24	Antares	112°15.32 -26°29.32
16		313°43.25		70°45.26	32.18	52°27.23	53.41	197°30.26	25.46	317°11.66	4.22	Atria	107°9.46 -69°4.40
17		328°45.71		85°44.44	32.84	67°27.66	53.54	212°32.91	25.50	332°14.10	4.20	Sabik	102°2.30 -15°45.39
18		343°48.17		100°43.62	S20°33.50	82°28.10	S23°53.67	227°35.57	N21°25.53	347°16.54	S04°4.18	Shaula	96°9.80 -37°7.35
19		358°50.64		115°42.80	34.16	97°28.53	53.80	242°38.23	25.57	2°18.98	4.16	Rasalhague	95°58.21 12°32.50
20		13°53.10		130°41.98	34.82	112°28.96	53.93	257°40.89	25.61	17°21.42	4.14	Eltanin	90°42.37 51°29.17
21		28°55.57		145°41.16	· · 35.47	127°29.39	· · 54.07	272°43.55	· · 25.65	32°23.86	· · 4.12	Kaus Aust.	83°31.93 -34°22.36
22		43°58.03		160°40.34	36.13	142°29.83	54.20	287°46.21	25.69	47°26.30	4.10	Vega	80°33.13 38°48.54
23		59°0.50		175°39.52	36.78	157°30.26	54.33	302°48.87	25.73	62°28.74	4.08	Nunki	75°47.18 -26°15.90
Mer.pass. 19:05		ν-0.8' d0.7' m-3.90				ν0.4' d0.1' m1.29		ν2.7' d0.0' m-2.55		ν2.4' d-0.0' m0.93			
Fri		GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0		74°2.96		190°38.69	S20°37.44	172°30.69	S23°54.45	317°51.54	N21°25.77	77°31.18	S04°4.06	Altair	61°59.50 8°56.28
1		89°5.42		205°37.87	38.09	187°31.12	54.58	332°54.20	25.81	92°33.62	4.04	Peacock	53°4.95 -56°39.27
2		104°7.89		220°37.04	38.74	202°31.55	54.71	347°56.86	25.85	107°36.06	4.02	Deneb	49°25.58 45°22.59
3		119°10.35		235°36.22	· · 39.39	217°31.98	· · 54.84	2°59.52	· · 25.89	122°38.50	· · 4.00	Enif	33°38.18 9°59.74
4		134°12.82		250°35.40	40.04	232°32.41	54.97	18°2.18	25.93	137°40.94	3.98	Al Na'ir	27°32.09 -46°50.32
5		149°15.28		265°34.57	40.69	247°32.84	55.10	33°4.85	25.97	152°43.38	3.96	Fomalhaut	15°13.70 -29°29.20
6		164°17.75		280°33.74	S20°41.34	262°33.28	S23°55.22	48°7.51	N21°26.01	167°45.82	S04°3.94	Scheat	13°44.48 28°13.62
7		179°20.21		295°32.92	41.98	277°33.71	55.35	63°10.17	26.05	182°48.25	3.91	Markab	13°29.16 15°20.83
8		194°22.67		310°32.09	42.63	292°34.14	55.47	78°12.84	26.09	197°50.69	3.89	Dec 03 Wed	
9		209°25.14		325°31.26	· · 43.27	307°34.57	· · 55.60	93°15.50	· · 26.13	212°53.13	· · 3.87	Venus	SHA 119°12.97 Mer.pass 11:15
10		224°27.60		340°30.44	43.92	322°35.00	55.73	108°18.16	26.17	227°55.57	3.85	Mars	100°5.10 12:31
11		239°30.07		355°29.61	44.56	337°35.43	55.85	123°20.83	26.20	242°58.01	3.83	Jupiter	243°39.49 02:57
12		254°32.53											

Sun			Moon				
h	GHA	Dec	GHA	ν	Dec	d	HP
Wed							
0	182°34.66	S22°6.05	32°55.77	5.9'	N19°48.92	13.2'	61.0'
1	197°34.41	6.40	47°20.62	5.7'	20°2.14	13.1'	61.0'
2	212°34.17	6.75	61°45.34	5.6'	20°15.23	13.0'	61.0'
3	227°33.92	· · 7.10	76°9.93	5.5'	20°28.20	12.8'	61.0'
4	242°33.68	7.45	90°34.39	5.3'	20°41.03	12.7'	61.1'
5	257°33.43	7.80	104°58.72	5.2'	20°53.74	12.6'	61.1'
6	272°33.19	S22°8.15	119°22.92	5.1'	N21°6.31	12.4'	61.1'
7	287°32.94	8.50	133°46.99	4.9'	21°18.75	12.3'	61.1'
8	302°32.70	8.85	148°10.92	4.8'	21°31.04	12.2'	61.1'
9	317°32.45	· · 9.19	162°34.73	4.7'	21°43.19	12.0'	61.1'
10	332°32.20	9.54	176°58.41	4.5'	21°55.21	11.9'	61.2'
11	347°31.95	9.88	191°21.96	4.4'	22°7.07	11.7'	61.2'
12	2°31.71	S22°10.23	205°45.38	4.3'	N22°18.78	11.6'	61.2'
13	17°31.46	10.57	220°8.67	4.2'	22°30.35	11.4'	61.2'
14	32°31.21	10.91	234°31.83	4.0'	22°41.76	11.3'	61.2'
15	47°30.96	· · 11.26	248°54.87	3.9'	22°53.01	11.1'	61.2'
16	62°30.72	11.60	263°17.79	3.8'	23°4.11	10.9'	61.2'
17	77°30.47	11.94	277°40.58	3.7'	23°15.05	10.8'	61.3'
18	92°30.22	S22°12.28	292°3.24	3.5'	N23°25.82	10.6'	61.3'
19	107°29.97	12.62	306°25.78	3.4'	23°36.43	10.4'	61.3'
20	122°29.72	12.96	320°48.21	3.3'	23°46.87	10.3'	61.3'
21	137°29.47	· · 13.29	335°10.51	3.2'	23°57.14	10.1'	61.3'
22	152°29.22	13.63	349°32.69	3.1'	24°7.24	9.9'	61.3'
23	167°28.97	13.97	3°54.76	3.0'	24°17.17	9.7'	61.3'
SD = 16.2' $d = 0.4'$			SD = 16.6'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°28.72	S22°14.30	18°16.71	2.8'	N24°26.92	9.6'	61.3'
1	197°28.47	14.64	32°38.55	2.7'	24°36.49	9.4'	61.3'
2	212°28.22	14.97	47°0.28	2.6'	24°45.88	9.2'	61.3'
3	227°27.97	· · 15.30	61°21.89	2.5'	24°55.08	9.0'	61.3'
4	242°27.72	15.64	75°43.40	2.4'	25°4.11	8.8'	61.3'
5	257°27.47	15.97	90°4.80	2.3'	25°12.94	8.6'	61.3'
6	272°27.21	S22°16.30	104°26.10	2.2'	N25°21.59	8.5'	61.3'
7	287°26.96	16.63	118°47.29	2.1'	25°30.05	8.3'	61.3'
8	302°26.71	16.96	133°8.38	2.0'	25°38.31	8.1'	61.3'
9	317°26.46	· · 17.29	147°29.38	1.9'	25°46.38	7.9'	61.3'
10	332°26.20	17.62	161°50.28	1.8'	25°54.25	7.7'	61.3'
11	347°25.95	17.94	176°11.08	1.7'	26°1.93	7.5'	61.3'
12	2°25.70	S22°18.27	190°31.80	1.6'	N26°9.41	7.3'	61.3'
13	17°25.45	18.60	204°52.43	1.5'	26°16.68	7.1'	61.3'
14	32°25.19	18.92	219°12.97	1.5'	26°23.75	6.9'	61.3'
15	47°24.94	· · 19.25	233°33.43	1.4'	26°30.62	6.7'	61.3'
16	62°24.68	19.57	247°53.81	1.3'	26°37.28	6.5'	61.3'
17	77°24.43	19.89	262°14.11	1.2'	26°43.73	6.2'	61.3'
18	92°24.17	S22°20.21	276°34.34	1.2'	N26°49.97	6.0'	61.3'
19	107°23.92	20.53	290°54.50	1.1'	26°56.00	5.8'	61.3'
20	122°23.66	20.86	305°14.59	1.0'	27°1.82	5.6'	61.3'
21	137°23.41	· · 21.17	319°34.61	1.0'	27°7.43	5.4'	61.3'
22	152°23.15	21.49	333°54.57	0.9'	27°12.82	5.2'	61.3'
23	167°22.90	21.81	348°0.48	0.8'	27°18.00	5.0'	61.3'
SD = 16.2' $d = 0.3'$			SD = 16.7'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°22.64	S22°22.13	2°34.32	0.8'	N27°22.96	4.7'	61.3'
1	197°22.38	22.45	16°54.12	0.7'	27°27.70	4.5'	61.3'
2	212°22.13	22.76	31°13.87	0.7'	27°32.23	4.3'	61.3'
3	227°21.87	· · 23.08	45°33.58	0.7'	27°36.53	4.1'	61.3'
4	242°21.61	23.39	59°53.24	0.6'	27°40.61	3.9'	61.3'
5	257°21.36	23.71	74°12.86	0.6'	27°44.48	3.6'	61.3'
6	272°21.10	S22°24.02	88°32.46	0.6'	N27°48.12	3.4'	61.2'
7	287°20.84	24.33	102°52.02	0.5'	27°51.54	3.2'	61.2'
8	302°20.58	24.64	117°11.55	0.5'	27°54.73	3.0'	61.2'
9	317°20.33	· · 24.95	131°31.06	0.5'	27°57.70	2.7'	61.2'
10	332°20.07	25.26	145°50.55	0.5'	28°0.45	2.5'	61.2'
11	347°19.81	25.57	160°10.03	0.5'	28°2.97	2.3'	61.2'
12	2°19.55	S22°25.88	174°29.50	0.5'	N28°5.27	2.1'	61.2'
13	17°19.29	26.19	188°48.95	0.5'	28°7.34	1.8'	61.2'
14	32°19.03	26.50	203°8.41	0.5'	28°9.19	1.6'	61.1'
15	47°18.77	· · 26.80	217°27.86	0.5'	28°10.82	1.4'	61.1'
16	62°18.51	27.11	231°47.32	0.5'	28°12.21	1.2'	61.1'
17	77°18.25	27.41	246°6.78	0.5'	28°13.38	0.9'	61.1'
18	92°17.99	S22°27.72	260°26.26	0.5'	N28°14.33	0.7'	61.1'
19	107°17.73	28.02	274°45.75	0.5'	28°15.05	0.5'	61.1'
20	122°17.47	28.32	289°5.26	0.5'	28°15.55	0.3'	61.0'
21	137°17.21	· · 28.62	303°24.79	0.6'	28°15.82	0.0'	61.0'
22	152°16.95	28.92	317°44.35	0.6'	28°15.87	-0.2'	61.0'
23	167°16.68	29.22	332°3.94	0.6'	28°15.70	-0.4'	61.0'
SD = 16.2' $d = 0.3'$			SD = 16.7'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	07:59	10:05	■	■	13:35	15:41
N 70°	07:42	09:21	■	■	14:19	15:58
68°	07:28	08:52	10:57	12:43	14:48	16:12
66°	07:17	08:30	09:58	13:42	15:10	16:24
64°	07:07	08:13	09:25	14:16	15:27	16:33
62°	06:58	07:58	09:00	14:40	15:42	16:42
60°	06:51	07:46	08:41	14:59	15:54	16:50
N 58°	06:44	07:35	08:25	15:15	16:05	16:56
56°	06:38	07:26	08:12	15:28	16:14	17:03
54°	06:32	07:18	08:00	15:40	16:23	17:08
52°	06:27	07:10	07:50	15:50	16:30	17:13
50°	06:22	07:03	07:41	16:00	16:37	17:18
45°	06:11	06:48	07:21	16:19	16:52	17:29
N 40°	06:02	06:35	07:06	16:35	17:05	17:39
35°	05:53	06:24	06:52	16:48	17:16	17:47
30°	05:45	06:15	06:41	17:00	17:26	17:55
20°	05:30	05:57	06:21	17:20	17:44	18:11
N 10°	05:14	05:40	06:03	17:37	18:00	18:26
0°	04:58	05:24	05:47	17:54	18:16	18:42
S 10°	04:40	05:07	05:30	18:11	18:34	19:00
20°	04:19	04:48	05:12	18:29	18:53	19:22
30°	03:51	04:24	04:51	18:50	19:17	19:50
35°	03:34	04:10	04:39	19:02	19:31	20:07
40°	03:12	03:53	04:25	19:16	19:48	20:29
45°	02:44	03:31	04:08	19:33	20:10	20:58
S 50°	02:03	03:04	03:47	19:54	20:37	21:39
52°	01:39	02:50	03:37	20:04	20:51	22:03
54°	01:06	02:34	03:26	20:16	21:08	22:37
56°	////	02:14	03:13	20:29	21:28	////
58°	////	01:49	02:57	20:44	21:53	////
S 60°	////	01:14	02:39	21:03	22:30	////

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	10:39	□	□	09:27	□	□
66°	11:53	□	□	08:14	□	□
64°	12:30	11:35	□	07:38	10:46	□
62°	12:57	12:52	12:40	07:12	09:30	12:03
60°	13:18	13:29	14:00	06:52	08:54	10:44
N 58°	13:36	13:55	14:36	06:36	08:28	10:08
56°	13:50	14:16	15:02	06:22	08:07	09:42
54°	14:03	14:33	15:23	06:10	07:50	09:21
52°	14:14	14:48	15:40	05:59	07:36	09:04
50°	14:24	15:01	15:55	05:50	07:23	08:49
45°	14:45	15:28	16:26	05:30	06:57	08:19
N 40°	15:03	15:50	16:49	05:15	06:37	07:55
35°	15:17	16:08	17:09	05:01	06:20	07:36
30°	15:30	16:23	17:25	04:50	06:05	07:20
20°	15:52	16:49	17:54	04:30	05:40	06:52
N 10°	16:11	17:12	18:18	04:13	05:19	06:28
0°	16:29	17:33	18:41	03:57	04:59	06:05
S 10°	16:47	17:55	19:04	03:41	04:39	05:43
20°	17:06	18:18	19:28	03:24	04:18	05:19
30°	17:29	18:45	19:57	03:05	03:53	04:51
35°	17:43	19:01	20:14	02:54	03:39	04:35
40°	17:58	19:19	20:34	02:41	03:22	04:15
45°	18:17	19:42	20:58	02:26	03:03	03:52
S 50°	18:40	20:11	21:29	02:07	02:38	03:23
52°	18:51	20:25	21:44	01:59	02:26	03:08
54°	19:04	20:42	22:02	01:49	02:13	02:51
56°	19:19	21:02	22:24	01:39	01:57	02:31
58°	19:36	21:26	22:52	01:26	01:39	02:06
S 60°	19:58	22:00	23:32	01:12	01:17	01:33

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 13-15 94-100%
03	10:19	10:07	11:50	22:44	10:13	
04	09:55	09:43	11:50	23:49	11:16	
05	09:31	09:18	11:51	--:--	12:23	

December 06, 07, 08 UT (Sat., Sun., Mon.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	75°2.10	190°18.79	S20°52.81	172°41.00	S23°57.43	318°55.50	N21°26.73	78°29.68	S04°3.55						
1	90°4.57	205°17.96	53.44	187°41.43	57.55	333°58.17	26.77	93°32.12	3.52						
2	105°7.03	220°17.12	54.07	202°41.85	57.67	349°0.84	26.81	108°34.55	3.50						
3	120°9.50	235°16.29	•• 54.69	217°42.28	•• 57.78	4°3.51	•• 26.85	123°36.99	•• 3.48						
4	135°11.96	250°15.45	55.32	232°42.71	57.90	19°6.18	26.89	138°39.42	3.46						
5	150°14.42	265°14.62	55.94	247°43.14	58.02	34°8.85	26.93	153°41.86	3.43						
6	165°16.89	280°13.78	S20°56.56	262°43.56	S23°58.14	49°11.52	N21°26.97	168°44.29	S04°3.41						
7	180°19.35	295°12.94	57.19	277°43.99	58.25	64°14.19	27.01	183°46.72	3.39						
8	195°21.82	310°12.10	57.81	292°44.42	58.37	79°16.86	27.05	198°49.16	3.37						
9	210°24.28	325°11.26	•• 58.43	307°44.84	•• 58.48	94°19.53	•• 27.09	213°51.59	•• 3.34						
10	225°26.75	340°10.42	59.04	322°45.27	58.60	109°22.21	27.13	228°54.03	3.32						
11	240°29.21	355°9.58	20°59.66	337°45.69	58.71	124°24.88	27.18	243°56.46	3.30						
12	255°31.67	10°8.74	S21°0.28	352°46.12	S23°58.82	139°27.55	N21°27.22	258°58.89	S04°3.27						
13	270°34.14	25°7.90	0.89	7°46.55	58.94	154°30.22	27.26	274°1.33	3.25						
14	285°36.60	40°7.06	1.51	22°46.97	59.05	169°32.90	27.30	289°3.76	3.23						
15	300°39.07	55°6.22	•• 2.12	37°47.40	•• 59.16	184°35.57	•• 27.34	304°6.19	•• 3.20						
16	315°41.53	70°5.38	2.73	52°47.82	59.27	199°38.24	27.38	319°8.62	3.18						
17	330°43.99	85°4.54	3.34	67°48.25	59.39	214°40.92	27.42	334°11.06	3.16						
18	345°46.46	100°3.69	S21°3.95	82°48.67	S23°59.50	229°43.59	N21°27.46	349°13.49	S04°3.13						
19	0°48.92	115°2.85	4.56	97°49.10	59.61	244°46.27	27.51	4°15.92	3.11						
20	15°51.39	130°2.01	5.17	112°49.52	59.72	259°48.94	27.55	19°18.35	3.09						
21	30°53.85	145°1.16	•• 5.78	127°49.95	•• 59.83	274°51.62	•• 27.59	34°20.79	•• 3.06						
22	45°56.32	160°0.32	6.38	142°50.37	23°59.94	289°54.30	27.63	49°23.22	3.04						
23	60°58.78	174°59.47	6.99	157°50.79	24°0.05	304°56.97	27.67	64°25.65	3.01						
Mer.pass. 18:57		ν-0.8' d0.6' m-3.90			ν0.4' d0.1' m1.28			ν2.7' d0.0' m-2.57			ν2.4' d-0.0' m0.93				
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	76°1.24	189°58.63	S21°7.59	172°51.22	S24°0.16	319°59.65	N21°27.71	79°28.08	S04°2.99						
1	91°3.71	204°57.78	8.19	187°51.64	0.26	335°2.32	27.75	94°30.51	2.97						
2	106°6.17	219°56.93	8.79	202°52.06	0.37	350°5.00	27.80	109°32.94	2.94						
3	121°8.64	234°56.09	•• 9.39	217°52.49	•• 0.48	5°7.68	•• 27.84	124°35.37	•• 2.92						
4	136°11.10	249°55.24	9.99	232°52.91	0.58	20°10.36	27.88	139°37.80	2.89						
5	151°13.57	264°54.39	10.59	247°53.33	0.69	35°13.03	27.92	154°40.24	2.87						
6	166°16.03	279°53.54	S21°11.19	262°53.76	S24°0.80	50°15.71	N21°27.96	169°42.67	S04°2.84						
7	181°18.49	294°52.69	11.78	277°54.18	0.90	65°18.39	28.01	184°45.10	2.82						
8	196°20.96	309°51.84	12.38	292°54.60	1.01	80°21.07	28.05	199°47.53	2.79						
9	211°23.42	324°50.99	•• 12.97	307°55.03	•• 1.11	95°23.75	•• 28.09	214°49.96	•• 2.77						
10	226°25.89	339°50.14	13.57	322°55.45	1.22	110°26.43	28.13	229°52.39	2.75						
11	241°28.35	354°49.29	14.16	337°55.87	1.32	125°29.11	28.17	244°54.81	2.72						
12	256°30.82	9°48.44	S21°14.75	352°56.29	S24°1.42	140°31.79	N21°28.22	259°57.24	S04°2.70						
13	271°33.28	24°47.59	15.34	7°56.71	1.53	155°34.47	28.26	274°59.67	2.67						
14	286°35.74	39°46.74	15.93	22°57.14	1.63	170°37.15	28.30	290°2.10	2.65						
15	301°38.21	54°45.88	•• 16.51	37°57.56	•• 1.73	185°39.83	•• 28.34	305°4.53	•• 2.62						
16	316°40.67	69°45.03	17.10	52°57.98	1.83	200°42.51	28.39	320°6.96	2.60						
17	331°43.14	84°44.18	17.69	67°58.40	1.93	215°45.20	28.43	335°9.39	2.57						
18	346°45.60	99°43.32	S21°18.27	82°58.82	S24°2.03	230°47.88	N21°28.47	350°11.82	S04°2.54						
19	1°48.07	114°42.47	18.85	97°59.24	2.13	245°50.56	28.51	5°14.24	2.52						
20	16°50.53	129°41.61	19.44	112°59.66	2.23	260°53.24	28.56	20°16.67	2.49						
21	31°52.99	144°40.76	•• 20.02	128°0.08	•• 2.33	275°55.93	•• 28.60	35°19.10	•• 2.47						
22	46°55.46	159°39.90	20.60	143°0.50	2.43	290°58.61	28.64	50°21.53	2.44						
23	61°57.92	174°39.05	21.18	158°0.93	2.53	306°1.29	28.68	65°23.96	2.42						
Mer.pass. 18:53		ν-0.8' d0.6' m-3.90			ν0.4' d0.1' m1.27			ν2.7' d0.0' m-2.57			ν2.4' d-0.0' m0.94				
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°0.39	189°38.19	S21°21.75	173°1.35	S24°2.63	321°3.98	N21°28.73	80°26.38	S04°2.39						
1	92°2.85	204°37.33	22.33	188°1.77	2.73	336°6.66	28.77	95°28.81	2.37						
2	107°5.31	219°36.48	22.91	203°2.19	2.82	351°9.35	28.81	110°31.24	2.34						
3	122°7.78	234°35.62	•• 23.48	218°2.61	•• 2.92	6°12.03	•• 28.86	125°33.66	•• 2.31						
4	137°10.24	249°34.76	24.05	233°3.02	3.01	21°14.72	28.90	140°36.09	2.29						
5	152°12.71	264°33.90	24.63	248°3.44	3.11	36°17.40	28.94	155°38.52	2.26						
6	167°15.17	279°33.04	S21°25.20	263°3.86	S24°3.21	51°20.09	N21°28.98	170°40.94	S04°2.23						
7	182°17.64	294°32.18	25.77	278°4.28	3.30	66°22.77	29.03	185°43.37	2.21						
8	197°20.10	309°31.32	26.34	293°4.70	3.40	81°25.46	29.07	200°45.80	2.18						
9	212°22.56	324°30.46	•• 26.91	308°5.12	•• 3.49	96°28.15	•• 29.11	215°48.22	•• 2.16						
10	227°25.03	339°29.60	27.47	323°5.54	3.58	111°30.83	29.16	230°50.65	2.13						
11	242°27.49	354°28.74	28.04	338°5.96	3.68	126°33.52	29.20	245°53.07	2.10						
12	257°29.96	9°27.88	S21°28.60	353°6.38	S24°3.77	141°36.21	N21°29.24	260°55.50	S04°2.08						
13	272°32.42	24°27.01	29.17	8°6.79	3.86	156°38.90	29.29	275°57.92	2.05						
14	287°34.88	39°26.15	29.73	23°7.21	3.95	171°41.58	29.33	291°0.35	2.02						
15	302°37.35	54°25.29	•• 30.29	38°7.63	•• 4.04	186°44.27	•• 29.37	306°2.77	•• 2.00						
16	317°39.81	69°24.42	30.85	53°8.05	4.13	201°46.96	29.42	321°5.20	1.97						
17	332°42.28	84°23.56	31.41	68°8.47	4.23	216°49.65	29.46	336°7.62	1.94						
18	347°44.74	99°22.69	S21°31.97	83°8.88	S24°4.32	231°52.34	N21°29.50	351°10.04	S04°1.91						
19	2°47.21	114°21.83	32.53	98°9.30	4.40	246°55.03	29.55	6°12.47	1.89						
20	17°49.67	129°20.96	33.08	113°9.72	4.49	261°57.72	29.59	21°14.89	1.86						
21	32°52.13	144°20.10	•• 33.64	128°10.14	•• 4.58	277°0.41	•• 29.64	36°17.32	•• 1.83						
22	47°54.60	159°19.23	34.19	143°10.55	4.67	292°3.10	29.68	51°19.74	1.81						
23	62°57.06	174°18.37	34.74	158°10.97	4.76	307°5.79	29.72	66°22.16	1.78						
Mer.pass. 18:49		ν-0.9' d0.6' m-3.90			ν0.4' d0.1' m1.27			ν2.7' d0.0' m-2.58			ν2.4' d-0.0' m0.94				

	SHA	Dec
Alpheratz	357°33.90	29°14.24
Ankaa	353°6.24	-42°10.06
Schedar	349°29.94	56°41.08
Diphda	348°46.40	-17°50.69
Achernar	335°19.23	-57°6.47
Hamal	327°50.09	23°35.25
Polaris	313°11.52	89°22.56
Acamar	315°10.82	-40°12.09
Menkar	314°5.07	4°11.56
Mirfak	308°26.70	49°57.33
Aldebaran	290°38.41	16°33.74
Rigel	281°2.81	-8°10.24
Capella	280°20.29	46°1.44
Bellatrix	278°21.74	6°22.43
Elnath	278°0.54	28

h		Sun		Moon				
Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		182°16.42	S22°29.52	346°23.56	0.7'	N28°15.30	-0.6'	61.0'
1		197°16.16	29.82	0°43.22	0.7'	28°14.68	-0.8'	60.9'
2		212°15.90	30.12	15°2.92	0.7'	28°13.84	-1.1'	60.9'
3		227°15.64	· · 30.42	29°22.67	0.8'	28°12.77	-1.3'	60.9'
4		242°15.37	30.71	43°42.47	0.9'	28°11.49	-1.5'	60.9'
5		257°15.11	31.01	58°2.32	0.9'	28°9.99	-1.7'	60.8'
6		272°14.85	S22°31.30	72°22.23	1.0'	N28°8.27	-1.9'	60.8'
7		287°14.58	31.60	86°42.19	1.0'	28°6.33	-2.2'	60.8'
8		302°14.32	31.89	101°2.22	1.1'	28°4.17	-2.4'	60.8'
9		317°14.06	· · 32.18	115°22.32	1.2'	28°1.80	-2.6'	60.7'
10		332°13.79	32.48	129°42.48	1.2'	27°59.21	-2.8'	60.7'
11		347°13.53	32.77	144°2.72	1.3'	27°56.41	-3.0'	60.7'
12		2°13.26	S22°33.06	158°23.04	1.4'	N27°53.40	-3.2'	60.7'
13		17°13.00	33.35	172°43.43	1.5'	27°50.18	-3.4'	60.6'
14		32°12.73	33.64	187°3.91	1.6'	27°46.74	-3.6'	60.6'
15		47°12.47	· · 33.92	201°24.47	1.7'	27°43.10	-3.8'	60.6'
16		62°12.20	34.21	215°45.13	1.7'	27°39.26	-4.1'	60.6'
17		77°11.94	34.50	230°5.87	1.8'	27°35.20	-4.3'	60.5'
18		92°11.67	S22°34.78	244°26.71	1.9'	N27°30.95	-4.5'	60.5'
19		107°11.41	35.07	258°47.65	2.0'	27°26.49	-4.7'	60.5'
20		122°11.14	35.35	273°8.69	2.1'	27°21.83	-4.9'	60.4'
21		137°10.87	· · 35.64	287°29.83	2.2'	27°16.98	-5.1'	60.4'
22		152°10.61	35.92	301°51.08	2.4'	27°11.92	-5.2'	60.4'
23		167°10.34	36.20	316°12.43	2.5'	27°6.68	-5.4'	60.3'
		SD = 16.2' $d = 0.3'$		SD = 16.6'				

Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		182°10.07	S22°36.48	330°33.90	2.6'	N27°1.23	-5.6'	60.3'
1		197°9.80	36.76	344°55.48	2.7'	26°55.60	-5.8'	60.3'
2		212°9.54	37.04	359°17.17	2.8'	26°49.78	-6.0'	60.3'
3		227°9.27	· · 37.32	13°38.98	2.9'	26°43.77	-6.2'	60.2'
4		242°9.00	37.60	28°0.91	3.1'	26°37.57	-6.4'	60.2'
5		257°8.73	37.87	42°22.96	3.2'	26°31.19	-6.6'	60.2'
6		272°8.46	S22°38.15	56°45.14	3.3'	N26°24.62	-6.7'	60.1'
7		287°8.20	38.43	71°7.44	3.4'	26°17.88	-6.9'	60.1'
8		302°7.93	38.70	85°29.87	3.6'	26°10.96	-7.1'	60.1'
9		317°7.66	· · 38.98	99°52.42	3.7'	26°3.86	-7.3'	60.0'
10		332°7.39	39.25	114°15.11	3.8'	25°56.59	-7.4'	60.0'
11		347°7.12	39.52	128°37.93	4.0'	25°49.15	-7.6'	59.9'
12		2°6.85	S22°39.79	143°0.88	4.1'	N25°41.54	-7.8'	59.9'
13		17°6.58	40.07	157°23.97	4.2'	25°33.76	-7.9'	59.9'
14		32°6.31	40.34	171°47.19	4.4'	25°25.81	-8.1'	59.8'
15		47°6.04	· · 40.61	186°10.55	4.5'	25°17.70	-8.3'	59.8'
16		62°5.77	40.87	200°34.05	4.6'	25°9.43	-8.4'	59.8'
17		77°5.50	41.14	214°57.69	4.8'	25°1.01	-8.6'	59.7'
18		92°5.22	S22°41.41	229°21.46	4.9'	N24°52.42	-8.7'	59.7'
19		107°4.95	41.68	243°45.38	5.1'	24°43.68	-8.9'	59.7'
20		122°4.68	41.94	258°9.44	5.2'	24°34.79	-9.0'	59.6'
21		137°4.41	· · 42.21	272°33.65	5.3'	24°25.75	-9.2'	59.6'
22		152°4.14	42.47	286°57.99	5.5'	24°16.56	-9.3'	59.5'
23		167°3.87	42.73	301°22.49	5.6'	24°7.22	-9.5'	59.5'
		SD = 16.2' $d = 0.3'$		SD = 16.4'				

Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		182°3.59	S22°43.00	315°47.12	5.8'	N23°57.74	-9.6'	59.5'
1		197°3.32	43.26	330°11.90	5.9'	23°48.12	-9.8'	59.4'
2		212°3.05	43.52	344°36.83	6.1'	23°38.37	-9.9'	59.4'
3		227°2.77	· · 43.78	359°1.90	6.2'	23°28.47	-10.0'	59.4'
4		242°2.50	44.04	13°27.12	6.4'	23°18.44	-10.2'	59.3'
5		257°2.23	44.30	27°52.48	6.5'	23°8.28	-10.3'	59.3'
6		272°1.95	S22°44.56	42°17.99	6.7'	N22°57.99	-10.4'	59.2'
7		287°1.68	44.81	56°43.65	6.8'	22°47.57	-10.5'	59.2'
8		302°1.41	45.07	71°9.45	6.9'	22°37.02	-10.7'	59.2'
9		317°1.13	· · 45.33	85°35.40	7.1'	22°26.35	-10.8'	59.1'
10		332°0.86	45.58	100°1.50	7.2'	22°15.56	-10.9'	59.1'
11		347°0.58	45.84	114°27.74	7.4'	22°4.65	-11.0'	59.0'
12		2°0.31	S22°46.09	128°54.12	7.5'	N21°53.62	-11.1'	59.0'
13		17°0.03	46.34	143°20.65	7.7'	21°42.48	-11.3'	59.0'
14		31°59.76	46.59	157°47.33	7.8'	21°31.23	-11.4'	58.9'
15		46°59.48	· · 46.84	172°14.15	8.0'	21°19.86	-11.5'	58.9'
16		61°59.21	47.09	186°41.12	8.1'	21°8.39	-11.6'	58.8'
17		76°58.93	47.34	201°8.23	8.3'	20°56.81	-11.7'	58.8'
18		91°58.65	S22°47.59	215°35.48	8.4'	N20°45.13	-11.8'	58.8'
19		106°58.38	47.84	230°2.87	8.5'	20°33.34	-11.9'	58.7'
20		121°58.10	48.09	244°30.41	8.7'	20°21.46	-12.0'	58.7'
21		136°57.82	· · 48.33	258°58.09	8.8'	20°9.47	-12.1'	58.6'
22		151°57.55	48.58	273°25.91	9.0'	19°57.39	-12.2'	58.6'
23		166°57.27	48.83	287°53.86	9.1'	19°45.22	-12.3'	58.5'
		SD = 16.2' $d = 0.3'$		SD = 16.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:06	10:18	■	■	13:24	15:36
N 70°	07:48	09:30	■	■	14:13	15:54
68°	07:34	08:59	11:21	12:21	14:43	16:09
66°	07:22	08:36	10:08	13:35	15:06	16:21
64°	07:11	08:18	09:32	14:11	15:25	16:31
62°	07:02	08:03	09:06	14:36	15:40	16:40
60°	06:55	07:50	08:46	14:56	15:52	16:48
N 58°	06:48	07:39	08:30	15:13	16:03	16:55
56°	06:41	07:30	08:16	15:27	16:13	17:02
54°	06:35	07:21	08:04	15:39	16:22	17:07
52°	06:30	07:13	07:54	15:49	16:29	17:13
50°	06:25	07:06	07:44	15:59	16:37	17:18
45°	06:14	06:51	07:25	16:18	16:52	17:29
N 40°	06:04	06:38	07:08	16:35	17:05	17:39
35°	05:55	06:27	06:55	16:48	17:16	17:48
30°	05:47	06:17	06:43	17:00	17:26	17:56
20°	05:31	05:59	06:22	17:21	17:44	18:12
N 10°	05:16	05:42	06:05	17:38	18:01	18:27
0°	04:59	05:25	05:48	17:55	18:18	18:44
S 10°	04:41	05:08	05:31	18:12	18:35	19:02
20°	04:19	04:48	05:13	18:31	18:55	19:24
30°	03:51	04:24	04:51	18:52	19:19	19:52
35°	03:33	04:10	04:39	19:04	19:34	20:10
40°	03:11	03:52	04:24	19:19	19:51	20:32
45°	02:42	03:30	04:07	19:36	20:13	21:02
S 50°	02:00	03:02	03:46	19:58	20:41	21:44
52°	01:35	02:48	03:35	20:08	20:56	22:09
54°	00:59	02:31	03:24	20:20	21:13	22:46
56°	////	02:11	03:10	20:33	21:33	////
58°	////	01:45	02:55	20:49	22:00	////
S 60°	////	01:06	02:36	21:08	22:40	////

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	16:54	□	□	14:28
66°	□	□	17:46	□	□	13:36
64°	□	15:44	18:17	□	13:36	13:03
62°	14:15	16:36	18:41	12:51	12:44	12:39
60°	15:17	17:07	18:59	11:48	12:11	12:19
N 58°	15:51	17:31	19:15	11:14	11:47	12:03
56°	16:16	17:50	19:28	10:49	11:28	11:49
54°	16:36	18:06	19:39	10:28	11:11	11:37
52°	16:53	18:19	19:49	10:11	10:57	11:26
50°	17:07	18:31	19:58	09:57	10:45	11:17
45°	17:37	18:56	20:17	09:27	10:19	10:57
N 40°	18:00	19:16	20:32	09:04	09:58	10:40
35°	18:19	19:32	20:45	08:44	09:41	10:26
30°	18:35	19:46	20:56	08:28	09:26	10:14
20°	19:02	20:10	21:15	08:00	09:01	09:53
N 10°	19:26	20:31	21:31	07:36	08:39	09:35
0°	19:48	20:50	21:46	07:13	08:18	09:18
S 10°	20:10	21:09	22:02	06:50	07:57	09:00
20°	20:33	21:30	22:18	06:26	07:35	08:42
30°	21:00	21:53	22:36	05:58	07:09	08:20
35°	21:16	22:07	22:47	05:41	06:53	08:07
40°	21:35	22:23	22:59	05:21	06:35	07:52
45°	21:57	22:41	23:14	04:57	06:13	07:35
S 50°	22:26	23:05	23:31	04:26	05:46	07:12
52°	22:40	23:16	23:39	04:11	05:32	07:02
54°	22:56	23:29	23:49	03:53	05:16	06:50
56°	23:15	23:43	23:59	03:31	04:58	06:36
58°	23:38	· ·	00:00	03:03	04:35	06:20
S 60°	· ·	00:09	00:20	02:23	04:04	06:00

Day	Sun		Mer. Pass hh:mm	Moon		Age 16-18 98-87%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
06	09:06	08:53	11:51	00:57	13:30	

Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°59.53	189°17.50	S21°35.30	173°11.39	S24°4.85	322°8.48	N21°29.77	81°24.59	S04°1.75
1	93°1.99	204°16.63	35.85	188°11.80	4.93	337°11.17	29.81	96°27.01	1.72
2	108°4.46	219°15.76	36.40	203°12.22	5.02	352°13.87	29.85	111°29.43	1.69
3	123°6.92	234°14.89	· · 36.95	218°12.64	· · 5.11	7°16.56	· · 29.90	126°31.86	· · 1.67
4	138°9.38	249°14.02	37.49	233°13.05	5.19	22°19.25	29.94	141°34.28	1.64
5	153°11.85	264°13.15	38.04	248°13.47	5.28	37°21.94	29.99	156°36.70	1.61
6	168°14.31	279°12.29	S21°38.58	263°13.88	S24°5.36	52°24.64	N21°30.03	171°39.12	S04°1.58
7	183°16.78	294°11.41	39.13	278°14.30	5.44	67°27.33	30.08	186°41.54	1.56
8	198°19.24	309°10.54	39.67	293°14.71	5.53	82°30.02	30.12	201°43.97	1.53
9	213°21.70	324°9.67	· · 40.21	308°15.13	· · 5.61	97°32.72	· · 30.16	216°46.39	· · 1.50
10	228°24.17	339°8.80	40.75	323°15.54	5.69	112°35.41	30.21	231°48.81	1.47
11	243°26.63	354°7.93	41.29	338°15.96	5.78	127°38.11	30.25	246°51.23	1.44
12	258°29.10	9°7.06	S21°41.83	353°16.37	S24°5.86	142°40.80	N21°30.30	261°53.65	S04°1.41
13	273°31.56	24°6.18	42.37	8°16.79	5.94	157°43.50	30.34	276°56.07	1.39
14	288°34.02	39°5.31	42.91	23°17.20	6.02	172°46.19	30.39	291°58.49	1.36
15	303°36.49	54°4.44	· · 43.44	38°17.62	· · 6.10	187°48.89	· · 30.43	307°0.91	· · 1.33
16	318°38.95	69°3.56	43.97	53°18.03	6.18	202°51.59	30.48	322°3.33	1.30
17	333°41.42	84°2.69	44.51	68°18.45	6.26	217°54.28	30.52	337°5.76	1.27
18	348°43.88	99°1.81	S21°45.04	83°18.86	S24°6.34	232°56.98	N21°30.56	352°8.18	S04°1.24
19	3°46.35	114°0.94	45.57	98°19.28	6.42	247°59.68	30.61	7°10.60	1.21
20	18°48.81	129°0.06	46.10	113°19.69	6.50	263°2.37	30.65	22°13.02	1.18
21	33°51.27	143°59.19	· · 46.63	128°20.10	· · 6.58	278°5.07	· · 30.70	37°15.43	· · 1.16
22	48°53.74	158°58.31	47.16	143°20.52	6.65	293°7.77	30.74	52°17.85	1.13
23	63°56.20	173°57.43	47.68	158°20.93	6.73	308°10.47	30.79	67°20.27	1.10
Mer.pass. 18:45		ν-0.9' d0.6' m-3.90		ν0.4' d0.1' m1.26		ν2.7' d0.0' m-2.58		ν2.4' d-0.0' m0.94	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°58.67	188°56.55	S21°48.21	173°21.34	S24°6.81	323°13.17	N21°30.83	82°22.69	S04°1.07
1	94°1.13	203°55.68	48.73	188°21.76	6.88	338°15.86	30.88	97°25.11	1.04
2	109°3.59	218°54.80	49.25	203°22.17	6.96	353°18.56	30.92	112°27.53	1.01
3	124°6.06	233°53.92	· · 49.78	218°22.58	· · 7.04	8°21.26	· · 30.97	127°29.95	· · 0.98
4	139°8.52	248°53.04	50.30	233°22.99	7.11	23°23.96	31.01	142°32.37	0.95
5	154°10.99	263°52.16	50.82	248°23.41	7.18	38°26.66	31.06	157°34.79	0.92
6	169°13.45	278°51.28	S21°51.33	263°23.82	S24°7.26	53°29.36	N21°31.10	172°37.20	S04°0.89
7	184°15.92	293°50.40	51.85	278°24.2					

Dec 09 Tue	SHA	Mer.pass
Venus	111° 17.97	11:23
Mars	95° 11.86	12:27
Jupiter	244° 8.96	02:31
Saturn	3° 25.06	18:31

Dec 10 Wed	SHA	Mer.pass
Venus	109° 57.89	11:25
Mars	94° 22.68	12:26
Jupiter	244° 14.50	02:27
Saturn	3° 24.03	18:28

Dec 11 Thu	SHA	Mer.pass
Venus	108° 37.56	11:26
Mars	93° 33.41	12:26
Jupiter	244° 20.22	02:22
Saturn	3° 22.90	18:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		181°56.99	S22°49.07	302°21.96	9.2'	N19°32.95	-12.4' 58.5'
1		196°56.71	49.31	316°50.19	9.4'	19°20.60	-12.4' 58.5'
2		211°56.44	49.55	331°18.57	9.5'	19°8.16	-12.5' 58.4'
3		226°56.16	· · 49.80	345°47.07	9.6'	18°55.63	-12.6' 58.4'
4		241°55.88	50.04	0°15.72	9.8'	18°43.01	-12.7' 58.3'
5		256°55.60	50.28	14°44.50	9.9'	18°30.32	-12.8' 58.3'
6		271°55.32	S22°50.52	29°13.41	10.0'	N18°17.54	-12.9' 58.3'
7		286°55.05	50.76	43°42.45	10.2'	18°4.69	-12.9' 58.2'
8		301°54.77	50.99	58°11.63	10.3'	17°51.75	-13.0' 58.2'
9		316°54.49	· · 51.23	72°40.93	10.4'	17°38.75	-13.1' 58.1'
10		331°54.21	51.47	87°10.36	10.6'	17°25.67	-13.1' 58.1'
11		346°53.93	51.70	101°39.93	10.7'	17°12.52	-13.2' 58.1'
12		1°53.65	S22°51.94	116°9.62	10.8'	N16°59.30	-13.3' 58.0'
13		16°53.37	52.17	130°39.43	10.9'	16°46.02	-13.4' 58.0'
14		31°53.09	52.40	145°9.37	11.1'	16°32.66	-13.4' 57.9'
15		46°52.81	· · 52.64	159°39.43	11.2'	16°19.25	-13.5' 57.9'
16		61°52.53	52.87	174°9.62	11.3'	16°5.77	-13.5' 57.8'
17		76°52.25	53.10	188°39.92	11.4'	15°52.23	-13.6' 57.8'
18		91°51.97	S22°53.33	203°10.35	11.5'	N15°38.63	-13.7' 57.8'
19		106°51.68	53.56	217°40.89	11.7'	15°24.97	-13.7' 57.7'
20		121°51.40	53.79	232°11.55	11.8'	15°11.26	-13.8' 57.7'
21		136°51.12	· · 54.01	246°42.32	11.9'	14°57.50	-13.8' 57.6'
22		151°50.84	54.24	261°13.21	12.0'	14°43.68	-13.9' 57.6'
23		166°50.56	54.47	275°44.21	12.1'	14°29.81	-13.9' 57.6'
		SD = 16.2' $d = 0.2'$		SD = 16.0'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		181°50.28	S22°54.69	290°15.33	12.2'	N14°15.89	-14.0' 57.5'
1		196°49.99	54.92	304°46.55	12.3'	14°1.92	-14.0' 57.5'
2		211°49.71	55.14	319°17.88	12.4'	13°47.91	-14.1' 57.4'
3		226°49.43	· · 55.36	333°49.32	12.5'	13°33.85	-14.1' 57.4'
4		241°49.15	55.59	348°20.87	12.7'	13°19.75	-14.1' 57.4'
5		256°48.86	55.81	2°52.52	12.8'	13°5.61	-14.2' 57.3'
6		271°48.58	S22°56.03	17°24.28	12.9'	N12°51.42	-14.2' 57.3'
7		286°48.30	56.25	31°56.13	13.0'	12°37.20	-14.3' 57.2'
8		301°48.01	56.47	46°28.09	13.1'	12°22.94	-14.3' 57.2'
9		316°47.73	· · 56.69	61°0.14	13.2'	12°8.64	-14.3' 57.2'
10		331°47.45	56.90	75°32.29	13.2'	11°54.31	-14.4' 57.1'
11		346°47.16	57.12	90°4.54	13.3'	11°39.94	-14.4' 57.1'
12		1°46.88	S22°57.34	104°36.89	13.4'	N11°25.55	-14.4' 57.1'
13		16°46.59	57.55	119°9.32	13.5'	11°11.12	-14.5' 57.0'
14		31°46.31	57.77	133°41.85	13.6'	10°56.66	-14.5' 57.0'
15		46°46.02	· · 57.98	148°14.47	13.7'	10°42.17	-14.5' 56.9'
16		61°45.74	58.19	162°47.17	13.8'	10°27.65	-14.5' 56.9'
17		76°45.45	58.40	177°19.97	13.9'	10°13.11	-14.6' 56.9'
18		91°45.17	S22°58.61	191°52.85	14.0'	N09°58.55	-14.6' 56.8'
19		106°44.88	58.83	206°25.81	14.0'	09°43.96	-14.6' 56.8'
20		121°44.60	59.03	220°58.86	14.1'	09°29.35	-14.6' 56.7'
21		136°44.31	· · 59.24	235°31.99	14.2'	09°14.72	-14.7' 56.7'
22		151°44.02	59.45	250°5.20	14.3'	09°0.06	-14.7' 56.7'
23		166°43.74	59.66	264°38.49	14.4'	08°45.39	-14.7' 56.6'
		SD = 16.2' $d = 0.2'$		SD = 15.7'			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		181°43.45	S22°59.87	279°11.85	14.4'	N08°30.70	-14.7' 56.6'
1		196°43.16	23°0.07	293°45.29	14.5'	08°16.00	-14.7' 56.6'
2		211°42.88	0.28	308°18.81	14.6'	08°1.28	-14.7' 56.5'
3		226°42.59	· · 0.48	322°52.39	14.7'	07°46.54	-14.7' 56.5'
4		241°42.30	0.68	337°26.05	14.7'	07°31.79	-14.8' 56.5'
5		256°42.02	0.89	351°59.78	14.8'	07°17.03	-14.8' 56.4'
6		271°41.73	S23°1.09	6°33.58	14.9'	N07°2.26	-14.8' 56.4'
7		286°41.44	1.29	21°7.44	14.9'	06°47.48	-14.8' 56.3'
8		301°41.15	1.49	35°41.37	15.0'	06°32.69	-14.8' 56.3'
9		316°40.86	· · 1.69	50°15.37	15.1'	06°17.89	-14.8' 56.3'
10		331°40.58	1.89	64°49.42	15.1'	06°3.08	-14.8' 56.2'
11		346°40.29	2.08	79°23.54	15.2'	05°48.27	-14.8' 56.2'
12		1°40.00	S23°2.28	93°57.72	15.2'	N05°33.45	-14.8' 56.2'
13		16°39.71	2.48	108°31.95	15.3'	05°18.63	-14.8' 56.1'
14		31°39.42	2.67	123°6.25	15.3'	05°3.80	-14.8' 56.1'
15		46°39.13	· · 2.87	137°40.59	15.4'	04°48.97	-14.8' 56.1'
16		61°38.84	3.06	152°15.00	15.5'	04°34.14	-14.8' 56.0'
17		76°38.55	3.25	166°49.45	15.5'	04°19.31	-14.8' 56.0'
18		91°38.26	S23°3.45	181°23.96	15.6'	N04°4.48	-14.8' 56.0'
19		106°37.98	3.64	195°58.52	15.6'	03°49.66	-14.8' 55.9'
20		121°37.69	3.83	210°33.12	15.7'	03°34.83	-14.8' 55.9'
21		136°37.40	· · 4.02	225°7.77	15.7'	03°20.01	-14.8' 55.9'
22		151°37.11	4.21	239°42.47	15.7'	03°5.19	-14.8' 55.8'
23		166°36.81	4.40	254°17.21	15.8'	02°50.37	-14.8' 55.8'
		SD = 16.2' $d = 0.2'$		SD = 15.4'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:12	10:30	■	■	13:15	15:33
N 70°	07:54	09:38	■	■	14:08	15:52
68°	07:38	09:05	■	■	14:40	16:07
66°	07:26	08:42	10:16	13:29	15:04	16:19
64°	07:15	08:23	09:38	14:07	15:23	16:30
62°	07:06	08:07	09:12	14:34	15:38	16:39
60°	06:58	07:54	08:51	14:54	15:51	16:47
N 58°	06:51	07:43	08:34	15:11	16:02	16:55
56°	06:44	07:33	08:20	15:25	16:12	17:01
54°	06:39	07:24	08:08	15:38	16:21	17:07
52°	06:33	07:17	07:57	15:48	16:29	17:12
50°	06:28	07:09	07:48	15:58	16:36	17:18
45°	06:17	06:54	07:27	16:18	16:52	17:29
N 40°	06:07	06:41	07:11	16:35	17:05	17:39
35°	05:58	06:29	06:57	16:48	17:17	17:48
30°	05:49	06:19	06:45	17:01	17:27	17:57
20°	05:33	06:00	06:24	17:21	17:45	18:13
N 10°	05:17	05:43	06:06	17:40	18:02	18:29
0°	05:01	05:27	05:49	17:57	18:19	18:45
S 10°	04:42	05:09	05:32	18:14	18:37	19:04
20°	04:20	04:49	05:13	18:32	18:57	19:26
30°	03:51	04:25	04:52	18:54	19:21	19:55
35°	03:33	04:10	04:39	19:07	19:36	20:13
40°	03:11	03:52	04:25	19:21	19:54	20:35
45°	02:41	03:30	04:07	19:39	20:16	21:05
S 50°	01:58	03:01	03:45	20:01	20:45	21:49
52°	01:32	02:47	03:35	20:12	21:00	22:15
54°	00:53	02:29	03:23	20:24	21:17	22:55
56°	////	02:08	03:09	20:37	21:38	////
58°	////	01:41	02:53	20:54	22:06	////
S 60°	////	00:58	02:33	21:13	22:50	////

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	18:37	21:21	23:32	14:36	13:30	12:51
N 70°	19:16	21:36	23:35	13:56	13:13	12:44
68°	19:43	21:48	23:38	13:27	12:59	12:38
66°	20:03	21:57	23:41	13:06	12:48	12:33
64°	20:19	22:05	23:43	12:48	12:38	12:29
62°	20:32	22:12	23:45	12:34	12:30	12:25
60°	20:43	22:18	23:47	12:22	12:22	12:22
N 58°	20:53	22:23	23:48	12:11	12:16	12:19
56°	21:01	22:28	23:49	12:02	12:10	12:17
54°	21:08	22:32	23:50	11:54	12:05	12:14
52°	21:15	22:35	23:52	11:46	12:01	12:12
50°	21:21	22:39	23:52	11:40	11:56	12:10
45°	21:34	22:46	23:55	11:25	11:47	12:06
N 40°	21:44	22:52	23:56	11:13	11:40	12:02
35°	21:53	22:57	23:58	11:03	11:33	11:59
30°	22:01	23:02	23:59	10:54	11:27	11:56
20°	22:14	23:09	· · ·	10:38	11:17	11:52
N 10°	22:26	23:16	· · ·	10:24	11:08	11:47
0°	22:37	23:23	· · ·	10:11	10:59	11:43
S 10°	22:48	23:29	· · ·	09:58	10:51	11:39
20°	22:59	23:36	· · ·	09:44	10:41	11:35
30°	23:12	23:43	· · ·	09:27	10:31	11:30
35°	23:20	23:48	· · ·	09:18	10:24	11:27
40°	23:28	23:53	· · ·	09:07	10:17	11:23
45°	23:38	23:58	· · ·	08:54	10:09	11:19
S 50°	23:50	· · ·	00:05	08:38	09:59	11:15
52°	23:56	· · ·	00:08	08:30	09:54	11:12
54°	· · ·	00:02	00:12	08:22	09:49	11:10
56°	· · ·	00:09	00:15	08:13	09:43	11:07
58°	00:11	00:16	00:20	08:02	09:37	11:04
S 60°	00:24	00:25	00:24	07:49	09:29	11:01

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-59%
09	07:48	07:35	11:52	03:59	16:24	
10	07:21	07:08	11:53	04:48	17:11	
11	06:54	06:40	11:53	05:33	17:54	

December 12, 13, 14 UT (Fri., Sat., Sun.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Fri	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec		SHA	Dec	
0	80°56.94	188°13.95	S22°12.09	173°41.02	S24°9.96		325°23.04	N21°33.04		84°18.61	S03°59.58					Alpheratz	357°33.92 29°14.23	
1	95°59.41	203°13.05	12.56	188°41.42	10.01		340°25.76	33.09		99°21.02	59.54					Ankaa	353°6.27 -42°10.07	
2	111°1.87	218°12.15	13.03	203°41.83	10.07		355°28.47	33.13		114°23.43	59.51					Schedar	349°29.98 56°41.09	
3	126°4.34	233°11.26	•• 13.50	218°42.24	•• 10.12		10°31.18	•• 33.18		129°25.84	•• 59.48					Diphda	348°46.41 -17°50.70	
4	141°6.80	248°10.36	13.97	233°42.64	10.17		25°33.90	33.23		144°28.25	59.45					Achernar	335°19.27 -57°6.49	
5	156°9.26	263°9.46	14.43	248°43.05	10.23		40°36.61	33.27		159°30.66	59.41					Hamal	327°50.10 23°35.26	
6	171°11.73	278°8.56	S22°14.89	263°43.46	S24°10.28		55°39.33	N21°33.32		174°33.07	S03°59.38					Polaris	313°12.74 89°22.60	
7	186°14.19	293°7.66	15.36	278°43.86	10.33		70°42.04	33.37		189°35.48	59.35					Acamar	315°10.83 -40°12.11	
8	201°16.66	308°6.76	15.82	293°44.27	10.38		85°44.76	33.42		204°37.89	59.31					Menkar	314°5.07 4°11.55	
9	216°19.12	323°5.86	•• 16.28	308°44.67	•• 10.43		100°47.47	•• 33.46		219°40.30	•• 59.28					Mirfak	308°26.70 49°57.35	
10	231°21.58	338°4.96	16.74	323°45.08	10.48		115°50.19	33.51		234°42.71	59.25					Aldebaran	290°38.40 16°33.74	
11	246°24.05	353°4.06	17.20	338°45.48	10.53		130°52.90	33.56		249°45.12	59.21					Rigel	281°2.79 -8°10.26	
12	261°26.51	8°3.16	S22°17.65	353°45.89	S24°10.58		145°55.62	N21°33.60		264°47.53	S03°59.18					Capella	280°20.27 46°1.45	
13	276°28.98	23°2.25	18.11	8°46.29	10.63		160°58.34	33.65		279°49.94	59.15					Bellatrix	278°21.72 6°22.43	
14	291°31.44	38°1.35	18.57	23°46.70	10.68		176°1.05	33.70		294°52.35	59.11					Elnath	278°0.51 28°37.77	
15	306°33.90	53°0.45	•• 19.02	38°47.10	•• 10.73		191°3.77	•• 33.75		309°54.76	•• 59.08					Alnilam	275°36.61 -1°11.08	
16	321°36.37	67°59.55	19.47	53°47.51	10.78		206°6.49	33.79		324°57.16	59.04					Betelgeuse	270°50.92 7°24.74	
17	336°38.83	82°58.64	19.92	68°47.91	10.83		221°9.20	33.84		339°59.57	59.01					Canopus	263°51.51 -52°42.43	
18	351°41.30	97°57.74	S22°20.37	83°48.32	S24°10.87		236°11.92	N21°33.89		355°1.98	S03°58.98					Sirius	258°25.23 -16°45.04	
19	6°43.76	112°56.83	20.82	98°48.72	10.92		251°14.64	33.94		10°4.39	58.94					Adhara	255°4.91 -29°0.33	
20	21°46.22	127°55.93	21.27	113°49.13	10.96		266°17.36	33.98		25°6.80	58.91					Procyon	244°49.75 5°9.50	
21	36°48.69	142°55.02	•• 21.72	128°49.53	•• 11.01		281°20.08	•• 34.03		40°9.20	•• 58.87					Pollux	243°16.06 27°57.72	
22	51°51.15	157°54.12	22.16	143°49.93	11.06		296°22.80	34.08		55°11.61	58.84					Avior	234°13.95 -59°35.31	
23	66°53.62	172°53.21	22.61	158°50.34	11.10		311°25.52	34.13		70°14.02	58.80					Suhail	222°45.49 -43°32.02	
Mer.pass. 18:33			ν-0.9' d0.5' m-3.90			ν0.4' d0.1' m1.24			ν2.7' d0.0' m-2.60			ν2.4' d-0.0' m0.95						
Sat	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	81°56.08	187°52.31	S22°23.05	173°50.74	S24°11.14		326°28.23	N21°34.18		85°16.42	S03°58.77					Denebola	182°24.21 14°25.53	
1	96°58.55	202°51.40	23.49	188°51.15	11.19		341°30.95	34.22		100°18.83	58.74					Gienah	175°42.88 -17°41.07	
2	112°1.01	217°50.49	23.93	203°51.55	11.23		356°33.67	34.27		115°21.24	58.70					Acrux	172°59.47 -63°14.30	
3	127°3.47	232°49.59	•• 24.37	218°51.95	•• 11.27		11°36.39	•• 34.32		130°23.64	•• 58.67					Gacrux	171°50.99 -57°15.25	
4	142°5.94	247°48.68	24.81	233°52.36	11.32		26°39.12	34.37		145°26.05	58.63					Alioth	166°12.52 55°48.85	
5	157°8.40	262°47.77	25.25	248°52.76	11.36		41°41.84	34.42		160°28.46	58.60					Spica	158°21.67 -11°17.76	
6	172°10.87	277°46.86	S22°25.68	263°53.16	S24°11.40		56°44.56	N21°34.46		175°30.86	S03°58.56					Alkaid	152°51.70 49°10.78	
7	187°13.33	292°45.95	26.12	278°53.57	11.44		71°47.28	34.51		190°33.27	58.53					Hadar	148°35.38 -60°29.66	
8	202°15.79	307°45.05	26.55	293°53.97	11.48		86°50.00	34.56		205°35.67	58.49					Menkent	147°57.00 -36°29.71	
9	217°18.26	322°44.14	•• 26.99	308°54.37	•• 11.52		101°52.72	•• 34.61		220°38.08	•• 58.46					Arcturus	145°47.46 19°2.73	
10	232°20.72	337°43.23	27.42	323°54.77	11.56		116°55.45	34.66		235°40.48	58.42					Rigel Kent.	139°39.77 -60°56.35	
11	247°23.19	352°42.32	27.85	338°55.18	11.60		131°58.17	34.70		250°42.89	58.39					Kochab	137°20.76 74°2.64	
12	262°25.65	7°41.41	S22°28.28	353°55.58	S24°11.64		147°0.89	N21°34.75		265°45.29	S03°58.35					Zuben'ubi	136°55.45 -16°8.92	
13	277°28.11	22°40.50	28.71	8°55.98	11.68		162°3.61	34.80		280°47.70	58.32					Alphecca	126°3.43 26°37.54	
14	292°30.58	37°39.58	29.13	23°56.38	11.72		177°6.34	34.85		295°50.10	58.28					Antares	112°15.27 -26°29.32	
15	307°33.04	52°38.67	•• 29.56	38°56.78	•• 11.75		192°9.06	•• 34.90		310°52.51	•• 58.24					Atria	107°9.39 -69°4.36	
16	322°35.51	67°37.76	29.98	53°57.19	11.79		207°11.78	34.95		325°54.91	58.21					Sabik	102°2.27 -15°45.40	
17	337°37.97	82°36.85	30.41	68°57.59	11.83		222°14.51	34.99		340°57.32	58.17					Shaula	96°9.76 -37°7.34	
18	352°40.43	97°35.94	S22°30.83	83°57.99	S24°11.86		237°17.23	N21°35.04		355°59.72	S03°58.14					Rasalhague	95°58.19 12°32.46	
19	7°42.90	112°35.02	31.25	98°58.39	11.90		252°19.96	35.09		11°2.12	58.10					Eltanin	90°42.37 51°29.11	
20	22°45.36	127°34.11	31.67	113°58.79	11.93		267°22.68	35.14		26°4.53	58.06					Kaus Aust.	83°31.91 -34°22.35	
21	37°47.83	142°33.20	•• 32.09	128°59.19	•• 11.97		282°25.41	•• 35.19		41°6.93	•• 58.03					Vega	80°33.13 38°48.50	
22	52°50.29	157°32.28	32.51	143°59.60	12.00		297°28.13	35.24		56°9.33	57.99					Nunki	75°47.17 -26°15.89	
23	67°52.75	172°31.37	32.92	159°0.00	12.04		312°30.86	35.29		71°11.74	57.96					Altair	61°59.50 8°56.26	
Mer.pass. 18:29			ν-0.9' d0.4' m-3.90			ν0.4' d0.0' m1.24			ν2.7' d0.0' m-2.61			ν2.4' d-0.0' m0.96						
Sun	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	82°55.22	187°30.45	S22°33.34	174°0.40	S24°12.07		327°33.59	N21°35.33		86°14.14	S03°57.92					Dec 12 Fri	SHA Mer.pass	
1	97°57.68	202°29.54	33.75	189°0.80	12.10		342°36.31	35.38		101°16.54	57.88					Venus	107°17.01 11:28	
2	113°0.15	217°28.62	34.16	204°1.20	12.13		357°39.04	35.43		116°18.94	57.85					Mars	92°44.07 12:25	
3	128°2.61	232°27.71	•• 34.58	219°1.60	•• 12.17		12°41.77	•• 35.48		131°21.35	•• 57.81					Jupiter	244°26.10 02:18	
4	143°5.08																	

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	181°36.52	S23°4.58	268°52.00	15.8'	N02°35.56	-14.8'	55.8'
1	196°36.23	4.77	283°26.83	15.9'	02°20.76	-14.8'	55.8'
2	211°35.94	4.96	298°1.69	15.9'	02°5.97	-14.8'	55.7'
3	226°35.65	· · 5.14	312°36.60	15.9'	01°51.18	-14.8'	55.7'
4	241°35.36	5.32	327°11.54	16.0'	01°36.40	-14.8'	55.7'
5	256°35.07	5.51	341°46.52	16.0'	01°21.64	-14.8'	55.6'
6	271°34.78	S23°5.69	356°21.54	16.0'	N01°6.88	-14.7'	55.6'
7	286°34.49	5.87	10°56.59	16.1'	00°52.13	-14.7'	55.6'
8	301°34.19	6.05	25°31.67	16.1'	00°37.40	-14.7'	55.5'
9	316°33.90	· · 6.23	40°6.78	16.1'	00°22.68	-14.7'	55.5'
10	331°33.61	6.41	54°41.92	16.2'	N00°7.97	-14.7'	55.5'
11	346°33.32	6.59	69°17.09	16.2'	S00°6.72	14.7'	55.5'
12	1°33.03	S23°6.77	83°52.29	16.2'	S00°21.40	14.7'	55.4'
13	16°32.73	6.95	98°27.51	16.2'	00°36.06	14.6'	55.4'
14	31°32.44	7.12	113°2.76	16.3'	00°50.71	14.6'	55.4'
15	46°32.15	· · 7.30	127°38.03	16.3'	01°5.33	14.6'	55.3'
16	61°31.85	7.47	142°13.32	16.3'	01°19.94	14.6'	55.3'
17	76°31.56	7.65	156°48.63	16.3'	01°34.53	14.6'	55.3'
18	91°31.27	S23°7.82	171°23.96	16.3'	S01°49.10	14.5'	55.3'
19	106°30.97	7.99	185°59.31	16.4'	02°3.65	14.5'	55.2'
20	121°30.68	8.17	200°34.68	16.4'	02°18.18	14.5'	55.2'
21	136°30.39	· · 8.34	215°10.06	16.4'	02°32.69	14.5'	55.2'
22	151°30.09	8.51	229°45.46	16.4'	02°47.17	14.5'	55.2'
23	166°29.80	8.67	244°20.86	16.4'	03°1.63	14.4'	55.1'
SD = 16.2' $d = 0.2'$			SD = 15.2'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°29.50	S23°8.84	258°56.29	16.4'	S03°16.07	14.4'	55.1'
1	196°29.21	9.01	273°31.72	16.4'	03°30.48	14.4'	55.1'
2	211°28.91	9.18	288°7.16	16.4'	03°44.87	14.4'	55.1'
3	226°28.62	· · 9.34	302°42.60	16.5'	03°59.23	14.3'	55.0'
4	241°28.32	9.51	317°18.06	16.5'	04°13.56	14.3'	55.0'
5	256°28.03	9.67	331°53.52	16.5'	04°27.87	14.3'	55.0'
6	271°27.73	S23°9.84	346°28.98	16.5'	S04°42.15	14.2'	55.0'
7	286°27.44	10.00	1°4.45	16.5'	04°56.40	14.2'	54.9'
8	301°27.14	10.16	15°39.92	16.5'	05°10.62	14.2'	54.9'
9	316°26.85	· · 10.32	30°15.39	16.5'	05°24.80	14.2'	54.9'
10	331°26.55	10.48	44°50.87	16.5'	05°38.96	14.1'	54.9'
11	346°26.26	10.64	59°26.33	16.5'	05°53.09	14.1'	54.8'
12	1°25.96	S23°10.80	74°1.80	16.5'	S06°7.18	14.1'	54.8'
13	16°25.66	10.96	88°37.26	16.5'	06°21.25	14.0'	54.8'
14	31°25.37	11.12	103°12.72	16.5'	06°35.27	14.0'	54.8'
15	46°25.07	· · 11.27	117°48.17	16.4'	06°49.27	14.0'	54.8'
16	61°24.77	11.43	132°23.62	16.4'	07°3.22	13.9'	54.7'
17	76°24.48	11.58	146°59.05	16.4'	07°17.15	13.9'	54.7'
18	91°24.18	S23°11.74	161°34.48	16.4'	S07°31.03	13.8'	54.7'
19	106°23.88	11.89	176°9.90	16.4'	07°44.88	13.8'	54.7'
20	121°23.59	12.04	190°45.30	16.4'	07°58.69	13.8'	54.7'
21	136°23.29	· · 12.19	205°20.69	16.4'	08°12.46	13.7'	54.6'
22	151°22.99	12.34	219°56.07	16.4'	08°26.20	13.7'	54.6'
23	166°22.69	12.49	234°31.43	16.3'	08°39.89	13.7'	54.6'
SD = 16.2' $d = 0.2'$			SD = 15.0'				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°22.40	S23°12.64	249°6.78	16.3'	S08°53.55	13.6'	54.6'
1	196°22.10	12.79	263°42.11	16.3'	09°7.16	13.6'	54.6'
2	211°21.80	12.94	278°17.42	16.3'	09°20.73	13.5'	54.5'
3	226°21.50	· · 13.09	292°52.71	16.3'	09°34.26	13.5'	54.5'
4	241°21.20	13.23	307°27.98	16.2'	09°47.74	13.4'	54.5'
5	256°20.91	13.38	322°3.23	16.2'	10°1.18	13.4'	54.5'
6	271°20.61	S23°13.52	336°38.45	16.2'	S10°14.58	13.4'	54.5'
7	286°20.31	13.66	351°13.66	16.2'	10°27.93	13.3'	54.5'
8	301°20.01	13.81	5°48.84	16.2'	10°41.23	13.3'	54.4'
9	316°19.71	· · 13.95	20°23.99	16.1'	10°54.49	13.2'	54.4'
10	331°19.41	14.09	34°59.12	16.1'	11°7.70	13.2'	54.4'
11	346°19.11	14.23	49°34.22	16.1'	11°20.86	13.1'	54.4'
12	1°18.81	S23°14.37	64°9.29	16.0'	S11°33.98	13.1'	54.4'
13	16°18.51	14.51	78°44.33	16.0'	11°47.04	13.0'	54.4'
14	31°18.22	14.65	93°19.34	16.0'	12°0.05	13.0'	54.4'
15	46°17.92	· · 14.78	107°54.32	15.9'	12°13.02	12.9'	54.3'
16	61°17.62	14.92	122°29.26	15.9'	12°25.93	12.9'	54.3'
17	76°17.32	15.06	137°4.17	15.9'	12°38.79	12.8'	54.3'
18	91°17.02	S23°15.19	151°39.05	15.8'	S12°51.60	12.8'	54.3'
19	106°16.72	15.32	166°13.90	15.8'	13°4.35	12.7'	54.3'
20	121°16.42	15.46	180°48.70	15.8'	13°17.05	12.6'	54.3'
21	136°16.12	· · 15.59	195°23.47	15.7'	13°29.69	12.6'	54.3'
22	151°15.81	15.72	209°58.20	15.7'	13°42.28	12.5'	54.2'
23	166°15.51	15.85	224°32.90	15.7'	13°54.81	12.5'	54.2'
SD = 16.2' $d = 0.1'$			SD = 14.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:18	10:41	■	■	13:07	15:31
N 70°	07:58	09:44	■	■	14:04	15:50
68°	07:43	09:11	■	■	14:38	16:06
66°	07:30	08:46	10:24	13:25	15:02	16:18
64°	07:19	08:27	09:43	14:05	15:21	16:29
62°	07:10	08:11	09:16	14:32	15:37	16:39
60°	07:01	07:58	08:55	14:53	15:50	16:47
N 58°	06:54	07:46	08:38	15:10	16:02	16:54
56°	06:47	07:36	08:23	15:25	16:12	17:01
54°	06:41	07:27	08:11	15:37	16:21	17:07
52°	06:36	07:19	08:00	15:48	16:29	17:13
50°	06:31	07:12	07:50	15:58	16:36	17:18
45°	06:19	06:56	07:30	16:19	16:52	17:29
N 40°	06:09	06:43	07:13	16:35	17:06	17:40
35°	06:00	06:31	06:59	16:49	17:17	17:49
30°	05:51	06:21	06:47	17:01	17:28	17:58
20°	05:35	06:02	06:26	17:22	17:46	18:14
N 10°	05:19	05:45	06:08	17:41	18:04	18:30
0°	05:02	05:28	05:51	17:58	18:21	18:47
S 10°	04:43	05:10	05:33	18:15	18:38	19:05
20°	04:21	04:50	05:14	18:34	18:59	19:28
30°	03:52	04:25	04:53	18:56	19:23	19:57
35°	03:34	04:10	04:40	19:09	19:39	20:15
40°	03:11	03:52	04:25	19:24	19:57	20:38
45°	02:41	03:30	04:07	19:42	20:19	21:08
S 50°	01:56	03:01	03:45	20:04	20:48	21:53
52°	01:30	02:46	03:34	20:15	21:03	22:20
54°	00:47	02:28	03:22	20:27	21:21	23:03
56°	////	02:07	03:08	20:41	21:43	////
58°	////	01:38	02:52	20:57	22:11	////
S 60°	////	00:52	02:32	21:17	22:58	////

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	· · ·	01:33	03:38	12:18	11:46	11:07
N 70°	· · ·	01:28	03:22	12:19	11:54	11:26
68°	· · ·	01:23	03:09	12:20	12:01	11:41
66°	· · ·	01:20	02:58	12:20	12:07	11:53
64°	· · ·	01:17	02:50	12:21	12:12	12:03
62°	· · ·	01:14	02:42	12:21	12:16	12:12
60°	· · ·	01:12	02:36	12:21	12:20	12:20
N 58°	· · ·	01:10	02:30	12:21	12:24	12:26
56°	· · ·	01:08	02:25	12:22	12:27	12:32
54°	· · ·	01:06	02:21	12:22	12:29	12:37
52°	· · ·	01:05	02:17	12:22	12:32	12:42
50°	· · ·	01:03	02:13	12:22	12:34	12:47
45°	· · ·	01:01	02:06	12:23	12:39	12:56
N 40°	· · ·	00:58	01:59	12:23	12:43	13:04
35°	· · ·	00:56	01:54	12:23	12:47	13:11
30°	· · ·	00:54	01:49	12:24	12:50	13:17
20°	00:01	00:51	01:40	12:24	12:56	13:28
N 10°	00:03	00:48	01:33	12:24	13:01	13:37
0°	00:05	00:46	01:26	12:25	13:05	13:46
S 10°	00:07	00:43	01:20	12:25	13:10	13:55
20°	00:09	00:41	01:12	12:25	13:15	14:04
30°	00:11	00:38	01:04	12:26	13:21	14:15
35°	00:13	00:36	01:00	12:26	13:24	14:21
40°	00:14	00:34	00:55	12:26	13:28	14:28
45°	00:16	00:32	00:49	12:27	13:32	14:37
S 50°	00:18	00:30	00:42	12:27	13:37	14:47
52°	00:19	00:28	00:38	12:27	13:40	14:52
54°	00:20	00:27	00:35	12:27	13:42	14:57
56°	00:21	00:26	00:31	12:27	13:45	15:03
58°	00:22	00:24	00:26	12:27	13:48	15:09
S 60°	00:23	00:22	00:21	12:28	13:52	15:17

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of 00 ^h	Time 12 ^h		Mer.Pass. Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-24 49-30%
12	06:26	06:12	11:54	06:15	18:35	
13	05:58	05:44	11:54	06:56	19:16	
14	05:30	05:15	11:55	07:36	19:57	


December 15, 16, 17 UT (Mon., Tue., Wed.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	83°54.36	187°8.40	S22°42.95	174°9.99	S24°12.73	328°39.10	N21°36.51	87°11.76	S03°57.03	Alpheratz	357°33.93 29°14.23
1	98°56.82	202°7.48	43.33	189°10.38	12.75	343°41.83	36.56	102°14.16	56.99	Ankaa	353°6.29 -42°10.08
2	113°59.29	217°6.55	43.72	204°10.78	12.77	358°44.56	36.61	117°16.56	56.95	Schedar	349°30.00 56°41.10
3	129°1.75	232°5.63	· · 44.10	219°11.18	· · 12.79	13°47.30	· · 36.66	132°18.95	· · 56.92	Diphda	348°46.43 -17°50.71
4	144°4.21	247°4.71	44.48	234°11.58	12.81	28°50.03	36.71	147°21.35	56.88	Achernar	335°19.29 -57°6.50
5	159°6.68	262°3.78	44.87	249°11.98	12.83	43°52.76	36.76	162°23.75	56.84	Hamal	327°50.10 23°35.26
6	174°9.14	277°2.86	S22°45.24	264°12.37	S24°12.85	58°55.50	N21°36.81	177°26.15	S03°56.80	Polaris	313°13.34 89°22.61
7	189°11.61	292°1.93	45.62	279°12.77	12.87	73°58.23	36.86	192°28.55	56.76	Acamar	315°10.84 -40°12.12
8	204°14.07	307°1.01	46.00	294°13.17	12.89	89°0.97	36.91	207°30.94	56.72	Menkar	314°5.08 4°11.55
9	219°16.53	322°0.08	· · 46.38	309°13.57	· · 12.91	104°3.70	· · 36.96	222°33.34	· · 56.68	Mirfak	308°26.71 49°57.36
10	234°19.00	336°59.15	46.75	324°13.96	12.93	119°6.44	37.01	237°35.74	56.65	Aldebaran	290°38.39 16°33.74
11	249°21.46	351°58.23	47.13	339°14.36	12.95	134°9.17	37.06	252°38.13	56.61	Rigel	281°2.79 -8°10.27
12	264°23.93	6°57.30	S22°47.50	354°14.76	S24°12.96	149°11.91	N21°37.11	267°40.53	S03°56.57	Capella	280°20.26 46°1.46
13	279°26.39	21°56.37	47.87	9°15.15	12.98	164°14.65	37.16	282°42.93	56.53	Bellatrix	278°21.71 6°22.42
14	294°28.86	36°55.45	48.24	24°15.55	12.99	179°17.38	37.21	297°45.32	56.49	Elnath	278°0.51 28°37.77
15	309°31.32	51°54.52	· · 48.61	39°15.95	· · 13.01	194°20.12	· · 37.26	312°47.72	· · 56.45	Alnilam	275°36.61 -1°11.09
16	324°33.78	66°53.59	48.98	54°16.34	13.02	209°22.86	37.31	327°50.12	56.41	Betelgeuse	270°50.91 7°24.73
17	339°36.25	81°52.66	49.34	69°16.74	13.04	224°25.59	37.36	342°52.51	56.37	Canopus	263°51.50 -52°42.45
18	354°38.71	96°51.73	S22°49.71	84°17.14	S24°13.05	239°28.33	N21°37.41	357°54.91	S03°56.33	Sirius	258°25.22 -16°45.05
19	9°41.18	111°50.81	50.07	99°17.53	13.07	254°31.07	37.46	12°57.30	56.29	Adhara	255°4.90 -29°0.34
20	24°43.64	126°49.88	50.44	114°17.93	13.08	269°33.81	37.51	27°59.70	56.25	Procyon	244°49.74 5°9.50
21	39°46.10	141°48.95	· · 50.80	129°18.33	· · 13.09	284°36.54	· · 37.56	43°2.10	· · 56.22	Pollux	243°16.04 27°57.72
22	54°48.57	156°48.02	51.16	144°18.72	13.11	299°39.28	37.61	58°4.49	56.18	Avior	234°13.93 -59°35.32
23	69°51.03	171°47.09	51.52	159°19.12	13.12	314°42.02	37.66	73°6.89	56.14	Suhail	222°45.47 -43°32.03
Mer.pass. 18:21		ν-0.9' d0.4' m-3.90		ν0.4' d0.0' m1.23		ν2.7' d0.0' m-2.62		ν2.4' d-0.0' m0.96		Miaplacidus	221°37.55 -69°49.13
										Alphard	217°46.82 -8°46.22
										Regulus	207°33.50 11°50.35
										Dubhe	193°39.96 61°36.34
										Denebola	182°24.19 14°25.52
										Gienah	175°42.86 -17°41.08
										Acrux	172°59.42 -63°14.30
										Gacrux	171°50.95 -57°15.25
										Alioth	166°12.49 55°48.84
										Spica	158°21.65 -11°17.76
										Alkaid	152°51.68 49°10.76
										Hadar	148°35.34 -60°29.66
										Menkent	147°56.98 -36°29.71
										Arcturus	145°47.44 19°2.72
										Rigil Kent.	139°39.74 -60°56.35
										Kochab	137°20.73 74°2.63
										Zuben'ubi	136°55.44 -16°8.92
										Alphecca	126°3.42 26°37.53
										Antares	112°15.26 -26°29.32
										Atria	107°9.37 -69°4.35
										Sabik	102°2.26 -15°45.40
										Shaula	96°9.76 -37°7.33
										Rasalhague	95°58.19 12°32.45
										Eltanin	90°42.37 51°29.10
										Kaus Aust.	83°31.90 -34°22.35
										Vega	80°33.13 38°48.49
										Nunki	75°47.17 -26°15.89
										Altair	61°59.50 8°56.25
										Peacock	53°4.98 -56°39.24
										Deneb	49°25.63 45°22.55
										Enif	33°38.21 9°59.72
										Al Na'ir	27°32.14 -46°50.31
										Fomalhaut	15°13.74 -29°29.21
										Scheat	13°44.52 28°13.61
										Markab	13°29.19 15°20.82
Dec 15 Mon		SHA		Mer.pass							
		Venus		103°14.04 11:32							
		Mars		90°15.63 12:23							
		Jupiter		244°44.74 02:05							
		Saturn		3°17.40 18:08							
Dec 16 Tue		SHA		Mer.pass							
		Venus		101°52.66 11:34							
		Mars		89°26.02 12:22							
		Jupiter		244°51.26 02:01							
		Saturn		3°15.78 18:04							
Dec 17 Wed		SHA		Mer.pass							
		Venus		100°31.10 11:35							
		Mars		88°36.35 12:22							
		Jupiter		244°57.94 01:56							
		Saturn		3°14.07 18:01							
		Horizontal parallax									
		Venus:		0.1							
		Mars:		0.1							
Mer.pass. 18:13		ν-0.9' d0.3' m-3.90		ν0.4' d-0.0' m1.21		ν2.7' d0.1' m-2.63		ν2.4' d-0.0' m0.97			

h		Sun			Moon			
Mon		GHA	Dec		GHA	ν	Dec	d HP
0		181°15.21	S23°15.98		239°7.55	15.6'	S14°7.28	12.4' 54.2'
1		196°14.91	16.11		253°42.16	15.6'	14°19.70	12.4' 54.2'
2		211°14.61	16.24		268°16.73	15.5'	14°32.05	12.3' 54.2'
3		226°14.31	16.37		282°51.26	15.5'	14°44.35	12.2' 54.2'
4		241°14.01	16.49		297°25.74	15.4'	14°56.59	12.2' 54.2'
5		256°13.71	16.62		312°0.18	15.4'	15°8.76	12.1' 54.2'
6		271°13.41	S23°16.74		326°34.58	15.3'	S15°20.88	12.1' 54.1'
7		286°13.10	16.87		341°8.93	15.3'	15°32.93	12.0' 54.1'
8		301°12.80	16.99		355°43.23	15.3'	15°44.92	11.9' 54.1'
9		316°12.50	17.11		10°17.49	15.2'	15°56.84	11.9' 54.1'
10		331°12.20	17.23		24°51.69	15.2'	16°8.70	11.8' 54.1'
11		346°11.90	17.36		39°25.85	15.1'	16°20.49	11.7' 54.1'
12		1°11.59	S23°17.48		53°59.96	15.1'	S16°32.22	11.7' 54.1'
13		16°11.29	17.60		68°34.02	15.0'	16°43.88	11.6' 54.1'
14		31°10.99	17.71		83°8.03	15.0'	16°55.47	11.5' 54.1'
15		46°10.69	17.83		97°41.98	14.9'	17°7.00	11.5' 54.1'
16		61°10.38	17.95		112°15.89	14.8'	17°18.45	11.4' 54.1'
17		76°10.08	18.06		126°49.74	14.8'	17°29.84	11.3' 54.0'
18		91°9.78	S23°18.18		141°23.53	14.7'	S17°41.15	11.2' 54.0'
19		106°9.48	18.29		155°57.27	14.7'	17°52.39	11.2' 54.0'
20		121°9.17	18.41		170°30.96	14.6'	18°3.56	11.1' 54.0'
21		136°8.87	18.52		185°4.59	14.6'	18°14.65	11.0' 54.0'
22		151°8.57	18.63		199°38.16	14.5'	18°25.67	10.9' 54.0'
23		166°8.26	18.74		214°11.68	14.5'	18°36.62	10.9' 54.0'
		SD = 16.2' $d = 0.1'$			SD = 14.8'			
Tue		GHA	Dec		GHA	ν	Dec	d HP
0		181°7.96	S23°18.85		228°45.14	14.4'	S18°47.49	10.8' 54.0'
1		196°7.66	18.96		243°18.54	14.3'	18°58.28	10.7' 54.0'
2		211°7.35	19.07		257°51.88	14.3'	19°9.00	10.6' 54.0'
3		226°7.05	19.18		272°25.16	14.2'	19°19.64	10.6' 54.0'
4		241°6.75	19.29		286°58.38	14.2'	19°30.20	10.5' 54.0'
5		256°6.44	19.39		301°31.54	14.1'	19°40.68	10.4' 54.0'
6		271°6.14	S23°19.50		316°4.64	14.0'	S19°51.07	10.3' 54.0'
7		286°5.83	19.60		330°37.68	14.0'	20°1.39	10.2' 54.0'
8		301°5.53	19.71		345°10.66	13.9'	20°11.62	10.2' 54.0'
9		316°5.22	19.81		359°43.58	13.9'	20°21.78	10.1' 53.9'
10		331°4.92	19.91		14°16.43	13.8'	20°31.84	10.0' 53.9'
11		346°4.62	20.02		28°49.22	13.7'	20°41.82	9.9' 53.9'
12		1°4.31	S23°20.12		43°21.94	13.7'	S20°51.72	9.8' 53.9'
13		16°4.01	20.22		57°54.61	13.6'	21°1.53	9.7' 53.9'
14		31°3.70	20.32		72°27.20	13.5'	21°11.25	9.6' 53.9'
15		46°3.40	20.41		86°59.74	13.5'	21°20.89	9.5' 53.9'
16		61°3.09	20.51		101°32.21	13.4'	21°30.43	9.5' 53.9'
17		76°2.79	20.61		116°4.61	13.3'	21°39.89	9.4' 53.9'
18		91°2.48	S23°20.70		130°36.95	13.3'	S21°49.25	9.3' 53.9'
19		106°2.18	20.80		145°9.22	13.2'	21°58.52	9.2' 53.9'
20		121°1.87	20.89		159°41.43	13.1'	22°7.70	9.1' 53.9'
21		136°1.56	20.99		174°13.57	13.1'	22°16.79	9.0' 53.9'
22		151°1.26	21.08		188°45.64	13.0'	22°25.78	8.9' 53.9'
23		166°0.95	21.17		203°17.65	12.9'	22°34.68	8.8' 53.9'
		SD = 16.2' $d = 0.1'$			SD = 14.7'			
Wed		GHA	Dec		GHA	ν	Dec	d HP
0		181°0.65	S23°21.26		217°49.60	12.9'	S22°43.48	8.7' 53.9'
1		196°0.34	21.35		232°21.47	12.8'	22°52.18	8.6' 53.9'
2		211°0.04	21.44		246°53.28	12.7'	23°0.79	8.5' 53.9'
3		225°59.73	21.53		261°25.02	12.7'	23°9.30	8.4' 53.9'
4		240°59.42	21.62		275°56.70	12.6'	23°17.71	8.3' 53.9'
5		255°59.12	21.70		290°28.31	12.5'	23°26.02	8.2' 53.9'
6		270°58.81	S23°21.79		304°59.85	12.5'	S23°34.22	8.1' 53.9'
7		285°58.50	21.88		319°31.32	12.4'	23°42.33	8.0' 53.9'
8		300°58.20	21.96		334°2.73	12.3'	23°50.33	7.9' 53.9'
9		315°57.89	22.04		348°34.07	12.3'	23°58.23	7.8' 53.9'
10		330°57.58	22.13		3°5.35	12.2'	24°6.03	7.7' 53.9'
11		345°57.28	22.21		17°36.56	12.1'	24°13.72	7.6' 53.9'
12		0°56.97	S23°22.29		32°7.70	12.1'	S24°21.30	7.5' 53.9'
13		15°56.66	22.37		46°38.78	12.0'	24°28.78	7.4' 53.9'
14		30°56.36	22.45		61°9.79	11.9'	24°36.15	7.3' 53.9'
15		45°56.05	22.53		75°40.73	11.9'	24°43.41	7.2' 53.9'
16		60°55.74	22.61		90°11.61	11.8'	24°50.56	7.0' 53.9'
17		75°55.44	22.68		104°42.43	11.8'	24°57.60	6.9' 53.9'
18		90°55.13	S23°22.76		119°13.18	11.7'	S25°4.53	6.8' 53.9'
19		105°54.82	22.84		133°43.86	11.6'	25°11.35	6.7' 53.9'
20		120°54.51	22.91		148°14.49	11.6'	25°18.05	6.6' 53.9'
21		135°54.21	22.98		162°45.05	11.5'	25°24.64	6.5' 53.9'
22		150°53.90	23.06		177°15.54	11.4'	25°31.12	6.4' 53.9'
23		165°53.59	23.13		191°45.97	11.4'	25°37.48	6.2' 53.9'
		SD = 16.2' $d = 0.1'$			SD = 14.7'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:22	10:50	■	■	13:01	15:30
N 70°	08:02	09:50	■	■	14:02	15:49
68°	07:46	09:15	■	■	14:36	16:05
66°	07:33	08:50	10:29	13:22	15:01	16:18
64°	07:22	08:30	09:48	14:04	15:21	16:29
62°	07:12	08:14	09:20	14:32	15:37	16:39
60°	07:04	08:01	08:58	14:53	15:51	16:47
N 58°	06:57	07:49	08:41	15:10	16:02	16:55
56°	06:50	07:39	08:26	15:25	16:12	17:01
54°	06:44	07:30	08:14	15:38	16:21	17:08
52°	06:38	07:22	08:03	15:49	16:30	17:13
50°	06:33	07:14	07:53	15:59	16:37	17:19
45°	06:21	06:58	07:32	16:19	16:53	17:30
N 40°	06:11	06:45	07:15	16:36	17:06	17:41
35°	06:01	06:33	07:01	16:50	17:18	17:50
30°	05:53	06:23	06:49	17:02	17:29	17:59
20°	05:36	06:04	06:28	17:24	17:48	18:15
N 10°	05:20	05:47	06:09	17:42	18:05	18:31
0°	05:03	05:29	05:52	17:59	18:22	18:48
S 10°	04:44	05:11	05:34	18:17	18:40	19:07
20°	04:22	04:51	05:16	18:36	19:00	19:30
30°	03:53	04:26	04:54	18:58	19:25	19:59
35°	03:34	04:11	04:41	19:11	19:41	20:17
40°	03:11	03:53	04:26	19:26	19:59	20:40
45°	02:41	03:30	04:08	19:44	20:21	21:11
S 50°	01:56	03:01	03:45	20:06	20:51	21:56
52°	01:28	02:46	03:34	20:17	21:06	22:24
54°	00:43	02:28	03:22	20:29	21:24	23:09
56°	////	02:06	03:08	20:44	21:46	////
58°	////	01:36	02:51	21:00	22:16	////
S 60°	////	00:48	02:31	21:21	23:05	////

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	06:07	■	■	10:06	■	■
N 70°	05:28	■	■	10:46	■	■
68°	05:02	07:20	■	11:14	10:27	■
66°	04:42	06:37	■	11:36	11:11	■
64°	04:26	06:09	08:06	11:53	11:40	11:18
62°	04:12	05:47	07:28	12:07	12:02	11:57
60°	04:01	05:30	07:01	12:19	12:20	12:24
N 58°	03:52	05:15	06:40	12:30	12:36	12:45
56°	03:43	05:03	06:23	12:39	12:49	13:03
54°	03:36	04:52	06:09	12:47	13:00	13:18
52°	03:29	04:43	05:56	12:55	13:10	13:31
50°	03:23	04:34	05:45	13:01	13:19	13:42
45°	03:11	04:16	05:22	13:15	13:38	14:06
N 40°	03:00	04:02	05:04	13:27	13:54	14:25
35°	02:51	03:50	04:49	13:37	14:07	14:41
30°	02:43	03:39	04:36	13:46	14:18	14:55
20°	02:30	03:21	04:13	14:02	14:38	15:19
N 10°	02:18	03:05	03:54	14:15	14:56	15:39
0°	02:07	02:50	03:36	14:28	15:12	15:59
S 10°	01:57	02:36	03:18	14:41	15:28	16:18
20°	01:45	02:20	02:59	14:54	15:46	16:39
30°	01:32	02:03	02:37	15:10	16:06	17:03
35°	01:25	01:53	02:24	15:19	16:18	17:17
40°	01:16	01:41	02:10	15:30	16:32	17:34
45°	01:07	01:27	01:52	15:42	16:48	17:54
S 50°	00:55	01:11	01:31	15:57	17:08	18:19
52°	00:49	01:03	01:21	16:05	17:18	18:31
54°	00:43	00:54	01:10	16:12	17:29	18:45
56°	00:37	00:45	00:57	16:21	17:41	19:01
58°	00:29	00:34	00:42	16:32	17:56	19:20
S 60°	00:21	00:21	00:24	16:43	18:13	19:45

Day	Sun			Moon			
	Eqn. of Time		Mer.	Mer.Pass.			Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm		25-27 22-8%
15	05:01	04:46	11:55	08:18	20:39		
16	04:32	04:17	11:56	09:01	21:24		
17	04:03	03:48	11:56	09:47	22:11		

December 18, 19, 20 UT (Thu., Fri., Sat.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	86°51.78	186°1.16	S23°7.65	174°38.40	S24°13.13	331°56.53	N21°40.17	90°4.03	S03°54.11					Alpheratz	357°33.94	29°14.23		
1	101°54.24	201°0.21	7.94	189°38.79	13.12	346°59.28	40.22	105°6.42	54.06					Ankaa	353°6.30	-42°10.08		
2	116°56.70	215°59.27	8.24	204°39.18	13.11	2°2.04	40.27	120°8.81	54.02					Schedar	349°30.02	56°41.10		
3	131°59.17	230°58.32	· · 8.54	219°39.57	· · 13.10	17°4.79	· · 40.33	135°11.19	· · 53.98					Diphda	348°46.43	-17°50.71		
4	147°1.63	245°57.38	8.83	234°39.96	13.08	32°7.54	40.38	150°13.58	53.93					Achernar	335°19.31	-57°6.51		
5	162°4.10	260°56.43	9.13	249°40.35	13.07	47°10.29	40.43	165°15.97	53.89					Hamal	327°50.11	23°35.26		
6	177°6.56	275°55.49	S23°9.42	264°40.74	S24°13.06	62°13.04	N21°40.48	180°18.35	S03°53.85					Polaris	313°13.85	89°22.63		
7	192°9.03	290°54.54	9.71	279°41.13	13.04	77°15.80	40.53	195°20.74	53.80					Acamar	315°10.85	-40°12.14		
8	207°11.49	305°53.60	10.00	294°41.52	13.03	92°18.55	40.59	210°23.12	53.76					Menkar	314°5.08	4°11.54		
9	222°13.95	320°52.65	· · 10.29	309°41.91	· · 13.01	107°21.30	· · 40.64	225°25.51	· · 53.72					Mirfak	308°26.70	49°57.37		
10	237°16.42	335°51.70	10.58	324°42.30	13.00	122°24.06	40.69	240°27.89	53.67					Aldebaran	290°38.39	16°33.73		
11	252°18.88	350°50.76	10.87	339°42.69	12.98	137°26.81	40.74	255°30.28	53.63					Rigel	281°2.78	-8°10.28		
12	267°21.35	5°49.81	S23°11.15	354°43.08	S24°12.97	152°29.56	N21°40.80	270°32.66	S03°53.58					Capella	280°20.25	46°1.47		
13	282°23.81	20°48.86	11.43	9°43.47	12.95	167°32.32	40.85	285°35.05	53.54					Bellatrix	278°21.70	6°22.41		
14	297°26.28	35°47.92	11.72	24°43.86	12.93	182°35.07	40.90	300°37.43	53.50					Elmath	278°0.50	28°37.77		
15	312°28.74	50°46.97	· · 12.00	39°44.25	· · 12.91	197°37.83	· · 40.95	315°39.82	· · 53.45					Alnilam	275°36.60	-1°11.10		
16	327°31.20	65°46.02	12.28	54°44.64	12.90	212°40.58	41.00	330°42.20	53.41					Betelgeuse	270°50.90	7°24.72		
17	342°33.67	80°45.07	12.56	69°45.03	12.88	227°43.34	41.06	345°44.59	53.36					Canopus	263°51.49	-52°42.47		
18	357°36.13	95°44.12	S23°12.84	84°45.42	S24°12.86	242°46.09	N21°41.11	0°46.97	S03°53.32					Sirius	258°25.21	-16°45.06		
19	12°38.60	110°43.18	13.11	99°45.81	12.84	257°48.85	41.16	15°49.35	53.27					Adhara	255°4.88	-29°0.36		
20	27°41.06	125°42.23	13.39	114°46.20	12.82	272°51.61	41.21	30°51.74	53.23					Procyon	244°49.72	5°9.49		
21	42°43.52	140°41.28	· · 13.66	129°46.59	· · 12.80	287°54.36	· · 41.27	45°54.12	· · 53.19					Pollux	243°16.02	27°57.71		
22	57°45.99	155°40.33	13.94	144°46.98	12.78	302°57.12	41.32	60°56.50	53.14					Avior	234°13.90	-59°35.34		
23	72°48.45	170°39.38	14.21	159°47.37	12.76	317°59.87	41.37	75°58.89	53.10					Suhail	222°45.44	-43°32.05		
Mer.pass. 18:10			ν-0.9' d0.3' m-3.90			ν0.4' d-0.0' m1.21			ν2.8' d0.1' m-2.63			ν2.4' d-0.0' m0.97						
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	87°50.92	185°38.43	S23°14.48	174°47.76	S24°12.73	333°2.63	N21°41.42	91°1.27	S03°53.05					Regulus	207°33.47	11°50.33		
1	102°53.38	200°37.48	14.75	189°48.15	12.71	348°5.39	41.48	106°3.65	53.01					Dubhe	193°39.92	61°36.33		
2	117°55.85	215°36.53	15.02	204°48.54	12.69	3°8.15	41.53	121°6.03	52.96					Denebola	182°24.16	14°25.50		
3	132°58.31	230°35.58	· · 15.28	219°48.93	· · 12.66	18°10.90	· · 41.58	136°8.42	· · 52.92					Gienah	175°42.83	-17°41.09		
4	148°0.77	245°34.63	15.55	234°49.32	12.64	33°13.66	41.63	151°10.80	52.87					Acrux	172°59.37	-63°14.30		
5	163°3.24	260°33.68	15.81	249°49.71	12.62	48°16.42	41.69	166°13.18	52.83					Gacrux	171°50.90	-57°15.25		
6	178°5.70	275°32.72	S23°16.07	264°50.09	S24°12.59	63°19.18	N21°41.74	181°15.56	S03°52.78					Alioth	166°12.45	55°48.82		
7	193°8.17	290°31.77	16.34	279°50.48	12.57	78°21.94	41.79	196°17.94	52.74					Spica	158°21.63	-11°17.77		
8	208°10.63	305°30.82	16.60	294°50.87	12.54	93°24.69	41.85	211°20.33	52.69					Alkaid	152°51.65	49°10.75		
9	223°13.10	320°29.87	· · 16.86	309°51.26	· · 12.52	108°27.45	· · 41.90	226°22.71	· · 52.64					Hadar	148°35.29	-60°29.65		
10	238°15.56	335°28.92	17.11	324°51.65	12.49	123°30.21	41.95	241°25.09	52.60					Menkent	147°56.94	-36°29.71		
11	253°18.02	350°27.96	17.37	339°52.04	12.46	138°32.97	42.00	256°27.47	52.55					Arcturus	145°47.42	19°2.71		
12	268°20.49	5°27.01	S23°17.63	354°52.43	S24°12.43	153°35.73	N21°42.06	271°29.85	S03°52.51					Rigel Kent.	139°39.69	-60°56.34		
13	283°22.95	20°26.06	17.88	9°52.81	12.41	168°38.49	42.11	286°32.23	52.46					Kochab	137°20.69	74°2.61		
14	298°25.42	35°25.11	18.14	24°53.20	12.38	183°41.25	42.16	301°34.61	52.42					Zuben'ubi	136°55.41	-16°8.93		
15	313°27.88	50°24.15	· · 18.39	39°53.59	· · 12.35	198°44.01	· · 42.22	316°36.99	· · 52.37					Alphecca	126°3.40	26°37.51		
16	328°30.34	65°23.20	18.64	54°53.98	12.32	213°46.77	42.27	331°39.37	52.32					Antares	112°15.24	-26°29.32		
17	343°32.81	80°22.25	18.89	69°54.37	12.29	228°49.53	42.32	346°41.75	52.28					Atria	107°9.33	-69°4.33		
18	358°35.27	95°21.29	S23°19.14	84°54.75	S24°12.26	243°52.29	N21°42.38	1°44.13	S03°52.23					Sabik	102°2.24	-15°45.40		
19	13°37.74	110°20.34	19.38	99°55.14	12.23	258°55.06	42.43	16°46.51	52.19					Shaula	96°9.74	-37°7.32		
20	28°40.20	125°19.38	19.63	114°55.53	12.20	273°57.82	42.48	31°48.89	52.14					Rasalhague	95°58.18	12°32.45		
21	43°42.67	140°18.43	· · 19.87	129°55.92	· · 12.17	289°0.58	· · 42.53	46°51.27	· · 52.09					Eltanin	90°42.37	51°29.08		
22	58°45.13	155°17.47	20.12	144°56.30	12.14	304°3.34	42.59	61°53.65	52.05					Kaus Aust.	83°31.90	-34°22.34		
23	73°47.59	170°16.52	20.36	159°56.69	12.10	319°6.10	42.64	76°56.03	52.00					Vega	80°33.13	38°48.47		
Mer.pass. 18:06			ν-1.0' d0.3' m-3.90			ν0.4' d-0.0' m1.20			ν2.8' d0.1' m-2.63			ν2.4' d-0.0' m0.98						
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	88°50.06	185°15.56	S23°20.60	174°57.08	S24°12.07	334°8.87	N21°42.69	91°58.41	S03°51.95					Dec 18 Thu	SHA	Mer.pass		
1	103°52.52	200°14.61	20.84	189°57.47	12.04	349°11.63	42.75	107°0.79	51.91					Venus	99°9.38	11:37		
2	118°54.99	215°13.65	21.08	204°57.85	12.00	4°14.39	42.80	122°3.16	51.86					Mars	87°46.62	12:21		
3	133°57.45	230°12.70	· · 21.31	219°58.24	· · 11.97	19°17.												

h		Sun		Moon				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		180°53.28	S23°23.20	206°16.34	11.3'	S25°43.73	6.1'	53.9'
1		195°52.98	23.27	220°46.65	11.2'	25°49.86	6.0'	53.9'
2		210°52.67	23.34	235°16.90	11.2'	25°55.87	5.9'	53.9'
3		225°52.36	· · 23.41	249°47.08	11.1'	26°1.77	5.8'	53.9'
4		240°52.05	23.48	264°17.21	11.1'	26°7.54	5.7'	53.9'
5		255°51.74	23.55	278°47.28	11.0'	26°13.20	5.5'	53.9'
6		270°51.43	S23°23.61	293°17.28	10.9'	S26°18.73	5.4'	54.0'
7		285°51.13	23.68	307°47.23	10.9'	26°24.14	5.3'	54.0'
8		300°50.82	23.74	322°17.12	10.8'	26°29.44	5.2'	54.0'
9		315°50.51	· · 23.81	336°46.96	10.8'	26°34.61	5.0'	54.0'
10		330°50.20	23.87	351°16.74	10.7'	26°39.65	4.9'	54.0'
11		345°49.89	23.93	5°46.46	10.7'	26°44.57	4.8'	54.0'
12		0°49.58	S23°23.99	20°16.13	10.6'	S26°49.37	4.7'	54.0'
13		15°49.28	24.06	34°45.74	10.6'	26°54.04	4.5'	54.0'
14		30°48.97	24.12	49°15.30	10.5'	26°58.58	4.4'	54.0'
15		45°48.66	· · 24.18	63°44.81	10.5'	27°3.00	4.3'	54.0'
16		60°48.35	24.23	78°14.27	10.4'	27°7.29	4.2'	54.0'
17		75°48.04	24.29	92°43.68	10.4'	27°11.46	4.0'	54.0'
18		90°47.73	S23°24.35	107°13.04	10.3'	S27°15.49	3.9'	54.0'
19		105°47.42	24.40	121°42.35	10.3'	27°19.39	3.8'	54.0'
20		120°47.11	24.46	136°11.61	10.2'	27°23.17	3.6'	54.0'
21		135°46.80	· · 24.51	150°40.83	10.2'	27°26.81	3.5'	54.0'
22		150°46.50	24.57	165°10.00	10.1'	27°30.33	3.4'	54.0'
23		165°46.19	24.62	179°39.12	10.1'	27°33.71	3.2'	54.0'
		SD = 16.2' $d = 0.1'$		SD = 14.7'				

Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		180°45.88	S23°24.67	194°8.21	10.0'	S27°36.96	3.1'	54.1'
1		195°45.57	24.72	208°37.25	10.0'	27°40.07	3.0'	54.1'
2		210°45.26	24.77	223°6.24	10.0'	27°43.05	2.8'	54.1'
3		225°44.95	· · 24.82	237°35.20	9.9'	27°45.90	2.7'	54.1'
4		240°44.64	24.87	252°4.12	9.9'	27°48.62	2.6'	54.1'
5		255°44.33	24.92	266°33.01	9.8'	27°51.20	2.4'	54.1'
6		270°44.02	S23°24.97	281°1.85	9.8'	S27°53.64	2.3'	54.1'
7		285°43.71	25.01	295°30.66	9.8'	27°55.95	2.2'	54.1'
8		300°43.40	25.06	309°59.44	9.7'	27°58.12	2.0'	54.1'
9		315°43.09	· · 25.10	324°28.18	9.7'	28°0.16	1.9'	54.1'
10		330°42.78	25.15	338°56.89	9.7'	28°2.06	1.8'	54.1'
11		345°42.47	25.19	353°25.58	9.7'	28°3.82	1.6'	54.1'
12		0°42.16	S23°25.23	7°54.23	9.6'	S28°5.44	1.5'	54.1'
13		15°41.85	25.27	22°22.85	9.6'	28°6.92	1.3'	54.2'
14		30°41.54	25.31	36°51.45	9.6'	28°8.27	1.2'	54.2'
15		45°41.23	· · 25.35	51°20.02	9.5'	28°9.48	1.1'	54.2'
16		60°40.92	25.39	65°48.57	9.5'	28°10.55	0.9'	54.2'
17		75°40.61	25.43	80°17.10	9.5'	28°11.48	0.8'	54.2'
18		90°40.30	S23°25.47	94°45.60	9.5'	S28°12.27	0.6'	54.2'
19		105°39.99	25.50	109°14.09	9.5'	28°12.91	0.5'	54.2'
20		120°39.68	25.54	123°42.55	9.4'	28°13.42	0.4'	54.2'
21		135°39.37	· · 25.57	138°11.00	9.4'	28°13.79	0.2'	54.2'
22		150°39.06	25.61	152°39.44	9.4'	28°14.02	0.1'	54.2'
23		165°38.75	25.64	167°7.85	9.4'	28°14.11	-0.1'	54.2'
		SD = 16.2' $d = 0.1'$		SD = 14.7'				

Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		180°38.44	S23°25.67	181°36.26	9.4'	S28°14.05	-0.2'	54.3'
1		195°38.13	25.70	196°4.66	9.4'	28°13.86	-0.3'	54.3'
2		210°37.82	25.73	210°33.04	9.4'	28°13.52	-0.5'	54.3'
3		225°37.51	· · 25.76	225°1.41	9.4'	28°13.04	-0.6'	54.3'
4		240°37.20	25.79	239°29.78	9.4'	28°12.42	-0.8'	54.3'
5		255°36.89	25.82	253°58.15	9.4'	28°11.66	-0.9'	54.3'
6		270°36.57	S23°25.85	268°26.50	9.4'	S28°10.76	-1.0'	54.3'
7		285°36.26	25.88	282°54.86	9.4'	28°9.71	-1.2'	54.3'
8		300°35.95	25.90	297°23.21	9.4'	28°8.53	-1.3'	54.3'
9		315°35.64	· · 25.93	311°51.56	9.4'	28°7.20	-1.5'	54.4'
10		330°35.33	25.95	326°19.92	9.4'	28°5.73	-1.6'	54.4'
11		345°35.02	25.97	340°48.27	9.4'	28°4.12	-1.8'	54.4'
12		0°34.71	S23°26.00	355°16.63	9.4'	S28°2.36	-1.9'	54.4'
13		15°34.40	26.02	9°45.00	9.4'	28°0.47	-2.0'	54.4'
14		30°34.09	26.04	24°13.37	9.4'	27°58.43	-2.2'	54.4'
15		45°33.78	· · 26.06	38°41.75	9.4'	27°56.26	-2.3'	54.4'
16		60°33.47	26.08	53°10.13	9.4'	27°53.94	-2.5'	54.4'
17		75°33.15	26.10	67°38.53	9.4'	27°51.48	-2.6'	54.4'
18		90°32.84	S23°26.11	82°6.94	9.4'	S27°48.88	-2.7'	54.5'
19		105°32.53	26.13	96°35.37	9.4'	27°46.13	-2.9'	54.5'
20		120°32.22	26.15	111°3.81	9.5'	27°43.25	-3.0'	54.5'
21		135°31.91	· · 26.16	125°32.26	9.5'	27°40.23	-3.2'	54.5'
22		150°31.60	26.18	140°0.73	9.5'	27°37.07	-3.3'	54.5'
23		165°31.29	26.19	154°29.22	9.5'	27°33.76	-3.4'	54.5'
		SD = 16.2' $d = 0.0'$		SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:25	10:56	■	■	12:58	15:30
N 70°	08:04	09:53	■	■	14:01	15:50
68°	07:49	09:18	■	■	14:36	16:06
66°	07:35	08:53	10:33	13:21	15:02	16:19
64°	07:24	08:33	09:51	14:03	15:22	16:30
62°	07:15	08:17	09:23	14:32	15:38	16:40
60°	07:06	08:03	09:01	14:53	15:51	16:48
N 58°	06:59	07:51	08:43	15:11	16:03	16:56
56°	06:52	07:41	08:29	15:26	16:13	17:02
54°	06:46	07:32	08:16	15:38	16:22	17:09
52°	06:40	07:24	08:05	15:50	16:31	17:14
50°	06:35	07:16	07:55	15:59	16:38	17:20
45°	06:23	07:00	07:34	16:20	16:54	17:31
N 40°	06:13	06:47	07:17	16:37	17:08	17:42
35°	06:03	06:35	07:03	16:51	17:19	17:51
30°	05:54	06:24	06:51	17:04	17:30	18:00
20°	05:38	06:05	06:29	17:25	17:49	18:16
N 10°	05:22	05:48	06:11	17:43	18:06	18:33
0°	05:05	05:31	05:53	18:01	18:23	18:50
S 10°	04:46	05:13	05:36	18:19	18:42	19:09
20°	04:23	04:52	05:17	18:38	19:02	19:31
30°	03:54	04:27	04:55	19:00	19:27	20:00
35°	03:35	04:12	04:42	19:13	19:42	20:19
40°	03:12	03:54	04:27	19:28	20:01	20:42
45°	02:41	03:31	04:09	19:46	20:23	21:13
S 50°	01:56	03:01	03:46	20:08	20:53	21:59
52°	01:28	02:46	03:35	20:19	21:08	22:27
54°	00:41	02:28	03:23	20:32	21:26	23:14
56°	////	02:06	03:09	20:46	21:49	////
58°	////	01:36	02:52	21:03	22:18	////
S 60°	////	00:45	02:31	21:23	23:10	////

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	■	■	■	■
64°	■	■	■	■	■	■
62°	09:17	■	■	11:48	■	■
60°	08:33	09:55	10:49	12:33	12:57	13:53
N 58°	08:04	09:18	10:11	13:03	13:35	14:30
56°	07:42	08:51	09:45	13:25	14:02	14:57
54°	07:23	08:30	09:24	13:44	14:23	15:17
52°	07:08	08:13	09:06	14:00	14:40	15:35
50°	06:54	07:58	08:51	14:13	14:55	15:50
45°	06:27	07:28	08:21	14:41	15:25	16:20
N 40°	06:06	07:04	07:58	15:03	15:49	16:43
35°	05:48	06:45	07:38	15:21	16:08	17:02
30°	05:33	06:29	07:22	15:37	16:25	17:19
20°	05:07	06:01	06:54	16:04	16:53	17:46
N 10°	04:45	05:37	06:29	16:27	17:17	18:10
0°	04:24	05:15	06:07	16:48	17:40	18:32
S 10°	04:04	04:53	05:44	17:10	18:02	18:54
20°	03:42	04:29	05:20	17:33	18:26	19:18
30°	03:16	04:01	04:52	18:00	18:55	19:45
35°	03:01	03:45	04:36	18:16	19:11	20:02
40°	02:44	03:26	04:16	18:34	19:31	20:20
45°	02:24	03:03	03:53	18:57	19:54	20:43
S 50°	01:58	02:34	03:23	19:25	20:24	21:12
52°	01:45	02:20	03:08	19:40	20:39	21:26
54°	01:31	02:03	02:50	19:56	20:57	21:43
56°	01:15	01:44	02:29	20:16	21:18	22:02
58°	00:55	01:19	02:03	20:40	21:44	22:26
S 60°	00:30	00:46	01:25	21:13	22:22	22:59

Day	Sun		Mer. Pass hh:mm	Moon		Age 28-0 4-0%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
18	03:33	03:18	11:57	10:36	23:01	

December 21, 22, 23 UT (Sun., Mon., Tue.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	89°49.20	184°52.58	S23°26.01	175°6.36	S24°11.14	335°15.23	N21°43.98	92°55.45	S03°50.82	Alpheratz	357°33.94	29°14.23
1	104°51.66	199°51.62	26.22	190°6.74	11.09	350°18.00	44.03	107°57.83	50.77	Ankaa	353°6.31	-42°10.08
2	119°54.13	214°50.66	26.42	205°7.13	11.05	5°20.77	44.09	123°0.20	50.72	Schedar	349°30.03	56°41.10
3	134°56.59	229°49.70	•• 26.63	220°7.52	•• 11.00	20°23.53	•• 44.14	138°2.57	•• 50.67	Diphda	348°46.44	-17°50.72
4	149°59.06	244°48.74	26.84	235°7.90	10.96	35°26.30	44.19	153°4.95	50.63	Achernar	335°19.33	-57°6.51
5	165°1.52	259°47.78	27.04	250°8.29	10.91	50°29.07	44.25	168°7.32	50.58	Hamal	327°50.11	23°35.26
6	180°3.98	274°46.82	S23°27.24	265°8.67	S24°10.86	65°31.84	N21°44.30	183°9.70	S03°50.53	Polaris	313°14.51	89°22.64
7	195°6.45	289°45.86	27.45	280°9.06	10.82	80°34.61	44.36	198°12.07	50.48	Acamar	315°10.85	-40°12.14
8	210°8.91	304°44.90	27.65	295°9.44	10.77	95°37.38	44.41	213°14.44	50.43	Menkar	314°5.07	4°11.54
9	225°11.38	319°43.93	•• 27.85	310°9.83	•• 10.72	110°40.15	•• 44.46	228°16.82	•• 50.38	Mirfak	308°26.70	49°57.37
10	240°13.84	334°42.97	28.05	325°10.21	10.67	125°42.92	44.52	243°19.19	50.33	Aldebaran	290°38.38	16°33.73
11	255°16.31	349°42.01	28.24	340°10.60	10.62	140°45.69	44.57	258°21.56	50.28	Rigel	281°2.77	-8°10.27
12	270°18.77	4°41.05	S23°28.44	355°10.98	S24°10.57	155°48.46	N21°44.63	273°23.94	S03°50.24	Capella	280°20.24	46°1.42
13	285°21.23	19°40.09	28.63	10°11.37	10.52	170°51.23	44.68	288°26.31	50.19	Bellatrix	278°21.69	6°22.41
14	300°23.70	34°39.12	28.83	25°11.75	10.47	185°54.00	44.73	303°28.68	50.14	Elnath	278°0.48	28°37.77
15	315°26.16	49°38.16	•• 29.02	40°12.14	•• 10.42	200°56.77	•• 44.79	318°31.06	•• 50.09	Alnilam	275°36.59	-1°11.11
16	330°28.63	64°37.20	29.21	55°12.52	10.37	215°59.54	44.84	333°33.43	50.04	Betelgeuse	270°50.88	7°24.72
17	345°31.09	79°36.24	29.40	70°12.91	10.32	231°2.31	44.90	348°35.80	49.99	Canopus	263°51.48	-52°42.49
18	0°33.56	94°35.27	S23°29.59	85°13.29	S24°10.27	246°5.09	N21°44.95	3°38.17	S03°49.94	Sirius	258°25.19	-16°45.08
19	15°36.02	109°34.31	29.78	100°13.68	10.21	261°7.86	45.01	18°40.54	49.89	Adhara	255°4.87	-29°0.38
20	30°38.48	124°33.35	29.96	115°14.06	10.16	276°10.63	45.06	33°42.92	49.84	Procyon	244°49.70	5°9.48
21	45°40.95	139°32.38	•• 30.15	130°14.45	•• 10.11	291°13.40	•• 45.11	48°45.29	•• 49.79	Pollux	243°16.00	27°57.71
22	60°43.41	154°31.42	30.33	145°14.83	10.05	306°16.17	45.17	63°47.66	49.74	Avior	234°13.87	-59°35.36
23	75°45.88	169°30.46	30.51	160°15.22	10.00	321°18.95	45.22	78°50.03	49.69	Suhail	222°45.42	-43°32.07
Mer.pass. 17:58		ν-1.0' d0.2' m-3.90		ν0.4' d-0.0' m1.19		ν2.8' d0.1' m-2.64		ν2.4' d-0.0' m0.98		Miaplacidus	221°37.47	-69°49.16
										Alphard	217°46.77	-8°46.25
										Regulus	207°33.44	11°50.32
										Dubhe	193°39.87	61°36.33
										Denebola	182°24.13	14°25.49
										Gienah	175°42.80	-17°41.10
										Acruz	172°59.32	-63°14.31
										Gacrux	171°50.86	-57°15.26
										Alioth	166°12.41	55°48.81
										Spica	158°21.60	-11°17.79
										Alkaid	152°51.61	49°10.73
										Hadar	148°35.25	-60°29.65
										Menkent	147°56.91	-36°29.71
										Arcturus	145°47.39	19°2.69
										Rigel Kent.	139°39.65	-60°56.34
										Kochab	137°20.65	74°2.59
										Zuben'ubi	136°55.39	-16°8.94
										Alphecca	126°3.38	26°37.50
										Antares	112°15.22	-26°29.32
										Atria	107°9.29	-69°4.32
										Sabik	102°2.23	-15°45.41
										Shaula	96°9.72	-37°7.32
										Rasalhague	95°58.17	12°32.43
										Eltanin	90°42.37	51°29.06
										Kaus Aust.	83°31.88	-34°22.34
										Vega	80°33.13	38°48.46
										Nunki	75°47.15	-26°15.88
										Altair	61°59.50	8°56.24
										Peacock	53°4.99	-56°39.22
										Deneb	49°25.64	45°22.53
										Enif	33°38.22	9°59.71
										Al Na'ir	27°32.16	-46°50.30
										Fomalhaut	15°13.75	-29°29.21
										Scheat	13°44.54	28°13.61
										Markab	13°29.20	15°20.82
Dec 21 Sun		SHA		Mer.pass								
		Venus		95°3.38		11:41						
		Mars		85°17.16		12:19						
		Jupiter		245°26.03		01:39						
		Saturn		3°6.25		17:45						
Dec 22 Mon		SHA		Mer.pass								
		Venus		93°41.15		11:43						
		Mars		84°27.26		12:19						
		Jupiter		245°33.38		01:34						
		Saturn		3°4.06		17:42						
Dec 23 Tue		SHA		Mer.pass								
		Venus		92°18.84		11:44						
		Mars		83°37.33		12:18						
		Jupiter		245°40.85		01:30						
		Saturn		3°1.78		17:38						
Horizontal parallax												
		Venus:		0.1								
		Mars:		0.1								
Mer.pass. 17:50		ν-1.0' d0.1' m-3.90		ν0.4' d-0.1' m1.18		ν2.8' d0.1' m-2.65		ν2.4' d-0.1' m0.99				

h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.98	S23°26.20	168°57.73	9.5'	S27°30.32	-3.6'	54.5'
1	195°30.67	26.21	183°26.26	9.6'	27°26.74	-3.7'	54.6'
2	210°30.35	26.23	197°54.82	9.6'	27°23.02	-3.9'	54.6'
3	225°30.04	26.24	212°23.39	9.6'	27°19.16	-4.0'	54.6'
4	240°29.73	26.24	226°51.99	9.6'	27°15.16	-4.1'	54.6'
5	255°29.42	26.25	241°20.62	9.7'	27°11.03	-4.3'	54.6'
6	270°29.11	S23°26.26	255°49.28	9.7'	S27°6.75	-4.4'	54.6'
7	285°28.80	26.27	270°17.96	9.7'	27°2.34	-4.5'	54.6'
8	300°28.49	26.27	284°46.67	9.7'	26°57.80	-4.7'	54.6'
9	315°28.17	26.28	299°15.41	9.8'	26°53.11	-4.8'	54.7'
10	330°27.86	26.28	313°44.18	9.8'	26°48.29	-5.0'	54.7'
11	345°27.55	26.29	328°12.99	9.8'	26°43.34	-5.1'	54.7'
12	0°27.24	S23°26.29	342°41.83	9.9'	S26°38.25	-5.2'	54.7'
13	15°26.93	26.29	357°10.70	9.9'	26°33.02	-5.4'	54.7'
14	30°26.62	26.29	11°39.61	9.9'	26°27.66	-5.5'	54.7'
15	45°26.31	26.29	26°8.55	10.0'	26°22.17	-5.6'	54.7'
16	60°25.99	26.29	40°37.54	10.0'	26°16.54	-5.8'	54.8'
17	75°25.68	26.29	55°6.56	10.1'	26°10.78	-5.9'	54.8'
18	90°25.37	S23°26.29	69°35.62	10.1'	S26°4.89	-6.0'	54.8'
19	105°25.06	26.29	84°4.72	10.1'	25°58.87	-6.2'	54.8'
20	120°24.75	26.28	98°33.86	10.2'	25°52.72	-6.3'	54.8'
21	135°24.44	26.28	113°3.04	10.2'	25°46.44	-6.4'	54.8'
22	150°24.12	26.27	127°32.27	10.3'	25°40.03	-6.5'	54.9'
23	165°23.81	26.27	142°1.54	10.3'	25°33.48	-6.7'	54.9'
SD = 16.2'		$d = 0.0'$	SD = 14.9'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.50	S23°26.26	156°30.85	10.4'	S25°26.81	-6.8'	54.9'
1	195°23.19	26.25	171°0.21	10.4'	25°20.02	-6.9'	54.9'
2	210°22.88	26.24	185°29.61	10.4'	25°13.09	-7.1'	54.9'
3	225°22.57	26.24	199°59.06	10.5'	25°6.04	-7.2'	54.9'
4	240°22.25	26.23	214°28.56	10.5'	24°58.86	-7.3'	54.9'
5	255°21.94	26.21	228°58.10	10.6'	24°51.56	-7.4'	55.0'
6	270°21.63	S23°26.20	243°27.69	10.6'	S24°44.14	-7.5'	55.0'
7	285°21.32	26.19	257°57.33	10.7'	24°36.59	-7.7'	55.0'
8	300°21.01	26.18	272°27.02	10.7'	24°28.91	-7.8'	55.0'
9	315°20.70	26.16	286°56.76	10.8'	24°21.12	-7.9'	55.0'
10	330°20.38	26.15	301°26.55	10.8'	24°13.20	-8.0'	55.0'
11	345°20.07	26.13	315°56.39	10.9'	24°5.16	-8.2'	55.1'
12	0°19.76	S23°26.11	330°26.28	10.9'	S23°57.01	-8.3'	55.1'
13	15°19.45	26.10	344°56.22	11.0'	23°48.73	-8.4'	55.1'
14	30°19.14	26.08	359°26.21	11.0'	23°40.33	-8.5'	55.1'
15	45°18.83	26.06	13°56.26	11.1'	23°31.82	-8.6'	55.1'
16	60°18.52	26.04	28°26.36	11.2'	23°23.19	-8.7'	55.2'
17	75°18.20	26.02	42°56.51	11.2'	23°14.45	-8.9'	55.2'
18	90°17.89	S23°26.00	57°26.71	11.3'	S23°5.58	-9.0'	55.2'
19	105°17.58	25.97	71°56.96	11.3'	22°56.61	-9.1'	55.2'
20	120°17.27	25.95	86°27.27	11.4'	22°47.52	-9.2'	55.2'
21	135°16.96	25.93	100°57.64	11.4'	22°38.32	-9.3'	55.2'
22	150°16.65	25.90	115°28.05	11.5'	22°29.00	-9.4'	55.3'
23	165°16.33	25.88	129°58.52	11.5'	22°19.58	-9.5'	55.3'
SD = 16.3'		$d = -0.0'$	SD = 15.0'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.02	S23°25.85	144°29.05	11.6'	S22°10.04	-9.6'	55.3'
1	195°15.71	25.82	158°59.62	11.6'	22°0.39	-9.8'	55.3'
2	210°15.40	25.79	173°30.25	11.7'	21°50.64	-9.9'	55.3'
3	225°15.09	25.76	188°0.94	11.7'	21°40.78	-10.0'	55.4'
4	240°14.78	25.73	202°31.68	11.8'	21°30.81	-10.1'	55.4'
5	255°14.46	25.70	217°2.47	11.8'	21°20.73	-10.2'	55.4'
6	270°14.15	S23°25.67	231°33.32	11.9'	S21°10.55	-10.3'	55.4'
7	285°13.84	25.64	246°4.22	12.0'	21°0.27	-10.4'	55.4'
8	300°13.53	25.61	260°35.17	12.0'	20°49.88	-10.5'	55.4'
9	315°13.22	25.57	275°6.18	12.1'	20°39.39	-10.6'	55.5'
10	330°12.91	25.54	289°37.24	12.1'	20°28.80	-10.7'	55.5'
11	345°12.60	25.50	304°8.35	12.2'	20°18.10	-10.8'	55.5'
12	0°12.28	S23°25.47	318°39.52	12.2'	S20°7.31	-10.9'	55.5'
13	15°11.97	25.43	333°10.74	12.3'	19°56.41	-11.0'	55.5'
14	30°11.66	25.39	347°42.01	12.3'	19°45.42	-11.1'	55.6'
15	45°11.35	25.35	2°13.33	12.4'	19°34.34	-11.2'	55.6'
16	60°11.04	25.31	16°44.71	12.4'	19°23.15	-11.3'	55.6'
17	75°10.73	25.27	31°16.14	12.5'	19°11.87	-11.4'	55.6'
18	90°10.42	S23°25.23	45°47.61	12.5'	S19°0.50	-11.5'	55.6'
19	105°10.10	25.19	60°19.14	12.6'	18°49.03	-11.6'	55.7'
20	120°9.79	25.15	74°50.72	12.6'	18°37.47	-11.7'	55.7'
21	135°9.48	25.10	89°22.35	12.7'	18°25.81	-11.7'	55.7'
22	150°9.17	25.06	103°54.03	12.7'	18°14.07	-11.8'	55.7'
23	165°8.86	25.01	118°25.75	12.8'	18°2.23	-11.9'	55.8'
SD = 16.3'		$d = -0.0'$	SD = 15.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:26	10:58	■	■	12:59	15:31
N 70°	08:06	09:55	■	■	14:02	15:51
68°	07:50	09:20	■	■	14:38	16:07
66°	07:37	08:54	10:35	13:22	15:03	16:20
64°	07:26	08:35	09:53	14:05	15:23	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:08	08:05	09:03	14:55	15:53	16:50
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:54	07:43	08:30	15:27	16:15	17:04
54°	06:47	07:34	08:18	15:40	16:24	17:10
52°	06:42	07:25	08:06	15:51	16:32	17:16
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:25	07:02	07:36	16:22	16:56	17:33
N 40°	06:14	06:48	07:19	16:39	17:09	17:43
35°	06:05	06:36	07:05	16:53	17:21	17:53
30°	05:56	06:26	06:52	17:05	17:32	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:50	06:12	17:45	18:08	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
S 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:54	05:18	18:39	19:04	19:33
30°	03:55	04:29	04:56	19:01	19:29	20:02
35°	03:37	04:13	04:43	19:14	19:44	20:21
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:43	03:33	04:10	19:47	20:25	21:15
S 50°	01:57	03:03	03:47	20:10	20:55	22:00
52°	01:29	02:48	03:37	20:21	21:10	22:28
54°	00:42	02:30	03:24	20:33	21:28	23:15
56°	////	02:07	03:10	20:47	21:50	////
58°	////	01:37	02:53	21:04	22:20	////
S 60°	////	00:46	02:33	21:25	23:11	////

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	■	■	■	■	■	■
N 70°	■	■	14:17	■	■	15:44
68°	■	■	13:05	■	■	16:54
66°	■	13:33	12:28	■	14:44	17:30
64°	■	12:23	12:02	■	15:54	17:55
62°	11:55	11:47	11:41	14:36	16:29	18:15
60°	11:12	11:21	11:24	15:18	16:54	18:31
N 58°	10:43	11:00	11:10	15:47	17:14	18:45
56°	10:21	10:43	10:57	16:09	17:31	18:56
54°	10:02	10:29	10:47	16:27	17:45	19:06
52°	09:47	10:16	10:37	16:42	17:57	19:15
50°	09:33	10:05	10:28	16:55	18:08	19:23
45°	09:06	09:41	10:10	17:22	18:30	19:40
N 40°	08:44	09:23	09:55	17:43	18:48	19:54
35°	08:26	09:07	09:42	18:01	19:03	20:06
30°	08:10	08:53	09:31	18:16	19:16	20:16
20°	07:44	08:30	09:12	18:42	19:38	20:33
N 10°	07:21	08:09	08:55	19:04	19:57	20:48
0°	06:59	07:50	08:39	19:24	20:14	21:02
S 10°	06:38	07:31	08:24	19:44	20:32	21:16
20°	06:15	07:11	08:07	20:06	20:50	21:31
30°	05:48	06:47	07:47	20:31	21:12	21:47
35°	05:32	06:33	07:35	20:46	21:24	21:57
40°	05:14	06:17	07:22	21:03	21:38	22:08
45°	04:51	05:57	07:06	21:23	21:55	22:21
S 50°	04:23	05:32	06:47	21:49	22:16	22:37
52°	04:09	05:21	06:38	22:01	22:26	22:44
54°	03:53	05:07	06:27	22:15	22:37	22:52
56°	03:33	04:51	06:15	22:31	22:49	23:01
58°	03:09	04:32	06:02	22:50	23:03	23:11
S 60°	02:37	04:09	05:45	23:14	23:20	23:23

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 1-8%
21	02:04	01:49	11:58	13:12	00:46	
22	01:34	01:19	11:59	14:02	01:37	
23	01:04	00:49	11:59	14:51	02:27	

December 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	92°46.62	183°43.07	S23°37.89	175°33.99	S24°6.74	338°35.05	N21°47.91	95°46.02	S03°47.17	Alpheratz	357°33.95	29°14.23						
1	107°49.09	198°42.10	38.01	190°34.37	6.66	353°37.84	47.97	110°48.38	47.12	Ankaa	353°6.32	-42°10.08						
2	122°51.55	213°41.13	38.13	205°34.76	6.59	8°40.62	48.02	125°50.75	47.07	Schedar	349°30.05	56°41.11						
3	137°54.01	228°40.16	•• 38.24	220°35.14	•• 6.51	23°43.40	•• 48.08	140°53.11	•• 47.01	Diphda	348°46.44	-17°50.72						
4	152°56.48	243°39.19	38.36	235°35.52	6.43	38°46.19	48.13	155°55.47	46.96	Achernar	335°19.35	-57°6.52						
5	167°58.94	258°38.21	38.47	250°35.90	6.35	53°48.97	48.19	170°57.83	46.91	Hamal	327°50.11	23°35.26						
6	183°1.41	273°37.24	S23°38.58	265°36.28	S24°6.27	68°51.75	N21°48.24	186°0.20	S03°46.85	Polaris	313°15.47	89°22.66						
7	198°3.87	288°36.27	38.69	280°36.66	6.19	83°54.54	48.30	201°2.56	46.80	Acamar	315°10.86	-40°12.15						
8	213°6.33	303°35.30	38.81	295°37.05	6.10	98°57.32	48.36	216°4.92	46.75	Menkar	314°5.08	4°11.54						
9	228°8.80	318°34.33	•• 38.91	310°37.43	•• 6.02	114°0.10	•• 48.41	231°7.28	•• 46.69	Mirfak	308°26.71	49°57.38						
10	243°11.26	333°33.36	39.02	325°37.81	5.94	129°2.89	48.47	246°9.64	46.64	Aldebaran	290°38.37	16°33.73						
11	258°13.73	348°32.39	39.13	340°38.19	5.86	144°5.67	48.52	261°12.01	46.59	Rigel	281°2.76	-8°10.29						
12	273°16.19	3°31.42	S23°39.23	355°38.57	S24°5.77	159°8.46	N21°48.58	276°14.37	S03°46.53	Capella	280°20.23	46°1.48						
13	288°18.65	18°30.45	39.34	10°38.95	5.69	174°11.24	48.63	291°16.73	46.48	Bellatrix	278°21.68	6°22.40						
14	303°21.12	33°29.48	39.44	25°39.34	5.61	189°14.03	48.69	306°19.09	46.42	Elnath	278°0.47	28°37.78						
15	318°23.58	48°28.50	•• 39.54	40°39.72	•• 5.52	204°16.81	•• 48.74	321°21.45	•• 46.37	Alnilam	275°36.58	-1°11.11						
16	333°26.05	63°27.53	39.64	55°40.10	5.44	219°19.60	48.80	336°23.81	46.32	Betelgeuse	270°50.88	7°24.72						
17	348°28.51	78°26.56	39.74	70°40.48	5.35	234°22.38	48.86	351°26.17	46.26	Canopus	263°51.48	-52°42.51						
18	3°30.98	93°25.59	S23°39.84	85°40.86	S24°5.27	249°25.17	N21°48.91	6°28.53	S03°46.21	Sirius	258°25.18	-16°45.09						
19	18°33.44	108°24.62	39.93	100°41.24	5.18	264°27.96	48.97	21°30.89	46.15	Adhara	255°4.86	-29°0.39						
20	33°35.90	123°23.65	40.03	115°41.62	5.09	279°30.74	49.02	36°33.25	46.10	Procyon	244°49.68	5°9.47						
21	48°38.37	138°22.67	•• 40.12	130°42.01	•• 5.00	294°33.53	•• 49.08	51°35.61	•• 46.04	Pollux	243°15.98	27°57.71						
22	63°40.83	153°21.70	40.21	145°42.39	4.92	309°36.31	49.13	66°37.97	45.99	Avior	234°13.85	-59°35.38						
23	78°43.30	168°20.73	40.30	160°42.77	4.83	324°39.10	49.19	81°40.33	45.94	Suhail	222°45.39	-43°32.08						
Mer.pass. 17:46			ν-1.0' d0.1' m-3.90			ν0.4' d-0.1' m1.17			ν2.8' d0.1' m-2.65			ν2.4' d-0.1' m0.99						
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	93°45.76	183°19.76	S23°40.39	175°43.15	S24°4.74	339°41.89	N21°49.25	96°42.69	S03°45.88	Denebola	182°24.10	14°25.48						
1	108°48.22	198°18.79	40.48	190°43.53	4.65	354°44.67	49.30	111°45.05	45.83	Gienah	175°42.78	-17°41.11						
2	123°50.69	213°17.81	40.57	205°43.91	4.56	9°47.46	49.36	126°47.41	45.77	Acrux	172°59.27	-63°14.31						
3	138°53.15	228°16.84	•• 40.65	220°44.29	•• 4.47	24°50.25	•• 49.41	141°49.77	•• 45.72	Gacrux	171°50.82	-57°15.27						
4	153°55.62	243°15.87	40.74	235°44.67	4.38	39°53.04	49.47	156°52.13	45.66	Alioth	166°12.37	55°48.80						
5	168°58.08	258°14.90	40.82	250°45.06	4.29	54°55.82	49.52	171°54.49	45.61	Spica	158°21.57	-11°17.80						
6	184°0.54	273°13.92	S23°40.90	265°45.44	S24°4.20	69°58.61	N21°49.58	186°56.85	S03°45.55	Alkaid	152°51.58	49°10.72						
7	199°3.01	288°12.95	40.99	280°45.82	4.10	85°1.40	49.64	201°59.20	45.50	Hadar	148°35.21	-60°29.66						
8	214°5.47	303°11.98	41.07	295°46.20	4.01	100°4.19	49.69	217°1.56	45.44	Menkent	147°56.88	-36°29.72						
9	229°7.94	318°11.01	•• 41.14	310°46.58	•• 3.92	115°6.98	•• 49.75	232°3.92	•• 45.39	Arcturus	145°47.37	19°2.68						
10	244°10.40	333°10.03	41.22	325°46.96	3.83	130°9.77	49.80	247°6.28	45.33	Rigel Kent.	139°39.61	-60°56.34						
11	259°12.87	348°9.06	41.30	340°47.34	3.73	145°12.55	49.86	262°8.64	45.28	Kochab	137°20.60	74°2.58						
12	274°15.33	3°8.09	S23°41.37	355°47.72	S24°3.64	160°15.34	N21°49.91	277°10.99	S03°45.22	Zuben'ubi	136°55.36	-16°8.95						
13	289°17.79	18°7.12	41.44	10°48.10	3.54	175°18.13	49.97	292°13.35	45.16	Alphecca	126°3.36	26°37.48						
14	304°20.26	33°6.14	41.52	25°48.48	3.45	190°20.92	50.03	307°15.71	45.11	Antares	112°15.20	-26°29.32						
15	319°22.72	48°5.17	•• 41.59	40°48.86	•• 3.35	205°23.71	•• 50.08	322°18.06	•• 45.05	Atria	107°9.26	-69°4.32						
16	334°25.19	63°4.20	41.66	55°49.24	3.25	220°26.50	50.14	337°20.42	45.00	Sabik	102°2.21	-15°45.41						
17	349°27.65	78°3.22	41.72	70°49.63	3.16	235°29.29	50.19	352°22.78	44.94	Shaula	96°9.71	-37°7.32						
18	4°30.11	93°2.25	S23°41.79	85°50.01	S24°3.06	250°32.08	N21°50.25	7°25.14	S03°44.89	Rasalhague	95°58.16	12°32.42						
19	19°32.58	108°1.28	41.86	100°50.39	2.96	265°34.87	50.31	22°27.49	44.83	Eltanin	90°42.36	51°29.04						
20	34°35.04	123°0.30	41.92	115°50.77	2.87	280°37.66	50.36	37°29.85	44.77	Kaus Aust.	83°31.87	-34°22.34						
21	49°37.51	137°59.33	•• 41.98	130°51.15	•• 2.77	295°40.45	•• 50.42	52°32.20	•• 44.72	Vega	80°33.12	38°48.44						
22	64°39.97	152°58.36	42.04	145°51.53	2.67	310°43.24	50.47	67°34.56	44.66	Nunki	75°47.15	-26°15.89						
23	79°42.43	167°57.38	42.11	160°51.91	2.57	325°46.03	50.53	82°36.92	44.61	Altair	61°59.50	8°56.23						
Mer.pass. 17:42			ν-1.0' d0.1' m-3.90			ν0.4' d-0.1' m1.17			ν2.8' d0.1' m-2.66			ν2.4' d-0.1' m0.99						
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	94°44.90	182°56.41	S23°42.16	175°52.29	S24°2.47	340°48.82	N21°50.59	97°39.27	S03°44.55	Dec 24 Wed	SHA	Mer.pass						
1	109°47.36	197°55.44	42.22	190°52.67	2.37	355°51.62	50.64	112°41.63	44.49	Venus	90°56.45	11:46						
2	124°49.83	212°54.46	42.28	205°53.05	2.27	10°54.41	50.70	127°43.98	44.44	Mars	82°47.37	12:17						
3	139°52.29	227°53.49	•• 42.33	220°53.43	•• 2.17	25°57.20	•• 50.76	142°46.34	•• 44.38	Jupiter	245°48.43	01:25						
4	154°54.76	242°52.52	42.39	235°53.81	2.06	40°59.99	50.81	157°48.69	44.32	Saturn	2°59.40	17:34						
5	169°57.22	257°51.54	42.44	250°54.19	1.96	56°2.78	50.87	172°51.05	44.27									
6	184°59.68	272°50.57	S23°42.49	265°54.57	S24°1.86	71°5.57	N21°50.92	187°53.40	S03°44.21	Dec 25 Thu	SHA	Mer.pass						
7	200°2.15	287°49.59	42.54	280°54.95	1.75	86°8.37	50.98	202°55.76	44.15	Venus	89°34.00	11:47						
8	215°4.61	302°48.62	42.59	295°55.33	1.65	101°11.16	51.04	217°58.11	44.10	Mars	81°57.39	12:17						
9	230°7.08	317°47.65	•• 42.64	310°55.71	•• 1.55	116°13.95	•• 51.09	233°0.47	•• 44.04	Jupiter	245°56.13	01:21						
10	245°9.54	332°46.67	42.69	325°56.09	1.44	131°16.74	51.15	248°2.82	43.98	Saturn	2°56.93	17:30						
11	260°12.00	347°45.70	42.73	340°56.47	1.34	146°19.54	51.20	263°53										

h		Sun		Moon			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		180°8.55	S23°24.97	132°57.53	12.8'	S17°50.31	-12.0' 55.8'
1		195°8.24	24.92	147°29.35	12.9'	17°38.30	-12.1' 55.8'
2		210°7.93	24.87	162°1.22	12.9'	17°26.20	-12.2' 55.8'
3		225°7.62	· · 24.82	176°33.14	13.0'	17°14.01	-12.3' 55.8'
4		240°7.30	24.77	191°5.10	13.0'	17°1.74	-12.4' 55.9'
5		255°6.99	24.72	205°37.11	13.1'	16°49.39	-12.4' 55.9'
6		270°6.68	S23°24.67	220°9.17	13.1'	S16°36.95	-12.5' 55.9'
7		285°6.37	24.62	234°41.26	13.1'	16°24.43	-12.6' 55.9'
8		300°6.06	24.57	249°13.41	13.2'	16°11.82	-12.7' 55.9'
9		315°5.75	· · 24.51	263°45.59	13.2'	15°59.14	-12.8' 56.0'
10		330°5.44	24.46	278°17.82	13.3'	15°46.38	-12.8' 56.0'
11		345°5.13	24.40	292°50.09	13.3'	15°33.53	-12.9' 56.0'
12		0°4.82	S23°24.35	307°22.41	13.4'	S15°20.61	-13.0' 56.0'
13		15°4.51	24.29	321°54.76	13.4'	15°7.61	-13.1' 56.1'
14		30°4.20	24.23	336°27.15	13.4'	14°54.54	-13.1' 56.1'
15		45°3.88	· · 24.17	350°59.58	13.5'	14°41.39	-13.2' 56.1'
16		60°3.57	24.12	5°32.05	13.5'	14°28.17	-13.3' 56.1'
17		75°3.26	24.06	20°4.55	13.5'	14°14.87	-13.4' 56.2'
18		90°2.95	S23°23.99	34°37.10	13.6'	S14°1.50	-13.4' 56.2'
19		105°2.64	23.93	49°9.68	13.6'	13°48.06	-13.5' 56.2'
20		120°2.33	23.87	63°42.29	13.6'	13°34.54	-13.6' 56.2'
21		135°2.02	· · 23.81	78°14.94	13.7'	13°20.96	-13.7' 56.2'
22		150°1.71	23.74	92°47.62	13.7'	13°7.31	-13.7' 56.3'
23		165°1.40	23.68	107°20.33	13.7'	12°53.59	-13.8' 56.3'
		SD = 16.3' d = -0.0'		SD = 15.2'			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		180°1.09	S23°23.61	121°53.07	13.8'	S12°39.81	-13.9' 56.3'
1		195°0.78	23.54	136°25.85	13.8'	12°25.95	-13.9' 56.3'
2		210°0.47	23.48	150°58.65	13.8'	12°12.04	-14.0' 56.4'
3		225°0.16	· · 23.41	165°31.48	13.9'	11°58.06	-14.0' 56.4'
4		239°59.85	23.34	180°4.35	13.9'	11°44.01	-14.1' 56.4'
5		254°59.54	23.27	194°37.23	13.9'	11°29.91	-14.2' 56.4'
6		269°59.23	S23°23.20	209°10.14	13.9'	S11°15.74	-14.2' 56.5'
7		284°58.92	23.13	223°43.08	14.0'	11°1.51	-14.3' 56.5'
8		299°58.61	23.06	238°16.04	14.0'	10°47.22	-14.3' 56.5'
9		314°58.30	· · 22.98	252°49.03	14.0'	10°32.88	-14.4' 56.5'
10		329°57.99	22.91	267°22.03	14.0'	10°18.48	-14.5' 56.6'
11		344°57.68	22.83	281°55.06	14.0'	10°4.02	-14.5' 56.6'
12		359°57.37	S23°22.76	296°28.10	14.1'	S09°49.50	-14.6' 56.6'
13		14°57.06	22.68	311°1.17	14.1'	09°34.93	-14.6' 56.6'
14		29°56.75	22.60	325°34.25	14.1'	09°20.31	-14.7' 56.7'
15		44°56.44	· · 22.53	340°7.35	14.1'	09°5.63	-14.7' 56.7'
16		59°56.13	22.45	354°40.46	14.1'	08°50.90	-14.8' 56.7'
17		74°55.82	22.37	9°13.58	14.1'	08°36.12	-14.8' 56.8'
18		89°55.51	S23°22.29	23°46.72	14.2'	S08°21.29	-14.9' 56.8'
19		104°55.20	22.21	38°19.88	14.2'	08°6.41	-14.9' 56.8'
20		119°54.89	22.12	52°53.04	14.2'	07°51.49	-15.0' 56.8'
21		134°54.58	· · 22.04	67°26.21	14.2'	07°36.51	-15.0' 56.9'
22		149°54.27	21.96	81°59.39	14.2'	07°21.49	-15.1' 56.9'
23		164°53.97	21.87	96°32.58	14.2'	07°6.43	-15.1' 56.9'
		SD = 16.3' d = -0.1'		SD = 15.4'			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		179°53.66	S23°21.79	111°5.77	14.2'	S06°51.32	-15.2' 56.9'
1		194°53.35	21.70	125°38.97	14.2'	06°36.17	-15.2' 57.0'
2		209°53.04	21.61	140°12.17	14.2'	06°20.97	-15.2' 57.0'
3		224°52.73	· · 21.53	154°45.38	14.2'	06°5.74	-15.3' 57.0'
4		239°52.42	21.44	169°18.58	14.2'	05°50.46	-15.3' 57.0'
5		254°52.11	21.35	183°51.79	14.2'	05°35.14	-15.4' 57.1'
6		269°51.80	S23°21.26	198°24.99	14.2'	S05°19.79	-15.4' 57.1'
7		284°51.49	21.17	212°58.20	14.2'	05°4.40	-15.4' 57.1'
8		299°51.19	21.07	227°31.40	14.2'	04°48.97	-15.5' 57.2'
9		314°50.88	· · 20.98	242°4.59	14.2'	04°33.51	-15.5' 57.2'
10		329°50.57	20.89	256°37.78	14.2'	04°18.01	-15.5' 57.2'
11		344°50.26	20.79	271°10.96	14.2'	04°2.48	-15.6' 57.2'
12		359°49.95	S23°20.70	285°44.13	14.2'	S03°46.92	-15.6' 57.3'
13		14°49.64	20.60	300°17.29	14.1'	03°31.32	-15.6' 57.3'
14		29°49.33	20.51	314°50.44	14.1'	03°15.70	-15.7' 57.3'
15		44°49.03	· · 20.41	329°23.57	14.1'	03°0.05	-15.7' 57.4'
16		59°48.72	20.31	343°56.70	14.1'	02°44.36	-15.7' 57.4'
17		74°48.41	20.21	358°29.80	14.1'	02°28.66	-15.7' 57.4'
18		89°48.10	S23°20.11	13°2.90	14.1'	S02°12.92	-15.8' 57.4'
19		104°47.79	20.01	27°35.97	14.1'	01°57.16	-15.8' 57.5'
20		119°47.49	19.91	42°9.02	14.0'	01°41.38	-15.8' 57.5'
21		134°47.18	· · 19.81	56°42.05	14.0'	01°25.57	-15.8' 57.5'
22		149°46.87	19.70	71°15.07	14.0'	01°9.74	-15.8' 57.6'
23		164°46.56	19.60	85°48.05	14.0'	00°53.89	-15.9' 57.6'
		SD = 16.3' d = -0.1'		SD = 15.5'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:27	10:57	■	■	13:04	15:34
N 70°	08:07	09:55	■	■	14:05	15:53
68°	07:51	09:20	■	■	14:40	16:09
66°	07:38	08:55	10:35	13:25	15:05	16:22
64°	07:27	08:35	09:53	14:07	15:25	16:34
62°	07:17	08:19	09:25	14:35	15:41	16:43
60°	07:09	08:06	09:03	14:57	15:55	16:51
N 58°	07:01	07:54	08:46	15:14	16:06	16:59
56°	06:55	07:44	08:31	15:29	16:17	17:06
54°	06:49	07:35	08:19	15:42	16:26	17:12
52°	06:43	07:27	08:08	15:53	16:34	17:18
50°	06:38	07:19	07:58	16:03	16:41	17:23
45°	06:26	07:03	07:37	16:23	16:57	17:35
N 40°	06:15	06:50	07:20	16:40	17:11	17:45
35°	06:06	06:38	07:06	16:54	17:23	17:54
30°	05:57	06:27	06:54	17:07	17:33	18:03
20°	05:41	06:08	06:32	17:28	17:52	18:20
N 10°	05:25	05:51	06:14	17:46	18:09	18:36
0°	05:08	05:34	05:56	18:04	18:26	18:53
S 10°	04:49	05:16	05:39	18:21	18:45	19:12
20°	04:26	04:55	05:20	18:40	19:05	19:34
30°	03:57	04:30	04:58	19:02	19:30	20:03
35°	03:38	04:15	04:45	19:15	19:45	20:22
40°	03:15	03:57	04:30	19:30	20:03	20:45
45°	02:45	03:34	04:12	19:48	20:26	21:16
S 50°	01:59	03:05	03:49	20:11	20:56	22:01
52°	01:31	02:50	03:38	20:22	21:11	22:29
54°	00:45	02:32	03:26	20:34	21:28	23:14
56°	////	02:09	03:12	20:48	21:51	////
58°	////	01:40	02:55	21:05	22:20	////
S 60°	////	00:49	02:35	21:25	23:10	////

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	13:19	12:24	11:46	18:20	20:51	23:04
N 70°	12:47	12:09	11:41	18:51	21:03	23:06
68°	12:23	11:57	11:36	19:13	21:13	23:07
66°	12:04	11:47	11:33	19:30	21:21	23:08
64°	11:49	11:39	11:30	19:44	21:27	23:09
62°	11:36	11:31	11:27	19:56	21:33	23:10
60°	11:25	11:25	11:24	20:06	21:38	23:10
N 58°	11:16	11:19	11:22	20:14	21:42	23:11
56°	11:07	11:14	11:20	20:22	21:46	23:11
54°	11:00	11:10	11:19	20:28	21:50	23:12
52°	10:53	11:06	11:17	20:34	21:53	23:12
50°	10:47	11:02	11:16	20:39	21:56	23:12
45°	10:34	10:54	11:12	20:51	22:02	23:13
N 40°	10:23	10:47	11:10	21:00	22:07	23:14
35°	10:13	10:41	11:07	21:09	22:11	23:14
30°	10:05	10:36	11:05	21:16	22:15	23:15
20°	09:51	10:27	11:02	21:28	22:22	23:15
N 10°	09:38	10:19	10:59	21:38	22:27	23:16
0°	09:26	10:11	10:56	21:48	22:33	23:17
S 10°	09:14	10:04	10:53	21:58	22:38	23:17
20°	09:02	09:56	10:50	22:08	22:43	23:18
30°	08:47	09:46	10:46	22:20	22:50	23:19
35°	08:38	09:41	10:44	22:26	22:53	23:19
40°	08:29	09:35	10:42	22:34	22:57	23:19
45°	08:17	09:28	10:39	22:43	23:02	23:20
S 50°	08:03	09:19	10:36	22:53	23:07	23:20
52°	07:56	09:15	10:34	22:58	23:10	23:21
54°	07:49	09:11	10:32	23:03	23:13	23:21
56°	07:41	09:06	10:30	23:09	23:16	23:21
58°	07:32	09:00	10:28	23:16	23:19	23:22
S 60°	07:21	08:54	10:26	23:23	23:23	23:22

Day	Sun		Mer. Pass	Moon		Age 4-6 14-31%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
24	00:34	00:19	12:00	15:37	03:14	
25	00:04	00:11	12:00	16:22	04:00	
26	00:25	00:40	12:01	17:06	04:44	

December 27, 28, 29 UT (Sat., Sun., Mon.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	95°44.04	182°33.04	S23°43.20	176°1.41	S23°59.93	341°55.86	N21°51.94	98°35.76	S03°43.18			Alpheratz	357°33.97 29°14.22
1	110°46.50	197°32.06	43.23	191°1.79	59.82	356°58.65	51.99	113°38.11	43.12			Ankaa	353°6.34 -42°10.09
2	125°48.96	212°31.09	43.25	206°2.17	59.70	12°1.45	52.05	128°40.46	43.07			Schedar	349°30.08 56°41.11
3	140°51.43	227°30.11	· · 43.28	221°2.55	· · 59.59	27°4.24	· · 52.11	143°42.82	· · 43.01			Diphda	348°46.46 -17°50.72
4	155°53.89	242°29.14	43.30	236°2.93	59.48	42°7.04	52.16	158°45.17	42.95			Achernar	335°19.38 -57°6.52
5	170°56.36	257°28.16	43.32	251°3.31	59.37	57°9.83	52.22	173°47.52	42.89			Hamal	327°50.13 23°35.26
6	185°58.82	272°27.19	S23°43.35	266°3.69	S23°59.25	72°12.63	N21°52.27	188°49.87	S03°42.83			Polaris	313°16.55 89°22.67
7	201°1.29	287°26.22	43.36	281°4.07	59.14	87°15.43	52.33	203°52.22	42.78			Acamar	315°10.88 -40°12.16
8	216°3.75	302°25.24	43.38	296°4.45	59.02	102°18.22	52.39	218°54.57	42.72			Menkar	314°5.09 4°11.53
9	231°6.21	317°24.27	· · 43.40	311°4.83	· · 58.91	117°21.02	· · 52.44	233°56.92	· · 42.66			Mirfak	308°26.72 49°57.39
10	246°8.68	332°23.29	43.42	326°5.21	58.79	132°23.82	52.50	248°59.27	42.60			Aldebaran	290°38.38 16°33.73
11	261°11.14	347°22.32	43.43	341°5.59	58.67	147°26.61	52.56	264°1.62	42.54			Rigel	281°2.76 -8°10.30
12	276°13.61	2°21.34	S23°43.44	356°5.97	S23°58.56	162°29.41	N21°52.61	279°3.97	S03°42.48			Capella	280°20.23 46°1.49
13	291°16.07	17°20.37	43.46	11°6.35	58.44	177°32.21	52.67	294°6.32	42.42			Bellatrix	278°21.68 6°22.40
14	306°18.53	32°19.40	43.47	26°6.73	58.32	192°35.00	52.73	309°8.67	42.37			Elnath	278°0.47 28°37.78
15	321°21.00	47°18.42	· · 43.48	41°7.11	· · 58.20	207°37.80	· · 52.78	324°11.02	· · 42.31			Alnilam	275°36.58 -1°11.12
16	336°23.46	62°17.45	43.48	56°7.49	58.09	222°40.60	52.84	339°13.37	42.25			Betelgeuse	270°50.87 7°24.71
17	351°25.93	77°16.47	43.49	71°7.87	57.97	237°43.40	52.90	354°15.72	42.19			Canopus	263°51.47 -52°42.52
18	6°28.39	92°15.50	S23°43.50	86°8.25	S23°57.85	252°46.19	N21°52.95	9°18.07	S03°42.13			Sirius	258°25.18 -16°45.10
19	21°30.85	107°14.52	43.50	101°8.63	57.73	267°48.99	53.01	24°20.42	42.07			Adhara	255°4.85 -29°0.40
20	36°33.32	122°13.55	43.50	116°9.01	57.61	282°51.79	53.06	39°22.77	42.01			Procyon	244°49.67 5°9.47
21	51°35.78	137°12.58	· · 43.50	131°9.39	· · 57.48	297°54.59	· · 53.12	54°25.12	· · 41.95			Pollux	243°15.96 27°57.71
22	66°38.25	152°11.60	43.50	146°9.77	57.36	312°57.39	53.18	69°27.46	41.89			Avior	234°13.84 -59°35.39
23	81°40.71	167°10.63	43.50	161°10.15	57.24	328°0.18	53.23	84°29.81	41.84			Suhail	222°45.38 -43°32.10
Mer.pass. 17:34		ν-1.0' d0.0' m-3.90		ν0.4' d-0.1' m1.15		ν2.8' d0.1' m-2.66		ν2.4' d-0.1' m1.00					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	96°43.17	182°9.65	S23°43.50	176°10.53	S23°57.12	343°2.98	N21°53.29	99°32.16	S03°41.78				
1	111°45.64	197°8.68	43.50	191°10.91	57.00	358°5.78	53.35	114°34.51	41.72				
2	126°48.10	212°7.70	43.49	206°11.29	56.87	13°8.58	53.40	129°36.86	41.66				
3	141°50.57	227°6.73	· · 43.49	221°11.67	· · 56.75	28°11.38	· · 53.46	144°39.20	· · 41.60				
4	156°53.03	242°5.76	43.48	236°12.05	56.62	43°14.18	53.52	159°41.55	41.54				
5	171°55.50	257°4.78	43.47	251°12.43	56.50	58°16.98	53.57	174°43.90	41.48				
6	186°57.96	272°3.81	S23°43.46	266°12.81	S23°56.37	73°19.78	N21°53.63	189°46.25	S03°41.42				
7	202°0.42	287°2.83	43.45	281°13.19	56.25	88°22.58	53.69	204°48.59	41.36				
8	217°2.89	302°1.86	43.44	296°13.56	56.12	103°25.38	53.74	219°50.94	41.30				
9	232°5.35	317°0.88	· · 43.42	311°13.94	· · 56.00	118°28.18	· · 53.80	234°53.29	· · 41.24				
10	247°7.82	331°59.91	43.41	326°14.32	55.87	133°30.98	53.86	249°55.63	41.18				
11	262°10.28	346°58.94	43.39	341°14.70	55.74	148°33.78	53.91	264°57.98	41.12				
12	277°12.74	1°57.96	S23°43.38	356°15.08	S23°55.61	163°36.58	N21°53.97	280°0.33	S03°41.06				
13	292°15.21	16°56.99	43.36	11°15.46	55.49	178°39.38	54.03	295°2.67	41.00				
14	307°17.67	31°56.01	43.34	26°15.84	55.36	193°42.18	54.08	310°5.02	40.94				
15	322°20.14	46°55.04	· · 43.32	41°16.22	· · 55.23	208°44.98	· · 54.14	325°7.36	· · 40.88				
16	337°22.60	61°54.07	43.29	56°16.60	55.10	223°47.78	54.20	340°9.71	40.82				
17	352°25.06	76°53.09	43.27	71°16.98	54.97	238°50.58	54.25	355°12.06	40.76				
18	7°27.53	91°52.12	S23°43.24	86°17.36	S23°54.84	253°53.38	N21°54.31	10°14.40	S03°40.70				
19	22°29.99	106°51.14	43.22	101°17.74	54.70	268°56.18	54.37	25°16.75	40.64				
20	37°32.46	121°50.17	43.19	116°18.12	54.57	283°58.99	54.42	40°19.09	40.58				
21	52°34.92	136°49.20	· · 43.16	131°18.50	· · 54.44	299°1.79	· · 54.48	55°21.44	· · 40.52				
22	67°37.38	151°48.22	43.13	146°18.88	54.31	314°4.59	54.54	70°23.78	40.45				
23	82°39.85	166°47.25	43.10	161°19.26	54.18	329°7.39	54.59	85°26.13	40.39				
Mer.pass. 17:30		ν-1.0' d-0.0' m-3.90		ν0.4' d-0.1' m1.15		ν2.8' d0.1' m-2.66		ν2.3' d-0.1' m1.00					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	97°42.31	181°46.28	S23°43.07	176°19.64	S23°54.04	344°10.19	N21°54.65	100°28.47	S03°40.33				
1	112°44.78	196°45.30	43.03	191°20.02	53.91	359°12.99	54.71	115°30.81	40.27				
2	127°47.24	211°44.33	43.00	206°20.39	53.77	14°15.80	54.76	130°33.16	40.21				
3	142°49.71	226°43.36	· · 42.96	221°20.77	· · 53.64	29°18.60	· · 54.82	145°35.50	· · 40.15				
4	157°52.17	241°42.38	42.92	236°21.15	53.50	44°21.40	54.88	160°37.85	40.09				
5	172°54.63	256°41.41	42.88	251°21.53	53.37	59°24.21	54.93	175°40.19	40.03				
6	187°57.10	271°40.43	S23°42.84	266°21.91	S23°53.23	74°27.01	N21°54.99	190°42.53	S03°39.97				
7	202°59.56	286°39.46	42.80	281°22.29	53.09	89°29.81	55.05	205°44.88	39.91				
8	218°2.03	301°38.49	42.76	296°22.67	52.96	104°32.61	55.11	220°47.22	39.84				
9	233°4.49	316°37.52	· · 42.71	311°23.05	· · 52.82	119°35.42	· · 55.16	235°49.56	· · 39.78				
10	248°6.95	331°36.54	42.67	326°23.43	52.68	134°38.22	55.22	250°51.91	39.72				
11	263°9.42	346°35.57	42.62	341°23.81	52.54	149°41.02	55.28	265°54.25	39.66				
12	278°11.88	1°34.60	S23°42.57	356°24.19	S23°52.40	164°43.83	N21°55.33	280°56.59	S03°39.60				
13	293°14.35	16°33.62	42.52	11°24.57	52.26	179°46.63	55.39	295°58.93	39.54				
14	308°16.81	31°32.65	42.47	26°24.95	52.12	194°49.44	55.45	311°1.28	39.47				
15	323°19.27	46°31.68	· · 42.42	41°25.33	· · 51.98	209°52.24	· · 55.50	326°3.62	· · 39.41				
16	338°21.74	61°30.70	42.37	56°25.71	51.84	224°55.04	55.56	341°5.96	39.35				
17	353°24.20	76°29.73	42.31	71°26.08	51.70	239°57.85	55.62	356°8.30	39.29				
18	8°26.67	91°28.76	S23°42.26	86°26.46	S23°51.56	255°0.65	N21°55.67	11°10.65	S03°39.23				
19	23°29.13	106°27.79	42.20	101°26.84	51.41	270°3.46	55.73	26°12.99	39.16				
20	38°31.60	121°26.81	42.14	116°27.22	51.27	285°6.26	55.79	41°15.33	39.10				
21	53°34.06	136°25.84	· · 42.08	131°27.60	· · 51.13	300°9.07	· · 55.84	56°17.67	· · 39.04				
22	68°36.52	151°24.87	42.02	146°27.98	50.98	315°11.87	55.90	71°20.01	38.98				
23	83°38.99	166°23.89	41.96	161°28.36	50.84	330°14.68	55.96	86°22.35	38.92				
Mer.pass. 17:26		ν-1.0' d-0.0' m-3.90		ν0.4' d-0.1' m1.14		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.00					

Alpheratz	357°33.97	29°14.22
Ankaa	353°6.34	-42°10.09
Schedar	349°30.08	56°41.11

h	Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d HP
0	179°46.26	S23°19.49		100°21.01	13.9'	S00°38.02	-15.9' 57.6'
1	194°45.95	19.39		114°53.95	13.9'	00°22.13	-15.9' 57.6'
2	209°45.64	19.28		129°26.86	13.9'	S00°6.23	-15.9' 57.7'
3	224°45.33	· · 19.17		143°59.74	13.8'	N00°9.69	15.9' 57.7'
4	239°45.03	19.07		158°32.59	13.8'	00°25.63	16.0' 57.7'
5	254°44.72	18.96		173°5.41	13.8'	00°41.58	16.0' 57.8'
6	269°44.41	S23°18.85		187°38.19	13.7'	N00°57.54	16.0' 57.8'
7	284°44.10	18.74		202°10.94	13.7'	01°13.52	16.0' 57.8'
8	299°43.80	18.62		216°43.65	13.7'	01°29.51	16.0' 57.9'
9	314°43.49	· · 18.51		231°16.33	13.6'	01°45.50	16.0' 57.9'
10	329°43.18	18.40		245°48.97	13.6'	02°1.51	16.0' 57.9'
11	344°42.88	18.29		260°21.56	13.6'	02°17.52	16.0' 57.9'
12	359°42.57	S23°18.17		274°54.12	13.5'	N02°33.54	16.0' 58.0'
13	14°42.26	18.06		289°26.63	13.5'	02°49.56	16.0' 58.0'
14	29°41.96	17.94		303°59.10	13.4'	03°5.59	16.0' 58.0'
15	44°41.65	· · 17.82		318°31.52	13.4'	03°21.62	16.0' 58.1'
16	59°41.34	17.70		333°3.89	13.3'	03°37.65	16.0' 58.1'
17	74°41.04	17.59		347°36.22	13.3'	03°53.68	16.0' 58.1'
18	89°40.73	S23°17.47		2°8.49	13.2'	N04°9.71	16.0' 58.2'
19	104°40.43	17.35		16°40.72	13.2'	04°25.73	16.0' 58.2'
20	119°40.12	17.22		31°12.89	13.1'	04°41.76	16.0' 58.2'
21	134°39.81	· · 17.10		45°45.00	13.1'	04°57.77	16.0' 58.2'
22	149°39.51	16.98		60°17.06	13.0'	05°13.78	16.0' 58.3'
23	164°39.20	16.86		74°49.06	12.9'	05°29.79	16.0' 58.3'
SD = 16.3'			$d = -0.1'$				
			SD = 15.7'				

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	179°38.90	S23°16.73		89°21.00	12.9'	N05°45.78	16.0' 58.3'
1	194°38.59	16.61		103°52.88	12.8'	06°1.76	16.0' 58.4'
2	209°38.29	16.48		118°24.70	12.8'	06°17.74	16.0' 58.4'
3	224°37.98	· · 16.35		132°56.45	12.7'	06°33.70	15.9' 58.4'
4	239°37.68	16.23		147°28.14	12.6'	06°49.64	15.9' 58.5'
5	254°37.37	16.10		161°59.76	12.6'	07°5.57	15.9' 58.5'
6	269°37.07	S23°15.97		176°31.32	12.5'	N07°21.48	15.9' 58.5'
7	284°36.76	15.84		191°2.80	12.4'	07°37.37	15.9' 58.6'
8	299°36.46	15.71		205°34.22	12.3'	07°53.25	15.9' 58.6'
9	314°36.15	· · 15.57		220°5.56	12.3'	08°9.10	15.8' 58.6'
10	329°35.85	15.44		234°36.82	12.2'	08°24.93	15.8' 58.6'
11	344°35.54	15.31		249°8.02	12.1'	08°40.73	15.8' 58.7'
12	359°35.24	S23°15.17		263°39.13	12.0'	N08°56.51	15.8' 58.7'
13	14°34.93	15.04		278°10.17	12.0'	09°12.26	15.7' 58.7'
14	29°34.63	14.90		292°41.12	11.9'	09°27.98	15.7' 58.8'
15	44°34.32	· · 14.77		307°12.00	11.8'	09°43.67	15.7' 58.8'
16	59°34.02	14.63		321°42.79	11.7'	09°59.33	15.6' 58.8'
17	74°33.72	14.49		336°13.50	11.6'	10°14.95	15.6' 58.9'
18	89°33.41	S23°14.35		350°44.12	11.5'	N10°30.54	15.6' 58.9'
19	104°33.11	14.21		5°14.65	11.4'	10°46.10	15.5' 58.9'
20	119°32.80	14.07		19°45.10	11.4'	11°1.61	15.5' 58.9'
21	134°32.50	· · 13.93		34°15.46	11.3'	11°17.09	15.4' 59.0'
22	149°32.20	13.79		48°45.72	11.2'	11°32.52	15.4' 59.0'
23	164°31.89	13.65		63°15.90	11.1'	11°47.91	15.3' 59.0'
SD = 16.3'			$d = -0.1'$				
			SD = 15.9'				

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	179°31.59	S23°13.50		77°45.97	11.0'	N12°3.26	15.3' 59.1'
1	194°31.29	13.36		92°15.96	10.9'	12°18.55	15.2' 59.1'
2	209°30.98	13.21		106°45.84	10.8'	12°33.80	15.2' 59.1'
3	224°30.68	· · 13.07		121°15.63	10.7'	12°49.00	15.1' 59.2'
4	239°30.38	12.92		135°45.32	10.6'	13°4.15	15.1' 59.2'
5	254°30.07	12.77		150°14.91	10.5'	13°19.25	15.0' 59.2'
6	269°29.77	S23°12.62		164°44.39	10.4'	N13°34.29	15.0' 59.2'
7	284°29.47	12.47		179°13.77	10.3'	13°49.27	14.9' 59.3'
8	299°29.17	12.32		193°43.05	10.2'	14°4.19	14.9' 59.3'
9	314°28.86	· · 12.17		208°12.22	10.1'	14°19.05	14.8' 59.3'
10	329°28.56	12.02		222°41.28	10.0'	14°33.85	14.7' 59.4'
11	344°28.26	11.87		237°10.24	9.8'	14°48.59	14.7' 59.4'
12	359°27.96	S23°11.71		251°39.08	9.7'	N15°3.26	14.6' 59.4'
13	14°27.66	11.56		266°7.82	9.6'	15°17.86	14.5' 59.4'
14	29°27.35	11.40		280°36.44	9.5'	15°32.39	14.5' 59.5'
15	44°27.05	· · 11.25		295°4.95	9.4'	15°46.85	14.4' 59.5'
16	59°26.75	11.09		309°33.34	9.3'	16°1.23	14.3' 59.5'
17	74°26.45	10.93		324°1.62	9.2'	16°15.54	14.2' 59.5'
18	89°26.15	S23°10.78		338°29.79	9.0'	N16°29.77	14.2' 59.6'
19	104°25.85	10.62		352°57.83	8.9'	16°43.92	14.1' 59.6'
20	119°25.54	10.46		7°25.76	8.8'	16°57.99	14.0' 59.6'
21	134°25.24	· · 10.30		21°53.56	8.7'	17°11.97	13.9' 59.7'
22	149°24.94	10.13		36°21.25	8.6'	17°25.87	13.8' 59.7'
23	164°24.64	9.97		50°48.82	8.4'	17°39.68	13.7' 59.7'
SD = 16.3'			$d = -0.1'$				
			SD = 16.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:26	10:52	■	■	13:11	15:37
N 70°	08:07	09:54	■	■	14:10	15:57
68°	07:51	09:20	■	■	14:44	16:12
66°	07:38	08:55	10:33	13:30	15:09	16:25
64°	07:27	08:35	09:52	14:11	15:28	16:36
62°	07:18	08:20	09:25	14:39	15:44	16:46
60°	07:09	08:06	09:03	15:00	15:57	16:54
N 58°	07:02	07:55	08:46	15:17	16:09	17:01
56°	06:55	07:44	08:32	15:32	16:19	17:08
54°	06:49	07:35	08:19	15:44	16:28	17:14
52°	06:44	07:27	08:08	15:55	16:36	17:20
50°	06:38	07:20	07:58	16:05	16:43	17:25
45°	06:27	07:04	07:38	16:26	16:59	17:37
N 40°	06:17	06:51	07:21	16:42	17:13	17:47
35°	06:07	06:39	07:07	16:56	17:24	17:56
30°	05:59	06:28	06:55	17:09	17:35	18:05
20°	05:42	06:10	06:34	17:30	17:54	18:21
N 10°	05:26	05:52	06:15	17:48	18:11	18:37
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	04:50	05:17	05:40	18:23	18:46	19:13
20°	04:28	04:57	05:22	18:42	19:06	19:35
30°	03:59	04:32	05:00	19:04	19:31	20:04
35°	03:40	04:17	04:47	19:16	19:46	20:23
40°	03:17	03:59	04:32	19:31	20:04	20:46
45°	02:47	03:37	04:14	19:49	20:26	21:16
S 50°	02:02	03:07	03:52	20:12	20:56	22:01
52°	01:35	02:52	03:41	20:22	21:11	22:28
54°	00:51	02:34	03:29	20:34	21:28	23:11
56°	////	02:12	03:14	20:48	21:50	////
58°	////	01:43	02:58	21:05	22:19	////
S 60°	////	00:55	02:38	21:25	23:06	////

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	11:12	10:34	09:41	· · ·	01:20	03:56
N 70°	11:15	10:46	10:09	· · ·	01:11	03:30
68°	11:17	10:56	10:31	· · ·	01:04	03:11
66°	11:19	11:05	10:48	· · ·	00:58	02:56
64°	11:21	11:12	11:02	· · ·	00:53	02:43
62°	11:22	11:18	11:14	· · ·	00:48	02:33
60°	11:24	11:23	11:24	· · ·	00:45	02:24
N 58°	11:25	11:28	11:33	· · ·	00:41	02:16
56°	11:26	11:32	11:40	· · ·	00:38	02:10
54°	11:27	11:36	11:48	· · ·	00:36	02:04
52°	11:28	11:40	11:54	· · ·	00:33	01:58
50°	11:29	11:43	12:00	· · ·	00:31	01:53
45°	11:31	11:50	12:12	· · ·	00:26	01:43
N 40°	11:32	11:56	12:23	· · ·	00:22	01:34
35°	11:33	12:01	12:31	· · ·	00:19	01:27
30°	11:35	12:05	12:39	· · ·	00:16	01:20
20°	11:37	12:13	12:53	· · ·	00:11	01:09
N 10°	11:39	12:20	13:05	· · ·	00:06	00:59
0°	11:40	12:27	13:17	· · ·	00:02	00:50
S 10°	11:42	12:34	13:28	23:58	· · ·	00:41
20°	11:44	12:41	13:41	23:53	· · ·	00:31
30°	11:46	12:49	13:55	23:48	· · ·	00:20
35°	11:48	12:54	14:03	23:45	· · ·	00:14
40°	11:49	12:59	14:13	23:42	· · ·	00:07
45°	11:51	13:06	14:24	23:38	23:59	· · ·
S 50°	11:53	13:14	14:38	23:34	23:49	· · ·
52°	11:54	13:17	14:45	23:32	23:44	· · ·
54°	11:55	13:21	14:52	23:29	23:39	23:52
56°	11:56	13:26	15:00	23:27	23:34	23:43
58°	11:58	13:30	15:09	23:24	23:28	23:33
S 60°	11:59	13:36	15:20	23:21	23:21	23:21

December 30, 31, 01 UT (Tue., Wed., Thu.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	98°41.45	181°22.92	S23°41.89	176°28.74	S23°50.70	345°17.48	N21°56.01	101°24.69	S03°38.85			Alpheratz	357°33.98 29°14.22
1	113°43.92	196°21.95	41.83	191°29.12	50.55	0°20.29	56.07	116°27.03	38.79			Ankaa	353°6.36 -42°10.09
2	128°46.38	211°20.98	41.76	206°29.50	50.40	15°23.09	56.13	131°29.37	38.73			Schedar	349°30.10 56°41.10
3	143°48.84	226°20.01	· · 41.70	221°29.88	· · 50.26	30°25.90	· · 56.19	146°31.71	· · 38.67			Diphda	348°46.47 -17°50.73
4	158°51.31	241°19.03	41.63	236°30.26	50.11	45°28.70	56.24	161°34.05	38.60			Achernar	335°19.40 -57°6.53
5	173°53.77	256°18.06	41.56	251°30.64	49.96	60°31.51	56.30	176°36.39	38.54			Hamal	327°50.13 23°35.26
6	188°56.24	271°17.09	S23°41.49	266°31.02	S23°49.82	75°34.32	N21°56.36	191°38.73	S03°38.48			Polaris	313°17.40 89°22.68
7	203°58.70	286°16.12	41.41	281°31.40	49.67	90°37.12	56.41	206°41.07	38.41			Acamar	315°10.89 -40°12.17
8	219°1.17	301°15.15	41.34	296°31.78	49.52	105°39.93	56.47	221°43.41	38.35			Menkar	314°5.09 4°11.53
9	234°3.63	316°14.17	· · 41.26	311°32.15	· · 49.37	120°42.73	· · 56.53	236°45.75	· · 38.29			Mirfak	308°26.73 49°57.39
10	249°6.09	331°13.20	41.19	326°32.53	49.22	135°45.54	56.58	251°48.09	38.23			Aldebaran	290°38.38 16°33.73
11	264°8.56	346°12.23	41.11	341°32.91	49.07	150°48.35	56.64	266°50.43	38.16			Rigel	281°2.76 -8°10.31
12	279°11.02	1°11.26	S23°41.03	356°33.29	S23°48.92	165°51.15	N21°56.70	281°52.77	S03°38.10			Capella	280°20.22 46°1.50
13	294°13.49	16°10.29	40.95	11°33.67	48.77	180°53.96	56.75	296°55.11	38.04			Bellatrix	278°21.68 6°22.39
14	309°15.95	31°9.32	40.87	26°34.05	48.62	195°56.77	56.81	311°57.45	37.97			Elnath	278°0.47 28°37.78
15	324°18.41	46°8.34	· · 40.79	41°34.43	· · 48.47	210°59.58	· · 56.87	326°59.79	· · 37.91			Alnilam	275°36.58 -1°11.13
16	339°20.88	61°7.37	40.70	56°34.81	48.32	226°2.38	56.92	342°2.13	37.85			Betelgeuse	270°50.87 7°24.70
17	354°23.34	76°6.40	40.62	71°35.19	48.16	241°5.19	56.98	357°4.46	37.78			Canopus	263°51.47 -52°42.54
18	9°25.81	91°5.43	S23°40.53	86°35.57	S23°48.01	256°8.00	N21°57.04	12°6.80	S03°37.72			Sirius	258°25.17 -16°45.11
19	24°28.27	106°4.46	40.44	101°35.95	47.86	271°10.80	57.10	27°9.14	37.66			Adhara	255°4.84 -29°0.42
20	39°30.74	121°3.49	40.36	116°36.33	47.70	286°13.61	57.15	42°11.48	37.59			Procyon	244°49.66 5°9.46
21	54°33.20	136°2.52	· · 40.26	131°36.71	· · 47.55	301°16.42	· · 57.21	57°13.82	· · 37.53			Pollux	243°15.95 27°57.71
22	69°35.66	151°1.55	40.17	146°37.09	47.39	316°19.23	57.27	72°16.15	37.46			Avior	234°13.82 -59°35.41
23	84°38.13	166°0.58	40.08	161°37.47	47.24	331°22.04	57.32	87°18.49	37.40			Suhail	222°45.35 -43°32.11
Mer.pass. 17:22		ν-1.0' d-0.1' m-3.90		ν0.4' d-0.1' m1.14		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.00					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	99°40.59	180°59.61	S23°39.99	176°37.85	S23°47.08	346°24.84	N21°57.38	102°20.83	S03°37.34				
1	114°43.06	195°58.64	39.89	191°38.23	46.93	1°27.65	57.44	117°23.16	37.27				
2	129°45.52	210°57.67	39.79	206°38.60	46.77	16°30.46	57.49	132°25.50	37.21				
3	144°47.98	225°56.70	· · 39.70	221°38.98	· · 46.61	31°33.27	· · 57.55	147°27.84	· · 37.14				
4	159°50.45	240°55.73	39.60	236°39.36	46.45	46°36.08	57.61	162°30.17	37.08				
5	174°52.91	255°54.76	39.50	251°39.74	46.30	61°38.89	57.67	177°32.51	37.02				
6	189°55.38	270°53.79	S23°39.39	266°40.12	S23°46.14	76°41.70	N21°57.72	192°34.85	S03°36.95				
7	204°57.84	285°52.82	39.29	281°40.50	45.98	91°44.50	57.78	207°37.18	36.89				
8	220°0.31	300°51.85	39.19	296°40.88	45.82	106°47.31	57.84	222°39.52	36.82				
9	235°2.77	315°50.88	· · 39.08	311°41.26	· · 45.66	121°50.12	· · 57.89	237°41.86	· · 36.76				
10	250°5.23	330°49.91	38.97	326°41.64	45.50	136°52.93	57.95	252°44.19	36.69				
11	265°7.70	345°48.94	38.87	341°42.02	45.34	151°55.74	58.01	267°46.53	36.63				
12	280°10.16	0°47.97	S23°38.76	356°42.40	S23°45.17	166°58.55	N21°58.06	282°48.86	S03°36.56				
13	295°12.63	15°47.00	38.65	11°42.78	45.01	182°1.36	58.12	297°51.20	36.50				
14	310°15.09	30°46.03	38.53	26°43.16	44.85	197°4.17	58.18	312°53.53	36.44				
15	325°17.56	45°45.06	· · 38.42	41°43.54	· · 44.69	212°6.98	· · 58.24	327°55.87	· · 36.37				
16	340°20.02	60°44.09	38.31	56°43.92	44.52	227°9.79	58.29	342°58.20	36.31				
17	355°22.48	75°43.12	38.19	71°44.30	44.36	242°12.60	58.35	358°0.54	36.24				
18	10°24.95	90°42.15	S23°38.07	86°44.68	S23°44.20	257°15.41	N21°58.41	13°2.87	S03°36.18				
19	25°27.41	105°41.19	37.96	101°45.06	44.03	272°18.22	58.46	28°5.21	36.11				
20	40°29.88	120°40.22	37.84	116°45.44	43.87	287°21.03	58.52	43°7.54	36.05				
21	55°32.34	135°39.25	· · 37.71	131°45.82	· · 43.70	302°23.84	· · 58.58	58°9.87	· · 35.98				
22	70°34.80	150°38.28	37.59	146°46.20	43.53	317°26.65	58.63	73°12.21	35.91				
23	85°37.27	165°37.31	37.47	161°46.58	43.37	332°29.46	58.69	88°14.54	35.85				
Mer.pass. 17:18		ν-1.0' d-0.1' m-3.90		ν0.4' d-0.2' m1.13		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.00					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	100°39.73	180°36.35	S23°37.34	176°46.96	S23°43.20	347°32.27	N21°58.75	103°16.88	S03°35.78				
1	115°42.20	195°35.38	37.22	191°47.34	43.03	2°35.08	58.81	118°19.21	35.72				
2	130°44.66	210°34.41	37.09	206°47.72	42.86	17°37.90	58.86	133°21.54	35.65				
3	145°47.13	225°33.44	· · 36.96	221°48.10	· · 42.70	32°40.71	· · 58.92	148°23.88	· · 35.59				
4	160°49.59	240°32.47	36.83	236°48.47	42.53	47°43.52	58.98	163°26.21	35.52				
5	175°52.05	255°31.51	36.70	251°48.85	42.36	62°46.33	59.03	178°28.54	35.46				
6	190°54.52	270°30.54	S23°36.57	266°49.23	S23°42.19	77°49.14	N21°59.09	193°30.87	S03°35.39				
7	205°56.98	285°29.57	36.44	281°49.61	42.02	92°51.95	59.15	208°33.21	35.32				
8	220°59.45	300°28.61	36.30	296°49.99	41.85	107°54.76	59.20	223°35.54	35.26				
9	236°1.91	315°27.64	· · 36.16	311°50.37	· · 41.68	122°57.58	· · 59.26	238°37.87	· · 35.19				
10	251°4.38	330°26.67	36.03	326°50.75	41.50	138°0.39	59.32	253°40.20	35.13				
11	266°6.84	345°25.71	35.89	341°51.13	41.33	153°3.20	59.38	268°42.54	35.06				
12	281°9.30	0°24.74	S23°35.75	356°51.51	S23°41.16	168°6.01	N21°59.43	283°44.87	S03°34.99				
13	296°11.77	15°23.77	35.61	11°51.89	40.99	183°8.82	59.49	298°47.20	34.93				
14	311°14.23	30°22.81	35.46	26°52.27	40.81	198°11.64	59.55	313°49.53	34.86				
15	326°16.70	45°21.84	· · 35.32	41°52.65	· · 40.64	213°14.45	· · 59.60	328°51.86	· · 34.79				
16	341°19.16	60°20.87	35.18	56°53.03	40.46	228°17.26	59.66	343°54.19	34.73				
17	356°21.63	75°19.91	35.03	71°53.41	40.29	243°20.07	59.72	358°56.52	34.66				

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		179°24.34	S23°9.81	65°16.26	8.3'	N17°53.41	13.6' 59.7'
1		194°24.04	9.64	79°43.58	8.2'	18°7.03	13.5' 59.8'
2		209°23.74	9.48	94°10.78	8.1'	18°20.57	13.4' 59.8'
3		224°23.44	· · 9.31	108°37.85	7.9'	18°34.01	13.3' 59.8'
4		239°23.14	9.15	123°4.79	7.8'	18°47.35	13.2' 59.8'
5		254°22.84	8.98	137°31.61	7.7'	19°0.59	13.1' 59.9'
6		269°22.54	S23°8.81	151°58.31	7.6'	N19°13.73	13.0' 59.9'
7		284°22.24	8.64	166°24.87	7.4'	19°26.76	12.9' 59.9'
8		299°21.94	8.47	180°51.31	7.3'	19°39.69	12.8' 59.9'
9		314°21.64	· · 8.30	195°17.62	7.2'	19°52.50	12.7' 60.0'
10		329°21.34	8.13	209°43.80	7.1'	20°5.21	12.6' 60.0'
11		344°21.04	7.96	224°9.85	6.9'	20°17.80	12.5' 60.0'
12		359°20.74	S23°7.79	238°35.78	6.8'	N20°30.28	12.4' 60.0'
13		14°20.44	7.61	253°1.57	6.7'	20°42.64	12.2' 60.1'
14		29°20.14	7.44	267°27.23	6.5'	20°54.88	12.1' 60.1'
15		44°19.84	· · 7.26	281°52.76	6.4'	21°7.00	12.0' 60.1'
16		59°19.55	7.09	296°18.16	6.3'	21°18.99	11.9' 60.1'
17		74°19.25	6.91	310°43.43	6.1'	21°30.86	11.7' 60.1'
18		89°18.95	S23°6.73	325°8.57	6.0'	N21°42.60	11.6' 60.2'
19		104°18.65	6.56	339°33.58	5.9'	21°54.20	11.5' 60.2'
20		119°18.35	6.38	353°58.46	5.7'	22°5.68	11.3' 60.2'
21		134°18.05	· · 6.20	8°23.21	5.6'	22°17.02	11.2' 60.2'
22		149°17.75	6.02	22°47.83	5.5'	22°28.22	11.1' 60.3'
23		164°17.46	5.83	37°12.32	5.4'	22°39.28	10.9' 60.3'
		SD = 16.3' $d = -0.2'$		SD = 16.3'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		179°17.16	S23°5.65	51°36.67	5.2'	N22°50.20	10.8' 60.3'
1		194°16.86	5.47	66°0.90	5.1'	23°0.98	10.6' 60.3'
2		209°16.56	5.28	80°25.00	5.0'	23°11.61	10.5' 60.3'
3		224°16.27	· · 5.10	94°48.97	4.8'	23°22.09	10.3' 60.3'
4		239°15.97	4.91	109°12.82	4.7'	23°32.43	10.2' 60.4'
5		254°15.67	4.73	123°36.54	4.6'	23°42.60	10.0' 60.4'
6		269°15.37	S23°4.54	138°0.13	4.5'	N23°52.63	9.9' 60.4'
7		284°15.08	4.35	152°23.59	4.3'	24°2.50	9.7' 60.4'
8		299°14.78	4.16	166°46.93	4.2'	24°12.20	9.5' 60.4'
9		314°14.48	· · 3.97	181°10.15	4.1'	24°21.75	9.4' 60.5'
10		329°14.19	3.78	195°33.25	4.0'	24°31.13	9.2' 60.5'
11		344°13.89	3.59	209°56.22	3.9'	24°40.35	9.1' 60.5'
12		359°13.60	S23°3.40	224°19.08	3.7'	N24°49.40	8.9' 60.5'
13		14°13.30	3.21	238°41.81	3.6'	24°58.28	8.7' 60.5'
14		29°13.00	3.01	253°4.43	3.5'	25°6.99	8.5' 60.5'
15		44°12.71	· · 2.82	267°26.93	3.4'	25°15.53	8.4' 60.5'
16		59°12.41	2.62	281°49.32	3.3'	25°23.89	8.2' 60.6'
17		74°12.12	2.43	296°11.60	3.2'	25°32.07	8.0' 60.6'
18		89°11.82	S23°2.23	310°33.76	3.1'	N25°40.08	7.8' 60.6'
19		104°11.53	2.03	324°55.82	2.9'	25°47.90	7.6' 60.6'
20		119°11.23	1.84	339°17.76	2.8'	25°55.54	7.5' 60.6'
21		134°10.93	· · 1.64	353°39.60	2.7'	26°2.99	7.3' 60.6'
22		149°10.64	1.44	8°1.34	2.6'	26°10.26	7.1' 60.6'
23		164°10.35	1.24	22°22.98	2.5'	26°17.33	6.9' 60.6'
		SD = 16.3' $d = -0.2'$		SD = 16.4'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		179°10.05	S23°1.03	36°44.52	2.4'	N26°24.22	6.7' 60.7'
1		194°9.76	0.83	51°5.95	2.3'	26°30.92	6.5' 60.7'
2		209°9.46	0.63	65°27.30	2.3'	26°37.42	6.3' 60.7'
3		224°9.17	· · 0.43	79°48.55	2.2'	26°43.73	6.1' 60.7'
4		239°8.87	0.22	94°9.72	2.1'	26°49.84	5.9' 60.7'
5		254°8.58	23°0.02	108°30.79	2.0'	26°55.75	5.7' 60.7'
6		269°8.29	S22°59.81	122°51.78	1.9'	N27°1.46	5.5' 60.7'
7		284°7.99	59.60	137°12.69	1.8'	27°6.97	5.3' 60.7'
8		299°7.70	59.39	151°33.52	1.8'	27°12.27	5.1' 60.7'
9		314°7.41	· · 59.19	165°54.27	1.7'	27°17.37	4.9' 60.7'
10		329°7.11	58.98	180°14.95	1.6'	27°22.27	4.7' 60.7'
11		344°6.82	58.77	194°35.55	1.5'	27°26.96	4.5' 60.7'
12		359°6.53	S22°58.55	208°56.09	1.5'	N27°31.44	4.3' 60.7'
13		14°6.23	58.34	223°16.57	1.4'	27°35.71	4.1' 60.8'
14		29°5.94	58.13	237°36.98	1.4'	27°39.77	3.9' 60.8'
15		44°5.65	· · 57.92	251°57.34	1.3'	27°43.63	3.6' 60.8'
16		59°5.36	57.70	266°17.64	1.2'	27°47.26	3.4' 60.8'
17		74°5.06	57.49	280°37.88	1.2'	27°50.69	3.2' 60.8'
18		89°4.77	S22°57.27	294°58.08	1.2'	N27°53.90	3.0' 60.8'
19		104°4.48	57.05	309°18.23	1.1'	27°56.89	2.8' 60.8'
20		119°4.19	56.84	323°38.35	1.1'	27°59.67	2.6' 60.8'
21		134°3.90	· · 56.62	337°58.42	1.0'	28°2.23	2.3' 60.8'
22		149°3.61	56.40	352°18.46	1.0'	28°4.58	2.1' 60.8'
23		164°3.31	56.18	6°38.46	1.0'	28°6.71	1.9' 60.8'
		SD = 16.3' $d = -0.2'$		SD = 16.5'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:25	10:45	■	■	13:21	15:42
N 70°	08:06	09:51	■	■	14:16	16:01
68°	07:50	09:18	■	■	14:49	16:16
66°	07:38	08:54	10:29	13:37	15:13	16:29
64°	07:27	08:35	09:50	14:16	15:32	16:40
62°	07:18	08:19	09:23	14:43	15:47	16:49
60°	07:09	08:06	09:03	15:04	16:01	16:57
N 58°	07:02	07:54	08:46	15:21	16:12	17:04
56°	06:56	07:44	08:31	15:35	16:22	17:11
54°	06:50	07:36	08:19	15:47	16:31	17:17
52°	06:44	07:28	08:08	15:58	16:39	17:22
50°	06:39	07:20	07:59	16:08	16:46	17:27
45°	06:27	07:05	07:38	16:28	17:02	17:39
N 40°	06:17	06:51	07:22	16:45	17:15	17:49
35°	06:08	06:40	07:08	16:58	17:27	17:58
30°	06:00	06:29	06:56	17:11	17:37	18:07
20°	05:43	06:11	06:35	17:31	17:55	18:23
N 10°	05:27	05:54	06:17	17:50	18:12	18:39
0°	05:11	05:37	05:59	18:07	18:29	18:55
S 10°	04:52	05:19	05:42	18:24	18:47	19:14
20°	04:30	04:59	05:23	18:43	19:07	19:36
30°	04:01	04:34	05:02	19:04	19:32	20:05
35°	03:43	04:19	04:49	19:17	19:47	20:23
40°	03:20	04:01	04:34	19:32	20:05	20:46
45°	02:50	03:39	04:16	19:50	20:27	21:16
S 50°	02:06	03:10	03:54	20:12	20:56	22:00
52°	01:39	02:55	03:44	20:22	21:10	22:26
54°	00:58	02:38	03:32	20:34	21:28	23:06
56°	////	02:16	03:18	20:48	21:49	////
58°	////	01:48	03:01	21:04	22:17	////
S 60°	////	01:03	02:42	21:24	23:01	////

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	□	□	□	□	□	□
N 70°	08:43	□	□	06:48	□	□
68°	09:47	□	□	05:46	□	□
66°	10:23	□	□	05:11	□	□
64°	10:49	10:25	□	04:46	07:12	□
62°	11:09	11:04	10:58	04:27	06:34	08:53
60°	11:26	11:32	11:50	04:11	06:07	08:02
N 58°	11:40	11:54	12:21	03:58	05:45	07:31
56°	11:52	12:12	12:45	03:47	05:28	07:07
54°	12:03	12:27	13:05	03:37	05:14	06:48
52°	12:13	12:40	13:21	03:28	05:01	06:32
50°	12:21	12:52	13:36	03:20	04:50	06:18
45°	12:40	13:16	14:05	03:03	04:27	05:49
N 40°	12:55	13:35	14:27	02:50	04:08	05:27
35°	13:08	13:52	14:46	02:38	03:53	05:09
30°	13:19	14:06	15:03	02:28	03:40	04:53
20°	13:38	14:30	15:30	02:11	03:17	04:26
N 10°	13:55	14:52	15:54	01:56	02:57	04:03
0°	14:11	15:11	16:16	01:42	02:39	03:42
S 10°	14:27	15:31	16:39	01:28	02:21	03:20
20°	14:45	15:53	17:03	01:13	02:02	02:58
30°	15:05	16:18	17:31	00:57	01:40	02:31
35°	15:17	16:33	17:48	00:47	01:27	02:16
40°	15:31	16:50	18:07	00:36	01:12	01:58
45°	15:47	17:11	18:31	00:23	00:54	01:36
S 50°	16:07	17:38	19:01	00:07	00:32	01:08
52°	16:17	17:51	19:16	00:00	00:22	00:55
54°	16:28	18:05	19:34	· · ·	00:11	00:40
56°	16:40	18:23	19:55	23:57	· · ·	00:22
58°	16:55	18:44	20:23	23:42	· · ·	00:00
S 60°	17:12	19:11	21:01	23:24	23:33	· · ·

Day	Sun		Mer. Pass hh:mm	Moon		Age 10-12 74-91%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
30	02:23	02:37	12:03	20:25	07:56	
31	02:51	03:06	12:03	21:26	08:55	
01	03:20	03:34	12:04	22:32	09:59	