G.M.T.	ARIES	VENUS −3.5		MARS +1.4		JUPITER −2.0		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
7 00	195 10.8	179 02.9	N 5 32.2	180 05.3	N 5 47.1	10 53.2	S 0 07.7	8 59.3	N 0 12.8
01	210 13.2	194 02.5	33.4	195 06.0	47.9	25 55.9	07.6	24 01.9	12.9
02	225 15.7	209 02.1	34.7	210 06.7	48.6	40 58.7	07.5	39 04.6	12.9
03	240 18.1	224 01.7	·· 35.9	225 07.4	·· 49.4	56 01.4	·· 07.4	54 07.2	·· 13.0
04	255 20.6	239 01.3	37.1	240 08.1	50.2	71 04.2	07.2	69 09.8	13.1
05	270 23.1	254 00.9	38.4	255 08.8	50.9	86 06.9	07.1	84 12.5	13.1
06	285 25.5	269 00.5	N 5 39.6	270 09.5	N 5 51.7	101 09.7	S 0 07.0	99 15.1	N 0 13.2
07	300 28.0	284 00.1	40.8	285 10.2	52.4	116 12.4	06.9	114 17.8	13.3
08	315 30.5	298 59.7	42.1	300 10.9	53.2	131 15.1	06.8	129 20.4	13.4
TUESDAY 09	330 32.9	313 59.3	·· 43.3	315 11.6	·· 53.9	146 17.9	·· 06.6	144 23.0	·· 13.4
10	345 35.4	328 58.9	44.5	330 12.3	54.7	161 20.6	06.5	159 25.7	13.5
11	0 37.9	343 58.5	45.7	345 13.0	55.4	176 23.4	06.4	174 28.3	13.6
12	15 40.3	358 58.1	N 5 47.0	0 13.7	N 5 56.2	191 26.1	S 0 06.3	189 30.9	N 0 13.7
13	30 42.8	13 57.7	48.2	15 14.4	57.0	206 28.9	06.2	204 33.6	13.7
14	45 45.2	28 57.3	49.4	30 15.1	57.7	221 31.6	06.0	219 36.2	13.8
15	60 47.7	43 56.9	·· 50.7	45 15.8	·· 58.5	236 34.4	·· 05.9	234 38.9	·· 13.9
16	75 50.2	58 56.5	51.9	60 16.5	5 59.2	251 37.1	05.8	249 41.5	14.0
17	90 52.6	73 56.1	53.1	75 17.2	6 00.0	266 39.9	05.7	264 44.1	14.0
18	105 55.1	88 55.7	N 5 54.3	90 17.9	N 6 00.7	281 42.6	S 0 05.6	279 46.8	N 0 14.1
19	120 57.6	103 55.3	55.6	105 18.6	01.5	296 45.4	05.5	294 49.4	14.2
20	136 00.0	118 54.9	56.8	120 19.3	02.2	311 48.1	05.3	309 52.1	14.2
21	151 02.5	133 54.5	·· 58.0	135 20.0	·· 03.0	326 50.8	·· 05.2	324 54.7	·· 14.3
22	166 05.0	148 54.1	5 59.3	150 20.7	03.7	341 53.6	05.1	339 57.3	14.4
23	181 07.4	163 53.7	6 00.5	165 21.4	04.5	356 56.3	05.0	355 00.0	14.5
8 00	196 09.9	178 53.3	N 6 01.7	180 22.1	N 6 05.2	11 59.1	S 0 04.9	10 02.6	N 0 14.5
01	211 12.4	193 52.9	02.9	195 22.8	06.0	27 01.8	04.7	25 05.2	14.6
02	226 14.8	208 52.5	04.2	210 23.5	06.8	42 04.6	04.6	40 07.9	14.7
03	241 17.3	223 52.2	·· 05.4	225 24.2	·· 07.5	57 07.3	·· 04.5	55 10.5	·· 14.8
04	256 19.7	238 51.8	06.6	240 24.9	08.3	72 10.1	04.4	70 13.1	14.8
05	271 22.2	253 51.4	07.8	255 25.6	09.0	87 12.8	04.3	85 15.8	14.9
06	286 24.7	268 51.0	N 6 09.1	270 26.3	N 6 09.8	102 15.6	S 0 04.1	100 18.4	N 0 15.0
07	301 27.1	283 50.6	10.3	285 27.0	10.5	117 18.3	04.0	115 21.1	15.1
WEDNESDAY 08	316 29.6	298 50.2	11.5	300 27.7	11.3	132 21.0	03.9	130 23.7	15.1
09	331 32.1	313 49.8	·· 12.7	315 28.4	·· 12.0	147 23.8	·· 03.8	145 26.3	·· 15.2
10	346 34.5	328 49.4	14.0	330 29.1	12.8	162 26.5	03.7	160 29.0	15.3
11	1 37.0	343 49.0	15.2	345 29.8	13.5	177 29.3	03.6	175 31.6	15.3
12	16 39.5	358 48.6	N 6 16.4	0 30.5	N 6 14.3	192 32.0	S 0 03.4	190 34.2	N 0 15.4
13	31 41.9	13 48.2	17.6	15 31.2	15.0	207 34.8	03.3	205 36.9	15.5
14	46 44.4	28 47.8	18.9	30 31.8	15.8	222 37.5	03.2	220 39.5	15.6
15	61 46.9	43 47.4	·· 20.1	45 32.5	·· 16.5	237 40.3	·· 03.1	235 42.2	·· 15.6
16	76 49.3	58 47.0	21.3	60 33.2	17.3	252 43.0	03.0	250 44.8	15.7
17	91 51.8	73 46.6	22.5	75 33.9	18.0	267 45.7	02.9	265 47.4	15.8
18	106 54.2	88 46.2	N 6 23.7	90 34.6	N 6 18.8	282 48.5	S 0 02.7	280 50.1	N 0 15.9
19	121 56.7	103 45.7	25.0	105 35.3	19.5	297 51.2	02.6	295 52.7	15.9
20	136 59.2	118 45.3	26.2	120 36.0	20.3	312 54.0	02.5	310 55.3	16.0
21	152 01.6	133 44.9	·· 27.4	135 36.7	·· 21.0	327 56.7	·· 02.4	325 58.0	·· 16.1
22	167 04.1	148 44.5	28.6	150 37.4	21.8	342 59.5	02.3	341 00.6	16.1
23	182 06.6	163 44.1	29.9	165 38.1	22.5	358 02.2	02.1	356 03.2	16.2
9 00	197 09.0	178 43.7	N 6 31.1	180 38.8	N 6 23.3	13 04.9	S 0 02.0	11 05.9	N 0 16.3
01	212 11.5	193 43.3	32.3	195 39.5	24.0	28 07.7	01.9	26 08.5	16.4
02	227 14.0	208 42.9	33.5	210 40.2	24.8	43 10.4	01.8	41 11.2	16.4
03	242 16.4	223 42.5	·· 34.7	225 40.9	·· 25.5	58 13.2	·· 01.7	56 13.8	·· 16.5
04	257 18.9	238 42.1	36.0	240 41.6	26.3	73 15.9	01.6	71 16.4	16.6
05	272 21.3	253 41.7	37.2	255 42.3	27.0	88 18.7	01.4	86 19.1	16.6
06	287 23.8	268 41.3	N 6 38.4	270 43.0	N 6 27.8	103 21.4	S 0 01.3	101 21.7	N 0 16.7
07	302 26.3	283 40.9	39.6	285 43.7	28.5	118 24.1	01.2	116 24.3	16.8
THURSDAY 08	317 28.7	298 40.5	40.8	300 44.4	29.3	133 26.9	01.1	131 27.0	16.9
09	332 31.2	313 40.1	·· 42.1	315 45.1	·· 30.0	148 29.6	·· 01.0	146 29.6	·· 16.9
10	347 33.7	328 39.7	43.3	330 45.8	30.8	163 32.4	00.9	161 32.2	17.0
11	2 36.1	343 39.3	44.5	345 46.5	31.5	178 35.1	00.7	176 34.9	17.1
12	17 38.6	358 38.9	N 6 45.7	0 47.2	N 6 32.3	193 37.8	S 0 00.6	191 37.5	N 0 17.2
13	32 41.1	13 38.5	46.9	15 47.9	33.0	208 40.6	00.5	206 40.2	17.2
14	47 43.5	28 38.1	48.1	30 48.6	33.8	223 43.3	00.4	221 42.8	17.3
15	62 46.0	43 37.7	·· 49.4	45 49.3	·· 34.5	238 46.1	·· 00.3	236 45.4	·· 17.4
16	77 48.5	58 37.3	50.6	60 50.0	35.3	253 48.8	S 0 00.2	251 48.1	17.4
17	92 50.9	73 36.9	51.8	75 50.7	36.0	268 51.5	0 00.0	266 50.7	17.5
18	107 53.4	88 36.5	N 6 53.0	90 51.4	N 6 36.8	283 54.3	N 0 00.1	281 53.3	N 0 17.6
19	122 55.8	103 36.1	54.2	105 52.1	37.5	298 57.0	00.2	296 56.0	17.7
20	137 58.3	118 35.6	55.4	120 52.8	38.3	313 59.8	00.3	311 58.6	17.7
21	153 00.8	133 35.2	·· 56.7	135 53.5	·· 39.0	329 02.5	·· 00.4	327 01.2	·· 17.8
22	168 03.2	148 34.8	57.9	150 54.2	39.8	344 05.3	00.5	342 03.9	17.9
23	183 05.7	163 34.4	59.1	165 54.9	40.5	359 08.0	00.6	357 06.5	17.9
	h m								
er. Pass.	10 53.6	v −0.4	d 1.2	v 0.7	d 0.8	v 2.7	d 0.1	v 2.6	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 23.1
Achernar	335 45.6	S57 20.1
Acrux	173 36.1	S62 59.7
Adhara	255 31.9	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.6	N56 03.7
Alkaid	153 17.7	N49 24.4
Al Na'ir	28 14.8	S47 03.1
Alnilam	276 11.4	S 1 13.0
Alphard	218 20.0	S 8 34.8
Alphecca	126 31.5	N26 46.6
Alpheratz	358 09.3	N28 59.0
Altair	62 32.2	N 8 48.9
Ankaa	353 40.3	S42 24.6
Antares	112 56.2	S26 23.4
Arcturus	146 17.8	N19 16.7
Atria	108 19.8	S68 59.4
Avior	234 27.9	S59 27.3
Bellatrix	278 58.5	N 6 19.8
Betelgeuse	271 28.0	N 7 24.1
Canopus	264 07.2	S52 41.5
Capella	281 11.0	N45 58.8
Deneb	49 48.4	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.6
Dubhe	194 21.1	N61 51.3
Elnath	278 43.9	N28 35.5
Eltanin	90 57.4	N51 29.2
Enif	34 11.4	N 9 47.1
Fomalhaut	15 51.3	S29 43.4
Gacrux	172 27.8	S57 00.5
Gienah	176 17.3	S17 26.3
Hadar	149 22.2	S60 16.9
Hamal	328 28.9	N23 22.2
Kaus Aust.	84 16.3	S34 23.5
Kochab	137 18.0	N74 13.9
Markab	14 03.1	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.6
Miaplacidus	221 44.4	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.7	S26 19.2
Peacock	53 58.0	S56 47.6
Pollux	243 57.7	N28 04.3
Procyon	245 25.4	N 5 16.3
Rasalhague	96 29.1	N12 34.3
Regulus	208 09.4	N12 03.5
Rigel	281 35.8	S 8 13.6
Rigil Kent.	140 24.7	S60 45.3
Sabik	102 40.5	S15 42.1
Schedar	350 09.2	N56 25.9
Shaula	96 55.1	S37 05.3
Sirius	258 55.4	S16 41.7
Spica	158 56.8	S11 03.8
Suhail	223 10.3	S43 21.7
Vega	80 55.5	N38 45.7
Zuben'ubi	137 32.3	S15 57.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	342 43.5	12 05
Mars	344 12.2	11 58
Jupiter	175 49.2	23 08
Saturn	173 52.7	23 16

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
7 00	179 25.8	N 6 42.8	148 33.8	6.7	N12 19.2	10.8	60.9
01	194 25.9	43.7	162 59.5	6.5	12 30.0	10.7	60.9
02	209 26.1	44.6	177 25.0	6.6	12 40.7	10.6	60.9
03	224 26.3	·· 45.6	191 50.6	6.6	12 51.3	10.5	60.9
04	239 26.5	46.5	206 16.2	6.5	13 01.8	10.4	60.9
05	254 26.6	47.5	220 41.7	6.4	13 12.2	10.3	60.9
06	269 26.8	N 6 48.4	235 07.1	6.5	N13 22.5	10.3	60.8
07	284 27.0	49.3	249 32.6	6.4	13 32.8	10.1	60.8
08	299 27.2	50.3	263 58.0	6.4	13 42.9	10.0	60.8
TUESDAY 09	314 27.4	·· 51.2	278 23.4	6.4	13 52.9	9.9	60.8
10	329 27.5	52.2	292 48.8	6.3	14 02.8	9.9	60.8
11	344 27.7	53.1	307 14.1	6.4	14 12.7	9.7	60.7
12	359 27.9	N 6 54.0	321 39.5	6.3	N14 22.4	9.6	60.7
13	14 28.1	55.0	336 04.8	6.2	14 32.0	9.5	60.7
14	29 28.2	55.9	350 30.0	6.3	14 41.5	9.4	60.7
15	44 28.4	·· 56.9	4 55.3	6.2	14 50.9	9.3	60.7
16	59 28.6	57.8	19 20.5	6.2	15 00.2	9.2	60.6
17	74 28.8	58.7	33 45.7	6.1	15 09.4	9.1	60.6
18	89 28.9	N 6 59.7	48 10.8	6.2	N15 18.5	9.0	60.6
19	104 29.1	7 00.6	62 36.0	6.1	15 27.5	8.9	60.6
20	119 29.3	01.5	77 01.1	6.1	15 36.4	8.7	60.5
21	134 29.5	·· 02.5	91 26.2	6.1	15 45.1	8.7	60.5
22	149 29.6	03.4	105 51.3	6.1	15 53.8	8.5	60.5
23	164 29.8	04.4	120 16.4	6.0	16 02.3	8.4	60.5
8 00	179 30.0	N 7 05.3	134 41.4	6.0	N16 10.7	8.3	60.4
01	194 30.2	06.2	149 06.4	6.0	16 19.0	8.2	60.4
02	209 30.3	07.2	163 31.4	6.0	16 27.2	8.0	60.4
03	224 30.5	·· 08.1	177 56.4	6.0	16 35.2	8.0	60.4
04	239 30.7	09.0	192 21.4	5.9	16 43.2	7.8	60.3
05	254 30.8	10.0	206 46.3	6.0	16 51.0	7.7	60.3
06	269 31.0	N 7 10.9	221 11.3	5.9	N16 58.7	7.5	60.3
07	284 31.2	11.8	235 36.2	5.9	17 06.2	7.5	60.3
08	299 31.4	12.8	250 01.1	5.9	17 13.7	7.3	60.2
WEDNESDAY 09	314 31.5	·· 13.7	264 26.0	5.9	17 21.0	7.2	60.2
10	329 31.7	14.7	278 50.9	5.9	17 28.2	7.1	60.2
11	344 31.9	15.6	293 15.8	5.8	17 35.3	7.0	60.2
12	359 32.1	N 7 16.5	307 40.6	5.9	N17 42.3	6.8	60.1
13	14 32.2	17.5	322 05.5	5.8	17 49.1	6.7	60.1
14	29 32.4	18.4	336 30.3	5.9	17 55.8	6.6	60.1
15	44 32.6	·· 19.3	350 55.2	5.8	18 02.4	6.4	60.0
16	59 32.8	20.3	5 20.0	5.8	18 08.8	6.4	60.0
17	74 32.9	21.2	19 44.8	5.8	18 15.2	6.2	60.0
18	89 33.1	N 7 22.1	34 09.6	5.9	N18 21.4	6.0	59.9
19	104 33.3	23.1	48 34.5	5.8	18 27.4	5.9	59.9
20	119 33.4	24.0	62 59.3	5.8	18 33.3	5.8	59.9
21	134 33.6	·· 24.9	77 24.1	5.8	18 39.1	5.7	59.9
22	149 33.8	25.8	91 48.9	5.8	18 44.8	5.6	59.8
23	164 34.0	26.8	106 13.7	5.8	18 50.4	5.4	59.8
9 00	179 34.1	N 7 27.7	120 38.5	5.8	N18 55.8	5.2	59.8
01	194 34.3	28.6	135 03.3	5.8	19 01.0	5.2	59.7
02	209 34.5	29.6	149 28.1	5.9	19 06.2	5.0	59.7
03	224 34.6	·· 30.5	163 53.0	5.8	19 11.2	4.9	59.7
04	239 34.8	31.4	178 17.8	5.8	19 16.1	4.7	59.6
05	254 35.0	32.4	192 42.6	5.8	19 20.8	4.6	59.6
06	269 35.2	N 7 33.3	207 07.4	5.9	N19 25.4	4.5	59.6
07	284 35.3	34.2	221 32.3	5.8	19 29.9	4.3	59.5
THURSDAY 08	299 35.5	35.2	235 57.1	5.9	19 34.2	4.2	59.5
09	314 35.7	·· 36.1	250 22.0	5.9	19 38.4	4.1	59.5
10	329 35.8	37.0	264 46.9	5.9	19 42.5	3.9	59.4
11	344 36.0	37.9	279 11.8	5.9	19 46.4	3.9	59.4
12	359 36.2	N 7 38.9	293 36.7	5.9	N19 50.3	3.6	59.4
13	14 36.4	39.8	308 01.6	5.9	19 53.9	3.5	59.3
14	29 36.5	40.7	322 26.5	6.0	19 57.4	3.4	59.3
15	44 36.7	·· 41.7	336 51.5	6.0	20 00.8	3.3	59.3
16	59 36.9	42.6	351 16.5	5.9	20 04.1	3.1	59.2
17	74 37.0	43.5	5 41.4	6.1	20 07.2	3.0	59.2
18	89 37.2	N 7 44.4	20 06.5	6.0	N20 10.2	2.9	59.2
19	104 37.4	45.4	34 31.5	6.0	20 13.1	2.7	59.1
20	119 37.5	46.3	48 56.5	6.1	20 15.8	2.6	59.1
21	134 37.7	·· 47.2	63 21.6	6.1	20 18.4	2.4	59.1
22	149 37.9	48.1	77 46.7	6.1	20 20.8	2.3	59.0
23	164 38.1	49.1	92 11.8	6.2	20 23.1	2.2	59.0
	S.D. 16.0	d 0.9	S.D. 16.5		16.4		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 56	04 19	05 15	04 44	▭	▭
N 70	01 11	03 19	04 31	05 39	05 31	05 17	▭
68	02 01	03 37	04 40	05 58	06 02	06 12	06 39
66	02 31	03 51	04 48	06 13	06 25	06 45	07 23
64	02 53	04 03	04 54	06 25	06 43	07 10	07 52
62	03 10	04 12	05 00	06 35	06 58	07 29	08 14
60	03 24	04 21	05 05	06 44	07 11	07 45	08 32
N 58	03 36	04 28	05 09	06 52	07 22	07 59	08 47
56	03 46	04 34	05 13	06 59	07 31	08 11	09 00
54	03 54	04 39	05 16	07 06	07 40	08 21	09 11
52	04 02	04 44	05 19	07 11	07 47	08 30	09 21
50	04 08	04 49	05 22	07 17	07 54	08 38	09 30
45	04 22	04 58	05 28	07 28	08 09	08 56	09 49
N 40	04 33	05 06	05 33	07 37	08 21	09 10	10 04
35	04 42	05 12	05 38	07 45	08 32	09 22	10 17
30	04 49	05 17	05 41	07 52	08 41	09 33	10 28
20	05 00	05 26	05 48	08 05	08 57	09 51	10 48
N 10	05 08	05 32	05 53	08 16	09 11	10 07	11 04
0	05 14	05 38	05 59	08 26	09 24	10 22	11 20
S 10	05 18	05 42	06 04	08 36	09 37	10 38	11 36
20	05 21	05 47	06 09	08 47	09 51	10 54	11 53
30	05 23	05 51	06 15	09 00	10 08	11 12	12 13
35	05 23	05 53	06 18	09 08	10 17	11 23	12 24
40	05 23	05 55	06 22	09 16	10 28	11 36	12 37
45	05 23	05 57	06 26	09 26	10 41	11 51	12 53
S 50	05 21	05 59	06 31	09 38	10 57	12 09	13 12
52	05 21	06 00	06 34	09 44	11 04	12 18	13 21
54	05 20	06 01	06 36	09 50	11 12	12 27	13 31
56	05 19	06 02	06 39	09 57	11 22	12 38	13 43
58	05 17	06 03	06 42	10 05	11 32	12 51	13 56
S 60	05 16	06 04	06 46	10 14	11 44	13 05	14 11

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 48	21 13	////	25 18	01 18	▭	▭
N 70	19 36	20 49	23 08	24 32	00 32	02 49	▭
68	19 26	20 30	22 10	24 02	00 02	01 54	03 29
66	19 18	20 16	21 37	23 40	25 21	01 21	02 46
64	19 11	20 04	21 14	23 23	24 57	00 57	02 17
62	19 06	19 54	20 57	23 09	24 38	00 38	01 55
60	19 01	19 45	20 42	22 57	24 23	00 23	01 37
N 58	18 56	19 38	20 30	22 46	24 10	00 10	01 22
56	18 52	19 31	20 20	22 37	23 58	25 09	01 09
54	18 49	19 26	20 11	22 29	23 48	24 58	00 58
52	18 46	19 21	20 04	22 22	23 39	24 48	00 48
50	18 43	19 16	19 57	22 16	23 31	24 39	00 39
45	18 36	19 07	19 43	22 02	23 15	24 21	00 21
N 40	18 31	18 59	19 32	21 50	23 01	24 06	00 06
35	18 27	18 52	19 23	21 41	22 49	23 53	24 51
30	18 23	18 47	19 16	21 32	22 39	23 42	24 40
20	18 16	18 38	19 05	21 18	22 21	23 23	24 20
N 10	18 10	18 32	18 56	21 05	22 06	23 06	24 03
0	18 05	18 26	18 50	20 53	21 52	22 50	23 47
S 10	18 00	18 21	18 46	20 41	21 37	22 35	23 32
20	17 55	18 17	18 42	20 29	21 22	22 18	23 15
30	17 49	18 13	18 40	20 14	21 05	21 59	22 55
35	17 45	18 11	18 40	20 06	20 55	21 47	22 44
40	17 41	18 08	18 40	19 57	20 43	21 35	22 31
45	17 37	18 06	18 40	19 46	20 30	21 19	22 15
S 50	17 32	18 04	18 41	19 32	20 13	21 01	21 56
52	17 29	18 03	18 42	19 26	20 05	20 52	21 47
54	17 27	18 02	18 43	19 19	19 57	20 42	21 37
56	17 24	18 01	18 44	19 12	19 47	20 31	21 25
58	17 21	18 00	18 45	19 03	19 36	20 18	21 12
S 60	17 17	17 59	18 47	18 53	19 23	20 04	20 57

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	02 17	02 09	12 02	14 40	02 11	03	◐
8	02 00	01 52	12 02	15 38	03 09	04	
9	01 44	01 36	12 02	16 36	04 07	05	

G.M.T.		ARIES	VENUS −3.5		MARS +1.4		JUPITER −2.0		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
10	00	198 08.2	178 34.0	N 7 00.3	180 55.6	N 6 41.3	14 10.7	N 0 00.8	12 09.1	N 0 18.0
	01	213 10.6	193 33.6	01.5	195 56.3	42.0	29 13.5	00.9	27 11.8	18.1
	02	228 13.1	208 33.2	02.7	210 57.0	42.7	44 16.2	01.0	42 14.4	18.2
	03	243 15.6	223 32.8	·· 03.9	225 57.7	·· 43.5	59 19.0	·· 01.1	57 17.0	·· 18.2
	04	258 18.0	238 32.4	05.2	240 58.4	44.2	74 21.7	01.2	72 19.7	18.3
	05	273 20.5	253 32.0	06.4	255 59.1	45.0	89 24.4	01.3	87 22.3	18.4
	06	288 23.0	268 31.6	N 7 07.6	270 59.8	N 6 45.7	104 27.2	N 0 01.5	102 24.9	N 0 18.4
	07	303 25.4	283 31.2	08.8	286 00.5	46.5	119 29.9	01.6	117 27.6	18.5
	08	318 27.9	298 30.8	10.0	301 01.1	47.2	134 32.6	01.7	132 30.2	18.6
I	09	333 30.3	313 30.3	·· 11.2	316 01.8	·· 48.0	149 35.4	·· 01.8	147 32.9	·· 18.7
R	10	348 32.8	328 29.9	12.4	331 02.5	48.7	164 38.1	01.9	162 35.5	18.7
I	11	3 35.3	343 29.5	13.6	346 03.2	49.5	179 40.9	02.0	177 38.1	18.8
D	12	18 37.7	358 29.1	N 7 14.9	1 03.9	N 6 50.2	194 43.6	N 0 02.1	192 40.8	N 0 18.9
A	13	33 40.2	13 28.7	16.1	16 04.6	51.0	209 46.3	02.3	207 43.4	18.9
Y	14	48 42.7	28 28.3	17.3	31 05.3	51.7	224 49.1	02.4	222 46.0	19.0
	15	63 45.1	43 27.9	·· 18.5	46 06.0	·· 52.4	239 51.8	·· 02.5	237 48.7	·· 19.1
	16	78 47.6	58 27.5	19.7	61 06.7	53.2	254 54.6	02.6	252 51.3	19.2
	17	93 50.1	73 27.1	20.9	76 07.4	53.9	269 57.3	02.7	267 53.9	19.2
	18	108 52.5	88 26.7	N 7 22.1	91 08.1	N 6 54.7	285 00.0	N 0 02.8	282 56.6	N 0 19.3
	19	123 55.0	103 26.2	23.3	106 08.8	55.4	300 02.8	02.9	297 59.2	19.4
	20	138 57.4	118 25.8	24.5	121 09.5	56.2	315 05.5	03.1	313 01.8	19.4
	21	153 59.9	133 25.4	·· 25.7	136 10.2	·· 56.9	330 08.2	·· 03.2	328 04.5	·· 19.5
	22	169 02.4	148 25.0	27.0	151 10.9	57.7	345 11.0	03.3	343 07.1	19.6
	23	184 04.8	163 24.6	28.2	166 11.6	58.4	0 13.7	03.4	358 09.7	19.7
11	00	199 07.3	178 24.2	N 7 29.4	181 12.3	N 6 59.1	15 16.5	N 0 03.5	13 12.4	N 0 19.7
	01	214 09.8	193 23.8	30.6	196 13.0	6 59.9	30 19.2	03.6	28 15.0	19.8
	02	229 12.2	208 23.4	31.8	211 13.7	7 00.6	45 21.9	03.7	43 17.6	19.9
	03	244 14.7	223 22.9	·· 33.0	226 14.4	·· 01.4	60 24.7	·· 03.9	58 20.3	·· 19.9
	04	259 17.2	238 22.5	34.2	241 15.1	02.1	75 27.4	04.0	73 22.9	20.0
	05	274 19.6	253 22.1	35.4	256 15.8	02.9	90 30.1	04.1	88 25.5	20.1
	06	289 22.1	268 21.7	N 7 36.6	271 16.5	N 7 03.6	105 32.9	N 0 04.2	103 28.2	N 0 20.2
	07	304 24.6	283 21.3	37.8	286 17.2	04.3	120 35.6	04.3	118 30.8	20.2
S	08	319 27.0	298 20.9	39.0	301 17.9	05.1	135 38.3	04.4	133 33.4	20.3
A	09	334 29.5	313 20.5	·· 40.2	316 18.6	·· 05.8	150 41.1	·· 04.5	148 36.1	·· 20.4
T	10	349 31.9	328 20.0	41.4	331 19.3	06.6	165 43.8	04.7	163 38.7	20.4
U	11	4 34.4	343 19.6	42.6	346 20.0	07.3	180 46.6	04.8	178 41.3	20.5
R	12	19 36.9	358 19.2	N 7 43.8	1 20.7	N 7 08.0	195 49.3	N 0 04.9	193 44.0	N 0 20.6
D	13	34 39.3	13 18.8	45.0	16 21.4	08.8	210 52.0	05.0	208 46.6	20.6
A	14	49 41.8	28 18.4	46.3	31 22.1	09.5	225 54.8	05.1	223 49.2	20.7
Y	15	64 44.3	43 18.0	·· 47.5	46 22.8	·· 10.3	240 57.5	·· 05.2	238 51.9	·· 20.8
	16	79 46.7	58 17.6	48.7	61 23.5	11.0	256 00.2	05.3	253 54.5	20.9
	17	94 49.2	73 17.1	49.9	76 24.1	11.8	271 03.0	05.4	268 57.1	20.9
	18	109 51.7	88 16.7	N 7 51.1	91 24.8	N 7 12.5	286 05.7	N 0 05.6	283 59.8	N 0 21.0
	19	124 54.1	103 16.3	52.3	106 25.5	13.2	301 08.4	05.7	299 02.4	21.1
	20	139 56.6	118 15.9	53.5	121 26.2	14.0	316 11.2	05.8	314 05.0	21.1
	21	154 59.1	133 15.5	·· 54.7	136 26.9	·· 14.7	331 13.9	·· 05.9	329 07.7	·· 21.2
	22	170 01.5	148 15.1	55.9	151 27.6	15.5	346 16.6	06.0	344 10.3	21.3
	23	185 04.0	163 14.6	57.1	166 28.3	16.2	1 19.4	06.1	359 12.9	21.3
12	00	200 06.4	178 14.2	N 7 58.3	181 29.0	N 7 16.9	16 22.1	N 0 06.2	14 15.6	N 0 21.4
	01	215 08.9	193 13.8	7 59.5	196 29.7	17.7	31 24.8	06.3	29 18.2	21.5
	02	230 11.4	208 13.4	8 00.7	211 30.4	18.4	46 27.6	06.5	44 20.8	21.6
	03	245 13.8	223 13.0	·· 01.9	226 31.1	·· 19.2	61 30.3	·· 06.6	59 23.5	·· 21.6
	04	260 16.3	238 12.5	03.1	241 31.8	19.9	76 33.0	06.7	74 26.1	21.7
	05	275 18.8	253 12.1	04.3	256 32.5	20.6	91 35.8	06.8	89 28.7	21.8
	06	290 21.2	268 11.7	N 8 05.5	271 33.2	N 7 21.4	106 38.5	N 0 06.9	104 31.4	N 0 21.8
	07	305 23.7	283 11.3	06.7	286 33.9	22.1	121 41.2	07.0	119 34.0	21.9
	08	320 26.2	298 10.9	07.9	301 34.6	22.9	136 44.0	07.1	134 36.6	22.0
S	09	335 28.6	313 10.4	·· 09.1	316 35.3	·· 23.6	151 46.7	·· 07.2	149 39.2	·· 22.0
U	10	350 31.1	328 10.0	10.3	331 36.0	24.3	166 49.4	07.4	164 41.9	22.1
N	11	5 33.5	343 09.6	11.5	346 36.7	25.1	181 52.2	07.5	179 44.5	22.2
D	12	20 36.0	358 09.2	N 8 12.7	1 37.4	N 7 25.8	196 54.9	N 0 07.6	194 47.1	N 0 22.3
A	13	35 38.5	13 08.8	13.9	16 38.1	26.5	211 57.6	07.7	209 49.8	22.3
Y	14	50 40.9	28 08.3	15.1	31 38.8	27.3	227 00.4	07.8	224 52.4	22.4
	15	65 43.4	43 07.9	·· 16.2	46 39.5	·· 28.0	242 03.1	·· 07.9	239 55.0	·· 22.5
	16	80 45.9	58 07.5	17.4	61 40.2	28.8	257 05.8	08.0	254 57.7	22.5
	17	95 48.3	73 07.1	18.6	76 40.9	29.5	272 08.6	08.1	270 00.3	22.6
	18	110 50.8	88 06.7	N 8 19.8	91 41.6	N 7 30.2	287 11.3	N 0 08.2	285 02.9	N 0 22.7
	19	125 53.3	103 06.2	21.0	106 42.3	31.0	302 14.0	08.4	300 05.6	22.7
	20	140 55.7	118 05.8	22.2	121 42.9	31.7	317 16.8	08.5	315 08.2	22.8
	21	155 58.2	133 05.4	·· 23.4	136 43.6	·· 32.4	332 19.5	·· 08.6	330 10.8	·· 22.9
	22	171 00.7	148 05.0	24.6	151 44.3	33.2	347 22.2	08.7	345 13.5	23.0
	23	186 03.1	163 04.5	25.8	166 45.0	33.9	2 25.0	08.8	0 16.1	23.0
Mer Pass.		h m 10 41.8	v −0.4	d 1.2	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 23.1
Achernar	335 45.6	S57 20.1
Acrux	173 36.1	S62 59.8
Adhara	255 31.9	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.6	N56 03.8
Alkaid	153 17.7	N49 24.4
Al Na'ir	28 14.8	S47 03.1
Alnilam	276 11.4	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.5	N26 46.6
Alpheratz	358 09.3	N28 59.0
Altair	62 32.2	N 8 48.9
Ankaa	353 40.3	S42 24.6
Antares	112 56.2	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.7	S68 59.4
Avior	234 27.9	S59 27.3
Bellatrix	278 58.5	N 6 19.8
Betelgeuse	271 28.0	N 7 24.1
Canopus	264 07.2	S52 41.5
Capella	281 11.0	N45 58.8
Deneb	49 48.3	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.6
Dubhe	194 21.2	N61 51.3
Elnath	278 43.9	N28 35.5
Eltanin	90 57.4	N51 29.2
Enif	34 11.4	N 9 47.1
Fomalhaut	15 51.3	S29 43.4
Gacrux	172 27.8	S57 00.5
Gienah	176 17.3	S17 26.3
Hadar	149 22.2	S60 16.9
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.2	S34 23.5
Kochab	137 17.9	N74 13.9
Markab	14 03.1	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.5	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.7	S26 19.2
Peacock	53 57.9	S56 47.6
Pollux	243 57.7	N28 04.3
Procyon	245 25.4	N 5 16.3
Rasalhague	96 29.1	N12 34.3
Regulus	208 09.4	N12 03.5
Rigel	281 35.8	S 8 13.6
Rigil Kent.	140 24.7	S60 45.3
Sabik	102 40.5	S15 42.1
Schedar	350 09.1	N56 25.9
Shaula	96 55.1	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.8
Suhail	223 10.3	S43 21.7
Vega	80 55.5	N38 45.7
Zuben'ubi	137 32.3	S15 57.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	339 16.9	12 07
Mars	342 05.0	11 55
Jupiter	176 09.1	22 55
Saturn	174 05.1	23 03

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
10 00	179 38.2	N 7 50.0	106 37.0	6.2	N20 25.3	2.1	59.0
01	194 38.4	50.9	121 02.2	6.2	20 27.4	1.9	58.9
02	209 38.6	51.9	135 27.4	6.2	20 29.3	1.7	58.9
03	224 38.7	·· 52.8	149 52.6	6.3	20 31.0	1.7	58.9
04	239 38.9	53.7	164 17.9	6.3	20 32.7	1.5	58.8
05	254 39.1	54.6	178 43.2	6.4	20 34.2	1.4	58.8
06	269 39.2	N 7 55.6	193 08.6	6.3	N20 35.6	1.2	58.8
07	284 39.4	56.5	207 33.9	6.4	20 36.8	1.1	58.7
08	299 39.6	57.4	221 59.3	6.5	20 37.9	1.0	58.7
F 09	314 39.7	·· 58.3	236 24.8	6.5	20 38.9	0.8	58.7
R 10	329 39.9	7 59.2	250 50.3	6.5	20 39.7	0.7	58.6
I 11	344 40.1	8 00.2	265 15.8	6.6	20 40.4	0.6	58.6
D 12	359 40.3	N 8 01.1	279 41.4	6.6	N20 41.0	0.4	58.6
A 13	14 40.4	02.0	294 07.0	6.6	20 41.4	0.4	58.5
Y 14	29 40.6	02.9	308 32.6	6.7	20 41.8	0.1	58.5
15	44 40.8	·· 03.9	322 58.3	6.7	20 41.9	0.1	58.4
16	59 40.9	04.8	337 24.0	6.8	20 42.0	0.1	58.4
17	74 41.1	05.7	351 49.8	6.8	20 41.9	0.2	58.4
18	89 41.3	N 8 06.6	6 15.6	6.9	N20 41.7	0.3	58.3
19	104 41.4	07.5	20 41.5	6.9	20 41.4	0.5	58.3
20	119 41.6	08.5	35 07.4	7.0	20 40.9	0.6	58.3
21	134 41.8	·· 09.4	49 33.4	7.0	20 40.3	0.7	58.2
22	149 41.9	10.3	63 59.4	7.1	20 39.6	0.8	58.2
23	164 42.1	11.2	78 25.5	7.1	20 38.8	1.0	58.2
11 00	179 42.3	N 8 12.2	92 51.6	7.1	N20 37.8	1.1	58.1
01	194 42.4	13.1	107 17.7	7.3	20 36.7	1.2	58.1
02	209 42.6	14.0	121 44.0	7.2	20 35.5	1.3	58.1
03	224 42.8	·· 14.9	136 10.2	7.4	20 34.2	1.5	58.0
04	239 42.9	15.8	150 36.6	7.4	20 32.7	1.6	58.0
05	254 43.1	16.8	165 03.0	7.4	20 31.1	1.7	58.0
06	269 43.3	N 8 17.7	179 29.4	7.5	N20 29.4	1.8	57.9
07	284 43.4	18.6	193 55.9	7.5	20 27.6	2.0	57.9
S 08	299 43.6	19.5	208 22.4	7.7	20 25.6	2.0	57.9
A 09	314 43.8	·· 20.4	222 49.1	7.6	20 23.6	2.2	57.8
T 10	329 43.9	21.3	237 15.7	7.8	20 21.4	2.3	57.8
U 11	344 44.1	22.3	251 42.5	7.7	20 19.1	2.5	57.8
R 12	359 44.3	N 8 23.2	266 09.2	7.9	N20 16.6	2.5	57.7
D 13	14 44.4	24.1	280 36.1	7.9	20 14.1	2.7	57.7
A 14	29 44.6	25.0	295 03.0	8.0	20 11.4	2.8	57.7
Y 15	44 44.7	·· 25.9	309 30.0	8.0	20 08.6	2.8	57.6
16	59 44.9	26.8	323 57.0	8.1	20 05.8	3.0	57.6
17	74 45.1	27.8	338 24.1	8.2	20 02.8	3.2	57.6
18	89 45.2	N 8 28.7	352 51.3	8.2	N19 59.6	3.2	57.5
19	104 45.4	29.6	7 18.5	8.3	19 56.4	3.3	57.5
20	119 45.6	30.5	21 45.8	8.3	19 53.1	3.5	57.5
21	134 45.7	·· 31.4	36 13.1	8.5	19 49.6	3.6	57.4
22	149 45.9	32.3	50 40.6	8.5	19 46.0	3.6	57.4
23	164 46.1	33.3	65 08.1	8.5	19 42.4	3.8	57.4
12 00	179 46.2	N 8 34.2	79 35.6	8.6	N19 38.6	3.9	57.3
01	194 46.4	35.1	94 03.2	8.7	19 34.7	4.0	57.3
02	209 46.6	36.0	108 30.9	8.8	19 30.7	4.1	57.3
03	224 46.7	·· 36.9	122 58.7	8.8	19 26.6	4.2	57.2
04	239 46.9	37.8	137 26.5	8.9	19 22.4	4.3	57.2
05	254 47.0	38.7	151 54.4	8.9	19 18.1	4.5	57.2
06	269 47.2	N 8 39.7	166 22.3	9.1	N19 13.6	4.5	57.1
07	284 47.4	40.6	180 50.4	9.1	19 09.1	4.6	57.1
08	299 47.5	41.5	195 18.5	9.1	19 04.5	4.7	57.1
S 09	314 47.7	·· 42.4	209 46.6	9.3	18 59.8	4.9	57.0
U 10	329 47.9	43.3	224 14.9	9.3	18 54.9	4.9	57.0
N 11	344 48.0	44.2	238 43.2	9.3	18 50.0	5.0	57.0
D 12	359 48.2	N 8 45.1	253 11.5	9.5	N18 45.0	5.1	56.9
A 13	14 48.3	46.0	267 40.0	9.5	18 39.9	5.2	56.9
Y 14	29 48.5	46.9	282 08.5	9.6	18 34.7	5.3	56.9
15	44 48.7	·· 47.9	296 37.1	9.6	18 29.4	5.4	56.9
16	59 48.8	48.8	311 05.7	9.8	18 24.0	5.5	56.8
17	74 49.0	49.7	325 34.5	9.8	18 18.5	5.6	56.8
18	89 49.2	N 8 50.6	340 03.3	9.8	N18 12.9	5.7	56.8
19	104 49.3	51.5	354 32.1	10.0	18 07.2	5.8	56.7
20	119 49.5	52.4	9 01.1	10.0	18 01.4	5.9	56.7
21	134 49.6	·· 53.3	23 30.1	10.0	17 55.5	5.9	56.7
22	149 49.8	54.2	37 59.1	10.2	17 49.6	6.1	56.6
23	164 50.0	55.1	52 28.3	10.2	17 43.5	6.1	56.6
	S.D. 16.0	d 0.9	S.D. 16.0		15.7		15.5

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	01 27	01 19	12 01	17 34	05 05	06	◐
11	01 11	01 03	12 01	18 30	06 02	07	
12	00 55	00 48	12 01	19 23	06 57	08	

G.M.T.		ARIES	VENUS −3.5		MARS +1.4		JUPITER −2.0		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
13	00	201 05.6	178 04.1	N 8 27.0	181 45.7	N 7 34.7	17 27.7	N 0 08.9	15 18.7	N 0 23.1
	01	216 08.0	193 03.7	28.2	196 46.4	35.4	32 30.4	09.0	30 21.4	23.2
	02	231 10.5	208 03.3	29.4	211 47.1	36.1	47 33.1	09.1	45 24.0	23.2
	03	246 13.0	223 02.8	·· 30.6	226 47.8	·· 36.9	62 35.9	·· 09.2	60 26.6	·· 23.3
	04	261 15.4	238 02.4	31.8	241 48.5	37.6	77 38.6	09.4	75 29.2	23.4
	05	276 17.9	253 02.0	33.0	256 49.2	38.3	92 41.3	09.5	90 31.9	23.4
	06	291 20.4	268 01.6	N 8 34.1	271 49.9	N 7 39.1	107 44.1	N 0 09.6	105 34.5	N 0 23.5
	07	306 22.8	283 01.1	35.3	286 50.6	39.8	122 46.8	09.7	120 37.1	23.6
	08	321 25.3	298 00.7	36.5	301 51.3	40.5	137 49.5	09.8	135 39.8	23.6
MONDAY	09	336 27.8	313 00.3	·· 37.7	316 52.0	·· 41.3	152 52.3	·· 09.9	150 42.4	·· 23.7
	10	351 30.2	327 59.9	38.9	331 52.7	42.0	167 55.0	10.0	165 45.0	23.8
	11	6 32.7	342 59.4	40.1	346 53.4	42.7	182 57.7	10.1	180 47.7	23.8
	12	21 35.2	357 59.0	N 8 41.3	1 54.1	N 7 43.5	198 00.4	N 0 10.2	195 50.3	N 0 23.9
	13	36 37.6	12 58.6	42.5	16 54.8	44.2	213 03.2	10.3	210 52.9	24.0
	14	51 40.1	27 58.1	43.7	31 55.5	44.9	228 05.9	10.5	225 55.5	24.1
	15	66 42.5	42 57.7	·· 44.9	46 56.2	·· 45.7	243 08.6	·· 10.6	240 58.2	·· 24.1
	16	81 45.0	57 57.3	46.0	61 56.9	46.4	258 11.4	10.7	256 00.8	24.2
	17	96 47.5	72 56.9	47.2	76 57.6	47.1	273 14.1	10.8	271 03.4	24.3
	18	111 49.9	87 56.4	N 8 48.4	91 58.2	N 7 47.9	288 16.8	N 0 10.9	286 06.1	N 0 24.3
	19	126 52.4	102 56.0	49.6	106 58.9	48.6	303 19.5	11.0	301 08.7	24.4
	20	141 54.9	117 55.6	50.8	121 59.6	49.3	318 22.3	11.1	316 11.3	24.5
	21	156 57.3	132 55.2	·· 52.0	137 00.3	·· 50.1	333 25.0	·· 11.2	331 14.0	·· 24.5
	22	171 59.8	147 54.7	53.2	152 01.0	50.8	348 27.7	11.3	346 16.6	24.6
	23	187 02.3	162 54.3	54.3	167 01.7	51.5	3 30.4	11.4	1 19.2	24.7
14	00	202 04.7	177 53.9	N 8 55.5	182 02.4	N 7 52.3	18 33.2	N 0 11.6	16 21.8	N 0 24.7
	01	217 07.2	192 53.4	56.7	197 03.1	53.0	33 35.9	11.7	31 24.5	24.8
	02	232 09.7	207 53.0	57.9	212 03.8	53.7	48 38.6	11.8	46 27.1	24.9
	03	247 12.1	222 52.6	8 59.1	227 04.5	·· 54.5	63 41.4	·· 11.9	61 29.7	·· 24.9
	04	262 14.6	237 52.1	9 00.3	242 05.2	55.2	78 44.1	12.0	76 32.4	25.0
	05	277 17.0	252 51.7	01.4	257 05.9	55.9	93 46.8	12.1	91 35.0	25.1
	06	292 19.5	267 51.3	N 9 02.6	272 06.6	N 7 56.7	108 49.5	N 0 12.2	106 37.6	N 0 25.1
	07	307 22.0	282 50.8	03.8	287 07.3	57.4	123 52.3	12.3	121 40.3	25.2
	08	322 24.4	297 50.4	05.0	302 08.0	58.1	138 55.0	12.4	136 42.9	25.3
TUESDAY	09	337 26.9	312 50.0	·· 06.2	317 08.7	·· 58.9	153 57.7	·· 12.5	151 45.5	·· 25.4
	10	352 29.4	327 49.5	07.4	332 09.4	7 59.6	169 00.4	12.6	166 48.1	25.4
	11	7 31.8	342 49.1	08.5	347 10.1	8 00.3	184 03.2	12.7	181 50.8	25.5
	12	22 34.3	357 48.7	N 9 09.7	2 10.8	N 8 01.1	199 05.9	N 0 12.9	196 53.4	N 0 25.6
	13	37 36.8	12 48.2	10.9	17 11.5	01.8	214 08.6	13.0	211 56.0	25.6
	14	52 39.2	27 47.8	12.1	32 12.1	02.5	229 11.3	13.1	226 58.7	25.7
	15	67 41.7	42 47.4	·· 13.3	47 12.8	·· 03.3	244 14.1	·· 13.2	242 01.3	·· 25.8
	16	82 44.1	57 46.9	14.4	62 13.5	04.0	259 16.8	13.3	257 03.9	25.8
	17	97 46.6	72 46.5	15.6	77 14.2	04.7	274 19.5	13.4	272 06.5	25.9
	18	112 49.1	87 46.1	N 9 16.8	92 14.9	N 8 05.4	289 22.2	N 0 13.5	287 09.2	N 0 26.0
	19	127 51.5	102 45.6	18.0	107 15.6	06.2	304 25.0	13.6	302 11.8	26.0
	20	142 54.0	117 45.2	19.2	122 16.3	06.9	319 27.7	13.7	317 14.4	26.1
	21	157 56.5	132 44.8	·· 20.3	137 17.0	·· 07.6	334 30.4	·· 13.8	332 17.1	·· 26.2
	22	172 58.9	147 44.3	21.5	152 17.7	08.4	349 33.1	13.9	347 19.7	26.2
	23	188 01.4	162 43.9	22.7	167 18.4	09.1	4 35.9	14.0	2 22.3	26.3
15	00	203 03.9	177 43.5	N 9 23.9	182 19.1	N 8 09.8	19 38.6	N 0 14.1	17 24.9	N 0 26.4
	01	218 06.3	192 43.0	25.0	197 19.8	10.5	34 41.3	14.3	32 27.6	26.4
	02	233 08.8	207 42.6	26.2	212 20.5	11.3	49 44.0	14.4	47 30.2	26.5
	03	248 11.3	222 42.1	·· 27.4	227 21.2	·· 12.0	64 46.8	·· 14.5	62 32.8	·· 26.6
	04	263 13.7	237 41.7	28.6	242 21.9	12.7	79 49.5	14.6	77 35.4	26.6
	05	278 16.2	252 41.3	29.7	257 22.6	13.5	94 52.2	14.7	92 38.1	26.7
	06	293 18.6	267 40.8	N 9 30.9	272 23.3	N 8 14.2	109 54.9	N 0 14.8	107 40.7	N 0 26.8
	07	308 21.1	282 40.4	32.1	287 24.0	14.9	124 57.6	14.9	122 43.3	26.8
	08	323 23.6	297 39.9	33.3	302 24.6	15.6	140 00.4	15.0	137 46.0	26.9
WEDNESDAY	09	338 26.0	312 39.5	·· 34.4	317 25.3	·· 16.4	155 03.1	·· 15.1	152 48.6	·· 27.0
	10	353 28.5	327 39.1	35.6	332 26.0	17.1	170 05.8	15.2	167 51.2	27.0
	11	8 31.0	342 38.6	36.8	347 26.7	17.8	185 08.5	15.3	182 53.8	27.1
	12	23 33.4	357 38.2	N 9 37.9	2 27.4	N 8 18.6	200 11.3	N 0 15.4	197 56.5	N 0 27.2
	13	38 35.9	12 37.7	39.1	17 28.1	19.3	215 14.0	15.5	212 59.1	27.2
	14	53 38.4	27 37.3	40.3	32 28.8	20.0	230 16.7	15.6	228 01.7	27.3
	15	68 40.8	42 36.9	·· 41.5	47 29.5	·· 20.7	245 19.4	·· 15.7	243 04.3	·· 27.4
	16	83 43.3	57 36.4	42.6	62 30.2	21.5	260 22.1	15.9	258 07.0	27.4
	17	98 45.8	72 36.0	43.8	77 30.9	22.2	275 24.9	16.0	273 09.6	27.5
	18	113 48.2	87 35.5	N 9 45.0	92 31.6	N 8 22.9	290 27.6	N 0 16.1	288 12.2	N 0 27.6
	19	128 50.7	102 35.1	46.1	107 32.3	23.6	305 30.3	16.2	303 14.9	27.6
	20	143 53.1	117 34.7	47.3	122 33.0	24.4	320 33.0	16.3	318 17.5	27.7
	21	158 55.6	132 34.2	·· 48.5	137 33.7	·· 25.1	335 35.7	·· 16.4	333 20.1	·· 27.8
	22	173 58.1	147 33.8	49.6	152 34.4	25.8	350 38.5	16.5	348 22.7	27.8
	23	189 00.5	162 33.3	50.8	167 35.1	26.5	5 41.2	16.6	3 25.4	27.9
Mer. Pass.		h m 10 30.0	v −0.4	d 1.2	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.6	S57 20.1
Acrux	173 36.1	S62 59.8
Adhara	255 31.9	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.6	N56 03.8
Alkaid	153 17.7	N49 24.4
Al Na'ir	28 14.7	S47 03.1
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.5	N26 46.6
Alpheratz	358 09.3	N28 59.0
Altair	62 32.2	N 8 48.9
Ankaa	353 40.3	S42 24.6
Antares	112 56.1	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.7	S68 59.4
Avior	234 27.9	S59 27.3
Bellatrix	278 58.5	N 6 19.8
Betelgeuse	271 28.0	N 7 24.1
Canopus	264 07.2	S52 41.5
Capella	281 11.0	N45 58.8
Deneb	49 48.3	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.6
Dubhe	194 21.2	N61 51.3
Elnath	278 43.9	N28 35.5
Eltanin	90 57.3	N51 29.2
Enif	34 11.4	N 9 47.1
Fomalhaut	15 51.3	S29 43.4
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.3
Hadar	149 22.2	S60 16.9
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.2	S34 23.5
Kochab	137 17.9	N74 13.9
Markab	14 03.0	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.5	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.6	S26 19.2
Peacock	53 57.9	S56 47.6
Pollux	243 57.7	N28 04.3
Procyon	245 25.4	N 5 16.3
Rasalhague	96 29.1	N12 34.3
Regulus	208 09.4	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.7	S60 45.3
Sabik	102 40.5	S15 42.1
Schedar	350 09.1	N56 25.8
Shaula	96 55.0	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.8
Suhail	223 10.4	S43 21.7
Vega	80 55.5	N38 45.7
Zuben'ubi	137 32.3	S15 57.8

	S.H.A. ° ′	Mer. Pass. h m
Venus	335 49.1	12 09
Mars	339 57.7	11 51
Jupiter	176 28.5	22 42
Saturn	174 17.1	22 51

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
13	00	179 50.1	N 8 56.0	66 57.5	10.3	N17 37.4	6.2	56.6
	01	194 50.3	57.0	81 26.8	10.4	17 31.2	6.3	56.6
	02	209 50.4	57.9	95 56.2	10.4	17 24.9	6.4	56.5
	03	224 50.6	·· 58.8	110 25.6	10.5	17 18.5	6.5	56.5
	04	239 50.8	8 59.7	124 55.1	10.6	17 12.0	6.5	56.5
	05	254 50.9	9 00.6	139 24.7	10.6	17 05.5	6.7	56.4
	06	269 51.1	N 9 01.5	153 54.3	10.7	N16 58.8	6.7	56.4
	07	284 51.2	02.4	168 24.0	10.8	16 52.1	6.8	56.4
	08	299 51.4	03.3	182 53.8	10.9	16 45.3	6.9	56.4
MONDAY	09	314 51.6	·· 04.2	197 23.7	10.9	16 38.4	6.9	56.3
	10	329 51.7	05.1	211 53.6	11.0	16 31.5	7.1	56.3
	11	344 51.9	06.0	226 23.6	11.0	16 24.4	7.1	56.3
	12	359 52.0	N 9 06.9	240 53.6	11.1	N16 17.3	7.2	56.2
	13	14 52.2	07.8	255 23.7	11.2	16 10.1	7.2	56.2
	14	29 52.4	08.7	269 53.9	11.3	16 02.9	7.4	56.2
	15	44 52.5	·· 09.6	284 24.2	11.3	15 55.5	7.4	56.2
	16	59 52.7	10.5	298 54.5	11.4	15 48.1	7.4	56.1
	17	74 52.8	11.4	313 24.9	11.5	15 40.7	7.6	56.1
	18	89 53.0	N 9 12.4	327 55.4	11.5	N15 33.1	7.6	56.1
	19	104 53.2	13.3	342 25.9	11.6	15 25.5	7.7	56.1
	20	119 53.3	14.2	356 56.5	11.7	15 17.8	7.8	56.0
	21	134 53.5	·· 15.1	11 27.2	11.7	15 10.0	7.8	56.0
	22	149 53.6	16.0	25 57.9	11.8	15 02.2	7.9	56.0
	23	164 53.8	16.9	40 28.7	11.9	14 54.3	8.0	56.0
14	00	179 53.9	N 9 17.8	54 59.6	11.9	N14 46.3	8.0	55.9
	01	194 54.1	18.7	69 30.5	12.0	14 38.3	8.1	55.9
	02	209 54.3	19.6	84 01.5	12.1	14 30.2	8.1	55.9
	03	224 54.4	·· 20.5	98 32.6	12.1	14 22.1	8.2	55.9
	04	239 54.6	21.4	113 03.7	12.2	14 13.9	8.3	55.8
	05	254 54.7	22.3	127 34.9	12.2	14 05.6	8.4	55.8
	06	269 54.9	N 9 23.2	142 06.1	12.3	N13 57.2	8.4	55.8
	07	284 55.0	24.1	156 37.4	12.4	13 48.8	8.4	55.8
	08	299 55.2	25.0	171 08.8	12.4	13 40.4	8.5	55.7
TUESDAY	09	314 55.4	·· 25.9	185 40.2	12.5	13 31.9	8.6	55.7
	10	329 55.5	26.8	200 11.7	12.6	13 23.3	8.6	55.7
	11	344 55.7	27.7	214 43.3	12.6	13 14.7	8.7	55.7
	12	359 55.8	N 9 28.6	229 14.9	12.7	N13 06.0	8.8	55.6
	13	14 56.0	29.5	243 46.6	12.7	12 57.2	8.7	55.6
	14	29 56.1	30.4	258 18.3	12.8	12 48.5	8.9	55.6
	15	44 56.3	·· 31.3	272 50.1	12.9	12 39.6	8.9	55.6
	16	59 56.4	32.2	287 22.0	12.9	12 30.7	8.9	55.6
	17	74 56.6	33.1	301 53.9	12.9	12 21.8	9.0	55.5
	18	89 56.8	N 9 34.0	316 25.8	13.1	N12 12.8	9.1	55.5
	19	104 56.9	34.9	330 57.9	13.0	12 03.7	9.1	55.5
	20	119 57.1	35.8	345 29.9	13.2	11 54.6	9.1	55.5
	21	134 57.2	·· 36.6	0 02.1	13.2	11 45.5	9.2	55.4
	22	149 57.4	37.5	14 34.3	13.2	11 36.3	9.3	55.4
	23	164 57.5	38.4	29 06.5	13.3	11 27.0	9.3	55.4
15	00	179 57.7	N 9 39.3	43 38.8	13.3	N11 17.7	9.3	55.4
	01	194 57.8	40.2	58 11.1	13.4	11 08.4	9.4	55.4
	02	209 58.0	41.1	72 43.5	13.5	10 59.0	9.4	55.3
	03	224 58.2	·· 42.0	87 16.0	13.5	10 49.6	9.4	55.3
	04	239 58.3	42.9	101 48.5	13.6	10 40.2	9.5	55.3
	05	254 58.5	43.8	116 21.1	13.6	10 30.7	9.6	55.3
	06	269 58.6	N 9 44.7	130 53.7	13.6	N10 21.1	9.6	55.3
	07	284 58.8	45.6	145 26.3	13.7	10 11.5	9.6	55.2
	08	299 58.9	46.5	159 59.0	13.8	10 01.9	9.6	55.2
WEDNESDAY	09	314 59.1	·· 47.4	174 31.8	13.8	9 52.3	9.7	55.2
	10	329 59.2	48.3	189 04.6	13.8	9 42.6	9.8	55.2
	11	344 59.4	49.2	203 37.4	13.9	9 32.8	9.7	55.2
	12	359 59.5	N 9 50.1	218 10.3	13.9	N 9 23.1	9.8	55.1
	13	14 59.7	51.0	232 43.2	14.0	9 13.3	9.9	55.1
	14	29 59.8	51.8	247 16.2	14.1	9 03.4	9.9	55.1
	15	45 00.0	·· 52.7	261 49.3	14.0	8 53.5	9.9	55.1
	16	60 00.1	53.6	276 22.3	14.2	8 43.6	9.9	55.1
	17	75 00.3	54.5	290 55.5	14.1	8 33.7	10.0	55.0
	18	90 00.4	N 9 55.4	305 28.6	14.2	N 8 23.7	10.0	55.0
	19	105 00.6	56.3	320 01.8	14.3	8 13.7	10.0	55.0
	20	120 00.7	57.2	334 35.1	14.2	8 03.7	10.1	55.0
	21	135 00.9	·· 58.1	349 08.3	14.4	7 53.6	10.1	55.0
	22	150 01.0	59.0	3 41.7	14.3	7 43.5	10.1	55.0
	23	165 01.2	59.9	18 15.0	14.4	7 33.4	10.1	54.9
		S.D. 16.0	d 0.9	S.D. 15.3		15.2		15.0

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
13	00 40	00 32	12 01	20 13	07 48	09	◐
14	00 25	00 17	12 00	21 00	08 37	10	
15	00 10	00 02	12 00	21 45	09 23	11	

G.M.T.		ARIES	VENUS −3.5		MARS +1.4		JUPITER −2.0		SATURN +0.8	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
16	00	204 03.0	177 32.9	N 9 52.0	182 35.7	N 8 27.3	20 43.9	N 0 16.7	18 28.0	N 0 28.0
	01	219 05.5	192 32.4	53.1	197 36.4	28.0	35 46.6	16.8	33 30.6	28.0
	02	234 07.9	207 32.0	54.3	212 37.1	28.7	50 49.3	16.9	48 33.2	28.1
	03	249 10.4	222 31.5	·· 55.5	227 37.8	·· 29.4	65 52.1	·· 17.0	63 35.9	·· 28.2
	04	264 12.9	237 31.1	56.6	242 38.5	30.2	80 54.8	17.1	78 38.5	28.2
	05	279 15.3	252 30.7	57.8	257 39.2	30.9	95 57.5	17.2	93 41.1	28.3
	06	294 17.8	267 30.2	N 9 59.0	272 39.9	N 8 31.6	111 00.2	N 0 17.3	108 43.7	N 0 28.4
	07	309 20.2	282 29.8	10 00.1	287 40.6	32.3	126 02.9	17.4	123 46.4	28.4
T	08	324 22.7	297 29.3	01.3	302 41.3	33.1	141 05.7	17.5	138 49.0	28.5
H	09	339 25.2	312 28.9	·· 02.5	317 42.0	·· 33.8	156 08.4	·· 17.6	153 51.6	·· 28.6
U	10	354 27.6	327 28.4	03.6	332 42.7	34.5	171 11.1	17.7	168 54.2	28.6
R	11	9 30.1	342 28.0	04.8	347 43.4	35.2	186 13.8	17.8	183 56.9	28.7
S	12	24 32.6	357 27.5	N10 05.9	2 44.1	N 8 35.9	201 16.5	N 0 18.0	198 59.5	N 0 28.8
D	13	39 35.0	12 27.1	07.1	17 44.8	36.7	216 19.2	18.1	214 02.1	28.8
A	14	54 37.5	27 26.6	08.3	32 45.4	37.4	231 22.0	18.2	229 04.7	28.9
Y	15	69 40.0	42 26.2	·· 09.4	47 46.1	·· 38.1	246 24.7	·· 18.3	244 07.4	·· 29.0
	16	84 42.4	57 25.7	10.6	62 46.8	38.8	261 27.4	18.4	259 10.0	29.0
	17	99 44.9	72 25.3	11.7	77 47.5	39.6	276 30.1	18.5	274 12.6	29.1
	18	114 47.4	87 24.8	N10 12.9	92 48.2	N 8 40.3	291 32.8	N 0 18.6	289 15.2	N 0 29.2
	19	129 49.8	102 24.4	14.1	107 48.9	41.0	306 35.5	18.7	304 17.9	29.2
	20	144 52.3	117 23.9	15.2	122 49.6	41.7	321 38.3	18.8	319 20.5	29.3
	21	159 54.7	132 23.5	·· 16.4	137 50.3	·· 42.4	336 41.0	·· 18.9	334 23.1	·· 29.4
	22	174 57.2	147 23.0	17.5	152 51.0	43.2	351 43.7	19.0	349 25.7	29.4
	23	189 59.7	162 22.6	18.7	167 51.7	43.9	6 46.4	19.1	4 28.4	29.5
17	00	205 02.1	177 22.1	N10 19.9	182 52.4	N 8 44.6	21 49.1	N 0 19.2	19 31.0	N 0 29.6
	01	220 04.6	192 21.7	21.0	197 53.1	45.3	36 51.8	19.3	34 33.6	29.6
	02	235 07.1	207 21.2	22.2	212 53.8	46.0	51 54.6	19.4	49 36.2	29.7
	03	250 09.5	222 20.8	·· 23.3	227 54.5	·· 46.8	66 57.3	·· 19.5	64 38.9	·· 29.8
	04	265 12.0	237 20.3	24.5	242 55.1	47.5	82 00.0	19.6	79 41.5	29.8
	05	280 14.5	252 19.9	25.6	257 55.8	48.2	97 02.7	19.7	94 44.1	29.9
	06	295 16.9	267 19.4	N10 26.8	272 56.5	N 8 48.9	112 05.4	N 0 19.8	109 46.7	N 0 29.9
	07	310 19.4	282 19.0	27.9	287 57.2	49.6	127 08.1	19.9	124 49.4	30.0
	08	325 21.9	297 18.5	29.1	302 57.9	50.4	142 10.8	20.0	139 52.0	30.1
F	09	340 24.3	312 18.1	·· 30.2	317 58.6	·· 51.1	157 13.6	·· 20.1	154 54.6	·· 30.1
R	10	355 26.8	327 17.6	31.4	332 59.3	51.8	172 16.3	20.2	169 57.2	30.2
I	11	10 29.2	342 17.1	32.6	348 00.0	52.5	187 19.0	20.3	184 59.9	30.3
D	12	25 31.7	357 16.7	N10 33.7	3 00.7	N 8 53.2	202 21.7	N 0 20.4	200 02.5	N 0 30.3
A	13	40 34.2	12 16.2	34.9	18 01.4	54.0	217 24.4	20.5	215 05.1	30.4
Y	14	55 36.6	27 15.8	36.0	33 02.1	54.7	232 27.1	20.6	230 07.7	30.5
	15	70 39.1	42 15.3	·· 37.2	48 02.8	·· 55.4	247 29.8	·· 20.7	245 10.3	·· 30.5
	16	85 41.6	57 14.9	38.3	63 03.5	56.1	262 32.6	20.8	260 13.0	30.6
	17	100 44.0	72 14.4	39.5	78 04.1	56.8	277 35.3	20.9	275 15.6	30.7
	18	115 46.5	87 13.9	N10 40.6	93 04.8	N 8 57.5	292 38.0	N 0 21.0	290 18.2	N 0 30.7
	19	130 49.0	102 13.5	41.8	108 05.5	58.3	307 40.7	21.1	305 20.8	30.8
	20	145 51.4	117 13.0	42.9	123 06.2	59.0	322 43.4	21.2	320 23.5	30.9
	21	160 53.9	132 12.6	·· 44.1	138 06.9	8 59.7	337 46.1	·· 21.3	335 26.1	·· 30.9
	22	175 56.3	147 12.1	45.2	153 07.6	9 00.4	352 48.8	21.5	350 28.7	31.0
	23	190 58.8	162 11.7	46.3	168 08.3	01.1	7 51.5	21.6	5 31.3	31.0
18	00	206 01.3	177 11.2	N10 47.5	183 09.0	N 9 01.9	22 54.2	N 0 21.7	20 34.0	N 0 31.1
	01	221 03.7	192 10.7	48.6	198 09.7	02.6	37 57.0	21.8	35 36.6	31.2
	02	236 06.2	207 10.3	49.8	213 10.4	03.3	52 59.7	21.9	50 39.2	31.2
	03	251 08.7	222 09.8	·· 50.9	228 11.1	·· 04.0	68 02.4	·· 22.0	65 41.8	·· 31.3
	04	266 11.1	237 09.4	52.1	243 11.8	04.7	83 05.1	22.1	80 44.4	31.4
	05	281 13.6	252 08.9	53.2	258 12.4	05.4	98 07.8	22.2	95 47.1	31.4
	06	296 16.1	267 08.4	N10 54.4	273 13.1	N 9 06.1	113 10.5	N 0 22.3	110 49.7	N 0 31.5
	07	311 18.5	282 08.0	55.5	288 13.8	06.9	128 13.2	22.4	125 52.3	31.6
S	08	326 21.0	297 07.5	56.7	303 14.5	07.6	143 15.9	22.5	140 54.9	31.6
A	09	341 23.5	312 07.0	·· 57.8	318 15.2	·· 08.3	158 18.6	·· 22.6	155 57.6	·· 31.7
T	10	356 25.9	327 06.6	10 58.9	333 15.9	09.0	173 21.4	22.7	171 00.2	31.8
U	11	11 28.4	342 06.1	11 00.1	348 16.6	09.7	188 24.1	22.8	186 02.8	31.8
R	12	26 30.8	357 05.7	N11 01.2	3 17.3	N 9 10.4	203 26.8	N 0 22.9	201 05.4	N 0 31.9
D	13	41 33.3	12 05.2	02.4	18 18.0	11.2	218 29.5	23.0	216 08.0	31.9
A	14	56 35.8	27 04.7	03.5	33 18.7	11.9	233 32.2	23.1	231 10.7	32.0
Y	15	71 38.2	42 04.3	·· 04.6	48 19.4	·· 12.6	248 34.9	·· 23.2	246 13.3	·· 32.1
	16	86 40.7	57 03.8	05.8	63 20.0	13.3	263 37.6	23.3	261 15.9	32.1
	17	101 43.2	72 03.3	06.9	78 20.7	14.0	278 40.3	23.4	276 18.5	32.2
	18	116 45.6	87 02.9	N11 08.1	93 21.4	N 9 14.7	293 43.0	N 0 23.5	291 21.1	N 0 32.3
	19	131 48.1	102 02.4	09.2	108 22.1	15.4	308 45.7	23.6	306 23.8	32.3
	20	146 50.6	117 01.9	10.3	123 22.8	16.1	323 48.4	23.7	321 26.4	32.4
	21	161 53.0	132 01.5	·· 11.5	138 23.5	·· 16.9	338 51.2	·· 23.8	336 29.0	·· 32.5
	22	176 55.5	147 01.0	12.6	153 24.2	17.6	353 53.9	23.9	351 31.6	32.5
	23	191 58.0	162 00.5	13.7	168 24.9	18.3	8 56.6	24.0	6 34.2	32.6
Mer. Pass.		h m 10 18.2	v −0.5	d 1.2	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.6	S57 20.1
Acrux	173 36.2	S62 59.8
Adhara	255 31.9	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.6	N56 03.8
Alkaid	153 17.7	N49 24.4
Al Na'ir	28 14.7	S47 03.1
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.5	N26 46.6
Alpheratz	358 09.3	N28 59.0
Altair	62 32.2	N 8 48.9
Ankaa	353 40.3	S42 24.6
Antares	112 56.1	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.7	S68 59.4
Avior	234 28.0	S59 27.3
Bellatrix	278 58.5	N 6 19.8
Betelgeuse	271 28.0	N 7 24.1
Canopus	264 07.2	S52 41.5
Capella	281 11.0	N45 58.8
Deneb	49 48.3	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.5
Dubhe	194 21.2	N61 51.3
Elnath	278 43.9	N28 35.5
Eltanin	90 57.3	N51 29.2
Enif	34 11.4	N 9 47.1
Fomalhaut	15 51.3	S29 43.4
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.3
Hadar	149 22.2	S60 16.9
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.2	S34 23.5
Kochab	137 17.9	N74 13.9
Markab	14 03.0	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.6	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.6	S26 19.2
Peacock	53 57.9	S56 47.6
Pollux	243 57.7	N28 04.4
Procyon	245 25.4	N 5 16.3
Rasalhague	96 29.1	N12 34.3
Regulus	208 09.4	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.7	S60 45.3
Sabik	102 40.5	S15 42.1
Schedar	350 09.1	N56 25.8
Shaula	96 55.0	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.8
Suhail	223 10.4	S43 21.7
Vega	80 55.4	N38 45.7
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	332 20.0	12 11
Mars	337 50.2	11 48
Jupiter	176 47.0	22 29
Saturn	174 28.9	22 38

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
16 00	180 01.3	N10 00.7	32 48.4	14.5	N 7 23.3	10.2	54.9
01	195 01.5	01.6	47 21.9	14.4	7 13.1	10.2	54.9
02	210 01.6	02.5	61 55.3	14.5	7 02.9	10.2	54.9
03	225 01.8	·· 03.4	76 28.8	14.6	6 52.7	10.2	54.9
04	240 01.9	04.3	91 02.4	14.6	6 42.5	10.3	54.9
05	255 02.1	05.2	105 36.0	14.6	6 32.2	10.3	54.8
06	270 02.2	N10 06.1	120 09.6	14.7	N 6 21.9	10.3	54.8
07	285 02.4	07.0	134 43.3	14.6	6 11.6	10.3	54.8
T 08	300 02.5	07.8	149 16.9	14.8	6 01.3	10.4	54.8
H 09	315 02.7	·· 08.7	163 50.7	14.7	5 50.9	10.3	54.8
U 10	330 02.8	09.6	178 24.4	14.8	5 40.6	10.4	54.8
R 11	345 03.0	10.5	192 58.2	14.8	5 30.2	10.4	54.7
S 12	0 03.1	N10 11.4	207 32.0	14.9	N 5 19.8	10.5	54.7
D 13	15 03.3	12.3	222 05.9	14.8	5 09.3	10.4	54.7
A 14	30 03.4	13.2	236 39.7	14.9	4 58.9	10.5	54.7
Y 15	45 03.6	·· 14.0	251 13.6	15.0	4 48.4	10.4	54.7
16	60 03.7	14.9	265 47.6	14.9	4 38.0	10.5	54.7
17	75 03.9	15.8	280 21.5	15.0	4 27.5	10.5	54.7
18	90 04.0	N10 16.7	294 55.5	15.0	N 4 17.0	10.5	54.6
19	105 04.2	17.6	309 29.5	15.0	4 06.5	10.6	54.6
20	120 04.3	18.5	324 03.5	15.1	3 55.9	10.5	54.6
21	135 04.5	·· 19.3	338 37.6	15.1	3 45.4	10.6	54.6
22	150 04.6	20.2	353 11.7	15.1	3 34.8	10.5	54.6
23	165 04.8	21.1	7 45.8	15.1	3 24.3	10.6	54.6
17 00	180 04.9	N10 22.0	22 19.9	15.2	N 3 13.7	10.6	54.6
01	195 05.1	22.9	36 54.1	15.1	3 03.1	10.6	54.5
02	210 05.2	23.7	51 28.2	15.2	2 52.5	10.6	54.5
03	225 05.4	·· 24.6	66 02.4	15.2	2 41.9	10.6	54.5
04	240 05.5	25.5	80 36.6	15.3	2 31.3	10.6	54.5
05	255 05.6	26.4	95 10.9	15.2	2 20.7	10.6	54.5
06	270 05.8	N10 27.3	109 45.1	15.3	N 2 10.1	10.6	54.5
07	285 05.9	28.1	124 19.4	15.3	1 59.5	10.6	54.5
08	300 06.1	29.0	138 53.7	15.3	1 48.9	10.7	54.5
F 09	315 06.2	·· 29.9	153 28.0	15.3	1 38.2	10.6	54.4
R 10	330 06.4	30.8	168 02.3	15.3	1 27.6	10.6	54.4
I 11	345 06.5	31.7	182 36.6	15.4	1 17.0	10.7	54.4
D 12	0 06.7	N10 32.5	197 11.0	15.3	N 1 06.3	10.6	54.4
A 13	15 06.8	33.4	211 45.3	15.4	0 55.7	10.6	54.4
Y 14	30 07.0	34.3	226 19.7	15.4	0 45.1	10.7	54.4
15	45 07.1	·· 35.2	240 54.1	15.4	0 34.4	10.6	54.4
16	60 07.2	36.0	255 28.5	15.4	0 23.8	10.6	54.4
17	75 07.4	36.9	270 02.9	15.4	0 13.2	10.7	54.4
18	90 07.5	N10 37.8	284 37.3	15.4	N 0 02.5	10.6	54.3
19	105 07.7	38.7	299 11.7	15.5	S 0 08.1	10.6	54.3
20	120 07.8	39.6	313 46.2	15.4	0 18.7	10.6	54.3
21	135 08.0	·· 40.4	328 20.6	15.5	0 29.3	10.6	54.3
22	150 08.1	41.3	342 55.1	15.4	0 39.9	10.7	54.3
23	165 08.2	42.2	357 29.5	15.5	0 50.6	10.6	54.3
18 00	180 08.4	N10 43.1	12 04.0	15.5	S 1 01.2	10.6	54.3
01	195 08.5	43.9	26 38.5	15.5	1 11.8	10.5	54.3
02	210 08.7	44.8	41 13.0	15.4	1 22.3	10.6	54.3
03	225 08.8	·· 45.7	55 47.4	15.5	1 32.9	10.6	54.3
04	240 09.0	46.5	70 21.9	15.5	1 43.5	10.6	54.2
05	255 09.1	47.4	84 56.4	15.5	1 54.1	10.5	54.2
06	270 09.2	N10 48.3	99 30.9	15.5	S 2 04.6	10.5	54.2
07	285 09.4	49.2	114 05.4	15.5	2 15.1	10.6	54.2
S 08	300 09.5	50.0	128 39.9	15.5	2 25.7	10.5	54.2
A 09	315 09.7	·· 50.9	143 14.4	15.5	2 36.2	10.5	54.2
T 10	330 09.8	51.8	157 48.9	15.5	2 46.7	10.5	54.2
U 11	345 10.0	52.7	172 23.4	15.5	2 57.2	10.5	54.2
R 12	0 10.1	N10 53.5	186 57.9	15.5	S 3 07.7	10.4	54.2
D 13	15 10.2	54.4	201 32.4	15.5	3 18.1	10.5	54.2
A 14	30 10.4	55.3	216 06.9	15.5	3 28.6	10.4	54.2
Y 15	45 10.5	·· 56.1	230 41.4	15.5	3 39.0	10.4	54.2
16	60 10.7	57.0	245 15.9	15.4	3 49.4	10.4	54.1
17	75 10.8	57.9	259 50.3	15.5	3 59.8	10.4	54.1
18	90 10.9	N10 58.7	274 24.8	15.5	S 4 10.2	10.3	54.1
19	105 11.1	10 59.6	288 59.3	15.4	4 20.5	10.4	54.1
20	120 11.2	11 00.5	303 33.7	15.5	4 30.9	10.3	54.1
21	135 11.4	·· 01.3	318 08.2	15.5	4 41.2	10.3	54.1
22	150 11.5	02.2	332 42.7	15.4	4 51.5	10.3	54.1
23	165 11.6	03.1	347 17.1	15.4	5 01.8	10.2	54.1
	S.D. 16.0	d 0.9	S.D. 14.9		14.8		14.8

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	00 05	00 12	12 00	22 28	10 07	12	○
17	00 19	00 26	12 00	23 10	10 49	13	
18	00 33	00 40	11 59	23 52	11 31	14	

G.M.T.		ARIES	VENUS −3.5		MARS +1.4		JUPITER −2.0		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
19	00	207 00.4	177 00.1	N11 14.9	183 25.6	N 9 19.0	23 59.3	N 0 24.1	21 36.9	N 0 32.6
	01	222 02.9	191 59.6	16.0	198 26.3	19.7	39 02.0	24.2	36 39.5	32.7
	02	237 05.3	206 59.1	17.2	213 27.0	20.4	54 04.7	24.3	51 42.1	32.8
	03	252 07.8	221 58.7	·· 18.3	228 27.6	·· 21.1	69 07.4	·· 24.4	66 44.7	·· 32.8
	04	267 10.3	236 58.2	19.4	243 28.3	21.8	84 10.1	24.5	81 47.3	32.9
	05	282 12.7	251 57.7	20.6	258 29.0	22.6	99 12.8	24.6	96 50.0	33.0
	06	297 15.2	266 57.3	N11 21.7	273 29.7	N 9 23.3	114 15.5	N 0 24.7	111 52.6	N 0 33.0
	07	312 17.7	281 56.8	22.8	288 30.4	24.0	129 18.2	24.8	126 55.2	33.1
	08	327 20.1	296 56.3	24.0	303 31.1	24.7	144 20.9	24.9	141 57.8	33.1
SUN	09	342 22.6	311 55.8	·· 25.1	318 31.8	·· 25.4	159 23.6	·· 24.9	157 00.4	·· 33.2
	10	357 25.1	326 55.4	26.2	333 32.5	26.1	174 26.3	25.0	172 03.1	33.3
	11	12 27.5	341 54.9	27.4	348 33.2	26.8	189 29.0	25.1	187 05.7	33.3
DAY	12	27 30.0	356 54.4	N11 28.5	3 33.9	N 9 27.5	204 31.7	N 0 25.2	202 08.3	N 0 33.4
	13	42 32.4	11 54.0	29.6	18 34.5	28.2	219 34.5	25.3	217 10.9	33.5
	14	57 34.9	26 53.5	30.7	33 35.2	29.0	234 37.2	25.4	232 13.5	33.5
	15	72 37.4	41 53.0	·· 31.9	48 35.9	·· 29.7	249 39.9	·· 25.5	247 16.2	·· 33.6
	16	87 39.8	56 52.5	33.0	63 36.6	30.4	264 42.6	25.6	262 18.8	33.7
	17	102 42.3	71 52.1	34.1	78 37.3	31.1	279 45.3	25.7	277 21.4	33.7
	18	117 44.8	86 51.6	N11 35.3	93 38.0	N 9 31.8	294 48.0	N 0 25.8	292 24.0	N 0 33.8
	19	132 47.2	101 51.1	36.4	108 38.7	32.5	309 50.7	25.9	307 26.6	33.8
	20	147 49.7	116 50.6	37.5	123 39.4	33.2	324 53.4	26.0	322 29.3	33.9
	21	162 52.2	131 50.2	·· 38.6	138 40.1	·· 33.9	339 56.1	·· 26.1	337 31.9	·· 34.0
	22	177 54.6	146 49.7	39.8	153 40.7	34.6	354 58.8	26.2	352 34.5	34.0
	23	192 57.1	161 49.2	40.9	168 41.4	35.3	10 01.5	26.3	7 37.1	34.1
20	00	207 59.6	176 48.7	N11 42.0	183 42.1	N 9 36.0	25 04.2	N 0 26.4	22 39.7	N 0 34.2
	01	223 02.0	191 48.3	43.1	198 42.8	36.7	40 06.9	26.5	37 42.4	34.2
	02	238 04.5	206 47.8	44.3	213 43.5	37.5	55 09.6	26.6	52 45.0	34.3
	03	253 06.9	221 47.3	·· 45.4	228 44.2	·· 38.2	70 12.3	·· 26.7	67 47.6	·· 34.3
	04	268 09.4	236 46.8	46.5	243 44.9	38.9	85 15.0	26.8	82 50.2	34.4
	05	283 11.9	251 46.4	47.6	258 45.6	39.6	100 17.7	26.9	97 52.8	34.5
	06	298 14.3	266 45.9	N11 48.7	273 46.3	N 9 40.3	115 20.4	N 0 27.0	112 55.4	N 0 34.5
	07	313 16.8	281 45.4	49.9	288 47.0	41.0	130 23.1	27.1	127 58.1	34.6
	08	328 19.3	296 44.9	51.0	303 47.6	41.7	145 25.8	27.2	143 00.7	34.6
MON	09	343 21.7	311 44.4	·· 52.1	318 48.3	·· 42.4	160 28.5	·· 27.3	158 03.3	·· 34.7
	10	358 24.2	326 44.0	53.2	333 49.0	43.1	175 31.2	27.4	173 05.9	34.8
	11	13 26.7	341 43.5	54.3	348 49.7	43.8	190 33.9	27.5	188 08.5	34.8
DAY	12	28 29.1	356 43.0	N11 55.5	3 50.4	N 9 44.5	205 36.6	N 0 27.6	203 11.2	N 0 34.9
	13	43 31.6	11 42.5	56.6	18 51.1	45.2	220 39.3	27.7	218 13.8	35.0
	14	58 34.1	26 42.0	57.7	33 51.8	45.9	235 42.0	27.8	233 16.4	35.0
	15	73 36.5	41 41.6	·· 58.8	48 52.5	·· 46.6	250 44.7	·· 27.9	248 19.0	·· 35.1
	16	88 39.0	56 41.1	11 59.9	63 53.2	47.3	265 47.4	28.0	263 21.6	35.1
	17	103 41.4	71 40.6	12 01.1	78 53.8	48.0	280 50.1	28.1	278 24.2	35.2
	18	118 43.9	86 40.1	N12 02.2	93 54.5	N 9 48.7	295 52.8	N 0 28.1	293 26.9	N 0 35.3
	19	133 46.4	101 39.6	03.3	108 55.2	49.5	310 55.5	28.2	308 29.5	35.3
	20	148 48.8	116 39.1	04.4	123 55.9	50.2	325 58.2	28.3	323 32.1	35.4
	21	163 51.3	131 38.7	·· 05.5	138 56.6	·· 50.9	341 00.9	·· 28.4	338 34.7	·· 35.4
	22	178 53.8	146 38.2	06.6	153 57.3	51.6	356 03.6	28.5	353 37.3	35.5
	23	193 56.2	161 37.7	07.7	168 58.0	52.3	11 06.3	28.6	8 39.9	35.6
21	00	208 58.7	176 37.2	N12 08.9	183 58.7	N 9 53.0	26 09.0	N 0 28.7	23 42.6	N 0 35.6
	01	224 01.2	191 36.7	10.0	198 59.3	53.7	41 11.7	28.8	38 45.2	35.7
	02	239 03.6	206 36.2	11.1	214 00.0	54.4	56 14.4	28.9	53 47.8	35.8
	03	254 06.1	221 35.8	·· 12.2	229 00.7	·· 55.1	71 17.1	·· 29.0	68 50.4	·· 35.8
	04	269 08.5	236 35.3	13.3	244 01.4	55.8	86 19.8	29.1	83 53.0	35.9
	05	284 11.0	251 34.8	14.4	259 02.1	56.5	101 22.5	29.2	98 55.6	35.9
	06	299 13.5	266 34.3	N12 15.5	274 02.8	N 9 57.2	116 25.2	N 0 29.3	113 58.3	N 0 36.0
	07	314 15.9	281 33.8	16.6	289 03.5	57.9	131 27.9	29.4	129 00.9	36.1
	08	329 18.4	296 33.3	17.7	304 04.2	58.6	146 30.6	29.5	144 03.5	36.1
TUE	09	344 20.9	311 32.8	·· 18.8	319 04.8	9 59.3	161 33.3	·· 29.6	159 06.1	·· 36.2
	10	359 23.3	326 32.3	20.0	334 05.5	10 00.0	176 36.0	29.7	174 08.7	36.2
	11	14 25.8	341 31.8	21.1	349 06.2	00.7	191 38.7	29.8	189 11.3	36.3
SDAY	12	29 28.3	356 31.4	N12 22.2	4 06.9	N10 01.4	206 41.4	N 0 29.8	204 13.9	N 0 36.4
	13	44 30.7	11 30.9	23.3	19 07.6	02.1	221 44.1	29.9	219 16.6	36.4
	14	59 33.2	26 30.4	24.4	34 08.3	02.8	236 46.8	30.0	234 19.2	36.5
	15	74 35.7	41 29.9	·· 25.5	49 09.0	·· 03.5	251 49.5	·· 30.1	249 21.8	·· 36.5
	16	89 38.1	56 29.4	26.6	64 09.7	04.2	266 52.2	30.2	264 24.4	36.6
	17	104 40.6	71 28.9	27.7	79 10.3	04.9	281 54.8	30.3	279 27.0	36.7
	18	119 43.0	86 28.4	N12 28.8	94 11.0	N10 05.6	296 57.5	N 0 30.4	294 29.6	N 0 36.7
	19	134 45.5	101 27.9	29.9	109 11.7	06.3	312 00.2	30.5	309 32.3	36.8
	20	149 48.0	116 27.4	31.0	124 12.4	07.0	327 02.9	30.6	324 34.9	36.8
	21	164 50.4	131 26.9	·· 32.1	139 13.1	·· 07.7	342 05.6	·· 30.7	339 37.5	·· 36.9
	22	179 52.9	146 26.4	33.2	154 13.8	08.4	357 08.3	30.8	354 40.1	37.0
	23	194 55.4	161 25.9	34.3	169 14.5	09.1	12 11.0	30.9	9 42.7	37.0
		h m								
Mer. Pass.		10 06.4	v −0.5	d 1.1	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.6	S57 20.0
Acrux	173 36.2	S62 59.8
Adhara	255 31.9	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.6	N56 03.8
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.7	S47 03.1
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.5	N26 46.6
Alpheratz	358 09.2	N28 59.0
Altair	62 32.1	N 8 49.0
Ankaa	353 40.3	S42 24.6
Antares	112 56.1	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.6	S68 59.4
Avior	234 28.0	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.3	S52 41.5
Capella	281 11.1	N45 58.8
Deneb	49 48.3	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.5
Dubhe	194 21.2	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.3	N51 29.2
Enif	34 11.3	N 9 47.1
Fomalhaut	15 51.2	S29 43.4
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.3
Hadar	149 22.2	S60 16.9
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.2	S34 23.5
Kochab	137 17.9	N74 14.0
Markab	14 03.0	N15 06.0
Menkar	314 41.1	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.6	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.6	S26 19.2
Peacock	53 57.8	S56 47.6
Pollux	243 57.8	N28 04.4
Procyon	245 25.4	N 5 16.3
Rasalhague	96 29.0	N12 34.3
Regulus	208 09.4	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.7	S60 45.4
Sabik	102 40.5	S15 42.1
Schedar	350 09.1	N56 25.8
Shaula	96 55.0	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.8
Suhail	223 10.4	S43 21.7
Vega	80 55.4	N38 45.7
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	328 49.2	12 13
Mars	335 42.6	11 45
Jupiter	177 04.6	22 16
Saturn	174 40.2	22 25

G.M.T.		SUN G.H.A.	SUN Dec.		MOON G.H.A.	v	Dec.		d	H.P.
d	h	° ′	° ′		° ′	′	° ′		′	′
19	00	180 11.8	N11 03.9		1 51.5	15.5	S 5 12.0	10.3	54.1
	01	195 11.9	04.8		16 26.0	15.4	5 22.3	10.2	54.1
	02	210 12.0	05.7		31 00.4	15.4	5 32.5	10.2	54.1
	03	225 12.2	06.5		45 34.8	15.4	5 42.7	10.1	54.1
	04	240 12.3	07.4		60 09.2	15.4	5 52.8	10.2	54.1
	05	255 12.5	08.3		74 43.6	15.3	6 03.0	10.1	54.1
	06	270 12.6	N11 09.1		89 17.9	15.4	S 6 13.1	10.1	54.1
	07	285 12.7	10.0		103 52.3	15.3	6 23.2	10.0	54.1
	08	300 12.9	10.9		118 26.6	15.4	6 33.2	10.0	54.0
SUN	09	315 13.0	11.7		133 01.0	15.3	6 43.2	10.0	54.0
	10	330 13.2	12.6		147 35.3	15.3	6 53.2	10.0	54.0
	11	345 13.3	13.5		162 09.6	15.3	7 03.2	10.0	54.0
DAY	12	0 13.4	N11 14.3		176 43.9	15.3	S 7 13.2	9.9	54.0
	13	15 13.6	15.2		191 18.2	15.2	7 23.1	9.9	54.0
	14	30 13.7	16.0		205 52.4	15.3	7 33.0	9.8	54.0
	15	45 13.8	16.9		220 26.7	15.2	7 42.8	9.8	54.0
	16	60 14.0	17.8		235 00.9	15.2	7 52.6	9.8	54.0
	17	75 14.1	18.6		249 35.1	15.2	8 02.4	9.8	54.0
	18	90 14.2	N11 19.5		264 09.3	15.2	S 8 12.2	9.7	54.0
	19	105 14.4	20.4		278 43.5	15.1	8 21.9	9.7	54.0
	20	120 14.5	21.2		293 17.6	15.1	8 31.6	9.6	54.0
	21	135 14.6	22.1		307 51.7	15.2	8 41.2	9.7	54.0
	22	150 14.8	22.9		322 25.9	15.0	8 50.9	9.5	54.0
	23	165 14.9	23.8		336 59.9	15.1	9 00.4	9.6	54.0
20	00	180 15.0	N11 24.7		351 34.0	15.1	S 9 10.0	9.5	54.0
	01	195 15.2	25.5		6 08.1	15.0	9 19.5	9.4	54.0
	02	210 15.3	26.4		20 42.1	15.0	9 28.9	9.5	54.0
	03	225 15.5	27.2		35 16.1	15.0	9 38.4	9.4	54.0
	04	240 15.6	28.1		49 50.1	14.9	9 47.8	9.3	54.0
	05	255 15.7	28.9		64 24.0	14.9	9 57.1	9.3	54.0
	06	270 15.9	N11 29.8		78 57.9	14.9	S10 06.4	9.3	54.0
	07	285 16.0	30.7		93 31.8	14.9	10 15.7	9.2	54.0
	08	300 16.1	31.5		108 05.7	14.9	10 24.9	9.2	54.0
MON	09	315 16.3	32.4		122 39.6	14.8	10 34.1	9.1	54.0
	10	330 16.4	33.2		137 13.4	14.8	10 43.2	9.1	54.0
	11	345 16.5	34.1		151 47.2	14.8	10 52.3	9.1	54.0
DAY	12	0 16.6	N11 34.9		166 21.0	14.7	S11 01.4	9.0	54.0
	13	15 16.8	35.8		180 54.7	14.7	11 10.4	8.9	54.0
	14	30 16.9	36.7		195 28.4	14.7	11 19.3	8.9	54.0
	15	45 17.0	37.5		210 02.1	14.7	11 28.2	8.9	54.0
	16	60 17.2	38.4		224 35.8	14.6	11 37.1	8.8	54.0
	17	75 17.3	39.2		239 09.4	14.6	11 45.9	8.8	54.0
	18	90 17.4	N11 40.1		253 43.0	14.6	S11 54.7	8.7	54.0
	19	105 17.6	40.9		268 16.6	14.5	12 03.4	8.7	54.0
	20	120 17.7	41.8		282 50.1	14.6	12 12.1	8.6	54.0
	21	135 17.8	42.6		297 23.7	14.4	12 20.7	8.6	54.0
	22	150 18.0	43.5		311 57.1	14.5	12 29.3	8.5	54.0
	23	165 18.1	44.3		326 30.6	14.4	12 37.8	8.5	54.0
21	00	180 18.2	N11 45.2		341 04.0	14.4	S12 46.3	8.4	54.0
	01	195 18.4	46.0		355 37.4	14.3	12 54.7	8.3	54.0
	02	210 18.5	46.9		10 10.7	14.4	13 03.0	8.3	54.0
	03	225 18.6	47.7		24 44.1	14.3	13 11.3	8.3	54.0
	04	240 18.7	48.6		39 17.4	14.2	13 19.6	8.2	54.0
	05	255 18.9	49.4		53 50.6	14.2	13 27.8	8.1	54.0
	06	270 19.0	N11 50.3		68 23.8	14.2	S13 35.9	8.1	54.0
	07	285 19.1	51.1		82 57.0	14.2	13 44.0	8.0	54.0
	08	300 19.3	52.0		97 30.2	14.1	13 52.0	8.0	54.0
TUE	09	315 19.4	52.8		112 03.3	14.1	14 00.0	7.9	54.0
	10	330 19.5	53.7		126 36.4	14.0	14 07.9	7.9	54.0
	11	345 19.6	54.5		141 09.4	14.0	14 15.8	7.8	54.0
SDAY	12	0 19.8	N11 55.4		155 42.4	14.0	S14 23.6	7.7	54.0
	13	15 19.9	56.2		170 15.4	13.9	14 31.3	7.7	54.0
	14	30 20.0	57.1		184 48.3	13.9	14 39.0	7.6	54.0
	15	45 20.1	57.9		199 21.2	13.9	14 46.6	7.6	54.0
	16	60 20.3	58.8		213 54.1	13.8	14 54.2	7.4	54.0
	17	75 20.4	11 59.6		228 26.9	13.8	15 01.6	7.5	54.0
	18	90 20.5	N12 00.4		242 59.7	13.8	S15 09.1	7.3	54.0
	19	105 20.7	01.3		257 32.5	13.7	15 16.4	7.3	54.0
	20	120 20.8	02.1		272 05.2	13.7	15 23.7	7.3	54.0
	21	135 20.9	03.0		286 37.9	13.6	15 31.0	7.1	54.0
	22	150 21.0	03.8		301 10.5	13.6	15 38.1	7.1	54.0
	23	165 21.2	04.7		315 43.1	13.6	15 45.2	7.1	54.0
		S.D. 15.9	d 0.9		S.D. 14.7		14.7		14.7

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
19	00 47	00 53	11 59	24 35	12 13	15	○
20	01 00	01 06	11 59	00 35	12 56	16	
21	01 13	01 19	11 59	01 18	13 40	17	

G.M.T.		ARIES	VENUS −3.4		MARS +1.4		JUPITER −1.9		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
22	00	209 57.8	176 25.5	N12 35.4	184 15.2	N10 09.8	27 13.7	N 0 31.0	24 45.3	N 0 37.1
	01	225 00.3	191 25.0	36.5	199 15.8	10.5	42 16.4	31.1	39 47.9	37.1
	02	240 02.8	206 24.5	37.6	214 16.5	11.2	57 19.1	31.2	54 50.6	37.2
	03	255 05.2	221 24.0	·· 38.7	229 17.2	·· 11.9	72 21.8	·· 31.2	69 53.2	·· 37.3
	04	270 07.7	236 23.5	39.8	244 17.9	12.6	87 24.5	31.3	84 55.8	37.3
	05	285 10.2	251 23.0	40.9	259 18.6	13.3	102 27.2	31.4	99 58.4	37.4
	06	300 12.6	266 22.5	N12 42.0	274 19.3	N10 14.0	117 29.9	N 0 31.5	115 01.0	N 0 37.4
	07	315 15.1	281 22.0	43.1	289 20.0	14.7	132 32.6	31.6	130 03.6	37.5
W	08	330 17.5	296 21.5	44.2	304 20.7	15.4	147 35.2	31.7	145 06.2	37.6
E	09	345 20.0	311 21.0	·· 45.3	319 21.3	·· 16.1	162 37.9	·· 31.8	160 08.8	·· 37.6
D	10	0 22.5	326 20.5	46.4	334 22.0	16.8	177 40.6	31.9	175 11.5	37.7
N	11	15 24.9	341 20.0	47.5	349 22.7	17.5	192 43.3	32.0	190 14.1	37.7
E	12	30 27.4	356 19.5	N12 48.6	4 23.4	N10 18.2	207 46.0	N 0 32.1	205 16.7	N 0 37.8
S	13	45 29.9	11 19.0	49.7	19 24.1	18.9	222 48.7	32.2	220 19.3	37.9
D	14	60 32.3	26 18.5	50.8	34 24.8	19.6	237 51.4	32.3	235 21.9	37.9
A	15	75 34.8	41 18.0	·· 51.9	49 25.5	·· 20.3	252 54.1	·· 32.3	250 24.5	·· 38.0
Y	16	90 37.3	56 17.5	52.9	64 26.1	21.0	267 56.8	32.4	265 27.1	38.0
	17	105 39.7	71 17.0	54.0	79 26.8	21.6	282 59.5	32.5	280 29.8	38.1
	18	120 42.2	86 16.5	N12 55.1	94 27.5	N10 22.3	298 02.2	N 0 32.6	295 32.4	N 0 38.2
	19	135 44.6	101 16.0	56.2	109 28.2	23.0	313 04.8	32.7	310 35.0	38.2
	20	150 47.1	116 15.5	57.3	124 28.9	23.7	328 07.5	32.8	325 37.6	38.3
	21	165 49.6	131 15.0	·· 58.4	139 29.6	·· 24.4	343 10.2	·· 32.9	340 40.2	·· 38.3
	22	180 52.0	146 14.5	12 59.5	154 30.3	25.1	358 12.9	33.0	355 42.8	38.4
	23	195 54.5	161 14.0	13 00.6	169 30.9	25.8	13 15.6	33.1	10 45.4	38.4
23	00	210 57.0	176 13.5	N13 01.7	184 31.6	N10 26.5	28 18.3	N 0 33.2	25 48.0	N 0 38.5
	01	225 59.4	191 13.0	02.8	199 32.3	27.2	43 21.0	33.2	40 50.7	38.6
	02	241 01.9	206 12.5	03.8	214 33.0	27.9	58 23.7	33.3	55 53.3	38.6
	03	256 04.4	221 12.0	·· 04.9	229 33.7	·· 28.6	73 26.4	·· 33.4	70 55.9	·· 38.7
	04	271 06.8	236 11.5	06.0	244 34.4	29.3	88 29.0	33.5	85 58.5	38.7
	05	286 09.3	251 11.0	07.1	259 35.1	30.0	103 31.7	33.6	101 01.1	38.8
	06	301 11.8	266 10.4	N13 08.2	274 35.7	N10 30.7	118 34.4	N 0 33.7	116 03.7	N 0 38.9
	07	316 14.2	281 09.9	09.3	289 36.4	31.4	133 37.1	33.8	131 06.3	38.9
T	08	331 16.7	296 09.4	10.3	304 37.1	32.1	148 39.8	33.9	146 08.9	39.0
H	09	346 19.1	311 08.9	·· 11.4	319 37.8	·· 32.7	163 42.5	·· 34.0	161 11.5	·· 39.0
U	10	1 21.6	326 08.4	12.5	334 38.5	33.4	178 45.2	34.1	176 14.2	39.1
R	11	16 24.1	341 07.9	13.6	349 39.2	34.1	193 47.9	34.1	191 16.8	39.2
S	12	31 26.5	356 07.4	N13 14.7	4 39.9	N10 34.8	208 50.5	N 0 34.2	206 19.4	N 0 39.2
D	13	46 29.0	11 06.9	15.8	19 40.5	35.5	223 53.2	34.3	221 22.0	39.3
A	14	61 31.5	26 06.4	16.8	34 41.2	36.2	238 55.9	34.4	236 24.6	39.3
Y	15	76 33.9	41 05.9	·· 17.9	49 41.9	·· 36.9	253 58.6	·· 34.5	251 27.2	·· 39.4
	16	91 36.4	56 05.4	19.0	64 42.6	37.6	269 01.3	34.6	266 29.8	39.4
	17	106 38.9	71 04.9	20.1	79 43.3	38.3	284 04.0	34.7	281 32.4	39.5
	18	121 41.3	86 04.3	N13 21.1	94 44.0	N10 39.0	299 06.7	N 0 34.8	296 35.0	N 0 39.6
	19	136 43.8	101 03.8	22.2	109 44.6	39.7	314 09.3	34.9	311 37.7	39.6
	20	151 46.3	116 03.3	23.3	124 45.3	40.4	329 12.0	34.9	326 40.3	39.7
	21	166 48.7	131 02.8	·· 24.4	139 46.0	·· 41.0	344 14.7	·· 35.0	341 42.9	·· 39.7
	22	181 51.2	146 02.3	25.5	154 46.7	41.7	359 17.4	35.1	356 45.5	39.8
	23	196 53.6	161 01.8	26.5	169 47.4	42.4	14 20.1	35.2	11 48.1	39.8
24	00	211 56.1	176 01.3	N13 27.6	184 48.1	N10 43.1	29 22.8	N 0 35.3	26 50.7	N 0 39.9
	01	226 58.6	191 00.8	28.7	199 48.8	43.8	44 25.4	35.4	41 53.3	40.0
	02	242 01.0	206 00.2	29.7	214 49.4	44.5	59 28.1	35.5	56 55.9	40.0
	03	257 03.5	220 59.7	·· 30.8	229 50.1	·· 45.2	74 30.8	·· 35.6	71 58.5	·· 40.1
	04	272 06.0	235 59.2	31.9	244 50.8	45.9	89 33.5	35.6	87 01.1	40.1
	05	287 08.4	250 58.7	33.0	259 51.5	46.6	104 36.2	35.7	102 03.7	40.2
	06	302 10.9	265 58.2	N13 34.0	274 52.2	N10 47.2	119 38.9	N 0 35.8	117 06.4	N 0 40.2
	07	317 13.4	280 57.7	35.1	289 52.9	47.9	134 41.5	35.9	132 09.0	40.3
	08	332 15.8	295 57.1	36.2	304 53.5	48.6	149 44.2	36.0	147 11.6	40.4
F	09	347 18.3	310 56.6	·· 37.2	319 54.2	·· 49.3	164 46.9	·· 36.1	162 14.2	·· 40.4
R	10	2 20.8	325 56.1	38.3	334 54.9	50.0	179 49.6	36.2	177 16.8	40.5
I	11	17 23.2	340 55.6	39.4	349 55.6	50.7	194 52.3	36.3	192 19.4	40.5
D	12	32 25.7	355 55.1	N13 40.4	4 56.3	N10 51.4	209 54.9	N 0 36.3	207 22.0	N 0 40.6
A	13	47 28.1	10 54.6	41.5	19 57.0	52.1	224 57.6	36.4	222 24.6	40.6
Y	14	62 30.6	25 54.0	42.6	34 57.6	52.7	240 00.3	36.5	237 27.2	40.7
	15	77 33.1	40 53.5	·· 43.6	49 58.3	·· 53.4	255 03.0	·· 36.6	252 29.8	·· 40.8
	16	92 35.5	55 53.0	44.7	64 59.0	54.1	270 05.7	36.7	267 32.4	40.8
	17	107 38.0	70 52.5	45.8	79 59.7	54.8	285 08.3	36.8	282 35.0	40.9
	18	122 40.5	85 52.0	N13 46.8	95 00.4	N10 55.5	300 11.0	N 0 36.9	297 37.7	N 0 40.9
	19	137 42.9	100 51.4	47.9	110 01.1	56.2	315 13.7	36.9	312 40.3	41.0
	20	152 45.4	115 50.9	49.0	125 01.7	56.9	330 16.4	37.0	327 42.9	41.0
	21	167 47.9	130 50.4	·· 50.0	140 02.4	·· 57.5	345 19.1	·· 37.1	342 45.5	·· 41.1
	22	182 50.3	145 49.9	51.1	155 03.1	58.2	0 21.7	37.2	357 48.1	41.2
	23	197 52.8	160 49.3	52.2	170 03.8	58.9	15 24.4	37.3	12 50.7	41.2
Mer. Pass.		h m 9 54.6	v −0.5	d 1.1	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.6	S57 20.0
Acrux	173 36.2	S62 59.8
Adhara	255 31.9	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.7	N56 03.8
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.7	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.5	N26 46.6
Alpheratz	358 09.2	N28 59.0
Altair	62 32.1	N 8 49.0
Ankaa	353 40.2	S42 24.5
Antares	112 56.1	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.6	S68 59.5
Avior	234 28.0	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.3	S52 41.5
Capella	281 11.1	N45 58.8
Deneb	49 48.2	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.5
Dubhe	194 21.2	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.3	N51 29.3
Enif	34 11.3	N 9 47.1
Fomalhaut	15 51.2	S29 43.3
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.3
Hadar	149 22.2	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.2	S34 23.5
Kochab	137 17.9	N74 14.0
Markab	14 03.0	N15 06.0
Menkar	314 41.1	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.6	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.6	S26 19.2
Peacock	53 57.8	S56 47.6
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 29.0	N12 34.3
Regulus	208 09.5	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.7	S60 45.4
Sabik	102 40.5	S15 42.1
Schedar	350 09.1	N56 25.8
Shaula	96 55.0	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.8
Suhail	223 10.4	S43 21.7
Vega	80 55.4	N38 45.7
Zuben'ubi	137 32.3	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	325 16.5	12 16
Mars	333 34.7	11 41
Jupiter	177 21.3	22 03
Saturn	174 51.1	22 13

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
22	00	180 21.3	N12 05.5	330 15.7	13.5	S15 52.3	6.9	54.0
	01	195 21.4	06.4	344 48.2	13.5	15 59.2	6.9	54.1
	02	210 21.5	07.2	359 20.7	13.5	16 06.1	6.9	54.1
	03	225 21.7	·· 08.0	13 53.2	13.4	16 13.0	6.7	54.1
	04	240 21.8	08.9	28 25.6	13.4	16 19.7	6.7	54.1
	05	255 21.9	09.7	42 58.0	13.3	16 26.4	6.6	54.1
	06	270 22.0	N12 10.6	57 30.3	13.3	S16 33.0	6.6	54.1
	07	285 22.2	11.4	72 02.6	13.2	16 39.6	6.5	54.1
	08	300 22.3	12.2	86 34.8	13.3	16 46.1	6.4	54.1
W	09	315 22.4	·· 13.1	101 07.1	13.1	16 52.5	6.3	54.1
E	10	330 22.5	13.9	115 39.2	13.2	16 58.8	6.3	54.1
D	11	345 22.6	14.8	130 11.4	13.1	17 05.1	6.2	54.1
N	12	0 22.8	N12 15.6	144 43.5	13.0	S17 11.3	6.1	54.1
E	13	15 22.9	16.4	159 15.5	13.0	17 17.4	6.0	54.1
S	14	30 23.0	17.3	173 47.5	13.0	17 23.4	6.0	54.1
D	15	45 23.1	·· 18.1	188 19.5	13.0	17 29.4	5.9	54.2
A	16	60 23.3	19.0	202 51.5	12.9	17 35.3	5.8	54.2
Y	17	75 23.4	19.8	217 23.4	12.8	17 41.1	5.7	54.2
	18	90 23.5	N12 20.6	231 55.2	12.8	S17 46.8	5.7	54.2
	19	105 23.6	21.5	246 27.0	12.8	17 52.5	5.6	54.2
	20	120 23.7	22.3	260 58.8	12.7	17 58.1	5.5	54.2
	21	135 23.9	·· 23.1	275 30.5	12.7	18 03.6	5.4	54.2
	22	150 24.0	24.0	290 02.2	12.7	18 09.0	5.3	54.2
	23	165 24.1	24.8	304 33.9	12.6	18 14.3	5.3	54.2
23	00	180 24.2	N12 25.6	319 05.5	12.6	S18 19.6	5.2	54.2
	01	195 24.3	26.5	333 37.1	12.5	18 24.8	5.1	54.2
	02	210 24.5	27.3	348 08.6	12.5	18 29.9	5.0	54.3
	03	225 24.6	·· 28.1	2 40.1	12.5	18 34.9	4.9	54.3
	04	240 24.7	29.0	17 11.6	12.4	18 39.8	4.9	54.3
	05	255 24.8	29.8	31 43.0	12.4	18 44.7	4.8	54.3
	06	270 24.9	N12 30.6	46 14.4	12.3	S18 49.5	4.7	54.3
	07	285 25.1	31.5	60 45.7	12.3	18 54.2	4.6	54.3
T	08	300 25.2	32.3	75 17.0	12.2	18 58.8	4.5	54.3
H	09	315 25.3	·· 33.1	89 48.2	12.3	19 03.3	4.4	54.3
U	10	330 25.4	34.0	104 19.5	12.1	19 07.7	4.3	54.4
R	11	345 25.5	34.8	118 50.6	12.2	19 12.0	4.3	54.4
S	12	0 25.7	N12 35.6	133 21.8	12.1	S19 16.3	4.2	54.4
D	13	15 25.8	36.5	147 52.9	12.0	19 20.5	4.1	54.4
A	14	30 25.9	37.3	162 23.9	12.1	19 24.6	4.0	54.4
Y	15	45 26.0	·· 38.1	176 55.0	12.0	19 28.6	3.9	54.4
	16	60 26.1	38.9	191 26.0	11.9	19 32.5	3.8	54.4
	17	75 26.2	39.8	205 56.9	11.9	19 36.3	3.7	54.4
	18	90 26.4	N12 40.6	220 27.8	11.9	S19 40.0	3.6	54.5
	19	105 26.5	41.4	234 58.7	11.8	19 43.6	3.6	54.5
	20	120 26.6	42.3	249 29.5	11.8	19 47.2	3.4	54.5
	21	135 26.7	·· 43.1	264 00.3	11.8	19 50.6	3.4	54.5
	22	150 26.8	43.9	278 31.1	11.7	19 54.0	3.3	54.5
	23	165 26.9	44.7	293 01.8	11.7	19 57.3	3.2	54.5
24	00	180 27.1	N12 45.6	307 32.5	11.6	S20 00.5	3.1	54.5
	01	195 27.2	46.4	322 03.1	11.6	20 03.6	2.9	54.6
	02	210 27.3	47.2	336 33.7	11.6	20 06.5	2.9	54.6
	03	225 27.4	·· 48.0	351 04.3	11.5	20 09.4	2.9	54.6
	04	240 27.5	48.9	5 34.8	11.5	20 12.3	2.7	54.6
	05	255 27.6	49.7	20 05.3	11.5	20 15.0	2.6	54.6
	06	270 27.7	N12 50.5	34 35.8	11.5	S20 17.6	2.5	54.6
	07	285 27.9	51.3	49 06.3	11.3	20 20.1	2.4	54.7
	08	300 28.0	52.2	63 36.6	11.4	20 22.5	2.4	54.7
F	09	315 28.1	·· 53.0	78 07.0	11.3	20 24.9	2.2	54.7
R	10	330 28.2	53.8	92 37.3	11.3	20 27.1	2.1	54.7
I	11	345 28.3	54.6	107 07.6	11.3	20 29.2	2.1	54.7
D	12	0 28.4	N12 55.5	121 37.9	11.2	S20 31.3	1.9	54.7
A	13	15 28.5	56.3	136 08.1	11.2	20 33.2	1.9	54.8
Y	14	30 28.7	57.1	150 38.3	11.2	20 35.1	1.7	54.8
	15	45 28.8	·· 57.9	165 08.5	11.1	20 36.8	1.7	54.8
	16	60 28.9	58.7	179 38.6	11.1	20 38.5	1.5	54.8
	17	75 29.0	12 59.6	194 08.7	11.1	20 40.0	1.5	54.8
	18	90 29.1	N13 00.4	208 38.8	11.1	S20 41.5	1.3	54.9
	19	105 29.2	01.2	223 08.9	11.0	20 42.8	1.2	54.9
	20	120 29.3	02.0	237 38.9	10.9	20 44.0	1.2	54.9
	21	135 29.4	·· 02.8	252 08.8	11.0	20 45.2	1.0	54.9
	22	150 29.5	03.7	266 38.8	10.9	20 46.2	1.0	54.9
	23	165 29.7	04.5	281 08.7	10.9	20 47.2	0.8	55.0
		S.D. 15.9	d 0.8	S.D. 14.7		14.8		14.9

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
22	01 25	01 31	11 58	02 03	14 26	18	◑
23	01 37	01 42	11 58	02 49	15 13	19	
24	01 48	01 53	11 58	03 37	16 01	20	

	G.M.T.	ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.9		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
25	00	212 55.2	175 48.8	N13 53.2	185 04.5	N10 59.6	30 27.1	N 0 37.4	27 53.3	N 0 41.3
	01	227 57.7	190 48.3	54.3	200 05.2	11 00.3	45 29.8	37.5	42 55.9	41.3
	02	243 00.2	205 47.8	55.3	215 05.8	01.0	60 32.5	37.5	57 58.5	41.4
	03	258 02.6	220 47.2	·· 56.4	230 06.5	·· 01.6	75 35.1	·· 37.6	73 01.1	·· 41.4
	04	273 05.1	235 46.7	57.4	245 07.2	02.3	90 37.8	37.7	88 03.7	41.5
	05	288 07.6	250 46.2	58.5	260 07.9	03.0	105 40.5	37.8	103 06.3	41.5
	06	303 10.0	265 45.7	N13 59.6	275 08.6	N11 03.7	120 43.2	N 0 37.9	118 08.9	N 0 41.6
	07	318 12.5	280 45.1	14 00.6	290 09.2	04.4	135 45.8	38.0	133 11.6	41.7
S	08	333 15.0	295 44.6	01.7	305 09.9	05.1	150 48.5	38.1	148 14.2	41.7
A	09	348 17.4	310 44.1	·· 02.7	320 10.6	·· 05.7	165 51.2	·· 38.1	163 16.8	·· 41.8
T	10	3 19.9	325 43.6	03.8	335 11.3	06.4	180 53.9	38.2	178 19.4	41.8
U	11	18 22.4	340 43.0	04.8	350 12.0	07.1	195 56.6	38.3	193 22.0	41.9
R	12	33 24.8	355 42.5	N14 05.9	5 12.7	N11 07.8	210 59.2	N 0 38.4	208 24.6	N 0 41.9
D	13	48 27.3	10 42.0	06.9	20 13.3	08.5	226 01.9	38.5	223 27.2	42.0
A	14	63 29.7	25 41.4	08.0	35 14.0	09.2	241 04.6	38.6	238 29.8	42.1
Y	15	78 32.2	40 40.9	·· 09.0	50 14.7	·· 09.8	256 07.3	·· 38.6	253 32.4	·· 42.1
	16	93 34.7	55 40.4	10.1	65 15.4	10.5	271 09.9	38.7	268 35.0	42.2
	17	108 37.1	70 39.9	11.1	80 16.1	11.2	286 12.6	38.8	283 37.6	42.2
	18	123 39.6	85 39.3	N14 12.2	95 16.8	N11 11.9	301 15.3	N 0 38.9	298 40.2	N 0 42.3
	19	138 42.1	100 38.8	13.2	110 17.4	12.6	316 18.0	39.0	313 42.8	42.3
	20	153 44.5	115 38.3	14.3	125 18.1	13.2	331 20.6	39.1	328 45.4	42.4
	21	168 47.0	130 37.7	·· 15.3	140 18.8	·· 13.9	346 23.3	·· 39.1	343 48.0	·· 42.4
	22	183 49.5	145 37.2	16.4	155 19.5	14.6	1 26.0	39.2	358 50.6	42.5
	23	198 51.9	160 36.7	17.4	170 20.2	15.3	16 28.6	39.3	13 53.2	42.6
26	00	213 54.4	175 36.1	N14 18.5	185 20.8	N11 16.0	31 31.3	N 0 39.4	28 55.8	N 0 42.6
	01	228 56.9	190 35.6	19.5	200 21.5	16.6	46 34.0	39.5	43 58.5	42.7
	02	243 59.3	205 35.1	20.6	215 22.2	17.3	61 36.7	39.6	59 01.1	42.7
	03	259 01.8	220 34.5	·· 21.6	230 22.9	·· 18.0	76 39.3	·· 39.6	74 03.7	·· 42.8
	04	274 04.2	235 34.0	22.7	245 23.6	18.7	91 42.0	39.7	89 06.3	42.8
	05	289 06.7	250 33.5	23.7	260 24.2	19.3	106 44.7	39.8	104 08.9	42.9
	06	304 09.2	265 32.9	N14 24.7	275 24.9	N11 20.0	121 47.4	N 0 39.9	119 11.5	N 0 42.9
	07	319 11.6	280 32.4	25.8	290 25.6	20.7	136 50.0	40.0	134 14.1	43.0
	08	334 14.1	295 31.8	26.8	305 26.3	21.4	151 52.7	40.1	149 16.7	43.0
S	09	349 16.6	310 31.3	·· 27.9	320 27.0	·· 22.1	166 55.4	·· 40.1	164 19.3	·· 43.1
U	10	4 19.0	325 30.8	28.9	335 27.7	22.7	181 58.0	40.2	179 21.9	43.2
N	11	19 21.5	340 30.2	30.0	350 28.3	23.4	197 00.7	40.3	194 24.5	43.2
D	12	34 24.0	355 29.7	N14 31.0	5 29.0	N11 24.1	212 03.4	N 0 40.4	209 27.1	N 0 43.3
A	13	49 26.4	10 29.2	32.0	20 29.7	24.8	227 06.1	40.5	224 29.7	43.3
Y	14	64 28.9	25 28.6	33.1	35 30.4	25.4	242 08.7	40.5	239 32.3	43.4
	15	79 31.3	40 28.1	·· 34.1	50 31.1	·· 26.1	257 11.4	·· 40.6	254 34.9	·· 43.4
	16	94 33.8	55 27.5	35.1	65 31.7	26.8	272 14.1	40.7	269 37.5	43.5
	17	109 36.3	70 27.0	36.2	80 32.4	27.5	287 16.7	40.8	284 40.1	43.5
	18	124 38.7	85 26.4	N14 37.2	95 33.1	N11 28.1	302 19.4	N 0 40.9	299 42.7	N 0 43.6
	19	139 41.2	100 25.9	38.2	110 33.8	28.8	317 22.1	41.0	314 45.3	43.6
	20	154 43.7	115 25.4	39.3	125 34.5	29.5	332 24.7	41.0	329 47.9	43.7
	21	169 46.1	130 24.8	·· 40.3	140 35.1	·· 30.2	347 27.4	·· 41.1	344 50.5	·· 43.7
	22	184 48.6	145 24.3	41.3	155 35.8	30.8	2 30.1	41.2	359 53.1	43.8
	23	199 51.1	160 23.7	42.4	170 36.5	31.5	17 32.7	41.3	14 55.7	43.9
27	00	214 53.5	175 23.2	N14 43.4	185 37.2	N11 32.2	32 35.4	N 0 41.4	29 58.3	N 0 43.9
	01	229 56.0	190 22.6	44.4	200 37.9	32.9	47 38.1	41.4	45 00.9	44.0
	02	244 58.5	205 22.1	45.5	215 38.5	33.5	62 40.8	41.5	60 03.5	44.0
	03	260 00.9	220 21.6	·· 46.5	230 39.2	·· 34.2	77 43.4	·· 41.6	75 06.1	·· 44.1
	04	275 03.4	235 21.0	47.5	245 39.9	34.9	92 46.1	41.7	90 08.7	44.1
	05	290 05.8	250 20.5	48.5	260 40.6	35.6	107 48.8	41.8	105 11.3	44.2
	06	305 08.3	265 19.9	N14 49.6	275 41.3	N11 36.2	122 51.4	N 0 41.8	120 13.9	N 0 44.2
	07	320 10.8	280 19.4	50.6	290 41.9	36.9	137 54.1	41.9	135 16.5	44.3
	08	335 13.2	295 18.8	51.6	305 42.6	37.6	152 56.8	42.0	150 19.1	44.3
M	09	350 15.7	310 18.3	·· 52.7	320 43.3	·· 38.3	167 59.4	·· 42.1	165 21.7	·· 44.4
O	10	5 18.2	325 17.7	53.7	335 44.0	38.9	183 02.1	42.2	180 24.4	44.4
N	11	20 20.6	340 17.2	54.7	350 44.7	39.6	198 04.7	42.2	195 27.0	44.5
D	12	35 23.1	355 16.6	N14 55.7	5 45.3	N11 40.3	213 07.4	N 0 42.3	210 29.6	N 0 44.6
A	13	50 25.6	10 16.1	56.7	20 46.0	40.9	228 10.1	42.4	225 32.2	44.6
Y	14	65 28.0	25 15.5	57.8	35 46.7	41.6	243 12.7	42.5	240 34.8	44.7
	15	80 30.5	40 15.0	·· 58.8	50 47.4	·· 42.3	258 15.4	·· 42.6	255 37.4	·· 44.7
	16	95 33.0	55 14.4	14 59.8	65 48.0	43.0	273 18.1	42.6	270 40.0	44.8
	17	110 35.4	70 13.9	15 00.8	80 48.7	43.6	288 20.7	42.7	285 42.6	44.8
	18	125 37.9	85 13.3	N15 01.9	95 49.4	N11 44.3	303 23.4	N 0 42.8	300 45.2	N 0 44.9
	19	140 40.3	100 12.8	02.9	110 50.1	45.0	318 26.1	42.9	315 47.8	44.9
	20	155 42.8	115 12.2	03.9	125 50.8	45.6	333 28.7	42.9	330 50.4	45.0
	21	170 45.3	130 11.7	·· 04.9	140 51.4	·· 46.3	348 31.4	·· 43.0	345 53.0	·· 45.0
	22	185 47.7	145 11.1	05.9	155 52.1	47.0	3 34.1	43.1	0 55.6	45.1
	23	200 50.2	160 10.5	06.9	170 52.8	47.6	18 36.7	43.2	15 58.2	45.1
Mer. Pass.		h m 9 42.8	v −0.5	d 1.0	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.6	S57 20.0
Acrux	173 36.2	S62 59.8
Adhara	255 32.0	S28 57.1
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.7	N56 03.8
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.6	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.4	N26 46.6
Alpheratz	358 09.2	N28 59.0
Altair	62 32.1	N 8 49.0
Ankaa	353 40.2	S42 24.5
Antares	112 56.1	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.5	S68 59.5
Avior	234 28.1	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.3	S52 41.5
Capella	281 11.1	N45 58.8
Deneb	49 48.2	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.5
Dubhe	194 21.3	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.2	N51 29.3
Enif	34 11.3	N 9 47.1
Fomalhaut	15 51.2	S29 43.3
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.3
Hadar	149 22.1	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.1	S34 23.5
Kochab	137 17.9	N74 14.0
Markab	14 03.0	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.7	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.5	S26 19.2
Peacock	53 57.8	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 29.0	N12 34.3
Regulus	208 09.5	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.6	S60 45.4
Sabik	102 40.4	S15 42.1
Schedar	350 09.1	N56 25.8
Shaula	96 54.9	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.9
Suhail	223 10.4	S43 21.7
Vega	80 55.4	N38 45.7
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	321 41.7	12 18
Mars	331 26.5	11 38
Jupiter	177 36.9	21 50
Saturn	175 01.5	22 00

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
25 00	180 29.8	N13 05.3	295 38.6	10.9	S20 48.0	0.8	55.0
01	195 29.9	06.1	310 08.5	10.8	20 48.8	0.6	55.0
02	210 30.0	06.9	324 38.3	10.8	20 49.4	0.6	55.0
03	225 30.1	·· 07.7	339 08.1	10.8	20 50.0	0.4	55.1
04	240 30.2	08.6	353 37.9	10.7	20 50.4	0.3	55.1
05	255 30.3	09.4	8 07.6	10.8	20 50.7	0.2	55.1
06	270 30.4	N13 10.2	22 37.4	10.7	S20 50.9	0.2	55.1
07	285 30.5	11.0	37 07.1	10.6	20 51.1	0.0	55.1
S 08	300 30.6	11.8	51 36.7	10.7	20 51.1	0.1	55.2
A 09	315 30.8	·· 12.6	66 06.4	10.6	20 51.0	0.2	55.2
T 10	330 30.9	13.4	80 36.0	10.6	20 50.8	0.3	55.2
U 11	345 31.0	14.3	95 05.6	10.6	20 50.5	0.4	55.2
R 12	0 31.1	N13 15.1	109 35.2	10.6	S20 50.1	0.5	55.3
D 13	15 31.2	15.9	124 04.8	10.5	20 49.6	0.6	55.3
A 14	30 31.3	16.7	138 34.3	10.5	20 49.0	0.7	55.3
Y 15	45 31.4	·· 17.5	153 03.8	10.5	20 48.3	0.8	55.3
16	60 31.5	18.3	167 33.3	10.4	20 47.5	0.9	55.4
17	75 31.6	19.1	182 02.7	10.5	20 46.6	1.0	55.4
18	90 31.7	N13 19.9	196 32.2	10.4	S20 45.6	1.2	55.4
19	105 31.8	20.7	211 01.6	10.4	20 44.4	1.2	55.4
20	120 31.9	21.6	225 31.0	10.4	20 43.2	1.4	55.5
21	135 32.0	·· 22.4	240 00.4	10.4	20 41.8	1.4	55.5
22	150 32.1	23.2	254 29.8	10.3	20 40.4	1.6	55.5
23	165 32.2	24.0	268 59.1	10.3	20 38.8	1.6	55.5
26 00	180 32.4	N13 24.8	283 28.4	10.3	S20 37.2	1.8	55.6
01	195 32.5	25.6	297 57.7	10.3	20 35.4	1.9	55.6
02	210 32.6	26.4	312 27.0	10.3	20 33.5	2.0	55.6
03	225 32.7	·· 27.2	326 56.3	10.2	20 31.5	2.1	55.6
04	240 32.8	28.0	341 25.5	10.3	20 29.4	2.2	55.7
05	255 32.9	28.8	355 54.8	10.2	20 27.2	2.3	55.7
06	270 33.0	N13 29.6	10 24.0	10.2	S20 24.9	2.4	55.7
07	285 33.1	30.4	24 53.2	10.2	20 22.5	2.5	55.8
08	300 33.2	31.2	39 22.4	10.2	20 20.0	2.6	55.8
S 09	315 33.3	·· 32.0	53 51.6	10.1	20 17.4	2.8	55.8
U 10	330 33.4	32.9	68 20.7	10.2	20 14.6	2.8	55.8
N 11	345 33.5	33.7	82 49.9	10.1	20 11.8	3.0	55.9
D 12	0 33.6	N13 34.5	97 19.0	10.1	S20 08.8	3.0	55.9
A 13	15 33.7	35.3	111 48.1	10.2	20 05.8	3.2	55.9
Y 14	30 33.8	36.1	126 17.3	10.1	20 02.6	3.3	56.0
15	45 33.9	·· 36.9	140 46.4	10.0	19 59.3	3.4	56.0
16	60 34.0	37.7	155 15.4	10.1	19 55.9	3.4	56.0
17	75 34.1	38.5	169 44.5	10.1	19 52.5	3.6	56.1
18	90 34.2	N13 39.3	184 13.6	10.0	S19 48.9	3.7	56.1
19	105 34.3	40.1	198 42.6	10.1	19 45.2	3.9	56.1
20	120 34.4	40.9	213 11.7	10.0	19 41.3	3.9	56.1
21	135 34.5	·· 41.7	227 40.7	10.0	19 37.4	4.0	56.2
22	150 34.6	42.5	242 09.7	10.0	19 33.4	4.1	56.2
23	165 34.7	43.3	256 38.7	10.0	19 29.3	4.3	56.2
27 00	180 34.8	N13 44.1	271 07.7	10.0	S19 25.0	4.3	56.3
01	195 34.9	44.9	285 36.7	10.0	19 20.7	4.5	56.3
02	210 35.0	45.7	300 05.7	10.0	19 16.2	4.5	56.3
03	225 35.1	·· 46.5	314 34.7	10.0	19 11.7	4.7	56.4
04	240 35.2	47.3	329 03.7	9.9	19 07.0	4.8	56.4
05	255 35.3	48.1	343 32.6	10.0	19 02.2	4.9	56.4
06	270 35.4	N13 48.9	358 01.6	10.0	S18 57.3	5.0	56.5
07	285 35.5	49.7	12 30.6	9.9	18 52.3	5.0	56.5
08	300 35.6	50.5	26 59.5	9.9	18 47.3	5.2	56.5
M 09	315 35.7	·· 51.3	41 28.4	10.0	18 42.1	5.4	56.6
O 10	330 35.8	52.0	55 57.4	9.9	18 36.7	5.4	56.6
N 11	345 35.9	52.8	70 26.3	9.9	18 31.3	5.5	56.6
D 12	0 36.0	N13 53.6	84 55.2	10.0	S18 25.8	5.6	56.7
A 13	15 36.1	54.4	99 24.2	9.9	18 20.2	5.7	56.7
Y 14	30 36.2	55.2	113 53.1	9.9	18 14.5	5.9	56.7
15	45 36.3	·· 56.0	128 22.0	9.9	18 08.6	5.9	56.8
16	60 36.4	56.8	142 50.9	9.9	18 02.7	6.0	56.8
17	75 36.5	57.6	157 19.8	9.9	17 56.7	6.2	56.9
18	90 36.6	N13 58.4	171 48.7	9.9	S17 50.5	6.2	56.9
19	105 36.7	13 59.2	186 17.6	9.9	17 44.3	6.4	56.9
20	120 36.8	14 00.0	200 46.5	9.9	17 37.9	6.4	57.0
21	135 36.9	·· 00.8	215 15.4	9.8	17 31.5	6.6	57.0
22	150 36.9	01.6	229 44.2	9.9	17 24.9	6.6	57.0
23	165 37.0	02.3	244 13.1	9.9	17 18.3	6.8	57.1
	S.D. 15.9	d 0.8	S.D. 15.1		15.2		15.4

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
25	01 59	02 04	11 58	04 26	16 52	21	◑
26	02 09	02 14	11 58	05 17	17 42	22	
27	02 19	02 24	11 58	06 08	18 34	23	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.9		SATURN +0.9	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
28	00	215 52.7	175 10.0	N15 08.0	185 53.5	N11 48.3	33 39.4	N 0 43.3	31 00.8	N 0 45.2
	01	230 55.1	190 09.4	09.0	200 54.2	49.0	48 42.0	43.3	46 03.4	45.2
	02	245 57.6	205 08.9	10.0	215 54.8	49.7	63 44.7	43.4	61 06.0	45.3
	03	261 00.1	220 08.3	11.0	230 55.5	50.3	78 47.4	43.5	76 08.6	45.3
	04	276 02.5	235 07.8	12.0	245 56.2	51.0	93 50.0	43.6	91 11.2	45.4
	05	291 05.0	250 07.2	13.0	260 56.9	51.7	108 52.7	43.6	106 13.8	45.4
	06	306 07.4	265 06.7	N15 14.0	275 57.5	N11 52.3	123 55.3	N 0 43.7	121 16.4	N 0 45.5
	07	321 09.9	280 06.1	15.0	290 58.2	53.0	138 58.0	43.8	136 19.0	45.6
	08	336 12.4	295 05.5	16.1	305 58.9	53.7	154 00.7	43.9	151 21.5	45.6
TUESDAY	09	351 14.8	310 05.0	17.1	320 59.6	54.3	169 03.3	44.0	166 24.1	45.7
	10	6 17.3	325 04.4	18.1	336 00.3	55.0	184 06.0	44.0	181 26.7	45.7
	11	21 19.8	340 03.9	19.1	351 00.9	55.7	199 08.6	44.1	196 29.3	45.8
	12	36 22.2	355 03.3	N15 20.1	6 01.6	N11 56.3	214 11.3	N 0 44.2	211 31.9	N 0 45.8
	13	51 24.7	10 02.7	21.1	21 02.3	57.0	229 14.0	44.3	226 34.5	45.9
	14	66 27.2	25 02.2	22.1	36 03.0	57.7	244 16.6	44.3	241 37.1	45.9
	15	81 29.6	40 01.6	23.1	51 03.6	58.3	259 19.3	44.4	256 39.7	46.0
	16	96 32.1	55 01.0	24.1	66 04.3	59.0	274 21.9	44.5	271 42.3	46.0
	17	111 34.6	70 00.5	25.1	81 05.0	11 59.7	289 24.6	44.6	286 44.9	46.1
	18	126 37.0	84 59.9	N15 26.1	96 05.7	N12 00.3	304 27.3	N 0 44.6	301 47.5	N 0 46.1
	19	141 39.5	99 59.4	27.1	111 06.4	01.0	319 29.9	44.7	316 50.1	46.2
	20	156 41.9	114 58.8	28.1	126 07.0	01.6	334 32.6	44.8	331 52.7	46.2
	21	171 44.4	129 58.2	29.1	141 07.7	02.3	349 35.2	44.9	346 55.3	46.3
	22	186 46.9	144 57.7	30.1	156 08.4	03.0	4 37.9	44.9	1 57.9	46.3
	23	201 49.3	159 57.1	31.1	171 09.1	03.6	19 40.5	45.0	17 00.5	46.4
29	00	216 51.8	174 56.5	N15 32.1	186 09.7	N12 04.3	34 43.2	N 0 45.1	32 03.1	N 0 46.4
	01	231 54.3	189 56.0	33.1	201 10.4	05.0	49 45.9	45.2	47 05.7	46.5
	02	246 56.7	204 55.4	34.1	216 11.1	05.6	64 48.5	45.2	62 08.3	46.5
	03	261 59.2	219 54.8	35.1	231 11.8	06.3	79 51.2	45.3	77 10.9	46.6
	04	277 01.7	234 54.3	36.1	246 12.4	07.0	94 53.8	45.4	92 13.5	46.6
	05	292 04.1	249 53.7	37.1	261 13.1	07.6	109 56.5	45.5	107 16.1	46.7
	06	307 06.6	264 53.1	N15 38.1	276 13.8	N12 08.3	124 59.1	N 0 45.5	122 18.7	N 0 46.7
	07	322 09.1	279 52.6	39.1	291 14.5	08.9	140 01.8	45.6	137 21.3	46.8
WEDNESDAY	08	337 11.5	294 52.0	40.1	306 15.1	09.6	155 04.5	45.7	152 23.9	46.8
	09	352 14.0	309 51.4	41.1	321 15.8	10.3	170 07.1	45.8	167 26.5	46.9
	10	7 16.4	324 50.8	42.1	336 16.5	10.9	185 09.8	45.8	182 29.1	46.9
	11	22 18.9	339 50.3	43.1	351 17.2	11.6	200 12.4	45.9	197 31.7	47.0
	12	37 21.4	354 49.7	N15 44.1	6 17.9	N12 12.3	215 15.1	N 0 46.0	212 34.3	N 0 47.0
	13	52 23.8	9 49.1	45.1	21 18.5	12.9	230 17.7	46.1	227 36.9	47.1
	14	67 26.3	24 48.6	46.1	36 19.2	13.6	245 20.4	46.1	242 39.5	47.1
	15	82 28.8	39 48.0	47.0	51 19.9	14.2	260 23.0	46.2	257 42.1	47.2
	16	97 31.2	54 47.4	48.0	66 20.6	14.9	275 25.7	46.3	272 44.7	47.2
	17	112 33.7	69 46.8	49.0	81 21.2	15.6	290 28.3	46.4	287 47.2	47.3
	18	127 36.2	84 46.3	N15 50.0	96 21.9	N12 16.2	305 31.0	N 0 46.4	302 49.8	N 0 47.3
	19	142 38.6	99 45.7	51.0	111 22.6	16.9	320 33.6	46.5	317 52.4	47.4
	20	157 41.1	114 45.1	52.0	126 23.3	17.5	335 36.3	46.6	332 55.0	47.4
	21	172 43.5	129 44.5	53.0	141 23.9	18.2	350 38.9	46.7	347 57.6	47.5
	22	187 46.0	144 44.0	54.0	156 24.6	18.9	5 41.6	46.7	3 00.2	47.5
	23	202 48.5	159 43.4	54.9	171 25.3	19.5	20 44.2	46.8	18 02.8	47.6
30	00	217 50.9	174 42.8	N15 55.9	186 26.0	N12 20.2	35 46.9	N 0 46.9	33 05.4	N 0 47.6
	01	232 53.4	189 42.2	56.9	201 26.6	20.8	50 49.5	46.9	48 08.0	47.7
	02	247 55.9	204 41.7	57.9	216 27.3	21.5	65 52.2	47.0	63 10.6	47.7
	03	262 58.3	219 41.1	58.9	231 28.0	22.1	80 54.9	47.1	78 13.2	47.8
	04	278 00.8	234 40.5	15 59.8	246 28.7	22.8	95 57.5	47.2	93 15.8	47.8
	05	293 03.3	249 39.9	16 00.8	261 29.3	23.5	111 00.2	47.2	108 18.4	47.9
	06	308 05.7	264 39.3	N16 01.8	276 30.0	N12 24.1	126 02.8	N 0 47.3	123 21.0	N 0 47.9
	07	323 08.2	279 38.8	02.8	291 30.7	24.8	141 05.5	47.4	138 23.6	48.0
THURSDAY	08	338 10.7	294 38.2	03.8	306 31.4	25.4	156 08.1	47.4	153 26.2	48.0
	09	353 13.1	309 37.6	04.7	321 32.0	26.1	171 10.7	47.5	168 28.8	48.1
	10	8 15.6	324 37.0	05.7	336 32.7	26.7	186 13.4	47.6	183 31.3	48.1
	11	23 18.0	339 36.4	06.7	351 33.4	27.4	201 16.0	47.7	198 33.9	48.2
	12	38 20.5	354 35.8	N16 07.7	6 34.1	N12 28.1	216 18.7	N 0 47.7	213 36.5	N 0 48.2
	13	53 23.0	9 35.3	08.6	21 34.7	28.7	231 21.3	47.8	228 39.1	48.3
	14	68 25.4	24 34.7	09.6	36 35.4	29.4	246 24.0	47.9	243 41.7	48.3
	15	83 27.9	39 34.1	10.6	51 36.1	30.0	261 26.6	47.9	258 44.3	48.4
	16	98 30.4	54 33.5	11.6	66 36.8	30.7	276 29.3	48.0	273 46.9	48.4
	17	113 32.8	69 32.9	12.5	81 37.4	31.3	291 31.9	48.1	288 49.5	48.5
	18	128 35.3	84 32.3	N16 13.5	96 38.1	N12 32.0	306 34.6	N 0 48.2	303 52.1	N 0 48.5
	19	143 37.8	99 31.8	14.5	111 38.8	32.6	321 37.2	48.2	318 54.7	48.6
	20	158 40.2	114 31.2	15.4	126 39.4	33.3	336 39.9	48.3	333 57.3	48.6
	21	173 42.7	129 30.6	16.4	141 40.1	33.9	351 42.5	48.4	348 59.9	48.7
	22	188 45.2	144 30.0	17.4	156 40.8	34.6	6 45.2	48.4	4 02.5	48.7
	23	203 47.6	159 29.4	18.3	171 41.5	35.2	21 47.8	48.5	19 05.0	48.8
Mer Pass.		h m 9 31.0	v −0.6	d 1.0	v 0.7	d 0.7	v 2.7	d 0.1	v 2.6	d 0.1

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.6	S57 20.0
Acrux	173 36.2	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.7	N56 03.8
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.6	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.4	N26 46.6
Alpheratz	358 09.2	N28 58.9
Altair	62 32.1	N 8 49.0
Ankaa	353 40.2	S42 24.5
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.5	S68 59.5
Avior	234 28.1	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.3	S52 41.5
Capella	281 11.1	N45 58.8
Deneb	49 48.2	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.5
Dubhe	194 21.3	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.2	N51 29.3
Enif	34 11.3	N 9 47.1
Fomalhaut	15 51.2	S29 43.3
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.1	S34 23.5
Kochab	137 17.8	N74 14.0
Markab	14 03.0	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.7	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.5	S26 19.2
Peacock	53 57.7	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 29.0	N12 34.3
Regulus	208 09.5	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.6	S60 45.4
Sabik	102 40.4	S15 42.1
Schedar	350 09.0	N56 25.8
Shaula	96 54.9	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.9
Suhail	223 10.4	S43 21.7
Vega	80 55.3	N38 45.8
Zuben'ubi	137 32.3	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	318 04.7	12 21
Mars	329 17.9	11 35
Jupiter	177 51.4	21 37
Saturn	175 11.3	21 48

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
28	00	180 37.1	N14 03.1	258 42.0	9.9	S17 11.5	6.8	57.1
	01	195 37.2	03.9	273 10.9	9.8	17 04.7	7.0	57.1
	02	210 37.3	04.7	287 39.7	9.9	16 57.7	7.1	57.2
	03	225 37.4	·· 05.5	302 08.6	9.9	16 50.6	7.1	57.2
	04	240 37.5	06.3	316 37.5	9.9	16 43.5	7.3	57.3
	05	255 37.6	07.1	331 06.4	9.8	16 36.2	7.3	57.3
	06	270 37.7	N14 07.9	345 35.2	9.9	S16 28.9	7.5	57.3
	07	285 37.8	08.7	0 04.1	9.8	16 21.4	7.6	57.4
	08	300 37.9	09.4	14 32.9	9.9	16 13.8	7.6	57.4
TUESDAY	09	315 38.0	·· 10.2	29 01.8	9.9	16 06.2	7.8	57.4
	10	330 38.1	11.0	43 30.7	9.8	15 58.4	7.8	57.5
	11	345 38.2	11.8	57 59.5	9.9	15 50.6	8.0	57.5
	12	0 38.3	N14 12.6	72 28.4	9.8	S15 42.6	8.0	57.6
	13	15 38.3	13.4	86 57.2	9.9	15 34.6	8.2	57.6
	14	30 38.4	14.1	101 26.1	9.8	15 26.4	8.2	57.6
	15	45 38.5	·· 14.9	115 54.9	9.9	15 18.2	8.3	57.7
	16	60 38.6	15.7	130 23.8	9.8	15 09.9	8.5	57.7
	17	75 38.7	16.5	144 52.6	9.8	15 01.4	8.5	57.8
	18	90 38.8	N14 17.3	159 21.4	9.9	S14 52.9	8.6	57.8
	19	105 38.9	18.1	173 50.3	9.8	14 44.3	8.7	57.8
	20	120 39.0	18.8	188 19.1	9.9	14 35.6	8.8	57.9
	21	135 39.1	·· 19.6	202 48.0	9.8	14 26.8	8.9	57.9
	22	150 39.2	20.4	217 16.8	9.8	14 17.9	9.0	57.9
	23	165 39.2	21.2	231 45.6	9.9	14 08.9	9.1	58.0
29	00	180 39.3	N14 22.0	246 14.5	9.8	S13 59.8	9.2	58.0
	01	195 39.4	22.7	260 43.3	9.8	13 50.6	9.2	58.1
	02	210 39.5	23.5	275 12.1	9.8	13 41.4	9.4	58.1
	03	225 39.6	·· 24.3	289 40.9	9.8	13 32.0	9.4	58.1
	04	240 39.7	25.1	304 09.7	9.9	13 22.6	9.5	58.2
	05	255 39.8	25.9	318 38.6	9.8	13 13.1	9.6	58.2
	06	270 39.9	N14 26.6	333 07.4	9.8	S13 03.5	9.7	58.3
	07	285 40.0	27.4	347 36.2	9.8	12 53.8	9.8	58.3
	08	300 40.0	28.2	2 05.0	9.8	12 44.0	9.9	58.3
WEDNESDAY	09	315 40.1	·· 29.0	16 33.8	9.8	12 34.1	9.9	58.4
	10	330 40.2	29.7	31 02.6	9.8	12 24.2	10.0	58.4
	11	345 40.3	30.5	45 31.4	9.8	12 14.2	10.2	58.5
	12	0 40.4	N14 31.3	60 00.2	9.7	S12 04.0	10.2	58.5
	13	15 40.5	32.1	74 28.9	9.8	11 53.8	10.2	58.5
	14	30 40.6	32.8	88 57.7	9.8	11 43.6	10.4	58.6
	15	45 40.6	·· 33.6	103 26.5	9.7	11 33.2	10.4	58.6
	16	60 40.7	34.4	117 55.2	9.8	11 22.8	10.6	58.7
	17	75 40.8	35.2	132 24.0	9.8	11 12.2	10.6	58.7
	18	90 40.9	N14 35.9	146 52.8	9.7	S11 01.6	10.6	58.7
	19	105 41.0	36.7	161 21.5	9.7	10 51.0	10.8	58.8
	20	120 41.1	37.5	175 50.2	9.8	10 40.2	10.8	58.8
	21	135 41.1	·· 38.2	190 19.0	9.7	10 29.4	10.9	58.9
	22	150 41.2	39.0	204 47.7	9.7	10 18.5	11.0	58.9
	23	165 41.3	39.8	219 16.4	9.7	10 07.5	11.0	58.9
30	00	180 41.4	N14 40.6	233 45.1	9.7	S 9 56.5	11.1	59.0
	01	195 41.5	41.3	248 13.8	9.7	9 45.4	11.2	59.0
	02	210 41.6	42.1	262 42.5	9.7	9 34.2	11.3	59.0
	03	225 41.6	·· 42.9	277 11.2	9.7	9 22.9	11.3	59.1
	04	240 41.7	43.6	291 39.9	9.6	9 11.6	11.4	59.1
	05	255 41.8	44.4	306 08.5	9.7	9 00.2	11.5	59.2
	06	270 41.9	N14 45.2	320 37.2	9.6	S 8 48.7	11.5	59.2
	07	285 42.0	45.9	335 05.8	9.6	8 37.2	11.6	59.2
THURSDAY	08	300 42.1	46.7	349 34.4	9.6	8 25.6	11.7	59.3
	09	315 42.1	·· 47.5	4 03.0	9.6	8 13.9	11.7	59.3
	10	330 42.2	48.2	18 31.6	9.6	8 02.2	11.8	59.4
	11	345 42.3	49.0	33 00.2	9.6	7 50.4	11.8	59.4
	12	0 42.4	N14 49.8	47 28.8	9.6	S 7 38.6	11.9	59.4
	13	15 42.5	50.5	61 57.4	9.5	7 26.7	12.0	59.5
	14	30 42.5	51.3	76 25.9	9.5	7 14.7	12.0	59.5
	15	45 42.6	·· 52.1	90 54.4	9.6	7 02.7	12.1	59.5
	16	60 42.7	52.8	105 23.0	9.5	6 50.6	12.2	59.6
	17	75 42.8	53.6	119 51.5	9.4	6 38.4	12.1	59.6
	18	90 42.9	N14 54.3	134 19.9	9.5	S 6 26.3	12.3	59.7
	19	105 42.9	55.1	148 48.4	9.5	6 14.0	12.3	59.7
	20	120 43.0	55.9	163 16.9	9.4	6 01.7	12.3	59.7
	21	135 43.1	·· 56.6	177 45.3	9.4	5 49.4	12.4	59.8
	22	150 43.2	57.4	192 13.7	9.4	5 37.0	12.5	59.8
	23	165 43.3	58.1	206 42.1	9.4	5 24.5	12.5	59.8
		S.D. 15.9	d 0.8	S.D. 15.7		15.9		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 09	05 25	04 53	04 35	04 20
N 70	////	////	02 43	04 39	04 29	04 21	04 14
68	////	01 28	03 07	04 08	04 09	04 10	04 09
66	////	02 08	03 26	03 45	03 54	04 00	04 05
64	////	02 35	03 41	03 27	03 41	03 52	04 01
62	01 18	02 55	03 53	03 12	03 31	03 45	03 58
60	01 54	03 12	04 04	02 59	03 21	03 39	03 55
N 58	02 19	03 26	04 13	02 48	03 13	03 34	03 53
56	02 38	03 37	04 21	02 39	03 06	03 30	03 51
54	02 54	03 47	04 28	02 30	03 00	03 25	03 49
52	03 07	03 56	04 35	02 23	02 54	03 21	03 47
50	03 18	04 04	04 40	02 16	02 49	03 18	03 45
45	03 41	04 21	04 53	02 01	02 37	03 10	03 42
N 40	03 58	04 34	05 03	01 49	02 28	03 04	03 39
35	04 12	04 45	05 12	01 39	02 20	02 59	03 36
30	04 24	04 54	05 19	01 30	02 13	02 54	03 34
20	04 42	05 09	05 32	01 14	02 00	02 45	03 30
N 10	04 56	05 22	05 43	01 00	01 49	02 38	03 26
0	05 08	05 33	05 54	00 47	01 39	02 31	03 23
S 10	05 18	05 43	06 04	00 34	01 29	02 24	03 20
20	05 26	05 53	06 15	00 21	01 18	02 16	03 16
30	05 35	06 03	06 28	00 05	01 05	02 08	03 12
35	05 39	06 08	06 35	24 58	00 58	02 03	03 10
40	05 43	06 15	06 43	24 50	00 50	01 57	03 07
45	05 47	06 21	06 52	24 40	00 40	01 51	03 04
S 50	05 51	06 29	07 03	24 28	00 28	01 43	03 01
52	05 53	06 33	07 09	24 23	00 23	01 39	02 59
54	05 55	06 37	07 14	24 17	00 17	01 35	02 57
56	05 57	06 41	07 21	24 10	00 10	01 31	02 55
58	05 59	06 46	07 28	24 02	00 02	01 26	02 53
S 60	06 01	06 51	07 36	23 54	25 20	01 20	02 51

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 28	Moonset 29	Moonset 30	Moonset 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 51	////	////	08 48	11 09	13 16	15 22
N 70	21 16	////	////	09 34	11 32	13 28	15 25
68	20 51	22 35	////	10 04	11 50	13 38	15 28
66	20 31	21 51	////	10 26	12 04	13 45	15 30
64	20 16	21 23	////	10 43	12 15	13 52	15 31
62	20 03	21 02	22 44	10 57	12 25	13 57	15 33
60	19 53	20 45	22 05	11 10	12 34	14 02	15 34
N 58	19 43	20 31	21 39	11 20	12 41	14 06	15 35
56	19 35	20 19	21 19	11 29	12 47	14 10	15 36
54	19 28	20 09	21 03	11 37	12 53	14 14	15 37
52	19 21	20 00	20 50	11 44	12 58	14 17	15 38
50	19 15	19 52	20 38	11 50	13 03	14 19	15 39
45	19 03	19 35	20 15	12 04	13 13	14 25	15 40
N 40	18 52	19 22	19 57	12 15	13 22	14 30	15 42
35	18 44	19 11	19 43	12 25	13 29	14 35	15 43
30	18 36	19 01	19 31	12 33	13 35	14 38	15 44
20	18 23	18 46	19 13	12 48	13 46	14 45	15 45
N 10	18 11	18 33	18 59	13 00	13 55	14 50	15 47
0	18 01	18 22	18 47	13 12	14 04	14 56	15 48
S 10	17 50	18 12	18 37	13 24	14 12	15 01	15 49
20	17 39	18 02	18 28	13 36	14 22	15 06	15 51
30	17 27	17 51	18 20	13 50	14 32	15 12	15 52
35	17 20	17 46	18 16	13 58	14 38	15 16	15 53
40	17 11	17 40	18 11	14 07	14 45	15 20	15 54
45	17 02	17 33	18 07	14 18	14 52	15 24	15 55
S 50	16 51	17 25	18 03	14 31	15 02	15 30	15 57
52	16 45	17 21	18 01	14 37	15 06	15 32	15 57
54	16 40	17 17	17 59	14 43	15 11	15 35	15 58
56	16 33	17 13	17 57	14 51	15 16	15 38	15 59
58	16 26	17 08	17 55	14 59	15 22	15 41	15 59
S 60	16 18	17 03	17 52	15 08	15 28	15 45	16 00

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
28	02 28	02 33	11 57	07 00	19 26	24	
29	02 37	02 41	11 57	07 51	20 17	25	◐
30	02 45	02 49	11 57	08 43	21 09	26	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.9		SATURN +0.9	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1	00	218 50.1	174 28.8	N16 19.3	186 42.1	N12 35.9	36 50.5	N 0 48.6	34 07.6	N 0 48.8
	01	233 52.5	189 28.2	20.3	201 42.8	36.6	51 53.1	48.7	49 10.2	48.9
	02	248 55.0	204 27.6	21.2	216 43.5	37.2	66 55.7	48.7	64 12.8	48.9
	03	263 57.5	219 27.1	·· 22.2	231 44.2	·· 37.9	81 58.4	·· 48.8	79 15.4	·· 49.0
	04	278 59.9	234 26.5	23.2	246 44.8	38.5	97 01.0	48.9	94 18.0	49.0
	05	294 02.4	249 25.9	24.1	261 45.5	39.2	112 03.7	48.9	109 20.6	49.1
	06	309 04.9	264 25.3	N16 25.1	276 46.2	N12 39.8	127 06.3	N 0 49.0	124 23.2	N 0 49.1
	07	324 07.3	279 24.7	26.1	291 46.9	40.5	142 09.0	49.1	139 25.8	49.2
	08	339 09.8	294 24.1	27.0	306 47.5	41.1	157 11.6	49.1	154 28.4	49.2
F	09	354 12.3	309 23.5	·· 28.0	321 48.2	·· 41.8	172 14.3	·· 49.2	169 31.0	·· 49.2
R	10	9 14.7	324 22.9	28.9	336 48.9	42.4	187 16.9	49.3	184 33.6	49.3
I	11	24 17.2	339 22.3	29.9	351 49.5	43.1	202 19.5	49.3	199 36.1	49.3
D	12	39 19.6	354 21.7	N16 30.8	6 50.2	N12 43.7	217 22.2	N 0 49.4	214 38.7	N 0 49.4
A	13	54 22.1	9 21.1	31.8	21 50.9	44.4	232 24.8	49.5	229 41.3	49.4
Y	14	69 24.6	24 20.5	32.8	36 51.6	45.0	247 27.5	49.5	244 43.9	49.5
	15	84 27.0	39 19.9	·· 33.7	51 52.2	·· 45.7	262 30.1	·· 49.6	259 46.5	·· 49.5
	16	99 29.5	54 19.3	34.7	66 52.9	46.3	277 32.7	49.7	274 49.1	49.6
	17	114 32.0	69 18.7	35.6	81 53.6	47.0	292 35.4	49.8	289 51.7	49.6
	18	129 34.4	84 18.1	N16 36.6	96 54.3	N12 47.6	307 38.0	N 0 49.8	304 54.3	N 0 49.7
	19	144 36.9	99 17.6	37.5	111 54.9	48.3	322 40.7	49.9	319 56.9	49.7
	20	159 39.4	114 17.0	38.5	126 55.6	48.9	337 43.3	50.0	334 59.4	49.8
	21	174 41.8	129 16.4	·· 39.4	141 56.3	·· 49.6	352 45.9	·· 50.0	350 02.0	·· 49.8
	22	189 44.3	144 15.8	40.4	156 56.9	50.2	7 48.6	50.1	5 04.6	49.9
	23	204 46.8	159 15.2	41.3	171 57.6	50.9	22 51.2	50.2	20 07.2	49.9
2	00	219 49.2	174 14.6	N16 42.3	186 58.3	N12 51.5	37 53.9	N 0 50.2	35 09.8	N 0 50.0
	01	234 51.7	189 14.0	43.2	201 59.0	52.1	52 56.5	50.3	50 12.4	50.0
	02	249 54.1	204 13.4	44.2	216 59.6	52.8	67 59.1	50.4	65 15.0	50.1
	03	264 56.6	219 12.8	·· 45.1	232 00.3	·· 53.4	83 01.8	·· 50.4	80 17.6	·· 50.1
	04	279 59.1	234 12.2	46.1	247 01.0	54.1	98 04.4	50.5	95 20.2	50.1
	05	295 01.5	249 11.5	47.0	262 01.6	54.7	113 07.1	50.6	110 22.7	50.2
	06	310 04.0	264 10.9	N16 48.0	277 02.3	N12 55.4	128 09.7	N 0 50.6	125 25.3	N 0 50.2
	07	325 06.5	279 10.3	48.9	292 03.0	56.0	143 12.3	50.7	140 27.9	50.3
S	08	340 08.9	294 09.7	49.8	307 03.7	56.7	158 15.0	50.8	155 30.5	50.3
A	09	355 11.4	309 09.1	·· 50.8	322 04.3	·· 57.3	173 17.6	·· 50.8	170 33.1	·· 50.4
T	10	10 13.9	324 08.5	51.7	337 05.0	58.0	188 20.2	50.9	185 35.7	50.4
U	11	25 16.3	339 07.9	52.7	352 05.7	58.6	203 22.9	51.0	200 38.3	50.5
R	12	40 18.8	354 07.3	N16 53.6	7 06.3	N12 59.2	218 25.5	N 0 51.0	215 40.9	N 0 50.5
D	13	55 21.3	9 06.7	54.5	22 07.0	12 59.9	233 28.2	51.1	230 43.4	50.6
A	14	70 23.7	24 06.1	55.5	37 07.7	13 00.5	248 30.8	51.2	245 46.0	50.6
Y	15	85 26.2	39 05.5	·· 56.4	52 08.4	·· 01.2	263 33.4	·· 51.2	260 48.6	·· 50.7
	16	100 28.6	54 04.9	57.4	67 09.0	01.8	278 36.1	51.3	275 51.2	50.7
	17	115 31.1	69 04.3	58.3	82 09.7	02.5	293 38.7	51.4	290 53.8	50.8
	18	130 33.6	84 03.7	N16 59.2	97 10.4	N13 03.1	308 41.3	N 0 51.4	305 56.4	N 0 50.8
	19	145 36.0	99 03.1	17 00.2	112 11.0	03.8	323 44.0	51.5	320 59.0	50.8
	20	160 38.5	114 02.5	01.1	127 11.7	04.4	338 46.6	51.5	336 01.6	50.9
	21	175 41.0	129 01.9	·· 02.0	142 12.4	·· 05.0	353 49.2	·· 51.6	351 04.1	·· 50.9
	22	190 43.4	144 01.2	03.0	157 13.1	05.7	8 51.9	51.7	6 06.7	51.0
	23	205 45.9	159 00.6	03.9	172 13.7	06.3	23 54.5	51.7	21 09.3	51.0
3	00	220 48.4	174 00.0	N17 04.8	187 14.4	N13 07.0	38 57.1	N 0 51.8	36 11.9	N 0 51.1
	01	235 50.8	188 59.4	05.8	202 15.1	07.6	53 59.8	51.9	51 14.5	51.1
	02	250 53.3	203 58.8	06.7	217 15.7	08.2	69 02.4	51.9	66 17.1	51.2
	03	265 55.7	218 58.2	·· 07.6	232 16.4	·· 08.9	84 05.0	·· 52.0	81 19.7	·· 51.2
	04	280 58.2	233 57.6	08.5	247 17.1	09.5	99 07.7	52.1	96 22.2	51.3
	05	296 00.7	248 57.0	09.5	262 17.7	10.2	114 10.3	52.1	111 24.8	51.3
	06	311 03.1	263 56.3	N17 10.4	277 18.4	N13 10.8	129 12.9	N 0 52.2	126 27.4	N 0 51.3
	07	326 05.6	278 55.7	11.3	292 19.1	11.4	144 15.6	52.3	141 30.0	51.4
	08	341 08.1	293 55.1	12.2	307 19.8	12.1	159 18.2	52.3	156 32.6	51.4
S	09	356 10.5	308 54.5	·· 13.2	322 20.4	·· 12.7	174 20.8	·· 52.4	171 35.2	·· 51.5
U	10	11 13.0	323 53.9	14.1	337 21.1	13.4	189 23.5	52.4	186 37.7	51.5
N	11	26 15.5	338 53.3	15.0	352 21.8	14.0	204 26.1	52.5	201 40.3	51.6
D	12	41 17.9	353 52.6	N17 15.9	7 22.4	N13 14.6	219 28.7	N 0 52.6	216 42.9	N 0 51.6
A	13	56 20.4	8 52.0	16.9	22 23.1	15.3	234 31.4	52.6	231 45.5	51.7
Y	14	71 22.9	23 51.4	17.8	37 23.8	15.9	249 34.0	52.7	246 48.1	51.7
	15	86 25.3	38 50.8	·· 18.7	52 24.4	·· 16.6	264 36.6	·· 52.8	261 50.7	·· 51.7
	16	101 27.8	53 50.2	19.6	67 25.1	17.2	279 39.2	52.8	276 53.3	51.8
	17	116 30.2	68 49.6	20.5	82 25.8	17.8	294 41.9	52.9	291 55.8	51.8
	18	131 32.7	83 48.9	N17 21.4	97 26.4	N13 18.5	309 44.5	N 0 52.9	306 58.4	N 0 51.9
	19	146 35.2	98 48.3	22.4	112 27.1	19.1	324 47.1	53.0	322 01.0	51.9
	20	161 37.6	113 47.7	23.3	127 27.8	19.7	339 49.8	53.1	337 03.6	52.0
	21	176 40.1	128 47.1	·· 24.2	142 28.5	·· 20.4	354 52.4	·· 53.1	352 06.2	·· 52.0
	22	191 42.6	143 46.5	25.1	157 29.1	21.0	9 55.0	53.2	7 08.8	52.1
	23	206 45.0	158 45.8	26.0	172 29.8	21.7	24 57.6	53.3	22 11.3	52.1
Mer. Pass.		h m 9 19.2	v −0.6	d 0.9	v 0.7	d 0.6	v 2.6	d 0.1	v 2.6	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.4	S40 23.0
Achernar	335 45.5	S57 20.0
Acrux	173 36.2	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.9	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.6	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.4	N26 46.6
Alpheratz	358 09.2	N28 58.9
Altair	62 32.0	N 8 49.0
Ankaa	353 40.2	S42 24.5
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.5	S68 59.5
Avior	234 28.1	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.4	S52 41.4
Capella	281 11.1	N45 58.8
Deneb	49 48.2	N45 12.5
Denebola	182 58.4	N14 40.6
Diphda	349 20.8	S18 05.5
Dubhe	194 21.3	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.2	N51 29.3
Enif	34 11.3	N 9 47.1
Fomalhaut	15 51.2	S29 43.3
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.1	S34 23.5
Kochab	137 17.8	N74 14.0
Markab	14 02.9	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.2	S36 16.7
Miaplacidus	221 44.8	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.5	S26 19.2
Peacock	53 57.7	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 29.0	N12 34.3
Regulus	208 09.5	N12 03.5
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.6	S60 45.4
Sabik	102 40.4	S15 42.1
Schedar	350 09.0	N56 25.8
Shaula	96 54.9	S37 05.3
Sirius	258 55.5	S16 41.7
Spica	158 56.8	S11 03.9
Suhail	223 10.5	S43 21.7
Vega	80 55.3	N38 45.8
Zuben'ubi	137 32.3	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	314 25.3	12 24
Mars	327 09.1	11 32
Jupiter	178 04.6	21 25
Saturn	175 20.6	21 36

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
1 00	180 43.3	N14 58.9	221 10.5	9.3	S 5 12.0	12.5	59.9
01	195 43.4	14 59.7	235 38.8	9.4	4 59.5	12.6	59.9
02	210 43.5	15 00.4	250 07.2	9.3	4 46.9	12.7	59.9
03	225 43.6	·· 01.2	264 35.5	9.3	4 34.2	12.6	60.0
04	240 43.6	01.9	279 03.8	9.2	4 21.6	12.8	60.0
05	255 43.7	02.7	293 32.0	9.3	4 08.8	12.7	60.0
06	270 43.8	N15 03.5	308 00.3	9.2	S 3 56.1	12.8	60.1
07	285 43.9	04.2	322 28.5	9.2	3 43.3	12.8	60.1
08	300 43.9	05.0	336 56.7	9.2	3 30.5	12.9	60.1
F 09	315 44.0	·· 05.7	351 24.9	9.1	3 17.6	12.9	60.2
R 10	330 44.1	06.5	5 53.0	9.2	3 04.7	13.0	60.2
I 11	345 44.2	07.2	20 21.2	9.1	2 51.7	12.9	60.2
D 12	0 44.2	N15 08.0	34 49.3	9.0	S 2 38.8	13.0	60.3
A 13	15 44.3	08.7	49 17.3	9.1	2 25.8	13.1	60.3
Y 14	30 44.4	09.5	63 45.4	9.0	2 12.7	13.0	60.3
15	45 44.5	·· 10.3	78 13.4	9.0	1 59.7	13.1	60.4
16	60 44.5	11.0	92 41.4	8.9	1 46.6	13.1	60.4
17	75 44.6	11.8	107 09.3	9.0	1 33.5	13.2	60.4
18	90 44.7	N15 12.5	121 37.3	8.9	S 1 20.3	13.1	60.5
19	105 44.8	13.3	136 05.2	8.8	1 07.2	13.2	60.5
20	120 44.8	14.0	150 33.0	8.9	0 54.0	13.2	60.5
21	135 44.9	·· 14.8	165 00.9	8.8	0 40.8	13.2	60.6
22	150 45.0	15.5	179 28.7	8.7	0 27.6	13.3	60.6
23	165 45.1	16.3	193 56.4	8.8	0 14.3	13.2	60.6
2 00	180 45.1	N15 17.0	208 24.2	8.7	S 0 01.1	13.3	60.6
01	195 45.2	17.8	222 51.9	8.6	N 0 12.2	13.2	60.7
02	210 45.3	18.5	237 19.5	8.7	0 25.4	13.3	60.7
03	225 45.3	·· 19.3	251 47.2	8.6	0 38.7	13.3	60.7
04	240 45.4	20.0	266 14.8	8.5	0 52.0	13.3	60.7
05	255 45.5	20.8	280 42.3	8.6	1 05.3	13.3	60.8
06	270 45.6	N15 21.5	295 09.9	8.5	N 1 18.6	13.3	60.8
07	285 45.6	22.2	309 37.4	8.4	1 31.9	13.3	60.8
S 08	300 45.7	23.0	324 04.8	8.4	1 45.2	13.4	60.8
A 09	315 45.8	·· 23.7	338 32.2	8.4	1 58.6	13.3	60.9
T 10	330 45.8	24.5	352 59.6	8.3	2 11.9	13.3	60.9
U 11	345 45.9	25.2	7 26.9	8.3	2 25.2	13.3	60.9
R 12	0 46.0	N15 26.0	21 54.2	8.3	N 2 38.5	13.3	60.9
D 13	15 46.0	26.7	36 21.5	8.2	2 51.8	13.3	61.0
A 14	30 46.1	27.5	50 48.7	8.2	3 05.1	13.3	61.0
Y 15	45 46.2	·· 28.2	65 15.9	8.1	3 18.4	13.2	61.0
16	60 46.2	28.9	79 43.0	8.1	3 31.6	13.3	61.0
17	75 46.3	29.7	94 10.1	8.0	3 44.9	13.2	61.0
18	90 46.4	N15 30.4	108 37.1	8.1	N 3 58.1	13.3	61.1
19	105 46.4	31.2	123 04.2	7.9	4 11.4	13.2	61.1
20	120 46.5	31.9	137 31.1	7.9	4 24.6	13.2	61.1
21	135 46.6	·· 32.6	151 58.0	7.9	4 37.8	13.1	61.1
22	150 46.6	33.4	166 24.9	7.8	4 50.9	13.2	61.1
23	165 46.7	34.1	180 51.7	7.8	5 04.1	13.1	61.2
3 00	180 46.8	N15 34.9	195 18.5	7.8	N 5 17.2	13.1	61.2
01	195 46.8	35.6	209 45.3	7.6	5 30.3	13.1	61.2
02	210 46.9	36.3	224 11.9	7.7	5 43.4	13.0	61.2
03	225 47.0	·· 37.1	238 38.6	7.6	5 56.4	13.1	61.2
04	240 47.0	37.8	253 05.2	7.5	6 09.5	12.9	61.2
05	255 47.1	38.6	267 31.7	7.5	6 22.4	13.0	61.3
06	270 47.2	N15 39.3	281 58.2	7.5	N 6 35.4	12.9	61.3
07	285 47.2	40.0	296 24.7	7.4	6 48.3	12.9	61.3
08	300 47.3	40.8	310 51.1	7.4	7 01.2	12.8	61.3
S 09	315 47.4	·· 41.5	325 17.5	7.3	7 14.0	12.8	61.3
U 10	330 47.4	42.2	339 43.8	7.2	7 26.8	12.7	61.3
N 11	345 47.5	43.0	354 10.0	7.2	7 39.5	12.7	61.3
D 12	0 47.6	N15 43.7	8 36.2	7.2	N 7 52.2	12.7	61.3
A 13	15 47.6	44.4	23 02.4	7.1	8 04.9	12.6	61.3
Y 14	30 47.7	45.2	37 28.5	7.1	8 17.5	12.5	61.4
15	45 47.7	·· 45.9	51 54.6	7.0	8 30.0	12.5	61.4
16	60 47.8	46.6	66 20.6	7.0	8 42.5	12.5	61.4
17	75 47.9	47.4	80 46.6	6.9	8 55.0	12.3	61.4
18	90 47.9	N15 48.1	95 12.5	6.8	N 9 07.3	12.4	61.4
19	105 48.0	48.8	109 38.3	6.9	9 19.7	12.3	61.4
20	120 48.1	49.5	124 04.2	6.7	9 32.0	12.2	61.4
21	135 48.1	·· 50.3	138 29.9	6.7	9 44.2	12.1	61.4
22	150 48.2	51.0	152 55.6	6.7	9 56.3	12.1	61.4
23	165 48.2	51.7	167 21.3	6.6	10 08.4	12.0	61.4
	S.D. 15.9	d 0.7	S.D. 16.4		16.6		16.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	01 45	04 20	04 06	03 53	03 36
N 70	////	////	02 26	04 14	04 07	04 01	03 54
68	////	00 57	02 53	04 09	04 08	04 08	04 08
66	////	01 50	03 14	04 05	04 09	04 13	04 19
64	////	02 21	03 31	04 01	04 10	04 18	04 29
62	00 50	02 44	03 44	03 58	04 10	04 23	04 37
60	01 38	03 02	03 56	03 55	04 10	04 26	04 45
N 58	02 06	03 17	04 06	03 53	04 11	04 30	04 51
56	02 28	03 29	04 14	03 51	04 11	04 33	04 57
54	02 45	03 40	04 22	03 49	04 12	04 35	05 02
52	02 59	03 50	04 29	03 47	04 12	04 38	05 06
50	03 11	03 58	04 35	03 45	04 12	04 40	05 11
45	03 35	04 16	04 48	03 42	04 13	04 45	05 20
N 40	03 54	04 30	04 59	03 39	04 13	04 49	05 27
35	04 09	04 41	05 08	03 36	04 14	04 53	05 34
30	04 21	04 51	05 16	03 34	04 14	04 56	05 40
20	04 40	05 07	05 30	03 30	04 15	05 01	05 50
N 10	04 55	05 20	05 42	03 26	04 16	05 06	05 59
0	05 07	05 32	05 54	03 23	04 16	05 11	06 08
S 10	05 18	05 43	06 05	03 20	04 17	05 16	06 16
20	05 27	05 53	06 16	03 16	04 18	05 21	06 26
30	05 36	06 05	06 29	03 12	04 19	05 27	06 36
35	05 41	06 11	06 37	03 10	04 19	05 30	06 42
40	05 45	06 17	06 46	03 07	04 20	05 34	06 50
45	05 50	06 25	06 56	03 04	04 20	05 39	06 58
S 50	05 55	06 34	07 08	03 01	04 21	05 44	07 08
52	05 57	06 37	07 13	02 59	04 22	05 47	07 12
54	06 00	06 42	07 20	02 57	04 22	05 49	07 18
56	06 02	06 46	07 26	02 55	04 23	05 52	07 23
58	06 04	06 51	07 34	02 53	04 23	05 56	07 30
S 60	06 07	06 57	07 43	02 51	04 24	06 00	07 37

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 1	Moonset 2	Moonset 3	Moonset 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 17	////	////	15 22	17 30	19 44	22 10
N 70	21 33	////	////	15 25	17 25	19 29	21 39
68	21 04	23 10	////	15 28	17 20	19 17	21 16
66	20 43	22 09	////	15 30	17 17	19 07	20 58
64	20 26	21 36	////	15 31	17 14	18 58	20 44
62	20 12	21 13	23 16	15 33	17 11	18 51	20 32
60	20 00	20 54	22 21	15 34	17 09	18 45	20 22
N 58	19 50	20 39	21 51	15 35	17 06	18 40	20 13
56	19 41	20 26	21 29	15 36	17 05	18 35	20 06
54	19 33	20 15	21 11	15 37	17 03	18 31	19 59
52	19 26	20 05	20 57	15 38	17 02	18 27	19 53
50	19 20	19 57	20 44	15 39	17 00	18 23	19 47
45	19 07	19 39	20 20	15 40	16 57	18 16	19 35
N 40	18 55	19 25	20 01	15 42	16 55	18 10	19 25
35	18 46	19 13	19 46	15 43	16 53	18 04	19 17
30	18 38	19 03	19 34	15 44	16 51	18 00	19 09
20	18 24	18 47	19 14	15 45	16 48	17 51	18 57
N 10	18 12	18 34	18 59	15 47	16 45	17 44	18 46
0	18 00	18 22	18 47	15 48	16 42	17 38	18 35
S 10	17 49	18 11	18 36	15 49	16 39	17 31	18 25
20	17 37	18 00	18 26	15 51	16 36	17 24	18 14
30	17 24	17 49	18 17	15 52	16 33	17 16	18 01
35	17 16	17 43	18 13	15 53	16 31	17 11	17 54
40	17 08	17 36	18 08	15 54	16 29	17 06	17 46
45	16 58	17 28	18 03	15 55	16 27	17 00	17 36
S 50	16 45	17 20	17 58	15 57	16 24	16 52	17 25
52	16 40	17 16	17 56	15 57	16 22	16 49	17 20
54	16 34	17 11	17 54	15 58	16 21	16 46	17 14
56	16 27	17 07	17 51	15 59	16 19	16 41	17 07
58	16 19	17 02	17 48	15 59	16 17	16 37	17 00
S 60	16 10	16 56	17 46	16 00	16 15	16 32	16 52

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
1	02 53	02 57	11 57	09 36	22 02	27	
2	03 00	03 04	11 57	10 29	22 56	28	●
3	03 07	03 10	11 57	11 24	23 53	29	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.9		SATURN +0.9	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
4	00	221 47.5	173 45.2	N17 26.9	187 30.5	N13 22.3	40 00.3	N 0 53.3	37 13.9	N 0 52.1
	01	236 50.0	188 44.6	27.8	202 31.1	22.9	55 02.9	53.4	52 16.5	52.2
	02	251 52.4	203 44.0	28.8	217 31.8	23.6	70 05.5	53.4	67 19.1	52.2
	03	266 54.9	218 43.3	·· 29.7	232 32.5	·· 24.2	85 08.1	·· 53.5	82 21.7	·· 52.3
	04	281 57.4	233 42.7	30.6	247 33.1	24.8	100 10.8	53.6	97 24.2	52.3
	05	296 59.8	248 42.1	31.5	262 33.8	25.5	115 13.4	53.6	112 26.8	52.4
	06	312 02.3	263 41.5	N17 32.4	277 34.5	N13 26.1	130 16.0	N 0 53.7	127 29.4	N 0 52.4
	07	327 04.7	278 40.8	33.3	292 35.1	26.7	145 18.6	53.7	142 32.0	52.5
	08	342 07.2	293 40.2	34.2	307 35.8	27.4	160 21.3	53.8	157 34.6	52.5
MO	09	357 09.7	308 39.6	·· 35.1	322 36.5	·· 28.0	175 23.9	·· 53.9	172 37.2	·· 52.5
N	10	12 12.1	323 39.0	36.0	337 37.1	28.6	190 26.5	53.9	187 39.7	52.6
	11	27 14.6	338 38.3	36.9	352 37.8	29.3	205 29.1	54.0	202 42.3	52.6
DA	12	42 17.1	353 37.7	N17 37.8	7 38.5	N13 29.9	220 31.8	N 0 54.1	217 44.9	N 0 52.7
	13	57 19.5	8 37.1	38.7	22 39.1	30.5	235 34.4	54.1	232 47.5	52.7
Y	14	72 22.0	23 36.4	39.6	37 39.8	31.2	250 37.0	54.2	247 50.1	52.8
	15	87 24.5	38 35.8	·· 40.5	52 40.5	·· 31.8	265 39.6	·· 54.2	262 52.6	·· 52.8
	16	102 26.9	53 35.2	41.4	67 41.1	32.4	280 42.3	54.3	277 55.2	52.8
	17	117 29.4	68 34.5	42.3	82 41.8	33.1	295 44.9	54.4	292 57.8	52.9
	18	132 31.8	83 33.9	N17 43.2	97 42.5	N13 33.7	310 47.5	N 0 54.4	308 00.4	N 0 52.9
	19	147 34.3	98 33.3	44.1	112 43.2	34.3	325 50.1	54.5	323 03.0	53.0
	20	162 36.8	113 32.6	45.0	127 43.8	35.0	340 52.8	54.5	338 05.5	53.0
	21	177 39.2	128 32.0	·· 45.9	142 44.5	·· 35.6	355 55.4	·· 54.6	353 08.1	·· 53.1
	22	192 41.7	143 31.4	46.8	157 45.2	36.2	10 58.0	54.6	8 10.7	53.1
	23	207 44.2	158 30.7	47.7	172 45.8	36.8	26 00.6	54.7	23 13.3	53.1
5	00	222 46.6	173 30.1	N17 48.6	187 46.5	N13 37.5	41 03.2	N 0 54.8	38 15.9	N 0 53.2
	01	237 49.1	188 29.5	49.5	202 47.2	38.1	56 05.9	54.8	53 18.4	53.2
	02	252 51.6	203 28.8	50.4	217 47.8	38.7	71 08.5	54.9	68 21.0	53.3
	03	267 54.0	218 28.2	·· 51.3	232 48.5	·· 39.4	86 11.1	·· 54.9	83 23.6	·· 53.3
	04	282 56.5	233 27.6	52.2	247 49.2	40.0	101 13.7	55.0	98 26.2	53.4
	05	297 59.0	248 26.9	53.0	262 49.8	40.6	116 16.3	55.1	113 28.8	53.4
	06	313 01.4	263 26.3	N17 53.9	277 50.5	N13 41.2	131 19.0	N 0 55.1	128 31.3	N 0 53.4
	07	328 03.9	278 25.7	54.8	292 51.2	41.9	146 21.6	55.2	143 33.9	53.5
	08	343 06.3	293 25.0	55.7	307 51.8	42.5	161 24.2	55.2	158 36.5	53.5
TU	09	358 08.8	308 24.4	·· 56.6	322 52.5	·· 43.1	176 26.8	·· 55.3	173 39.1	·· 53.6
E	10	13 11.3	323 23.7	57.5	337 53.1	43.8	191 29.4	55.3	188 41.7	53.6
S	11	28 13.7	338 23.1	58.4	352 53.8	44.4	206 32.1	55.4	203 44.2	53.7
DA	12	43 16.2	353 22.5	N17 59.2	7 54.5	N13 45.0	221 34.7	N 0 55.5	218 46.8	N 0 53.7
	13	58 18.7	8 21.8	18 00.1	22 55.1	45.6	236 37.3	55.5	233 49.4	53.7
Y	14	73 21.1	23 21.2	01.0	37 55.8	46.3	251 39.9	55.6	248 52.0	53.8
	15	88 23.6	38 20.5	·· 01.9	52 56.5	·· 46.9	266 42.5	·· 55.6	263 54.5	·· 53.8
	16	103 26.1	53 19.9	02.8	67 57.1	47.5	281 45.1	55.7	278 57.1	53.9
	17	118 28.5	68 19.3	03.6	82 57.8	48.1	296 47.8	55.7	293 59.7	53.9
	18	133 31.0	83 18.6	N18 04.5	97 58.5	N13 48.8	311 50.4	N 0 55.8	309 02.3	N 0 53.9
	19	148 33.5	98 18.0	05.4	112 59.1	49.4	326 53.0	55.9	324 04.9	54.0
	20	163 35.9	113 17.3	06.3	127 59.8	50.0	341 55.6	55.9	339 07.4	54.0
	21	178 38.4	128 16.7	·· 07.2	143 00.5	·· 50.6	356 58.2	·· 56.0	354 10.0	·· 54.1
	22	193 40.8	143 16.0	08.0	158 01.1	51.3	12 00.8	56.0	9 12.6	54.1
	23	208 43.3	158 15.4	08.9	173 01.8	51.9	27 03.5	56.1	24 15.2	54.2
6	00	223 45.8	173 14.7	N18 09.8	188 02.5	N13 52.5	42 06.1	N 0 56.1	39 17.7	N 0 54.2
	01	238 48.2	188 14.1	10.7	203 03.1	53.1	57 08.7	56.2	54 20.3	54.2
	02	253 50.7	203 13.4	11.5	218 03.8	53.8	72 11.3	56.3	69 22.9	54.3
	03	268 53.2	218 12.8	·· 12.4	233 04.5	·· 54.4	87 13.9	·· 56.3	84 25.5	·· 54.3
	04	283 55.6	233 12.2	13.3	248 05.1	55.0	102 16.5	56.4	99 28.1	54.4
	05	298 58.1	248 11.5	14.1	263 05.8	55.6	117 19.1	56.4	114 30.6	54.4
	06	314 00.6	263 10.9	N18 15.0	278 06.5	N13 56.3	132 21.8	N 0 56.5	129 33.2	N 0 54.4
	07	329 03.0	278 10.2	15.9	293 07.1	56.9	147 24.4	56.5	144 35.8	54.5
	08	344 05.5	293 09.6	16.7	308 07.8	57.5	162 27.0	56.6	159 38.4	54.5
WE	09	359 07.9	308 08.9	·· 17.6	323 08.4	·· 58.1	177 29.6	·· 56.6	174 40.9	·· 54.6
D	10	14 10.4	323 08.3	18.5	338 09.1	58.7	192 32.2	56.7	189 43.5	54.6
N	11	29 12.9	338 07.6	19.3	353 09.8	13 59.4	207 34.8	56.8	204 46.1	54.6
E	12	44 15.3	353 07.0	N18 20.2	8 10.4	N14 00.0	222 37.4	N 0 56.8	219 48.7	N 0 54.7
S	13	59 17.8	8 06.3	21.1	23 11.1	00.6	237 40.0	56.9	234 51.2	54.7
DA	14	74 20.3	23 05.6	21.9	38 11.8	01.2	252 42.7	56.9	249 53.8	54.8
Y	15	89 22.7	38 05.0	·· 22.8	53 12.4	·· 01.8	267 45.3	·· 57.0	264 56.4	·· 54.8
	16	104 25.2	53 04.3	23.6	68 13.1	02.5	282 47.9	57.0	279 59.0	54.8
	17	119 27.7	68 03.7	24.5	83 13.8	03.1	297 50.5	57.1	295 01.5	54.9
	18	134 30.1	83 03.0	N18 25.4	98 14.4	N14 03.7	312 53.1	N 0 57.1	310 04.1	N 0 54.9
	19	149 32.6	98 02.4	26.2	113 15.1	04.3	327 55.7	57.2	325 06.7	55.0
	20	164 35.1	113 01.7	27.1	128 15.8	04.9	342 58.3	57.2	340 09.3	55.0
	21	179 37.5	128 01.1	·· 27.9	143 16.4	·· 05.6	358 00.9	·· 57.3	355 11.8	·· 55.0
	22	194 40.0	143 00.4	28.8	158 17.1	06.2	13 03.5	57.3	10 14.4	55.1
	23	209 42.4	157 59.8	29.6	173 17.7	06.8	28 06.1	57.4	25 17.0	55.1
Mer. Pass.		h m 9 07.4	v −0.6	d 0.9	v 0.7	d 0.6	v 2.6	d 0.1	v 2.6	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.4	S40 22.9
Achernar	335 45.5	S57 19.9
Acrux	173 36.2	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.9	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.6	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.1	S 8 34.8
Alphecca	126 31.4	N26 46.6
Alpheratz	358 09.2	N28 58.9
Altair	62 32.0	N 8 49.0
Ankaa	353 40.2	S42 24.5
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.4	S68 59.5
Avior	234 28.2	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.4	S52 41.4
Capella	281 11.1	N45 58.8
Deneb	49 48.1	N45 12.5
Denebola	182 58.4	N14 40.7
Diphda	349 20.7	S18 05.5
Dubhe	194 21.3	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.2	N51 29.3
Enif	34 11.2	N 9 47.2
Fomalhaut	15 51.1	S29 43.3
Gacrux	172 27.8	S57 00.6
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.1	S34 23.5
Kochab	137 17.8	N74 14.0
Markab	14 02.9	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.7
Miaplacidus	221 44.8	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.5	S26 19.2
Peacock	53 57.6	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.3
Regulus	208 09.5	N12 03.6
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.6	S60 45.4
Sabik	102 40.4	S15 42.1
Schedar	350 09.0	N56 25.8
Shaula	96 54.9	S37 05.3
Sirius	258 55.6	S16 41.7
Spica	158 56.8	S11 03.9
Suhail	223 10.5	S43 21.7
Vega	80 55.3	N38 45.8
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	310 43.5	12 27
Mars	324 59.9	11 28
Jupiter	178 16.6	21 12
Saturn	175 29.2	21 23

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
4 00	180 48.3	N15 52.5	181 46.9	6.6	N10 20.4	12.0	61.4
01	195 48.4	53.2	196 12.5	6.5	10 32.4	11.8	61.4
02	210 48.4	53.9	210 38.0	6.4	10 44.2	11.8	61.4
03	225 48.5	·· 54.6	225 03.4	6.4	10 56.0	11.8	61.4
04	240 48.5	55.4	239 28.8	6.4	11 07.8	11.6	61.4
05	255 48.6	56.1	253 54.2	6.3	11 19.4	11.6	61.4
06	270 48.7	N15 56.8	268 19.5	6.3	N11 31.0	11.5	61.4
07	285 48.7	57.5	282 44.8	6.2	11 42.5	11.4	61.4
08	300 48.8	58.3	297 10.0	6.1	11 53.9	11.4	61.4
M 09	315 48.8	·· 59.0	311 35.1	6.2	12 05.3	11.2	61.4
O 10	330 48.9	15 59.7	326 00.3	6.0	12 16.5	11.2	61.4
N 11	345 49.0	16 00.4	340 25.3	6.0	12 27.7	11.1	61.4
D 12	0 49.0	N16 01.2	354 50.3	6.0	N12 38.8	11.0	61.4
A 13	15 49.1	01.9	9 15.3	5.9	12 49.8	10.9	61.4
Y 14	30 49.1	02.6	23 40.2	5.9	13 00.7	10.8	61.4
15	45 49.2	·· 03.3	38 05.1	5.8	13 11.5	10.7	61.4
16	60 49.2	04.0	52 29.9	5.8	13 22.2	10.7	61.4
17	75 49.3	04.8	66 54.7	5.7	13 32.9	10.5	61.4
18	90 49.3	N16 05.5	81 19.4	5.7	N13 43.4	10.4	61.4
19	105 49.4	06.2	95 44.1	5.6	13 53.8	10.3	61.4
20	120 49.5	06.9	110 08.7	5.6	14 04.1	10.3	61.4
21	135 49.5	·· 07.6	124 33.3	5.6	14 14.4	10.1	61.3
22	150 49.6	08.4	138 57.9	5.5	14 24.5	10.0	61.3
23	165 49.6	09.1	153 22.4	5.4	14 34.5	10.0	61.3
5 00	180 49.7	N16 09.8	167 46.8	5.5	N14 44.5	9.8	61.3
01	195 49.7	10.5	182 11.3	5.3	14 54.3	9.7	61.3
02	210 49.8	11.2	196 35.6	5.4	15 04.0	9.6	61.3
03	225 49.8	·· 11.9	211 00.0	5.3	15 13.6	9.4	61.3
04	240 49.9	12.7	225 24.3	5.2	15 23.0	9.4	61.3
05	255 50.0	13.4	239 48.5	5.3	15 32.4	9.3	61.2
06	270 50.0	N16 14.1	254 12.8	5.1	N15 41.7	9.1	61.2
07	285 50.1	14.8	268 36.9	5.2	15 50.8	9.0	61.2
08	300 50.1	15.5	283 01.1	5.1	15 59.8	8.9	61.2
T 09	315 50.2	·· 16.2	297 25.2	5.1	16 08.7	8.8	61.2
U 10	330 50.2	16.9	311 49.3	5.0	16 17.5	8.7	61.2
E 11	345 50.3	17.6	326 13.3	5.0	16 26.2	8.6	61.2
S 12	0 50.3	N16 18.4	340 37.3	5.0	N16 34.8	8.4	61.1
D 13	15 50.4	19.1	355 01.3	4.9	16 43.2	8.3	61.1
A 14	30 50.4	19.8	9 25.2	4.9	16 51.5	8.2	61.1
Y 15	45 50.5	·· 20.5	23 49.1	4.9	16 59.7	8.0	61.1
16	60 50.5	21.2	38 13.0	4.8	17 07.7	7.9	61.1
17	75 50.6	21.9	52 36.8	4.9	17 15.6	7.8	61.0
18	90 50.6	N16 22.6	67 00.7	4.8	N17 23.4	7.7	61.0
19	105 50.7	23.3	81 24.5	4.7	17 31.1	7.5	61.0
20	120 50.7	24.0	95 48.2	4.8	17 38.6	7.4	61.0
21	135 50.8	·· 24.7	110 12.0	4.7	17 46.0	7.3	61.0
22	150 50.8	25.4	124 35.7	4.7	17 53.3	7.1	60.9
23	165 50.9	26.1	138 59.4	4.7	18 00.4	7.0	60.9
6 00	180 50.9	N16 26.9	153 23.1	4.7	N18 07.4	6.9	60.9
01	195 51.0	27.6	167 46.8	4.6	18 14.3	6.7	60.9
02	210 51.0	28.3	182 10.4	4.6	18 21.0	6.6	60.8
03	225 51.1	·· 29.0	196 34.0	4.7	18 27.6	6.5	60.8
04	240 51.1	29.7	210 57.7	4.6	18 34.1	6.3	60.8
05	255 51.2	30.4	225 21.3	4.5	18 40.4	6.2	60.8
06	270 51.2	N16 31.1	239 44.8	4.6	N18 46.6	6.1	60.7
07	285 51.3	31.8	254 08.4	4.6	18 52.7	5.9	60.7
08	300 51.3	32.5	268 32.0	4.5	18 58.6	5.7	60.7
W 09	315 51.4	·· 33.2	282 55.5	4.6	19 04.3	5.6	60.7
E 10	330 51.4	33.9	297 19.1	4.5	19 09.9	5.5	60.6
D 11	345 51.4	34.6	311 42.6	4.6	19 15.4	5.4	60.6
N 12	0 51.5	N16 35.3	326 06.2	4.5	N19 20.8	5.2	60.6
E 13	15 51.5	36.0	340 29.7	4.6	19 26.0	5.0	60.5
S 14	30 51.6	36.7	354 53.3	4.5	19 31.0	4.9	60.5
D 15	45 51.6	·· 37.4	9 16.8	4.5	19 35.9	4.8	60.5
A 16	60 51.7	38.1	23 40.3	4.6	19 40.7	4.6	60.5
Y 17	75 51.7	38.8	38 03.9	4.5	19 45.3	4.5	60.4
18	90 51.8	N16 39.5	52 27.4	4.6	N19 49.8	4.3	60.4
19	105 51.8	40.2	66 51.0	4.6	19 54.1	4.2	60.4
20	120 51.9	40.9	81 14.6	4.5	19 58.3	4.1	60.3
21	135 51.9	·· 41.6	95 38.1	4.6	20 02.4	3.9	60.3
22	150 51.9	42.3	110 01.7	4.6	20 06.3	3.7	60.3
23	165 52.0	43.0	124 25.3	4.6	20 10.0	3.6	60.2
	S.D. 15.9	d 0.7	S.D. 16.7		16.7		16.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	01 15	03 36	03 12	▭	▭
N 70	////	////	02 07	03 54	03 45	03 32	▭
68	////	////	02 39	04 08	04 09	04 15	04 30
66	////	01 29	03 02	04 19	04 28	04 44	05 12
64	////	02 07	03 20	04 29	04 44	05 05	05 40
62	////	02 32	03 35	04 37	04 56	05 23	06 02
60	01 19	02 52	03 48	04 45	05 07	05 38	06 20
N 58	01 53	03 08	03 58	04 51	05 17	05 51	06 35
56	02 17	03 22	04 08	04 57	05 25	06 01	06 47
54	02 36	03 33	04 16	05 02	05 33	06 11	06 59
52	02 51	03 44	04 23	05 06	05 40	06 20	07 08
50	03 04	03 52	04 30	05 11	05 46	06 27	07 17
45	03 30	04 11	04 44	05 20	05 59	06 44	07 36
N 40	03 50	04 26	04 55	05 27	06 10	06 58	07 51
35	04 05	04 38	05 05	05 34	06 19	07 09	08 04
30	04 18	04 48	05 14	05 40	06 28	07 19	08 15
20	04 38	05 05	05 29	05 50	06 42	07 37	08 35
N 10	04 54	05 19	05 41	05 59	06 55	07 52	08 52
0	05 07	05 32	05 53	06 08	07 07	08 07	09 07
S 10	05 18	05 43	06 05	06 16	07 19	08 21	09 23
20	05 28	05 54	06 17	06 26	07 31	08 37	09 40
30	05 38	06 06	06 31	06 36	07 46	08 55	10 00
35	05 43	06 13	06 39	06 42	07 55	09 05	10 12
40	05 48	06 20	06 49	06 50	08 05	09 18	10 25
45	05 53	06 28	06 59	06 58	08 16	09 32	10 40
S 50	05 59	06 38	07 12	07 08	08 31	09 49	11 00
52	06 01	06 42	07 18	07 12	08 37	09 58	11 09
54	06 04	06 47	07 25	07 18	08 45	10 07	11 19
56	06 07	06 52	07 32	07 23	08 53	10 17	11 31
58	06 10	06 57	07 41	07 30	09 02	10 29	11 44
S 60	06 13	07 03	07 50	07 37	09 13	10 43	12 00

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 4	Moonset 5	Moonset 6	Moonset 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 49	////	////	22 10	▭	▭	▭
N 70	21 51	////	////	21 39	23 58	▭	▭
68	21 18	////	////	21 16	23 16	25 08	01 08
66	20 54	22 31	////	20 58	22 48	24 27	00 27
64	20 35	21 51	////	20 44	22 27	23 59	25 10
62	20 20	21 24	////	20 32	22 10	23 37	24 46
60	20 07	21 04	22 40	20 22	21 56	23 20	24 28
N 58	19 57	20 47	22 04	20 13	21 43	23 05	24 12
56	19 47	20 33	21 39	20 06	21 33	22 52	23 59
54	19 39	20 21	21 20	19 59	21 24	22 42	23 48
52	19 31	20 11	21 04	19 53	21 16	22 32	23 38
50	19 25	20 02	20 51	19 47	21 08	22 23	23 29
45	19 10	19 43	20 24	19 35	20 53	22 05	23 09
N 40	18 58	19 28	20 05	19 25	20 40	21 50	22 54
35	18 48	19 16	19 49	19 17	20 29	21 37	22 41
30	18 40	19 05	19 36	19 09	20 19	21 26	22 29
20	18 25	18 48	19 16	18 57	20 03	21 08	22 09
N 10	18 12	18 34	19 00	18 46	19 48	20 51	21 52
0	18 00	18 22	18 47	18 35	19 35	20 36	21 36
S 10	17 48	18 10	18 35	18 25	19 22	20 20	21 20
20	17 36	17 59	18 25	18 14	19 07	20 04	21 03
30	17 22	17 47	18 15	18 01	18 51	19 45	20 43
35	17 13	17 40	18 10	17 54	18 42	19 34	20 31
40	17 04	17 33	18 05	17 46	18 31	19 22	20 18
45	16 53	17 25	18 00	17 36	18 18	19 07	20 02
S 50	16 40	17 15	17 54	17 25	18 03	18 49	19 43
52	16 34	17 11	17 51	17 20	17 56	18 40	19 33
54	16 28	17 06	17 48	17 14	17 48	18 31	19 23
56	16 20	17 01	17 46	17 07	17 39	18 20	19 12
58	16 12	16 55	17 43	17 00	17 29	18 08	18 58
S 60	16 02	16 49	17 39	16 52	17 18	17 54	18 42

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
4	03 13	03 16	11 57	12 21	24 51	00	●
5	03 19	03 21	11 57	13 21	00 51	01	
6	03 24	03 26	11 57	14 21	01 51	02	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.9		SATURN +0.9	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
7	00	224 44.9	172 59.1	N18 30.5	188 18.4	N14 07.4	43 08.8	N 0 57.5	40 19.5	N 0 55.2
	01	239 47.4	187 58.4	31.4	203 19.1	08.0	58 11.4	57.5	55 22.1	55.2
	02	254 49.8	202 57.8	32.2	218 19.7	08.6	73 14.0	57.6	70 24.7	55.2
	03	269 52.3	217 57.1	·· 33.1	233 20.4	·· 09.3	88 16.6	·· 57.6	85 27.3	·· 55.3
	04	284 54.8	232 56.5	33.9	248 21.1	09.9	103 19.2	57.7	100 29.8	55.3
	05	299 57.2	247 55.8	34.8	263 21.7	10.5	118 21.8	57.7	115 32.4	55.4
	06	314 59.7	262 55.1	N18 35.6	278 22.4	N14 11.1	133 24.4	N 0 57.8	130 35.0	N 0 55.4
	07	330 02.2	277 54.5	36.5	293 23.0	11.7	148 27.0	57.8	145 37.6	55.4
T	08	345 04.6	292 53.8	37.3	308 23.7	12.3	163 29.6	57.9	160 40.1	55.5
H	09	0 07.1	307 53.2	·· 38.1	323 24.4	·· 13.0	178 32.2	·· 57.9	175 42.7	·· 55.5
U	10	15 09.6	322 52.5	39.0	338 25.0	13.6	193 34.8	58.0	190 45.3	55.6
R	11	30 12.0	337 51.8	39.8	353 25.7	14.2	208 37.4	58.0	205 47.8	55.6
S	12	45 14.5	352 51.2	N18 40.7	8 26.4	N14 14.8	223 40.0	N 0 58.1	220 50.4	N 0 55.6
D	13	60 16.9	7 50.5	41.5	23 27.0	15.4	238 42.6	58.1	235 53.0	55.7
A	14	75 19.4	22 49.8	42.4	38 27.7	16.0	253 45.2	58.2	250 55.6	55.7
Y	15	90 21.9	37 49.2	·· 43.2	53 28.3	·· 16.6	268 47.9	·· 58.2	265 58.1	·· 55.7
	16	105 24.3	52 48.5	44.0	68 29.0	17.3	283 50.5	58.3	281 00.7	55.8
	17	120 26.8	67 47.8	44.9	83 29.7	17.9	298 53.1	58.3	296 03.3	55.8
	18	135 29.3	82 47.2	N18 45.7	98 30.3	N14 18.5	313 55.7	N 0 58.4	311 05.9	N 0 55.9
	19	150 31.7	97 46.5	46.6	113 31.0	19.1	328 58.3	58.4	326 08.4	55.9
	20	165 34.2	112 45.8	47.4	128 31.7	19.7	344 00.9	58.5	341 11.0	55.9
	21	180 36.7	127 45.2	·· 48.2	143 32.3	·· 20.3	359 03.5	·· 58.5	356 13.6	·· 56.0
	22	195 39.1	142 44.5	49.1	158 33.0	20.9	14 06.1	58.6	11 16.1	56.0
	23	210 41.6	157 43.8	49.9	173 33.6	21.6	29 08.7	58.6	26 18.7	56.1
8	00	225 44.0	172 43.2	N18 50.7	188 34.3	N14 22.2	44 11.3	N 0 58.7	41 21.3	N 0 56.1
	01	240 46.5	187 42.5	51.6	203 35.0	22.8	59 13.9	58.7	56 23.8	56.1
	02	255 49.0	202 41.8	52.4	218 35.6	23.4	74 16.5	58.8	71 26.4	56.2
	03	270 51.4	217 41.2	·· 53.2	233 36.3	·· 24.0	89 19.1	·· 58.8	86 29.0	·· 56.2
	04	285 53.9	232 40.5	54.1	248 36.9	24.6	104 21.7	58.9	101 31.6	56.2
	05	300 56.4	247 39.8	54.9	263 37.6	25.2	119 24.3	58.9	116 34.1	56.3
	06	315 58.8	262 39.1	N18 55.7	278 38.3	N14 25.8	134 26.9	N 0 59.0	131 36.7	N 0 56.3
	07	331 01.3	277 38.5	56.5	293 38.9	26.4	149 29.5	59.0	146 39.3	56.4
	08	346 03.8	292 37.8	57.4	308 39.6	27.0	164 32.1	59.1	161 41.8	56.4
F	09	1 06.2	307 37.1	·· 58.2	323 40.3	·· 27.7	179 34.7	·· 59.1	176 44.4	·· 56.4
R	10	16 08.7	322 36.4	59.0	338 40.9	28.3	194 37.3	59.2	191 47.0	56.5
I	11	31 11.2	337 35.8	18 59.8	353 41.6	28.9	209 39.9	59.2	206 49.5	56.5
D	12	46 13.6	352 35.1	N19 00.7	8 42.2	N14 29.5	224 42.5	N 0 59.3	221 52.1	N 0 56.5
A	13	61 16.1	7 34.4	01.5	23 42.9	30.1	239 45.1	59.3	236 54.7	56.6
Y	14	76 18.5	22 33.7	02.3	38 43.6	30.7	254 47.7	59.4	251 57.2	56.6
	15	91 21.0	37 33.1	·· 03.1	53 44.2	·· 31.3	269 50.3	·· 59.4	266 59.8	·· 56.7
	16	106 23.5	52 32.4	03.9	68 44.9	31.9	284 52.9	59.5	282 02.4	56.7
	17	121 25.9	67 31.7	04.8	83 45.5	32.5	299 55.5	59.5	297 05.0	56.7
	18	136 28.4	82 31.0	N19 05.6	98 46.2	N14 33.1	314 58.1	N 0 59.6	312 07.5	N 0 56.8
	19	151 30.9	97 30.4	06.4	113 46.9	33.7	330 00.7	59.6	327 10.1	56.8
	20	166 33.3	112 29.7	07.2	128 47.5	34.3	345 03.3	59.7	342 12.7	56.8
	21	181 35.8	127 29.0	·· 08.0	143 48.2	·· 34.9	0 05.9	·· 59.7	357 15.2	·· 56.9
	22	196 38.3	142 28.3	08.8	158 48.8	35.6	15 08.5	59.8	12 17.8	56.9
	23	211 40.7	157 27.6	09.7	173 49.5	36.2	30 11.1	59.8	27 20.4	57.0
9	00	226 43.2	172 27.0	N19 10.5	188 50.2	N14 36.8	45 13.7	N 0 59.9	42 22.9	N 0 57.0
	01	241 45.7	187 26.3	11.3	203 50.8	37.4	60 16.2	0 59.9	57 25.5	57.0
	02	256 48.1	202 25.6	12.1	218 51.5	38.0	75 18.8	1 00.0	72 28.1	57.1
	03	271 50.6	217 24.9	·· 12.9	233 52.1	·· 38.6	90 21.4	·· 00.0	87 30.6	·· 57.1
	04	286 53.0	232 24.2	13.7	248 52.8	39.2	105 24.0	00.1	102 33.2	57.1
	05	301 55.5	247 23.5	14.5	263 53.5	39.8	120 26.6	00.1	117 35.8	57.2
	06	316 58.0	262 22.9	N19 15.3	278 54.1	N14 40.4	135 29.2	N 1 00.1	132 38.3	N 0 57.2
	07	332 00.4	277 22.2	16.1	293 54.8	41.0	150 31.8	00.2	147 40.9	57.2
S	08	347 02.9	292 21.5	16.9	308 55.4	41.6	165 34.4	00.2	162 43.5	57.3
A	09	2 05.4	307 20.8	·· 17.7	323 56.1	·· 42.2	180 37.0	·· 00.3	177 46.0	·· 57.3
T	10	17 07.8	322 20.1	18.5	338 56.7	42.8	195 39.6	00.3	192 48.6	57.4
U	11	32 10.3	337 19.4	19.3	353 57.4	43.4	210 42.2	00.4	207 51.2	57.4
R	12	47 12.8	352 18.7	N19 20.1	8 58.1	N14 44.0	225 44.8	N 1 00.4	222 53.7	N 0 57.4
D	13	62 15.2	7 18.1	20.9	23 58.7	44.6	240 47.4	00.5	237 56.3	57.5
A	14	77 17.7	22 17.4	21.7	38 59.4	45.2	255 50.0	00.5	252 58.9	57.5
Y	15	92 20.1	37 16.7	·· 22.5	54 00.0	·· 45.8	270 52.6	·· 00.6	268 01.4	·· 57.5
	16	107 22.6	52 16.0	23.3	69 00.7	46.4	285 55.1	00.6	283 04.0	57.6
	17	122 25.1	67 15.3	24.1	84 01.4	47.0	300 57.7	00.6	298 06.5	57.6
	18	137 27.5	82 14.6	N19 24.9	99 02.0	N14 47.6	316 00.3	N 1 00.7	313 09.1	N 0 57.6
	19	152 30.0	97 13.9	25.7	114 02.7	48.2	331 02.9	00.7	328 11.7	57.7
	20	167 32.5	112 13.2	26.5	129 03.3	48.8	346 05.5	00.8	343 14.2	57.7
	21	182 34.9	127 12.5	·· 27.3	144 04.0	·· 49.4	1 08.1	·· 00.8	358 16.8	·· 57.7
	22	197 37.4	142 11.9	28.1	159 04.7	50.0	16 10.7	00.9	13 19.4	57.8
	23	212 39.9	157 11.2	28.9	174 05.3	50.6	31 13.3	00.9	28 21.9	57.8
Mer. Pass.		h m 8 55.6	v −0.7	d 0.8	v 0.7	d 0.6	v 2.6	d 0.0	v 2.6	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.4	S40 22.9
Achernar	335 45.5	S57 19.9
Acrux	173 36.2	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.9	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.5	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.2	S 8 34.8
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.1	N28 59.0
Altair	62 32.0	N 8 49.0
Ankaa	353 40.2	S42 24.5
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.4	S68 59.5
Avior	234 28.2	S59 27.3
Bellatrix	278 58.6	N 6 19.8
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.4	S52 41.4
Capella	281 11.1	N45 58.8
Deneb	49 48.1	N45 12.5
Denebola	182 58.4	N14 40.7
Diphda	349 20.7	S18 05.5
Dubhe	194 21.3	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.1	N51 29.3
Enif	34 11.2	N 9 47.2
Fomalhaut	15 51.1	S29 43.3
Gacrux	172 27.8	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.0	S34 23.5
Kochab	137 17.9	N74 14.1
Markab	14 02.9	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.7
Miaplacidus	221 44.9	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.4	S26 19.2
Peacock	53 57.6	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.3
Regulus	208 09.5	N12 03.6
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.6	S60 45.4
Sabik	102 40.4	S15 42.1
Schedar	350 09.0	N56 25.8
Shaula	96 54.9	S37 05.3
Sirius	258 55.6	S16 41.7
Spica	158 56.8	S11 03.9
Suhail	223 10.5	S43 21.7
Vega	80 55.3	N38 45.8
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	306 59.1	12 30
Mars	322 50.3	11 25
Jupiter	178 27.2	21 00
Saturn	175 37.2	21 11

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
7 00	180 52.0	N16 43.6	138 48.9	4.6	N20 13.6	3.5	60.2
01	195 52.1	44.3	153 12.5	4.7	20 17.1	3.3	60.2
02	210 52.1	45.0	167 36.2	4.6	20 20.4	3.1	60.1
03	225 52.2	·· 45.7	181 59.8	4.7	20 23.5	3.1	60.1
04	240 52.2	46.4	196 23.5	4.7	20 26.6	2.8	60.1
05	255 52.2	47.1	210 47.2	4.8	20 29.4	2.8	60.0
06	270 52.3	N16 47.8	225 11.0	4.7	N20 32.2	2.5	60.0
07	285 52.3	48.5	239 34.7	4.8	20 34.7	2.5	60.0
T 08	300 52.4	49.2	253 58.5	4.8	20 37.2	2.3	59.9
H 09	315 52.4	·· 49.9	268 22.3	4.8	20 39.5	2.1	59.9
U 10	330 52.4	50.6	282 46.1	4.9	20 41.6	2.0	59.9
R 11	345 52.5	51.2	297 10.0	4.9	20 43.6	1.9	59.8
S 12	0 52.5	N16 51.9	311 33.9	4.9	N20 45.5	1.7	59.8
D 13	15 52.6	52.6	325 57.8	5.0	20 47.2	1.5	59.8
A 14	30 52.6	53.3	340 21.8	5.0	20 48.7	1.4	59.7
Y 15	45 52.6	·· 54.0	354 45.8	5.0	20 50.1	1.3	59.7
16	60 52.7	54.7	9 09.8	5.1	20 51.4	1.1	59.6
17	75 52.7	55.4	23 33.9	5.1	20 52.5	1.0	59.6
18	90 52.8	N16 56.1	37 58.0	5.2	N20 53.5	0.9	59.6
19	105 52.8	56.7	52 22.2	5.2	20 54.4	0.7	59.5
20	120 52.8	57.4	66 46.4	5.3	20 55.1	0.5	59.5
21	135 52.9	·· 58.1	81 10.7	5.3	20 55.6	0.4	59.5
22	150 52.9	58.8	95 35.0	5.3	20 56.0	0.3	59.4
23	165 52.9	16 59.5	109 59.3	5.4	20 56.3	0.1	59.4
8 00	180 53.0	N17 00.2	124 23.7	5.5	N20 56.4	0.0	59.4
01	195 53.0	00.8	138 48.2	5.5	20 56.4	0.1	59.3
02	210 53.1	01.5	153 12.7	5.5	20 56.3	0.3	59.3
03	225 53.1	·· 02.2	167 37.2	5.6	20 56.0	0.4	59.2
04	240 53.1	02.9	182 01.8	5.7	20 55.6	0.6	59.2
05	255 53.2	03.6	196 26.5	5.7	20 55.0	0.7	59.2
06	270 53.2	N17 04.2	210 51.2	5.8	N20 54.3	0.8	59.1
07	285 53.2	04.9	225 16.0	5.9	20 53.5	1.0	59.1
08	300 53.3	05.6	239 40.9	5.9	20 52.5	1.1	59.0
F 09	315 53.3	·· 06.3	254 05.8	5.9	20 51.4	1.3	59.0
R 10	330 53.3	07.0	268 30.7	6.0	20 50.1	1.3	59.0
I 11	345 53.4	07.6	282 55.7	6.1	20 48.8	1.5	58.9
D 12	0 53.4	N17 08.3	297 20.8	6.2	N20 47.3	1.7	58.9
A 13	15 53.5	09.0	311 46.0	6.2	20 45.6	1.8	58.8
Y 14	30 53.5	09.7	326 11.2	6.3	20 43.8	1.9	58.8
15	45 53.5	·· 10.3	340 36.5	6.4	20 41.9	2.0	58.8
16	60 53.6	11.0	355 01.9	6.4	20 39.9	2.2	58.7
17	75 53.6	11.7	9 27.3	6.5	20 37.7	2.3	58.7
18	90 53.6	N17 12.4	23 52.8	6.5	N20 35.4	2.4	58.7
19	105 53.7	13.0	38 18.3	6.7	20 33.0	2.5	58.6
20	120 53.7	13.7	52 44.0	6.7	20 30.5	2.7	58.6
21	135 53.7	·· 14.4	67 09.7	6.8	20 27.8	2.8	58.5
22	150 53.7	15.0	81 35.5	6.8	20 25.0	2.9	58.5
23	165 53.8	15.7	96 01.3	7.0	20 22.1	3.0	58.5
9 00	180 53.8	N17 16.4	110 27.3	7.0	N20 19.1	3.2	58.4
01	195 53.8	17.1	124 53.3	7.1	20 15.9	3.3	58.4
02	210 53.9	17.7	139 19.4	7.1	20 12.6	3.4	58.3
03	225 53.9	·· 18.4	153 45.5	7.3	20 09.2	3.5	58.3
04	240 53.9	19.1	168 11.8	7.3	20 05.7	3.6	58.3
05	255 54.0	19.7	182 38.1	7.4	20 02.1	3.8	58.2
06	270 54.0	N17 20.4	197 04.5	7.5	N19 58.3	3.9	58.2
07	285 54.0	21.1	211 31.0	7.5	19 54.4	3.9	58.1
S 08	300 54.1	21.7	225 57.5	7.7	19 50.5	4.1	58.1
A 09	315 54.1	·· 22.4	240 24.2	7.7	19 46.4	4.3	58.1
T 10	330 54.1	23.1	254 50.9	7.8	19 42.1	4.3	58.0
U 11	345 54.1	23.7	269 17.7	7.9	19 37.8	4.4	58.0
R 12	0 54.2	N17 24.4	283 44.6	7.9	N19 33.4	4.6	57.9
D 13	15 54.2	25.1	298 11.5	8.1	19 28.8	4.6	57.9
A 14	30 54.2	25.7	312 38.6	8.1	19 24.2	4.8	57.9
Y 15	45 54.3	·· 26.4	327 05.7	8.2	19 19.4	4.8	57.8
16	60 54.3	27.0	341 32.9	8.3	19 14.6	5.0	57.8
17	75 54.3	27.7	356 00.2	8.4	19 09.6	5.1	57.7
18	90 54.3	N17 28.4	10 27.6	8.5	N19 04.5	5.2	57.7
19	105 54.4	29.0	24 55.1	8.5	18 59.3	5.2	57.7
20	120 54.4	29.7	39 22.6	8.7	18 54.1	5.4	57.6
21	135 54.4	·· 30.3	53 50.3	8.7	18 48.7	5.5	57.6
22	150 54.4	31.0	68 18.0	8.8	18 43.2	5.6	57.6
23	165 54.5	31.7	82 45.8	8.9	18 37.6	5.7	57.5
	S.D. 15.9	d 0.7	S.D. 16.3		16.0		15.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	00 28	▭	▭	▭	06 23
N 70	////	////	01 47	▭	▭	05 16	07 44
68	////	////	02 24	04 30	05 16	06 42	08 23
66	////	01 05	02 50	05 12	06 03	07 20	08 49
64	////	01 51	03 10	05 40	06 34	07 47	09 10
62	////	02 21	03 26	06 02	06 57	08 07	09 26
60	00 57	02 42	03 40	06 20	07 16	08 24	09 40
N 58	01 40	03 00	03 51	06 35	07 31	08 38	09 52
56	02 07	03 14	04 01	06 47	07 44	08 50	10 02
54	02 27	03 27	04 10	06 59	07 56	09 01	10 11
52	02 44	03 37	04 18	07 08	08 06	09 10	10 19
50	02 58	03 47	04 25	07 17	08 15	09 19	10 26
45	03 25	04 07	04 40	07 36	08 34	09 37	10 41
N 40	03 45	04 22	04 52	07 51	08 50	09 51	10 54
35	04 02	04 35	05 02	08 04	09 03	10 03	11 04
30	04 15	04 46	05 12	08 15	09 14	10 14	11 14
20	04 36	05 04	05 27	08 35	09 34	10 33	11 30
N 10	04 53	05 18	05 40	08 52	09 51	10 49	11 44
0	05 06	05 31	05 53	09 07	10 07	11 04	11 57
S 10	05 18	05 43	06 05	09 23	10 23	11 18	12 10
20	05 29	05 55	06 18	09 40	10 40	11 34	12 24
30	05 40	06 08	06 33	10 00	11 00	11 53	12 39
35	05 45	06 15	06 42	10 12	11 11	12 03	12 49
40	05 50	06 23	06 52	10 25	11 24	12 16	12 59
45	05 56	06 32	07 03	10 40	11 40	12 30	13 11
S 50	06 03	06 42	07 17	11 00	11 59	12 48	13 26
52	06 06	06 46	07 23	11 09	12 08	12 56	13 33
54	06 09	06 51	07 30	11 19	12 19	13 05	13 41
56	06 12	06 57	07 38	11 31	12 30	13 15	13 49
58	06 15	07 03	07 47	11 44	12 43	13 27	13 59
S 60	06 19	07 10	07 57	12 00	12 59	13 41	14 10

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	05 15
N 70	22 12	////	////	▭	▭	04 28	03 53
68	21 32	////	////	01 08	02 28	03 02	03 14
66	21 05	22 57	////	00 27	01 40	02 24	02 46
64	20 45	22 06	////	25 10	01 10	01 57	02 25
62	20 28	21 36	////	24 46	00 46	01 36	02 08
60	20 15	21 13	23 04	24 28	00 28	01 18	01 54
N 58	20 03	20 55	22 17	24 12	00 12	01 04	01 42
56	19 53	20 40	21 49	23 59	24 52	00 52	01 31
54	19 44	20 28	21 28	23 48	24 41	00 41	01 22
52	19 36	20 17	21 11	23 38	24 31	00 31	01 14
50	19 29	20 07	20 57	23 29	24 23	00 23	01 06
45	19 14	19 47	20 29	23 09	24 04	00 04	00 50
N 40	19 01	19 31	20 08	22 54	23 49	24 37	00 37
35	18 51	19 19	19 52	22 41	23 37	24 25	00 25
30	18 42	19 08	19 38	22 29	23 26	24 16	00 16
20	18 26	18 49	19 17	22 09	23 07	23 58	24 45
N 10	18 12	18 35	19 00	21 52	22 50	23 44	24 33
0	18 00	18 22	18 47	21 36	22 34	23 29	24 21
S 10	17 47	18 09	18 35	21 20	22 19	23 15	24 09
20	17 34	17 57	18 24	21 03	22 02	23 00	23 56
30	17 19	17 44	18 13	20 43	21 43	22 43	23 42
35	17 11	17 37	18 08	20 31	21 31	22 33	23 33
40	17 01	17 30	18 02	20 18	21 18	22 21	23 24
45	16 50	17 21	17 56	20 02	21 03	22 07	23 12
S 50	16 36	17 11	17 49	19 43	20 44	21 50	22 58
52	16 29	17 06	17 47	19 33	20 35	21 42	22 52
54	16 22	17 01	17 44	19 23	20 25	21 33	22 44
56	16 14	16 55	17 40	19 12	20 14	21 23	22 36
58	16 05	16 49	17 37	18 58	20 01	21 12	22 27
S 60	15 55	16 42	17 33	18 42	19 45	20 59	22 17

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	03 28	03 30	11 56	15 22	02 52	03	◐
8	03 32	03 34	11 56	16 21	03 52	04	
9	03 35	03 37	11 56	17 17	04 49	05	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.9		SATURN +0.9	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
10	00	227 42.3	172 10.5	N19 29.7	189 06.0	N14 51.2	46 15.9	N 1 01.0	43 24.5	N 0 57.9
	01	242 44.8	187 09.8	30.5	204 06.6	51.8	61 18.5	01.0	58 27.1	57.9
	02	257 47.3	202 09.1	31.3	219 07.3	52.4	76 21.0	01.0	73 29.6	57.9
	03	272 49.7	217 08.4	·· 32.1	234 07.9	·· 53.0	91 23.6	·· 01.1	88 32.2	·· 58.0
	04	287 52.2	232 07.7	32.8	249 08.6	53.6	106 26.2	01.1	103 34.8	58.0
	05	302 54.6	247 07.0	33.6	264 09.3	54.2	121 28.8	01.2	118 37.3	58.0
	06	317 57.1	262 06.3	N19 34.4	279 09.9	N14 54.8	136 31.4	N 1 01.2	133 39.9	N 0 58.1
	07	332 59.6	277 05.6	35.2	294 10.6	55.4	151 34.0	01.3	148 42.4	58.1
	08	348 02.0	292 04.9	36.0	309 11.2	56.0	166 36.6	01.3	163 45.0	58.1
SUN	09	3 04.5	307 04.2	·· 36.8	324 11.9	·· 56.6	181 39.2	·· 01.4	178 47.6	·· 58.2
	10	18 07.0	322 03.5	37.5	339 12.5	57.2	196 41.7	01.4	193 50.1	58.2
	11	33 09.4	337 02.8	38.3	354 13.2	57.8	211 44.3	01.4	208 52.7	58.2
DAY	12	48 11.9	352 02.1	N19 39.1	9 13.9	N14 58.4	226 46.9	N 1 01.5	223 55.3	N 0 58.3
	13	63 14.4	7 01.4	39.9	24 14.5	59.0	241 49.5	01.5	238 57.8	58.3
	14	78 16.8	22 00.7	40.7	39 15.2	14 59.6	256 52.1	01.6	254 00.4	58.3
	15	93 19.3	37 00.0	·· 41.4	54 15.8	15 00.2	271 54.7	·· 01.6	269 02.9	·· 58.4
	16	108 21.8	51 59.3	42.2	69 16.5	00.8	286 57.3	01.7	284 05.5	58.4
	17	123 24.2	66 58.6	43.0	84 17.1	01.4	301 59.8	01.7	299 08.1	58.4
	18	138 26.7	81 57.9	N19 43.8	99 17.8	N15 02.0	317 02.4	N 1 01.7	314 10.6	N 0 58.5
	19	153 29.1	96 57.2	44.5	114 18.5	02.6	332 05.0	01.8	329 13.2	58.5
	20	168 31.6	111 56.5	45.3	129 19.1	03.1	347 07.6	01.8	344 15.7	58.5
	21	183 34.1	126 55.8	·· 46.1	144 19.8	·· 03.7	2 10.2	·· 01.9	359 18.3	·· 58.6
	22	198 36.5	141 55.1	46.9	159 20.4	04.3	17 12.8	01.9	14 20.9	58.6
	23	213 39.0	156 54.4	47.6	174 21.1	04.9	32 15.3	01.9	29 23.4	58.6
11	00	228 41.5	171 53.7	N19 48.4	189 21.7	N15 05.5	47 17.9	N 1 02.0	44 26.0	N 0 58.7
	01	243 43.9	186 53.0	49.2	204 22.4	06.1	62 20.5	02.0	59 28.6	58.7
	02	258 46.4	201 52.3	49.9	219 23.0	06.7	77 23.1	02.1	74 31.1	58.7
	03	273 48.9	216 51.6	·· 50.7	234 23.7	·· 07.3	92 25.7	·· 02.1	89 33.7	·· 58.8
	04	288 51.3	231 50.9	51.5	249 24.4	07.9	107 28.3	02.2	104 36.2	58.8
	05	303 53.8	246 50.2	52.2	264 25.0	08.5	122 30.8	02.2	119 38.8	58.8
	06	318 56.2	261 49.5	N19 53.0	279 25.7	N15 09.1	137 33.4	N 1 02.2	134 41.4	N 0 58.9
	07	333 58.7	276 48.8	53.7	294 26.3	09.7	152 36.0	02.3	149 43.9	58.9
	08	349 01.2	291 48.1	54.5	309 27.0	10.2	167 38.6	02.3	164 46.5	58.9
MON	09	4 03.6	306 47.4	·· 55.3	324 27.6	·· 10.8	182 41.2	·· 02.4	179 49.0	·· 59.0
	10	19 06.1	321 46.6	56.0	339 28.3	11.4	197 43.7	02.4	194 51.6	59.0
	11	34 08.6	336 45.9	56.8	354 28.9	12.0	212 46.3	02.4	209 54.1	59.0
DAY	12	49 11.0	351 45.2	N19 57.5	9 29.6	N15 12.6	227 48.9	N 1 02.5	224 56.7	N 0 59.1
	13	64 13.5	6 44.5	58.3	24 30.3	13.2	242 51.5	02.5	239 59.3	59.1
	14	79 16.0	21 43.8	59.1	39 30.9	13.8	257 54.1	02.6	255 01.8	59.1
	15	94 18.4	36 43.1	19 59.8	54 31.6	·· 14.4	272 56.6	·· 02.6	270 04.4	·· 59.2
	16	109 20.9	51 42.4	20 00.6	69 32.2	15.0	287 59.2	02.6	285 06.9	59.2
	17	124 23.4	66 41.7	01.3	84 32.9	15.6	303 01.8	02.7	300 09.5	59.2
	18	139 25.8	81 41.0	N20 02.1	99 33.5	N15 16.1	318 04.4	N 1 02.7	315 12.1	N 0 59.3
	19	154 28.3	96 40.2	02.8	114 34.2	16.7	333 07.0	02.8	330 14.6	59.3
	20	169 30.7	111 39.5	03.6	129 34.8	17.3	348 09.5	02.8	345 17.2	59.3
	21	184 33.2	126 38.8	·· 04.3	144 35.5	·· 17.9	3 12.1	·· 02.8	0 19.7	·· 59.4
	22	199 35.7	141 38.1	05.1	159 36.1	18.5	18 14.7	02.9	15 22.3	59.4
	23	214 38.1	156 37.4	05.8	174 36.8	19.1	33 17.3	02.9	30 24.8	59.4
12	00	229 40.6	171 36.7	N20 06.6	189 37.5	N15 19.7	48 19.8	N 1 02.9	45 27.4	N 0 59.5
	01	244 43.1	186 36.0	07.3	204 38.1	20.2	63 22.4	03.0	60 30.0	59.5
	02	259 45.5	201 35.2	08.0	219 38.8	20.8	78 25.0	03.0	75 32.5	59.5
	03	274 48.0	216 34.5	·· 08.8	234 39.4	·· 21.4	93 27.6	·· 03.1	90 35.1	·· 59.6
	04	289 50.5	231 33.8	09.5	249 40.1	22.0	108 30.1	03.1	105 37.6	59.6
	05	304 52.9	246 33.1	10.3	264 40.7	22.6	123 32.7	03.1	120 40.2	59.6
	06	319 55.4	261 32.4	N20 11.0	279 41.4	N15 23.2	138 35.3	N 1 03.2	135 42.7	N 0 59.6
	07	334 57.9	276 31.7	11.8	294 42.0	23.8	153 37.9	03.2	150 45.3	59.7
	08	350 00.3	291 30.9	12.5	309 42.7	24.3	168 40.4	03.3	165 47.9	59.7
TUE	09	5 02.8	306 30.2	·· 13.2	324 43.3	·· 24.9	183 43.0	·· 03.3	180 50.4	·· 59.7
	10	20 05.2	321 29.5	14.0	339 44.0	25.5	198 45.6	03.3	195 53.0	59.8
	11	35 07.7	336 28.8	14.7	354 44.6	26.1	213 48.2	03.4	210 55.5	59.8
SDAY	12	50 10.2	351 28.1	N20 15.4	9 45.3	N15 26.7	228 50.7	N 1 03.4	225 58.1	N 0 59.8
	13	65 12.6	6 27.3	16.2	24 46.0	27.3	243 53.3	03.4	241 00.6	59.9
	14	80 15.1	21 26.6	16.9	39 46.6	27.8	258 55.9	03.5	256 03.2	59.9
	15	95 17.6	36 25.9	·· 17.6	54 47.3	·· 28.4	273 58.4	·· 03.5	271 05.7	0 59.9
	16	110 20.0	51 25.2	18.4	69 47.9	29.0	289 01.0	03.5	286 08.3	1 00.0
	17	125 22.5	66 24.4	19.1	84 48.6	29.6	304 03.6	03.6	301 10.9	00.0
	18	140 25.0	81 23.7	N20 19.8	99 49.2	N15 30.2	319 06.2	N 1 03.6	316 13.4	N 1 00.0
	19	155 27.4	96 23.0	20.6	114 49.9	30.7	334 08.7	03.7	331 16.0	00.1
	20	170 29.9	111 22.3	21.3	129 50.5	31.3	349 11.3	03.7	346 18.5	00.1
	21	185 32.4	126 21.5	·· 22.0	144 51.2	·· 31.9	4 13.9	·· 03.7	1 21.1	·· 00.1
	22	200 34.8	141 20.8	22.7	159 51.8	32.5	19 16.4	03.8	16 23.6	00.1
	23	215 37.3	156 20.1	23.5	174 52.5	33.1	34 19.0	03.8	31 26.2	00.2
Mer. Pass.		h m 8 43.8	v −0.7	d 0.8	v 0.7	d 0.6	v 2.6	d 0.0	v 2.6	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.4	S40 22.9
Achernar	335 45.5	S57 19.9
Acrux	173 36.2	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.7	N49 24.5
Al Na'ir	28 14.5	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.1	N28 59.0
Altair	62 32.0	N 8 49.0
Ankaa	353 40.1	S42 24.4
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.3	S68 59.5
Avior	234 28.2	S59 27.3
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.4	S52 41.4
Capella	281 11.1	N45 58.8
Deneb	49 48.1	N45 12.5
Denebola	182 58.4	N14 40.7
Diphda	349 20.7	S18 05.5
Dubhe	194 21.4	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.1	N51 29.3
Enif	34 11.2	N 9 47.2
Fomalhaut	15 51.1	S29 43.3
Gacrux	172 27.8	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.0
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.0	S34 23.5
Kochab	137 17.9	N74 14.1
Markab	14 02.9	N15 06.0
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.7
Miaplacidus	221 44.9	S69 38.7
Mirfak	309 16.0	N49 47.6
Nunki	76 28.4	S26 19.2
Peacock	53 57.6	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.3
Regulus	208 09.5	N12 03.6
Rigel	281 35.9	S 8 13.6
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.9	N56 25.8
Shaula	96 54.8	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.9
Suhail	223 10.5	S43 21.7
Vega	80 55.3	N38 45.8
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	303 12.2	12 33
Mars	320 40.3	11 22
Jupiter	178 36.5	20 47
Saturn	175 44.5	20 59

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
10 00	180 54.5	N17 32.3	97 13.7	9.0	N18 31.9	5.7	57.5
01	195 54.5	33.0	111 41.7	9.0	18 26.2	5.9	57.4
02	210 54.5	33.6	126 09.7	9.2	18 20.3	6.0	57.4
03	225 54.6	34.3	140 37.9	9.2	18 14.3	6.0	57.4
04	240 54.6	35.0	155 06.1	9.3	18 08.3	6.2	57.3
05	255 54.6	35.6	169 34.4	9.4	18 02.1	6.2	57.3
06	270 54.6	N17 36.3	184 02.8	9.5	N17 55.9	6.3	57.3
07	285 54.7	36.9	198 31.3	9.6	17 49.6	6.5	57.2
08	300 54.7	37.6	212 59.9	9.6	17 43.1	6.5	57.2
SUN 09	315 54.7	38.2	227 28.5	9.8	17 36.6	6.6	57.1
10	330 54.7	38.9	241 57.3	9.8	17 30.0	6.7	57.1
11	345 54.8	39.5	256 26.1	9.9	17 23.3	6.7	57.1
12	0 54.8	N17 40.2	270 55.0	10.0	N17 16.6	6.9	57.0
13	15 54.8	40.8	285 24.0	10.1	17 09.7	6.9	57.0
14	30 54.8	41.5	299 53.1	10.2	17 02.8	7.0	57.0
15	45 54.9	42.1	314 22.3	10.2	16 55.8	7.1	56.9
16	60 54.9	42.8	328 51.5	10.3	16 48.7	7.2	56.9
17	75 54.9	43.4	343 20.8	10.5	16 41.5	7.2	56.9
18	90 54.9	N17 44.1	357 50.3	10.5	N16 34.3	7.4	56.8
19	105 54.9	44.7	12 19.8	10.5	16 26.9	7.4	56.8
20	120 55.0	45.4	26 49.3	10.7	16 19.5	7.5	56.7
21	135 55.0	46.0	41 19.0	10.7	16 12.0	7.5	56.7
22	150 55.0	46.7	55 48.7	10.9	16 04.5	7.7	56.7
23	165 55.0	47.3	70 18.6	10.9	15 56.8	7.7	56.6
11 00	180 55.0	N17 48.0	84 48.5	11.0	N15 49.1	7.7	56.6
01	195 55.1	48.6	99 18.5	11.0	15 41.4	7.9	56.6
02	210 55.1	49.3	113 48.5	11.2	15 33.5	7.9	56.5
03	225 55.1	49.9	128 18.7	11.2	15 25.6	8.0	56.5
04	240 55.1	50.5	142 48.9	11.3	15 17.6	8.0	56.5
05	255 55.1	51.2	157 19.2	11.4	15 09.6	8.1	56.4
06	270 55.2	N17 51.8	171 49.6	11.5	N15 01.5	8.2	56.4
07	285 55.2	52.5	186 20.1	11.5	14 53.3	8.3	56.4
08	300 55.2	53.1	200 50.6	11.6	14 45.0	8.3	56.3
MON 09	315 55.2	53.8	215 21.2	11.7	14 36.7	8.4	56.3
10	330 55.2	54.4	229 51.9	11.8	14 28.3	8.4	56.3
11	345 55.2	55.0	244 22.7	11.8	14 19.9	8.5	56.2
12	0 55.3	N17 55.7	258 53.5	11.9	N14 11.4	8.5	56.2
13	15 55.3	56.3	273 24.4	12.0	14 02.9	8.7	56.2
14	30 55.3	57.0	287 55.4	12.1	13 54.2	8.6	56.1
15	45 55.3	57.6	302 26.5	12.1	13 45.6	8.7	56.1
16	60 55.3	58.2	316 57.6	12.2	13 36.9	8.8	56.1
17	75 55.3	58.9	331 28.8	12.3	13 28.1	8.9	56.1
18	90 55.4	N17 59.5	346 00.1	12.4	N13 19.2	8.9	56.0
19	105 55.4	18 00.1	0 31.5	12.4	13 10.3	8.9	56.0
20	120 55.4	00.8	15 02.9	12.5	13 01.4	9.0	56.0
21	135 55.4	01.4	29 34.4	12.6	12 52.4	9.0	55.9
22	150 55.4	02.1	44 06.0	12.6	12 43.4	9.1	55.9
23	165 55.4	02.7	58 37.6	12.7	12 34.3	9.2	55.9
12 00	180 55.4	N18 03.3	73 09.3	12.8	N12 25.1	9.2	55.8
01	195 55.5	04.0	87 41.1	12.8	12 15.9	9.2	55.8
02	210 55.5	04.6	102 12.9	12.9	12 06.7	9.3	55.8
03	225 55.5	05.2	116 44.8	13.0	11 57.4	9.4	55.8
04	240 55.5	05.8	131 16.8	13.0	11 48.0	9.3	55.7
05	255 55.5	06.5	145 48.8	13.1	11 38.7	9.5	55.7
06	270 55.5	N18 07.1	160 20.9	13.2	N11 29.2	9.4	55.7
07	285 55.5	07.7	174 53.1	13.2	11 19.8	9.5	55.6
08	300 55.5	08.4	189 25.3	13.3	11 10.3	9.6	55.6
TUES 09	315 55.6	09.0	203 57.6	13.3	11 00.7	9.6	55.6
10	330 55.6	09.6	218 29.9	13.4	10 51.1	9.6	55.6
11	345 55.6	10.3	233 02.3	13.5	10 41.5	9.7	55.5
12	0 55.6	N18 10.9	247 34.8	13.5	N10 31.8	9.7	55.5
13	15 55.6	11.5	262 07.3	13.6	10 22.1	9.8	55.5
14	30 55.6	12.1	276 39.9	13.6	10 12.3	9.7	55.5
15	45 55.6	12.8	291 12.5	13.7	10 02.6	9.9	55.4
16	60 55.6	13.4	305 45.2	13.7	9 52.7	9.8	55.4
17	75 55.6	14.0	320 17.9	13.8	9 42.9	9.9	55.4
18	90 55.7	N18 14.6	334 50.7	13.9	N 9 33.0	9.9	55.4
19	105 55.7	15.3	349 23.6	13.9	9 23.1	10.0	55.3
20	120 55.7	15.9	3 56.5	13.9	9 13.1	10.0	55.3
21	135 55.7	16.5	18 29.4	14.1	9 03.1	10.0	55.3
22	150 55.7	17.1	33 02.5	14.0	8 53.1	10.0	55.3
23	165 55.7	17.7	47 35.5	14.1	8 43.1	10.1	55.2
	S.D. 15.9	d 0.6	S.D. 15.5		15.3		15.1

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	03 38	03 39	11 56	18 09	05 43	06	◐
11	03 40	03 41	11 56	18 58	06 34	07	
12	03 42	03 42	11 56	19 44	07 21	08	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.8		SATURN +1.0	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
13	00	230 39.7	171 19.4	N20 24.2	189 53.1	N15 33.6	49 21.6	N 1 03.8	46 28.7	N 1 00.2
	01	245 42.2	186 18.6	24.9	204 53.8	34.2	64 24.1	03.9	61 31.3	00.2
	02	260 44.7	201 17.9	25.6	219 54.4	34.8	79 26.7	03.9	76 33.8	00.3
	03	275 47.1	216 17.2	·· 26.3	234 55.1	·· 35.4	94 29.3	·· 03.9	91 36.4	·· 00.3
	04	290 49.6	231 16.5	27.1	249 55.7	36.0	109 31.9	04.0	106 39.0	00.3
	05	305 52.1	246 15.7	27.8	264 56.4	36.5	124 34.4	04.0	121 41.5	00.4
	06	320 54.5	261 15.0	N20 28.5	279 57.0	N15 37.1	139 37.0	N 1 04.0	136 44.1	N 1 00.4
	07	335 57.0	276 14.3	29.2	294 57.7	37.7	154 39.6	04.1	151 46.6	00.4
	08	350 59.5	291 13.5	29.9	309 58.3	38.3	169 42.1	04.1	166 49.2	00.4
W	09	6 01.9	306 12.8	·· 30.7	324 59.0	·· 38.9	184 44.7	·· 04.1	181 51.7	·· 00.5
E	10	21 04.4	321 12.1	31.4	339 59.6	39.4	199 47.3	04.2	196 54.3	00.5
D	11	36 06.8	336 11.4	32.1	355 00.3	40.0	214 49.8	04.2	211 56.8	00.5
N	12	51 09.3	351 10.6	N20 32.8	10 01.0	N15 40.6	229 52.4	N 1 04.2	226 59.4	N 1 00.6
E	13	66 11.8	6 09.9	33.5	25 01.6	41.2	244 55.0	04.3	242 01.9	00.6
S	14	81 14.2	21 09.2	34.2	40 02.3	41.7	259 57.5	04.3	257 04.5	00.6
D	15	96 16.7	36 08.4	·· 34.9	55 02.9	·· 42.3	275 00.1	·· 04.3	272 07.0	·· 00.7
A	16	111 19.2	51 07.7	35.6	70 03.6	42.9	290 02.6	04.4	287 09.6	00.7
Y	17	126 21.6	66 07.0	36.3	85 04.2	43.5	305 05.2	04.4	302 12.1	00.7
	18	141 24.1	81 06.2	N20 37.0	100 04.9	N15 44.0	320 07.8	N 1 04.4	317 14.7	N 1 00.7
	19	156 26.6	96 05.5	37.7	115 05.5	44.6	335 10.3	04.5	332 17.2	00.8
	20	171 29.0	111 04.7	38.4	130 06.2	45.2	350 12.9	04.5	347 19.8	00.8
	21	186 31.5	126 04.0	·· 39.2	145 06.8	·· 45.8	5 15.5	·· 04.5	2 22.3	·· 00.8
	22	201 34.0	141 03.3	39.9	160 07.5	46.3	20 18.0	04.6	17 24.9	00.9
	23	216 36.4	156 02.5	40.6	175 08.1	46.9	35 20.6	04.6	32 27.4	00.9
14	00	231 38.9	171 01.8	N20 41.3	190 08.8	N15 47.5	50 23.2	N 1 04.6	47 30.0	N 1 00.9
	01	246 41.3	186 01.1	42.0	205 09.4	48.0	65 25.7	04.7	62 32.5	00.9
	02	261 43.8	201 00.3	42.7	220 10.1	48.6	80 28.3	04.7	77 35.1	01.0
	03	276 46.3	215 59.6	·· 43.3	235 10.7	·· 49.2	95 30.8	·· 04.7	92 37.6	·· 01.0
	04	291 48.7	230 58.8	44.0	250 11.4	49.8	110 33.4	04.8	107 40.2	01.0
	05	306 51.2	245 58.1	44.7	265 12.0	50.3	125 36.0	04.8	122 42.7	01.1
	06	321 53.7	260 57.4	N20 45.4	280 12.7	N15 50.9	140 38.5	N 1 04.8	137 45.3	N 1 01.1
	07	336 56.1	275 56.6	46.1	295 13.3	51.5	155 41.1	04.9	152 47.8	01.1
T	08	351 58.6	290 55.9	46.8	310 14.0	52.0	170 43.7	04.9	167 50.4	01.1
H	09	7 01.1	305 55.1	·· 47.5	325 14.6	·· 52.6	185 46.2	·· 04.9	182 52.9	·· 01.2
U	10	22 03.5	320 54.4	48.2	340 15.3	53.2	200 48.8	05.0	197 55.5	01.2
R	11	37 06.0	335 53.7	48.9	355 15.9	53.8	215 51.3	05.0	212 58.0	01.2
S	12	52 08.5	350 52.9	N20 49.6	10 16.6	N15 54.3	230 53.9	N 1 05.0	228 00.6	N 1 01.3
D	13	67 10.9	5 52.2	50.3	25 17.2	54.9	245 56.4	05.1	243 03.1	01.3
A	14	82 13.4	20 51.4	51.0	40 17.9	55.5	260 59.0	05.1	258 05.7	01.3
Y	15	97 15.8	35 50.7	·· 51.6	55 18.5	·· 56.0	276 01.6	·· 05.1	273 08.2	·· 01.3
	16	112 18.3	50 49.9	52.3	70 19.2	56.6	291 04.1	05.1	288 10.8	01.4
	17	127 20.8	65 49.2	53.0	85 19.8	57.2	306 06.7	05.2	303 13.3	01.4
	18	142 23.2	80 48.4	N20 53.7	100 20.5	N15 57.7	321 09.2	N 1 05.2	318 15.9	N 1 01.4
	19	157 25.7	95 47.7	54.4	115 21.1	58.3	336 11.8	05.2	333 18.4	01.4
	20	172 28.2	110 47.0	55.0	130 21.8	58.9	351 14.4	05.3	348 21.0	01.5
	21	187 30.6	125 46.2	·· 55.7	145 22.4	15 59.4	6 16.9	·· 05.3	3 23.5	·· 01.5
	22	202 33.1	140 45.5	56.4	160 23.0	16 00.0	21 19.5	05.3	18 26.1	01.5
	23	217 35.6	155 44.7	57.1	175 23.7	00.6	36 22.0	05.4	33 28.6	01.6
15	00	232 38.0	170 44.0	N20 57.8	190 24.3	N16 01.1	51 24.6	N 1 05.4	48 31.2	N 1 01.6
	01	247 40.5	185 43.2	58.4	205 25.0	01.7	66 27.1	05.4	63 33.7	01.6
	02	262 42.9	200 42.5	59.1	220 25.6	02.3	81 29.7	05.4	78 36.2	01.6
	03	277 45.4	215 41.7	20 59.8	235 26.3	·· 02.8	96 32.2	·· 05.5	93 38.8	·· 01.7
	04	292 47.9	230 41.0	21 00.5	250 26.9	03.4	111 34.8	05.5	108 41.3	01.7
	05	307 50.3	245 40.2	01.1	265 27.6	04.0	126 37.4	05.5	123 43.9	01.7
	06	322 52.8	260 39.5	N21 01.8	280 28.2	N16 04.5	141 39.9	N 1 05.6	138 46.4	N 1 01.7
	07	337 55.3	275 38.7	02.5	295 28.9	05.1	156 42.5	05.6	153 49.0	01.8
	08	352 57.7	290 38.0	03.1	310 29.5	05.7	171 45.0	05.6	168 51.5	01.8
F	09	8 00.2	305 37.2	·· 03.8	325 30.2	·· 06.2	186 47.6	·· 05.6	183 54.1	·· 01.8
R	10	23 02.7	320 36.5	04.5	340 30.8	06.8	201 50.1	05.7	198 56.6	01.8
I	11	38 05.1	335 35.7	05.1	355 31.5	07.3	216 52.7	05.7	213 59.2	01.9
D	12	53 07.6	350 35.0	N21 05.8	10 32.1	N16 07.9	231 55.2	N 1 05.7	229 01.7	N 1 01.9
A	13	68 10.1	5 34.2	06.5	25 32.8	08.5	246 57.8	05.8	244 04.3	01.9
Y	14	83 12.5	20 33.4	07.1	40 33.4	09.0	262 00.3	05.8	259 06.8	02.0
	15	98 15.0	35 32.7	·· 07.8	55 34.1	·· 09.6	277 02.9	·· 05.8	274 09.3	·· 02.0
	16	113 17.4	50 31.9	08.4	70 34.7	10.2	292 05.4	05.8	289 11.9	02.0
	17	128 19.9	65 31.2	09.1	85 35.4	10.7	307 08.0	05.9	304 14.4	02.0
	18	143 22.4	80 30.4	N21 09.8	100 36.0	N16 11.3	322 10.5	N 1 05.9	319 17.0	N 1 02.1
	19	158 24.8	95 29.7	10.4	115 36.7	11.8	337 13.1	05.9	334 19.5	02.1
	20	173 27.3	110 28.9	11.1	130 37.3	12.4	352 15.6	05.9	349 22.1	02.1
	21	188 29.8	125 28.1	·· 11.7	145 37.9	·· 13.0	7 18.2	·· 06.0	4 24.6	·· 02.1
	22	203 32.2	140 27.4	12.4	160 38.6	13.5	22 20.7	06.0	19 27.2	02.2
	23	218 34.7	155 26.6	13.0	175 39.2	14.1	37 23.3	06.0	34 29.7	02.2
Mer. Pass		h m 8 32.0	v −0.7	d 0.7	v 0.6	d 0.6	v 2.6	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.3	S40 22.9
Achernar	335 45.5	S57 19.9
Acrux	173 36.3	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.9	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.7	N49 24.6
Al Na'ir	28 14.5	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.1	N28 59.0
Altair	62 32.0	N 8 49.0
Ankaa	353 40.1	S42 24.4
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.3	S68 59.5
Avior	234 28.2	S59 27.3
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.4	S52 41.4
Capella	281 11.1	N45 58.8
Deneb	49 48.0	N45 12.5
Denebola	182 58.4	N14 40.7
Diphda	349 20.7	S18 05.4
Dubhe	194 21.4	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.1	N51 29.3
Enif	34 11.2	N 9 47.2
Fomalhaut	15 51.1	S29 43.3
Gacrux	172 27.9	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.1
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.0	S34 23.5
Kochab	137 17.9	N74 14.1
Markab	14 02.9	N15 06.1
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.7
Miaplacidus	221 45.0	S69 38.7
Mirfak	309 16.0	N49 47.5
Nunki	76 28.4	S26 19.2
Peacock	53 57.5	S56 47.5
Pollux	243 57.8	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.4
Regulus	208 09.5	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.9	N56 25.8
Shaula	96 54.8	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.9
Suhail	223 10.5	S43 21.7
Vega	80 55.2	N38 45.8
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	299 22.9	12 37
Mars	318 29.9	11 19
Jupiter	178 44.3	20 35
Saturn	175 51.1	20 46

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
13	00	180 55.7	N18 18.4	62 08.6	14.2	N 8 33.0	10.1	55.2
	01	195 55.7	19.0	76 41.8	14.2	8 22.9	10.2	55.2
	02	210 55.7	19.6	91 15.0	14.3	8 12.7	10.1	55.2
	03	225 55.7	20.2	105 48.3	14.3	8 02.6	10.2	55.1
	04	240 55.7	20.8	120 21.6	14.3	7 52.4	10.2	55.1
	05	255 55.7	21.5	134 54.9	14.4	7 42.2	10.3	55.1
	06	270 55.8	N18 22.1	149 28.3	14.4	N 7 31.9	10.3	55.1
	07	285 55.8	22.7	164 01.7	14.5	7 21.6	10.2	55.1
W	08	300 55.8	23.3	178 35.2	14.6	7 11.4	10.4	55.0
E	09	315 55.8	23.9	193 08.8	14.5	7 01.0	10.3	55.0
D	10	330 55.8	24.5	207 42.3	14.6	6 50.7	10.4	55.0
N	11	345 55.8	25.2	222 15.9	14.7	6 40.3	10.3	55.0
E	12	0 55.8	N18 25.8	236 49.6	14.7	N 6 30.0	10.4	54.9
S	13	15 55.8	26.4	251 23.3	14.7	6 19.6	10.4	54.9
D	14	30 55.8	27.0	265 57.0	14.8	6 09.2	10.5	54.9
A	15	45 55.8	27.6	280 30.8	14.8	5 58.7	10.4	54.9
Y	16	60 55.8	28.2	295 04.6	14.8	5 48.3	10.5	54.9
	17	75 55.8	28.8	309 38.4	14.9	5 37.8	10.5	54.8
	18	90 55.8	N18 29.4	324 12.3	14.9	N 5 27.3	10.5	54.8
	19	105 55.8	30.1	338 46.2	14.9	5 16.8	10.5	54.8
	20	120 55.8	30.7	353 20.1	15.0	5 06.3	10.6	54.8
	21	135 55.8	31.3	7 54.1	15.0	4 55.7	10.5	54.8
	22	150 55.8	31.9	22 28.1	15.1	4 45.2	10.6	54.8
	23	165 55.8	32.5	37 02.2	15.0	4 34.6	10.6	54.7
14	00	180 55.8	N18 33.1	51 36.2	15.1	N 4 24.0	10.5	54.7
	01	195 55.8	33.7	66 10.3	15.2	4 13.5	10.6	54.7
	02	210 55.8	34.3	80 44.5	15.1	4 02.9	10.7	54.7
	03	225 55.8	34.9	95 18.6	15.2	3 52.2	10.6	54.7
	04	240 55.8	35.5	109 52.8	15.2	3 41.6	10.6	54.6
	05	255 55.8	36.1	124 27.0	15.2	3 31.0	10.6	54.6
	06	270 55.8	N18 36.7	139 01.2	15.3	N 3 20.4	10.7	54.6
	07	285 55.8	37.3	153 35.5	15.3	3 09.7	10.6	54.6
T	08	300 55.8	37.9	168 09.8	15.3	2 59.1	10.7	54.6
H	09	315 55.8	38.5	182 44.1	15.3	2 48.4	10.7	54.6
U	10	330 55.8	39.1	197 18.4	15.4	2 37.7	10.6	54.5
R	11	345 55.8	39.7	211 52.8	15.4	2 27.1	10.7	54.5
S	12	0 55.8	N18 40.3	226 27.2	15.4	N 2 16.4	10.7	54.5
D	13	15 55.8	40.9	241 01.6	15.4	2 05.7	10.7	54.5
A	14	30 55.8	41.5	255 36.0	15.4	1 55.0	10.7	54.5
Y	15	45 55.8	42.1	270 10.4	15.5	1 44.3	10.7	54.5
	16	60 55.8	42.7	284 44.9	15.4	1 33.6	10.7	54.5
	17	75 55.8	43.3	299 19.3	15.5	1 22.9	10.7	54.4
	18	90 55.8	N18 43.9	313 53.8	15.5	N 1 12.2	10.7	54.4
	19	105 55.8	44.5	328 28.3	15.5	1 01.5	10.7	54.4
	20	120 55.8	45.1	343 02.8	15.6	0 50.8	10.6	54.4
	21	135 55.8	45.7	357 37.4	15.5	0 40.2	10.7	54.4
	22	150 55.8	46.3	12 11.9	15.6	0 29.5	10.7	54.4
	23	165 55.8	46.9	26 46.5	15.5	0 18.8	10.7	54.4
15	00	180 55.8	N18 47.5	41 21.0	15.6	N 0 08.1	10.7	54.4
	01	195 55.8	48.1	55 55.6	15.6	S 0 02.6	10.7	54.3
	02	210 55.8	48.7	70 30.2	15.6	0 13.3	10.7	54.3
	03	225 55.8	49.3	85 04.8	15.6	0 24.0	10.6	54.3
	04	240 55.8	49.9	99 39.4	15.6	0 34.6	10.7	54.3
	05	255 55.8	50.5	114 14.0	15.6	0 45.3	10.7	54.3
	06	270 55.8	N18 51.1	128 48.6	15.7	S 0 56.0	10.6	54.3
	07	285 55.8	51.7	143 23.3	15.6	1 06.6	10.7	54.3
	08	300 55.8	52.3	157 57.9	15.7	1 17.3	10.6	54.3
F	09	315 55.8	52.8	172 32.6	15.6	1 27.9	10.6	54.2
R	10	330 55.8	53.4	187 07.2	15.6	1 38.5	10.6	54.2
I	11	345 55.8	54.0	201 41.8	15.7	1 49.1	10.7	54.2
D	12	0 55.8	N18 54.6	216 16.5	15.6	S 1 59.8	10.6	54.2
A	13	15 55.8	55.2	230 51.1	15.7	2 10.4	10.5	54.2
Y	14	30 55.8	55.8	245 25.8	15.7	2 20.9	10.6	54.2
	15	45 55.7	56.4	260 00.5	15.6	2 31.5	10.6	54.2
	16	60 55.7	57.0	274 35.1	15.7	2 42.1	10.5	54.2
	17	75 55.7	57.5	289 09.8	15.6	2 52.6	10.6	54.2
	18	90 55.7	N18 58.1	303 44.4	15.7	S 3 03.2	10.5	54.2
	19	105 55.7	58.7	318 19.1	15.6	3 13.7	10.5	54.2
	20	120 55.7	59.3	332 53.7	15.7	3 24.2	10.5	54.1
	21	135 55.7	18 59.9	347 28.4	15.6	3 34.7	10.5	54.1
	22	150 55.7	19 00.5	2 03.0	15.6	3 45.2	10.4	54.1
	23	165 55.7	01.0	16 37.6	15.7	3 55.6	10.5	54.1
		S.D. 15.8	d 0.6	S.D. 15.0		14.9		14.8

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
13	03 43	03 43	11 56	20 27	08 06	09	◐
14	03 43	03 43	11 56	21 10	08 49	10	
15	03 43	03 43	11 56	21 52	09 31	11	

G.M.T.		ARIES	VENUS −3.4		MARS +1.5		JUPITER −1.8		SATURN +1.0	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
16	00	233 37.2	170 25.9	N21 13.7	190 39.9	N16 14.6	52 25.8	N 1 06.1	49 32.2	N 1 02.2
	01	248 39.6	185 25.1	14.3	205 40.5	15.2	67 28.4	06.1	64 34.8	02.2
	02	263 42.1	200 24.4	15.0	220 41.2	15.8	82 30.9	06.1	79 37.3	02.3
	03	278 44.6	215 23.6	·· 15.6	235 41.8	·· 16.3	97 33.5	·· 06.1	94 39.9	·· 02.3
	04	293 47.0	230 22.8	16.3	250 42.5	16.9	112 36.0	06.2	109 42.4	02.3
	05	308 49.5	245 22.1	16.9	265 43.1	17.4	127 38.6	06.2	124 45.0	02.3
	06	323 51.9	260 21.3	N21 17.6	280 43.8	N16 18.0	142 41.1	N 1 06.2	139 47.5	N 1 02.4
	07	338 54.4	275 20.5	18.2	295 44.4	18.5	157 43.7	06.2	154 50.0	02.4
S	08	353 56.9	290 19.8	18.9	310 45.1	19.1	172 46.2	06.3	169 52.6	02.4
A	09	8 59.3	305 19.0	·· 19.5	325 45.7	·· 19.7	187 48.8	·· 06.3	184 55.1	·· 02.4
T	10	24 01.8	320 18.3	20.2	340 46.3	20.2	202 51.3	06.3	199 57.7	02.5
U	11	39 04.3	335 17.5	20.8	355 47.0	20.8	217 53.9	06.3	215 00.2	02.5
R	12	54 06.7	350 16.7	N21 21.4	10 47.6	N16 21.3	232 56.4	N 1 06.4	230 02.7	N 1 02.5
D	13	69 09.2	5 16.0	22.1	25 48.3	21.9	247 59.0	06.4	245 05.3	02.5
A	14	84 11.7	20 15.2	22.7	40 48.9	22.4	263 01.5	06.4	260 07.8	02.6
Y	15	99 14.1	35 14.4	·· 23.3	55 49.6	·· 23.0	278 04.0	·· 06.4	275 10.4	·· 02.6
	16	114 16.6	50 13.7	24.0	70 50.2	23.6	293 06.6	06.5	290 12.9	02.6
	17	129 19.0	65 12.9	24.6	85 50.9	24.1	308 09.1	06.5	305 15.5	02.6
	18	144 21.5	80 12.1	N21 25.2	100 51.5	N16 24.7	323 11.7	N 1 06.5	320 18.0	N 1 02.7
	19	159 24.0	95 11.4	25.9	115 52.2	25.2	338 14.2	06.5	335 20.5	02.7
	20	174 26.4	110 10.6	26.5	130 52.8	25.8	353 16.8	06.6	350 23.1	02.7
	21	189 28.9	125 09.8	·· 27.1	145 53.4	·· 26.3	8 19.3	·· 06.6	5 25.6	·· 02.7
	22	204 31.4	140 09.1	27.8	160 54.1	26.9	23 21.9	06.6	20 28.2	02.8
	23	219 33.8	155 08.3	28.4	175 54.7	27.4	38 24.4	06.6	35 30.7	02.8
17	00	234 36.3	170 07.5	N21 29.0	190 55.4	N16 28.0	53 26.9	N 1 06.6	50 33.2	N 1 02.8
	01	249 38.8	185 06.8	29.7	205 56.0	28.5	68 29.5	06.7	65 35.8	02.8
	02	264 41.2	200 06.0	30.3	220 56.7	29.1	83 32.0	06.7	80 38.3	02.8
	03	279 43.7	215 05.2	·· 30.9	235 57.3	·· 29.6	98 34.6	·· 06.7	95 40.9	·· 02.9
	04	294 46.2	230 04.4	31.5	250 58.0	30.2	113 37.1	06.7	110 43.4	02.9
	05	309 48.6	245 03.7	32.1	265 58.6	30.7	128 39.6	06.8	125 45.9	02.9
	06	324 51.1	260 02.9	N21 32.8	280 59.2	N16 31.3	143 42.2	N 1 06.8	140 48.5	N 1 02.9
	07	339 53.5	275 02.1	33.4	295 59.9	31.8	158 44.7	06.8	155 51.0	03.0
	08	354 56.0	290 01.4	34.0	311 00.5	32.4	173 47.3	06.8	170 53.6	03.0
S	09	9 58.5	305 00.6	·· 34.6	326 01.2	·· 32.9	188 49.8	·· 06.9	185 56.1	·· 03.0
U	10	25 00.9	319 59.8	35.2	341 01.8	33.5	203 52.3	06.9	200 58.6	03.0
N	11	40 03.4	334 59.0	35.9	356 02.5	34.0	218 54.9	06.9	216 01.2	03.1
D	12	55 05.9	349 58.3	N21 36.5	11 03.1	N16 34.6	233 57.4	N 1 06.9	231 03.7	N 1 03.1
A	13	70 08.3	4 57.5	37.1	26 03.8	35.1	249 00.0	06.9	246 06.2	03.1
Y	14	85 10.8	19 56.7	37.7	41 04.4	35.7	264 02.5	07.0	261 08.8	03.1
	15	100 13.3	34 55.9	·· 38.3	56 05.0	·· 36.2	279 05.0	·· 07.0	276 11.3	·· 03.2
	16	115 15.7	49 55.2	38.9	71 05.7	36.8	294 07.6	07.0	291 13.9	03.2
	17	130 18.2	64 54.4	39.5	86 06.3	37.3	309 10.1	07.0	306 16.4	03.2
	18	145 20.7	79 53.6	N21 40.1	101 07.0	N16 37.9	324 12.6	N 1 07.0	321 18.9	N 1 03.2
	19	160 23.1	94 52.8	40.8	116 07.6	38.4	339 15.2	07.1	336 21.5	03.2
	20	175 25.6	109 52.0	41.4	131 08.3	39.0	354 17.7	07.1	351 24.0	03.3
	21	190 28.0	124 51.3	·· 42.0	146 08.9	·· 39.5	9 20.3	·· 07.1	6 26.5	·· 03.3
	22	205 30.5	139 50.5	42.6	161 09.5	40.1	24 22.8	07.1	21 29.1	03.3
	23	220 33.0	154 49.7	43.2	176 10.2	40.6	39 25.3	07.2	36 31.6	03.3
18	00	235 35.4	169 48.9	N21 43.8	191 10.8	N16 41.1	54 27.9	N 1 07.2	51 34.2	N 1 03.4
	01	250 37.9	184 48.2	44.4	206 11.5	41.7	69 30.4	07.2	66 36.7	03.4
	02	265 40.4	199 47.4	45.0	221 12.1	42.2	84 32.9	07.2	81 39.2	03.4
	03	280 42.8	214 46.6	·· 45.6	236 12.8	·· 42.8	99 35.5	·· 07.2	96 41.8	·· 03.4
	04	295 45.3	229 45.8	46.2	251 13.4	43.3	114 38.0	07.3	111 44.3	03.4
	05	310 47.8	244 45.0	46.8	266 14.0	43.9	129 40.5	07.3	126 46.8	03.5
	06	325 50.2	259 44.2	N21 47.4	281 14.7	N16 44.4	144 43.1	N 1 07.3	141 49.4	N 1 03.5
	07	340 52.7	274 43.5	48.0	296 15.3	45.0	159 45.6	07.3	156 51.9	03.5
	08	355 55.1	289 42.7	48.6	311 16.0	45.5	174 48.1	07.3	171 54.4	03.5
M	09	10 57.6	304 41.9	·· 49.1	326 16.6	·· 46.0	189 50.7	·· 07.3	186 57.0	·· 03.5
O	10	26 00.1	319 41.1	49.7	341 17.2	46.6	204 53.2	07.4	201 59.5	03.6
N	11	41 02.5	334 40.3	50.3	356 17.9	47.1	219 55.7	07.4	217 02.0	03.6
D	12	56 05.0	349 39.5	N21 50.9	11 18.5	N16 47.7	234 58.3	N 1 07.4	232 04.6	N 1 03.6
A	13	71 07.5	4 38.8	51.5	26 19.2	48.2	250 00.8	07.4	247 07.1	03.6
Y	14	86 09.9	19 38.0	52.1	41 19.8	48.8	265 03.3	07.4	262 09.6	03.7
	15	101 12.4	34 37.2	·· 52.7	56 20.5	·· 49.3	280 05.9	·· 07.5	277 12.2	·· 03.7
	16	116 14.9	49 36.4	53.3	71 21.1	49.8	295 08.4	07.5	292 14.7	03.7
	17	131 17.3	64 35.6	53.9	86 21.7	50.4	310 10.9	07.5	307 17.2	03.7
	18	146 19.8	79 34.8	N21 54.4	101 22.4	N16 50.9	325 13.5	N 1 07.5	322 19.8	N 1 03.7
	19	161 22.3	94 34.0	55.0	116 23.0	51.5	340 16.0	07.5	337 22.3	03.8
	20	176 24.7	109 33.2	55.6	131 23.7	52.0	355 18.5	07.6	352 24.8	03.8
	21	191 27.2	124 32.5	·· 56.2	146 24.3	·· 52.5	10 21.0	·· 07.6	7 27.4	·· 03.8
	22	206 29.6	139 31.7	56.8	161 24.9	53.1	25 23.6	07.6	22 29.9	03.8
	23	221 32.1	154 30.9	57.3	176 25.6	53.6	40 26.1	07.6	37 32.4	03.8
Mer. Pass.		h m 8 20.2	v −0.8	d 0.6	v 0.6	d 0.5	v 2.5	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 22.9
Achernar	335 45.5	S57 19.9
Acrux	173 36.3	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.9	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.7	N49 24.6
Al Na'ir	28 14.4	S47 03.0
Alnilam	276 11.5	S 1 13.0
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.1	N28 59.0
Altair	62 31.9	N 8 49.0
Ankaa	353 40.1	S42 24.4
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.8
Atria	108 19.3	S68 59.6
Avior	234 28.3	S59 27.3
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.4	S52 41.4
Capella	281 11.1	N45 58.7
Deneb	49 48.0	N45 12.5
Denebola	182 58.5	N14 40.7
Diphda	349 20.7	S18 05.4
Dubhe	194 21.4	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.1	N51 29.4
Enif	34 11.1	N 9 47.2
Fomalhaut	15 51.1	S29 43.3
Gacrux	172 27.9	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.1
Hamal	328 28.8	N23 22.2
Kaus Aust.	84 16.0	S34 23.5
Kochab	137 17.9	N74 14.1
Markab	14 02.8	N15 06.1
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.8
Miaplacidus	221 45.0	S69 38.7
Mirfak	309 16.0	N49 47.5
Nunki	76 28.4	S26 19.2
Peacock	53 57.5	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.4
Regulus	208 09.5	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.9	N56 25.8
Shaula	96 54.8	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.9
Suhail	223 10.6	S43 21.7
Vega	80 55.2	N38 45.8
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	295 31.2	12 40
Mars	316 19.1	11 16
Jupiter	178 50.6	20 23
Saturn	175 56.9	20 34

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
16 00	180 55.7	N19 01.6	31 12.3	15.6	S 4 06.1	10.4	54.1
01	195 55.7	02.2	45 46.9	15.6	4 16.5	10.4	54.1
02	210 55.7	02.8	60 21.5	15.6	4 26.9	10.4	54.1
03	225 55.6	·· 03.4	74 56.1	15.6	4 37.3	10.4	54.1
04	240 55.6	03.9	89 30.7	15.6	4 47.7	10.3	54.1
05	255 55.6	04.5	104 05.3	15.6	4 58.0	10.3	54.1
06	270 55.6	N19 05.1	118 39.9	15.5	S 5 08.3	10.3	54.1
07	285 55.6	05.7	133 14.4	15.6	5 18.6	10.3	54.1
S 08	300 55.6	06.3	147 49.0	15.5	5 28.9	10.3	54.1
A 09	315 55.6	·· 06.8	162 23.5	15.6	5 39.2	10.2	54.1
T 10	330 55.6	07.4	176 58.1	15.5	5 49.4	10.2	54.0
U 11	345 55.6	08.0	191 32.6	15.5	5 59.6	10.2	54.0
R 12	0 55.5	N19 08.6	206 07.1	15.5	S 6 09.8	10.2	54.0
D 13	15 55.5	09.1	220 41.6	15.5	6 20.0	10.1	54.0
A 14	30 55.5	09.7	235 16.1	15.4	6 30.1	10.1	54.0
Y 15	45 55.5	·· 10.3	249 50.5	15.5	6 40.2	10.1	54.0
16	60 55.5	10.8	264 25.0	15.4	6 50.3	10.1	54.0
17	75 55.5	11.4	278 59.4	15.4	7 00.4	10.0	54.0
18	90 55.5	N19 12.0	293 33.8	15.4	S 7 10.4	10.0	54.0
19	105 55.5	12.6	308 08.2	15.4	7 20.4	10.0	54.0
20	120 55.4	13.1	322 42.6	15.3	7 30.4	9.9	54.0
21	135 55.4	·· 13.7	337 16.9	15.4	7 40.3	9.9	54.0
22	150 55.4	14.3	351 51.3	15.3	7 50.2	9.9	54.0
23	165 55.4	14.8	6 25.6	15.3	8 00.1	9.8	54.0
17 00	180 55.4	N19 15.4	20 59.9	15.3	S 8 09.9	9.8	54.0
01	195 55.4	16.0	35 34.2	15.2	8 19.7	9.8	54.0
02	210 55.4	16.5	50 08.4	15.3	8 29.5	9.8	54.0
03	225 55.3	·· 17.1	64 42.7	15.2	8 39.3	9.7	54.0
04	240 55.3	17.7	79 16.9	15.1	8 49.0	9.6	54.0
05	255 55.3	18.2	93 51.0	15.2	8 58.6	9.7	54.0
06	270 55.3	N19 18.8	108 25.2	15.1	S 9 08.3	9.6	54.0
07	285 55.3	19.4	122 59.3	15.1	9 17.9	9.6	54.0
08	300 55.3	19.9	137 33.4	15.1	9 27.5	9.5	54.0
S 09	315 55.2	·· 20.5	152 07.5	15.1	9 37.0	9.5	54.0
U 10	330 55.2	21.1	166 41.6	15.0	9 46.5	9.4	54.0
N 11	345 55.2	21.6	181 15.6	15.0	9 55.9	9.4	54.0
D 12	0 55.2	N19 22.2	195 49.6	15.0	S10 05.3	9.4	54.0
A 13	15 55.2	22.7	210 23.6	14.9	10 14.7	9.3	54.0
Y 14	30 55.2	23.3	224 57.5	15.0	10 24.0	9.3	54.0
15	45 55.1	·· 23.9	239 31.5	14.8	10 33.3	9.3	54.0
16	60 55.1	24.4	254 05.3	14.9	10 42.6	9.2	54.0
17	75 55.1	25.0	268 39.2	14.8	10 51.8	9.1	54.0
18	90 55.1	N19 25.5	283 13.0	14.8	S11 00.9	9.2	54.0
19	105 55.1	26.1	297 46.8	14.8	11 10.1	9.0	54.0
20	120 55.0	26.6	312 20.6	14.7	11 19.1	9.1	54.0
21	135 55.0	·· 27.2	326 54.3	14.7	11 28.2	8.9	54.0
22	150 55.0	27.8	341 28.0	14.7	11 37.1	9.0	54.0
23	165 55.0	28.3	356 01.7	14.7	11 46.1	8.9	54.0
18 00	180 55.0	N19 28.9	10 35.4	14.6	S11 55.0	8.8	54.0
01	195 54.9	29.4	25 09.0	14.5	12 03.8	8.8	54.0
02	210 54.9	30.0	39 42.5	14.6	12 12.6	8.7	54.0
03	225 54.9	·· 30.5	54 16.1	14.5	12 21.3	8.7	54.0
04	240 54.9	31.1	68 49.6	14.4	12 30.0	8.7	54.0
05	255 54.9	31.6	83 23.0	14.5	12 38.7	8.5	54.0
06	270 54.8	N19 32.2	97 56.5	14.4	S12 47.2	8.6	54.0
07	285 54.8	32.7	112 29.9	14.3	12 55.8	8.5	54.0
08	300 54.8	33.3	127 03.2	14.4	13 04.3	8.4	54.0
M 09	315 54.8	·· 33.8	141 36.6	14.3	13 12.7	8.4	54.0
O 10	330 54.7	34.4	156 09.9	14.2	13 21.1	8.3	54.0
N 11	345 54.7	34.9	170 43.1	14.2	13 29.4	8.3	54.0
D 12	0 54.7	N19 35.5	185 16.3	14.2	S13 37.7	8.2	54.0
A 13	15 54.7	36.0	199 49.5	14.1	13 45.9	8.1	54.0
Y 14	30 54.6	36.6	214 22.6	14.1	13 54.0	8.1	54.0
15	45 54.6	·· 37.1	228 55.7	14.1	14 02.1	8.1	54.0
16	60 54.6	37.6	243 28.8	14.0	14 10.2	8.0	54.0
17	75 54.6	38.2	258 01.8	14.0	14 18.2	7.9	54.0
18	90 54.5	N19 38.7	272 34.8	14.0	S14 26.1	7.9	54.0
19	105 54.5	39.3	287 07.8	13.9	14 34.0	7.8	54.0
20	120 54.5	39.8	301 40.7	13.8	14 41.8	7.7	54.0
21	135 54.5	·· 40.4	316 13.5	13.9	14 49.5	7.7	54.0
22	150 54.4	40.9	330 46.4	13.8	14 57.2	7.6	54.0
23	165 54.4	41.4	345 19.2	13.7	15 04.8	7.6	54.0
	S.D. 15.8	d 0.6	S.D. 14.7		14.7		14.7

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	03 43	03 42	11 56	22 34	10 12	12	○
17	03 42	03 41	11 56	23 16	10 55	13	
18	03 40	03 39	11 56	24 01	11 38	14	

GMT		ARIES	VENUS −3.4		MARS +1.6		JUPITER −1.8		SATURN +1.0	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
19	00	236 34.6	169 30.1	N21 57.9	191 26.2	N16 54.2	55 28.6	N 1 07.6	52 35.0	N 1 03.9
	01	251 37.0	184 29.3	58.5	206 26.9	54.7	70 31.2	07.6	67 37.5	03.9
	02	266 39.5	199 28.5	59.1	221 27.5	55.2	85 33.7	07.7	82 40.0	03.9
	03	281 42.0	214 27.7	21 59.6	236 28.1	55.8	100 36.2	07.7	97 42.6	03.9
	04	296 44.4	229 26.9	22 00.2	251 28.8	56.3	115 38.7	07.7	112 45.1	03.9
	05	311 46.9	244 26.1	00.8	266 29.4	56.8	130 41.3	07.7	127 47.6	04.0
	06	326 49.4	259 25.3	N22 01.4	281 30.1	N16 57.4	145 43.8	N 1 07.7	142 50.2	N 1 04.0
	07	341 51.8	274 24.6	01.9	296 30.7	57.9	160 46.3	07.7	157 52.7	04.0
	08	356 54.3	289 23.8	02.5	311 31.4	58.4	175 48.9	07.8	172 55.2	04.0
TUESDAY	09	11 56.8	304 23.0	03.1	326 32.0	59.0	190 51.4	07.8	187 57.8	04.0
	10	26 59.2	319 22.2	03.6	341 32.6	16 59.5	205 53.9	07.8	203 00.3	04.1
	11	42 01.7	334 21.4	04.2	356 33.3	17 00.1	220 56.4	07.8	218 02.8	04.1
	12	57 04.1	349 20.6	N22 04.8	11 33.9	N17 00.6	235 59.0	N 1 07.8	233 05.4	N 1 04.1
	13	72 06.6	4 19.8	05.3	26 34.6	01.1	251 01.5	07.8	248 07.9	04.1
	14	87 09.1	19 19.0	05.9	41 35.2	01.7	266 04.0	07.8	263 10.4	04.1
	15	102 11.5	34 18.2	06.4	56 35.8	02.2	281 06.5	07.9	278 13.0	04.2
	16	117 14.0	49 17.4	07.0	71 36.5	02.7	296 09.1	07.9	293 15.5	04.2
	17	132 16.5	64 16.6	07.6	86 37.1	03.3	311 11.6	07.9	308 18.0	04.2
	18	147 18.9	79 15.8	N22 08.1	101 37.7	N17 03.8	326 14.1	N 1 07.9	323 20.5	N 1 04.2
	19	162 21.4	94 15.0	08.7	116 38.4	04.3	341 16.6	07.9	338 23.1	04.2
	20	177 23.9	109 14.2	09.2	131 39.0	04.9	356 19.1	07.9	353 25.6	04.3
	21	192 26.3	124 13.4	09.8	146 39.7	05.4	11 21.7	08.0	8 28.1	04.3
	22	207 28.8	139 12.6	10.3	161 40.3	05.9	26 24.2	08.0	23 30.7	04.3
	23	222 31.2	154 11.8	10.9	176 40.9	06.4	41 26.7	08.0	38 33.2	04.3
20	00	237 33.7	169 11.0	N22 11.4	191 41.6	N17 07.0	56 29.2	N 1 08.0	53 35.7	N 1 04.3
	01	252 36.2	184 10.2	12.0	206 42.2	07.5	71 31.8	08.0	68 38.2	04.4
	02	267 38.6	199 09.4	12.5	221 42.9	08.0	86 34.3	08.0	83 40.8	04.4
	03	282 41.1	214 08.6	13.1	236 43.5	08.6	101 36.8	08.0	98 43.3	04.4
	04	297 43.6	229 07.8	13.6	251 44.1	09.1	116 39.3	08.1	113 45.8	04.4
	05	312 46.0	244 07.0	14.2	266 44.8	09.6	131 41.8	08.1	128 48.4	04.4
	06	327 48.5	259 06.2	N22 14.7	281 45.4	N17 10.2	146 44.4	N 1 08.1	143 50.9	N 1 04.4
	07	342 51.0	274 05.4	15.3	296 46.1	10.7	161 46.9	08.1	158 53.4	04.5
	08	357 53.4	289 04.6	15.8	311 46.7	11.2	176 49.4	08.1	173 55.9	04.5
WEDNESDAY	09	12 55.9	304 03.8	16.3	326 47.3	11.7	191 51.9	08.1	188 58.5	04.5
	10	27 58.4	319 03.0	16.9	341 48.0	12.3	206 54.4	08.1	204 01.0	04.5
	11	43 00.8	334 02.2	17.4	356 48.6	12.8	221 57.0	08.1	219 03.5	04.5
	12	58 03.3	349 01.4	N22 18.0	11 49.2	N17 13.3	236 59.5	N 1 08.2	234 06.1	N 1 04.6
	13	73 05.7	4 00.6	18.5	26 49.9	13.9	252 02.0	08.2	249 08.6	04.6
	14	88 08.2	18 59.8	19.0	41 50.5	14.4	267 04.5	08.2	264 11.1	04.6
	15	103 10.7	33 59.0	19.6	56 51.2	14.9	282 07.0	08.2	279 13.6	04.6
	16	118 13.1	48 58.2	20.1	71 51.8	15.4	297 09.5	08.2	294 16.2	04.6
	17	133 15.6	63 57.4	20.6	86 52.4	16.0	312 12.1	08.2	309 18.7	04.6
	18	148 18.1	78 56.6	N22 21.2	101 53.1	N17 16.5	327 14.6	N 1 08.2	324 21.2	N 1 04.7
	19	163 20.5	93 55.8	21.7	116 53.7	17.0	342 17.1	08.2	339 23.7	04.7
	20	178 23.0	108 55.0	22.2	131 54.3	17.5	357 19.6	08.3	354 26.3	04.7
	21	193 25.5	123 54.1	22.8	146 55.0	18.1	12 22.1	08.3	9 28.8	04.7
	22	208 27.9	138 53.3	23.3	161 55.6	18.6	27 24.6	08.3	24 31.3	04.7
	23	223 30.4	153 52.5	23.8	176 56.3	19.1	42 27.2	08.3	39 33.8	04.7
21	00	238 32.9	168 51.7	N22 24.3	191 56.9	N17 19.6	57 29.7	N 1 08.3	54 36.4	N 1 04.8
	01	253 35.3	183 50.9	24.9	206 57.5	20.2	72 32.2	08.3	69 38.9	04.8
	02	268 37.8	198 50.1	25.4	221 58.2	20.7	87 34.7	08.3	84 41.4	04.8
	03	283 40.2	213 49.3	25.9	236 58.8	21.2	102 37.2	08.3	99 43.9	04.8
	04	298 42.7	228 48.5	26.4	251 59.4	21.7	117 39.7	08.3	114 46.5	04.8
	05	313 45.2	243 47.7	26.9	267 00.1	22.3	132 42.2	08.4	129 49.0	04.9
	06	328 47.6	258 46.9	N22 27.5	282 00.7	N17 22.8	147 44.8	N 1 08.4	144 51.5	N 1 04.9
	07	343 50.1	273 46.1	28.0	297 01.3	23.3	162 47.3	08.4	159 54.0	04.9
THURSDAY	08	358 52.6	288 45.2	28.5	312 02.0	23.8	177 49.8	08.4	174 56.6	04.9
	09	13 55.0	303 44.4	29.0	327 02.6	24.3	192 52.3	08.4	189 59.1	04.9
	10	28 57.5	318 43.6	29.5	342 03.3	24.9	207 54.8	08.4	205 01.6	04.9
	11	44 00.0	333 42.8	30.0	357 03.9	25.4	222 57.3	08.4	220 04.1	04.9
	12	59 02.4	348 42.0	N22 30.5	12 04.5	N17 25.9	237 59.8	N 1 08.4	235 06.7	N 1 05.0
	13	74 04.9	3 41.2	31.1	27 05.2	26.4	253 02.3	08.4	250 09.2	05.0
	14	89 07.3	18 40.4	31.6	42 05.8	26.9	268 04.9	08.4	265 11.7	05.0
	15	104 09.8	33 39.5	32.1	57 06.4	27.5	283 07.4	08.5	280 14.2	05.0
	16	119 12.3	48 38.7	32.6	72 07.1	28.0	298 09.9	08.5	295 16.8	05.0
	17	134 14.7	63 37.9	33.1	87 07.7	28.5	313 12.4	08.5	310 19.3	05.0
	18	149 17.2	78 37.1	N22 33.6	102 08.3	N17 29.0	328 14.9	N 1 08.5	325 21.8	N 1 05.1
	19	164 19.7	93 36.3	34.1	117 09.0	29.5	343 17.4	08.5	340 24.3	05.1
	20	179 22.1	108 35.5	34.6	132 09.6	30.1	358 19.9	08.5	355 26.8	05.1
	21	194 24.6	123 34.7	35.1	147 10.2	30.6	13 22.4	08.5	10 29.4	05.1
	22	209 27.1	138 33.8	35.6	162 10.9	31.1	28 24.9	08.5	25 31.9	05.1
	23	224 29.5	153 33.0	36.1	177 11.5	31.6	43 27.4	08.5	40 34.4	05.1
Mer. Pass.		h m 8 08.4	v −0.8	d 0.5	v 0.6	d 0.5	v 2.5	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 22.9
Achernar	335 45.5	S57 19.9
Acrux	173 36.3	S62 59.9
Adhara	255 32.0	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.7	N56 03.9
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.4	S47 03.0
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.1	N28 59.0
Altair	62 31.9	N 8 49.0
Ankaa	353 40.1	S42 24.4
Antares	112 56.0	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.3	S68 59.6
Avior	234 28.3	S59 27.3
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.5	S52 41.4
Capella	281 11.1	N45 58.7
Deneb	49 48.0	N45 12.5
Denebola	182 58.5	N14 40.7
Diphda	349 20.7	S18 05.4
Dubhe	194 21.4	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.1	N51 29.4
Enif	34 11.1	N 9 47.2
Fomalhaut	15 51.0	S29 43.2
Gacrux	172 27.9	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.1
Hamal	328 28.7	N23 22.2
Kaus Aust.	84 15.9	S34 23.5
Kochab	137 17.9	N74 14.1
Markab	14 02.8	N15 06.1
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.8
Miaplacidus	221 45.0	S69 38.7
Mirfak	309 16.0	N49 47.5
Nunki	76 28.4	S26 19.2
Peacock	53 57.5	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.4
Regulus	208 09.5	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.9	N56 25.8
Shaula	96 54.8	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.9
Suhail	223 10.6	S43 21.7
Vega	80 55.2	N38 45.8
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	291 37.3	12 44
Mars	314 07.9	11 13
Jupiter	178 55.5	20 11
Saturn	176 02.0	20 22

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
19 00	180 54.4	N19 42.0	359 51.9	13.7	S15 12.4	7.5	54.0
01	195 54.4	42.5	14 24.6	13.7	15 19.9	7.4	54.0
02	210 54.3	43.1	28 57.3	13.6	15 27.3	7.4	54.0
03	225 54.3	·· 43.6	43 29.9	13.6	15 34.7	7.3	54.0
04	240 54.3	44.1	58 02.5	13.5	15 42.0	7.2	54.0
05	255 54.3	44.7	72 35.0	13.5	15 49.2	7.2	54.1
06	270 54.2	N19 45.2	87 07.5	13.5	S15 56.4	7.1	54.1
07	285 54.2	45.7	101 40.0	13.4	16 03.5	7.0	54.1
08	300 54.2	46.3	116 12.4	13.4	16 10.5	7.0	54.1
09	315 54.1	·· 46.8	130 44.8	13.3	16 17.5	6.9	54.1
10	330 54.1	47.4	145 17.1	13.3	16 24.4	6.8	54.1
11	345 54.1	47.9	159 49.4	13.3	16 31.2	6.7	54.1
12	0 54.1	N19 48.4	174 21.7	13.2	S16 37.9	6.7	54.1
13	15 54.0	49.0	188 53.9	13.2	16 44.6	6.6	54.1
14	30 54.0	49.5	203 26.1	13.1	16 51.2	6.6	54.1
15	45 54.0	·· 50.0	217 58.2	13.1	16 57.8	6.5	54.1
16	60 53.9	50.5	232 30.3	13.0	17 04.3	6.3	54.1
17	75 53.9	51.1	247 02.3	13.0	17 10.6	6.4	54.1
18	90 53.9	N19 51.6	261 34.3	13.0	S17 17.0	6.2	54.1
19	105 53.8	52.1	276 06.3	12.9	17 23.2	6.2	54.1
20	120 53.8	52.7	290 38.2	12.9	17 29.4	6.1	54.2
21	135 53.8	·· 53.2	305 10.1	12.8	17 35.5	6.0	54.2
22	150 53.8	53.7	319 41.9	12.8	17 41.5	5.9	54.2
23	165 53.7	54.2	334 13.7	12.8	17 47.4	5.9	54.2
20 00	180 53.7	N19 54.8	348 45.5	12.7	S17 53.3	5.8	54.2
01	195 53.7	55.3	3 17.2	12.6	17 59.1	5.7	54.2
02	210 53.6	55.8	17 48.8	12.7	18 04.8	5.6	54.2
03	225 53.6	·· 56.3	32 20.5	12.5	18 10.4	5.6	54.2
04	240 53.6	56.9	46 52.0	12.6	18 16.0	5.4	54.2
05	255 53.5	57.4	61 23.6	12.5	18 21.4	5.4	54.2
06	270 53.5	N19 57.9	75 55.1	12.4	S18 26.8	5.3	54.2
07	285 53.5	58.4	90 26.5	12.4	18 32.1	5.2	54.2
08	300 53.4	59.0	104 57.9	12.4	18 37.3	5.2	54.3
09	315 53.4	19 59.5	119 29.3	12.4	18 42.5	5.0	54.3
10	330 53.4	20 00.0	134 00.7	12.2	18 47.5	5.0	54.3
11	345 53.3	00.5	148 31.9	12.3	18 52.5	4.9	54.3
12	0 53.3	N20 01.0	163 03.2	12.2	S18 57.4	4.8	54.3
13	15 53.3	01.6	177 34.4	12.2	19 02.2	4.7	54.3
14	30 53.2	02.1	192 05.6	12.1	19 06.9	4.6	54.3
15	45 53.2	·· 02.6	206 36.7	12.1	19 11.5	4.5	54.3
16	60 53.2	03.1	221 07.8	12.1	19 16.0	4.5	54.3
17	75 53.1	03.6	235 38.9	12.0	19 20.5	4.4	54.3
18	90 53.1	N20 04.1	250 09.9	12.0	S19 24.9	4.2	54.4
19	105 53.0	04.7	264 40.9	11.9	19 29.1	4.2	54.4
20	120 53.0	05.2	279 11.8	11.9	19 33.3	4.1	54.4
21	135 53.0	·· 05.7	293 42.7	11.9	19 37.4	4.0	54.4
22	150 52.9	06.2	308 13.6	11.8	19 41.4	3.9	54.4
23	165 52.9	06.7	322 44.4	11.8	19 45.3	3.9	54.4
21 00	180 52.9	N20 07.2	337 15.2	11.7	S19 49.2	3.7	54.4
01	195 52.8	07.7	351 45.9	11.7	19 52.9	3.7	54.4
02	210 52.8	08.2	6 16.6	11.7	19 56.6	3.5	54.4
03	225 52.7	·· 08.8	20 47.3	11.6	20 00.1	3.5	54.5
04	240 52.7	09.3	35 17.9	11.6	20 03.6	3.3	54.5
05	255 52.7	09.8	49 48.5	11.6	20 06.9	3.3	54.5
06	270 52.6	N20 10.3	64 19.1	11.5	S20 10.2	3.2	54.5
07	285 52.6	10.8	78 49.6	11.5	20 13.4	3.1	54.5
08	300 52.5	11.3	93 20.1	11.5	20 16.5	2.9	54.5
09	315 52.5	·· 11.8	107 50.6	11.4	20 19.4	2.9	54.5
10	330 52.5	12.3	122 21.0	11.4	20 22.3	2.8	54.5
11	345 52.4	12.8	136 51.4	11.4	20 25.1	2.7	54.6
12	0 52.4	N20 13.3	151 21.8	11.3	S20 27.8	2.6	54.6
13	15 52.3	13.8	165 52.1	11.3	20 30.4	2.5	54.6
14	30 52.3	14.3	180 22.4	11.3	20 32.9	2.4	54.6
15	45 52.3	·· 14.8	194 52.7	11.2	20 35.3	2.4	54.6
16	60 52.2	15.3	209 22.9	11.3	20 37.7	2.2	54.6
17	75 52.2	15.8	223 53.2	11.1	20 39.9	2.1	54.6
18	90 52.1	N20 16.3	238 23.3	11.2	S20 42.0	2.0	54.7
19	105 52.1	16.8	252 53.5	11.1	20 44.0	1.9	54.7
20	120 52.1	17.3	267 23.6	11.1	20 45.9	1.8	54.7
21	135 52.0	·· 17.8	281 53.7	11.1	20 47.7	1.7	54.7
22	150 52.0	18.3	296 23.8	11.0	20 49.4	1.6	54.7
23	165 51.9	18.8	310 53.8	11.0	20 51.0	1.6	54.7
	S.D. 15.8	d 0.5	S.D. 14.7		14.8		14.9

TUESDAY

WEDNESDAY

THURSDAY

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
19	03 38	03 36	11 56	00 01	12 23	15	○
20	03 35	03 33	11 56	00 46	13 10	16	
21	03 31	03 30	11 57	01 34	13 58	17	

G.M.T.		ARIES	VENUS −3.4		MARS +1.6		JUPITER −1.8		SATURN +1.0	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
22	00	239 32.0	168 32.2	N22 36.6	192 12.1	N17 32.1	58 29.9	N 1 08.5	55 36.9	N 1 05.2
	01	254 34.5	183 31.4	37.1	207 12.8	32.6	73 32.5	08.5	70 39.5	05.2
	02	269 36.9	198 30.6	37.6	222 13.4	33.2	88 35.0	08.5	85 42.0	05.2
	03	284 39.4	213 29.7	·· 38.1	237 14.1	·· 33.7	103 37.5	·· 08.6	100 44.5	·· 05.2
	04	299 41.8	228 28.9	38.6	252 14.7	34.2	118 40.0	08.6	115 47.0	05.2
	05	314 44.3	243 28.1	39.1	267 15.3	34.7	133 42.5	08.6	130 49.5	05.2
	06	329 46.8	258 27.3	N22 39.6	282 16.0	N17 35.2	148 45.0	N 1 08.6	145 52.1	N 1 05.2
	07	344 49.2	273 26.5	40.1	297 16.6	35.7	163 47.5	08.6	160 54.6	05.3
	08	359 51.7	288 25.6	40.5	312 17.2	36.2	178 50.0	08.6	175 57.1	05.3
F	09	14 54.2	303 24.8	·· 41.0	327 17.9	·· 36.8	193 52.5	·· 08.6	190 59.6	·· 05.3
R	10	29 56.6	318 24.0	41.5	342 18.5	37.3	208 55.0	08.6	206 02.1	05.3
I	11	44 59.1	333 23.2	42.0	357 19.1	37.8	223 57.5	08.6	221 04.7	05.3
D	12	60 01.6	348 22.4	N22 42.5	12 19.8	N17 38.3	239 00.0	N 1 08.6	236 07.2	N 1 05.3
A	13	75 04.0	3 21.5	43.0	27 20.4	38.8	254 02.5	08.6	251 09.7	05.4
Y	14	90 06.5	18 20.7	43.5	42 21.0	39.3	269 05.0	08.6	266 12.2	05.4
	15	105 09.0	33 19.9	·· 43.9	57 21.7	·· 39.8	284 07.5	·· 08.6	281 14.7	·· 05.4
	16	120 11.4	48 19.1	44.4	72 22.3	40.3	299 10.0	08.6	296 17.3	05.4
	17	135 13.9	63 18.2	44.9	87 22.9	40.9	314 12.5	08.6	311 19.8	05.4
	18	150 16.3	78 17.4	N22 45.4	102 23.6	N17 41.4	329 15.0	N 1 08.7	326 22.3	N 1 05.4
	19	165 18.8	93 16.6	45.9	117 24.2	41.9	344 17.5	08.7	341 24.8	05.4
	20	180 21.3	108 15.8	46.3	132 24.8	42.4	359 20.0	08.7	356 27.3	05.5
	21	195 23.7	123 14.9	·· 46.8	147 25.5	·· 42.9	14 22.6	·· 08.7	11 29.9	·· 05.5
	22	210 26.2	138 14.1	47.3	162 26.1	43.4	29 25.1	08.7	26 32.4	05.5
	23	225 28.7	153 13.3	47.8	177 26.7	43.9	44 27.6	08.7	41 34.9	05.5
23	00	240 31.1	168 12.5	N22 48.2	192 27.4	N17 44.4	59 30.1	N 1 08.7	56 37.4	N 1 05.5
	01	255 33.6	183 11.6	48.7	207 28.0	44.9	74 32.6	08.7	71 39.9	05.5
	02	270 36.1	198 10.8	49.2	222 28.6	45.4	89 35.1	08.7	86 42.4	05.5
	03	285 38.5	213 10.0	·· 49.6	237 29.3	·· 46.0	104 37.6	·· 08.7	101 45.0	·· 05.5
	04	300 41.0	228 09.2	50.1	252 29.9	46.5	119 40.1	08.7	116 47.5	05.6
	05	315 43.4	243 08.3	50.6	267 30.5	47.0	134 42.6	08.7	131 50.0	05.6
	06	330 45.9	258 07.5	N22 51.0	282 31.2	N17 47.5	149 45.1	N 1 08.7	146 52.5	N 1 05.6
	07	345 48.4	273 06.7	51.5	297 31.8	48.0	164 47.6	08.7	161 55.0	05.6
S	08	0 50.8	288 05.8	52.0	312 32.4	48.5	179 50.1	08.7	176 57.6	05.6
A	09	15 53.3	303 05.0	·· 52.4	327 33.1	·· 49.0	194 52.6	·· 08.7	192 00.1	·· 05.6
T	10	30 55.8	318 04.2	52.9	342 33.7	49.5	209 55.1	08.7	207 02.6	05.6
U	11	45 58.2	333 03.4	53.3	357 34.3	50.0	224 57.5	08.7	222 05.1	05.7
R	12	61 00.7	348 02.5	N22 53.8	12 35.0	N17 50.5	240 00.0	N 1 08.7	237 07.6	N 1 05.7
D	13	76 03.2	3 01.7	54.2	27 35.6	51.0	255 02.5	08.7	252 10.1	05.7
A	14	91 05.6	18 00.9	54.7	42 36.2	51.5	270 05.0	08.7	267 12.6	05.7
Y	15	106 08.1	33 00.0	·· 55.2	57 36.8	·· 52.0	285 07.5	·· 08.7	282 15.2	·· 05.7
	16	121 10.6	47 59.2	55.6	72 37.5	52.5	300 10.0	08.7	297 17.7	05.7
	17	136 13.0	62 58.4	56.1	87 38.1	53.0	315 12.5	08.7	312 20.2	05.7
	18	151 15.5	77 57.5	N22 56.5	102 38.7	N17 53.5	330 15.0	N 1 08.8	327 22.7	N 1 05.7
	19	166 17.9	92 56.7	57.0	117 39.4	54.0	345 17.5	08.8	342 25.2	05.8
	20	181 20.4	107 55.9	57.4	132 40.0	54.6	0 20.0	08.8	357 27.7	05.8
	21	196 22.9	122 55.0	·· 57.9	147 40.6	·· 55.1	15 22.5	·· 08.8	12 30.3	·· 05.8
	22	211 25.3	137 54.2	58.3	162 41.3	55.6	30 25.0	08.8	27 32.8	05.8
	23	226 27.8	152 53.4	58.8	177 41.9	56.1	45 27.5	08.8	42 35.3	05.8
24	00	241 30.3	167 52.5	N22 59.2	192 42.5	N17 56.6	60 30.0	N 1 08.8	57 37.8	N 1 05.8
	01	256 32.7	182 51.7	22 59.6	207 43.2	57.1	75 32.5	08.8	72 40.3	05.8
	02	271 35.2	197 50.9	23 00.1	222 43.8	57.6	90 35.0	08.8	87 42.8	05.8
	03	286 37.7	212 50.0	·· 00.5	237 44.4	·· 58.1	105 37.5	·· 08.8	102 45.3	·· 05.9
	04	301 40.1	227 49.2	01.0	252 45.1	58.6	120 40.0	08.8	117 47.9	05.9
	05	316 42.6	242 48.4	01.4	267 45.7	59.1	135 42.5	08.8	132 50.4	05.9
	06	331 45.1	257 47.5	N23 01.8	282 46.3	N17 59.6	150 45.0	N 1 08.8	147 52.9	N 1 05.9
	07	346 47.5	272 46.7	02.3	297 46.9	18 00.1	165 47.4	08.8	162 55.4	05.9
	08	1 50.0	287 45.9	02.7	312 47.6	00.6	180 49.9	08.8	177 57.9	05.9
S	09	16 52.4	302 45.0	·· 03.1	327 48.2	·· 01.1	195 52.4	·· 08.8	193 00.4	·· 05.9
U	10	31 54.9	317 44.2	03.6	342 48.8	01.6	210 54.9	08.8	208 02.9	05.9
N	11	46 57.4	332 43.3	04.0	357 49.5	02.1	225 57.4	08.8	223 05.4	05.9
D	12	61 59.8	347 42.5	N23 04.4	12 50.1	N18 02.6	240 59.9	N 1 08.8	238 08.0	N 1 06.0
A	13	77 02.3	2 41.7	04.9	27 50.7	03.1	256 02.4	08.8	253 10.5	06.0
Y	14	92 04.8	17 40.8	05.3	42 51.4	03.6	271 04.9	08.8	268 13.0	06.0
	15	107 07.2	32 40.0	·· 05.7	57 52.0	·· 04.0	286 07.4	·· 08.8	283 15.5	·· 06.0
	16	122 09.7	47 39.1	06.1	72 52.6	04.5	301 09.9	08.8	298 18.0	06.0
	17	137 12.2	62 38.3	06.6	87 53.2	05.0	316 12.4	08.8	313 20.5	06.0
	18	152 14.6	77 37.5	N23 07.0	102 53.9	N18 05.5	331 14.8	N 1 08.8	328 23.0	N 1 06.0
	19	167 17.1	92 36.6	07.4	117 54.5	06.0	346 17.3	08.8	343 25.5	06.0
	20	182 19.5	107 35.8	07.8	132 55.1	06.5	1 19.8	08.8	358 28.1	06.0
	21	197 22.0	122 34.9	·· 08.3	147 55.8	·· 07.0	16 22.3	·· 08.8	13 30.6	·· 06.1
	22	212 24.5	137 34.1	08.7	162 56.4	07.5	31 24.8	08.8	28 33.1	06.1
	23	227 26.9	152 33.3	09.1	177 57.0	08.0	46 27.3	08.8	43 35.6	06.1
Mer. Pass.		h m 7 56.6	v −0.8	d 0.5	v 0.6	d 0.5	v 2.5	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.3	S40 22.8
Achernar	335 45.4	S57 19.8
Acrux	173 36.3	S62 59.9
Adhara	255 32.1	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.8	N56 03.9
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.4	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.0	N28 59.0
Altair	62 31.9	N 8 49.0
Ankaa	353 40.1	S42 24.4
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.2	S68 59.6
Avior	234 28.3	S59 27.3
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.5	S52 41.4
Capella	281 11.1	N45 58.7
Deneb	49 48.0	N45 12.5
Denebola	182 58.5	N14 40.7
Diphda	349 20.6	S18 05.4
Dubhe	194 21.5	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.0	N51 29.4
Enif	34 11.1	N 9 47.2
Fomalhaut	15 51.0	S29 43.2
Gacrux	172 27.9	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.1
Hamal	328 28.7	N23 22.2
Kaus Aust.	84 15.9	S34 23.6
Kochab	137 17.9	N74 14.1
Markab	14 02.8	N15 06.1
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.8
Miaplacidus	221 45.1	S69 38.7
Mirfak	309 16.0	N49 47.5
Nunki	76 28.3	S26 19.2
Peacock	53 57.4	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.9	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.8	N56 25.8
Shaula	96 54.8	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.9
Suhail	223 10.6	S43 21.7
Vega	80 55.2	N38 45.8
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	287 41.3	12 48
Mars	311 56.2	11 10
Jupiter	178 58.9	19 59
Saturn	176 06.3	20 10

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
22	00	180 51.9	N20 19.3	325 23.8	11.0	S20 52.6	1.4	54.8
	01	195 51.8	19.8	339 53.8	10.9	20 54.0	1.3	54.8
	02	210 51.8	20.3	354 23.7	11.0	20 55.3	1.2	54.8
	03	225 51.8	·· 20.8	8 53.7	10.9	20 56.5	1.1	54.8
	04	240 51.7	21.3	23 23.6	10.8	20 57.6	1.0	54.8
	05	255 51.7	21.8	37 53.4	10.9	20 58.6	0.9	54.8
	06	270 51.6	N20 22.3	52 23.3	10.8	S20 59.5	0.8	54.8
	07	285 51.6	22.8	66 53.1	10.8	21 00.3	0.7	54.9
	08	300 51.5	23.3	81 22.9	10.8	21 01.0	0.6	54.9
F	09	315 51.5	·· 23.8	95 52.7	10.8	21 01.6	0.5	54.9
R	10	330 51.4	24.3	110 22.5	10.7	21 02.1	0.4	54.9
I	11	345 51.4	24.8	124 52.2	10.8	21 02.5	0.3	54.9
D	12	0 51.3	N20 25.2	139 22.0	10.7	S21 02.8	0.1	55.0
A	13	15 51.3	25.7	153 51.7	10.7	21 02.9	0.1	55.0
Y	14	30 51.3	26.2	168 21.4	10.6	21 03.0	0.0	55.0
	15	45 51.2	·· 26.7	182 51.0	10.7	21 03.0	0.2	55.0
	16	60 51.2	27.2	197 20.7	10.6	21 02.8	0.2	55.0
	17	75 51.1	27.7	211 50.3	10.6	21 02.6	0.3	55.0
	18	90 51.1	N20 28.2	226 19.9	10.6	S21 02.3	0.5	55.1
	19	105 51.0	28.7	240 49.5	10.6	21 01.8	0.6	55.1
	20	120 51.0	29.1	255 19.1	10.5	21 01.2	0.6	55.1
	21	135 50.9	·· 29.6	269 48.6	10.6	21 00.6	0.8	55.1
	22	150 50.9	30.1	284 18.2	10.5	20 59.8	0.9	55.1
	23	165 50.8	30.6	298 47.7	10.5	20 58.9	0.9	55.2
23	00	180 50.8	N20 31.1	313 17.2	10.6	S20 58.0	1.1	55.2
	01	195 50.7	31.6	327 46.8	10.4	20 56.9	1.2	55.2
	02	210 50.7	32.0	342 16.2	10.5	20 55.7	1.3	55.2
	03	225 50.6	·· 32.5	356 45.7	10.5	20 54.4	1.4	55.2
	04	240 50.6	33.0	11 15.2	10.5	20 53.0	1.5	55.3
	05	255 50.5	33.5	25 44.7	10.4	20 51.5	1.6	55.3
	06	270 50.5	N20 34.0	40 14.1	10.5	S20 49.9	1.7	55.3
	07	285 50.4	34.4	54 43.6	10.4	20 48.2	1.9	55.3
S	08	300 50.4	34.9	69 13.0	10.4	20 46.3	1.9	55.3
A	09	315 50.3	·· 35.4	83 42.4	10.4	20 44.4	2.0	55.4
T	10	330 50.3	35.9	98 11.8	10.4	20 42.4	2.2	55.4
U	11	345 50.2	36.3	112 41.2	10.4	20 40.2	2.2	55.4
R	12	0 50.2	N20 36.8	127 10.6	10.4	S20 38.0	2.4	55.4
D	13	15 50.1	37.3	141 40.0	10.4	20 35.6	2.5	55.4
A	14	30 50.1	37.8	156 09.4	10.4	20 33.1	2.5	55.5
Y	15	45 50.0	·· 38.2	170 38.8	10.4	20 30.6	2.7	55.5
	16	60 50.0	38.7	185 08.2	10.3	20 27.9	2.8	55.5
	17	75 49.9	39.2	199 37.5	10.4	20 25.1	2.9	55.5
	18	90 49.9	N20 39.7	214 06.9	10.4	S20 22.2	3.0	55.6
	19	105 49.8	40.1	228 36.3	10.3	20 19.2	3.1	55.6
	20	120 49.8	40.6	243 05.6	10.4	20 16.1	3.2	55.6
	21	135 49.7	·· 41.1	257 35.0	10.3	20 12.9	3.3	55.6
	22	150 49.6	41.5	272 04.3	10.4	20 09.6	3.4	55.7
	23	165 49.6	42.0	286 33.7	10.3	20 06.2	3.5	55.7
24	00	180 49.5	N20 42.5	301 03.0	10.4	S20 02.7	3.7	55.7
	01	195 49.5	43.0	315 32.4	10.3	19 59.0	3.7	55.7
	02	210 49.4	43.4	330 01.7	10.4	19 55.3	3.8	55.7
	03	225 49.4	·· 43.9	344 31.1	10.3	19 51.5	4.0	55.8
	04	240 49.3	44.3	359 00.4	10.4	19 47.5	4.0	55.8
	05	255 49.3	44.8	13 29.8	10.4	19 43.5	4.2	55.8
	06	270 49.2	N20 45.3	27 59.2	10.3	S19 39.3	4.2	55.8
	07	285 49.2	45.7	42 28.5	10.4	19 35.1	4.4	55.9
	08	300 49.1	46.2	56 57.9	10.3	19 30.7	4.5	55.9
S	09	315 49.0	·· 46.7	71 27.2	10.4	19 26.2	4.5	55.9
U	10	330 49.0	47.1	85 56.6	10.4	19 21.7	4.7	55.9
N	11	345 48.9	47.6	100 26.0	10.3	19 17.0	4.8	56.0
D	12	0 48.9	N20 48.1	114 55.3	10.4	S19 12.2	4.9	56.0
A	13	15 48.8	48.5	129 24.7	10.4	19 07.3	4.9	56.0
Y	14	30 48.8	49.0	143 54.1	10.4	19 02.4	5.1	56.0
	15	45 48.7	·· 49.4	158 23.5	10.4	18 57.3	5.2	56.1
	16	60 48.6	49.9	172 52.9	10.4	18 52.1	5.3	56.1
	17	75 48.6	50.3	187 22.3	10.4	18 46.8	5.4	56.1
	18	90 48.5	N20 50.8	201 51.7	10.4	S18 41.4	5.5	56.2
	19	105 48.5	51.3	216 21.1	10.4	18 35.9	5.6	56.2
	20	120 48.4	51.7	230 50.5	10.4	18 30.3	5.7	56.2
	21	135 48.4	·· 52.2	245 19.9	10.4	18 24.6	5.8	56.2
	22	150 48.3	52.6	259 49.3	10.4	18 18.8	5.8	56.3
	23	165 48.2	53.1	274 18.7	10.5	18 13.0	6.0	56.3
		S.D. 15.8	d 0.5	S.D. 15.0		15.1		15.3

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
22	03 28	03 25	11 57	02 23	14 48	18	◑
23	03 23	03 21	11 57	03 13	15 39	19	
24	03 18	03 16	11 57	04 04	16 29	20	

GMT		ARIES	VENUS −3.4		MARS +1.6		JUPITER −1.8		SATURN +1.0	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
25	00	242 29.4	167 32.4	N23 09.5	192 57.7	N18 08.5	61 29.8	N 1 08.8	58 38.1	N 1 06.1
	01	257 31.9	182 31.6	09.9	207 58.3	09.0	76 32.3	08.8	73 40.6	06.1
	02	272 34.3	197 30.7	10.3	222 58.9	09.5	91 34.7	08.8	88 43.1	06.1
	03	287 36.8	212 29.9	·· 10.8	237 59.5	·· 10.0	106 37.2	·· 08.8	103 45.6	·· 06.1
	04	302 39.3	227 29.0	11.2	253 00.2	10.5	121 39.7	08.8	118 48.1	06.1
	05	317 41.7	242 28.2	11.6	268 00.8	11.0	136 42.2	08.8	133 50.6	06.1
	06	332 44.2	257 27.4	N23 12.0	283 01.4	N18 11.5	151 44.7	N 1 08.8	148 53.2	N 1 06.1
	07	347 46.7	272 26.5	12.4	298 02.1	12.0	166 47.2	08.8	163 55.7	06.2
	08	2 49.1	287 25.7	12.8	313 02.7	12.5	181 49.7	08.8	178 58.2	06.2
MONDAY	09	17 51.6	302 24.8	·· 13.2	328 03.3	·· 12.9	196 52.1	·· 08.8	194 00.7	·· 06.2
	10	32 54.0	317 24.0	13.6	343 03.9	13.4	211 54.6	08.8	209 03.2	06.2
	11	47 56.5	332 23.1	14.0	358 04.6	13.9	226 57.1	08.8	224 05.7	06.2
	12	62 59.0	347 22.3	N23 14.4	13 05.2	N18 14.4	241 59.6	N 1 08.8	239 08.2	N 1 06.2
	13	78 01.4	2 21.4	14.8	28 05.8	14.9	257 02.1	08.7	254 10.7	06.2
	14	93 03.9	17 20.6	15.2	43 06.5	15.4	272 04.6	08.7	269 13.2	06.2
	15	108 06.4	32 19.7	·· 15.6	58 07.1	·· 15.9	287 07.0	·· 08.7	284 15.7	·· 06.2
	16	123 08.8	47 18.9	16.0	73 07.7	16.4	302 09.5	08.7	299 18.2	06.2
	17	138 11.3	62 18.0	16.4	88 08.3	16.9	317 12.0	08.7	314 20.8	06.2
	18	153 13.8	77 17.2	N23 16.8	103 09.0	N18 17.4	332 14.5	N 1 08.7	329 23.3	N 1 06.3
	19	168 16.2	92 16.4	17.2	118 09.6	17.8	347 17.0	08.7	344 25.8	06.3
	20	183 18.7	107 15.5	17.6	133 10.2	18.3	2 19.5	08.7	359 28.3	06.3
	21	198 21.2	122 14.7	·· 18.0	148 10.8	·· 18.8	17 21.9	·· 08.7	14 30.8	·· 06.3
	22	213 23.6	137 13.8	18.4	163 11.5	19.3	32 24.4	08.7	29 33.3	06.3
	23	228 26.1	152 13.0	18.8	178 12.1	19.8	47 26.9	08.7	44 35.8	06.3
26	00	243 28.5	167 12.1	N23 19.2	193 12.7	N18 20.3	62 29.4	N 1 08.7	59 38.3	N 1 06.3
	01	258 31.0	182 11.3	19.5	208 13.4	20.8	77 31.9	08.7	74 40.8	06.3
	02	273 33.5	197 10.4	19.9	223 14.0	21.2	92 34.3	08.7	89 43.3	06.3
	03	288 35.9	212 09.6	·· 20.3	238 14.6	·· 21.7	107 36.8	·· 08.7	104 45.8	·· 06.3
	04	303 38.4	227 08.7	20.7	253 15.2	22.2	122 39.3	08.7	119 48.3	06.3
	05	318 40.9	242 07.9	21.1	268 15.9	22.7	137 41.8	08.7	134 50.8	06.4
	06	333 43.3	257 07.0	N23 21.5	283 16.5	N18 23.2	152 44.3	N 1 08.7	149 53.3	N 1 06.4
	07	348 45.8	272 06.2	21.9	298 17.1	23.7	167 46.7	08.7	164 55.8	06.4
	08	3 48.3	287 05.3	22.2	313 17.7	24.2	182 49.2	08.7	179 58.4	06.4
TUESDAY	09	18 50.7	302 04.4	·· 22.6	328 18.4	·· 24.6	197 51.7	·· 08.7	195 00.9	·· 06.4
	10	33 53.2	317 03.6	23.0	343 19.0	25.1	212 54.2	08.7	210 03.4	06.4
	11	48 55.6	332 02.7	23.4	358 19.6	25.6	227 56.6	08.7	225 05.9	06.4
	12	63 58.1	347 01.9	N23 23.7	13 20.2	N18 26.1	242 59.1	N 1 08.7	240 08.4	N 1 06.4
	13	79 00.6	2 01.0	24.1	28 20.9	26.6	258 01.6	08.6	255 10.9	06.4
	14	94 03.0	17 00.2	24.5	43 21.5	27.1	273 04.1	08.6	270 13.4	06.4
	15	109 05.5	31 59.3	·· 24.9	58 22.1	·· 27.5	288 06.6	·· 08.6	285 15.9	·· 06.4
	16	124 08.0	46 58.5	25.2	73 22.8	28.0	303 09.0	08.6	300 18.4	06.4
	17	139 10.4	61 57.6	25.6	88 23.4	28.5	318 11.5	08.6	315 20.9	06.4
	18	154 12.9	76 56.8	N23 26.0	103 24.0	N18 29.0	333 14.0	N 1 08.6	330 23.4	N 1 06.5
	19	169 15.4	91 55.9	26.3	118 24.6	29.5	348 16.5	08.6	345 25.9	06.5
	20	184 17.8	106 55.1	26.7	133 25.3	29.9	3 18.9	08.6	0 28.4	06.5
	21	199 20.3	121 54.2	·· 27.1	148 25.9	·· 30.4	18 21.4	·· 08.6	15 30.9	·· 06.5
	22	214 22.8	136 53.3	27.4	163 26.5	30.9	33 23.9	08.6	30 33.4	06.5
	23	229 25.2	151 52.5	27.8	178 27.1	31.4	48 26.3	08.6	45 35.9	06.5
27	00	244 27.7	166 51.6	N23 28.1	193 27.8	N18 31.9	63 28.8	N 1 08.6	60 38.4	N 1 06.5
	01	259 30.1	181 50.8	28.5	208 28.4	32.3	78 31.3	08.6	75 40.9	06.5
	02	274 32.6	196 49.9	28.9	223 29.0	32.8	93 33.8	08.6	90 43.4	06.5
	03	289 35.1	211 49.1	·· 29.2	238 29.6	·· 33.3	108 36.2	·· 08.6	105 45.9	·· 06.5
	04	304 37.5	226 48.2	29.6	253 30.3	33.8	123 38.7	08.5	120 48.4	06.5
	05	319 40.0	241 47.3	29.9	268 30.9	34.3	138 41.2	08.5	135 50.9	06.5
	06	334 42.5	256 46.5	N23 30.3	283 31.5	N18 34.7	153 43.7	N 1 08.5	150 53.4	N 1 06.5
	07	349 44.9	271 45.6	30.6	298 32.1	35.2	168 46.1	08.5	165 55.9	06.5
	08	4 47.4	286 44.8	31.0	313 32.8	35.7	183 48.6	08.5	180 58.4	06.5
WEDNESDAY	09	19 49.9	301 43.9	·· 31.3	328 33.4	·· 36.2	198 51.1	·· 08.5	196 00.9	·· 06.6
	10	34 52.3	316 43.0	31.7	343 34.0	36.6	213 53.5	08.5	211 03.4	06.6
	11	49 54.8	331 42.2	32.0	358 34.6	37.1	228 56.0	08.5	226 05.9	06.6
	12	64 57.3	346 41.3	N23 32.4	13 35.3	N18 37.6	243 58.5	N 1 08.5	241 08.4	N 1 06.6
	13	79 59.7	1 40.5	32.7	28 35.9	38.1	259 01.0	08.5	256 10.9	06.6
	14	95 02.2	16 39.6	33.1	43 36.5	38.5	274 03.4	08.5	271 13.4	06.6
	15	110 04.6	31 38.7	·· 33.4	58 37.1	·· 39.0	289 05.9	·· 08.4	286 15.9	·· 06.6
	16	125 07.1	46 37.9	33.7	73 37.8	39.5	304 08.4	08.4	301 18.4	06.6
	17	140 09.6	61 37.0	34.1	88 38.4	40.0	319 10.8	08.4	316 20.9	06.6
	18	155 12.0	76 36.2	N23 34.4	103 39.0	N18 40.4	334 13.3	N 1 08.4	331 23.4	N 1 06.6
	19	170 14.5	91 35.3	34.8	118 39.6	40.9	349 15.8	08.4	346 25.9	06.6
	20	185 17.0	106 34.4	35.1	133 40.2	41.4	4 18.2	08.4	1 28.4	06.6
	21	200 19.4	121 33.6	·· 35.4	148 40.9	·· 41.8	19 20.7	·· 08.4	16 30.9	·· 06.6
	22	215 21.9	136 32.7	35.[illegible]	163 41.5	42.3	34 23.2	08.4	31 33.4	06.6
	23	230 24.4	151 31.9	36.1	178 42.1	42.8	49 25.6	08.4	46 35.9	06.6
Mer. Pass		h m 7 44.8	v −0.9	d 0.4	v 0.6	d 0.5	v 2.5	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 22.8
Achernar	335 45.4	S57 19.8
Acrux	173 36.3	S62 59.9
Adhara	255 32.1	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.8	N56 03.9
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.3	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.0	N28 59.0
Altair	62 31.9	N 8 49.0
Ankaa	353 40.0	S42 24.4
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.2	S68 59.6
Avior	234 28.3	S59 27.3
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.5	S52 41.4
Capella	281 11.1	N45 58.7
Deneb	49 47.9	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.6	S18 05.4
Dubhe	194 21.5	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.0	N51 29.4
Enif	34 11.1	N 9 47.2
Fomalhaut	15 51.0	S29 43.2
Gacrux	172 27.9	S57 00.7
Gienah	176 17.3	S17 26.4
Hadar	149 22.1	S60 17.1
Hamal	328 28.7	N23 22.2
Kaus Aust.	84 15.9	S34 23.6
Kochab	137 17.9	N74 14.1
Markab	14 02.8	N15 06.1
Menkar	314 41.0	N 4 00.8
Menkent	148 36.1	S36 16.8
Miaplacidus	221 45.1	S69 38.7
Mirfak	309 15.9	N49 47.5
Nunki	76 28.3	S26 19.2
Peacock	53 57.4	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.5	N 5 16.3
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.8	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.9
Suhail	223 10.6	S43 21.7
Vega	80 55.2	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	283 43.6	12 52
Mars	309 44.2	11 07
Jupiter	179 00.8	19 47
Saturn	176 09.8	19 58

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
25	00	180 48.2	N20 53.5	288 48.2	10.4	S18 07.0	6.1	56.3
	01	195 48.1	54.0	303 17.6	10.5	18 00.9	6.2	56.3
	02	210 48.1	54.4	317 47.1	10.4	17 54.7	6.3	56.4
	03	225 48.0	·· 54.9	332 16.5	10.5	17 48.4	6.4	56.4
	04	240 47.9	55.3	346 46.0	10.5	17 42.0	6.5	56.4
	05	255 47.9	55.8	1 15.5	10.5	17 35.5	6.6	56.5
	06	270 47.8	N20 56.2	15 45.0	10.4	S17 28.9	6.6	56.5
	07	285 47.7	56.7	30 14.4	10.5	17 22.3	6.8	56.5
	08	300 47.7	57.1	44 43.9	10.5	17 15.5	6.9	56.5
MONDAY	09	315 47.6	·· 57.6	59 13.4	10.6	17 08.6	6.9	56.6
	10	330 47.6	58.0	73 43.0	10.5	17 01.7	7.1	56.6
	11	345 47.5	58.5	88 12.5	10.5	16 54.6	7.2	56.6
	12	0 47.4	N20 58.9	102 42.0	10.5	S16 47.4	7.2	56.7
	13	15 47.4	59.4	117 11.5	10.6	16 40.2	7.4	56.7
	14	30 47.3	20 59.8	131 41.1	10.6	16 32.8	7.4	56.7
	15	45 47.3	21 00.3	146 10.7	10.5	16 25.4	7.5	56.8
	16	60 47.2	00.7	160 40.2	10.6	16 17.9	7.6	56.8
	17	75 47.1	01.1	175 09.8	10.6	16 10.3	7.8	56.8
	18	90 47.1	N21 01.6	189 39.4	10.6	S16 02.5	7.8	56.8
	19	105 47.0	02.0	204 09.0	10.6	15 54.7	7.9	56.9
	20	120 46.9	02.5	218 38.6	10.6	15 46.8	8.0	56.9
	21	135 46.9	·· 02.9	233 08.2	10.6	15 38.8	8.0	56.9
	22	150 46.8	03.3	247 37.8	10.6	15 30.8	8.2	57.0
	23	165 46.7	03.8	262 07.4	10.6	15 22.6	8.3	57.0
26	00	180 46.7	N21 04.2	276 37.0	10.7	S15 14.3	8.3	57.0
	01	195 46.6	04.7	291 06.7	10.6	15 06.0	8.4	57.1
	02	210 46.5	05.1	305 36.3	10.7	14 57.6	8.6	57.1
	03	225 46.5	·· 05.5	320 06.0	10.6	14 49.0	8.6	57.1
	04	240 46.4	06.0	334 35.6	10.7	14 40.4	8.7	57.2
	05	255 46.3	06.4	349 05.3	10.7	14 31.7	8.7	57.2
	06	270 46.3	N21 06.8	3 35.0	10.6	S14 23.0	8.9	57.2
	07	285 46.2	07.3	18 04.6	10.7	14 14.1	9.0	57.3
	08	300 46.1	07.7	32 34.3	10.7	14 05.1	9.0	57.3
TUESDAY	09	315 46.1	·· 08.1	47 04.0	10.7	13 56.1	9.1	57.3
	10	330 46.0	08.6	61 33.7	10.7	13 47.0	9.2	57.4
	11	345 45.9	09.0	76 03.4	10.7	13 37.8	9.3	57.4
	12	0 45.9	N21 09.4	90 33.1	10.7	S13 28.5	9.3	57.4
	13	15 45.8	09.9	105 02.8	10.8	13 19.2	9.5	57.5
	14	30 45.7	10.3	119 32.6	10.7	13 09.7	9.5	57.5
	15	45 45.7	·· 10.7	134 02.3	10.7	13 00.2	9.6	57.5
	16	60 45.6	11.1	148 32.0	10.8	12 50.6	9.7	57.6
	17	75 45.5	11.6	163 01.8	10.7	12 40.9	9.7	57.6
	18	90 45.5	N21 12.0	177 31.5	10.7	S12 31.2	9.9	57.6
	19	105 45.4	12.4	192 01.2	10.8	12 21.3	9.9	57.7
	20	120 45.3	12.9	206 31.0	10.7	12 11.4	10.0	57.7
	21	135 45.3	·· 13.3	221 00.7	10.8	12 01.4	10.0	57.7
	22	150 45.2	13.7	235 30.5	10.7	11 51.4	10.2	57.8
	23	165 45.1	14.1	250 00.2	10.8	11 41.2	10.2	57.8
27	00	180 45.1	N21 14.5	264 30.0	10.7	S11 31.0	10.3	57.8
	01	195 45.0	15.0	278 59.7	10.8	11 20.7	10.3	57.9
	02	210 44.9	15.4	293 29.5	10.7	11 10.4	10.5	57.9
	03	225 44.8	·· 15.8	307 59.2	10.8	10 59.9	10.5	57.9
	04	240 44.8	16.2	322 29.0	10.7	10 49.4	10.5	58.0
	05	255 44.7	16.7	336 58.7	10.8	10 38.9	10.7	58.0
	06	270 44.6	N21 17.1	351 28.5	10.7	S10 28.2	10.7	58.0
	07	285 44.6	17.5	5 58.2	10.8	10 17.5	10.8	58.1
	08	300 44.5	17.9	20 28.0	10.7	10 06.7	10.8	58.1
WEDNESDAY	09	315 44.4	·· 18.3	34 57.7	10.8	9 55.9	10.9	58.1
	10	330 44.3	18.7	49 27.5	10.7	9 45.0	11.0	58.2
	11	345 44.3	19.2	63 57.2	10.7	9 34.0	11.0	58.2
	12	0 44.2	N21 19.6	78 26.9	10.8	S 9 23.0	11.1	58.2
	13	15 44.1	20.0	92 56.7	10.7	9 11.9	11.2	58.3
	14	30 44.0	20.4	107 26.4	10.7	9 00.7	11.2	58.3
	15	45 44.0	·· 20.8	121 56.1	10.7	8 49.5	11.3	58.3
	16	60 43.9	21.2	136 25.8	10.7	8 38.2	11.3	58.4
	17	75 43.8	21.6	150 55.5	10.7	8 26.9	11.4	58.4
	18	90 43.8	N21 22.1	165 25.2	10.7	S 8 15.5	11.5	58.5
	19	105 43.7	22.5	179 54.9	10.7	8 04.0	11.5	58.5
	20	120 43.6	22.9	194 24.6	10.6	7 52.5	11.6	58.5
	21	135 43.5	·· 23.3	208 54.2	10.7	7 40.9	11.6	58.6
	22	150 43.5	23.7	223 23.9	10.7	7 29.3	11.7	58.6
	23	165 43.4	24.1	237 53.6	10.6	7 17.6	11.8	58.6
		S.D. 15.8	d 0.4	S.D. 15.4		15.6		15.9

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
25	03 13	03 10	11 57	04 55	17 20	21	◑
26	03 07	03 04	11 57	05 45	18 10	22	
27	03 00	02 57	11 57	06 35	19 00	23	

G.M.T.		ARIES	VENUS −3.4		MARS +1.6		JUPITER −1.8		SATURN +1.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
28	00	245 26.8	166 31.0	N23 36.4	193 42.7	N18 43.3	64 28.1	N 1 08.4	61 38.4	N 1 06.6
	01	260 29.3	181 30.1	36.8	208 43.4	43.7	79 30.6	08.4	76 40.9	06.6
	02	275 31.7	196 29.3	37.1	223 44.0	44.2	94 33.0	08.3	91 43.4	06.7
	03	290 34.2	211 28.4	·· 37.4	238 44.6	·· 44.7	109 35.5	·· 08.3	106 45.9	·· 06.7
	04	305 36.7	226 27.5	37.8	253 45.2	45.1	124 38.0	08.3	121 48.4	06.7
	05	320 39.1	241 26.7	38.1	268 45.9	45.6	139 40.4	08.3	136 50.9	06.7
	06	335 41.6	256 25.8	N23 38.4	283 46.5	N18 46.1	154 42.9	N 1 08.3	151 53.4	N 1 06.7
	07	350 44.1	271 24.9	38.7	298 47.1	46.6	169 45.4	08.3	166 55.9	06.7
T	08	5 46.5	286 24.1	39.1	313 47.7	47.0	184 47.8	08.3	181 58.4	06.7
H	09	20 49.0	301 23.2	·· 39.4	328 48.3	·· 47.5	199 50.3	·· 08.3	197 00.9	·· 06.7
U	10	35 51.5	316 22.3	39.7	343 49.0	48.0	214 52.7	08.3	212 03.4	06.7
R	11	50 53.9	331 21.5	40.0	358 49.6	48.4	229 55.2	08.2	227 05.9	06.7
S	12	65 56.4	346 20.6	N23 40.3	13 50.2	N18 48.9	244 57.7	N 1 08.2	242 08.4	N 1 06.7
D	13	80 58.9	1 19.7	40.6	28 50.8	49.4	260 00.1	08.2	257 10.9	06.7
A	14	96 01.3	16 18.9	41.0	43 51.5	49.8	275 02.6	08.2	272 13.4	06.7
Y	15	111 03.8	31 18.0	·· 41.3	58 52.1	·· 50.3	290 05.1	·· 08.2	287 15.9	·· 06.7
	16	126 06.2	46 17.1	41.6	73 52.7	50.8	305 07.5	08.2	302 18.4	06.7
	17	141 08.7	61 16.3	41.9	88 53.3	51.2	320 10.0	08.2	317 20.9	06.7
	18	156 11.2	76 15.4	N23 42.2	103 54.0	N18 51.7	335 12.4	N 1 08.2	332 23.4	N 1 06.7
	19	171 13.6	91 14.5	42.5	118 54.6	52.2	350 14.9	08.1	347 25.9	06.7
	20	186 16.1	106 13.7	42.8	133 55.2	52.6	5 17.4	08.1	2 28.4	06.7
	21	201 18.6	121 12.8	·· 43.1	148 55.8	·· 53.1	20 19.8	·· 08.1	17 30.9	·· 06.7
	22	216 21.0	136 11.9	43.4	163 56.4	53.6	35 22.3	08.1	32 33.4	06.7
	23	231 23.5	151 11.1	43.8	178 57.1	54.0	50 24.7	08.1	47 35.9	06.7
29	00	246 26.0	166 10.2	N23 44.1	193 57.7	N18 54.5	65 27.2	N 1 08.1	62 38.4	N 1 06.7
	01	261 28.4	181 09.3	44.4	208 58.3	54.9	80 29.7	08.1	77 40.9	06.7
	02	276 30.9	196 08.5	44.7	223 58.9	55.4	95 32.1	08.1	92 43.4	06.8
	03	291 33.4	211 07.6	·· 45.0	238 59.5	·· 55.9	110 34.6	·· 08.0	107 45.9	·· 06.8
	04	306 35.8	226 06.7	45.3	254 00.2	56.3	125 37.0	08.0	122 48.4	06.8
	05	321 38.3	241 05.9	45.6	269 00.8	56.8	140 39.5	08.0	137 50.9	06.8
	06	336 40.7	256 05.0	N23 45.9	284 01.4	N18 57.3	155 42.0	N 1 08.0	152 53.3	N 1 06.8
	07	351 43.2	271 04.1	46.1	299 02.0	57.7	170 44.4	08.0	167 55.8	06.8
	08	6 45.7	286 03.2	46.4	314 02.7	58.2	185 46.9	08.0	182 58.3	06.8
F	09	21 48.1	301 02.4	·· 46.7	329 03.3	·· 58.6	200 49.3	·· 08.0	198 00.8	·· 06.8
R	10	36 50.6	316 01.5	47.0	344 03.9	59.1	215 51.8	07.9	213 03.3	06.8
I	11	51 53.1	331 00.6	47.3	359 04.5	18 59.6	230 54.2	07.9	228 05.8	06.8
D	12	66 55.5	345 59.8	N23 47.6	14 05.1	N19 00.0	245 56.7	N 1 07.9	243 08.3	N 1 06.8
A	13	81 58.0	0 58.9	47.9	29 05.8	00.5	260 59.2	07.9	258 10.8	06.8
Y	14	97 00.5	15 58.0	48.2	44 06.4	00.9	276 01.6	07.9	273 13.3	06.8
	15	112 02.9	30 57.1	·· 48.5	59 07.0	·· 01.4	291 04.1	·· 07.9	288 15.8	·· 06.8
	16	127 05.4	45 56.3	48.7	74 07.6	01.9	306 06.5	07.9	303 18.3	06.8
	17	142 07.8	60 55.4	49.0	89 08.2	02.3	321 09.0	07.8	318 20.8	06.8
	18	157 10.3	75 54.5	N23 49.3	104 08.9	N19 02.8	336 11.4	N 1 07.8	333 23.3	N 1 06.8
	19	172 12.8	90 53.7	49.6	119 09.5	03.2	351 13.9	07.8	348 25.8	06.8
	20	187 15.2	105 52.8	49.9	134 10.1	03.7	6 16.3	07.8	3 28.3	06.8
	21	202 17.7	120 51.9	·· 50.2	149 10.7	·· 04.1	21 18.8	·· 07.8	18 30.7	·· 06.8
	22	217 20.2	135 51.0	50.4	164 11.3	04.6	36 21.2	07.8	33 33.2	06.8
	23	232 22.6	150 50.2	50.7	179 12.0	05.1	51 23.7	07.7	48 35.7	06.8
30	00	247 25.1	165 49.3	N23 51.0	194 12.6	N19 05.5	66 26.2	N 1 07.7	63 38.2	N 1 06.8
	01	262 27.6	180 48.4	51.3	209 13.2	06.0	81 28.6	07.7	78 40.7	06.8
	02	277 30.0	195 47.5	51.5	224 13.8	06.4	96 31.1	07.7	93 43.2	06.8
	03	292 32.5	210 46.7	·· 51.8	239 14.4	·· 06.9	111 33.5	·· 07.7	108 45.7	·· 06.8
	04	307 35.0	225 45.8	52.1	254 15.1	07.3	126 36.0	07.7	123 48.2	06.8
	05	322 37.4	240 44.9	52.3	269 15.7	07.8	141 38.4	07.6	138 50.7	06.8
	06	337 39.9	255 44.0	N23 52.6	284 16.3	N19 08.2	156 40.9	N 1 07.6	153 53.2	N 1 06.8
	07	352 42.3	270 43.2	52.9	299 16.9	08.7	171 43.3	07.6	168 55.7	06.8
S	08	7 44.8	285 42.3	53.1	314 17.5	09.1	186 45.8	07.6	183 58.1	06.8
A	09	22 47.3	300 41.4	·· 53.4	329 18.2	·· 09.6	201 48.2	·· 07.6	199 00.6	·· 06.8
T	10	37 49.7	315 40.5	53.7	344 18.8	10.0	216 50.7	07.6	214 03.1	06.8
U	11	52 52.2	330 39.7	53.9	359 19.4	10.5	231 53.1	07.5	229 05.6	06.8
R	12	67 54.7	345 38.8	N23 54.2	14 20.0	N19 10.9	246 55.6	N 1 07.5	244 08.1	N 1 06.8
D	13	82 57.1	0 37.9	54.4	29 20.6	11.4	261 58.0	07.5	259 10.6	06.8
A	14	97 59.6	15 37.0	54.7	44 21.2	11.9	277 00.5	07.5	274 13.1	06.8
Y	15	113 02.1	30 36.1	·· 55.0	59 21.9	·· 12.3	292 02.9	·· 07.5	289 15.6	·· 06.8
	16	128 04.5	45 35.3	55.2	74 22.5	12.8	307 05.4	07.4	304 18.1	06.8
	17	143 07.0	60 34.4	55.5	89 23.1	13.2	322 07.8	07.4	319 20.5	06.8
	18	158 09.5	75 33.5	N23 55.7	104 23.7	N19 13.7	337 10.3	N 1 07.4	334 23.0	N 1 06.8
	19	173 11.9	90 32.6	56.0	119 24.3	14.1	352 12.7	07.4	349 25.5	06.8
	20	188 14.4	105 31.8	56.2	134 25.0	14.6	7 15.1	07.4	4 28.0	06.8
	21	203 16.8	120 30.9	·· 56.5	149 25.6	·· 15.0	22 17.6	·· 07.4	19 30.5	·· 06.8
	22	218 19.3	135 30.0	56.7	164 26.2	15.4	37 20.0	07.3	34 33.0	06.8
	23	233 21.8	150 29.1	57.0	179 26.8	15.9	52 22.5	07.3	49 35.5	06.8
Mer Pass.		h m 7 33.0	v −0.9	d 0.3	v 0.6	d 0.5	v 2.5	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 22.8
Achernar	335 45.4	S57 19.8
Acrux	173 36.4	S63 00.0
Adhara	255 32.1	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.8	N56 04.0
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.3	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.0	N28 59.0
Altair	62 31.9	N 8 49.1
Ankaa	353 40.0	S42 24.4
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.2	S68 59.6
Avior	234 28.4	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.5	S52 41.3
Capella	281 11.1	N45 58.7
Deneb	49 47.9	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.6	S18 05.4
Dubhe	194 21.5	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.0	N51 29.4
Enif	34 11.1	N 9 47.2
Fomalhaut	15 50.9	S29 43.2
Gacrux	172 27.9	S57 00.7
Gienah	176 17.4	S17 26.4
Hadar	149 22.2	S60 17.1
Hamal	328 28.7	N23 22.2
Kaus Aust.	84 15.9	S34 23.6
Kochab	137 17.9	N74 14.2
Markab	14 02.8	N15 06.1
Menkar	314 41.0	N 4 00.9
Menkent	148 36.1	S36 16.8
Miaplacidus	221 45.2	S69 38.7
Mirfak	309 15.9	N49 47.5
Nunki	76 28.3	S26 19.2
Peacock	53 57.3	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.6	N 5 16.3
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Schedar	350 08.8	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.8
Suhail	223 10.6	S43 21.7
Vega	80 55.2	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	279 44.2	12 56
Mars	307 31.7	11 04
Jupiter	179 01.2	19 35
Saturn	176 12.4	19 46

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
28 00	180 43.3	N21 24.5	252 23.2	10.6	S 7 05.8	11.8	58.7
01	195 43.2	24.9	266 52.8	10.6	6 54.0	11.8	58.7
02	210 43.2	25.3	281 22.4	10.6	6 42.2	11.9	58.7
03	225 43.1	·· 25.7	295 52.0	10.6	6 30.3	12.0	58.8
04	240 43.0	26.1	310 21.6	10.6	6 18.3	12.0	58.8
05	255 42.9	26.5	324 51.2	10.5	6 06.3	12.0	58.8
06	270 42.8	N21 26.9	339 20.7	10.6	S 5 54.3	12.1	58.9
07	285 42.8	27.3	353 50.3	10.5	5 42.2	12.1	58.9
T 08	300 42.7	27.7	8 19.8	10.5	5 30.1	12.2	58.9
H 09	315 42.6	·· 28.1	22 49.3	10.5	5 17.9	12.3	59.0
U 10	330 42.5	28.5	37 18.8	10.4	5 05.6	12.2	59.0
R 11	345 42.5	28.9	51 48.2	10.5	4 53.4	12.3	59.0
S 12	0 42.4	N21 29.3	66 17.7	10.4	S 4 41.1	12.4	59.1
D 13	15 42.3	29.7	80 47.1	10.4	4 28.7	12.4	59.1
A 14	30 42.2	30.1	95 16.5	10.4	4 16.3	12.4	59.1
Y 15	45 42.1	·· 30.5	109 45.9	10.3	4 03.9	12.5	59.2
16	60 42.1	30.9	124 15.2	10.4	3 51.4	12.5	59.2
17	75 42.0	31.3	138 44.6	10.3	3 38.9	12.5	59.2
18	90 41.9	N21 31.7	153 13.9	10.3	S 3 26.4	12.6	59.3
19	105 41.8	32.1	167 43.2	10.2	3 13.8	12.6	59.3
20	120 41.8	32.5	182 12.4	10.3	3 01.2	12.7	59.3
21	135 41.7	·· 32.9	196 41.7	10.2	2 48.5	12.6	59.4
22	150 41.6	33.3	211 10.9	10.2	2 35.9	12.7	59.4
23	165 41.5	33.7	225 40.1	10.1	2 23.2	12.8	59.4
29 00	180 41.4	N21 34.1	240 09.2	10.1	S 2 10.4	12.7	59.5
01	195 41.4	34.5	254 38.3	10.1	1 57.7	12.8	59.5
02	210 41.3	34.9	269 07.4	10.1	1 44.9	12.8	59.5
03	225 41.2	·· 35.3	283 36.5	10.0	1 32.1	12.9	59.6
04	240 41.1	35.7	298 05.5	10.0	1 19.2	12.8	59.6
05	255 41.0	36.0	312 34.5	10.0	1 06.4	12.9	59.6
06	270 40.9	N21 36.4	327 03.5	9.9	S 0 53.5	12.9	59.7
07	285 40.9	36.8	341 32.4	9.9	0 40.6	12.9	59.7
08	300 40.8	37.2	356 01.3	9.8	0 27.7	12.9	59.7
F 09	315 40.7	·· 37.6	10 30.1	9.9	0 14.8	13.0	59.8
R 10	330 40.6	38.0	24 59.0	9.7	S 0 01.8	12.9	59.8
I 11	345 40.5	38.4	39 27.7	9.8	N 0 11.1	13.0	59.8
D 12	0 40.5	N21 38.8	53 56.5	9.7	N 0 24.1	13.0	59.9
A 13	15 40.4	39.1	68 25.2	9.7	0 37.1	13.0	59.9
Y 14	30 40.3	39.5	82 53.9	9.6	0 50.1	13.0	59.9
15	45 40.2	·· 39.9	97 22.5	9.6	1 03.1	13.0	60.0
16	60 40.1	40.3	111 51.1	9.5	1 16.1	13.1	60.0
17	75 40.0	40.7	126 19.6	9.5	1 29.2	13.0	60.0
18	90 40.0	N21 41.0	140 48.1	9.5	N 1 42.2	13.0	60.0
19	105 39.9	41.4	155 16.6	9.4	1 55.2	13.1	60.1
20	120 39.8	41.8	169 45.0	9.4	2 08.3	13.0	60.1
21	135 39.7	·· 42.2	184 13.4	9.3	2 21.3	13.0	60.1
22	150 39.6	42.6	198 41.7	9.3	2 34.3	13.1	60.2
23	165 39.5	42.9	213 10.0	9.2	2 47.4	13.0	60.2
30 00	180 39.4	N21 43.3	227 38.2	9.2	N 3 00.4	13.0	60.2
01	195 39.4	43.7	242 06.4	9.1	3 13.4	13.0	60.2
02	210 39.3	44.1	256 34.5	9.1	3 26.4	13.0	60.3
03	225 39.2	·· 44.4	271 02.6	9.1	3 39.4	13.0	60.3
04	240 39.1	44.8	285 30.7	9.0	3 52.4	13.0	60.3
05	255 39.0	45.2	299 58.7	8.9	4 05.4	13.0	60.4
06	270 38.9	N21 45.6	314 26.6	8.9	N 4 18.4	13.0	60.4
07	285 38.8	45.9	328 54.5	8.8	4 31.4	12.9	60.4
S 08	300 38.8	46.3	343 22.3	8.8	4 44.3	13.0	60.4
A 09	315 38.7	·· 46.7	357 50.1	8.7	4 57.3	12.9	60.5
T 10	330 38.6	47.0	12 17.8	8.7	5 10.2	12.9	60.5
U 11	345 38.5	47.4	26 45.5	8.6	5 23.1	12.8	60.5
R 12	0 38.4	N21 47.8	41 13.1	8.6	N 5 35.9	12.9	60.5
D 13	15 38.3	48.1	55 40.7	8.5	5 48.8	12.8	60.6
A 14	30 38.2	48.5	70 08.2	8.4	6 01.6	12.8	60.6
Y 15	45 38.2	·· 48.9	84 35.6	8.4	6 14.4	12.8	60.6
16	60 38.1	49.2	99 03.0	8.4	6 27.2	12.7	60.6
17	75 38.0	49.6	113 30.4	8.2	6 39.9	12.8	60.6
18	90 37.9	N21 50.0	127 57.6	8.3	N 6 52.7	12.6	60.7
19	105 37.8	50.3	142 24.9	8.1	7 05.3	12.7	60.7
20	120 37.7	50.7	156 52.0	8.1	7 18.0	12.6	60.7
21	135 37.6	·· 51.1	171 19.1	8.1	7 30.6	12.6	60.7
22	150 37.5	51.4	185 46.2	7.9	7 43.2	12.5	60.7
23	165 37.4	51.8	200 13.1	8.0	7 55.7	12.5	60.8
	S.D. 15.8	d 0.4	S.D. 16.1		16.3		16.5

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
28	02 53	02 50	11 57	07 26	19 51	24	
29	02 46	02 42	11 57	08 16	20 42	25	◐
30	02 38	02 34	11 57	09 09	21 36	26	

G.M.T.		ARIES	VENUS −3.3		MARS +1.6		JUPITER −1.7		SATURN +1.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
31	00	248 24.2	165 28.2	N23 57.2	194 27.4	N19 16.3	67 24.9	N 1 07.3	64 38.0	N 1 06.8
	01	263 26.7	180 27.4	57.5	209 28.1	16.8	82 27.4	07.3	79 40.5	06.8
	02	278 29.2	195 26.5	57.7	224 28.7	17.2	97 29.8	07.3	94 42.9	06.8
	03	293 31.6	210 25.6	·· 57.9	239 29.3	·· 17.7	112 32.3	·· 07.2	109 45.4	·· 06.8
	04	308 34.1	225 24.7	58.2	254 29.9	18.1	127 34.7	07.2	124 47.9	06.8
	05	323 36.6	240 23.8	58.4	269 30.5	18.6	142 37.2	07.2	139 50.4	06.8
	06	338 39.0	255 23.0	N23 58.7	284 31.1	N19 19.0	157 39.6	N 1 07.2	154 52.9	N 1 06.8
	07	353 41.5	270 22.1	58.9	299 31.8	19.5	172 42.0	07.2	169 55.4	06.8
	08	8 43.9	285 21.2	59.1	314 32.4	19.9	187 44.5	07.1	184 57.9	06.8
SUN	09	23 46.4	300 20.3	·· 59.4	329 33.0	·· 20.4	202 46.9	·· 07.1	200 00.3	·· 06.8
	10	38 48.9	315 19.4	59.6	344 33.6	20.8	217 49.4	07.1	215 02.8	06.8
	11	53 51.3	330 18.6	23 59.8	359 34.2	21.2	232 51.8	07.1	230 05.3	06.8
DAY	12	68 53.8	345 17.7	N24 00.1	14 34.8	N19 21.7	247 54.3	N 1 07.1	245 07.8	N 1 06.8
	13	83 56.3	0 16.8	00.3	29 35.5	22.1	262 56.7	07.0	260 10.3	06.8
	14	98 58.7	15 15.9	00.5	44 36.1	22.6	277 59.1	07.0	275 12.8	06.8
	15	114 01.2	30 15.0	·· 00.7	59 36.7	·· 23.0	293 01.6	·· 07.0	290 15.3	·· 06.8
	16	129 03.7	45 14.2	01.0	74 37.3	23.5	308 04.0	07.0	305 17.7	06.8
	17	144 06.1	60 13.3	01.2	89 37.9	23.9	323 06.5	07.0	320 20.2	06.8
	18	159 08.6	75 12.4	N24 01.4	104 38.5	N19 24.3	338 08.9	N 1 06.9	335 22.7	N 1 06.8
	19	174 11.1	90 11.5	01.6	119 39.2	24.8	353 11.3	06.9	350 25.2	06.8
	20	189 13.5	105 10.6	01.9	134 39.8	25.2	8 13.8	06.9	5 27.7	06.8
	21	204 16.0	120 09.7	·· 02.1	149 40.4	·· 25.7	23 16.2	·· 06.9	20 30.2	·· 06.8
	22	219 18.4	135 08.9	02.3	164 41.0	26.1	38 18.7	06.8	35 32.7	06.8
	23	234 20.9	150 08.0	02.5	179 41.6	26.6	53 21.1	06.8	50 35.1	06.8
1	00	249 23.4	165 07.1	N24 02.7	194 42.2	N19 27.0	68 23.5	N 1 06.8	65 37.6	N 1 06.8
	01	264 25.8	180 06.2	03.0	209 42.9	27.4	83 26.0	06.8	80 40.1	06.8
	02	279 28.3	195 05.3	03.2	224 43.5	27.9	98 28.4	06.8	95 42.6	06.8
	03	294 30.8	210 04.4	·· 03.4	239 44.1	·· 28.3	113 30.9	·· 06.7	110 45.1	·· 06.8
	04	309 33.2	225 03.6	03.6	254 44.7	28.7	128 33.3	06.7	125 47.6	06.8
	05	324 35.7	240 02.7	03.8	269 45.3	29.2	143 35.7	06.7	140 50.0	06.8
	06	339 38.2	255 01.8	N24 04.0	284 45.9	N19 29.6	158 38.2	N 1 06.7	155 52.5	N 1 06.8
	07	354 40.6	270 00.9	04.2	299 46.6	30.1	173 40.6	06.6	170 55.0	06.8
	08	9 43.1	285 00.0	04.4	314 47.2	30.5	188 43.0	06.6	185 57.5	06.8
MON	09	24 45.6	299 59.1	·· 04.6	329 47.8	·· 30.9	203 45.5	·· 06.6	201 00.0	·· 06.8
	10	39 48.0	314 58.3	04.8	344 48.4	31.4	218 47.9	06.6	216 02.5	06.8
	11	54 50.5	329 57.4	05.0	359 49.0	31.8	233 50.4	06.5	231 04.9	06.8
DAY	12	69 52.9	344 56.5	N24 05.2	14 49.6	N19 32.2	248 52.8	N 1 06.5	246 07.4	N 1 06.8
	13	84 55.4	359 55.6	05.4	29 50.3	32.7	263 55.2	06.5	261 09.9	06.8
	14	99 57.9	14 54.7	05.6	44 50.9	33.1	278 57.7	06.5	276 12.4	06.8
	15	115 00.3	29 53.8	·· 05.8	59 51.5	·· 33.5	294 00.1	·· 06.5	291 14.9	·· 06.8
	16	130 02.8	44 52.9	06.0	74 52.1	34.0	309 02.5	06.4	306 17.3	06.8
	17	145 05.3	59 52.1	06.2	89 52.7	34.4	324 05.0	06.4	321 19.8	06.8
	18	160 07.7	74 51.2	N24 06.4	104 53.3	N19 34.9	339 07.4	N 1 06.4	336 22.3	N 1 06.8
	19	175 10.2	89 50.3	06.6	119 53.9	35.3	354 09.8	06.4	351 24.8	06.8
	20	190 12.7	104 49.4	06.8	134 54.6	35.7	9 12.3	06.3	6 27.3	06.8
	21	205 15.1	119 48.5	·· 07.0	149 55.2	·· 36.2	24 14.7	·· 06.3	21 29.7	·· 06.8
	22	220 17.6	134 47.6	07.2	164 55.8	36.6	39 17.1	06.3	36 32.2	06.7
	23	235 20.0	149 46.7	07.4	179 56.4	37.0	54 19.6	06.3	51 34.7	06.7
2	00	250 22.5	164 45.9	N24 07.6	194 57.0	N19 37.4	69 22.0	N 1 06.2	66 37.2	N 1 06.7
	01	265 25.0	179 45.0	07.7	209 57.6	37.9	84 24.4	06.2	81 39.7	06.7
	02	280 27.4	194 44.1	07.9	224 58.2	38.3	99 26.9	06.2	96 42.1	06.7
	03	295 29.9	209 43.2	·· 08.1	239 58.9	·· 38.7	114 29.3	·· 06.2	111 44.6	·· 06.7
	04	310 32.4	224 42.3	08.3	254 59.5	39.2	129 31.7	06.1	126 47.1	06.7
	05	325 34.8	239 41.4	08.5	270 00.1	39.6	144 34.2	06.1	141 49.6	06.7
	06	340 37.3	254 40.5	N24 08.7	285 00.7	N19 40.0	159 36.6	N 1 06.1	156 52.1	N 1 06.7
	07	355 39.8	269 39.6	08.8	300 01.3	40.5	174 39.0	06.0	171 54.5	06.7
	08	10 42.2	284 38.8	09.0	315 01.9	40.9	189 41.4	06.0	186 57.0	06.7
TUE	09	25 44.7	299 37.9	·· 09.2	330 02.5	·· 41.3	204 43.9	·· 06.0	201 59.5	·· 06.7
	10	40 47.2	314 37.0	09.4	345 03.2	41.7	219 46.3	06.0	217 02.0	06.7
	11	55 49.6	329 36.1	09.5	0 03.8	42.2	234 48.7	05.9	232 04.5	06.7
SDAY	12	70 52.1	344 35.2	N24 09.7	15 04.4	N19 42.6	249 51.2	N 1 05.9	247 06.9	N 1 06.7
	13	85 54.5	359 34.3	09.9	30 05.0	43.0	264 53.6	05.9	262 09.4	06.7
	14	100 57.0	14 33.4	10.0	45 05.6	43.5	279 56.0	05.9	277 11.9	06.7
	15	115 59.5	29 32.5	·· 10.2	60 06.2	·· 43.9	294 58.4	·· 05.8	292 14.4	·· 06.7
	16	131 01.9	44 31.7	10.4	75 06.8	44.3	310 00.9	05.8	307 16.8	06.7
	17	146 04.4	59 30.8	10.6	90 07.5	44.7	325 03.3	05.8	322 19.3	06.7
	18	161 06.9	74 29.9	N24 10.7	105 08.1	N19 45.2	340 05.7	N 1 05.8	337 21.8	N 1 06.7
	19	176 09.3	89 29.0	10.9	120 08.7	45.6	355 08.2	05.7	352 24.3	06.7
	20	191 11.8	104 28.1	11.0	135 09.3	46.0	10 10.6	05.7	7 26.8	06.7
	21	206 14.3	119 27.2	·· 11.2	150 09.9	·· 46.4	25 13.0	·· 05.7	22 29.2	·· 06.7
	22	221 16.7	134 26.3	11.4	165 10.5	46.9	40 15.4	05.6	37 31.7	06.6
	23	236 19.2	149 25.4	11.5	180 11.1	47.3	55 17.9	05.6	52 34.2	06.6
Mer. Pass.		h m 7 21.2	v −0.9	d 0.2	v 0.6	d 0.4	v 2.4	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 22.8
Achernar	335 45.4	S57 19.8
Acrux	173 36.4	S63 00.0
Adhara	255 32.1	S28 57.0
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.8	N56 04.0
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.3	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.7
Alpheratz	358 09.0	N28 59.0
Altair	62 31.8	N 8 49.1
Ankaa	353 40.0	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.2	S68 59.6
Avior	234 28.4	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.1
Canopus	264 07.5	S52 41.3
Capella	281 11.1	N45 58.7
Deneb	49 47.9	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.6	S18 05.4
Dubhe	194 21.6	N61 51.4
Elnath	278 43.9	N28 35.5
Eltanin	90 57.0	N51 29.4
Enif	34 11.0	N 9 47.2
Fomalhaut	15 50.9	S29 43.2
Gacrux	172 27.9	S57 00.7
Gienah	176 17.4	S17 26.4
Hadar	149 22.2	S60 17.1
Hamal	328 28.7	N23 22.2
Kaus Aust.	84 15.9	S34 23.6
Kochab	137 18.0	N74 14.2
Markab	14 02.7	N15 06.1
Menkar	314 41.0	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.2	S69 38.7
Mirfak	309 15.9	N49 47.5
Nunki	76 28.3	S26 19.1
Peacock	53 57.3	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.6	N 5 16.3
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.3	S15 42.1
Scheder	350 08.7	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.8
Suhail	223 10.6	S43 21.7
Vega	80 55.1	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	275 43.7	13 00
Mars	305 18.9	11 01
Jupiter	179 00.2	19 23
Saturn	176 14.2	19 34

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
31 00	180 37.4	N21 52.2	214 40.1	7.8	N 8 08.2	12.4	60.8
01	195 37.3	52.5	229 06.9	7.8	8 20.6	12.4	60.8
02	210 37.2	52.9	243 33.7	7.7	8 33.0	12.4	60.8
03	225 37.1	·· 53.2	258 00.4	7.7	8 45.4	12.3	60.8
04	240 37.0	53.6	272 27.1	7.6	8 57.7	12.3	60.9
05	255 36.9	53.9	286 53.7	7.6	9 10.0	12.2	60.9
06	270 36.8	N21 54.3	301 20.3	7.4	N 9 22.2	12.1	60.9
07	285 36.7	54.7	315 46.7	7.5	9 34.3	12.1	60.9
08	300 36.6	55.0	330 13.2	7.3	9 46.4	12.1	60.9
SUN 09	315 36.5	·· 55.4	344 39.5	7.3	9 58.5	12.0	60.9
10	330 36.4	55.7	359 05.8	7.2	10 10.5	11.9	61.0
11	345 36.4	56.1	13 32.0	7.2	10 22.4	11.9	61.0
DAY 12	0 36.3	N21 56.4	27 58.2	7.1	N10 34.3	11.8	61.0
13	15 36.2	56.8	42 24.3	7.0	10 46.1	11.7	61.0
14	30 36.1	57.1	56 50.3	7.0	10 57.8	11.7	61.0
15	45 36.0	·· 57.5	71 16.3	6.8	11 09.5	11.6	61.0
16	60 35.9	57.8	85 42.1	6.9	11 21.1	11.5	61.0
17	75 35.8	58.2	100 08.0	6.7	11 32.6	11.5	61.0
18	90 35.7	N21 58.5	114 33.7	6.7	N11 44.1	11.4	61.1
19	105 35.6	58.9	128 59.4	6.7	11 55.5	11.3	61.1
20	120 35.5	59.2	143 25.1	6.6	12 06.8	11.2	61.1
21	135 35.4	·· 59.6	157 50.7	6.5	12 18.0	11.2	61.1
22	150 35.3	21 59.9	172 16.2	6.4	12 29.2	11.1	61.1
23	165 35.2	22 00.3	186 41.6	6.4	12 40.3	11.0	61.1
1 00	180 35.1	N22 00.6	201 07.0	6.3	N12 51.3	10.9	61.1
01	195 35.0	01.0	215 32.3	6.2	13 02.2	10.8	61.1
02	210 35.0	01.3	229 57.5	6.2	13 13.0	10.8	61.1
03	225 34.9	·· 01.6	244 22.7	6.1	13 23.8	10.6	61.1
04	240 34.8	02.0	258 47.8	6.1	13 34.4	10.6	61.1
05	255 34.7	02.3	273 12.9	6.0	13 45.0	10.4	61.1
06	270 34.6	N22 02.7	287 37.9	5.9	N13 55.4	10.4	61.2
07	285 34.5	03.0	302 02.8	5.8	14 05.8	10.3	61.2
08	300 34.4	03.3	316 27.6	5.8	14 16.1	10.2	61.2
MON 09	315 34.3	·· 03.7	330 52.4	5.8	14 26.3	10.1	61.2
10	330 34.2	04.0	345 17.2	5.6	14 36.4	10.0	61.2
11	345 34.1	04.4	359 41.8	5.7	14 46.4	9.9	61.2
DAY 12	0 34.0	N22 04.7	14 06.5	5.5	N14 56.3	9.8	61.2
13	15 33.9	05.0	28 31.0	5.5	15 06.1	9.6	61.2
14	30 33.8	05.4	42 55.5	5.4	15 15.7	9.6	61.2
15	45 33.7	·· 05.7	57 19.9	5.4	15 25.3	9.5	61.2
16	60 33.6	06.0	71 44.3	5.3	15 34.8	9.4	61.2
17	75 33.5	06.4	86 08.6	5.3	15 44.2	9.2	61.2
18	90 33.4	N22 06.7	100 32.9	5.2	N15 53.4	9.1	61.2
19	105 33.3	07.0	114 57.1	5.1	16 02.5	9.1	61.2
20	120 33.2	07.4	129 21.2	5.1	16 11.6	8.9	61.2
21	135 33.1	·· 07.7	143 45.3	5.1	16 20.5	8.8	61.2
22	150 33.0	08.0	158 09.4	5.0	16 29.3	8.6	61.2
23	165 32.9	08.4	172 33.4	4.9	16 37.9	8.6	61.1
2 00	180 32.8	N22 08.7	186 57.3	4.9	N16 46.5	8.4	61.1
01	195 32.7	09.0	201 21.2	4.8	16 54.9	8.3	61.1
02	210 32.6	09.3	215 45.0	4.8	17 03.2	8.2	61.1
03	225 32.5	·· 09.7	230 08.8	4.7	17 11.4	8.1	61.1
04	240 32.4	10.0	244 32.5	4.7	17 19.5	7.9	61.1
05	255 32.3	10.3	258 56.2	4.7	17 27.4	7.9	61.1
06	270 32.2	N22 10.7	273 19.9	4.6	N17 35.3	7.6	61.1
07	285 32.1	11.0	287 43.5	4.5	17 42.9	7.6	61.1
08	300 32.0	11.3	302 07.0	4.5	17 50.5	7.4	61.1
TUE 09	315 31.9	·· 11.6	316 30.5	4.5	17 57.9	7.3	61.1
10	330 31.8	11.9	330 54.0	4.4	18 05.2	7.2	61.1
11	345 31.7	12.3	345 17.4	4.4	18 12.4	7.0	61.1
SDAY 12	0 31.6	N22 12.6	359 40.8	4.4	N18 19.4	6.9	61.0
13	15 31.5	12.9	14 04.2	4.3	18 26.3	6.7	61.0
14	30 31.4	13.2	28 27.5	4.3	18 33.0	6.7	61.0
15	45 31.3	·· 13.5	42 50.8	4.2	18 39.7	6.4	61.0
16	60 31.2	13.9	57 14.0	4.2	18 46.1	6.4	61.0
17	75 31.1	14.2	71 37.2	4.2	18 52.5	6.2	61.0
18	90 31.0	N22 14.5	86 00.4	4.2	N18 58.7	6.0	61.0
19	105 30.9	14.8	100 23.6	4.1	19 04.7	6.0	60.9
20	120 30.8	15.1	114 46.7	4.1	19 10.7	5.7	60.9
21	135 30.7	·· 15.4	129 09.8	4.1	19 16.4	5.7	60.9
22	150 30.6	15.8	143 32.9	4.1	19 22.1	5.5	60.9
23	165 30.5	16.1	157 56.0	4.0	19 27.6	5.3	60.9
	S.D. 15.8	d 0.3	S.D. 16.6		16.7		16.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	01 58	01 39	01 03	▭
N 70	▭	▭	▭	02 10	02 02	01 51	01 28
68	▭	▭	▭	02 20	02 20	02 22	02 30
66	////	////	01 13	02 29	02 35	02 46	03 05
64	////	////	01 58	02 36	02 47	03 04	03 31
62	////	////	02 27	02 42	02 58	03 19	03 51
60	////	01 26	02 49	02 47	03 07	03 32	04 08
N 58	////	02 00	03 07	02 52	03 15	03 43	04 21
56	////	02 25	03 22	02 56	03 22	03 53	04 33
54	01 19	02 44	03 35	03 00	03 28	04 02	04 44
52	01 50	03 00	03 46	03 04	03 33	04 09	04 53
50	02 13	03 13	03 56	03 07	03 39	04 16	05 02
45	02 53	03 40	04 17	03 14	03 50	04 31	05 20
N 40	03 21	04 01	04 33	03 20	03 59	04 44	05 34
35	03 42	04 18	04 47	03 25	04 07	04 54	05 47
30	04 00	04 32	04 59	03 29	04 14	05 03	05 58
20	04 27	04 56	05 20	03 37	04 26	05 19	06 16
N 10	04 48	05 15	05 38	03 44	04 37	05 34	06 33
0	05 06	05 32	05 54	03 51	04 47	05 47	06 48
S 10	05 22	05 48	06 10	03 57	04 58	06 00	07 04
20	05 37	06 04	06 28	04 04	05 09	06 15	07 20
30	05 52	06 21	06 48	04 12	05 21	06 31	07 39
35	06 00	06 31	06 59	04 17	05 29	06 41	07 51
40	06 08	06 42	07 12	04 23	05 37	06 52	08 03
45	06 18	06 55	07 28	04 29	05 47	07 05	08 19
S 50	06 28	07 09	07 47	04 37	05 59	07 21	08 37
52	06 33	07 16	07 56	04 40	06 05	07 28	08 46
54	06 38	07 24	08 06	04 44	06 11	07 37	08 56
56	06 44	07 32	08 17	04 48	06 18	07 46	09 07
58	06 50	07 41	08 31	04 53	06 26	07 57	09 20
S 60	06 56	07 51	08 46	04 59	06 35	08 09	09 35

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 31	Moonset 1	Moonset 2	Moonset 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	19 03	21 42	▭	▭
N 70	▭	▭	▭	18 42	20 56	23 27	▭
68	▭	▭	▭	18 25	20 26	22 26	24 10
66	22 47	////	////	18 12	20 03	21 51	23 22
64	22 00	////	////	18 01	19 46	21 26	22 51
62	21 30	////	////	17 52	19 31	21 06	22 28
60	21 07	22 32	////	17 44	19 19	20 50	22 09
N 58	20 49	21 57	////	17 37	19 09	20 37	21 54
56	20 34	21 32	////	17 30	19 00	20 25	21 40
54	20 21	21 13	22 39	17 25	18 52	20 15	21 29
52	20 10	20 57	22 07	17 20	18 44	20 06	21 19
50	20 00	20 43	21 44	17 16	18 38	19 57	21 10
45	19 39	20 16	21 03	17 06	18 24	19 40	20 51
N 40	19 23	19 55	20 35	16 58	18 13	19 26	20 35
35	19 09	19 38	20 14	16 51	18 03	19 14	20 22
30	18 56	19 23	19 56	16 45	17 55	19 04	20 10
20	18 36	19 00	19 29	16 35	17 40	18 46	19 51
N 10	18 18	18 41	19 07	16 26	17 27	18 30	19 34
0	18 01	18 24	18 50	16 17	17 15	18 16	19 18
S 10	17 45	18 08	18 34	16 09	17 03	18 01	19 02
20	17 28	17 51	18 19	16 00	16 51	17 46	18 45
30	17 08	17 34	18 03	15 49	16 36	17 28	18 25
35	16 56	17 24	17 55	15 44	16 28	17 18	18 13
40	16 43	17 13	17 47	15 37	16 19	17 06	18 00
45	16 27	17 01	17 37	15 29	16 07	16 52	17 45
S 50	16 08	16 46	17 27	15 20	15 54	16 35	17 25
52	15 59	16 39	17 22	15 16	15 48	16 27	17 16
54	15 49	16 32	17 17	15 11	15 41	16 19	17 06
56	15 38	16 23	17 11	15 06	15 33	16 09	16 55
58	15 24	16 14	17 05	15 00	15 25	15 58	16 42
S 60	15 09	16 04	16 59	14 53	15 15	15 45	16 26

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
31	02 30	02 25	11 58	10 04	22 32	27	
1	02 21	02 16	11 58	11 01	23 31	28	●
2	02 12	02 07	11 58	12 01	24 32	00	

G.M.T.		ARIES	VENUS −3.3		MARS +1.6		JUPITER −1.7		SATURN +1.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
3	00	251 21.7	164 24.5	N24 11.7	195 11.7	N19 47.7	70 20.3	N 1 05.6	67 36.7	N 1 06.6
	01	266 24.1	179 23.6	11.8	210 12.4	48.1	85 22.7	05.6	82 39.1	06.6
	02	281 26.6	194 22.8	12.0	225 13.0	48.6	100 25.1	05.5	97 41.6	06.6
	03	296 29.0	209 21.9	·· 12.1	240 13.6	·· 49.0	115 27.6	·· 05.5	112 44.1	·· 06.6
	04	311 31.5	224 21.0	12.3	255 14.2	49.4	130 30.0	05.5	127 46.6	06.6
	05	326 34.0	239 20.1	12.4	270 14.8	49.8	145 32.4	05.4	142 49.0	06.6
	06	341 36.4	254 19.2	N24 12.6	285 15.4	N19 50.2	160 34.8	N 1 05.4	157 51.5	N 1 06.6
	07	356 38.9	269 18.3	12.7	300 16.0	50.7	175 37.3	05.4	172 54.0	06.6
W	08	11 41.4	284 17.4	12.9	315 16.7	51.1	190 39.7	05.4	187 56.5	06.6
E	09	26 43.8	299 16.5	·· 13.0	330 17.3	·· 51.5	205 42.1	·· 05.3	202 58.9	·· 06.6
D	10	41 46.3	314 15.6	13.2	345 17.9	51.9	220 44.5	05.3	218 01.4	06.6
N	11	56 48.8	329 14.7	13.3	0 18.5	52.3	235 46.9	05.3	233 03.9	06.6
E	12	71 51.2	344 13.9	N24 13.5	15 19.1	N19 52.8	250 49.4	N 1 05.2	248 06.4	N 1 06.6
S	13	86 53.7	359 13.0	13.6	30 19.7	53.2	265 51.8	05.2	263 08.8	06.6
D	14	101 56.2	14 12.1	13.8	45 20.3	53.6	280 54.2	05.2	278 11.3	06.6
A	15	116 58.6	29 11.2	·· 13.9	60 20.9	·· 54.0	295 56.6	·· 05.1	293 13.8	·· 06.6
Y	16	132 01.1	44 10.3	14.0	75 21.5	54.4	310 59.0	05.1	308 16.3	06.5
	17	147 03.5	59 09.4	14.2	90 22.2	54.9	326 01.5	05.1	323 18.7	06.5
	18	162 06.0	74 08.5	N24 14.3	105 22.8	N19 55.3	341 03.9	N 1 05.1	338 21.2	N 1 06.5
	19	177 08.5	89 07.6	14.4	120 23.4	55.7	356 06.3	05.0	353 23.7	06.5
	20	192 10.9	104 06.7	14.6	135 24.0	56.1	11 08.7	05.0	8 26.1	06.5
	21	207 13.4	119 05.8	·· 14.7	150 24.6	·· 56.5	26 11.1	·· 05.0	23 28.6	·· 06.5
	22	222 15.9	134 04.9	14.8	165 25.2	56.9	41 13.6	04.9	38 31.1	06.5
	23	237 18.3	149 04.0	15.0	180 25.8	57.4	56 16.0	04.9	53 33.6	06.5
4	00	252 20.8	164 03.2	N24 15.1	195 26.4	N19 57.8	71 18.4	N 1 04.9	68 36.0	N 1 06.5
	01	267 23.3	179 02.3	15.2	210 27.1	58.2	86 20.8	04.8	83 38.5	06.5
	02	282 25.7	194 01.4	15.3	225 27.7	58.6	101 23.2	04.8	98 41.0	06.5
	03	297 28.2	209 00.5	·· 15.5	240 28.3	·· 59.0	116 25.7	·· 04.8	113 43.5	·· 06.5
	04	312 30.6	223 59.6	15.6	255 28.9	59.4	131 28.1	04.7	128 45.9	06.5
	05	327 33.1	238 58.7	15.7	270 29.5	19 59.8	146 30.5	04.7	143 48.4	06.5
	06	342 35.6	253 57.8	N24 15.8	285 30.1	N20 00.3	161 32.9	N 1 04.7	158 50.9	N 1 06.5
	07	357 38.0	268 56.9	15.9	300 30.7	00.7	176 35.3	04.7	173 53.3	06.4
T	08	12 40.5	283 56.0	16.1	315 31.3	01.1	191 37.7	04.6	188 55.8	06.4
H	09	27 43.0	298 55.1	·· 16.2	330 31.9	·· 01.5	206 40.2	·· 04.6	203 58.3	·· 06.4
U	10	42 45.4	313 54.2	16.3	345 32.6	01.9	221 42.6	04.6	219 00.8	06.4
R	11	57 47.9	328 53.3	16.4	0 33.2	02.3	236 45.0	04.5	234 03.2	06.4
S	12	72 50.4	343 52.4	N24 16.5	15 33.8	N20 02.7	251 47.4	N 1 04.5	249 05.7	N 1 06.4
D	13	87 52.8	358 51.6	16.6	30 34.4	03.1	266 49.8	04.5	264 08.2	06.4
A	14	102 55.3	13 50.7	16.7	45 35.0	03.6	281 52.2	04.4	279 10.6	06.4
Y	15	117 57.8	28 49.8	·· 16.9	60 35.6	·· 04.0	296 54.6	·· 04.4	294 13.1	·· 06.4
	16	133 00.2	43 48.9	17.0	75 36.2	04.4	311 57.1	04.4	309 15.6	06.4
	17	148 02.7	58 48.0	17.1	90 36.8	04.8	326 59.5	04.3	324 18.0	06.4
	18	163 05.1	73 47.1	N24 17.2	105 37.4	N20 05.2	342 01.9	N 1 04.3	339 20.5	N 1 06.4
	19	178 07.6	88 46.2	17.3	120 38.0	05.6	357 04.3	04.3	354 23.0	06.4
	20	193 10.1	103 45.3	17.4	135 38.7	06.0	12 06.7	04.2	9 25.5	06.3
	21	208 12.5	118 44.4	·· 17.5	150 39.3	·· 06.4	27 09.1	·· 04.2	24 27.9	·· 06.3
	22	223 15.0	133 43.5	17.6	165 39.9	06.8	42 11.5	04.2	39 30.4	06.3
	23	238 17.5	148 42.6	17.7	180 40.5	07.2	57 14.0	04.1	54 32.9	06.3
5	00	253 19.9	163 41.7	N24 17.8	195 41.1	N20 07.6	72 16.4	N 1 04.1	69 35.3	N 1 06.3
	01	268 22.4	178 40.8	17.9	210 41.7	08.1	87 18.8	04.1	84 37.8	06.3
	02	283 24.9	193 39.9	18.0	225 42.3	08.5	102 21.2	04.0	99 40.3	06.3
	03	298 27.3	208 39.0	·· 18.1	240 42.9	·· 08.9	117 23.6	·· 04.0	114 42.7	·· 06.3
	04	313 29.8	223 38.2	18.2	255 43.5	09.3	132 26.0	04.0	129 45.2	06.3
	05	328 32.3	238 37.3	18.2	270 44.1	09.7	147 28.4	03.9	144 47.7	06.3
	06	343 34.7	253 36.4	N24 18.3	285 44.8	N20 10.1	162 30.8	N 1 03.9	159 50.1	N 1 06.3
	07	358 37.2	268 35.5	18.4	300 45.4	10.5	177 33.2	03.8	174 52.6	06.2
	08	13 39.6	283 34.6	18.5	315 46.0	10.9	192 35.6	03.8	189 55.1	06.2
F	09	28 42.1	298 33.7	·· 18.6	330 46.6	·· 11.3	207 38.1	·· 03.8	204 57.5	·· 06.2
R	10	43 44.6	313 32.8	18.7	345 47.2	11.7	222 40.5	03.7	220 00.0	06.2
I	11	58 47.0	328 31.9	18.8	0 47.8	12.1	237 42.9	03.7	235 02.5	06.2
D	12	73 49.5	343 31.0	N24 18.9	15 48.4	N20 12.5	252 45.3	N 1 03.7	250 04.9	N 1 06.2
A	13	88 52.0	358 30.1	18.9	30 49.0	12.9	267 47.7	03.6	265 07.4	06.2
Y	14	103 54.4	13 29.2	19.0	45 49.6	13.3	282 50.1	03.6	280 09.9	06.2
	15	118 56.9	28 28.3	·· 19.1	60 50.2	·· 13.7	297 52.5	·· 03.6	295 12.3	·· 06.2
	16	133 59.4	43 27.4	19.2	75 50.9	14.1	312 54.9	03.5	310 14.8	06.2
	17	149 01.8	58 26.5	19.3	90 51.5	14.5	327 57.3	03.5	325 17.3	06.2
	18	164 04.3	73 25.6	N24 19.3	105 52.1	N20 14.9	342 59.7	N 1 03.5	340 19.7	N 1 06.1
	19	179 06.7	88 24.7	19.4	120 52.7	15.3	358 02.1	03.4	355 22.2	06.1
	20	194 09.2	103 23.8	19.5	135 53.3	15.7	13 04.5	03.4	10 24.7	06.1
	21	209 11.7	118 23.0	·· 19.5	150 53.9	·· 16.1	28 06.9	·· 03.3	25 27.1	·· 06.1
	22	224 14.1	133 22.1	19.6	165 54.5	16.5	43 09.4	03.3	40 29.6	06.1
	23	239 16.6	148 21.2	19.7	180 55.1	16.9	58 11.8	03.3	55 32.1	06.1
Mer. Pass.		h m 7 09.4	v −0.9	d 0.1	v 0.6	d 0.4	v 2.4	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.3	S40 22.8
Achernar	335 45.3	S57 19.8
Acrux	173 36.4	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.8	N56 04.0
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.2	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.9	N28 59.0
Altair	62 31.8	N 8 49.1
Ankaa	353 40.0	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.6
Avior	234 28.4	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.3
Capella	281 11.1	N45 58.7
Deneb	49 47.9	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.6	S18 05.4
Dubhe	194 21.6	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 57.0	N51 29.4
Enif	34 11.0	N 9 47.2
Fomalhaut	15 50.9	S29 43.2
Gacrux	172 28.0	S57 00.7
Gienah	176 17.4	S17 26.4
Hadar	149 22.2	S60 17.1
Hamal	328 28.7	N23 22.2
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.0	N74 14.2
Markab	14 02.7	N15 06.1
Menkar	314 40.9	N 4 00.9
Menkent	148 36.1	S36 16.8
Miaplacidus	221 45.2	S69 38.7
Mirfak	309 15.9	N49 47.5
Nunki	76 28.3	S26 19.1
Peacock	53 57.3	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.6	N 5 16.3
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.5
Sabik	102 40.2	S15 42.1
Schedar	350 08.7	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.8
Suhail	223 10.6	S43 21.6
Vega	80 55.1	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	271 42.4	13 05
Mars	303 05.7	10 58
Jupiter	178 57.6	19 12
Saturn	176 15.2	19 22

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
3 00	180 30.4	N22 16.4	172 19.0	4.0	N19 32.9	5.2	60.9
01	195 30.3	16.7	186 42.0	4.0	19 38.1	5.1	60.8
02	210 30.2	17.0	201 05.0	4.0	19 43.2	4.9	60.8
03	225 30.1	17.3	215 28.0	4.0	19 48.1	4.7	60.8
04	240 30.0	17.6	229 51.0	4.0	19 52.8	4.6	60.8
05	255 29.9	17.9	244 14.0	3.9	19 57.4	4.5	60.8
06	270 29.8	N22 18.2	258 36.9	4.0	N20 01.9	4.3	60.7
07	285 29.7	18.6	272 59.9	3.9	20 06.2	4.2	60.7
08	300 29.6	18.9	287 22.8	3.9	20 10.4	4.0	60.7
09	315 29.5	19.2	301 45.7	4.0	20 14.4	3.9	60.7
10	330 29.4	19.5	316 08.7	3.9	20 18.3	3.7	60.7
11	345 29.3	19.8	330 31.6	3.9	20 22.0	3.5	60.6
12	0 29.2	N22 20.1	344 54.5	4.0	N20 25.5	3.4	60.6
13	15 29.1	20.4	359 17.5	3.9	20 28.9	3.3	60.6
14	30 29.0	20.7	13 40.4	3.9	20 32.2	3.1	60.6
15	45 28.9	21.0	28 03.3	4.0	20 35.3	3.0	60.5
16	60 28.8	21.3	42 26.3	4.0	20 38.3	2.8	60.5
17	75 28.7	21.6	56 49.3	3.9	20 41.1	2.6	60.5
18	90 28.6	N22 21.9	71 12.2	4.0	N20 43.7	2.5	60.5
19	105 28.4	22.2	85 35.2	4.0	20 46.2	2.4	60.4
20	120 28.3	22.5	99 58.2	4.0	20 48.6	2.2	60.4
21	135 28.2	22.8	114 21.2	4.1	20 50.8	2.0	60.4
22	150 28.1	23.1	128 44.3	4.0	20 52.8	1.9	60.4
23	165 28.0	23.4	143 07.3	4.1	20 54.7	1.7	60.3
4 00	180 27.9	N22 23.7	157 30.4	4.1	N20 56.4	1.6	60.3
01	195 27.8	24.0	171 53.5	4.1	20 58.0	1.5	60.3
02	210 27.7	24.3	186 16.6	4.2	20 59.5	1.2	60.2
03	225 27.6	24.6	200 39.8	4.2	21 00.7	1.2	60.2
04	240 27.5	24.9	215 03.0	4.2	21 01.9	1.0	60.2
05	255 27.4	25.2	229 26.2	4.3	21 02.9	0.8	60.1
06	270 27.3	N22 25.5	243 49.5	4.3	N21 03.7	0.7	60.1
07	285 27.2	25.7	258 12.8	4.3	21 04.4	0.5	60.1
08	300 27.1	26.0	272 36.1	4.4	21 04.9	0.4	60.1
09	315 27.0	26.3	286 59.5	4.4	21 05.3	0.2	60.0
10	330 26.8	26.6	301 22.9	4.4	21 05.5	0.1	60.0
11	345 26.7	26.9	315 46.3	4.5	21 05.6	0.1	60.0
12	0 26.6	N22 27.2	330 09.8	4.6	N21 05.5	0.2	59.9
13	15 26.5	27.5	344 33.4	4.5	21 05.3	0.3	59.9
14	30 26.4	27.8	358 56.9	4.7	21 05.0	0.5	59.9
15	45 26.3	28.1	13 20.6	4.7	21 04.5	0.7	59.8
16	60 26.2	28.3	27 44.3	4.7	21 03.8	0.8	59.8
17	75 26.1	28.6	42 08.0	4.8	21 03.0	0.9	59.8
18	90 26.0	N22 28.9	56 31.8	4.9	N21 02.1	1.1	59.7
19	105 25.9	29.2	70 55.7	4.9	21 01.0	1.2	59.7
20	120 25.8	29.5	85 19.6	4.9	20 59.8	1.4	59.7
21	135 25.7	29.8	99 43.5	5.1	20 58.4	1.5	59.6
22	150 25.5	30.0	114 07.6	5.0	20 56.9	1.7	59.6
23	165 25.4	30.3	128 31.6	5.2	20 55.2	1.8	59.5
5 00	180 25.3	N22 30.6	142 55.8	5.2	N20 53.4	1.9	59.5
01	195 25.2	30.9	157 20.0	5.3	20 51.5	2.1	59.5
02	210 25.1	31.2	171 44.3	5.4	20 49.4	2.2	59.4
03	225 25.0	31.4	186 08.7	5.4	20 47.2	2.3	59.4
04	240 24.9	31.7	200 33.1	5.5	20 44.9	2.5	59.4
05	255 24.8	32.0	214 57.6	5.5	20 42.4	2.6	59.3
06	270 24.7	N22 32.3	229 22.1	5.6	N20 39.8	2.8	59.3
07	285 24.6	32.5	243 46.7	5.8	20 37.0	2.9	59.3
08	300 24.4	32.8	258 11.5	5.7	20 34.1	3.0	59.2
09	315 24.3	33.1	272 36.2	5.9	20 31.1	3.1	59.2
10	330 24.2	33.4	287 01.1	5.9	20 28.0	3.3	59.1
11	345 24.1	33.6	301 26.0	6.0	20 24.7	3.4	59.1
12	0 24.0	N22 33.9	315 51.0	6.1	N20 21.3	3.6	59.1
13	15 23.9	34.2	330 16.1	6.2	20 17.7	3.6	59.0
14	30 23.8	34.5	344 41.3	6.2	20 14.1	3.8	59.0
15	45 23.7	34.7	359 06.5	6.4	20 10.3	3.9	59.0
16	60 23.6	35.0	13 31.9	6.4	20 06.4	4.0	58.9
17	75 23.4	35.3	27 57.3	6.5	20 02.4	4.2	58.9
18	90 23.3	N22 35.5	42 22.8	6.6	N19 58.2	4.3	58.8
19	105 23.2	35.8	56 48.4	6.6	19 53.9	4.4	58.8
20	120 23.1	36.1	71 14.0	6.8	19 49.5	4.5	58.8
21	135 23.0	36.3	85 39.8	6.8	19 45.0	4.6	58.7
22	150 22.9	36.6	100 05.6	6.9	19 40.4	4.8	58.7
23	165 22.8	36.9	114 31.5	7.1	19 35.6	4.8	58.6
	S.D. 15.8	d 0.3	S.D. 16.5		16.3		16.1

WEDNESDAY

THURSDAY

FRIDAY

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	▭
N 70	▭	▭	▭	01 28	▭	▭	04 53
68	▭	▭	▭	02 30	02 55	04 04	05 46
66	////	////	00 59	03 05	03 44	04 50	06 19
64	////	////	01 51	03 31	04 15	05 20	06 43
62	////	////	02 22	03 51	04 38	05 43	07 01
60	////	01 18	02 45	04 08	04 57	06 01	07 17
N 58	////	01 55	03 04	04 21	05 12	06 16	07 30
56	////	02 20	03 19	04 33	05 26	06 29	07 41
54	01 11	02 40	03 32	04 44	05 37	06 41	07 51
52	01 45	02 57	03 44	04 53	05 47	06 51	08 00
50	02 09	03 11	03 54	05 02	05 57	06 59	08 08
45	02 50	03 39	04 15	05 20	06 16	07 18	08 24
N 40	03 19	04 00	04 32	05 34	06 32	07 34	08 38
35	03 41	04 17	04 46	05 47	06 45	07 47	08 50
30	03 59	04 32	04 59	05 58	06 56	07 58	09 00
20	04 26	04 55	05 20	06 16	07 16	08 17	09 17
N 10	04 48	05 15	05 38	06 33	07 34	08 34	09 32
0	05 06	05 32	05 55	06 48	07 50	08 50	09 47
S 10	05 22	05 49	06 11	07 04	08 06	09 06	10 01
20	05 38	06 05	06 29	07 20	08 24	09 22	10 16
30	05 53	06 23	06 49	07 39	08 44	09 42	10 33
35	06 01	06 33	07 01	07 51	08 55	09 53	10 43
40	06 10	06 44	07 14	08 03	09 09	10 06	10 55
45	06 20	06 57	07 30	08 19	09 25	10 21	11 08
S 50	06 31	07 12	07 50	08 37	09 45	10 40	11 24
52	06 36	07 19	07 59	08 46	09 54	10 49	11 32
54	06 41	07 26	08 09	08 56	10 04	10 59	11 40
56	06 47	07 35	08 21	09 07	10 16	11 10	11 50
58	06 53	07 44	08 35	09 20	10 30	11 23	12 01
S 60	07 00	07 55	08 51	09 35	10 46	11 38	12 13

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	▭
N 70	▭	▭	▭	▭	▭	▭	02 21
68	▭	▭	▭	24 10	00 10	01 08	01 27
66	23 01	////	////	23 22	24 22	00 22	00 53
64	22 07	////	////	22 51	23 52	24 29	00 29
62	21 36	////	////	22 28	23 29	24 10	00 10
60	21 12	22 41	////	22 09	23 10	23 54	24 24
N 58	20 54	22 03	////	21 54	22 55	23 40	24 13
56	20 38	21 37	////	21 40	22 42	23 29	24 04
54	20 25	21 17	22 48	21 29	22 30	23 19	23 55
52	20 13	21 00	22 13	21 19	22 20	23 09	23 48
50	20 03	20 46	21 48	21 10	22 11	23 01	23 41
45	19 42	20 18	21 07	20 51	21 52	22 44	23 26
N 40	19 25	19 57	20 38	20 35	21 37	22 30	23 14
35	19 10	19 40	20 16	20 22	21 23	22 17	23 04
30	18 58	19 25	19 58	20 10	21 12	22 07	22 55
20	18 37	19 01	19 30	19 51	20 52	21 48	22 39
N 10	18 19	18 42	19 08	19 34	20 35	21 32	22 25
0	18 02	18 24	18 50	19 18	20 19	21 17	22 12
S 10	17 45	18 08	18 34	19 02	20 03	21 02	21 59
20	17 27	17 51	18 19	18 45	19 45	20 46	21 45
30	17 07	17 33	18 03	18 25	19 25	20 27	21 29
35	16 55	17 23	17 55	18 13	19 14	20 16	21 20
40	16 42	17 12	17 46	18 00	19 00	20 04	21 09
45	16 26	16 59	17 36	17 45	18 44	19 49	20 56
S 50	16 07	16 44	17 25	17 25	18 25	19 31	20 41
52	15 57	16 37	17 20	17 16	18 15	19 22	20 33
54	15 47	16 30	17 15	17 06	18 05	19 13	20 25
56	15 35	16 21	17 10	16 55	17 53	19 02	20 16
58	15 21	16 12	17 03	16 42	17 39	18 49	20 06
S 60	15 05	16 01	16 56	16 26	17 23	18 35	19 54

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	02 02	01 57	11 58	13 03	00 32	01	●
4	01 52	01 47	11 58	14 04	01 34	02	
5	01 42	01 36	11 58	15 04	02 34	03	

G.M.T.		ARIES	VENUS −3.3		MARS +1.6		JUPITER −1.7		SATURN +1.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
6	00	254 19.1	163 20.3	N24 19.8	195 55.7	N20 17.3	73 14.2	N 1 03.2	70 34.5	N 1 06.1
	01	269 21.5	178 19.4	19.8	210 56.3	17.7	88 16.6	03.2	85 37.0	06.1
	02	284 24.0	193 18.5	19.9	225 56.9	18.1	103 19.0	03.2	100 39.4	06.1
	03	299 26.5	208 17.6	·· 20.0	240 57.5	·· 18.5	118 21.4	·· 03.1	115 41.9	·· 06.1
	04	314 28.9	223 16.7	20.0	255 58.2	18.9	133 23.8	03.1	130 44.4	06.0
	05	329 31.4	238 15.8	20.1	270 58.8	19.3	148 26.2	03.1	145 46.8	06.0
	06	344 33.9	253 14.9	N24 20.1	285 59.4	N20 19.7	163 28.6	N 1 03.0	160 49.3	N 1 06.0
	07	359 36.3	268 14.0	20.2	301 00.0	20.1	178 31.0	03.0	175 51.8	06.0
S	08	14 38.8	283 13.1	20.3	316 00.6	20.5	193 33.4	02.9	190 54.2	06.0
A	09	29 41.2	298 12.2	·· 20.3	331 01.2	·· 20.9	208 35.8	·· 02.9	205 56.7	·· 06.0
T	10	44 43.7	313 11.3	20.4	346 01.8	21.3	223 38.2	02.9	220 59.2	06.0
U	11	59 46.2	328 10.4	20.4	1 02.4	21.7	238 40.6	02.8	236 01.6	06.0
R	12	74 48.6	343 09.5	N24 20.5	16 03.0	N20 22.1	253 43.0	N 1 02.8	251 04.1	N 1 06.0
D	13	89 51.1	358 08.6	20.5	31 03.6	22.5	268 45.4	02.7	266 06.5	05.9
A	14	104 53.6	13 07.7	20.6	46 04.2	22.9	283 47.8	02.7	281 09.0	05.9
Y	15	119 56.0	28 06.9	·· 20.6	61 04.8	·· 23.3	298 50.2	·· 02.7	296 11.5	·· 05.9
	16	134 58.5	43 06.0	20.7	76 05.4	23.7	313 52.6	02.6	311 13.9	05.9
	17	150 01.0	58 05.1	20.7	91 06.1	24.1	328 55.0	02.6	326 16.4	05.9
	18	165 03.4	73 04.2	N24 20.8	106 06.7	N20 24.4	343 57.4	N 1 02.6	341 18.9	N 1 05.9
	19	180 05.9	88 03.3	20.8	121 07.3	24.8	358 59.8	02.5	356 21.3	05.9
	20	195 08.4	103 02.4	20.9	136 07.9	25.2	14 02.2	02.5	11 23.8	05.9
	21	210 10.8	118 01.5	·· 20.9	151 08.5	·· 25.6	29 04.6	·· 02.4	26 26.2	·· 05.8
	22	225 13.3	133 00.6	20.9	166 09.1	26.0	44 07.0	02.4	41 28.7	05.8
	23	240 15.7	147 59.7	21.0	181 09.7	26.4	59 09.4	02.4	56 31.2	05.8
7	00	255 18.2	162 58.8	N24 21.0	196 10.3	N20 26.8	74 11.8	N 1 02.3	71 33.6	N 1 05.8
	01	270 20.7	177 57.9	21.1	211 10.9	27.2	89 14.2	02.3	86 36.1	05.8
	02	285 23.1	192 57.0	21.1	226 11.5	27.6	104 16.6	02.2	101 38.5	05.8
	03	300 25.6	207 56.1	·· 21.1	241 12.1	·· 28.0	119 19.0	·· 02.2	116 41.0	·· 05.8
	04	315 28.1	222 55.2	21.2	256 12.7	28.4	134 21.4	02.2	131 43.5	05.8
	05	330 30.5	237 54.3	21.2	271 13.3	28.7	149 23.8	02.1	146 45.9	05.8
	06	345 33.0	252 53.4	N24 21.2	286 13.9	N20 29.1	164 26.2	N 1 02.1	161 48.4	N 1 05.7
	07	0 35.5	267 52.5	21.2	301 14.6	29.5	179 28.6	02.0	176 50.8	05.7
	08	15 37.9	282 51.6	21.3	316 15.2	29.9	194 31.0	02.0	191 53.3	05.7
S	09	30 40.4	297 50.7	·· 21.3	331 15.8	·· 30.3	209 33.4	·· 02.0	206 55.8	·· 05.7
U	10	45 42.8	312 49.9	21.3	346 16.4	30.7	224 35.8	01.9	221 58.2	05.7
N	11	60 45.3	327 49.0	21.4	1 17.0	31.1	239 38.2	01.9	237 00.7	05.7
D	12	75 47.8	342 48.1	N24 21.4	16 17.6	N20 31.5	254 40.6	N 1 01.8	252 03.1	N 1 05.7
A	13	90 50.2	357 47.2	21.4	31 18.2	31.8	269 42.9	01.8	267 05.6	05.7
Y	14	105 52.7	12 46.3	21.4	46 18.8	32.2	284 45.3	01.7	282 08.1	05.6
	15	120 55.2	27 45.4	·· 21.4	61 19.4	·· 32.6	299 47.7	·· 01.7	297 10.5	·· 05.6
	16	135 57.6	42 44.5	21.5	76 20.0	33.0	314 50.1	01.7	312 13.0	05.6
	17	151 00.1	57 43.6	21.5	91 20.6	33.4	329 52.5	01.6	327 15.4	05.6
	18	166 02.6	72 42.7	N24 21.5	106 21.2	N20 33.8	344 54.9	N 1 01.6	342 17.9	N 1 05.6
	19	181 05.0	87 41.8	21.5	121 21.8	34.2	359 57.3	01.5	357 20.3	05.6
	20	196 07.5	102 40.9	21.5	136 22.4	34.5	14 59.7	01.5	12 22.8	05.6
	21	211 10.0	117 40.0	·· 21.5	151 23.0	·· 34.9	30 02.1	·· 01.5	27 25.3	·· 05.5
	22	226 12.4	132 39.1	21.5	166 23.7	35.3	45 04.5	01.4	42 27.7	05.5
	23	241 14.9	147 38.2	21.5	181 24.3	35.7	60 06.9	01.4	57 30.2	05.5
8	00	256 17.3	162 37.3	N24 21.6	196 24.9	N20 36.1	75 09.3	N 1 01.3	72 32.6	N 1 05.5
	01	271 19.8	177 36.4	21.6	211 25.5	36.5	90 11.7	01.3	87 35.1	05.5
	02	286 22.3	192 35.5	21.6	226 26.1	36.8	105 14.1	01.2	102 37.5	05.5
	03	301 24.7	207 34.6	·· 21.6	241 26.7	·· 37.2	120 16.4	·· 01.2	117 40.0	·· 05.5
	04	316 27.2	222 33.8	21.6	256 27.3	37.6	135 18.8	01.2	132 42.5	05.4
	05	331 29.7	237 32.9	21.6	271 27.9	38.0	150 21.2	01.1	147 44.9	05.4
	06	346 32.1	252 32.0	N24 21.6	286 28.5	N20 38.4	165 23.6	N 1 01.1	162 47.4	N 1 05.4
	07	1 34.6	267 31.1	21.6	301 29.1	38.7	180 26.0	01.0	177 49.8	05.4
	08	16 37.1	282 30.2	21.6	316 29.7	39.1	195 28.4	01.0	192 52.3	05.4
M	09	31 39.5	297 29.3	·· 21.6	331 30.3	·· 39.5	210 30.8	·· 00.9	207 54.7	·· 05.4
O	10	46 42.0	312 28.4	21.6	346 30.9	39.9	225 33.2	00.9	222 57.2	05.4
N	11	61 44.5	327 27.5	21.6	1 31.5	40.3	240 35.6	00.8	237 59.6	05.3
D	12	76 46.9	342 26.6	N24 21.6	16 32.1	N20 40.6	255 37.9	N 1 00.8	253 02.1	N 1 05.3
A	13	91 49.4	357 25.7	21.5	31 32.7	41.0	270 40.3	00.8	268 04.6	05.3
Y	14	106 51.8	12 24.8	21.5	46 33.3	41.4	285 42.7	00.7	283 07.0	05.3
	15	121 54.3	27 23.9	·· 21.5	61 33.9	·· 41.8	300 45.1	·· 00.7	298 09.5	·· 05.3
	16	136 56.8	42 23.0	21.5	76 34.5	42.1	315 47.5	00.6	313 11.9	05.3
	17	151 59.2	57 22.1	21.5	91 35.2	42.5	330 49.9	00.6	328 14.4	05.3
	18	167 01.7	72 21.2	N24 21.5	106 35.8	N20 42.9	345 52.3	N 1 00.5	343 16.8	N 1 05.2
	19	182 04.2	87 20.3	21.5	121 36.4	43.3	0 54.7	00.5	358 19.3	05.2
	20	197 06.6	102 19.4	21.5	136 37.0	43.6	15 57.0	00.4	13 21.7	05.2
	21	212 09.1	117 18.6	·· 21.4	151 37.6	·· 44.0	30 59.4	·· 00.4	28 24.2	·· 05.2
	22	227 11.6	132 17.7	21.4	166 38.2	44.4	46 01.8	00.4	43 26.6	05.2
	23	242 14.0	147 16.8	21.4	181 38.8	44.8	61 04.2	00.3	58 29.1	05.2
Mer. Pass.		h m 6 57.6	v 0.9	d 0.0	v 0.6	d 0.4	v 2.4	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.3	S40 22.8
Achernar	335 45.3	S57 19.8
Acrux	173 36.4	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.8	N56 04.0
Alkaid	153 17.8	N49 24.6
Al Na'ir	28 14.2	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.2	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.9	N28 59.0
Altair	62 31.8	N 8 49.1
Ankaa	353 39.9	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.6
Avior	234 28.4	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.3
Capella	281 11.1	N45 58.7
Deneb	49 47.8	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.5	S18 05.3
Dubhe	194 21.6	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 57.0	N51 29.5
Enif	34 11.0	N 9 47.3
Fomalhaut	15 50.9	S29 43.2
Gacrux	172 28.0	S57 00.7
Gienah	176 17.4	S17 26.4
Hadar	149 22.2	S60 17.1
Hamal	328 28.6	N23 22.3
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.0	N74 14.2
Markab	14 02.7	N15 06.1
Menkar	314 40.9	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.3	S69 38.7
Mirfak	309 15.9	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.2	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.7	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.8	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.1	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	267 40.6	13 09
Mars	300 52.1	10 55
Jupiter	178 53.6	19 00
Saturn	176 15.4	19 11

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
6 00	180 22.7	N22 37.1	128 57.6	7.1	N19 30.8	5.0	58.6
01	195 22.5	37.4	143 23.7	7.1	19 25.8	5.1	58.6
02	210 22.4	37.7	157 49.8	7.3	19 20.7	5.2	58.5
03	225 22.3	37.9	172 16.1	7.4	19 15.5	5.3	58.5
04	240 22.2	38.2	186 42.5	7.5	19 10.2	5.5	58.4
05	255 22.1	38.4	201 09.0	7.5	19 04.7	5.5	58.4
06	270 22.0	N22 38.7	215 35.5	7.7	N18 59.2	5.6	58.4
07	285 21.9	39.0	230 02.2	7.7	18 53.6	5.8	58.3
S 08	300 21.7	39.2	244 28.9	7.8	18 47.8	5.8	58.3
A 09	315 21.6	39.5	258 55.7	7.9	18 42.0	6.0	58.2
T 10	330 21.5	39.7	273 22.6	8.0	18 36.0	6.0	58.2
U 11	345 21.4	40.0	287 49.6	8.1	18 30.0	6.2	58.2
R 12	0 21.3	N22 40.2	302 16.7	8.2	N18 23.8	6.3	58.1
D 13	15 21.2	40.5	316 43.9	8.3	18 17.5	6.3	58.1
A 14	30 21.1	40.7	331 11.2	8.4	18 11.2	6.5	58.1
Y 15	45 20.9	41.0	345 38.6	8.5	18 04.7	6.5	58.0
16	60 20.8	41.3	0 06.1	8.6	17 58.2	6.7	58.0
17	75 20.7	41.5	14 33.7	8.6	17 51.5	6.7	57.9
18	90 20.6	N22 41.8	29 01.3	8.8	N17 44.8	6.8	57.9
19	105 20.5	42.0	43 29.1	8.8	17 38.0	6.9	57.9
20	120 20.4	42.3	57 56.9	9.0	17 31.1	7.0	57.8
21	135 20.3	42.5	72 24.9	9.0	17 24.1	7.1	57.8
22	150 20.1	42.8	86 52.9	9.2	17 17.0	7.2	57.7
23	165 20.0	43.0	101 21.1	9.2	17 09.8	7.3	57.7
7 00	180 19.9	N22 43.3	115 49.3	9.3	N17 02.5	7.3	57.7
01	195 19.8	43.5	130 17.6	9.4	16 55.2	7.5	57.6
02	210 19.7	43.7	144 46.0	9.5	16 47.7	7.5	57.6
03	225 19.6	44.0	159 14.5	9.6	16 40.2	7.6	57.5
04	240 19.4	44.2	173 43.1	9.7	16 32.6	7.7	57.5
05	255 19.3	44.5	188 11.8	9.8	16 24.9	7.7	57.5
06	270 19.2	N22 44.7	202 40.6	9.9	N16 17.2	7.9	57.4
07	285 19.1	45.0	217 09.5	9.9	16 09.3	7.9	57.4
08	300 19.0	45.2	231 38.4	10.1	16 01.4	8.0	57.3
S 09	315 18.9	45.4	246 07.5	10.1	15 53.4	8.0	57.3
U 10	330 18.7	45.7	260 36.6	10.3	15 45.4	8.2	57.3
N 11	345 18.6	45.9	275 05.9	10.3	15 37.2	8.2	57.2
D 12	0 18.5	N22 46.2	289 35.2	10.4	N15 29.0	8.3	57.2
A 13	15 18.4	46.4	304 04.6	10.5	15 20.7	8.3	57.2
Y 14	30 18.3	46.6	318 34.1	10.6	15 12.4	8.4	57.1
15	45 18.2	46.9	333 03.7	10.7	15 04.0	8.5	57.1
16	60 18.0	47.1	347 33.4	10.8	14 55.5	8.6	57.0
17	75 17.9	47.3	2 03.2	10.9	14 46.9	8.6	57.0
18	90 17.8	N22 47.6	16 33.1	10.9	N14 38.3	8.6	57.0
19	105 17.7	47.8	31 03.0	11.0	14 29.7	8.8	56.9
20	120 17.6	48.1	45 33.0	11.2	14 20.9	8.8	56.9
21	135 17.4	48.3	60 03.2	11.2	14 12.1	8.8	56.9
22	150 17.3	48.5	74 33.4	11.3	14 03.3	9.0	56.8
23	165 17.2	48.7	89 03.7	11.3	13 54.3	8.9	56.8
8 00	180 17.1	N22 49.0	103 34.0	11.5	N13 45.4	9.1	56.7
01	195 17.0	49.2	118 04.5	11.5	13 36.3	9.0	56.7
02	210 16.8	49.4	132 35.0	11.7	13 27.3	9.2	56.7
03	225 16.7	49.7	147 05.7	11.7	13 18.1	9.2	56.6
04	240 16.6	49.9	161 36.4	11.8	13 08.9	9.2	56.6
05	255 16.5	50.1	176 07.2	11.8	12 59.7	9.3	56.6
06	270 16.4	N22 50.3	190 38.0	12.0	N12 50.4	9.4	56.5
07	285 16.3	50.6	205 09.0	12.0	12 41.0	9.4	56.5
08	300 16.1	50.8	219 40.0	12.1	12 31.6	9.4	56.5
M 09	315 16.0	51.0	234 11.1	12.2	12 22.2	9.5	56.4
O 10	330 15.9	51.2	248 42.3	12.2	12 12.7	9.6	56.4
N 11	345 15.8	51.5	263 13.5	12.4	12 03.1	9.6	56.4
D 12	0 15.7	N22 51.7	277 44.9	12.4	N11 53.5	9.6	56.3
A 13	15 15.5	51.9	292 16.3	12.5	11 43.9	9.7	56.3
Y 14	30 15.4	52.1	306 47.8	12.5	11 34.2	9.7	56.3
15	45 15.3	52.4	321 19.3	12.6	11 24.5	9.8	56.2
16	60 15.2	52.6	335 50.9	12.7	11 14.7	9.8	56.2
17	75 15.1	52.8	350 22.6	12.8	11 04.9	9.8	56.2
18	90 14.9	N22 53.0	4 54.4	12.9	N10 55.1	9.9	56.1
19	105 14.8	53.2	19 26.3	12.9	10 45.2	9.9	56.1
20	120 14.7	53.4	33 58.2	13.0	10 35.3	10.0	56.1
21	135 14.6	53.7	48 30.2	13.0	10 25.3	10.0	56.0
22	150 14.4	53.9	63 02.2	13.1	10 15.3	10.0	56.0
23	165 14.3	54.1	77 34.3	13.2	10 05.3	10.1	56.0
	S.D. 15.8	d 0.2	S.D. 15.8		15.6		15.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	06 19	08 34	10 28
N 70	▭	▭	▭	04 53	07 03	08 57	10 40
68	▭	▭	▭	05 46	07 32	09 14	10 50
66	////	////	00 45	06 19	07 54	09 28	10 59
64	////	////	01 45	06 43	08 11	09 40	11 06
62	////	////	02 18	07 01	08 25	09 50	11 12
60	////	01 10	02 42	07 17	08 37	09 58	11 17
N 58	////	01 50	03 01	07 30	08 48	10 05	11 21
56	////	02 17	03 17	07 41	08 57	10 12	11 25
54	01 04	02 37	03 30	07 51	09 04	10 18	11 29
52	01 41	02 54	03 42	08 00	09 12	10 23	11 32
50	02 06	03 09	03 52	08 08	09 18	10 27	11 35
45	02 49	03 37	04 14	08 24	09 32	10 38	11 42
N 40	03 18	03 59	04 31	08 38	09 43	10 46	11 47
35	03 40	04 16	04 46	08 50	09 52	10 53	11 51
30	03 58	04 31	04 58	09 00	10 01	10 59	11 56
20	04 26	04 55	05 20	09 17	10 15	11 10	12 03
N 10	04 48	05 15	05 38	09 32	10 28	11 20	12 09
0	05 07	05 33	05 55	09 47	10 39	11 28	12 14
S 10	05 23	05 49	06 12	10 01	10 51	11 37	12 20
20	05 39	06 06	06 30	10 16	11 04	11 47	12 26
30	05 55	06 24	06 50	10 33	11 18	11 57	12 33
35	06 03	06 34	07 02	10 43	11 26	12 04	12 37
40	06 12	06 46	07 16	10 55	11 35	12 11	12 42
45	06 22	06 59	07 32	11 08	11 46	12 19	12 47
S 50	06 33	07 14	07 52	11 24	12 00	12 28	12 53
52	06 38	07 21	08 02	11 32	12 06	12 33	12 56
54	06 43	07 29	08 12	11 40	12 13	12 38	12 59
56	06 49	07 38	08 24	11 50	12 20	12 43	13 02
58	06 56	07 48	08 38	12 01	12 28	12 49	13 06
S 60	07 03	07 59	08 55	12 13	12 38	12 56	13 10

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 6	Moonset 7	Moonset 8	Moonset 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	02 48	02 17	01 59
N 70	▭	▭	▭	02 21	02 02	01 52	01 44
68	▭	▭	▭	01 27	01 32	01 33	01 33
66	23 17	////	////	00 53	01 09	01 18	01 23
64	22 15	////	////	00 29	00 51	01 05	01 15
62	21 41	////	////	00 10	00 37	00 55	01 08
60	21 17	22 50	////	24 24	00 24	00 46	01 02
N 58	20 57	22 09	////	24 13	00 13	00 38	00 56
56	20 41	21 42	////	24 04	00 04	00 30	00 52
54	20 28	21 21	22 56	23 55	24 24	00 24	00 47
52	20 16	21 04	22 18	23 48	24 18	00 18	00 43
50	20 06	20 49	21 53	23 41	24 13	00 13	00 40
45	19 44	20 21	21 10	23 26	24 02	00 02	00 32
N 40	19 26	19 59	20 40	23 14	23 52	24 25	00 25
35	19 12	19 41	20 18	23 04	23 44	24 20	00 20
30	18 59	19 27	20 00	22 55	23 37	24 15	00 15
20	18 38	19 02	19 31	22 39	23 25	24 06	00 06
N 10	18 19	18 42	19 09	22 25	23 14	23 58	24 40
0	18 02	18 25	18 51	22 12	23 03	23 51	24 36
S 10	17 45	18 08	18 34	21 59	22 53	23 43	24 31
20	17 28	17 51	18 19	21 45	22 42	23 36	24 27
30	17 07	17 33	18 03	21 29	22 29	23 27	24 22
35	16 55	17 23	17 54	21 20	22 22	23 21	24 19
40	16 41	17 12	17 45	21 09	22 13	23 15	24 16
45	16 25	16 59	17 36	20 56	22 03	23 08	24 12
S 50	16 05	16 43	17 24	20 41	21 51	23 00	24 07
52	15 56	16 36	17 19	20 33	21 45	22 56	24 05
54	15 45	16 28	17 14	20 25	21 39	22 52	24 02
56	15 33	16 19	17 08	20 16	21 32	22 47	24 00
58	15 19	16 10	17 02	20 06	21 24	22 42	23 57
S 60	15 02	15 59	16 55	19 54	21 15	22 36	23 54

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
6	01 31	01 25	11 59	16 00	03 32	04	◐
7	01 20	01 14	11 59	16 51	04 26	05	
8	01 09	01 03	11 59	17 40	05 16	06	

G.M.T.		ARIES	VENUS −3.3			MARS +1.6			JUPITER −1.7			SATURN +1.1		
		G.H.A.	G.H.A.	Dec.		G.H.A.	Dec.		G.H.A.	Dec.		G.H.A.	Dec.	
d	h	° ′	° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′	
9	00	257 16.5	162 15.9	N24	21.4	196 39.4	N20	45.1	76 06.6	N 1	00.3	73 31.5	N 1	05.2
	01	272 18.9	177 15.0		21.4	211 40.0		45.5	91 09.0		00.2	88 34.0		05.1
	02	287 21.4	192 14.1		21.3	226 40.6		45.9	106 11.4		00.2	103 36.4		05.1
	03	302 23.9	207 13.2	··	21.3	241 41.2	··	46.3	121 13.7	··	00.1	118 38.9	··	05.1
	04	317 26.3	222 12.3		21.3	256 41.8		46.6	136 16.1		00.1	133 41.4		05.1
	05	332 28.8	237 11.4		21.2	271 42.4		47.0	151 18.5		00.0	148 43.8		05.1
	06	347 31.3	252 10.5	N24	21.2	286 43.0	N20	47.4	166 20.9	N 1	00.0	163 46.3	N 1	05.1
	07	2 33.7	267 09.6		21.2	301 43.6		47.8	181 23.3	0	59.9	178 48.7		05.0
	08	17 36.2	282 08.7		21.2	316 44.2		48.1	196 25.7		59.9	193 51.2		05.0
	09	32 38.7	297 07.8	··	21.1	331 44.8	··	48.5	211 28.0	··	59.8	208 53.6	··	05.0
	10	47 41.1	312 06.9		21.1	346 45.4		48.9	226 30.4		59.8	223 56.1		05.0
TUESDAY	11	62 43.6	327 06.0		21.1	1 46.0		49.2	241 32.8		59.8	238 58.5		05.0
	12	77 46.1	342 05.2	N24	21.0	16 46.6	N20	49.6	256 35.2	N 0	59.7	254 01.0	N 1	05.0
	13	92 48.5	357 04.3		21.0	31 47.2		50.0	271 37.6		59.7	269 03.4		04.9
	14	107 51.0	12 03.4		20.9	46 47.8		50.3	286 39.9		59.6	284 05.9		04.9
	15	122 53.4	27 02.5	··	20.9	61 48.4	··	50.7	301 42.3	··	59.6	299 08.3	··	04.9
	16	137 55.9	42 01.6		20.9	76 49.1		51.1	316 44.7		59.5	314 10.8		04.9
	17	152 58.4	57 00.7		20.8	91 49.7		51.4	331 47.1		59.5	329 13.2		04.9
	18	168 00.8	71 59.8	N24	20.8	106 50.3	N20	51.8	346 49.5	N 0	59.4	344 15.7	N 1	04.9
	19	183 03.3	86 58.9		20.7	121 50.9		52.2	1 51.8		59.4	359 18.1		04.8
	20	198 05.8	101 58.0		20.7	136 51.5		52.6	16 54.2		59.3	14 20.6		04.8
	21	213 08.2	116 57.1	··	20.6	151 52.1	··	52.9	31 56.6	··	59.3	29 23.0	··	04.8
	22	228 10.7	131 56.2		20.6	166 52.7		53.3	46 59.0		59.2	44 25.5		04.8
	23	243 13.2	146 55.3		20.5	181 53.3		53.6	62 01.4		59.2	59 27.9		04.8
10	00	258 15.6	161 54.5	N24	20.5	196 53.9	N20	54.0	77 03.7	N 0	59.1	74 30.4	N 1	04.8
	01	273 18.1	176 53.6		20.4	211 54.5		54.4	92 06.1		59.1	89 32.8		04.7
	02	288 20.6	191 52.7		20.4	226 55.1		54.7	107 08.5		59.0	104 35.3		04.7
	03	303 23.0	206 51.8	··	20.3	241 55.7	··	55.1	122 10.9	··	59.0	119 37.7	··	04.7
	04	318 25.5	221 50.9		20.3	256 56.3		55.5	137 13.2		58.9	134 40.2		04.7
	05	333 27.9	236 50.0		20.2	271 56.9		55.8	152 15.6		58.9	149 42.6		04.7
	06	348 30.4	251 49.1	N24	20.1	286 57.5	N20	56.2	167 18.0	N 0	58.8	164 45.1	N 1	04.7
	07	3 32.9	266 48.2		20.1	301 58.1		56.6	182 20.4		58.8	179 47.5		04.6
WEDNESDAY	08	18 35.3	281 47.3		20.0	316 58.7		56.9	197 22.8		58.7	194 49.9		04.6
	09	33 37.8	296 46.4	··	20.0	331 59.3	··	57.3	212 25.1	··	58.7	209 52.4	··	04.6
	10	48 40.3	311 45.5		19.9	346 59.9		57.7	227 27.5		58.6	224 54.8		04.6
	11	63 42.7	326 44.7		19.8	2 00.5		58.0	242 29.9		58.6	239 57.3		04.6
	12	78 45.2	341 43.8	N24	19.8	17 01.1	N20	58.4	257 32.3	N 0	58.5	254 59.7	N 1	04.6
	13	93 47.7	356 42.9		19.7	32 01.7		58.7	272 34.6		58.5	270 02.2		04.5
	14	108 50.1	11 42.0		19.6	47 02.3		59.1	287 37.0		58.4	285 04.6		04.5
	15	123 52.6	26 41.1	··	19.6	62 02.9	··	59.5	302 39.4	··	58.4	300 07.1	··	04.5
	16	138 55.0	41 40.2		19.5	77 03.5	20	59.8	317 41.8		58.3	315 09.5		04.5
	17	153 57.5	56 39.3		19.4	92 04.1	21	00.2	332 44.1		58.3	330 12.0		04.5
	18	169 00.0	71 38.4	N24	19.3	107 04.7	N21	00.5	347 46.5	N 0	58.2	345 14.4	N 1	04.4
	19	184 02.4	86 37.5		19.3	122 05.3		00.9	2 48.9		58.2	0 16.9		04.4
	20	199 04.9	101 36.6		19.2	137 05.9		01.3	17 51.2		58.1	15 19.3		04.4
	21	214 07.4	116 35.8	··	19.1	152 06.5	··	01.6	32 53.6	··	58.1	30 21.8	··	04.4
	22	229 09.8	131 34.9		19.0	167 07.1		02.0	47 56.0		58.0	45 24.2		04.4
	23	244 12.3	146 34.0		18.9	182 07.7		02.3	62 58.4		58.0	60 26.6		04.3
11	00	259 14.8	161 33.1	N24	18.9	197 08.3	N21	02.7	78 00.7	N 0	57.9	75 29.1	N 1	04.3
	01	274 17.2	176 32.2		18.8	212 08.9		03.0	93 03.1		57.9	90 31.5		04.3
	02	289 19.7	191 31.3		18.7	227 09.6		03.4	108 05.5		57.8	105 34.0		04.3
	03	304 22.2	206 30.4	··	18.6	242 10.2	··	03.8	123 07.8	··	57.8	120 36.4	··	04.3
	04	319 24.6	221 29.5		18.5	257 10.8		04.1	138 10.2		57.7	135 38.9		04.3
	05	334 27.1	236 28.6		18.4	272 11.4		04.5	153 12.6		57.7	150 41.3		04.2
	06	349 29.5	251 27.7	N24	18.3	287 12.0	N21	04.8	168 15.0	N 0	57.6	165 43.8	N 1	04.2
	07	4 32.0	266 26.9		18.3	302 12.6		05.2	183 17.3		57.6	180 46.2		04.2
THURSDAY	08	19 34.5	281 26.0		18.2	317 13.2		05.5	198 19.7		57.5	195 48.6		04.2
	09	34 36.9	296 25.1	··	18.1	332 13.8	··	05.9	213 22.1	··	57.5	210 51.1	··	04.2
	10	49 39.4	311 24.2		18.0	347 14.4		06.2	228 24.4		57.4	225 53.5		04.1
	11	64 41.9	326 23.3		17.9	2 15.0		06.6	243 26.8		57.4	240 56.0		04.1
	12	79 44.3	341 22.4	N24	17.8	17 15.6	N21	06.9	258 29.2	N 0	57.3	255 58.4	N 1	04.1
	13	94 46.8	356 21.5		17.7	32 16.2		07.3	273 31.5		57.3	271 00.9		04.1
	14	109 49.3	11 20.6		17.6	47 16.8		07.6	288 33.9		57.2	286 03.3		04.1
	15	124 51.7	26 19.8	··	17.5	62 17.4	··	08.0	303 36.3	··	57.2	301 05.8	··	04.0
	16	139 54.2	41 18.9		17.4	77 18.0		08.3	318 38.6		57.1	316 08.2		04.0
	17	154 56.7	56 18.0		17.3	92 18.6		08.7	333 41.0		57.0	331 10.6		04.0
	18	169 59.1	71 17.1	N24	17.2	107 19.2	N21	09.1	348 43.4	N 0	57.0	346 13.1	N 1	04.0
	19	185 01.6	86 16.2		17.1	122 19.8		09.4	3 45.7		56.9	1 15.5		04.0
	20	200 04.0	101 15.3		17.0	137 20.4		09.8	18 48.1		56.9	16 18.0		03.9
	21	215 06.5	116 14.4	··	16.9	152 21.0	··	10.1	33 50.5	··	56.8	31 20.4	··	03.9
	22	230 09.0	131 13.6		16.8	167 21.6		10.4	48 52.8		56.8	46 22.8		03.9
	23	245 11.4	146 12.7		16.6	182 22.2		10.8	63 55.2		56.7	61 25.3		03.9
Mer. Pass.		h m 6 45.8	v -0.9	d	0.1	v 0.6	d	0.4	v 2.4	d	0.0	v 2.4	d	0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.2	S40 22.7
Achernar	335 45.3	S57 19.7
Acrux	173 36.5	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.9	N56 04.0
Alkaid	153 17.8	N49 24.7
Al Na'ir	28 14.2	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.9	N28 59.0
Altair	62 31.8	N 8 49.1
Ankaa	353 39.9	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.5	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.3
Capella	281 11.1	N45 58.7
Deneb	49 47.8	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.5	S18 05.3
Dubhe	194 21.6	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 57.0	N51 29.5
Enif	34 11.0	N 9 47.3
Fomalhaut	15 50.8	S29 43.2
Gacrux	172 28.0	S57 00.7
Gienah	176 17.4	S17 26.4
Hadar	149 22.2	S60 17.1
Hamal	328 28.6	N23 22.3
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.1	N74 14.2
Markab	14 02.7	N15 06.1
Menkar	314 40.9	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.3	S69 38.7
Mirfak	309 15.9	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.2	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.6	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.6	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.6
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.1	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	263 38.8	13 13
Mars	298 38.3	10 52
Jupiter	178 48.1	18 49
Saturn	176 14.7	18 59

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
9 00	180 14.2	N22 54.3	92 06.5	13.3	N 9 55.2	10.1	55.9
01	195 14.1	54.5	106 38.8	13.3	9 45.1	10.1	55.9
02	210 14.0	54.7	121 11.1	13.3	9 35.0	10.2	55.9
03	225 13.8	54.9	135 43.4	13.5	9 24.8	10.2	55.8
04	240 13.7	55.2	150 15.9	13.5	9 14.6	10.2	55.8
05	255 13.6	55.4	164 48.4	13.6	9 04.4	10.3	55.8
06	270 13.5	N22 55.6	179 21.0	13.6	N 8 54.1	10.3	55.7
07	285 13.4	55.8	193 53.6	13.7	8 43.8	10.3	55.7
08	300 13.2	56.0	208 26.3	13.7	8 33.5	10.3	55.7
09	315 13.1	56.2	222 59.0	13.8	8 23.2	10.4	55.7
10	330 13.0	56.4	237 31.8	13.9	8 12.8	10.4	55.6
11	345 12.9	56.6	252 04.7	13.9	8 02.4	10.4	55.6
12	0 12.7	N22 56.8	266 37.6	13.9	N 7 52.0	10.4	55.6
13	15 12.6	57.0	281 10.5	14.1	7 41.6	10.5	55.5
14	30 12.5	57.2	295 43.6	14.0	7 31.1	10.4	55.5
15	45 12.4	57.4	310 16.6	14.2	7 20.7	10.6	55.5
16	60 12.3	57.6	324 49.8	14.1	7 10.1	10.5	55.5
17	75 12.1	57.8	339 22.9	14.3	6 59.6	10.5	55.4
18	90 12.0	N22 58.0	353 56.2	14.2	N 6 49.1	10.6	55.4
19	105 11.9	58.2	8 29.4	14.4	6 38.5	10.6	55.4
20	120 11.8	58.4	23 02.8	14.3	6 27.9	10.6	55.3
21	135 11.6	58.6	37 36.1	14.5	6 17.3	10.6	55.3
22	150 11.5	58.8	52 09.6	14.4	6 06.7	10.6	55.3
23	165 11.4	59.0	66 43.0	14.5	5 56.1	10.7	55.3
10 00	180 11.3	N22 59.2	81 16.5	14.6	N 5 45.4	10.6	55.2
01	195 11.1	59.4	95 50.1	14.6	5 34.8	10.7	55.2
02	210 11.0	59.6	110 23.7	14.6	5 24.1	10.7	55.2
03	225 10.9	22 59.8	124 57.3	14.7	5 13.4	10.7	55.2
04	240 10.8	23 00.0	139 31.0	14.8	5 02.7	10.7	55.1
05	255 10.7	00.2	154 04.8	14.7	4 52.0	10.7	55.1
06	270 10.5	N23 00.4	168 38.5	14.8	N 4 41.3	10.8	55.1
07	285 10.4	00.6	183 12.3	14.9	4 30.5	10.7	55.1
08	300 10.3	00.8	197 46.2	14.8	4 19.8	10.8	55.0
09	315 10.2	01.0	212 20.0	15.0	4 09.0	10.7	55.0
10	330 10.0	01.2	226 54.0	14.9	3 58.3	10.8	55.0
11	345 09.9	01.3	241 27.9	15.0	3 47.5	10.8	55.0
12	0 09.8	N23 01.5	256 01.9	15.0	N 3 36.7	10.8	55.0
13	15 09.7	01.7	270 35.9	15.1	3 25.9	10.8	54.9
14	30 09.5	01.9	285 10.0	15.0	3 15.1	10.8	54.9
15	45 09.4	02.1	299 44.0	15.2	3 04.3	10.8	54.9
16	60 09.3	02.3	314 18.2	15.1	2 53.5	10.8	54.9
17	75 09.2	02.5	328 52.3	15.2	2 42.7	10.8	54.9
18	90 09.0	N23 02.7	343 26.5	15.2	N 2 31.9	10.8	54.8
19	105 08.9	02.8	358 00.7	15.2	2 21.1	10.8	54.8
20	120 08.8	03.0	12 34.9	15.2	2 10.3	10.8	54.8
21	135 08.7	03.2	27 09.1	15.3	1 59.5	10.8	54.8
22	150 08.5	03.4	41 43.4	15.3	1 48.7	10.8	54.8
23	165 08.4	03.6	56 17.7	15.3	1 37.9	10.9	54.7
11 00	180 08.3	N23 03.7	70 52.0	15.4	N 1 27.0	10.8	54.7
01	195 08.2	03.9	85 26.4	15.4	1 16.2	10.8	54.7
02	210 08.0	04.1	100 00.8	15.3	1 05.4	10.8	54.7
03	225 07.9	04.3	114 35.1	15.5	0 54.6	10.8	54.7
04	240 07.8	04.5	129 09.6	15.4	0 43.8	10.8	54.6
05	255 07.7	04.6	143 44.0	15.4	0 33.0	10.8	54.6
06	270 07.5	N23 04.8	158 18.4	15.5	N 0 22.2	10.8	54.6
07	285 07.4	05.0	172 52.9	15.5	0 11.4	10.8	54.6
08	300 07.3	05.2	187 27.4	15.5	N 0 00.6	10.8	54.6
09	315 07.1	05.3	202 01.9	15.5	S 0 10.2	10.7	54.6
10	330 07.0	05.5	216 36.4	15.5	0 20.9	10.8	54.5
11	345 06.9	05.7	231 10.9	15.5	0 31.7	10.8	54.5
12	0 06.8	N23 05.9	245 45.4	15.6	S 0 42.5	10.7	54.5
13	15 06.6	06.0	260 20.0	15.6	0 53.2	10.8	54.5
14	30 06.5	06.2	274 54.6	15.5	1 04.0	10.7	54.5
15	45 06.4	06.4	289 29.1	15.6	1 14.7	10.7	54.5
16	60 06.3	06.5	304 03.7	15.6	1 25.4	10.8	54.4
17	75 06.1	06.7	318 38.3	15.6	1 36.2	10.7	54.4
18	90 06.0	N23 06.9	333 12.9	15.6	S 1 46.9	10.7	54.4
19	105 05.9	07.0	347 47.5	15.6	1 57.6	10.6	54.4
20	120 05.8	07.2	2 22.1	15.6	2 08.2	10.7	54.4
21	135 05.6	07.4	16 56.7	15.6	2 18.9	10.7	54.4
22	150 05.5	07.5	31 31.3	15.7	2 29.6	10.6	54.4
23	165 05.4	07.7	46 06.0	15.6	2 40.2	10.6	54.4
	S.D. 15.8	d 0.2	S.D. 15.1		15.0		14.9

TUESDAY

WEDNESDAY

THURSDAY

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	10 28	12 13	13 54	15 35
N 70	▭	▭	▭	10 40	12 18	13 53	15 26
68	▭	▭	▭	10 50	12 22	13 51	15 20
66	////	////	00 29	10 59	12 26	13 50	15 14
64	////	////	01 39	11 06	12 29	13 49	15 09
62	////	////	02 14	11 12	12 31	13 49	15 05
60	////	01 03	02 39	11 17	12 33	13 48	15 02
N 58	////	01 46	02 59	11 21	12 35	13 47	14 59
56	////	02 14	03 15	11 25	12 37	13 47	14 56
54	00 57	02 35	03 29	11 29	12 38	13 46	14 53
52	01 37	02 53	03 41	11 32	12 40	13 46	14 51
50	02 03	03 07	03 51	11 35	12 41	13 45	14 49
45	02 47	03 36	04 13	11 42	12 44	13 45	14 45
N 40	03 17	03 58	04 31	11 47	12 46	13 44	14 41
35	03 39	04 16	04 45	11 51	12 48	13 43	14 38
30	03 58	04 31	04 58	11 56	12 50	13 43	14 35
20	04 26	04 55	05 20	12 03	12 53	13 42	14 30
N 10	04 48	05 15	05 38	12 09	12 55	13 41	14 26
0	05 07	05 33	05 56	12 14	12 58	13 40	14 22
S 10	05 24	05 50	06 13	12 20	13 00	13 39	14 18
20	05 40	06 07	06 31	12 26	13 03	13 39	14 14
30	05 56	06 25	06 52	12 33	13 06	13 38	14 09
35	06 04	06 36	07 04	12 37	13 08	13 37	14 07
40	06 13	06 47	07 18	12 42	13 10	13 37	14 04
45	06 23	07 01	07 34	12 47	13 12	13 36	14 00
S 50	06 35	07 16	07 54	12 53	13 15	13 36	13 56
52	06 40	07 23	08 04	12 56	13 16	13 35	13 54
54	06 45	07 31	08 15	12 59	13 17	13 35	13 52
56	06 51	07 40	08 27	13 02	13 19	13 34	13 50
58	06 58	07 50	08 41	13 06	13 21	13 34	13 47
S 60	07 05	08 02	08 58	13 10	13 22	13 34	13 45

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	01 59	01 45	01 32	01 20
N 70	▭	▭	▭	01 44	01 38	01 31	01 24
68	▭	▭	▭	01 33	01 31	01 30	01 28
66	23 37	////	////	01 23	01 26	01 29	01 31
64	22 21	////	////	01 15	01 22	01 28	01 33
62	21 46	////	////	01 08	01 18	01 27	01 36
60	21 20	22 58	////	01 02	01 15	01 26	01 38
N 58	21 01	22 14	////	00 56	01 12	01 26	01 39
56	20 44	21 46	////	00 52	01 09	01 25	01 41
54	20 31	21 24	23 04	00 47	01 07	01 25	01 42
52	20 19	21 07	22 22	00 43	01 05	01 24	01 43
50	20 08	20 52	21 56	00 40	01 03	01 24	01 45
45	19 46	20 23	21 12	00 32	00 58	01 23	01 47
N 40	19 28	20 01	20 42	00 25	00 55	01 22	01 49
35	19 13	19 43	20 19	00 20	00 52	01 22	01 51
30	19 01	19 28	20 01	00 15	00 49	01 21	01 53
20	18 39	19 03	19 33	00 06	00 44	01 20	01 56
N 10	18 20	18 43	19 10	24 40	00 40	01 19	01 58
0	18 03	18 25	18 52	24 36	00 36	01 18	02 00
S 10	17 46	18 09	18 35	24 31	00 31	01 17	02 03
20	17 28	17 52	18 19	24 27	00 27	01 17	02 05
30	17 07	17 33	18 03	24 22	00 22	01 15	02 08
35	16 55	17 23	17 54	24 19	00 19	01 15	02 10
40	16 41	17 11	17 45	24 16	00 16	01 14	02 11
45	16 24	16 58	17 35	24 12	00 12	01 13	02 14
S 50	16 04	16 42	17 24	24 07	00 07	01 12	02 16
52	15 54	16 35	17 19	24 05	00 05	01 12	02 17
54	15 44	16 27	17 13	24 02	00 02	01 11	02 19
56	15 31	16 18	17 07	24 00	00 00	01 10	02 20
58	15 17	16 08	17 00	23 57	25 10	01 10	02 22
S 60	15 00	15 57	16 53	23 54	25 09	01 09	02 23

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
9	00 57	00 51	11 59	18 25	06 03	07	◐
10	00 45	00 39	11 59	19 08	06 47	08	
11	00 33	00 27	12 00	19 50	07 29	09	

G.M.T.		ARIES	VENUS −3.3			MARS +1.7			JUPITER −1.7			SATURN +1.1		
		G.H.A.	G.H.A.	Dec.		G.H.A.	Dec.		G.H.A.	Dec.		G.H.A.	Dec.	
d	h	° ′	° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′	
12	00	260 13.9	161 11.8	N24	16.5	197 22.8	N21	11.1	78 57.6	N 0	56.7	76 27.7	N 1	03.9
	01	275 16.4	176 10.9		16.4	212 23.4		11.5	93 59.9		56.6	91 30.2		03.8
	02	290 18.8	191 10.0		16.3	227 24.0		11.8	109 02.3		56.6	106 32.6		03.8
	03	305 21.3	206 09.1	··	16.2	242 24.6	··	12.2	124 04.7	··	56.5	121 35.1	··	03.8
	04	320 23.8	221 08.2		16.1	257 25.2		12.5	139 07.0		56.5	136 37.5		03.8
	05	335 26.2	236 07.3		16.0	272 25.8		12.9	154 09.4		56.4	151 39.9		03.8
	06	350 28.7	251 06.5	N24	15.8	287 26.4	N21	13.2	169 11.8	N 0	56.3	166 42.4	N 1	03.7
	07	5 31.1	266 05.6		15.7	302 27.0		13.6	184 14.1		56.3	181 44.8		03.7
	08	20 33.6	281 04.7		15.6	317 27.6		13.9	199 16.5		56.2	196 47.3		03.7
F	09	35 36.1	296 03.8	··	15.5	332 28.2	··	14.3	214 18.8	··	56.2	211 49.7	··	03.7
R	10	50 38.5	311 02.9		15.3	347 28.8		14.6	229 21.2		56.1	226 52.1		03.7
I	11	65 41.0	326 02.0		15.2	2 29.4		15.0	244 23.6		56.1	241 54.6		03.6
D	12	80 43.5	341 01.2	N24	15.1	17 30.0	N21	15.3	259 25.9	N 0	56.0	256 57.0	N 1	03.6
A	13	95 45.9	356 00.3		15.0	32 30.6		15.6	274 28.3		56.0	271 59.5		03.6
Y	14	110 48.4	10 59.4		14.8	47 31.2		16.0	289 30.7		55.9	287 01.9		03.6
	15	125 50.9	25 58.5	··	14.7	62 31.8	··	16.3	304 33.0	··	55.8	302 04.3	··	03.5
	16	140 53.3	40 57.6		14.6	77 32.4		16.7	319 35.4		55.8	317 06.8		03.5
	17	155 55.8	55 56.7		14.4	92 33.0		17.0	334 37.7		55.7	332 09.2		03.5
	18	170 58.3	70 55.9	N24	14.3	107 33.6	N21	17.4	349 40.1	N 0	55.7	347 11.6	N 1	03.5
	19	186 00.7	85 55.0		14.2	122 34.2		17.7	4 42.5		55.6	2 14.1		03.5
	20	201 03.2	100 54.1		14.0	137 34.8		18.0	19 44.8		55.6	17 16.5		03.4
	21	216 05.6	115 53.2	··	13.9	152 35.4	··	18.4	34 47.2	··	55.5	32 19.0	··	03.4
	22	231 08.1	130 52.3		13.8	167 36.0		18.7	49 49.5		55.5	47 21.4		03.4
	23	246 10.6	145 51.4		13.6	182 36.6		19.1	64 51.9		55.4	62 23.8		03.4
13	00	261 13.0	160 50.6	N24	13.5	197 37.2	N21	19.4	79 54.3	N 0	55.3	77 26.3	N 1	03.3
	01	276 15.5	175 49.7		13.3	212 37.8		19.7	94 56.6		55.3	92 28.7		03.3
	02	291 18.0	190 48.8		13.2	227 38.4		20.1	109 59.0		55.2	107 31.1		03.3
	03	306 20.4	205 47.9	··	13.1	242 39.0	··	20.4	125 01.3	··	55.2	122 33.6	··	03.3
	04	321 22.9	220 47.0		12.9	257 39.6		20.8	140 03.7		55.1	137 36.0		03.3
	05	336 25.4	235 46.1		12.8	272 40.2		21.1	155 06.0		55.1	152 38.5		03.2
	06	351 27.8	250 45.3	N24	12.6	287 40.8	N21	21.4	170 08.4	N 0	55.0	167 40.9	N 1	03.2
	07	6 30.3	265 44.4		12.5	302 41.4		21.8	185 10.8		54.9	182 43.3		03.2
S	08	21 32.8	280 43.5		12.3	317 42.0		22.1	200 13.1		54.9	197 45.8		03.2
A	09	36 35.2	295 42.6	··	12.2	332 42.6	··	22.5	215 15.5	··	54.8	212 48.2	··	03.1
T	10	51 37.7	310 41.7		12.0	347 43.2		22.8	230 17.8		54.8	227 50.6		03.1
U	11	66 40.1	325 40.9		11.8	2 43.8		23.1	245 20.2		54.7	242 53.1		03.1
R	12	81 42.6	340 40.0	N24	11.7	17 44.4	N21	23.5	260 22.5	N 0	54.7	257 55.5	N 1	03.1
D	13	96 45.1	355 39.1		11.5	32 45.0		23.8	275 24.9		54.6	272 57.9		03.1
A	14	111 47.5	10 38.2		11.4	47 45.6		24.1	290 27.2		54.5	288 00.4		03.0
Y	15	126 50.0	25 37.3	··	11.2	62 46.2	··	24.5	305 29.6	··	54.5	303 02.8	··	03.0
	16	141 52.5	40 36.5		11.1	77 46.8		24.8	320 32.0		54.4	318 05.2		03.0
	17	156 54.9	55 35.6		10.9	92 47.4		25.1	335 34.3		54.4	333 07.7		03.0
	18	171 57.4	70 34.7	N24	10.7	107 48.0	N21	25.5	350 36.7	N 0	54.3	348 10.1	N 1	02.9
	19	186 59.9	85 33.8		10.6	122 48.6		25.8	5 39.0		54.2	3 12.6		02.9
	20	202 02.3	100 32.9		10.4	137 49.2		26.1	20 41.4		54.2	18 15.0		02.9
	21	217 04.8	115 32.1	··	10.2	152 49.8	··	26.5	35 43.7	··	54.1	33 17.4	··	02.9
	22	232 07.2	130 31.2		10.1	167 50.4		26.8	50 46.1		54.1	48 19.9		02.8
	23	247 09.7	145 30.3		09.9	182 51.0		27.1	65 48.4		54.0	63 22.3		02.8
14	00	262 12.2	160 29.4	N24	09.7	197 51.6	N21	27.5	80 50.8	N 0	53.9	78 24.7	N 1	02.8
	01	277 14.6	175 28.5		09.6	212 52.2		27.8	95 53.1		53.9	93 27.2		02.8
	02	292 17.1	190 27.7		09.4	227 52.8		28.1	110 55.5		53.8	108 29.6		02.7
	03	307 19.6	205 26.8	··	09.2	242 53.4	··	28.5	125 57.8	··	53.8	123 32.0	··	02.7
	04	322 22.0	220 25.9		09.0	257 54.0		28.8	141 00.2		53.7	138 34.5		02.7
	05	337 24.5	235 25.0		08.9	272 54.6		29.1	156 02.5		53.6	153 36.9		02.7
	06	352 27.0	250 24.2	N24	08.7	287 55.2	N21	29.4	171 04.9	N 0	53.6	168 39.3	N 1	02.7
	07	7 29.4	265 23.3		08.5	302 55.8		29.8	186 07.2		53.5	183 41.8		02.6
	08	22 31.9	280 22.4		08.3	317 56.4		30.1	201 09.6		53.5	198 44.2		02.6
S	09	37 34.4	295 21.5	··	08.1	332 57.0	··	30.4	216 11.9	··	53.4	213 46.6	··	02.6
U	10	52 36.8	310 20.7		07.9	347 57.6		30.8	231 14.3		53.3	228 49.1		02.6
N	11	67 39.3	325 19.8		07.8	2 58.2		31.1	246 16.6		53.3	243 51.5		02.5
D	12	82 41.7	340 18.9	N24	07.6	17 58.8	N21	31.4	261 19.0	N 0	53.2	258 53.9	N 1	02.5
A	13	97 44.2	355 18.0		07.4	32 59.4		31.7	276 21.3		53.2	273 56.3		02.5
Y	14	112 46.7	10 17.1		07.2	48 00.0		32.1	291 23.7		53.1	288 58.8		02.5
	15	127 49.1	25 16.3	··	07.0	63 00.6	··	32.4	306 26.0	··	53.0	304 01.2	··	02.4
	16	142 51.6	40 15.4		06.8	78 01.2		32.7	321 28.4		53.0	319 03.6		02.4
	17	157 54.1	55 14.5		06.6	93 01.8		33.0	336 30.7		52.9	334 06.1		02.4
	18	172 56.5	70 13.6	N24	06.4	108 02.4	N21	33.4	351 33.1	N 0	52.9	349 08.5	N 1	02.4
	19	187 59.0	85 12.8		06.2	123 03.0		33.7	6 35.4		52.8	4 10.9		02.3
	20	203 01.5	100 11.9		06.0	138 03.6		34.0	21 37.8		52.7	19 13.4		02.3
	21	218 03.9	115 11.0	··	05.8	153 04.2	··	34.3	36 40.1	··	52.7	34 15.8	··	02.3
	22	233 06.4	130 10.2		05.7	168 04.8		34.7	51 42.5		52.6	49 18.2		02.3
	23	248 08.9	145 09.3		05.5	183 05.4		35.0	66 44.8		52.5	64 20.7		02.2
Me. Pass.		h m 6 34.1	v −0.9	d	0.2	v 0.6	d	0.3	v 2.4	d	0.1	v 2.4	d	0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.2	S40 22.7
Achernar	335 45.2	S57 19.7
Acrux	173 36.5	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.9	N56 04.0
Alkaid	153 17.8	N49 24.7
Al Na'ir	28 14.2	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.9	N28 59.0
Altair	62 31.8	N 8 49.1
Ankaa	353 39.9	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.5	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.3
Capella	281 11.1	N45 58.7
Deneb	49 47.8	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.5	S18 05.3
Dubhe	194 21.6	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 57.0	N51 29.5
Enif	34 10.9	N 9 47.3
Fomalhaut	15 50.8	S29 43.2
Gacrux	172 28.0	S57 00.7
Gienah	176 17.4	S17 26.4
Hadar	149 22.2	S60 17.2
Hamal	328 28.6	N23 22.3
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.1	N74 14.2
Markab	14 02.6	N15 06.1
Menkar	314 40.9	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.4	S69 38.7
Mirfak	309 15.8	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.2	S56 47.5
Pollux	243 57.9	N28 04.4
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.6	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.1	N38 45.9
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	259 37.5	13 17
Mars	296 24.2	10 49
Jupiter	178 41.2	18 37
Saturn	176 13.2	18 47

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
12 00	180 05.2	N23 07.9	60 40.6	15.6	S 2 50.8	10.6	54.3
01	195 05.1	08.0	75 15.2	15.7	3 01.4	10.6	54.3
02	210 05.0	08.2	89 49.9	15.6	3 12.0	10.6	54.3
03	225 04.9	·· 08.3	104 24.5	15.6	3 22.6	10.6	54.3
04	240 04.7	08.5	118 59.1	15.7	3 33.2	10.5	54.3
05	255 04.6	08.7	133 33.8	15.6	3 43.7	10.5	54.3
06	270 04.5	N23 08.8	148 08.4	15.6	S 3 54.2	10.6	54.3
07	285 04.4	09.0	162 43.0	15.6	4 04.8	10.4	54.3
08	300 04.2	09.1	177 17.6	15.7	4 15.2	10.5	54.2
F 09	315 04.1	·· 09.3	191 52.3	15.6	4 25.7	10.5	54.2
R 10	330 04.0	09.5	206 26.9	15.6	4 36.2	10.4	54.2
I 11	345 03.8	09.6	221 01.5	15.6	4 46.6	10.4	54.2
D 12	0 03.7	N23 09.8	235 36.1	15.6	S 4 57.0	10.4	54.2
A 13	15 03.6	09.9	250 10.7	15.6	5 07.4	10.3	54.2
Y 14	30 03.5	10.1	264 45.3	15.5	5 17.7	10.4	54.2
15	45 03.3	·· 10.2	279 19.8	15.6	5 28.1	10.3	54.2
16	60 03.2	10.4	293 54.4	15.6	5 38.4	10.3	54.2
17	75 03.1	10.5	308 29.0	15.5	5 48.7	10.3	54.2
18	90 02.9	N23 10.7	323 03.5	15.5	S 5 59.0	10.2	54.2
19	105 02.8	10.8	337 38.0	15.6	6 09.2	10.2	54.2
20	120 02.7	11.0	352 12.6	15.5	6 19.4	10.2	54.1
21	135 02.6	·· 11.1	6 47.1	15.5	6 29.6	10.2	54.1
22	150 02.4	11.3	21 21.6	15.4	6 39.8	10.1	54.1
23	165 02.3	11.4	35 56.0	15.5	6 49.9	10.1	54.1
13 00	180 02.2	N23 11.6	50 30.5	15.5	S 7 00.0	10.1	54.1
01	195 02.0	11.7	65 05.0	15.4	7 10.1	10.0	54.1
02	210 01.9	11.9	79 39.4	15.4	7 20.1	10.0	54.1
03	225 01.8	·· 12.0	94 13.8	15.4	7 30.1	10.0	54.1
04	240 01.7	12.1	108 48.2	15.4	7 40.1	10.0	54.1
05	255 01.5	12.3	123 22.6	15.3	7 50.1	9.9	54.1
06	270 01.4	N23 12.4	137 56.9	15.4	S 8 00.0	9.9	54.1
07	285 01.3	12.6	152 31.3	15.3	8 09.9	9.9	54.1
S 08	300 01.1	12.7	167 05.6	15.3	8 19.8	9.8	54.1
A 09	315 01.0	·· 12.8	181 39.9	15.3	8 29.6	9.8	54.1
T 10	330 00.9	13.0	196 14.2	15.2	8 39.4	9.7	54.1
U 11	345 00.8	13.1	210 48.4	15.2	8 49.1	9.7	54.1
R 12	0 00.6	N23 13.3	225 22.6	15.2	S 8 58.8	9.7	54.1
D 13	15 00.5	13.4	239 56.8	15.2	9 08.5	9.7	54.1
A 14	30 00.4	13.5	254 31.0	15.2	9 18.2	9.6	54.1
Y 15	45 00.2	·· 13.7	269 05.2	15.1	9 27.8	9.6	54.1
16	60 00.1	13.8	283 39.3	15.1	9 37.4	9.5	54.0
17	75 00.0	13.9	298 13.4	15.1	9 46.9	9.5	54.0
18	89 59.8	N23 14.1	312 47.5	15.0	S 9 56.4	9.4	54.0
19	104 59.7	14.2	327 21.5	15.0	10 05.8	9.5	54.0
20	119 59.6	14.3	341 55.5	15.0	10 15.3	9.3	54.0
21	134 59.5	·· 14.5	356 29.5	15.0	10 24.6	9.4	54.0
22	149 59.3	14.6	11 03.5	14.9	10 34.0	9.3	54.0
23	164 59.2	14.7	25 37.4	14.9	10 43.3	9.2	54.0
14 00	179 59.1	N23 14.9	40 11.3	14.9	S10 52.5	9.2	54.0
01	194 58.9	15.0	54 45.2	14.8	11 01.7	9.2	54.0
02	209 58.8	15.1	69 19.0	14.8	11 10.9	9.1	54.0
03	224 58.7	·· 15.2	83 52.8	14.8	11 20.0	9.1	54.0
04	239 58.5	15.4	98 26.6	14.7	11 29.1	9.0	54.0
05	254 58.4	15.5	113 00.3	14.7	11 38.1	9.0	54.0
06	269 58.3	N23 15.6	127 34.0	14.7	S11 47.1	8.9	54.0
07	284 58.1	15.7	142 07.7	14.6	11 56.0	8.9	54.0
08	299 58.0	15.9	156 41.3	14.6	12 04.9	8.8	54.0
S 09	314 57.9	·· 16.0	171 14.9	14.6	12 13.7	8.8	54.0
U 10	329 57.8	16.1	185 48.5	14.5	12 22.5	8.8	54.0
N 11	344 57.6	16.2	200 22.0	14.5	12 31.3	8.7	54.0
D 12	359 57.5	N23 16.3	214 55.5	14.4	S12 40.0	8.6	54.0
A 13	14 57.4	16.5	229 28.9	14.5	12 48.6	8.6	54.0
Y 14	29 57.2	16.6	244 02.4	14.3	12 57.2	8.5	54.1
15	44 57.1	·· 16.7	258 35.7	14.4	13 05.7	8.5	54.1
16	59 57.0	16.8	273 09.1	14.3	13 14.2	8.4	54.1
17	74 56.8	16.9	287 42.4	14.2	13 22.6	8.4	54.1
18	89 56.7	N23 17.1	302 15.6	14.3	S13 31.0	8.3	54.1
19	104 56.6	17.2	316 48.9	14.1	13 39.3	8.3	54.1
20	119 56.4	17.3	331 22.0	14.2	13 47.6	8.2	54.1
21	134 56.3	·· 17.4	345 55.2	14.1	13 55.8	8.1	54.1
22	149 56.2	17.5	0 28.3	14.0	14 03.9	8.1	54.1
23	164 56.1	17.6	15 01.3	14.0	14 12.0	8.1	54.1
	S.D. 15.8	d 0.1	S.D. 14.8		14.7		14.7

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
12	00 21	00 15	12 00	20 32	08 11	10	◐
13	00 09	00 03	12 00	21 14	08 53	11	
14	00 03	00 10	12 00	21 58	09 36	12	

	G.M.T.	ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.6		SATURN +1.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15	00	263 11.3	160 08.4	N24 05.3	198 06.0	N21 35.3	81 47.1	N 0 52.5	79 23.1	N 1 02.2
	01	278 13.8	175 07.5	05.1	213 06.6	35.6	96 49.5	52.4	94 25.5	02.2
	02	293 16.2	190 06.7	04.8	228 07.2	35.9	111 51.8	52.4	109 27.9	02.2
	03	308 18.7	205 05.8	·· 04.6	243 07.8	·· 36.3	126 54.2	·· 52.3	124 30.4	·· 02.1
	04	323 21.2	220 04.9	04.4	258 08.4	36.6	141 56.5	52.2	139 32.8	02.1
	05	338 23.6	235 04.0	04.2	273 09.0	36.9	156 58.9	52.2	154 35.2	02.1
	06	353 26.1	250 03.2	N24 04.0	288 09.6	N21 37.2	172 01.2	N 0 52.1	169 37.7	N 1 02.0
	07	8 28.6	265 02.3	03.8	303 10.2	37.6	187 03.6	52.0	184 40.1	02.0
	08	23 31.0	280 01.4	03.6	318 10.7	37.9	202 05.9	52.0	199 42.5	02.0
MONDAY	09	38 33.5	295 00.6	·· 03.4	333 11.3	·· 38.2	217 08.2	·· 51.9	214 44.9	·· 02.0
	10	53 36.0	309 59.7	03.2	348 11.9	38.5	232 10.6	51.9	229 47.4	01.9
	11	68 38.4	324 58.8	03.0	3 12.5	38.8	247 12.9	51.8	244 49.8	01.9
	12	83 40.9	339 57.9	N24 02.8	18 13.1	N21 39.1	262 15.3	N 0 51.7	259 52.2	N 1 01.9
	13	98 43.4	354 57.1	02.5	33 13.7	39.5	277 17.6	51.7	274 54.7	01.9
	14	113 45.8	9 56.2	02.3	48 14.3	39.8	292 20.0	51.6	289 57.1	01.8
	15	128 48.3	24 55.3	·· 02.1	63 14.9	·· 40.1	307 22.3	·· 51.5	304 59.5	·· 01.8
	16	143 50.7	39 54.5	01.9	78 15.5	40.4	322 24.6	51.5	320 01.9	01.8
	17	158 53.2	54 53.6	01.7	93 16.1	40.7	337 27.0	51.4	335 04.4	01.8
	18	173 55.7	69 52.7	N24 01.4	108 16.7	N21 41.1	352 29.3	N 0 51.3	350 06.8	N 1 01.7
	19	188 58.1	84 51.9	01.2	123 17.3	41.4	7 31.7	51.3	5 09.2	01.7
	20	204 00.6	99 51.0	01.0	138 17.9	41.7	22 34.0	51.2	20 11.6	01.7
	21	219 03.1	114 50.1	·· 00.8	153 18.5	·· 42.0	37 36.3	·· 51.1	35 14.1	·· 01.7
	22	234 05.5	129 49.2	00.5	168 19.1	42.3	52 38.7	51.1	50 16.5	01.6
	23	249 08.0	144 48.4	00.3	183 19.7	42.6	67 41.0	51.0	65 18.9	01.6
16	00	264 10.5	159 47.5	N24 00.1	198 20.3	N21 42.9	82 43.4	N 0 51.0	80 21.3	N 1 01.6
	01	279 12.9	174 46.6	23 59.8	213 20.9	43.3	97 45.7	50.9	95 23.8	01.5
	02	294 15.4	189 45.8	59.6	228 21.5	43.6	112 48.0	50.8	110 26.2	01.5
	03	309 17.8	204 44.9	·· 59.4	243 22.1	·· 43.9	127 50.4	·· 50.8	125 28.6	·· 01.5
	04	324 20.3	219 44.0	59.1	258 22.7	44.2	142 52.7	50.7	140 31.1	01.5
	05	339 22.8	234 43.2	58.9	273 23.3	44.5	157 55.1	50.6	155 33.5	01.4
	06	354 25.2	249 42.3	N23 58.7	288 23.9	N21 44.8	172 57.4	N 0 50.6	170 35.9	N 1 01.4
	07	9 27.7	264 41.4	58.4	303 24.5	45.1	187 59.7	50.5	185 38.3	01.4
	08	24 30.2	279 40.6	58.2	318 25.1	45.4	203 02.1	50.4	200 40.8	01.4
TUESDAY	09	39 32.6	294 39.7	·· 57.9	333 25.7	·· 45.8	218 04.4	·· 50.4	215 43.2	·· 01.3
	10	54 35.1	309 38.8	57.7	348 26.3	46.1	233 06.7	50.3	230 45.6	01.3
	11	69 37.6	324 38.0	57.5	3 26.9	46.4	248 09.1	50.2	245 48.0	01.3
	12	84 40.0	339 37.1	N23 57.2	18 27.5	N21 46.7	263 11.4	N 0 50.2	260 50.4	N 1 01.2
	13	99 42.5	354 36.2	57.0	33 28.1	47.0	278 13.8	50.1	275 52.9	01.2
	14	114 45.0	9 35.4	56.7	48 28.7	47.3	293 16.1	50.0	290 55.3	01.2
	15	129 47.4	24 34.5	·· 56.5	63 29.3	·· 47.6	308 18.4	·· 50.0	305 57.7	·· 01.2
	16	144 49.9	39 33.7	56.2	78 29.9	47.9	323 20.8	49.9	321 00.1	01.1
	17	159 52.3	54 32.8	56.0	93 30.5	48.2	338 23.1	49.8	336 02.6	01.1
	18	174 54.8	69 31.9	N23 55.7	108 31.1	N21 48.5	353 25.4	N 0 49.8	351 05.0	N 1 01.1
	19	189 57.3	84 31.1	55.5	123 31.7	48.8	8 27.8	49.7	6 07.4	01.0
	20	204 59.7	99 30.2	55.2	138 32.3	49.1	23 30.1	49.6	21 09.8	01.0
	21	220 02.2	114 29.3	·· 55.0	153 32.9	·· 49.5	38 32.4	·· 49.6	36 12.3	·· 01.0
	22	235 04.7	129 28.5	54.7	168 33.5	49.8	53 34.8	49.5	51 14.7	01.0
	23	250 07.1	144 27.6	54.4	183 34.0	50.1	68 37.1	49.4	66 17.1	00.9
17	00	265 09.6	159 26.8	N23 54.2	198 34.6	N21 50.4	83 39.4	N 0 49.4	81 19.5	N 1 00.9
	01	280 12.1	174 25.9	53.9	213 35.2	50.7	98 41.8	49.3	96 21.9	00.9
	02	295 14.5	189 25.0	53.7	228 35.8	51.0	113 44.1	49.2	111 24.4	00.8
	03	310 17.0	204 24.2	·· 53.4	243 36.4	·· 51.3	128 46.4	·· 49.2	126 26.8	·· 00.8
	04	325 19.5	219 23.3	53.1	258 37.0	51.6	143 48.8	49.1	141 29.2	00.8
	05	340 21.9	234 22.4	52.9	273 37.6	51.9	158 51.1	49.0	156 31.6	00.8
	06	355 24.4	249 21.6	N23 52.6	288 38.2	N21 52.2	173 53.4	N 0 48.9	171 34.1	N 1 00.7
	07	10 26.8	264 20.7	52.3	303 38.8	52.5	188 55.8	48.9	186 36.5	00.7
	08	25 29.3	279 19.9	52.1	318 39.4	52.8	203 58.1	48.8	201 38.9	00.7
WEDNESDAY	09	40 31.8	294 19.0	·· 51.8	333 40.0	·· 53.1	219 00.4	·· 48.7	216 41.3	·· 00.6
	10	55 34.2	309 18.1	51.5	348 40.6	53.4	234 02.7	48.7	231 43.7	00.6
	11	70 36.7	324 17.3	51.3	3 41.2	53.7	249 05.1	48.6	246 46.2	00.6
	12	85 39.2	339 16.4	N23 51.0	18 41.8	N21 54.0	264 07.4	N 0 48.5	261 48.6	N 1 00.5
	13	100 41.6	354 15.6	50.7	33 42.4	54.3	279 09.7	48.5	276 51.0	00.5
	14	115 44.1	9 14.7	50.4	48 43.0	54.6	294 12.1	48.4	291 53.4	00.5
	15	130 46.6	24 13.9	·· 50.2	63 43.6	·· 54.9	309 14.4	·· 48.3	306 55.8	·· 00.5
	16	145 49.0	39 13.0	49.9	78 44.2	55.2	324 16.7	48.3	321 58.3	00.4
	17	160 51.5	54 12.1	49.6	93 44.8	55.5	339 19.0	48.2	337 00.7	00.4
	18	175 53.9	69 11.3	N23 49.3	108 45.4	N21 55.8	354 21.4	N 0 48.1	352 03.1	N 1 00.4
	19	190 56.4	84 10.4	49.0	123 46.0	56.1	9 23.7	48.0	7 05.5	00.3
	20	205 58.9	99 09.6	48.8	138 46.6	56.4	24 26.0	48.0	22 07.9	00.3
	21	221 01.3	114 08.7	·· 48.5	153 47.2	·· 56.7	39 28.4	·· 47.9	37 10.4	·· 00.3
	22	236 03.8	129 07.9	48.2	168 47.8	57.0	54 30.7	47.8	52 12.8	00.3
	23	251 06.3	144 07.0	47.9	183 48.4	57.3	69 33.0	47.8	67 15.2	00.2
		h m								
Mer. Pass.		6 22.3	v −0.9	d 0.2	v 0.6	d 0.3	v 2.3	d 0.1	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.2	S40 22.7
Achernar	335 45.2	S57 19.7
Acrux	173 36.5	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.9	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 14.1	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.8	N28 59.0
Altair	62 31.8	N 8 49.1
Ankaa	353 39.8	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.5	S59 27.2
Bellatrix	278 58.6	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.2
Capella	281 11.0	N45 58.7
Deneb	49 47.8	N45 12.6
Denebola	182 58.5	N14 40.7
Diphda	349 20.5	S18 05.3
Dubhe	194 21.7	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 57.0	N51 29.5
Enif	34 10.9	N 9 47.3
Fomalhaut	15 50.8	S29 43.2
Gacrux	172 28.0	S57 00.7
Gienah	176 17.4	S17 26.3
Hadar	149 22.2	S60 17.2
Hamal	328 28.6	N23 22.3
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.1	N74 14.2
Markab	14 02.6	N15 06.1
Menkar	314 40.9	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.4	S69 38.7
Mirfak	309 15.8	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.1	S56 47.5
Pollux	243 57.9	N28 04.3
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.5
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.6	N56 25.8
Shaula	96 54.7	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.1	N38 46.0
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	255 37.1	13 22
Mars	294 09.9	10 46
Jupiter	178 32.9	18 26
Saturn	176 10.9	18 36

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
15	00	179 55.9	N23 17.7	29 34.3	14.0	S14 20.1	8.0	54.1
	01	194 55.8	17.8	44 07.3	14.0	14 28.1	7.9	54.1
	02	209 55.7	18.0	58 40.3	13.8	14 36.0	7.8	54.1
	03	224 55.5	18.1	73 13.1	13.9	14 43.8	7.8	54.1
	04	239 55.4	18.2	87 46.0	13.8	14 51.6	7.8	54.1
	05	254 55.3	18.3	102 18.8	13.8	14 59.4	7.6	54.1
	06	269 55.1	N23 18.4	116 51.6	13.7	S15 07.0	7.7	54.1
	07	284 55.0	18.5	131 24.3	13.6	15 14.7	7.5	54.1
	08	299 54.9	18.6	145 56.9	13.7	15 22.2	7.5	54.1
MONDAY	09	314 54.7	18.7	160 29.6	13.6	15 29.7	7.4	54.1
	10	329 54.6	18.8	175 02.2	13.5	15 37.1	7.4	54.1
	11	344 54.5	18.9	189 34.7	13.5	15 44.5	7.3	54.1
	12	359 54.3	N23 19.0	204 07.2	13.4	S15 51.8	7.2	54.1
	13	14 54.2	19.1	218 39.6	13.5	15 59.0	7.2	54.2
	14	29 54.1	19.2	233 12.1	13.3	16 06.2	7.0	54.2
	15	44 53.9	19.3	247 44.4	13.3	16 13.2	7.1	54.2
	16	59 53.8	19.4	262 16.7	13.3	16 20.3	6.9	54.2
	17	74 53.7	19.5	276 49.0	13.2	16 27.2	6.9	54.2
	18	89 53.5	N23 19.6	291 21.2	13.2	S16 34.1	6.8	54.2
	19	104 53.4	19.7	305 53.4	13.1	16 40.9	6.8	54.2
	20	119 53.3	19.8	320 25.5	13.1	16 47.7	6.6	54.2
	21	134 53.1	19.9	334 57.6	13.1	16 54.3	6.6	54.2
	22	149 53.0	20.0	349 29.7	13.0	17 00.9	6.6	54.2
	23	164 52.9	20.1	4 01.7	12.9	17 07.5	6.4	54.2
16	00	179 52.8	N23 20.2	18 33.6	12.9	S17 13.9	6.4	54.2
	01	194 52.6	20.3	33 05.5	12.9	17 20.3	6.3	54.2
	02	209 52.5	20.4	47 37.4	12.8	17 26.6	6.2	54.3
	03	224 52.4	20.5	62 09.2	12.7	17 32.8	6.2	54.3
	04	239 52.2	20.6	76 40.9	12.7	17 39.0	6.0	54.3
	05	254 52.1	20.7	91 12.6	12.7	17 45.0	6.0	54.3
	06	269 52.0	N23 20.8	105 44.3	12.6	S17 51.0	6.0	54.3
	07	284 51.8	20.8	120 15.9	12.6	17 57.0	5.8	54.3
	08	299 51.7	20.9	134 47.5	12.5	18 02.8	5.8	54.3
TUESDAY	09	314 51.6	21.0	149 19.0	12.5	18 08.6	5.6	54.3
	10	329 51.4	21.1	163 50.5	12.5	18 14.2	5.6	54.3
	11	344 51.3	21.2	178 22.0	12.4	18 19.8	5.6	54.3
	12	359 51.2	N23 21.3	192 53.4	12.3	S18 25.4	5.4	54.3
	13	14 51.0	21.4	207 24.7	12.3	18 30.8	5.4	54.4
	14	29 50.9	21.5	221 56.0	12.3	18 36.2	5.2	54.4
	15	44 50.8	21.5	236 27.3	12.2	18 41.4	5.2	54.4
	16	59 50.6	21.6	250 58.5	12.1	18 46.6	5.1	54.4
	17	74 50.5	21.7	265 29.6	12.2	18 51.7	5.0	54.4
	18	89 50.4	N23 21.8	280 00.8	12.0	S18 56.7	5.0	54.4
	19	104 50.2	21.9	294 31.8	12.1	19 01.7	4.8	54.4
	20	119 50.1	21.9	309 02.9	12.0	19 06.5	4.8	54.4
	21	134 50.0	22.0	323 33.9	11.9	19 11.3	4.7	54.4
	22	149 49.8	22.1	338 04.8	11.9	19 16.0	4.5	54.5
	23	164 49.7	22.2	352 35.7	11.9	19 20.5	4.5	54.5
17	00	179 49.6	N23 22.3	7 06.6	11.8	S19 25.0	4.5	54.5
	01	194 49.4	22.3	21 37.4	11.7	19 29.5	4.3	54.5
	02	209 49.3	22.4	36 08.1	11.8	19 33.8	4.2	54.5
	03	224 49.2	22.5	50 38.9	11.7	19 38.0	4.1	54.5
	04	239 49.0	22.6	65 09.6	11.6	19 42.1	4.1	54.5
	05	254 48.9	22.6	79 40.2	11.6	19 46.2	3.9	54.5
	06	269 48.8	N23 22.7	94 10.8	11.6	S19 50.1	3.9	54.6
	07	284 48.6	22.8	108 41.4	11.5	19 54.0	3.8	54.6
WEDNESDAY	08	299 48.5	22.9	123 11.9	11.5	19 57.8	3.7	54.6
	09	314 48.4	22.9	137 42.4	11.4	20 01.5	3.5	54.6
	10	329 48.2	23.0	152 12.8	11.4	20 05.0	3.5	54.6
	11	344 48.1	23.1	166 43.2	11.3	20 08.5	3.4	54.6
	12	359 48.0	N23 23.1	181 13.5	11.4	S20 11.9	3.3	54.6
	13	14 47.8	23.2	195 43.9	11.3	20 15.2	3.2	54.6
	14	29 47.7	23.3	210 14.2	11.2	20 18.4	3.1	54.7
	15	44 47.5	23.3	224 44.4	11.2	20 21.5	3.0	54.7
	16	59 47.4	23.4	239 14.6	11.2	20 24.5	3.0	54.7
	17	74 47.3	23.5	253 44.8	11.1	20 27.5	2.8	54.7
	18	89 47.1	N23 23.5	268 14.9	11.1	S20 30.3	2.7	54.7
	19	104 47.0	23.6	282 45.0	11.1	20 33.0	2.6	54.7
	20	119 46.9	23.7	297 15.1	11.0	20 35.6	2.5	54.7
	21	134 46.7	23.7	311 45.1	11.0	20 38.1	2.4	54.8
	22	149 46.6	23.8	326 15.1	10.9	20 40.5	2.4	54.8
	23	164 46.5	23.8	340 45.0	11.0	20 42.9	2.2	54.8
		S.D. 15.8	d 0.1	S.D. 14.8		14.8		14.9

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
15	00 16	00 22	12 00	22 43	10 20	13	○
16	00 29	00 35	12 01	23 31	11 07	14	
17	00 42	00 48	12 01	24 20	11 55	15	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.6		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
18	00	266 08.7	159 06.1	N23 47.6	198 49.0	N21 57.6	84 35.3	N 0 47.7	82 17.6	N 1 00.2
	01	281 11.2	174 05.3	47.3	213 49.6	57.9	99 37.7	47.6	97 20.0	00.2
	02	296 13.7	189 04.4	47.0	228 50.1	58.2	114 40.0	47.6	112 22.4	00.1
	03	311 16.1	204 03.6	·· 46.7	243 50.7	·· 58.5	129 42.3	·· 47.5	127 24.9	·· 00.1
	04	326 18.6	219 02.7	46.4	258 51.3	58.8	144 44.6	47.4	142 27.3	00.1
	05	341 21.1	234 01.9	46.1	273 51.9	59.1	159 47.0	47.3	157 29.7	00.0
	06	356 23.5	249 01.0	N23 45.9	288 52.5	N21 59.4	174 49.3	N 0 47.3	172 32.1	N 1 00.0
	07	11 26.0	264 00.2	45.6	303 53.1	21 59.7	189 51.6	47.2	187 34.5	1 00.0
T	08	26 28.4	278 59.3	45.3	318 53.7	22 00.0	204 53.9	47.1	202 36.9	0 59.9
H	09	41 30.9	293 58.5	·· 45.0	333 54.3	·· 00.2	219 56.3	·· 47.1	217 39.4	·· 59.9
U	10	56 33.4	308 57.6	44.7	348 54.9	00.5	234 58.6	47.0	232 41.8	59.9
R	11	71 35.8	323 56.8	44.4	3 55.5	00.8	250 00.9	46.9	247 44.2	59.9
S	12	86 38.3	338 55.9	N23 44.1	18 56.1	N22 01.1	265 03.2	N 0 46.8	262 46.6	N 0 59.8
D	13	101 40.8	353 55.0	43.7	33 56.7	01.4	280 05.6	46.8	277 49.0	59.8
A	14	116 43.2	8 54.2	43.4	48 57.3	01.7	295 07.9	46.7	292 51.4	59.8
Y	15	131 45.7	23 53.3	·· 43.1	63 57.9	·· 02.0	310 10.2	·· 46.6	307 53.9	·· 59.7
	16	146 48.2	38 52.5	42.8	78 58.5	02.3	325 12.5	46.6	322 56.3	59.7
	17	161 50.6	53 51.6	42.5	93 59.1	02.6	340 14.9	46.5	337 58.7	59.7
	18	176 53.1	68 50.8	N23 42.2	108 59.7	N22 02.9	355 17.2	N 0 46.4	353 01.1	N 0 59.6
	19	191 55.6	83 49.9	41.9	124 00.3	03.2	10 19.5	46.3	8 03.5	59.6
	20	206 58.0	98 49.1	41.6	139 00.9	03.4	25 21.8	46.3	23 05.9	59.6
	21	222 00.5	113 48.2	·· 41.3	154 01.5	·· 03.7	40 24.1	·· 46.2	38 08.4	·· 59.5
	22	237 02.9	128 47.4	41.0	169 02.1	04.0	55 26.5	46.1	53 10.8	59.5
	23	252 05.4	143 46.5	40.6	184 02.7	04.3	70 28.8	46.0	68 13.2	59.5
19	00	267 07.9	158 45.7	N23 40.3	199 03.3	N22 04.6	85 31.1	N 0 46.0	83 15.6	N 0 59.4
	01	282 10.3	173 44.9	40.0	214 03.8	04.9	100 33.4	45.9	98 18.0	59.4
	02	297 12.8	188 44.0	39.7	229 04.4	05.2	115 35.7	45.8	113 20.4	59.4
	03	312 15.3	203 43.2	·· 39.4	244 05.0	·· 05.5	130 38.1	·· 45.8	128 22.8	·· 59.3
	04	327 17.7	218 42.3	39.0	259 05.6	05.7	145 40.4	45.7	143 25.3	59.3
	05	342 20.2	233 41.5	38.7	274 06.2	06.0	160 42.7	45.6	158 27.7	59.3
	06	357 22.7	248 40.6	N23 38.4	289 06.8	N22 06.3	175 45.0	N 0 45.5	173 30.1	N 0 59.2
	07	12 25.1	263 39.8	38.1	304 07.4	06.6	190 47.3	45.5	188 32.5	59.2
	08	27 27.6	278 38.9	37.7	319 08.0	06.9	205 49.7	45.4	203 34.9	59.2
F	09	42 30.0	293 38.1	·· 37.4	334 08.6	·· 07.2	220 52.0	·· 45.3	218 37.3	·· 59.2
R	10	57 32.5	308 37.2	37.1	349 09.2	07.5	235 54.3	45.2	233 39.7	59.1
I	11	72 35.0	323 36.4	36.8	4 09.8	07.7	250 56.6	45.2	248 42.1	59.1
D	12	87 37.4	338 35.5	N23 36.4	19 10.4	N22 08.0	265 58.9	N 0 45.1	263 44.6	N 0 59.1
A	13	102 39.9	353 34.7	36.1	34 11.0	08.3	281 01.3	45.0	278 47.0	59.0
Y	14	117 42.4	8 33.9	35.8	49 11.6	08.6	296 03.6	44.9	293 49.4	59.0
	15	132 44.8	23 33.0	·· 35.4	64 12.2	·· 08.9	311 05.9	·· 44.9	308 51.8	·· 59.0
	16	147 47.3	38 32.2	35.1	79 12.8	09.2	326 08.2	44.8	323 54.2	58.9
	17	162 49.8	53 31.3	34.8	94 13.4	09.4	341 10.5	44.7	338 56.6	58.9
	18	177 52.2	68 30.5	N23 34.4	109 14.0	N22 09.7	356 12.8	N 0 44.6	353 59.0	N 0 58.9
	19	192 54.7	83 29.6	34.1	124 14.6	10.0	11 15.2	44.6	9 01.4	58.8
	20	207 57.2	98 28.8	33.7	139 15.1	10.3	26 17.5	44.5	24 03.9	58.8
	21	222 59.6	113 28.0	·· 33.4	154 15.7	·· 10.6	41 19.8	·· 44.4	39 06.3	·· 58.8
	22	238 02.1	128 27.1	33.0	169 16.3	10.8	56 22.1	44.3	54 08.7	58.7
	23	253 04.5	143 26.3	32.7	184 16.9	11.1	71 24.4	44.3	69 11.1	58.7
20	00	268 07.0	158 25.4	N23 32.4	199 17.5	N22 11.4	86 26.7	N 0 44.2	84 13.5	N 0 58.7
	01	283 09.5	173 24.6	32.0	214 18.1	11.7	101 29.0	44.1	99 15.9	58.6
	02	298 11.9	188 23.7	31.7	229 18.7	12.0	116 31.4	44.0	114 18.3	58.6
	03	313 14.4	203 22.9	·· 31.3	244 19.3	·· 12.2	131 33.7	·· 44.0	129 20.7	·· 58.6
	04	328 16.9	218 22.1	31.0	259 19.9	12.5	146 36.0	43.9	144 23.1	58.5
	05	343 19.3	233 21.2	30.6	274 20.5	12.8	161 38.3	43.8	159 25.6	58.5
	06	358 21.8	248 20.4	N23 30.3	289 21.1	N22 13.1	176 40.6	N 0 43.7	174 28.0	N 0 58.5
	07	13 24.3	263 19.6	29.9	304 21.7	13.3	191 42.9	43.7	189 30.4	58.4
S	08	28 26.7	278 18.7	29.5	319 22.3	13.6	206 45.2	43.6	204 32.8	58.4
A	09	43 29.2	293 17.9	·· 29.2	334 22.9	·· 13.9	221 47.5	·· 43.5	219 35.2	·· 58.3
T	10	58 31.7	308 17.0	28.8	349 23.5	14.2	236 49.9	43.4	234 37.6	58.3
U	11	73 34.1	323 16.2	28.5	4 24.1	14.4	251 52.2	43.3	249 40.0	58.3
R	12	88 36.6	338 15.4	N23 28.1	19 24.7	N22 14.7	266 54.5	N 0 43.3	264 42.4	N 0 58.2
D	13	103 39.0	353 14.5	27.8	34 25.3	15.0	281 56.8	43.2	279 44.8	58.2
A	14	118 41.5	8 13.7	27.4	49 25.9	15.3	296 59.1	43.1	294 47.2	58.2
Y	15	133 44.0	23 12.9	·· 27.0	64 26.4	·· 15.5	312 01.4	·· 43.0	309 49.6	·· 58.1
	16	148 46.4	38 12.0	26.7	79 27.0	15.8	327 03.7	43.0	324 52.1	58.1
	17	163 48.9	53 11.2	26.3	94 27.6	16.1	342 06.0	42.9	339 54.5	58.1
	18	178 51.4	68 10.3	N23 25.9	109 28.2	N22 16.4	357 08.3	N 0 42.8	354 56.9	N 0 58.0
	19	193 53.8	83 09.5	25.6	124 28.8	16.6	12 10.7	42.7	9 59.3	58.0
	20	208 56.3	98 08.7	25.2	139 29.4	16.9	27 13.0	42.6	25 01.7	58.0
	21	223 58.8	113 07.8	·· 24.8	154 30.0	·· 17.2	42 15.3	·· 42.6	40 04.1	·· 57.9
	22	239 01.2	128 07.0	24.5	169 30.6	17.4	57 17.6	42.5	55 06.5	57.9
	23	254 03.7	143 06.2	24.1	184 31.2	17.7	72 19.9	42.4	70 08.9	57.9
Mer. Pass.		h m 6 10.5	v −0.8	d 0.3	v 0.6	d 0.3	v 2.3	d 0.1	v 2.4	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.2	S40 22.7
Achernar	335 45.2	S57 19.7
Acrux	173 36.5	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.8	N16 28.2
Alioth	166 41.9	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 14.1	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.8	N28 59.0
Altair	62 31.7	N 8 49.1
Ankaa	353 39.8	S42 24.3
Antares	112 55.9	S26 23.4
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.5	S59 27.2
Bellatrix	278 58.5	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.2
Capella	281 11.0	N45 58.7
Deneb	49 47.8	N45 12.7
Denebola	182 58.5	N14 40.7
Diphda	349 20.4	S18 05.3
Dubhe	194 21.7	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 57.0	N51 29.5
Enif	34 10.9	N 9 47.3
Fomalhaut	15 50.8	S29 43.2
Gacrux	172 28.1	S57 00.7
Gienah	176 17.4	S17 26.3
Hadar	149 22.2	S60 17.2
Hamal	328 28.5	N23 22.3
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.2	N74 14.2
Markab	14 02.6	N15 06.2
Menkar	314 40.9	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.4	S69 38.7
Mirfak	309 15.8	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.1	S56 47.5
Pollux	243 57.9	N28 04.3
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.4
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.5	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.1	N38 46.0
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	251 37.8	13 26
Mars	291 55.4	10 43
Jupiter	178 23.2	18 15
Saturn	176 07.7	18 24

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
18 00	179 46.3	N23 23.9	355 15.0	10.9	S20 45.1	2.1	54.8
01	194 46.2	24.0	9 44.9	10.8	20 47.2	2.0	54.8
02	209 46.1	24.0	24 14.7	10.9	20 49.2	1.9	54.8
03	224 45.9	24.1	38 44.6	10.8	20 51.1	1.9	54.8
04	239 45.8	24.1	53 14.4	10.7	20 53.0	1.7	54.9
05	254 45.7	24.2	67 44.1	10.8	20 54.7	1.6	54.9
06	269 45.5	N23 24.3	82 13.9	10.7	S20 56.3	1.5	54.9
07	284 45.4	24.3	96 43.6	10.7	20 57.8	1.4	54.9
T 08	299 45.3	24.4	111 13.3	10.6	20 59.2	1.3	54.9
H 09	314 45.1	24.4	125 42.9	10.6	21 00.5	1.2	54.9
U 10	329 45.0	24.5	140 12.5	10.6	21 01.7	1.1	55.0
R 11	344 44.9	24.5	154 42.1	10.6	21 02.8	1.0	55.0
S 12	359 44.7	N23 24.6	169 11.7	10.6	S21 03.8	0.8	55.0
D 13	14 44.6	24.6	183 41.3	10.5	21 04.6	0.8	55.0
A 14	29 44.5	24.7	198 10.8	10.5	21 05.4	0.7	55.0
Y 15	44 44.3	24.7	212 40.3	10.5	21 06.1	0.6	55.0
16	59 44.2	24.8	227 09.8	10.4	21 06.7	0.4	55.1
17	74 44.1	24.8	241 39.2	10.5	21 07.1	0.4	55.1
18	89 43.9	N23 24.9	256 08.7	10.4	S21 07.5	0.2	55.1
19	104 43.8	24.9	270 38.1	10.4	21 07.7	0.2	55.1
20	119 43.6	25.0	285 07.5	10.3	21 07.9	0.0	55.1
21	134 43.5	25.0	299 36.8	10.4	21 07.9	0.1	55.1
22	149 43.4	25.0	314 06.2	10.3	21 07.8	0.2	55.2
23	164 43.2	25.1	328 35.5	10.4	21 07.6	0.3	55.2
19 00	179 43.1	N23 25.1	343 04.9	10.3	S21 07.3	0.3	55.2
01	194 43.0	25.2	357 34.2	10.2	21 07.0	0.6	55.2
02	209 42.8	25.2	12 03.4	10.3	21 06.4	0.6	55.2
03	224 42.7	25.3	26 32.7	10.3	21 05.8	0.7	55.2
04	239 42.6	25.3	41 02.0	10.2	21 05.1	0.8	55.3
05	254 42.4	25.3	55 31.2	10.3	21 04.3	0.9	55.3
06	269 42.3	N23 25.4	70 00.5	10.2	S21 03.4	1.1	55.3
07	284 42.2	25.4	84 29.7	10.2	21 02.3	1.1	55.3
08	299 42.0	25.5	98 58.9	10.2	21 01.2	1.3	55.3
F 09	314 41.9	25.5	113 28.1	10.2	20 59.9	1.4	55.3
R 10	329 41.8	25.5	127 57.3	10.1	20 58.5	1.4	55.4
I 11	344 41.6	25.6	142 26.4	10.2	20 57.1	1.6	55.4
D 12	359 41.5	N23 25.6	156 55.6	10.2	S20 55.5	1.7	55.4
A 13	14 41.4	25.6	171 24.8	10.1	20 53.8	1.8	55.4
Y 14	29 41.2	25.7	185 53.9	10.2	20 52.0	1.9	55.4
15	44 41.1	25.7	200 23.1	10.1	20 50.1	2.0	55.5
16	59 40.9	25.7	214 52.2	10.1	20 48.1	2.2	55.5
17	74 40.8	25.8	229 21.3	10.2	20 45.9	2.2	55.5
18	89 40.7	N23 25.8	243 50.5	10.1	S20 43.7	2.3	55.5
19	104 40.5	25.8	258 19.6	10.1	20 41.4	2.5	55.5
20	119 40.4	25.8	272 48.7	10.1	20 38.9	2.5	55.5
21	134 40.3	25.9	287 17.8	10.1	20 36.4	2.7	55.6
22	149 40.1	25.9	301 46.9	10.2	20 33.7	2.8	55.6
23	164 40.0	25.9	316 16.1	10.1	20 30.9	2.9	55.6
20 00	179 39.9	N23 25.9	330 45.2	10.1	S20 28.0	2.9	55.6
01	194 39.7	26.0	345 14.3	10.1	20 25.1	3.1	55.6
02	209 39.6	26.0	359 43.4	10.1	20 22.0	3.2	55.7
03	224 39.5	26.0	14 12.5	10.1	20 18.8	3.4	55.7
04	239 39.3	26.0	28 41.6	10.2	20 15.4	3.4	55.7
05	254 39.2	26.1	43 10.8	10.1	20 12.0	3.5	55.7
06	269 39.1	N23 26.1	57 39.9	10.1	S20 08.5	3.6	55.7
07	284 38.9	26.1	72 09.0	10.2	20 04.9	3.8	55.8
S 08	299 38.8	26.1	86 38.2	10.1	20 01.1	3.8	55.8
A 09	314 38.6	26.1	101 07.3	10.1	19 57.3	4.0	55.8
T 10	329 38.5	26.2	115 36.4	10.2	19 53.3	4.0	55.8
U 11	344 38.4	26.2	130 05.6	10.2	19 49.3	4.2	55.8
R 12	359 38.2	N23 26.2	144 34.8	10.1	S19 45.1	4.2	55.9
D 13	14 38.1	26.2	159 03.9	10.2	19 40.9	4.4	55.9
A 14	29 38.0	26.2	173 33.1	10.2	19 36.5	4.5	55.9
Y 15	44 37.8	26.2	188 02.3	10.2	19 32.0	4.6	55.9
16	59 37.7	26.3	202 31.5	10.2	19 27.4	4.6	55.9
17	74 37.6	26.3	217 00.7	10.2	19 22.8	4.8	56.0
18	89 37.4	N23 26.3	231 29.9	10.2	S19 18.0	4.9	56.0
19	104 37.3	26.3	245 59.1	10.2	19 13.1	5.0	56.0
20	119 37.2	26.3	260 28.3	10.3	19 08.1	5.1	56.0
21	134 37.0	26.3	274 57.6	10.2	19 03.0	5.2	56.0
22	149 36.9	26.3	289 26.8	10.3	18 57.8	5.3	56.1
23	164 36.7	26.3	303 56.1	10.3	18 52.5	5.4	56.1
	S.D. 15.8	d 0.0	S.D. 15.0		15.1		15.2

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	00 54	01 01	12 01	00 20	12 45	16	○
19	01 07	01 14	12 01	01 10	13 36	17	
20	01 20	01 27	12 01	02 01	14 27	18	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.6		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
21	00	269 06.1	158 05.3	N23 23.7	199 31.8	N22 18.0	87 22.2	N 0 42.3	85 11.3	N 0 57.8
	01	284 08.6	173 04.5	23.3	214 32.4	18.3	102 24.5	42.3	100 13.7	57.8
	02	299 11.1	188 03.7	23.0	229 33.0	18.5	117 26.8	42.2	115 16.1	57.8
	03	314 13.5	203 02.8	·· 22.6	244 33.6	·· 18.8	132 29.1	·· 42.1	130 18.5	·· 57.7
	04	329 16.0	218 02.0	22.2	259 34.2	19.1	147 31.4	42.0	145 20.9	57.7
	05	344 18.5	233 01.2	21.8	274 34.8	19.3	162 33.7	41.9	160 23.3	57.7
	06	359 20.9	248 00.4	N23 21.4	289 35.4	N22 19.6	177 36.0	N 0 41.9	175 25.8	N 0 57.6
	07	14 23.4	262 59.5	21.1	304 35.9	19.9	192 38.3	41.8	190 28.2	57.6
	08	29 25.9	277 58.7	20.7	319 36.5	20.1	207 40.7	41.7	205 30.6	57.5
SUN	09	44 28.3	292 57.9	·· 20.3	334 37.1	·· 20.4	222 43.0	·· 41.6	220 33.0	·· 57.5
	10	59 30.8	307 57.0	19.9	349 37.7	20.7	237 45.3	41.5	235 35.4	57.5
	11	74 33.3	322 56.2	19.5	4 38.3	20.9	252 47.6	41.5	250 37.8	57.4
DAY	12	89 35.7	337 55.4	N23 19.1	19 38.9	N22 21.2	267 49.9	N 0 41.4	265 40.2	N 0 57.4
	13	104 38.2	352 54.5	18.7	34 39.5	21.5	282 52.2	41.3	280 42.6	57.4
	14	119 40.6	7 53.7	18.3	49 40.1	21.7	297 54.5	41.2	295 45.0	57.3
	15	134 43.1	22 52.9	·· 17.9	64 40.7	·· 22.0	312 56.8	·· 41.1	310 47.4	·· 57.3
	16	149 45.6	37 52.1	17.6	79 41.3	22.3	327 59.1	41.1	325 49.8	57.3
	17	164 48.0	52 51.2	17.2	94 41.9	22.5	343 01.4	41.0	340 52.2	57.2
	18	179 50.5	67 50.4	N23 16.8	109 42.5	N22 22.8	358 03.7	N 0 40.9	355 54.6	N 0 57.2
	19	194 53.0	82 49.6	16.4	124 43.1	23.1	13 06.0	40.8	10 57.0	57.2
	20	209 55.4	97 48.8	16.0	139 43.7	23.3	28 08.3	40.7	25 59.4	57.1
	21	224 57.9	112 47.9	·· 15.6	154 44.3	·· 23.6	43 10.6	·· 40.7	41 01.8	·· 57.1
	22	240 00.4	127 47.1	15.2	169 44.9	23.8	58 12.9	40.6	56 04.2	57.0
	23	255 02.8	142 46.3	14.8	184 45.4	24.1	73 15.2	40.5	71 06.6	57.0
22	00	270 05.3	157 45.5	N23 14.4	199 46.0	N22 24.4	88 17.5	N 0 40.4	86 09.0	N 0 57.0
	01	285 07.8	172 44.6	14.0	214 46.6	24.6	103 19.8	40.3	101 11.4	56.9
	02	300 10.2	187 43.8	13.6	229 47.2	24.9	118 22.1	40.3	116 13.8	56.9
	03	315 12.7	202 43.0	·· 13.2	244 47.8	·· 25.1	133 24.4	·· 40.2	131 16.2	·· 56.9
	04	330 15.1	217 42.2	12.7	259 48.4	25.4	148 26.7	40.1	146 18.6	56.8
	05	345 17.6	232 41.3	12.3	274 49.0	25.7	163 29.0	40.0	161 21.0	56.8
	06	0 20.1	247 40.5	N23 11.9	289 49.6	N22 25.9	178 31.3	N 0 39.9	176 23.4	N 0 56.7
	07	15 22.5	262 39.7	11.5	304 50.2	26.2	193 33.6	39.9	191 25.9	56.7
	08	30 25.0	277 38.9	11.1	319 50.8	26.4	208 35.9	39.8	206 28.3	56.7
MON	09	45 27.5	292 38.1	·· 10.7	334 51.4	·· 26.7	223 38.2	·· 39.7	221 30.7	·· 56.6
	10	60 29.9	307 37.2	10.3	349 52.0	27.0	238 40.5	39.6	236 33.1	56.6
	11	75 32.4	322 36.4	09.9	4 52.6	27.2	253 42.8	39.5	251 35.5	56.6
DAY	12	90 34.9	337 35.6	N23 09.4	19 53.2	N22 27.5	268 45.1	N 0 39.4	266 37.9	N 0 56.5
	13	105 37.3	352 34.8	09.0	34 53.8	27.7	283 47.4	39.4	281 40.3	56.5
	14	120 39.8	7 34.0	08.6	49 54.3	28.0	298 49.7	39.3	296 42.7	56.4
	15	135 42.2	22 33.1	·· 08.2	64 54.9	·· 28.2	313 52.0	·· 39.2	311 45.1	·· 56.4
	16	150 44.7	37 32.3	07.8	79 55.5	28.5	328 54.3	39.1	326 47.5	56.4
	17	165 47.2	52 31.5	07.3	94 56.1	28.7	343 56.6	39.0	341 49.9	56.3
	18	180 49.6	67 30.7	N23 06.9	109 56.7	N22 29.0	358 58.9	N 0 38.9	356 52.3	N 0 56.3
	19	195 52.1	82 29.9	06.5	124 57.3	29.3	14 01.2	38.9	11 54.7	56.3
	20	210 54.6	97 29.1	06.1	139 57.9	29.5	29 03.5	38.8	26 57.1	56.2
	21	225 57.0	112 28.2	·· 05.6	154 58.5	·· 29.8	44 05.8	·· 38.7	41 59.5	·· 56.2
	22	240 59.5	127 27.4	05.2	169 59.1	30.0	59 08.1	38.6	57 01.9	56.1
	23	256 02.0	142 26.6	04.8	184 59.7	30.3	74 10.4	38.5	72 04.3	56.1
23	00	271 04.4	157 25.8	N23 04.4	200 00.3	N22 30.5	89 12.7	N 0 38.4	87 06.7	N 0 56.1
	01	286 06.9	172 25.0	03.9	215 00.9	30.8	104 15.0	38.4	102 09.1	56.0
	02	301 09.4	187 24.2	03.5	230 01.5	31.0	119 17.3	38.3	117 11.5	56.0
	03	316 11.8	202 23.3	·· 03.1	245 02.1	·· 31.3	134 19.6	·· 38.2	132 13.9	·· 56.0
	04	331 14.3	217 22.5	02.6	260 02.6	31.5	149 21.9	38.1	147 16.3	55.9
	05	346 16.7	232 21.7	02.2	275 03.2	31.8	164 24.2	38.0	162 18.7	55.9
	06	1 19.2	247 20.9	N23 01.8	290 03.8	N22 32.0	179 26.5	N 0 37.9	177 21.1	N 0 55.8
	07	16 21.7	262 20.1	01.3	305 04.4	32.3	194 28.8	37.9	192 23.5	55.8
	08	31 24.1	277 19.3	00.9	320 05.0	32.5	209 31.1	37.8	207 25.9	55.8
TUE	09	46 26.6	292 18.5	·· 00.4	335 05.6	·· 32.8	224 33.4	·· 37.7	222 28.3	·· 55.7
	10	61 29.1	307 17.7	23 00.0	350 06.2	33.0	239 35.7	37.6	237 30.7	55.7
	11	76 31.5	322 16.8	22 59.6	5 06.8	33.3	254 37.9	37.5	252 33.0	55.6
SDAY	12	91 34.0	337 16.0	N22 59.1	20 07.4	N22 33.5	269 40.2	N 0 37.4	267 35.4	N 0 55.6
	13	106 36.5	352 15.2	58.7	35 08.0	33.8	284 42.5	37.4	282 37.8	55.6
	14	121 38.9	7 14.4	58.2	50 08.6	34.0	299 44.8	37.3	297 40.2	55.5
	15	136 41.4	22 13.6	·· 57.8	65 09.2	·· 34.3	314 47.1	·· 37.2	312 42.6	·· 55.5
	16	151 43.9	37 12.8	57.3	80 09.8	34.5	329 49.4	37.1	327 45.0	55.4
	17	166 46.3	52 12.0	56.9	95 10.3	34.8	344 51.7	37.0	342 47.4	55.4
	18	181 48.8	67 11.2	N22 56.4	110 10.9	N22 35.0	359 54.0	N 0 36.9	357 49.8	N 0 55.4
	19	196 51.2	82 10.4	56.0	125 11.5	35.3	14 56.3	36.8	12 52.2	55.3
	20	211 53.7	97 09.6	55.5	140 12.1	35.5	29 58.6	36.8	27 54.6	55.3
	21	226 56.2	112 08.8	·· 55.1	155 12.7	·· 35.7	45 00.9	·· 36.7	42 57.0	·· 55.2
	22	241 58.6	127 08.0	54.6	170 13.3	36.0	60 03.2	36.6	57 59.4	55.2
	23	257 01.1	142 07.2	54.1	185 13.9	36.2	75 05.5	36.5	73 01.8	55.2
Mer Pass.		h m 5 58.7	v −0.8	d 0.4	v 0.6	d 0.3	v 2.3	d 0.1	v 2.4	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.2	S40 22.7
Achernar	335 45.1	S57 19.7
Acrux	173 36.6	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.7	N16 28.2
Alioth	166 41.9	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 14.1	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.8	N28 59.0
Altair	62 31.7	N 8 49.1
Ankaa	353 39.8	S42 24.3
Antares	112 55.9	S26 23.5
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.5	S59 27.2
Bellatrix	278 58.5	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.2
Capella	281 11.0	N45 58.7
Deneb	49 47.7	N45 12.7
Denebola	182 58.6	N14 40.7
Diphda	349 20.4	S18 05.3
Dubhe	194 21.7	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 56.9	N51 29.5
Enif	34 10.9	N 9 47.3
Fomalhaut	15 50.7	S29 43.1
Gacrux	172 28.1	S57 00.7
Gienah	176 17.4	S17 26.3
Hadar	149 22.3	S60 17.2
Hamal	328 28.5	N23 22.3
Kaus Aust.	84 15.8	S34 23.6
Kochab	137 18.2	N74 14.2
Markab	14 02.6	N15 06.2
Menkar	314 40.8	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.5	S69 38.7
Mirfak	309 15.8	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.1	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.9	S 8 13.4
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.5	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.1	N38 46.0
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	247 40.2	13 30
Mars	289 40.8	10 41
Jupiter	178 12.2	18 04
Saturn	176 03.7	18 12

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
21 00	179 36.6	N23 26.4	318 25.4	10.3	S18 47.1	5.5	56.1
01	194 36.5	26.4	332 54.7	10.3	18 41.6	5.6	56.1
02	209 36.3	26.4	347 24.0	10.3	18 36.0	5.7	56.2
03	224 36.2	26.4	1 53.3	10.3	18 30.3	5.8	56.2
04	239 36.1	26.4	16 22.6	10.4	18 24.5	5.9	56.2
05	254 35.9	26.4	30 52.0	10.3	18 18.6	6.0	56.2
06	269 35.8	N23 26.4	45 21.3	10.4	S18 12.6	6.1	56.2
07	284 35.7	26.4	59 50.7	10.4	18 06.5	6.2	56.3
08	299 35.5	26.4	74 20.1	10.4	18 00.3	6.3	56.3
SUNDAY 09	314 35.4	26.4	88 49.5	10.4	17 54.0	6.4	56.3
10	329 35.3	26.4	103 18.9	10.5	17 47.6	6.5	56.3
11	344 35.1	26.4	117 48.4	10.4	17 41.1	6.6	56.4
12	359 35.0	N23 26.4	132 17.8	10.5	S17 34.5	6.7	56.4
13	14 34.8	26.4	146 47.3	10.5	17 27.8	6.8	56.4
14	29 34.7	26.4	161 16.8	10.5	17 21.0	6.9	56.4
15	44 34.6	26.4	175 46.3	10.5	17 14.1	6.9	56.4
16	59 34.4	26.4	190 15.8	10.6	17 07.2	7.1	56.5
17	74 34.3	26.4	204 45.4	10.5	17 00.1	7.1	56.5
18	89 34.2	N23 26.4	219 14.9	10.6	S16 53.0	7.3	56.5
19	104 34.0	26.4	233 44.5	10.6	16 45.7	7.3	56.5
20	119 33.9	26.4	248 14.1	10.6	16 38.4	7.5	56.6
21	134 33.8	26.4	262 43.7	10.6	16 30.9	7.5	56.6
22	149 33.6	26.4	277 13.3	10.7	16 23.4	7.6	56.6
23	164 33.5	26.4	291 43.0	10.7	16 15.8	7.7	56.6
22 00	179 33.4	N23 26.3	306 12.7	10.7	S16 08.1	7.8	56.7
01	194 33.2	26.3	320 42.4	10.7	16 00.3	7.9	56.7
02	209 33.1	26.3	335 12.1	10.7	15 52.4	7.9	56.7
03	224 33.0	26.3	349 41.8	10.7	15 44.5	8.1	56.7
04	239 32.8	26.3	4 11.5	10.8	15 36.4	8.1	56.7
05	254 32.7	26.3	18 41.3	10.7	15 28.3	8.3	56.8
06	269 32.5	N23 26.3	33 11.0	10.8	S15 20.0	8.3	56.8
07	284 32.4	26.3	47 40.8	10.8	15 11.7	8.4	56.8
08	299 32.3	26.2	62 10.6	10.9	15 03.3	8.4	56.8
MONDAY 09	314 32.1	26.2	76 40.5	10.8	14 54.9	8.6	56.9
10	329 32.0	26.2	91 10.3	10.9	14 46.3	8.7	56.9
11	344 31.9	26.2	105 40.2	10.9	14 37.6	8.7	56.9
12	359 31.7	N23 26.2	120 10.1	10.9	S14 28.9	8.8	56.9
13	14 31.6	26.2	134 40.0	10.9	14 20.1	8.9	57.0
14	29 31.5	26.1	149 09.9	10.9	14 11.2	9.0	57.0
15	44 31.3	26.1	163 39.8	11.0	14 02.2	9.0	57.0
16	59 31.2	26.1	178 09.8	10.9	13 53.2	9.2	57.0
17	74 31.1	26.1	192 39.7	11.0	13 44.0	9.2	57.1
18	89 30.9	N23 26.1	207 09.7	11.0	S13 34.8	9.3	57.1
19	104 30.8	26.0	221 39.7	11.0	13 25.5	9.3	57.1
20	119 30.7	26.0	236 09.7	11.1	13 16.2	9.5	57.1
21	134 30.5	26.0	250 39.8	11.0	13 06.7	9.5	57.2
22	149 30.4	26.0	265 09.8	11.1	12 57.2	9.6	57.2
23	164 30.3	25.9	279 39.9	11.0	12 47.6	9.6	57.2
23 00	179 30.1	N23 25.9	294 09.9	11.1	S12 38.0	9.8	57.2
01	194 30.0	25.9	308 40.0	11.1	12 28.2	9.8	57.3
02	209 29.8	25.9	323 10.1	11.2	12 18.4	9.8	57.3
03	224 29.7	25.8	337 40.3	11.1	12 08.6	10.0	57.3
04	239 29.6	25.8	352 10.4	11.1	11 58.6	10.0	57.3
05	254 29.4	25.8	6 40.5	11.2	11 48.6	10.1	57.4
06	269 29.3	N23 25.8	21 10.7	11.2	S11 38.5	10.2	57.4
07	284 29.2	25.7	35 40.9	11.1	11 28.3	10.2	57.4
08	299 29.0	25.7	50 11.0	11.2	11 18.1	10.3	57.4
TUESDAY 09	314 28.9	25.7	64 41.2	11.2	11 07.8	10.3	57.5
10	329 28.8	25.6	79 11.4	11.3	10 57.5	10.4	57.5
11	344 28.6	25.6	93 41.7	11.2	10 47.1	10.5	57.5
12	359 28.5	N23 25.6	108 11.9	11.2	S10 36.6	10.6	57.5
13	14 28.4	25.5	122 42.1	11.3	10 26.0	10.6	57.6
14	29 28.2	25.5	137 12.4	11.2	10 15.4	10.7	57.6
15	44 28.1	25.5	151 42.6	11.3	10 04.7	10.7	57.6
16	59 28.0	25.4	166 12.9	11.2	9 54.0	10.8	57.6
17	74 27.8	25.4	180 43.1	11.3	9 43.2	10.9	57.7
18	89 27.7	N23 25.3	195 13.4	11.3	S 9 32.3	10.9	57.7
19	104 27.6	25.3	209 43.7	11.3	9 21.4	10.9	57.7
20	119 27.4	25.3	224 14.0	11.3	9 10.5	11.1	57.8
21	134 27.3	25.2	238 44.3	11.3	8 59.4	11.1	57.8
22	149 27.2	25.2	253 14.6	11.3	8 48.3	11.1	57.8
23	164 27.0	25.1	267 44.9	11.3	8 37.2	11.2	57.8
	S.D. 15.8	d 0.0	S.D. 15.4		15.5		15.7

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
21	01 33	01 40	12 02	02 52	15 18	19	
22	01 46	01 53	12 02	03 43	16 08	20	◑
23	01 59	02 06	12 02	04 32	16 57	21	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.6		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
24	00	272 03.6	157 06.3	N22 53.7	200 14.5	N22 36.5	90 07.7	N 0 36.4	88 04.2	N 0 55.1
	01	287 06.0	172 05.5	53.2	215 15.1	36.7	105 10.0	36.3	103 06.6	55.1
	02	302 08.5	187 04.7	52.8	230 15.7	37.0	120 12.3	36.2	118 09.0	55.1
	03	317 11.0	202 03.9	·· 52.3	245 16.3	·· 37.2	135 14.6	·· 36.2	133 11.4	·· 55.0
	04	332 13.4	217 03.1	51.8	260 16.9	37.4	150 16.9	36.1	148 13.8	55.0
	05	347 15.9	232 02.3	51.4	275 17.5	37.7	165 19.2	36.0	163 16.2	54.9
	06	2 18.3	247 01.5	N22 50.9	290 18.1	N22 37.9	180 21.5	N 0 35.9	178 18.6	N 0 54.9
	07	17 20.8	262 00.7	50.4	305 18.6	38.2	195 23.8	35.8	193 21.0	54.9
W	08	32 23.3	276 59.9	50.0	320 19.2	38.4	210 26.1	35.7	208 23.4	54.8
E	09	47 25.7	291 59.1	·· 49.5	335 19.8	·· 38.7	225 28.3	·· 35.6	223 25.8	·· 54.8
D	10	62 28.2	306 58.3	49.0	350 20.4	38.9	240 30.6	35.5	238 28.2	54.7
N	11	77 30.7	321 57.5	48.6	5 21.0	39.1	255 32.9	35.5	253 30.5	54.7
E	12	92 33.1	336 56.7	N22 48.1	20 21.6	N22 39.4	270 35.2	N 0 35.4	268 32.9	N 0 54.6
S	13	107 35.6	351 55.9	47.6	35 22.2	39.6	285 37.5	35.3	283 35.3	54.6
D	14	122 38.1	6 55.1	47.2	50 22.8	39.8	300 39.8	35.2	298 37.7	54.6
A	15	137 40.5	21 54.3	·· 46.7	65 23.4	·· 40.1	315 42.1	·· 35.1	313 40.1	·· 54.5
Y	16	152 43.0	36 53.5	46.2	80 24.0	40.3	330 44.4	35.0	328 42.5	54.5
	17	167 45.5	51 52.7	45.7	95 24.6	40.6	345 46.6	34.9	343 44.9	54.4
	18	182 47.9	66 51.9	N22 45.2	110 25.2	N22 40.8	0 48.9	N 0 34.8	358 47.3	N 0 54.4
	19	197 50.4	81 51.1	44.8	125 25.7	41.0	15 51.2	34.8	13 49.7	54.4
	20	212 52.8	96 50.3	44.3	140 26.3	41.3	30 53.5	34.7	28 52.1	54.3
	21	227 55.3	111 49.5	·· 43.8	155 26.9	·· 41.5	45 55.8	·· 34.6	43 54.5	·· 54.3
	22	242 57.8	126 48.7	43.3	170 27.5	41.7	60 58.1	34.5	58 56.9	54.2
	23	258 00.2	141 47.9	42.8	185 28.1	42.0	76 00.4	34.4	73 59.3	54.2
25	00	273 02.7	156 47.2	N22 42.3	200 28.7	N22 42.2	91 02.6	N 0 34.3	89 01.7	N 0 54.1
	01	288 05.2	171 46.4	41.9	215 29.3	42.4	106 04.9	34.2	104 04.1	54.1
	02	303 07.6	186 45.6	41.4	230 29.9	42.7	121 07.2	34.1	119 06.4	54.1
	03	318 10.1	201 44.8	·· 40.9	245 30.5	·· 42.9	136 09.5	·· 34.1	134 08.8	·· 54.0
	04	333 12.6	216 44.0	40.4	260 31.1	43.1	151 11.8	34.0	149 11.2	54.0
	05	348 15.0	231 43.2	39.9	275 31.7	43.4	166 14.1	33.9	164 13.6	53.9
	06	3 17.5	246 42.4	N22 39.4	290 32.3	N22 43.6	181 16.3	N 0 33.8	179 16.0	N 0 53.9
	07	18 20.0	261 41.6	38.9	305 32.9	43.8	196 18.6	33.7	194 18.4	53.9
T	08	33 22.4	276 40.8	38.4	320 33.5	44.1	211 20.9	33.6	209 20.8	53.8
H	09	48 24.9	291 40.0	·· 37.9	335 34.1	·· 44.3	226 23.2	·· 33.5	224 23.2	·· 53.8
U	10	63 27.3	306 39.2	37.4	350 34.6	44.5	241 25.5	33.4	239 25.6	53.7
R	11	78 29.8	321 38.4	36.9	5 35.2	44.8	256 27.8	33.3	254 28.0	53.7
S	12	93 32.3	336 37.6	N22 36.4	20 35.8	N22 45.0	271 30.0	N 0 33.3	269 30.4	N 0 53.6
D	13	108 34.7	351 36.8	35.9	35 36.4	45.2	286 32.3	33.2	284 32.7	53.6
A	14	123 37.2	6 36.0	35.4	50 37.0	45.5	301 34.6	33.1	299 35.1	53.6
Y	15	138 39.7	21 35.3	·· 34.9	65 37.6	·· 45.7	316 36.9	·· 33.0	314 37.5	·· 53.5
	16	153 42.1	36 34.5	34.4	80 38.2	45.9	331 39.2	32.9	329 39.9	53.5
	17	168 44.6	51 33.7	33.9	95 38.8	46.1	346 41.4	32.8	344 42.3	53.4
	18	183 47.1	66 32.9	N22 33.4	110 39.4	N22 46.4	1 43.7	N 0 32.7	359 44.7	N 0 53.4
	19	198 49.5	81 32.1	32.9	125 40.0	46.6	16 46.0	32.6	14 47.1	53.3
	20	213 52.0	96 31.3	32.4	140 40.6	46.8	31 48.3	32.5	29 49.5	53.3
	21	228 54.4	111 30.5	·· 31.9	155 41.2	·· 47.1	46 50.6	·· 32.4	44 51.9	·· 53.3
	22	243 56.9	126 29.7	31.4	170 41.7	47.3	61 52.8	32.3	59 54.3	53.2
	23	258 59.4	141 29.0	30.9	185 42.3	47.5	76 55.1	32.3	74 56.6	53.2
26	00	274 01.8	156 28.2	N22 30.4	200 42.9	N22 47.7	91 57.4	N 0 32.2	89 59.0	N 0 53.1
	01	289 04.3	171 27.4	29.9	215 43.5	48.0	106 59.7	32.1	105 01.4	53.1
	02	304 06.8	186 26.6	29.4	230 44.1	48.2	122 02.0	32.0	120 03.8	53.0
	03	319 09.2	201 25.8	·· 28.8	245 44.7	·· 48.4	137 04.2	·· 31.9	135 06.2	·· 53.0
	04	334 11.7	216 25.0	28.3	260 45.3	48.6	152 06.5	31.8	150 08.6	53.0
	05	349 14.2	231 24.2	27.8	275 45.9	48.9	167 08.8	31.7	165 11.0	52.9
	06	4 16.6	246 23.5	N22 27.3	290 46.5	N22 49.1	182 11.1	N 0 31.6	180 13.4	N 0 52.9
	07	19 19.1	261 22.7	26.8	305 47.1	49.3	197 13.3	31.5	195 15.7	52.8
	08	34 21.6	276 21.9	26.2	320 47.7	49.5	212 15.6	31.4	210 18.1	52.8
F	09	49 24.0	291 21.1	·· 25.7	335 48.3	·· 49.8	227 17.9	·· 31.3	225 20.5	·· 52.7
R	10	64 26.5	306 20.3	25.2	350 48.9	50.0	242 20.2	31.3	240 22.9	52.7
I	11	79 28.9	321 19.6	24.7	5 49.4	50.2	257 22.4	31.2	255 25.3	52.7
D	12	94 31.4	336 18.8	N22 24.1	20 50.0	N22 50.4	272 24.7	N 0 31.1	270 27.7	N 0 52.6
A	13	109 33.9	351 18.0	23.6	35 50.6	50.6	287 27.0	31.0	285 30.1	52.6
Y	14	124 36.3	6 17.2	23.1	50 51.2	50.9	302 29.3	30.9	300 32.5	52.5
	15	139 38.8	21 16.4	·· 22.6	65 51.8	·· 51.1	317 31.5	·· 30.8	315 34.8	·· 52.5
	16	154 41.3	36 15.7	22.0	80 52.4	51.3	332 33.8	30.7	330 37.2	52.4
	17	169 43.7	51 14.9	21.5	95 53.0	51.5	347 36.1	30.6	345 39.6	52.4
	18	184 46.2	66 14.1	N22 21.0	110 53.6	N22 51.7	2 38.4	N 0 30.5	0 42.0	N 0 52.3
	19	199 48.7	81 13.3	20.4	125 54.2	52.0	17 40.6	30.4	15 44.4	52.3
	20	214 51.1	96 12.6	19.9	140 54.8	52.2	32 42.9	30.3	30 46.8	52.3
	21	229 53.6	111 11.8	·· 19.4	155 55.4	·· 52.4	47 45.2	·· 30.2	45 49.2	·· 52.2
	22	244 56.1	126 11.0	18.8	170 56.0	52.6	62 47.5	30.1	60 51.5	52.2
	23	259 58.5	141 10.2	18.3	185 56.5	52.8	77 49.7	30.0	75 53.9	52.1
Mer. Pass.		h m 5 46.9	v −0.8	d 0.5	v 0.6	d 0.2	v 2.3	d 0.1	v 2.4	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.1	S40 22.7
Achernar	335 45.1	S57 19.7
Acrux	173 36.6	S63 00.0
Adhara	255 32.1	S28 56.9
Aldebaran	291 17.7	N16 28.2
Alioth	166 42.0	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 14.0	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.8	N28 59.0
Altair	62 31.7	N 8 49.1
Ankaa	353 39.8	S42 24.3
Antares	112 55.9	S26 23.5
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.5	S59 27.1
Bellatrix	278 58.5	N 6 19.9
Betelgeuse	271 28.1	N 7 24.2
Canopus	264 07.5	S52 41.2
Capella	281 11.0	N45 58.7
Deneb	49 47.7	N45 12.7
Denebola	182 58.6	N14 40.7
Diphda	349 20.4	S18 05.3
Dubhe	194 21.7	N61 51.4
Elnath	278 43.9	N28 35.4
Eltanin	90 56.9	N51 29.6
Enif	34 10.9	N 9 47.3
Fomalhaut	15 50.7	S29 43.1
Gacrux	172 28.1	S57 00.7
Gienah	176 17.4	S17 26.3
Hadar	149 22.3	S60 17.2
Hamal	328 28.5	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.3	N74 14.3
Markab	14 02.5	N15 06.2
Menkar	314 40.8	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.5	S69 38.7
Mirfak	309 15.7	N49 47.5
Nunki	76 28.2	S26 19.1
Peacock	53 57.1	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.5	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.0	N38 46.0
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	243 44.5	13 34
Mars	287 26.0	10 38
Jupiter	177 59.9	17 53
Saturn	175 59.0	18 01

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
24	00	179 26.9	N23 25.1	282 15.2	11.3	S 8 26.0	11.2	57.9
	01	194 26.8	25.1	296 45.5	11.3	8 14.8	11.3	57.9
	02	209 26.6	25.0	311 15.8	11.3	8 03.5	11.4	57.9
	03	224 26.5	·· 25.0	325 46.1	11.3	7 52.1	11.4	57.9
	04	239 26.4	24.9	340 16.4	11.3	7 40.7	11.4	58.0
	05	254 26.2	24.9	354 46.7	11.3	7 29.3	11.5	58.0
	06	269 26.1	N23 24.8	9 17.0	11.4	S 7 17.8	11.6	58.0
	07	284 26.0	24.8	23 47.4	11.3	7 06.2	11.6	58.0
W	08	299 25.8	24.7	38 17.7	11.3	6 54.6	11.6	58.1
E	09	314 25.7	·· 24.7	52 48.0	11.3	6 43.0	11.7	58.1
D	10	329 25.6	24.6	67 18.3	11.3	6 31.3	11.8	58.1
N	11	344 25.4	24.6	81 48.6	11.3	6 19.5	11.7	58.1
E	12	359 25.3	N23 24.5	96 18.9	11.3	S 6 07.8	11.8	58.2
S	13	14 25.2	24.5	110 49.2	11.3	5 56.0	11.9	58.2
D	14	29 25.0	24.4	125 19.5	11.2	5 44.1	11.9	58.2
A	15	44 24.9	·· 24.4	139 49.7	11.3	5 32.2	11.9	58.3
Y	16	59 24.8	24.3	154 20.0	11.3	5 20.3	12.0	58.3
	17	74 24.6	24.3	168 50.3	11.2	5 08.3	12.0	58.3
	18	89 24.5	N23 24.2	183 20.5	11.3	S 4 56.3	12.1	58.3
	19	104 24.4	24.2	197 50.8	11.2	4 44.2	12.1	58.4
	20	119 24.2	24.1	212 21.0	11.2	4 32.1	12.1	58.4
	21	134 24.1	·· 24.0	226 51.2	11.3	4 20.0	12.2	58.4
	22	149 24.0	24.0	241 21.5	11.2	4 07.8	12.1	58.4
	23	164 23.9	23.9	255 51.7	11.1	3 55.7	12.3	58.5
25	00	179 23.7	N23 23.9	270 21.8	11.2	S 3 43.4	12.2	58.5
	01	194 23.6	23.8	284 52.0	11.2	3 31.2	12.3	58.5
	02	209 23.5	23.7	299 22.2	11.1	3 18.9	12.3	58.5
	03	224 23.3	·· 23.7	313 52.3	11.1	3 06.6	12.4	58.6
	04	239 23.2	23.6	328 22.4	11.2	2 54.2	12.3	58.6
	05	254 23.0	23.5	342 52.6	11.0	2 41.9	12.4	58.6
	06	269 22.9	N23 23.5	357 22.6	11.1	S 2 29.5	12.4	58.7
	07	284 22.8	23.4	11 52.7	11.1	2 17.1	12.5	58.7
T	08	299 22.6	23.3	26 22.8	11.0	2 04.6	12.4	58.7
H	09	314 22.5	·· 23.3	40 52.8	11.0	1 52.2	12.5	58.7
U	10	329 22.4	23.2	55 22.8	11.0	1 39.7	12.5	58.8
R	11	344 22.2	23.1	69 52.8	10.9	1 27.2	12.5	58.8
S	12	359 22.1	N23 23.1	84 22.7	11.0	S 1 14.7	12.6	58.8
D	13	14 22.0	23.0	98 52.7	10.9	1 02.1	12.5	58.8
A	14	29 21.8	22.9	113 22.6	10.9	0 49.6	12.6	58.9
Y	15	44 21.7	·· 22.9	127 52.5	10.8	0 37.0	12.6	58.9
	16	59 21.6	22.8	142 22.3	10.9	0 24.4	12.6	58.9
	17	74 21.4	22.7	156 52.2	10.8	S 0 11.8	12.6	58.9
	18	89 21.3	N23 22.7	171 22.0	10.8	N 0 00.8	12.6	59.0
	19	104 21.2	22.6	185 51.8	10.7	0 13.4	12.6	59.0
	20	119 21.0	22.5	200 21.5	10.7	0 26.0	12.7	59.0
	21	134 20.9	·· 22.4	214 51.2	10.7	0 38.7	12.6	59.0
	22	149 20.8	22.4	229 20.9	10.7	0 51.3	12.7	59.1
	23	164 20.6	22.3	243 50.6	10.6	1 04.0	12.7	59.1
26	00	179 20.5	N23 22.2	258 20.2	10.6	N 1 16.7	12.6	59.1
	01	194 20.4	22.1	272 49.8	10.5	1 29.3	12.7	59.1
	02	209 20.3	22.1	287 19.3	10.5	1 42.0	12.7	59.2
	03	224 20.1	·· 22.0	301 48.8	10.5	1 54.7	12.6	59.2
	04	239 20.0	21.9	316 18.3	10.4	2 07.3	12.7	59.2
	05	254 19.9	21.8	330 47.7	10.4	2 20.0	12.7	59.2
	06	269 19.7	N23 21.7	345 17.1	10.4	N 2 32.7	12.6	59.3
	07	284 19.6	21.6	359 46.5	10.3	2 45.3	12.7	59.3
	08	299 19.5	21.6	14 15.8	10.3	2 58.0	12.7	59.3
F	09	314 19.3	·· 21.5	28 45.1	10.2	3 10.7	12.6	59.3
R	10	329 19.2	21.4	43 14.3	10.2	3 23.3	12.6	59.4
I	11	344 19.1	21.3	57 43.5	10.1	3 35.9	12.7	59.4
D	12	359 18.9	N23 21.2	72 12.6	10.1	N 3 48.6	12.6	59.4
A	13	14 18.8	21.1	86 41.7	10.1	4 01.2	12.6	59.4
Y	14	29 18.7	21.1	101 10.8	10.0	4 13.8	12.6	59.5
	15	44 18.5	·· 21.0	115 39.8	10.0	4 26.4	12.6	59.5
	16	59 18.4	20.9	130 08.8	9.9	4 39.0	12.5	59.5
	17	74 18.3	20.8	144 37.7	9.9	4 51.5	12.6	59.5
	18	89 18.1	N23 20.7	159 06.6	9.8	N 5 04.1	12.5	59.6
	19	104 18.0	20.6	173 35.4	9.8	5 16.6	12.5	59.6
	20	119 17.9	20.5	188 04.2	9.7	5 29.1	12.5	59.6
	21	134 17.8	·· 20.4	202 32.9	9.7	5 41.6	12.5	59.6
	22	149 17.6	20.3	217 01.6	9.6	5 54.1	12.4	59.6
	23	164 17.5	20.2	231 30.2	9.5	6 06.5	12.4	59.7
		S.D. 15.8	d 0.1	S.D. 15.9		16.0		16.2

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
24	02 12	02 19	12 02	05 22	17 46	22	
25	02 25	02 31	12 03	06 11	18 36	23	◑
26	02 38	02 44	12 03	07 01	19 27	24	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.6		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27	00	275 01.0	156 09.5	N22 17.8	200 57.1	N22 53.0	92 52.0	N 0 30.0	90 56.3	N 0 52.1
	01	290 03.4	171 08.7	17.2	215 57.7	53.3	107 54.3	29.9	105 58.7	52.0
	02	305 05.9	186 07.9	16.7	230 58.3	53.5	122 56.6	29.8	121 01.1	52.0
	03	320 08.4	201 07.1	16.1	245 58.9	53.7	137 58.8	29.7	136 03.5	51.9
	04	335 10.8	216 06.4	15.6	260 59.5	53.9	153 01.1	29.6	151 05.8	51.9
	05	350 13.3	231 05.6	15.0	276 00.1	54.1	168 03.4	29.5	166 08.2	51.9
	06	5 15.8	246 04.8	N22 14.5	291 00.7	N22 54.3	183 05.6	N 0 29.4	181 10.6	N 0 51.8
	07	20 18.2	261 04.0	14.0	306 01.3	54.6	198 07.9	29.3	196 13.0	51.8
S	08	35 20.7	276 03.3	13.4	321 01.9	54.8	213 10.2	29.2	211 15.4	51.7
A	09	50 23.2	291 02.5	12.9	336 02.5	55.0	228 12.5	29.1	226 17.8	51.7
T	10	65 25.6	306 01.7	12.3	351 03.1	55.2	243 14.7	29.0	241 20.1	51.6
U	11	80 28.1	321 01.0	11.8	6 03.7	55.4	258 17.0	28.9	256 22.5	51.6
R	12	95 30.5	336 00.2	N22 11.2	21 04.2	N22 55.6	273 19.3	N 0 28.8	271 24.9	N 0 51.5
D	13	110 33.0	350 59.4	10.7	36 04.8	55.8	288 21.5	28.7	286 27.3	51.5
A	14	125 35.5	5 58.7	10.1	51 05.4	56.0	303 23.8	28.6	301 29.7	51.5
Y	15	140 37.9	20 57.9	09.5	66 06.0	56.3	318 26.1	28.5	316 32.1	51.4
	16	155 40.4	35 57.1	09.0	81 06.6	56.5	333 28.3	28.4	331 34.4	51.4
	17	170 42.9	50 56.4	08.4	96 07.2	56.7	348 30.6	28.4	346 36.8	51.3
	18	185 45.3	65 55.6	N22 07.9	111 07.8	N22 56.9	3 32.9	N 0 28.3	1 39.2	N 0 51.3
	19	200 47.8	80 54.8	07.3	126 08.4	57.1	18 35.1	28.2	16 41.6	51.2
	20	215 50.3	95 54.1	06.8	141 09.0	57.3	33 37.4	28.1	31 44.0	51.2
	21	230 52.7	110 53.3	06.2	156 09.6	57.5	48 39.7	28.0	46 46.4	51.1
	22	245 55.2	125 52.5	05.6	171 10.2	57.7	63 42.0	27.9	61 48.7	51.1
	23	260 57.7	140 51.8	05.1	186 10.8	57.9	78 44.2	27.8	76 51.1	51.0
28	00	276 00.1	155 51.0	N22 04.5	201 11.4	N22 58.1	93 46.5	N 0 27.7	91 53.5	N 0 51.0
	01	291 02.6	170 50.2	03.9	216 11.9	58.4	108 48.8	27.6	106 55.9	50.9
	02	306 05.0	185 49.5	03.4	231 12.5	58.6	123 51.0	27.5	121 58.3	50.9
	03	321 07.5	200 48.7	02.8	246 13.1	58.8	138 53.3	27.4	137 00.6	50.9
	04	336 10.0	215 48.0	02.2	261 13.7	59.0	153 55.6	27.3	152 03.0	50.8
	05	351 12.4	230 47.2	01.7	276 14.3	59.2	168 57.8	27.2	167 05.4	50.8
	06	6 14.9	245 46.4	N22 01.1	291 14.9	N22 59.4	184 00.1	N 0 27.1	182 07.8	N 0 50.7
	07	21 17.4	260 45.7	22 00.5	306 15.5	59.6	199 02.3	27.0	197 10.2	50.7
	08	36 19.8	275 44.9	21 59.9	321 16.1	22 59.8	214 04.6	26.9	212 12.5	50.6
S	09	51 22.3	290 44.2	59.4	336 16.7	23 00.0	229 06.9	26.8	227 14.9	50.6
U	10	66 24.8	305 43.4	58.8	351 17.3	00.2	244 09.1	26.7	242 17.3	50.5
N	11	81 27.2	320 42.6	58.2	6 17.9	00.4	259 11.4	26.6	257 19.7	50.5
D	12	96 29.7	335 41.9	N21 57.6	21 18.5	N23 00.6	274 13.7	N 0 26.5	272 22.1	N 0 50.4
A	13	111 32.2	350 41.1	57.1	36 19.1	00.8	289 15.9	26.4	287 24.4	50.4
Y	14	126 34.6	5 40.4	56.5	51 19.6	01.0	304 18.2	26.3	302 26.8	50.3
	15	141 37.1	20 39.6	55.9	66 20.2	01.2	319 20.5	26.2	317 29.2	50.3
	16	156 39.5	35 38.9	55.3	81 20.8	01.4	334 22.7	26.1	332 31.6	50.2
	17	171 42.0	50 38.1	54.7	96 21.4	01.6	349 25.0	26.0	347 34.0	50.2
	18	186 44.5	65 37.3	N21 54.1	111 22.0	N23 01.8	4 27.2	N 0 25.9	2 36.3	N 0 50.2
	19	201 46.9	80 36.6	53.6	126 22.6	02.0	19 29.5	25.8	17 38.7	50.1
	20	216 49.4	95 35.8	53.0	141 23.2	02.2	34 31.8	25.7	32 41.1	50.1
	21	231 51.9	110 35.1	52.4	156 23.8	02.4	49 34.0	25.6	47 43.5	50.0
	22	246 54.3	125 34.3	51.8	171 24.4	02.6	64 36.3	25.6	62 45.8	50.0
	23	261 56.8	140 33.6	51.2	186 25.0	02.8	79 38.6	25.5	77 48.2	49.9
29	00	276 59.3	155 32.8	N21 50.6	201 25.6	N23 03.0	94 40.8	N 0 25.4	92 50.6	N 0 49.9
	01	292 01.7	170 32.1	50.0	216 26.2	03.2	109 43.1	25.3	107 53.0	49.8
	02	307 04.2	185 31.3	49.4	231 26.7	03.4	124 45.3	25.2	122 55.4	49.8
	03	322 06.6	200 30.6	48.8	246 27.3	03.6	139 47.6	25.1	137 57.7	49.7
	04	337 09.1	215 29.8	48.2	261 27.9	03.8	154 49.9	25.0	153 00.1	49.7
	05	352 11.6	230 29.1	47.6	276 28.5	04.0	169 52.1	24.9	168 02.5	49.6
	06	7 14.0	245 28.3	N21 47.0	291 29.1	N23 04.2	184 54.4	N 0 24.8	183 04.9	N 0 49.6
	07	22 16.5	260 27.6	46.4	306 29.7	04.4	199 56.6	24.7	198 07.2	49.5
	08	37 19.0	275 26.8	45.8	321 30.3	04.6	214 58.9	24.6	213 09.6	49.5
M	09	52 21.4	290 26.1	45.2	336 30.9	04.8	230 01.2	24.5	228 12.0	49.4
O	10	67 23.9	305 25.3	44.6	351 31.5	05.0	245 03.4	24.4	243 14.4	49.4
N	11	82 26.4	320 24.6	44.0	6 32.1	05.2	260 05.7	24.3	258 16.7	49.3
D	12	97 28.8	335 23.8	N21 43.4	21 32.7	N23 05.4	275 07.9	N 0 24.2	273 19.1	N 0 49.3
A	13	112 31.3	350 23.1	42.8	36 33.3	05.6	290 10.2	24.1	288 21.5	49.2
Y	14	127 33.8	5 22.4	42.2	51 33.9	05.8	305 12.5	24.0	303 23.9	49.2
	15	142 36.2	20 21.6	41.6	66 34.4	06.0	320 14.7	23.9	318 26.2	49.1
	16	157 38.7	35 20.9	41.0	81 35.0	06.2	335 17.0	23.8	333 28.6	49.1
	17	172 41.1	50 20.1	40.4	96 35.6	06.4	350 19.2	23.7	348 31.0	49.0
	18	187 43.6	65 19.4	N21 39.8	111 36.2	N23 06.5	5 21.5	N 0 23.6	3 33.4	N 0 49.0
	19	202 46.1	80 18.6	39.2	126 36.8	06.7	20 23.7	23.5	18 35.7	49.0
	20	217 48.5	95 17.9	38.6	141 37.4	06.9	35 26.0	23.4	33 38.1	48.9
	21	232 51.0	110 17.2	38.0	156 38.0	07.1	50 28.2	23.3	48 40.5	48.9
	22	247 53.5	125 16.4	37.3	171 38.6	07.3	65 30.5	23.2	63 42.9	48.8
	23	262 55.9	140 15.7	36.7	186 39.2	07.5	80 32.8	23.1	78 45.2	48.8
Mer. Pass.		h m 5 35.1	v −0.8	d 0.6	v 0.6	d 0.2	v 2.3	d 0.1	v 2.4	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 37.1	S40 22.7
Achernar	335 45.1	S57 19.7
Acrux	173 36.6	S63 00.0
Adhara	255 32.1	S28 56.8
Aldebaran	291 17.7	N16 28.2
Alioth	166 42.0	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 14.0	S47 02.9
Alnilam	276 11.5	S 1 12.9
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.7	N28 59.0
Altair	62 31.7	N 8 49.2
Ankaa	353 39.7	S42 24.3
Antares	112 55.9	S26 23.5
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.6	S59 27.1
Bellatrix	278 58.5	N 6 19.9
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.2
Capella	281 11.0	N45 58.7
Deneb	49 47.7	N45 12.7
Denebola	182 58.6	N14 40.7
Diphda	349 20.4	S18 05.3
Dubhe	194 21.8	N61 51.4
Elnath	278 43.8	N28 35.4
Eltanin	90 56.9	N51 29.6
Enif	34 10.8	N 9 47.3
Fomalhaut	15 50.7	S29 43.1
Gacrux	172 28.1	S57 00.7
Gienah	176 17.4	S17 26.3
Hadar	149 22.3	S60 17.2
Hamal	328 28.5	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.3	N74 14.3
Markab	14 02.5	N15 06.2
Menkar	314 40.8	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.5	S69 38.6
Mirfak	309 15.7	N49 47.5
Nunki	76 28.1	S26 19.1
Peacock	53 57.0	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.4	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.0	N38 46.0
Zuben'ubi	137 32.2	S15 57.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	239 50.9	13 37
Mars	285 11.2	10 35
Jupiter	177 46.4	17 42
Saturn	175 53.4	17 50

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
27 00	179 17.4	N23 20.1	245 58.7	9.5	N 6 18.9	12.4	59.7
01	194 17.2	20.1	260 27.2	9.5	6 31.3	12.4	59.7
02	209 17.1	20.0	274 55.7	9.4	6 43.7	12.3	59.7
03	224 17.0	·· 19.9	289 24.1	9.3	6 56.0	12.3	59.8
04	239 16.8	19.8	303 52.4	9.3	7 08.3	12.3	59.8
05	254 16.7	19.7	318 20.7	9.3	7 20.6	12.2	59.8
06	269 16.6	N23 19.6	332 49.0	9.1	N 7 32.8	12.2	59.8
07	284 16.5	19.5	347 17.1	9.1	7 45.0	12.2	59.8
S 08	299 16.3	19.4	1 45.2	9.1	7 57.2	12.1	59.9
A 09	314 16.2	·· 19.3	16 13.3	9.0	8 09.3	12.1	59.9
T 10	329 16.1	19.2	30 41.3	8.9	8 21.4	12.0	59.9
U 11	344 15.9	19.1	45 09.2	8.9	8 33.4	12.0	59.9
R 12	359 15.8	N23 19.0	59 37.1	8.8	N 8 45.4	12.0	59.9
D 13	14 15.7	18.9	74 04.9	8.8	8 57.4	11.9	60.0
A 14	29 15.5	18.8	88 32.7	8.7	9 09.3	11.9	60.0
Y 15	44 15.4	·· 18.6	103 00.4	8.6	9 21.2	11.8	60.0
16	59 15.3	18.5	117 28.0	8.5	9 33.0	11.7	60.0
17	74 15.2	18.4	131 55.5	8.5	9 44.7	11.8	60.0
18	89 15.0	N23 18.3	146 23.0	8.5	N 9 56.5	11.6	60.1
19	104 14.9	18.2	160 50.5	8.3	10 08.1	11.6	60.1
20	119 14.8	18.1	175 17.8	8.3	10 19.7	11.6	60.1
21	134 14.6	·· 18.0	189 45.1	8.3	10 31.3	11.5	60.1
22	149 14.5	17.9	204 12.4	8.1	10 42.8	11.4	60.1
23	164 14.4	17.8	218 39.5	8.1	10 54.2	11.4	60.1
28 00	179 14.2	N23 17.7	233 06.6	8.1	N11 05.6	11.3	60.2
01	194 14.1	17.6	247 33.7	8.0	11 16.9	11.2	60.2
02	209 14.0	17.4	262 00.7	7.9	11 28.1	11.2	60.2
03	224 13.9	·· 17.3	276 27.6	7.8	11 39.3	11.2	60.2
04	239 13.7	17.2	290 54.4	7.8	11 50.5	11.0	60.2
05	254 13.6	17.1	305 21.2	7.6	12 01.5	11.0	60.2
06	269 13.5	N23 17.0	319 47.8	7.7	N12 12.5	10.9	60.2
07	284 13.3	16.9	334 14.5	7.5	12 23.4	10.8	60.3
08	299 13.2	16.8	348 41.0	7.5	12 34.2	10.8	60.3
S 09	314 13.1	·· 16.6	3 07.5	7.4	12 45.0	10.7	60.3
U 10	329 13.0	16.5	17 33.9	7.4	12 55.7	10.6	60.3
N 11	344 12.8	16.4	32 00.3	7.3	13 06.3	10.5	60.3
D 12	359 12.7	N23 16.3	46 26.6	7.2	N13 16.8	10.5	60.3
A 13	14 12.6	16.2	60 52.8	7.1	13 27.3	10.3	60.3
Y 14	29 12.5	16.0	75 18.9	7.1	13 37.6	10.3	60.3
15	44 12.3	·· 15.9	89 45.0	7.0	13 47.9	10.2	60.4
16	59 12.2	15.8	104 11.0	7.0	13 58.1	10.1	60.4
17	74 12.1	15.7	118 37.0	6.8	14 08.2	10.1	60.4
18	89 11.9	N23 15.5	133 02.8	6.8	N14 18.3	9.9	60.4
19	104 11.8	15.4	147 28.6	6.8	14 28.2	9.9	60.4
20	119 11.7	15.3	161 54.4	6.6	14 38.1	9.7	60.4
21	134 11.6	·· 15.2	176 20.0	6.6	14 47.8	9.7	60.4
22	149 11.4	15.0	190 45.6	6.5	14 57.5	9.5	60.4
23	164 11.3	14.9	205 11.1	6.5	15 07.0	9.5	60.4
29 00	179 11.2	N23 14.8	219 36.6	6.4	N15 16.5	9.4	60.4
01	194 11.1	14.7	234 02.0	6.3	15 25.9	9.3	60.5
02	209 10.9	14.5	248 27.3	6.3	15 35.2	9.1	60.5
03	224 10.8	·· 14.4	262 52.6	6.2	15 44.3	9.1	60.5
04	239 10.7	14.3	277 17.8	6.1	15 53.4	9.0	60.5
05	254 10.5	14.1	291 42.9	6.0	16 02.4	8.8	60.5
06	269 10.4	N23 14.0	306 07.9	6.0	N16 11.2	8.8	60.5
07	284 10.3	13.9	320 32.9	6.0	16 20.0	8.6	60.5
08	299 10.2	13.7	334 57.9	5.8	16 28.6	8.5	60.5
M 09	314 10.0	·· 13.6	349 22.7	5.8	16 37.1	8.5	60.5
O 10	329 09.9	13.5	3 47.5	5.8	16 45.6	8.3	60.5
N 11	344 09.8	13.3	18 12.3	5.7	16 53.9	8.2	60.5
D 12	359 09.7	N23 13.2	32 37.0	5.6	N17 02.1	8.1	60.5
A 13	14 09.5	13.0	47 01.6	5.5	17 10.2	7.9	60.5
Y 14	29 09.4	12.9	61 26.1	5.5	17 18.1	7.9	60.5
15	44 09.3	·· 12.8	75 50.6	5.5	17 26.0	7.7	60.5
16	59 09.2	12.6	90 15.1	5.4	17 33.7	7.6	60.5
17	74 09.0	12.5	104 39.5	5.3	17 41.3	7.5	60.5
18	89 08.9	N23 12.3	119 03.8	5.3	N17 48.8	7.4	60.5
19	104 08.8	12.2	133 28.1	5.2	17 56.2	7.2	60.5
20	119 08.7	12.1	147 52.3	5.1	18 03.4	7.1	60.5
21	134 08.5	·· 11.9	162 16.4	5.2	18 10.5	7.0	60.5
22	149 08.4	11.8	176 40.6	5.0	18 17.5	6.9	60.5
23	164 08.3	11.6	191 04.6	5.0	18 24.4	6.7	60.5
	S.D. 15.8	d 0.1	S.D. 16.3		16.4		16.5

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	02 50	02 57	12 03	07 53	20 20	25	
28	03 03	03 09	12 03	08 47	21 15	26	◐
29	03 15	03 21	12 03	09 44	22 14	27	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.5		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
30	00	277 58.4	155 14.9	N21 36.1	201 39.8	N23 07.7	95 35.0	N 0 23.0	93 47.6	N 0 48.7
	01	293 00.9	170 14.2	35.5	216 40.4	07.9	110 37.3	22.9	108 50.0	48.7
	02	308 03.3	185 13.4	34.9	231 41.0	08.1	125 39.5	22.8	123 52.4	48.6
	03	323 05.8	200 12.7	·· 34.3	246 41.6	·· 08.3	140 41.8	·· 22.7	138 54.7	·· 48.6
	04	338 08.3	215 12.0	33.6	261 42.1	08.4	155 44.0	22.6	153 57.1	48.5
	05	353 10.7	230 11.2	33.0	276 42.7	08.6	170 46.3	22.5	168 59.5	48.5
	06	8 13.2	245 10.5	N21 32.4	291 43.3	N23 08.8	185 48.5	N 0 22.4	184 01.9	N 0 48.4
	07	23 15.6	260 09.8	31.8	306 43.9	09.0	200 50.8	22.3	199 04.2	48.4
	08	38 18.1	275 09.0	31.1	321 44.5	09.2	215 53.1	22.2	214 06.6	48.3
TUESDAY	09	53 20.6	290 08.3	·· 30.5	336 45.1	·· 09.4	230 55.3	·· 22.1	229 09.0	·· 48.3
	10	68 23.0	305 07.6	29.9	351 45.7	09.6	245 57.6	22.0	244 11.3	48.2
	11	83 25.5	320 06.8	29.3	6 46.3	09.8	260 59.8	21.9	259 13.7	48.2
	12	98 28.0	335 06.1	N21 28.6	21 46.9	N23 09.9	276 02.1	N 0 21.8	274 16.1	N 0 48.1
	13	113 30.4	350 05.4	28.0	36 47.5	10.1	291 04.3	21.7	289 18.5	48.1
	14	128 32.9	5 04.6	27.4	51 48.1	10.3	306 06.6	21.5	304 20.8	48.0
	15	143 35.4	20 03.9	·· 26.7	66 48.7	·· 10.5	321 08.8	·· 21.4	319 23.2	·· 48.0
	16	158 37.8	35 03.2	26.1	81 49.3	10.7	336 11.1	21.3	334 25.6	47.9
	17	173 40.3	50 02.4	25.5	96 49.9	10.9	351 13.3	21.2	349 27.9	47.9
	18	188 42.7	65 01.7	N21 24.8	111 50.4	N23 11.1	6 15.6	N 0 21.1	4 30.3	N 0 47.8
	19	203 45.2	80 01.0	24.2	126 51.0	11.2	21 17.8	21.0	19 32.7	47.8
	20	218 47.7	95 00.2	23.6	141 51.6	11.4	36 20.1	20.9	34 35.1	47.7
	21	233 50.1	109 59.5	·· 22.9	156 52.2	·· 11.6	51 22.3	·· 20.8	49 37.4	·· 47.7
	22	248 52.6	124 58.8	22.3	171 52.8	11.8	66 24.6	20.7	64 39.8	47.6
	23	263 55.1	139 58.0	21.6	186 53.4	12.0	81 26.8	20.6	79 42.2	47.6
1	00	278 57.5	154 57.3	N21 21.0	201 54.0	N23 12.1	96 29.1	N 0 20.5	94 44.5	N 0 47.5
	01	294 00.0	169 56.6	20.4	216 54.6	12.3	111 31.3	20.4	109 46.9	47.5
	02	309 02.5	184 55.9	19.7	231 55.2	12.5	126 33.6	20.3	124 49.3	47.4
	03	324 04.9	199 55.1	·· 19.1	246 55.8	·· 12.7	141 35.8	·· 20.2	139 51.6	·· 47.4
	04	339 07.4	214 54.4	18.4	261 56.4	12.9	156 38.1	20.1	154 54.0	47.3
	05	354 09.9	229 53.7	17.8	276 57.0	13.0	171 40.3	20.0	169 56.4	47.3
	06	9 12.3	244 53.0	N21 17.1	291 57.6	N23 13.2	186 42.6	N 0 19.9	184 58.8	N 0 47.2
	07	24 14.8	259 52.2	16.5	306 58.2	13.4	201 44.8	19.8	200 01.1	47.2
	08	39 17.2	274 51.5	15.8	321 58.7	13.6	216 47.1	19.7	215 03.5	47.1
WEDNESDAY	09	54 19.7	289 50.8	·· 15.2	336 59.3	·· 13.8	231 49.3	·· 19.6	230 05.9	·· 47.0
	10	69 22.2	304 50.1	14.5	351 59.9	13.9	246 51.6	19.5	245 08.2	47.0
	11	84 24.6	319 49.3	13.9	7 00.5	14.1	261 53.8	19.4	260 10.6	46.9
	12	99 27.1	334 48.6	N21 13.2	22 01.1	N23 14.3	276 56.1	N 0 19.3	275 13.0	N 0 46.9
	13	114 29.6	349 47.9	12.6	37 01.7	14.5	291 58.3	19.2	290 15.3	46.8
	14	129 32.0	4 47.2	11.9	52 02.3	14.6	307 00.6	19.1	305 17.7	46.8
	15	144 34.5	19 46.5	·· 11.2	67 02.9	·· 14.8	322 02.8	·· 19.0	320 20.1	·· 46.7
	16	159 37.0	34 45.7	10.6	82 03.5	15.0	337 05.0	18.9	335 22.4	46.7
	17	174 39.4	49 45.0	09.9	97 04.1	15.2	352 07.3	18.8	350 24.8	46.6
	18	189 41.9	64 44.3	N21 09.3	112 04.7	N23 15.3	7 09.5	N 0 18.7	5 27.2	N 0 46.6
	19	204 44.4	79 43.6	08.6	127 05.3	15.5	22 11.8	18.5	20 29.5	46.5
	20	219 46.8	94 42.9	07.9	142 05.9	15.7	37 14.0	18.4	35 31.9	46.5
	21	234 49.3	109 42.1	·· 07.3	157 06.5	·· 15.9	52 16.3	·· 18.3	50 34.3	·· 46.4
	22	249 51.7	124 41.4	06.6	172 07.0	16.0	67 18.5	18.2	65 36.6	46.4
	23	264 54.2	139 40.7	05.9	187 07.6	16.2	82 20.8	18.1	80 39.0	46.3
2	00	279 56.7	154 40.0	N21 05.3	202 08.2	N23 16.4	97 23.0	N 0 18.0	95 41.4	N 0 46.3
	01	294 59.1	169 39.3	04.6	217 08.8	16.6	112 25.3	17.9	110 43.7	46.2
	02	310 01.6	184 38.6	03.9	232 09.4	16.7	127 27.5	17.8	125 46.1	46.2
	03	325 04.1	199 37.8	·· 03.3	247 10.0	·· 16.9	142 29.7	·· 17.7	140 48.5	·· 46.1
	04	340 06.5	214 37.1	02.6	262 10.6	17.1	157 32.0	17.6	155 50.8	46.1
	05	355 09.0	229 36.4	01.9	277 11.2	17.2	172 34.2	17.5	170 53.2	46.0
	06	10 11.5	244 35.7	N21 01.3	292 11.8	N23 17.4	187 36.5	N 0 17.4	185 55.6	N 0 46.0
	07	25 13.9	259 35.0	21 00.6	307 12.4	17.6	202 38.7	17.3	200 57.9	45.9
THURSDAY	08	40 16.4	274 34.3	20 59.9	322 13.0	17.7	217 41.0	17.2	216 00.3	45.9
	09	55 18.8	289 33.6	·· 59.2	337 13.6	·· 17.9	232 43.2	·· 17.1	231 02.7	·· 45.8
	10	70 21.3	304 32.9	58.6	352 14.2	18.1	247 45.4	17.0	246 05.0	45.7
	11	85 23.8	319 32.1	57.9	7 14.8	18.3	262 47.7	16.9	261 07.4	45.7
	12	100 26.2	334 31.4	N20 57.2	22 15.4	N23 18.4	277 49.9	N 0 16.8	276 09.8	N 0 45.6
	13	115 28.7	349 30.7	56.5	37 15.9	18.6	292 52.2	16.6	291 12.1	45.6
	14	130 31.2	4 30.0	55.8	52 16.5	18.8	307 54.4	16.5	306 14.5	45.5
	15	145 33.6	19 29.3	·· 55.2	67 17.1	·· 18.9	322 56.6	·· 16.4	321 16.9	·· 45.5
	16	160 36.1	34 28.6	54.5	82 17.7	19.1	337 58.9	16.3	336 19.2	45.4
	17	175 38.6	49 27.9	53.8	97 18.3	19.3	353 01.1	16.2	351 21.6	45.4
	18	190 41.0	64 27.2	N20 53.1	112 18.9	N23 19.4	8 03.4	N 0 16.1	6 24.0	N 0 45.3
	19	205 43.5	79 26.5	52.4	127 19.5	19.6	23 05.6	16.0	21 26.3	45.3
	20	220 46.0	94 25.8	51.7	142 20.1	19.7	38 07.8	15.9	36 28.7	45.2
	21	235 48.4	109 25.1	·· 51.1	157 20.7	·· 19.9	53 10.1	·· 15.8	51 31.0	·· 45.2
	22	250 50.9	124 24.4	50.4	172 21.3	20.1	68 12.3	15.7	66 33.4	45.1
	23	265 53.3	139 23.7	49.7	187 21.9	20.2	83 14.6	15.6	81 35.8	45.1
Mer. Pass.		h m 5 23.3	v −0.7	d 0.7	v 0.6	d 0.2	v 2.2	d 0.1	v 2.4	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.1	S40 22.6
Achernar	335 45.0	S57 19.7
Acrux	173 36.6	S63 00.0
Adhara	255 32.1	S28 56.8
Aldebaran	291 17.7	N16 28.2
Alioth	166 42.0	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 14.0	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.7	N28 59.1
Altair	62 31.7	N 8 49.2
Ankaa	353 39.7	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.8	N19 16.9
Atria	108 19.1	S68 59.7
Avior	234 28.6	S59 27.1
Bellatrix	278 58.5	N 6 19.9
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.2
Capella	281 11.0	N45 58.7
Deneb	49 47.7	N45 12.7
Denebola	182 58.6	N14 40.7
Diphda	349 20.3	S18 05.3
Dubhe	194 21.8	N61 51.4
Elnath	278 43.8	N28 35.4
Eltanin	90 56.9	N51 29.6
Enif	34 10.8	N 9 47.3
Fomalhaut	15 50.7	S29 43.1
Gacrux	172 28.1	S57 00.7
Gienah	176 17.4	S17 26.3
Hadar	149 22.3	S60 17.2
Hamal	328 28.5	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.4	N74 14.3
Markab	14 02.5	N15 06.2
Menkar	314 40.8	N 4 00.9
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.6	S69 38.6
Mirfak	309 15.7	N49 47.5
Nunki	76 28.1	S26 19.1
Peacock	53 57.0	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.6	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.4	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.7	S43 21.6
Vega	80 55.0	N38 46.0
Zuben'ubi	137 32.2	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	235 59.8	13 41
Mars	282 56.5	10 32
Jupiter	177 31.5	17 31
Saturn	175 47.0	17 38

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
30 00	179 08.2	N23 11.5	205 28.6	5.0	N18 31.1	6.6	60.5
01	194 08.0	11.3	219 52.6	4.9	18 37.7	6.5	60.5
02	209 07.9	11.2	234 16.5	4.9	18 44.2	6.3	60.5
03	224 07.8	·· 11.0	248 40.4	4.8	18 50.5	6.2	60.5
04	239 07.7	10.9	263 04.2	4.8	18 56.7	6.1	60.5
05	254 07.5	10.7	277 28.0	4.7	19 02.8	5.9	60.5
06	269 07.4	N23 10.6	291 51.7	4.7	N19 08.7	5.8	60.5
07	284 07.3	10.4	306 15.4	4.6	19 14.5	5.7	60.5
08	299 07.2	10.3	320 39.0	4.6	19 20.2	5.5	60.5
TUESDAY 09	314 07.0	·· 10.1	335 02.6	4.6	19 25.7	5.4	60.5
10	329 06.9	10.0	349 26.2	4.6	19 31.1	5.3	60.5
11	344 06.8	09.8	3 49.8	4.5	19 36.4	5.1	60.5
12	359 06.7	N23 09.7	18 13.3	4.4	N19 41.5	4.9	60.5
13	14 06.5	09.5	32 36.7	4.5	19 46.4	4.9	60.4
14	29 06.4	09.4	47 00.2	4.4	19 51.3	4.7	60.4
15	44 06.3	·· 09.2	61 23.6	4.4	19 56.0	4.5	60.4
16	59 06.2	09.1	75 47.0	4.3	20 00.5	4.4	60.4
17	74 06.0	08.9	90 10.3	4.4	20 04.9	4.3	60.4
18	89 05.9	N23 08.7	104 33.7	4.3	N20 09.2	4.1	60.4
19	104 05.8	08.6	118 57.0	4.3	20 13.3	3.9	60.4
20	119 05.7	08.4	133 20.3	4.2	20 17.2	3.8	60.4
21	134 05.6	·· 08.3	147 43.5	4.3	20 21.0	3.7	60.4
22	149 05.4	08.1	162 06.8	4.2	20 24.7	3.5	60.4
23	164 05.3	07.9	176 30.0	4.2	20 28.2	3.4	60.3
1 00	179 05.2	N23 07.8	190 53.2	4.2	N20 31.6	3.2	60.3
01	194 05.1	07.6	205 16.4	4.2	20 34.8	3.1	60.3
02	209 04.9	07.5	219 39.6	4.2	20 37.9	2.9	60.3
03	224 04.8	·· 07.3	234 02.8	4.2	20 40.8	2.8	60.3
04	239 04.7	07.1	248 26.0	4.2	20 43.6	2.6	60.3
05	254 04.6	07.0	262 49.2	4.1	20 46.2	2.5	60.3
06	269 04.4	N23 06.8	277 12.3	4.2	N20 48.7	2.3	60.2
07	284 04.3	06.6	291 35.5	4.2	20 51.0	2.2	60.2
WEDNESDAY 08	299 04.2	06.5	305 58.7	4.2	20 53.2	2.0	60.2
09	314 04.1	·· 06.3	320 21.9	4.1	20 55.2	1.9	60.2
10	329 04.0	06.1	334 45.0	4.2	20 57.1	1.7	60.2
11	344 03.8	06.0	349 08.2	4.2	20 58.8	1.6	60.2
12	359 03.7	N23 05.8	3 31.4	4.2	N21 00.4	1.4	60.1
13	14 03.6	05.6	17 54.6	4.2	21 01.8	1.3	60.1
14	29 03.5	05.4	32 17.8	4.2	21 03.1	1.1	60.1
15	44 03.4	·· 05.3	46 41.0	4.3	21 04.2	1.0	60.1
16	59 03.2	05.1	61 04.3	4.2	21 05.2	0.8	60.1
17	74 03.1	04.9	75 27.5	4.3	21 06.0	0.7	60.1
18	89 03.0	N23 04.7	89 50.8	4.3	N21 06.7	0.5	60.0
19	104 02.9	04.6	104 14.1	4.3	21 07.2	0.4	60.0
20	119 02.7	04.4	118 37.4	4.4	21 07.6	0.2	60.0
21	134 02.6	·· 04.2	133 00.8	4.3	21 07.8	0.1	60.0
22	149 02.5	04.0	147 24.1	4.4	21 07.9	0.1	60.0
23	164 02.4	03.9	161 47.5	4.5	21 07.8	0.2	59.9
2 00	179 02.3	N23 03.7	176 11.0	4.4	N21 07.6	0.4	59.9
01	194 02.1	03.5	190 34.4	4.5	21 07.2	0.5	59.9
02	209 02.0	03.3	204 57.9	4.6	21 06.7	0.7	59.9
03	224 01.9	·· 03.1	219 21.5	4.5	21 06.0	0.8	59.8
04	239 01.8	03.0	233 45.0	4.6	21 05.2	1.0	59.8
05	254 01.7	02.8	248 08.6	4.7	21 04.2	1.1	59.8
06	269 01.5	N23 02.6	262 32.3	4.7	N21 03.1	1.2	59.8
07	284 01.4	02.4	276 56.0	4.7	21 01.9	1.4	59.7
THURSDAY 08	299 01.3	02.2	291 19.7	4.8	21 00.5	1.6	59.7
09	314 01.2	·· 02.0	305 43.5	4.8	20 58.9	1.7	59.7
10	329 01.1	01.8	320 07.3	4.9	20 57.2	1.8	59.7
11	344 01.0	01.7	334 31.2	4.9	20 55.4	2.0	59.6
12	359 00.8	N23 01.5	348 55.1	5.0	N20 53.4	2.1	59.6
13	14 00.7	01.3	3 19.1	5.1	20 51.3	2.3	59.6
14	29 00.6	01.1	17 43.2	5.1	20 49.0	2.4	59.6
15	44 00.5	·· 00.9	32 07.3	5.1	20 46.6	2.5	59.5
16	59 00.4	00.7	46 31.4	5.2	20 44.1	2.7	59.5
17	74 00.2	00.5	60 55.6	5.3	20 41.4	2.8	59.5
18	89 00.1	N23 00.3	75 19.9	5.3	N20 38.6	2.9	59.4
19	104 00.0	23 00.1	89 44.2	5.4	20 35.7	3.1	59.4
20	118 59.9	22 59.9	104 08.6	5.5	20 32.6	3.2	59.4
21	133 59.8	·· 59.8	118 33.1	5.5	20 29.4	3.4	59.4
22	148 59.7	59.6	132 57.6	5.6	20 26.0	3.5	59.3
23	163 59.5	59.4	147 22.2	5.7	20 22.5	3.6	59.3
	S.D. 15.8	d 0.2	S.D. 16.5		16.4		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	▭
N 70	▭	▭	▭	▭	▭	▭	▭
68	▭	▭	▭	00 38	00 50	01 33	03 04
66	////	////	00 17	01 06	01 33	02 24	03 44
64	////	////	01 41	01 28	02 02	02 56	04 11
62	////	////	02 16	01 46	02 24	03 19	04 32
60	////	01 03	02 42	02 01	02 42	03 38	04 50
N 58	////	01 48	03 02	02 13	02 57	03 54	05 04
56	////	02 17	03 18	02 24	03 10	04 07	05 16
54	00 58	02 38	03 32	02 34	03 21	04 19	05 27
52	01 40	02 56	03 44	02 42	03 31	04 29	05 37
50	02 06	03 11	03 55	02 50	03 40	04 38	05 45
45	02 50	03 40	04 17	03 07	03 58	04 58	06 03
N 40	03 20	04 02	04 35	03 20	04 14	05 13	06 18
35	03 43	04 20	04 49	03 32	04 27	05 27	06 30
30	04 02	04 35	05 02	03 42	04 38	05 38	06 41
20	04 30	05 00	05 24	04 00	04 58	05 58	07 00
N 10	04 53	05 20	05 43	04 15	05 15	06 16	07 16
0	05 11	05 38	06 00	04 30	05 31	06 32	07 31
S 10	05 28	05 54	06 17	04 44	05 47	06 48	07 46
20	05 44	06 12	06 36	05 00	06 04	07 05	08 02
30	06 00	06 30	06 56	05 18	06 24	07 25	08 21
35	06 09	06 41	07 09	05 28	06 35	07 37	08 32
40	06 18	06 52	07 23	05 40	06 49	07 50	08 44
45	06 28	07 05	07 39	05 55	07 04	08 06	08 59
S 50	06 40	07 21	07 59	06 12	07 24	08 26	09 16
52	06 45	07 29	08 09	06 20	07 33	08 35	09 25
54	06 51	07 37	08 20	06 30	07 43	08 45	09 34
56	06 57	07 45	08 32	06 40	07 55	08 57	09 44
58	07 03	07 55	08 47	06 52	08 09	09 11	09 56
S 60	07 10	08 07	09 04	07 06	08 25	09 26	10 10

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 30	Moonset 1	Moonset 2	Moonset 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	▭
N 70	▭	▭	▭	▭	▭	▭	▭
68	▭	▭	▭	21 33	22 59	23 34	23 44
66	23 41	////	////	20 51	22 08	22 54	23 16
64	22 25	////	////	20 23	21 37	22 26	22 55
62	21 50	////	////	20 01	21 13	22 04	22 38
60	21 25	23 03	////	19 43	20 54	21 47	22 24
N 58	21 05	22 18	////	19 28	20 38	21 32	22 12
56	20 49	21 50	////	19 16	20 25	21 20	22 01
54	20 35	21 29	23 08	19 05	20 13	21 09	21 51
52	20 23	21 11	22 27	18 55	20 03	20 59	21 43
50	20 12	20 57	22 01	18 46	19 54	20 50	21 36
45	19 50	20 27	21 17	18 28	19 34	20 32	21 19
N 40	19 33	20 05	20 47	18 13	19 19	20 16	21 06
35	19 18	19 47	20 24	18 00	19 05	20 04	20 55
30	19 05	19 32	20 06	17 49	18 54	19 52	20 45
20	18 43	19 08	19 37	17 30	18 34	19 33	20 27
N 10	18 25	18 48	19 15	17 14	18 16	19 16	20 12
0	18 07	18 30	18 56	16 59	18 00	19 00	19 58
S 10	17 50	18 13	18 39	16 43	17 44	18 45	19 44
20	17 32	17 56	18 23	16 27	17 26	18 28	19 29
30	17 11	17 37	18 07	16 08	17 06	18 08	19 11
35	16 59	17 27	17 59	15 57	16 54	17 57	19 01
40	16 45	17 15	17 49	15 44	16 41	17 43	18 49
45	16 29	17 02	17 39	15 29	16 25	17 28	18 35
S 50	16 08	16 46	17 28	15 11	16 05	17 09	18 18
52	15 58	16 39	17 23	15 03	15 56	16 59	18 10
54	15 48	16 31	17 17	14 53	15 46	16 49	18 01
56	15 35	16 22	17 11	14 42	15 34	16 38	17 51
58	15 21	16 12	17 05	14 30	15 20	16 24	17 39
S 60	15 04	16 01	16 57	14 16	15 04	16 09	17 26

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
30	03 27	03 33	12 04	10 44	23 15	28	
1	03 39	03 45	12 04	11 45	24 16	29	●
2	03 51	03 56	12 04	12 46	00 16	01	

G.M.T.	ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.5		SATURN +1.2	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
3 00	280 55.8	154 23.0	N20 49.0	202 22.5	N23 20.4	98 16.8	N 0 15.5	96 38.1	N 0 45.0
01	295 58.3	169 22.3	48.3	217 23.1	20.6	113 19.0	15.4	111 40.5	44.9
02	311 00.7	184 21.6	47.6	232 23.7	20.7	128 21.3	15.3	126 42.9	44.9
03	326 03.2	199 20.9	·· 46.9	247 24.3	·· 20.9	143 23.5	·· 15.1	141 45.2	·· 44.8
04	341 05.7	214 20.2	46.2	262 24.8	21.1	158 25.8	15.0	156 47.6	44.8
05	356 08.1	229 19.5	45.5	277 25.4	21.2	173 28.0	14.9	171 49.9	44.7
06	11 10.6	244 18.8	N20 44.8	292 26.0	N23 21.4	188 30.2	N 0 14.8	186 52.3	N 0 44.7
07	26 13.1	259 18.1	44.1	307 26.6	21.5	203 32.5	14.7	201 54.7	44.6
08	41 15.5	274 17.4	43.4	322 27.2	21.7	218 34.7	14.6	216 57.0	44.6
F 09	56 18.0	289 16.7	·· 42.7	337 27.8	·· 21.9	233 36.9	·· 14.5	231 59.4	·· 44.5
R 10	71 20.5	304 16.0	42.0	352 28.4	22.0	248 39.2	14.4	247 01.8	44.5
I 11	86 22.9	319 15.3	41.3	7 29.0	22.2	263 41.4	14.3	262 04.1	44.4
D 12	101 25.4	334 14.6	N20 40.6	22 29.6	N23 22.3	278 43.6	N 0 14.2	277 06.5	N 0 44.4
A 13	116 27.8	349 13.9	39.9	37 30.2	22.5	293 45.9	14.1	292 08.8	44.3
Y 14	131 30.3	4 13.2	39.2	52 30.8	22.7	308 48.1	13.9	307 11.2	44.2
15	146 32.8	19 12.5	·· 38.5	67 31.4	·· 22.8	323 50.4	·· 13.8	322 13.6	·· 44.2
16	161 35.2	34 11.8	37.8	82 32.0	23.0	338 52.6	13.7	337 15.9	44.1
17	176 37.7	49 11.1	37.1	97 32.6	23.1	353 54.8	13.6	352 18.3	44.1
18	191 40.2	64 10.4	N20 36.4	112 33.2	N23 23.3	8 57.1	N 0 13.5	7 20.6	N 0 44.0
19	206 42.6	79 09.7	35.7	127 33.8	23.4	23 59.3	13.4	22 23.0	44.0
20	221 45.1	94 09.0	35.0	142 34.4	23.6	39 01.5	13.3	37 25.4	43.9
21	236 47.6	109 08.3	·· 34.2	157 34.9	·· 23.7	54 03.8	·· 13.2	52 27.7	·· 43.9
22	251 50.0	124 07.6	33.5	172 35.5	23.9	69 06.0	13.1	67 30.1	43.8
23	266 52.5	139 06.9	32.8	187 36.1	24.1	84 08.2	13.0	82 32.4	43.8
4 00	281 54.9	154 06.2	N20 32.1	202 36.7	N23 24.2	99 10.5	N 0 12.9	97 34.8	N 0 43.7
01	296 57.4	169 05.5	31.4	217 37.3	24.4	114 12.7	12.7	112 37.2	43.6
02	311 59.9	184 04.9	30.7	232 37.9	24.5	129 14.9	12.6	127 39.5	43.6
03	327 02.3	199 04.2	·· 30.0	247 38.5	·· 24.7	144 17.2	·· 12.5	142 41.9	·· 43.5
04	342 04.8	214 03.5	29.2	262 39.1	24.8	159 19.4	12.4	157 44.2	43.5
05	357 07.3	229 02.8	28.5	277 39.7	25.0	174 21.6	12.3	172 46.6	43.4
06	12 09.7	244 02.1	N20 27.8	292 40.3	N23 25.1	189 23.9	N 0 12.2	187 49.0	N 0 43.4
07	27 12.2	259 01.4	27.1	307 40.9	25.3	204 26.1	12.1	202 51.3	43.3
S 08	42 14.7	274 00.7	26.4	322 41.5	25.4	219 28.3	12.0	217 53.7	43.3
A 09	57 17.1	289 00.0	·· 25.6	337 42.1	·· 25.6	234 30.6	·· 11.9	232 56.0	·· 43.2
T 10	72 19.6	303 59.4	24.9	352 42.7	25.7	249 32.8	11.8	247 58.4	43.1
U 11	87 22.1	318 58.7	24.2	7 43.3	25.9	264 35.0	11.6	263 00.8	43.1
R 12	102 24.5	333 58.0	N20 23.5	22 43.9	N23 26.0	279 37.2	N 0 11.5	278 03.1	N 0 43.0
D 13	117 27.0	348 57.3	22.7	37 44.5	26.2	294 39.5	11.4	293 05.5	43.0
A 14	132 29.4	3 56.6	22.0	52 45.1	26.3	309 41.7	11.3	308 07.8	42.9
Y 15	147 31.9	18 55.9	·· 21.3	67 45.7	·· 26.5	324 43.9	·· 11.2	323 10.2	·· 42.9
16	162 34.4	33 55.3	20.5	82 46.2	26.6	339 46.2	11.1	338 12.5	42.8
17	177 36.8	48 54.6	19.8	97 46.8	26.8	354 48.4	11.0	353 14.9	42.8
18	192 39.3	63 53.9	N20 19.1	112 47.4	N23 26.9	9 50.6	N 0 10.9	8 17.3	N 0 42.7
19	207 41.8	78 53.2	18.3	127 48.0	27.1	24 52.9	10.7	23 19.6	42.6
20	222 44.2	93 52.5	17.6	142 48.6	27.2	39 55.1	10.6	38 22.0	42.6
21	237 46.7	108 51.9	·· 16.9	157 49.2	·· 27.4	54 57.3	·· 10.5	53 24.3	·· 42.5
22	252 49.2	123 51.2	16.1	172 49.8	27.5	69 59.5	10.4	68 26.7	42.5
23	267 51.6	138 50.5	15.4	187 50.4	27.7	85 01.8	10.3	83 29.0	42.4
5 00	282 54.1	153 49.8	N20 14.7	202 51.0	N23 27.8	100 04.0	N 0 10.2	98 31.4	N 0 42.4
01	297 56.6	168 49.2	13.9	217 51.6	28.0	115 06.2	10.1	113 33.7	42.3
02	312 59.0	183 48.5	13.2	232 52.2	28.1	130 08.5	10.0	128 36.1	42.2
03	328 01.5	198 47.8	·· 12.4	247 52.8	·· 28.2	145 10.7	·· 09.9	143 38.5	·· 42.2
04	343 03.9	213 47.1	11.7	262 53.4	28.4	160 12.9	09.7	158 40.8	42.1
05	358 06.4	228 46.4	11.0	277 54.0	28.5	175 15.1	09.6	173 43.2	42.1
06	13 08.9	243 45.8	N20 10.2	292 54.6	N23 28.7	190 17.4	N 0 09.5	188 45.5	N 0 42.0
07	28 11.3	258 45.1	09.5	307 55.2	28.8	205 19.6	09.4	203 47.9	42.0
08	43 13.8	273 44.4	08.7	322 55.8	29.0	220 21.8	09.3	218 50.2	41.9
S 09	58 16.3	288 43.8	·· 08.0	337 56.4	·· 29.1	235 24.0	·· 09.2	233 52.6	·· 41.8
U 10	73 18.7	303 43.1	07.2	352 57.0	29.2	250 26.3	09.1	248 54.9	41.8
N 11	88 21.2	318 42.4	06.5	7 57.6	29.4	265 28.5	09.0	263 57.3	41.7
D 12	103 23.7	333 41.7	N20 05.7	22 58.2	N23 29.5	280 30.7	N 0 08.8	278 59.7	N 0 41.7
A 13	118 26.1	348 41.1	05.0	37 58.8	29.7	295 32.9	08.7	294 02.0	41.6
Y 14	133 28.6	3 40.4	04.2	52 59.3	29.8	310 35.2	08.6	309 04.4	41.6
15	148 31.0	18 39.7	·· 03.5	67 59.9	·· 29.9	325 37.4	·· 08.5	324 06.7	·· 41.5
16	163 33.5	33 39.1	02.7	83 00.5	30.1	340 39.6	08.4	339 09.1	41.4
17	178 36.0	48 38.4	02.0	98 01.1	30.2	355 41.8	08.3	354 11.4	41.4
18	193 38.4	63 37.7	N20 01.2	113 01.7	N23 30.4	10 44.1	N 0 08.2	9 13.8	N 0 41.3
19	208 40.9	78 37.1	20 00.5	128 02.3	30.5	25 46.3	08.0	24 16.1	41.3
20	223 43.4	93 36.4	19 59.7	143 02.9	30.6	40 48.5	07.9	39 18.5	41.2
21	238 45.8	108 35.7	·· 59.0	158 03.5	·· 30.8	55 50.7	·· 07.8	54 20.8	·· 41.2
22	253 48.3	123 35.1	58.2	173 04.1	30.9	70 53.0	07.7	69 23.2	41.1
23	268 50.8	138 34.4	57.4	188 04.7	31.0	85 55.2	07.6	84 25.5	41.0
	h m								
Mer. Pass.	5 11.5	v −0.7	d 0.7	v 0.6	d 0.1	v 2.2	d 0.1	v 2.4	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.1	S40 22.6
Achernar	335 45.0	S57 19.7
Acrux	173 36.7	S63 00.0
Adhara	255 32.1	S28 56.8
Aldebaran	291 17.7	N16 28.2
Alioth	166 42.0	N56 04.0
Alkaid	153 17.9	N49 24.7
Al Na'ir	28 13.9	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.8
Alpheratz	358 08.7	N28 59.1
Altair	62 31.7	N 8 49.2
Ankaa	353 39.7	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.8	N19 17.0
Atria	108 19.1	S68 59.8
Avior	234 28.6	S59 27.1
Bellatrix	278 58.5	N 6 19.9
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.1
Capella	281 10.9	N45 58.7
Deneb	49 47.7	N45 12.7
Denebola	182 58.6	N14 40.7
Diphda	349 20.3	S18 05.3
Dubhe	194 21.8	N61 51.4
Elnath	278 43.8	N28 35.4
Eltanin	90 56.9	N51 29.6
Enif	34 10.8	N 9 47.3
Fomalhaut	15 50.6	S29 43.1
Gacrux	172 28.2	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.3	S60 17.2
Hamal	328 28.4	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.4	N74 14.3
Markab	14 02.5	N15 06.2
Menkar	314 40.7	N 4 01.0
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.6	S69 38.6
Mirfak	309 15.6	N49 47.5
Nunki	76 28.1	S26 19.1
Peacock	53 57.0	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.7	N12 34.5
Regulus	208 09.6	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.7	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.3	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.8	S43 21.6
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	232 11.3	13 44
Mars	280 41.8	10 29
Jupiter	177 15.5	17 21
Saturn	175 39.9	17 27

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
3 00	178 59.4	N22 59.2	161 46.9	5.7	N20 18.9	3.7	59.3
01	193 59.3	59.0	176 11.6	5.8	20 15.2	3.9	59.2
02	208 59.2	58.8	190 36.4	5.9	20 11.3	4.0	59.2
03	223 59.1	58.6	205 01.3	5.9	20 07.3	4.2	59.2
04	238 59.0	58.4	219 26.2	6.0	20 03.1	4.2	59.1
05	253 58.8	58.2	233 51.2	6.1	19 58.9	4.4	59.1
06	268 58.7	N22 58.0	248 16.3	6.2	N19 54.5	4.5	59.1
07	283 58.6	57.8	262 41.5	6.3	19 50.0	4.7	59.1
08	298 58.5	57.6	277 06.8	6.3	19 45.3	4.7	59.0
F 09	313 58.4	57.4	291 32.1	6.4	19 40.6	4.9	59.0
R 10	328 58.3	57.2	305 57.5	6.5	19 35.7	5.0	59.0
I 11	343 58.1	57.0	320 23.0	6.6	19 30.7	5.2	58.9
D 12	358 58.0	N22 56.8	334 48.6	6.6	N19 25.5	5.2	58.9
A 13	13 57.9	56.6	349 14.2	6.8	19 20.3	5.4	58.9
Y 14	28 57.8	56.4	3 40.0	6.8	19 14.9	5.4	58.8
15	43 57.7	56.1	18 05.8	6.9	19 09.5	5.6	58.8
16	58 57.6	55.9	32 31.7	7.0	19 03.9	5.7	58.8
17	73 57.4	55.7	46 57.7	7.0	18 58.2	5.8	58.7
18	88 57.3	N22 55.5	61 23.7	7.2	N18 52.4	5.9	58.7
19	103 57.2	55.3	75 49.9	7.2	18 46.5	6.1	58.7
20	118 57.1	55.1	90 16.1	7.4	18 40.4	6.1	58.6
21	133 57.0	54.9	104 42.5	7.4	18 34.3	6.2	58.6
22	148 56.9	54.7	119 08.9	7.5	18 28.1	6.4	58.6
23	163 56.8	54.5	133 35.4	7.6	18 21.7	6.4	58.5
4 00	178 56.6	N22 54.3	148 02.0	7.7	N18 15.3	6.6	58.5
01	193 56.5	54.0	162 28.7	7.8	18 08.7	6.7	58.5
02	208 56.4	53.8	176 55.5	7.9	18 02.0	6.7	58.4
03	223 56.3	53.6	191 22.4	7.9	17 55.3	6.9	58.4
04	238 56.2	53.4	205 49.3	8.1	17 48.4	6.9	58.3
05	253 56.1	53.2	220 16.4	8.1	17 41.5	7.1	58.3
06	268 56.0	N22 53.0	234 43.5	8.3	N17 34.4	7.1	58.3
07	283 55.8	52.8	249 10.8	8.3	17 27.3	7.3	58.2
S 08	298 55.7	52.5	263 38.1	8.4	17 20.0	7.3	58.2
A 09	313 55.6	52.3	278 05.5	8.5	17 12.7	7.4	58.2
T 10	328 55.5	52.1	292 33.0	8.6	17 05.3	7.5	58.1
U 11	343 55.4	51.9	307 00.6	8.7	16 57.8	7.6	58.1
R 12	358 55.3	N22 51.7	321 28.3	8.8	N16 50.2	7.7	58.1
D 13	13 55.2	51.4	335 56.1	8.9	16 42.5	7.8	58.0
A 14	28 55.1	51.2	350 24.0	8.9	16 34.7	7.8	58.0
Y 15	43 54.9	51.0	4 51.9	9.1	16 26.9	8.0	58.0
16	58 54.8	50.8	19 20.0	9.1	16 18.9	8.0	57.9
17	73 54.7	50.5	33 48.1	9.3	16 10.9	8.1	57.9
18	88 54.6	N22 50.3	48 16.4	9.3	N16 02.8	8.2	57.8
19	103 54.5	50.1	62 44.7	9.4	15 54.6	8.3	57.8
20	118 54.4	49.9	77 13.1	9.6	15 46.3	8.3	57.8
21	133 54.3	49.6	91 41.7	9.6	15 38.0	8.4	57.7
22	148 54.2	49.4	106 10.3	9.7	15 29.6	8.5	57.7
23	163 54.1	49.2	120 39.0	9.8	15 21.1	8.6	57.7
5 00	178 53.9	N22 49.0	135 07.8	9.8	N15 12.5	8.6	57.6
01	193 53.8	48.7	149 36.6	10.0	15 03.9	8.7	57.6
02	208 53.7	48.5	164 05.6	10.1	14 55.2	8.8	57.6
03	223 53.6	48.3	178 34.7	10.1	14 46.4	8.8	57.5
04	238 53.5	48.0	193 03.8	10.3	14 37.6	8.9	57.5
05	253 53.4	47.8	207 33.1	10.3	14 28.7	9.0	57.5
06	268 53.3	N22 47.6	222 02.4	10.4	N14 19.7	9.0	57.4
07	283 53.2	47.3	236 31.8	10.5	14 10.7	9.1	57.4
08	298 53.1	47.1	251 01.3	10.6	14 01.6	9.2	57.3
S 09	313 53.0	46.9	265 30.9	10.7	13 52.4	9.2	57.3
U 10	328 52.8	46.6	280 00.6	10.8	13 43.2	9.3	57.3
N 11	343 52.7	46.4	294 30.4	10.8	13 33.9	9.3	57.2
D 12	358 52.6	N22 46.2	309 00.2	11.0	N13 24.6	9.4	57.2
A 13	13 52.5	45.9	323 30.2	11.0	13 15.2	9.5	57.2
Y 14	28 52.4	45.7	338 00.2	11.1	13 05.7	9.5	57.1
15	43 52.3	45.4	352 30.3	11.2	12 56.2	9.6	57.1
16	58 52.2	45.2	7 00.5	11.3	12 46.6	9.6	57.1
17	73 52.1	45.0	21 30.8	11.3	12 37.0	9.6	57.0
18	88 52.0	N22 44.7	36 01.1	11.4	N12 27.4	9.8	57.0
19	103 51.9	44.5	50 31.5	11.6	12 17.6	9.7	57.0
20	118 51.8	44.2	65 02.1	11.6	12 07.9	9.8	56.9
21	133 51.7	44.0	79 32.7	11.6	11 58.1	9.9	56.9
22	148 51.5	43.7	94 03.3	11.8	11 48.2	9.9	56.8
23	163 51.4	43.5	108 34.1	11.9	11 38.3	9.9	56.8
	S.D. 15.8	d 0.2	S.D. 16.0		15.8		15.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	02 50	05 46	07 51
N 70	▭	▭	▭	▭	04 14	06 17	08 08
68	▭	▭	▭	03 04	04 52	06 40	08 21
66	////	////	00 40	03 44	05 19	06 57	08 32
64	////	////	01 47	04 11	05 40	07 11	08 41
62	////	////	02 21	04 32	05 56	07 23	08 48
60	////	01 10	02 45	04 50	06 10	07 33	08 55
N 58	////	01 53	03 05	05 04	06 22	07 42	09 01
56	////	02 20	03 21	05 16	06 32	07 49	09 06
54	01 05	02 41	03 34	05 27	06 41	07 56	09 10
52	01 44	02 58	03 46	05 37	06 49	08 02	09 15
50	02 09	03 13	03 57	05 45	06 56	08 08	09 18
45	02 53	03 42	04 19	06 03	07 11	08 20	09 26
N 40	03 22	04 04	04 36	06 18	07 24	08 29	09 33
35	03 45	04 21	04 51	06 30	07 35	08 38	09 39
30	04 03	04 36	05 04	06 41	07 44	08 45	09 44
20	04 31	05 01	05 25	07 00	08 00	08 58	09 53
N 10	04 54	05 21	05 44	07 16	08 14	09 09	10 00
0	05 12	05 38	06 01	07 31	08 27	09 19	10 08
S 10	05 29	05 55	06 18	07 46	08 40	09 29	10 15
20	05 44	06 12	06 36	08 02	08 54	09 40	10 22
30	06 00	06 30	06 56	08 21	09 10	09 53	10 31
35	06 09	06 40	07 08	08 32	09 19	10 00	10 36
40	06 18	06 52	07 22	08 44	09 30	10 08	10 42
45	06 28	07 05	07 38	08 59	09 42	10 18	10 48
S 50	06 39	07 20	07 59	09 16	09 57	10 29	10 56
52	06 44	07 28	08 08	09 25	10 04	10 34	11 00
54	06 50	07 36	08 19	09 34	10 11	10 40	11 03
56	06 56	07 44	08 31	09 44	10 20	10 47	11 08
58	07 02	07 54	08 45	09 56	10 30	10 54	11 13
S 60	07 09	08 05	09 02	10 10	10 41	11 02	11 18

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	01 49	00 43	00 20
N 70	▭	▭	▭	▭	00 23	00 10	{00 23 / 01 54}
68	▭	▭	▭	23 44	23 47	23 47	23 46
66	23 23	////	////	23 16	23 28	23 35	23 39
64	22 20	////	////	22 55	23 13	23 25	23 33
62	21 47	////	////	22 38	23 00	23 16	23 28
60	21 22	22 56	////	22 24	22 50	23 08	23 23
N 58	21 03	22 15	////	22 12	22 40	23 02	23 19
56	20 47	21 47	////	22 01	22 32	22 56	23 15
54	20 34	21 27	23 02	21 51	22 24	22 51	23 12
52	20 22	21 10	22 24	21 43	22 18	22 46	23 09
50	20 11	20 55	21 58	21 36	22 12	22 41	23 07
45	19 50	20 27	21 15	21 19	21 59	22 32	23 01
N 40	19 32	20 05	20 46	21 06	21 48	22 24	22 56
35	19 18	19 47	20 23	20 55	21 39	22 17	22 51
30	19 05	19 32	20 05	20 45	21 31	22 11	22 48
20	18 44	19 08	19 37	20 27	21 17	22 01	22 41
N 10	18 25	18 48	19 15	20 12	21 04	21 51	22 35
0	18 08	18 30	18 57	19 58	20 52	21 43	22 30
S 10	17 51	18 14	18 40	19 44	20 41	21 34	22 24
20	17 33	17 57	18 24	19 29	20 28	21 24	22 18
30	17 12	17 39	18 08	19 11	20 13	21 14	22 11
35	17 00	17 28	18 00	19 01	20 05	21 07	22 07
40	16 47	17 17	17 51	18 49	19 55	21 00	22 03
45	16 30	17 04	17 41	18 35	19 44	20 52	21 57
S 50	16 10	16 48	17 30	18 18	19 30	20 42	21 51
52	16 01	16 41	17 25	18 10	19 24	20 37	21 48
54	15 50	16 33	17 19	18 01	19 16	20 32	21 45
56	15 38	16 25	17 13	17 51	19 08	20 26	21 41
58	15 24	16 15	17 07	17 39	18 59	20 19	21 37
S 60	15 07	16 04	17 00	17 26	18 49	20 12	21 33

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	04 02	04 08	12 04	13 45	01 16	02	
4	04 13	04 19	12 04	14 40	02 13	03	◐
5	04 24	04 29	12 04	15 31	03 06	04	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.5		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
6	00	283 53.2	153 33.7	N19 56.7	203 05.3	N23 31.2	100 57.4	N 0 07.5	99 27.9	N 0 41.0
	01	298 55.7	168 33.1	55.9	218 05.9	31.3	115 59.6	07.4	114 30.3	40.9
	02	313 58.2	183 32.4	55.1	233 06.5	31.5	131 01.8	07.2	129 32.6	40.9
	03	329 00.6	198 31.7	54.4	248 07.1	31.6	146 04.1	07.1	144 35.0	40.8
	04	344 03.1	213 31.1	53.6	263 07.7	31.7	161 06.3	07.0	159 37.3	40.7
	05	359 05.5	228 30.4	52.9	278 08.3	31.9	176 08.5	06.9	174 39.7	40.7
	06	14 08.0	243 29.8	N19 52.1	293 08.9	N23 32.0	191 10.7	N 0 06.8	189 42.0	N 0 40.6
	07	29 10.5	258 29.1	51.3	308 09.5	32.1	206 13.0	06.7	204 44.4	40.6
	08	44 12.9	273 28.4	50.6	323 10.1	32.3	221 15.2	06.6	219 46.7	40.5
MONDAY	09	59 15.4	288 27.8	49.8	338 10.7	32.4	236 17.4	06.4	234 49.1	40.5
	10	74 17.9	303 27.1	49.0	353 11.3	32.5	251 19.6	06.3	249 51.4	40.4
	11	89 20.3	318 26.5	48.2	8 11.9	32.7	266 21.8	06.2	264 53.8	40.3
	12	104 22.8	333 25.8	N19 47.5	23 12.5	N23 32.8	281 24.1	N 0 06.1	279 56.1	N 0 40.3
	13	119 25.3	348 25.1	46.7	38 13.1	32.9	296 26.3	06.0	294 58.5	40.2
	14	134 27.7	3 24.5	45.9	53 13.7	33.1	311 28.5	05.9	310 00.8	40.2
	15	149 30.2	18 23.8	45.1	68 14.3	33.2	326 30.7	05.7	325 03.2	40.1
	16	164 32.7	33 23.2	44.4	83 14.9	33.3	341 32.9	05.6	340 05.5	40.0
	17	179 35.1	48 22.5	43.6	98 15.5	33.4	356 35.2	05.5	355 07.9	40.0
	18	194 37.6	63 21.9	N19 42.8	113 16.0	N23 33.6	11 37.4	N 0 05.4	10 10.2	N 0 39.9
	19	209 40.0	78 21.2	42.0	128 16.6	33.7	26 39.6	05.3	25 12.6	39.9
	20	224 42.5	93 20.6	41.3	143 17.2	33.8	41 41.8	05.2	40 14.9	39.8
	21	239 45.0	108 19.9	40.5	158 17.8	34.0	56 44.0	05.0	55 17.3	39.7
	22	254 47.4	123 19.3	39.7	173 18.4	34.1	71 46.3	04.9	70 19.6	39.7
	23	269 49.9	138 18.6	38.9	188 19.0	34.2	86 48.5	04.8	85 22.0	39.6
7	00	284 52.4	153 18.0	N19 38.1	203 19.6	N23 34.3	101 50.7	N 0 04.7	100 24.3	N 0 39.6
	01	299 54.8	168 17.3	37.3	218 20.2	34.5	116 52.9	04.6	115 26.7	39.5
	02	314 57.3	183 16.7	36.6	233 20.8	34.6	131 55.1	04.5	130 29.0	39.4
	03	329 59.8	198 16.0	35.8	248 21.4	34.7	146 57.3	04.3	145 31.4	39.4
	04	345 02.2	213 15.4	35.0	263 22.0	34.9	161 59.6	04.2	160 33.7	39.3
	05	0 04.7	228 14.7	34.2	278 22.6	35.0	177 01.8	04.1	175 36.1	39.3
	06	15 07.2	243 14.1	N19 33.4	293 23.2	N23 35.1	192 04.0	N 0 04.0	190 38.4	N 0 39.2
	07	30 09.6	258 13.4	32.6	308 23.8	35.2	207 06.2	03.9	205 40.8	39.2
	08	45 12.1	273 12.8	31.8	323 24.4	35.4	222 08.4	03.8	220 43.1	39.1
TUESDAY	09	60 14.5	288 12.1	31.0	338 25.0	35.5	237 10.6	03.6	235 45.5	39.0
	10	75 17.0	303 11.5	30.2	353 25.6	35.6	252 12.8	03.5	250 47.8	39.0
	11	90 19.5	318 10.8	29.5	8 26.2	35.7	267 15.1	03.4	265 50.1	38.9
	12	105 21.9	333 10.2	N19 28.7	23 26.8	N23 35.8	282 17.3	N 0 03.3	280 52.5	N 0 38.9
	13	120 24.4	348 09.5	27.9	38 27.4	36.0	297 19.5	03.2	295 54.8	38.8
	14	135 26.9	3 08.9	27.1	53 28.0	36.1	312 21.7	03.1	310 57.2	38.7
	15	150 29.3	18 08.3	26.3	68 28.6	36.2	327 23.9	02.9	325 59.5	38.7
	16	165 31.8	33 07.6	25.5	83 29.2	36.3	342 26.1	02.8	341 01.9	38.6
	17	180 34.3	48 07.0	24.7	98 29.8	36.5	357 28.3	02.7	356 04.2	38.5
	18	195 36.7	63 06.3	N19 23.9	113 30.4	N23 36.6	12 30.6	N 0 02.6	11 06.6	N 0 38.5
	19	210 39.2	78 05.7	23.1	128 31.0	36.7	27 32.8	02.5	26 08.9	38.4
	20	225 41.6	93 05.1	22.3	143 31.6	36.8	42 35.0	02.4	41 11.3	38.4
	21	240 44.1	108 04.4	21.5	158 32.2	36.9	57 37.2	02.2	56 13.6	38.3
	22	255 46.6	123 03.8	20.7	173 32.8	37.1	72 39.4	02.1	71 16.0	38.2
	23	270 49.0	138 03.1	19.9	188 33.4	37.2	87 41.6	02.0	86 18.3	38.2
8	00	285 51.5	153 02.5	N19 19.1	203 34.0	N23 37.3	102 43.8	N 0 01.9	101 20.7	N 0 38.1
	01	300 54.0	168 01.9	18.2	218 34.6	37.4	117 46.1	01.8	116 23.0	38.1
	02	315 56.4	183 01.2	17.4	233 35.2	37.5	132 48.3	01.6	131 25.3	38.0
	03	330 58.9	198 00.6	16.6	248 35.8	37.6	147 50.5	01.5	146 27.7	37.9
	04	346 01.4	213 00.0	15.8	263 36.4	37.8	162 52.7	01.4	161 30.0	37.9
	05	1 03.8	227 59.3	15.0	278 37.0	37.9	177 54.9	01.3	176 32.4	37.8
	06	16 06.3	242 58.7	N19 14.2	293 37.6	N23 38.0	192 57.1	N 0 01.2	191 34.7	N 0 37.8
	07	31 08.8	257 58.1	13.4	308 38.2	38.1	207 59.3	01.0	206 37.1	37.7
	08	46 11.2	272 57.4	12.6	323 38.8	38.2	223 01.5	00.9	221 39.4	37.6
WEDNESDAY	09	61 13.7	287 56.8	11.8	338 39.4	38.3	238 03.7	00.8	236 41.8	37.6
	10	76 16.1	302 56.2	11.0	353 40.0	38.5	253 06.0	00.7	251 44.1	37.5
	11	91 18.6	317 55.5	10.1	8 40.6	38.6	268 08.2	00.6	266 46.5	37.5
	12	106 21.1	332 54.9	N19 09.3	23 41.2	N23 38.7	283 10.4	N 0 00.4	281 48.8	N 0 37.4
	13	121 23.5	347 54.3	08.5	38 41.8	38.8	298 12.6	00.3	296 51.1	37.3
	14	136 26.0	2 53.6	07.7	53 42.4	38.9	313 14.8	00.2	311 53.5	37.3
	15	151 28.5	17 53.0	06.9	68 43.0	39.0	328 17.0	N 0 00.1	326 55.8	37.2
	16	166 30.9	32 52.4	06.0	83 43.6	39.1	343 19.2	0 00.0	341 58.2	37.1
	17	181 33.4	47 51.8	05.2	98 44.2	39.3	358 21.4	S 0 00.2	357 00.5	37.1
	18	196 35.9	62 51.1	N19 04.4	113 44.8	N23 39.4	13 23.6	S 0 00.3	12 02.9	N 0 37.0
	19	211 38.3	77 50.5	03.6	128 45.4	39.5	28 25.8	00.4	27 05.2	37.0
	20	226 40.8	92 49.9	02.8	143 46.0	39.6	43 28.0	00.5	42 07.5	36.9
	21	241 43.3	107 49.3	01.9	158 46.6	39.7	58 30.2	00.6	57 09.9	36.8
	22	256 45.7	122 48.6	01.1	173 47.2	39.8	73 32.5	00.8	72 12.2	36.8
	23	271 48.2	137 48.0	00.3	188 47.8	39.9	88 34.7	00.9	87 14.6	36.7
Mer. Pass		h m 4 59.7	v 0.6	d 0.8	v 0.6	d 0.1	v 2.2	d 0.1	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.0	S40 22.6
Achernar	335 45.0	S57 19.6
Acrux	173 36.7	S63 00.0
Adhara	255 32.1	S28 56.8
Aldebaran	291 17.7	N16 28.2
Alioth	166 42.0	N56 04.0
Alkaid	153 18.0	N49 24.7
Al Na'ir	28 13.9	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.7
Alphecca	126 31.4	N26 46.9
Alpheratz	358 08.7	N28 59.1
Altair	62 31.7	N 8 49.2
Ankaa	353 39.6	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.1	S68 59.8
Avior	234 28.6	S59 27.1
Bellatrix	278 58.5	N 6 20.0
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.1
Capella	281 10.9	N45 58.7
Deneb	49 47.7	N45 12.8
Denebola	182 58.6	N14 40.7
Diphda	349 20.3	S18 05.2
Dubhe	194 21.8	N61 51.4
Elnath	278 43.8	N28 35.4
Eltanin	90 57.0	N51 29.6
Enif	34 10.8	N 9 47.4
Fomalhaut	15 50.6	S29 43.1
Gacrux	172 28.2	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.4	S60 17.2
Hamal	328 28.4	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.5	N74 14.3
Markab	14 02.4	N15 06.2
Menkar	314 40.7	N 4 01.0
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.6	S69 38.6
Mirfak	309 15.6	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.7	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.8	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.3	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	228 25.6	13 47
Mars	278 27.3	10 26
Jupiter	176 58.3	17 10
Saturn	175 32.0	17 16

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
6 00	178 51.3	N22 43.3	123 05.0	11.9	N11 28.4	10.0	56.8
01	193 51.2	43.0	137 35.9	12.0	11 18.4	10.1	56.7
02	208 51.1	42.8	152 06.9	12.0	11 08.3	10.0	56.7
03	223 51.0	·· 42.5	166 37.9	12.2	10 58.3	10.2	56.7
04	238 50.9	42.3	181 09.1	12.2	10 48.1	10.1	56.6
05	253 50.8	42.0	195 40.3	12.3	10 38.0	10.2	56.6
06	268 50.7	N22 41.8	210 11.6	12.4	N10 27.8	10.3	56.6
07	283 50.6	41.5	224 43.0	12.4	10 17.5	10.2	56.5
08	298 50.5	41.3	239 14.4	12.5	10 07.3	10.3	56.5
M 09	313 50.4	·· 41.0	253 45.9	12.6	9 57.0	10.4	56.5
O 10	328 50.3	40.8	268 17.5	12.7	9 46.6	10.3	56.4
N 11	343 50.2	40.5	282 49.2	12.7	9 36.3	10.4	56.4
12	358 50.1	N22 40.3	297 20.9	12.8	N 9 25.9	10.5	56.4
D 13	13 50.0	40.0	311 52.7	12.9	9 15.4	10.4	56.3
A 14	28 49.9	39.7	326 24.6	12.9	9 05.0	10.5	56.3
Y 15	43 49.8	·· 39.5	340 56.5	13.0	8 54.5	10.6	56.3
16	58 49.6	39.2	355 28.5	13.1	8 43.9	10.5	56.2
17	73 49.5	39.0	10 00.6	13.1	8 33.4	10.6	56.2
18	88 49.4	N22 38.7	24 32.7	13.2	N 8 22.8	10.6	56.2
19	103 49.3	38.5	39 04.9	13.2	8 12.2	10.6	56.1
20	118 49.2	38.2	53 37.1	13.4	8 01.6	10.7	56.1
21	133 49.1	·· 37.9	68 09.5	13.3	7 50.9	10.6	56.1
22	148 49.0	37.7	82 41.8	13.5	7 40.3	10.7	56.0
23	163 48.9	37.4	97 14.3	13.5	7 29.6	10.8	56.0
7 00	178 48.8	N22 37.2	111 46.8	13.5	N 7 18.8	10.7	56.0
01	193 48.7	36.9	126 19.3	13.7	7 08.1	10.8	56.0
02	208 48.6	36.6	140 52.0	13.6	6 57.3	10.7	55.9
03	223 48.5	·· 36.4	155 24.6	13.8	6 46.6	10.8	55.9
04	238 48.4	36.1	169 57.4	13.7	6 35.8	10.8	55.9
05	253 48.3	35.8	184 30.1	13.9	6 25.0	10.9	55.8
06	268 48.2	N22 35.6	199 03.0	13.9	N 6 14.1	10.8	55.8
07	283 48.1	35.3	213 35.9	13.9	6 03.3	10.9	55.8
08	298 48.0	35.0	228 08.8	14.0	5 52.4	10.8	55.7
T 09	313 47.9	·· 34.8	242 41.8	14.1	5 41.6	10.9	55.7
U 10	328 47.8	34.5	257 14.9	14.1	5 30.7	10.9	55.7
E 11	343 47.7	34.2	271 48.0	14.1	5 19.8	10.9	55.7
12	358 47.6	N22 34.0	286 21.1	14.2	N 5 08.9	11.0	55.6
S 13	13 47.5	33.7	300 54.3	14.2	4 57.9	10.9	55.6
D 14	28 47.4	33.4	315 27.5	14.3	4 47.0	10.9	55.6
A 15	43 47.3	·· 33.1	330 00.8	14.4	4 36.1	11.0	55.5
Y 16	58 47.2	32.9	344 34.2	14.3	4 25.1	10.9	55.5
17	73 47.1	32.6	359 07.5	14.5	4 14.2	11.0	55.5
18	88 47.0	N22 32.3	13 41.0	14.4	N 4 03.2	10.9	55.5
19	103 46.9	32.1	28 14.4	14.5	3 52.3	11.0	55.4
20	118 46.8	31.8	42 47.9	14.6	3 41.3	11.0	55.4
21	133 46.7	·· 31.5	57 21.5	14.6	3 30.3	11.0	55.4
22	148 46.6	31.2	71 55.1	14.6	3 19.3	11.0	55.4
23	163 46.5	30.9	86 28.7	14.6	3 08.3	11.0	55.3
8 00	178 46.4	N22 30.7	101 02.3	14.7	N 2 57.3	10.9	55.3
01	193 46.3	30.4	115 36.0	14.8	2 46.4	11.0	55.3
02	208 46.2	30.1	130 09.8	14.7	2 35.4	11.0	55.3
03	223 46.1	·· 29.8	144 43.5	14.8	2 24.4	11.0	55.2
04	238 46.0	29.6	159 17.3	14.9	2 13.4	11.0	55.2
05	253 45.9	29.3	173 51.2	14.8	2 02.4	11.0	55.2
06	268 45.8	N22 29.0	188 25.0	14.9	N 1 51.4	11.0	55.2
W 07	283 45.7	28.7	202 58.9	15.0	1 40.4	11.0	55.1
E 08	298 45.6	28.4	217 32.9	14.9	1 29.4	10.9	55.1
D 09	313 45.5	·· 28.1	232 06.8	15.0	1 18.5	11.0	55.1
N 10	328 45.4	27.9	246 40.8	15.0	1 07.5	11.0	55.1
E 11	343 45.3	27.6	261 14.8	15.1	0 56.5	11.0	55.0
12	358 45.2	N22 27.3	275 48.9	15.1	N 0 45.5	10.9	55.0
S 13	13 45.1	27.0	290 23.0	15.0	0 34.6	11.0	55.0
D 14	28 45.0	26.7	304 57.0	15.2	0 23.6	10.9	55.0
A 15	43 44.9	·· 26.4	319 31.2	15.1	0 12.7	11.0	55.0
Y 16	58 44.8	26.1	334 05.3	15.2	N 0 01.7	10.9	54.9
17	73 44.8	25.8	348 39.5	15.1	S 0 09.2	10.9	54.9
18	88 44.7	N22 25.5	3 13.6	15.3	S 0 20.1	10.9	54.9
19	103 44.6	25.3	17 47.9	15.2	0 31.0	10.9	54.9
20	118 44.5	25.0	32 22.1	15.2	0 41.9	10.9	54.9
21	133 44.4	·· 24.7	46 56.3	15.3	0 52.8	10.9	54.8
22	148 44.3	24.4	61 30.6	15.3	1 03.7	10.9	54.8
23	163 44.2	24.1	76 04.9	15.2	1 14.6	10.8	54.8
	S.D. 15.8	d 0.3	S.D. 15.4		15.2		15.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	07 51	09 42	11 26	13 08
N 70	▭	▭	▭	08 08	09 50	11 28	13 02
68	▭	▭	▭	08 21	09 57	11 28	12 58
66	////	////	00 57	08 32	10 02	11 29	12 54
64	////	////	01 53	08 41	10 07	11 30	12 51
62	////	////	02 26	08 48	10 11	11 30	12 48
60	////	01 19	02 49	08 55	10 14	11 31	12 46
N 58	////	01 58	03 08	09 01	10 17	11 31	12 44
56	////	02 24	03 24	09 06	10 20	11 32	12 42
54	01 13	02 45	03 37	09 10	10 22	11 32	12 40
52	01 49	03 02	03 49	09 15	10 24	11 32	12 39
50	02 13	03 16	03 59	09 18	10 26	11 33	12 37
45	02 56	03 44	04 21	09 26	10 31	11 33	12 34
N 40	03 25	04 06	04 38	09 33	10 34	11 34	12 32
35	03 47	04 23	04 52	09 39	10 37	11 34	12 29
30	04 05	04 38	05 05	09 44	10 40	11 35	12 28
20	04 33	05 02	05 26	09 53	10 45	11 35	12 24
N 10	04 54	05 21	05 44	10 00	10 49	11 36	12 21
0	05 13	05 39	06 01	10 08	10 53	11 36	12 19
S 10	05 29	05 55	06 18	10 15	10 57	11 37	12 16
20	05 45	06 12	06 36	10 22	11 01	11 38	12 13
30	06 00	06 30	06 56	10 31	11 06	11 38	12 10
35	06 09	06 40	07 08	10 36	11 08	11 39	12 09
40	06 17	06 51	07 22	10 42	11 12	11 39	12 06
45	06 27	07 04	07 38	10 48	11 15	11 40	12 04
S 50	06 38	07 19	07 57	10 56	11 19	11 41	12 01
52	06 43	07 26	08 07	11 00	11 21	11 41	12 00
54	06 48	07 34	08 17	11 03	11 23	11 41	11 59
56	06 54	07 43	08 29	11 08	11 26	11 42	11 57
58	07 01	07 52	08 43	11 13	11 28	11 42	11 56
S 60	07 07	08 03	08 59	11 18	11 31	11 43	11 54

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 6	Moonset 7	Moonset 8	Moonset 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	00 20	{00 04 / 21 51}	23 39	23 26
N 70	▭	▭	▭	{00 01 / 23 54}	23 47	23 41	23 34
68	▭	▭	▭	23 46	23 44	23 42	23 40
66	23 08	////	////	23 39	23 41	23 44	23 46
64	22 14	////	////	23 33	23 39	23 45	23 50
62	21 43	////	////	23 28	23 37	23 46	23 54
60	21 19	22 48	////	23 23	23 35	23 47	23 58
N 58	21 00	22 10	////	23 19	23 34	23 47	24 01
56	20 45	21 44	////	23 15	23 32	23 48	24 04
54	20 32	21 24	22 55	23 12	23 31	23 49	24 06
52	20 20	21 07	22 20	23 09	23 30	23 49	24 09
50	20 10	20 53	21 55	23 07	23 29	23 50	24 11
45	19 49	20 25	21 13	23 01	23 27	23 51	24 15
N 40	19 31	20 04	20 45	22 56	23 25	23 52	24 19
35	19 17	19 46	20 23	22 51	23 23	23 53	24 22
30	19 05	19 32	20 05	22 48	23 21	23 54	24 25
20	18 44	19 08	19 37	22 41	23 19	23 55	24 30
N 10	18 25	18 48	19 15	22 35	23 16	23 56	24 35
0	18 08	18 31	18 57	22 30	23 14	23 57	24 39
S 10	17 52	18 14	18 41	22 24	23 12	23 58	24 43
20	17 34	17 58	18 25	22 18	23 09	23 59	24 48
30	17 14	17 40	18 10	22 11	23 07	24 00	00 00
35	17 02	17 30	18 01	22 07	23 05	24 01	00 01
40	16 48	17 19	17 52	22 03	23 03	24 02	00 02
45	16 32	17 06	17 43	21 57	23 01	24 03	00 03
S 50	16 13	16 51	17 32	21 51	22 58	24 04	00 04
52	16 03	16 44	17 27	21 48	22 57	24 04	00 04
54	15 53	16 36	17 21	21 45	22 56	24 05	00 05
56	15 41	16 27	17 16	21 41	22 54	24 05	00 05
58	15 27	16 18	17 09	21 37	22 53	24 06	00 06
S 60	15 11	16 07	17 02	21 33	22 51	24 07	00 07

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
6	04 34	04 40	12 05	16 19	03 55	05	◐
7	04 45	04 49	12 05	17 04	04 41	06	
8	04 54	04 59	12 05	17 47	05 25	07	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.5		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
9	00	286 50.6	152 47.4	N18 59.5	203 48.4	N23 40.0	103 36.9	S 0 01.0	102 16.9	N 0 36.6
	01	301 53.1	167 46.8	58.6	218 49.0	40.1	118 39.1	01.1	117 19.3	36.6
	02	316 55.6	182 46.1	57.8	233 49.6	40.2	133 41.3	01.2	132 21.6	36.5
	03	331 58.0	197 45.5	·· 57.0	248 50.2	·· 40.4	148 43.5	·· 01.4	147 23.9	·· 36.5
	04	347 00.5	212 44.9	56.1	263 50.8	40.5	163 45.7	01.5	162 26.3	36.4
	05	2 03.0	227 44.3	55.3	278 51.4	40.6	178 47.9	01.6	177 28.6	36.3
	06	17 05.4	242 43.7	N18 54.5	293 52.0	N23 40.7	193 50.1	S 0 01.7	192 31.0	N 0 36.3
	07	32 07.9	257 43.0	53.6	308 52.6	40.8	208 52.3	01.8	207 33.3	36.2
T	08	47 10.4	272 42.4	52.8	323 53.2	40.9	223 54.5	02.0	222 35.6	36.1
H	09	62 12.8	287 41.8	·· 52.0	338 53.8	·· 41.0	238 56.7	·· 02.1	237 38.0	·· 36.1
U	10	77 15.3	302 41.2	51.1	353 54.4	41.1	253 58.9	02.2	252 40.3	36.0
R	11	92 17.7	317 40.6	50.3	8 55.0	41.2	269 01.1	02.3	267 42.7	36.0
S	12	107 20.2	332 39.9	N18 49.5	23 55.6	N23 41.3	284 03.3	S 0 02.5	282 45.0	N 0 35.9
D	13	122 22.7	347 39.3	48.6	38 56.2	41.4	299 05.5	02.6	297 47.4	35.8
A	14	137 25.1	2 38.7	47.8	53 56.8	41.5	314 07.7	02.7	312 49.7	35.8
Y	15	152 27.6	17 38.1	·· 46.9	68 57.4	·· 41.6	329 10.0	·· 02.8	327 52.0	·· 35.7
	16	167 30.1	32 37.5	46.1	83 58.0	41.7	344 12.2	02.9	342 54.4	35.6
	17	182 32.5	47 36.9	45.3	98 58.6	41.8	359 14.4	03.1	357 56.7	35.6
	18	197 35.0	62 36.3	N18 44.4	113 59.2	N23 41.9	14 16.6	S 0 03.2	12 59.1	N 0 35.5
	19	212 37.5	77 35.7	43.6	128 59.8	42.0	29 18.8	03.3	28 01.4	35.5
	20	227 39.9	92 35.0	42.7	144 00.4	42.1	44 21.0	03.4	43 03.7	35.4
	21	242 42.4	107 34.4	·· 41.9	159 01.0	·· 42.2	59 23.2	·· 03.6	58 06.1	·· 35.3
	22	257 44.9	122 33.8	41.0	174 01.6	42.3	74 25.4	03.7	73 08.4	35.3
	23	272 47.3	137 33.2	40.2	189 02.2	42.4	89 27.6	03.8	88 10.8	35.2
10	00	287 49.8	152 32.6	N18 39.3	204 02.8	N23 42.5	104 29.8	S 0 03.9	103 13.1	N 0 35.1
	01	302 52.2	167 32.0	38.5	219 03.4	42.6	119 32.0	04.0	118 15.4	35.1
	02	317 54.7	182 31.4	37.6	234 04.0	42.7	134 34.2	04.2	133 17.8	35.0
	03	332 57.2	197 30.8	·· 36.8	249 04.6	·· 42.8	149 36.4	·· 04.3	148 20.1	·· 34.9
	04	347 59.6	212 30.2	35.9	264 05.2	42.9	164 38.6	04.4	163 22.4	34.9
	05	3 02.1	227 29.6	35.1	279 05.8	43.0	179 40.8	04.5	178 24.8	34.8
	06	18 04.6	242 28.9	N18 34.2	294 06.4	N23 43.1	194 43.0	S 0 04.7	193 27.1	N 0 34.8
	07	33 07.0	257 28.3	33.4	309 07.0	43.2	209 45.2	04.8	208 29.5	34.7
	08	48 09.5	272 27.7	32.5	324 07.6	43.3	224 47.4	04.9	223 31.8	34.6
F	09	63 12.0	287 27.1	·· 31.7	339 08.2	·· 43.4	239 49.6	·· 05.0	238 34.1	·· 34.6
R	10	78 14.4	302 26.5	30.8	354 08.8	43.5	254 51.8	05.2	253 36.5	34.5
I	11	93 16.9	317 25.9	30.0	9 09.4	43.6	269 54.0	05.3	268 38.8	34.4
D	12	108 19.4	332 25.3	N18 29.1	24 10.0	N23 43.7	284 56.2	S 0 05.4	283 41.1	N 0 34.4
A	13	123 21.8	347 24.7	28.2	39 10.6	43.8	299 58.4	05.5	298 43.5	34.3
Y	14	138 24.3	2 24.1	27.4	54 11.2	43.9	315 00.6	05.7	313 45.8	34.2
	15	153 26.7	17 23.5	·· 26.5	69 11.8	·· 44.0	330 02.8	·· 05.8	328 48.2	·· 34.2
	16	168 29.2	32 22.9	25.7	84 12.4	44.1	345 05.0	05.9	343 50.5	34.1
	17	183 31.7	47 22.3	24.8	99 13.0	44.2	0 07.2	06.0	358 52.8	34.0
	18	198 34.1	62 21.7	N18 23.9	114 13.6	N23 44.3	15 09.4	S 0 06.2	13 55.2	N 0 34.0
	19	213 36.6	77 21.1	23.1	129 14.2	44.4	30 11.6	06.3	28 57.5	33.9
	20	228 39.1	92 20.5	22.2	144 14.8	44.5	45 13.8	06.4	43 59.8	33.8
	21	243 41.5	107 19.9	·· 21.3	159 15.4	·· 44.6	60 16.0	·· 06.5	59 02.2	·· 33.8
	22	258 44.0	122 19.3	20.5	174 16.0	44.7	75 18.2	06.7	74 04.5	33.7
	23	273 46.5	137 18.7	19.6	189 16.6	44.8	90 20.4	06.8	89 06.9	33.7
11	00	288 48.9	152 18.1	N18 18.7	204 17.2	N23 44.9	105 22.6	S 0 06.9	104 09.2	N 0 33.6
	01	303 51.4	167 17.5	17.9	219 17.8	44.9	120 24.8	07.0	119 11.5	33.5
	02	318 53.8	182 16.9	17.0	234 18.4	45.0	135 27.0	07.2	134 13.9	33.5
	03	333 56.3	197 16.4	·· 16.1	249 19.0	·· 45.1	150 29.2	·· 07.3	149 16.2	·· 33.4
	04	348 58.8	212 15.8	15.3	264 19.6	45.2	165 31.3	07.4	164 18.5	33.3
	05	4 01.2	227 15.2	14.4	279 20.2	45.3	180 33.5	07.5	179 20.9	33.3
	06	19 03.7	242 14.6	N18 13.5	294 20.8	N23 45.4	195 35.7	S 0 07.7	194 23.2	N 0 33.2
	07	34 06.2	257 14.0	12.6	309 21.4	45.5	210 37.9	07.8	209 25.5	33.1
S	08	49 08.6	272 13.4	11.8	324 22.0	45.6	225 40.1	07.9	224 27.9	33.1
A	09	64 11.1	287 12.8	·· 10.9	339 22.6	·· 45.7	240 42.3	·· 08.0	239 30.2	·· 33.0
T	10	79 13.6	302 12.2	10.0	354 23.2	45.7	255 44.5	08.2	254 32.5	32.9
U	11	94 16.0	317 11.6	09.1	9 23.8	45.8	270 46.7	08.3	269 34.9	32.9
R	12	109 18.5	332 11.0	N18 08.2	24 24.4	N23 45.9	285 48.9	S 0 08.4	284 37.2	N 0 32.8
D	13	124 21.0	347 10.4	07.4	39 25.0	46.0	300 51.1	08.5	299 39.5	32.7
A	14	139 23.4	2 09.9	06.5	54 25.6	46.1	315 53.3	08.7	314 41.9	32.7
Y	15	154 25.9	17 09.3	·· 05.6	69 26.3	·· 46.2	330 55.5	·· 08.8	329 44.2	·· 32.6
	16	169 28.3	32 08.7	04.7	84 26.9	46.3	345 57.7	08.9	344 46.5	32.5
	17	184 30.8	47 08.1	03.8	99 27.5	46.4	0 59.9	09.0	359 48.9	32.5
	18	199 33.3	62 07.5	N18 03.0	114 28.1	N23 46.4	16 02.1	S 0 09.2	14 51.2	N 0 32.4
	19	214 35.7	77 06.9	02.1	129 28.7	46.5	31 04.3	09.3	29 53.5	32.3
	20	229 38.2	92 06.3	01.2	144 29.3	46.6	46 06.5	09.4	44 55.9	32.3
	21	244 40.7	107 05.8	18 00.3	159 29.9	·· 46.7	61 08.7	·· 09.5	59 58.2	·· 32.2
	22	259 43.1	122 05.2	17 59.4	174 30.5	46.8	76 10.8	09.7	75 00.5	32.1
	23	274 45.6	137 04.6	58.5	189 31.1	46.9	91 13.0	09.8	90 02.9	32.1
Mer. Pass.		h m 4 47.9	v −0.6	d 0.9	v 0.6	d 0.1	v 2.2	d 0.1	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.0	S40 22.6
Achernar	335 44.9	S57 19.6
Acrux	173 36.7	S63 00.0
Adhara	255 32.1	S28 56.8
Aldebaran	291 17.6	N16 28.3
Alioth	166 42.1	N56 04.0
Alkaid	153 18.0	N49 24.7
Al Na'ir	28 13.9	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.4	N26 46.9
Alpheratz	358 08.6	N28 59.1
Altair	62 31.7	N 8 49.2
Ankaa	353 39.6	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.1	S68 59.8
Avior	234 28.6	S59 27.1
Bellatrix	278 58.5	N 6 20.0
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.1
Capella	281 10.9	N45 58.6
Deneb	49 47.6	N45 12.8
Denebola	182 58.6	N14 40.7
Diphda	349 20.3	S18 05.2
Dubhe	194 21.8	N61 51.4
Elnath	278 43.8	N28 35.4
Eltanin	90 57.0	N51 29.6
Enif	34 10.8	N 9 47.4
Fomalhaut	15 50.6	S29 43.1
Gacrux	172 28.2	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.4	S60 17.2
Hamal	328 28.4	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.5	N74 14.3
Markab	14 02.4	N15 06.2
Menkar	314 40.7	N 4 01.0
Menkent	148 36.2	S36 16.8
Miaplacidus	221 45.6	S69 38.6
Mirfak	309 15.6	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.7	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.8	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.3	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.5
Spica	158 56.9	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	224 42.8	13 50
Mars	276 13.0	10 23
Jupiter	176 40.0	17 00
Saturn	175 23.3	17 04

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
9 00	178 44.1	N22 23.8	90 39.1	15.4	S 1 25.4	10.9	54.8
01	193 44.0	23.5	105 13.5	15.3	1 36.3	10.8	54.8
02	208 43.9	23.2	119 47.8	15.3	1 47.1	10.8	54.7
03	223 43.8	22.9	134 22.1	15.4	1 57.9	10.8	54.7
04	238 43.7	22.6	148 56.5	15.3	2 08.7	10.8	54.7
05	253 43.6	22.3	163 30.8	15.4	2 19.5	10.7	54.7
06	268 43.5	N22 22.0	178 05.2	15.4	S 2 30.2	10.8	54.7
07	283 43.4	21.7	192 39.6	15.4	2 41.0	10.7	54.7
T 08	298 43.3	21.4	207 14.0	15.4	2 51.7	10.7	54.6
H 09	313 43.2	21.1	221 48.4	15.4	3 02.4	10.7	54.6
U 10	328 43.2	20.8	236 22.8	15.4	3 13.1	10.7	54.6
R 11	343 43.1	20.5	250 57.2	15.4	3 23.8	10.7	54.6
S 12	358 43.0	N22 20.2	265 31.6	15.4	S 3 34.5	10.6	54.6
D 13	13 42.9	19.9	280 06.0	15.4	3 45.1	10.6	54.6
A 14	28 42.8	19.6	294 40.4	15.5	3 55.7	10.6	54.5
Y 15	43 42.7	19.3	309 14.9	15.4	4 06.3	10.6	54.5
16	58 42.6	19.0	323 49.3	15.4	4 16.9	10.6	54.5
17	73 42.5	18.7	338 23.7	15.4	4 27.5	10.5	54.5
18	88 42.4	N22 18.4	352 58.1	15.5	S 4 38.0	10.5	54.5
19	103 42.3	18.1	7 32.6	15.4	4 48.5	10.5	54.5
20	118 42.2	17.8	22 07.0	15.4	4 59.0	10.4	54.5
21	133 42.2	17.5	36 41.4	15.5	5 09.4	10.5	54.4
22	148 42.1	17.2	51 15.9	15.4	5 19.9	10.4	54.4
23	163 42.0	16.8	65 50.3	15.4	5 30.3	10.3	54.4
10 00	178 41.9	N22 16.5	80 24.7	15.4	S 5 40.6	10.4	54.4
01	193 41.8	16.2	94 59.1	15.4	5 51.0	10.3	54.4
02	208 41.7	15.9	109 33.5	15.4	6 01.3	10.3	54.4
03	223 41.6	15.6	124 07.9	15.4	6 11.6	10.3	54.4
04	238 41.5	15.3	138 42.3	15.4	6 21.9	10.2	54.4
05	253 41.4	15.0	153 16.7	15.3	6 32.1	10.2	54.4
06	268 41.4	N22 14.7	167 51.0	15.4	S 6 42.3	10.2	54.3
07	283 41.3	14.3	182 25.4	15.3	6 52.5	10.2	54.3
08	298 41.2	14.0	196 59.7	15.4	7 02.7	10.1	54.3
F 09	313 41.1	13.7	211 34.1	15.3	7 12.8	10.1	54.3
R 10	328 41.0	13.4	226 08.4	15.3	7 22.9	10.0	54.3
I 11	343 40.9	13.1	240 42.7	15.3	7 32.9	10.1	54.3
D 12	358 40.8	N22 12.8	255 17.0	15.3	S 7 43.0	10.0	54.3
A 13	13 40.7	12.4	269 51.3	15.3	7 53.0	9.9	54.3
Y 14	28 40.6	12.1	284 25.6	15.2	8 02.9	9.9	54.3
15	43 40.6	11.8	298 59.8	15.2	8 12.8	9.9	54.3
16	58 40.5	11.5	313 34.0	15.3	8 22.7	9.9	54.3
17	73 40.4	11.2	328 08.3	15.2	8 32.6	9.8	54.2
18	88 40.3	N22 10.8	342 42.5	15.1	S 8 42.4	9.8	54.2
19	103 40.2	10.5	357 16.6	15.2	8 52.2	9.7	54.2
20	118 40.1	10.2	11 50.8	15.1	9 01.9	9.7	54.2
21	133 40.0	09.9	26 24.9	15.2	9 11.6	9.7	54.2
22	148 40.0	09.5	40 59.1	15.1	9 21.3	9.6	54.2
23	163 39.9	09.2	55 33.2	15.0	9 30.9	9.6	54.2
11 00	178 39.8	N22 08.9	70 07.2	15.1	S 9 40.5	9.5	54.2
01	193 39.7	08.6	84 41.3	15.0	9 50.0	9.5	54.2
02	208 39.6	08.2	99 15.3	15.0	9 59.5	9.5	54.2
03	223 39.5	07.9	113 49.3	15.0	10 09.0	9.4	54.2
04	238 39.5	07.6	128 23.3	14.9	10 18.4	9.4	54.2
05	253 39.4	07.2	142 57.2	14.9	10 27.8	9.3	54.2
06	268 39.3	N22 06.9	157 31.1	14.9	S10 37.1	9.3	54.2
07	283 39.2	06.6	172 05.0	14.9	10 46.4	9.3	54.2
S 08	298 39.1	06.3	186 38.9	14.8	10 55.7	9.2	54.2
A 09	313 39.0	05.9	201 12.7	14.8	11 04.9	9.1	54.2
T 10	328 39.0	05.6	215 46.5	14.8	11 14.0	9.2	54.2
U 11	343 38.9	05.3	230 20.3	14.8	11 23.2	9.0	54.2
R 12	358 38.8	N22 04.9	244 54.1	14.7	S11 32.2	9.1	54.2
D 13	13 38.7	04.6	259 27.8	14.7	11 41.3	8.9	54.2
A 14	28 38.6	04.3	274 01.5	14.6	11 50.2	9.0	54.2
Y 15	43 38.5	03.9	288 35.1	14.6	11 59.2	8.8	54.2
16	58 38.5	03.6	303 08.7	14.6	12 08.0	8.9	54.2
17	73 38.4	03.2	317 42.3	14.6	12 16.9	8.7	54.2
18	88 38.3	N22 02.9	332 15.9	14.5	S12 25.6	8.8	54.2
19	103 38.2	02.6	346 49.4	14.5	12 34.4	8.6	54.2
20	118 38.1	02.2	1 22.9	14.4	12 43.0	8.7	54.2
21	133 38.1	01.9	15 56.3	14.4	12 51.7	8.5	54.2
22	148 38.0	01.5	30 29.7	14.4	13 00.2	8.6	54.2
23	163 37.9	01.2	45 03.1	14.3	13 08.8	8.4	54.2
	S.D. 15.8	d 0.3	S.D. 14.9		14.8		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	13 08	14 50	16 37	18 38
N 70	▭	▭	▭	13 02	14 37	16 15	17 57
68	▭	▭	▭	12 58	14 27	15 57	17 29
66	////	////	01 12	12 54	14 18	15 43	17 08
64	////	////	02 01	12 51	14 11	15 31	16 52
62	////	////	02 31	12 48	14 05	15 22	16 38
60	////	01 28	02 54	12 46	14 00	15 13	16 27
N 58	////	02 04	03 12	12 44	13 55	15 06	16 17
56	////	02 29	03 28	12 42	13 51	15 00	16 08
54	01 21	02 49	03 41	12 40	13 47	14 54	16 00
52	01 54	03 05	03 52	12 39	13 44	14 49	15 53
50	02 18	03 19	04 02	12 37	13 41	14 44	15 47
45	02 59	03 47	04 23	12 34	13 34	14 34	15 34
N 40	03 27	04 08	04 40	12 32	13 29	14 26	15 23
35	03 49	04 25	04 54	12 29	13 24	14 19	15 14
30	04 06	04 39	05 06	12 28	13 20	14 13	15 06
20	04 34	05 03	05 27	12 24	13 13	14 02	14 52
N 10	04 55	05 22	05 45	12 21	13 07	13 53	14 39
0	05 13	05 39	06 02	12 19	13 01	13 44	14 28
S 10	05 29	05 55	06 18	12 16	12 55	13 35	14 17
20	05 45	06 12	06 36	12 13	12 49	13 26	14 05
30	06 00	06 30	06 56	12 10	12 42	13 16	13 51
35	06 08	06 39	07 07	12 09	12 38	13 09	13 43
40	06 17	06 50	07 21	12 06	12 34	13 03	13 34
45	06 26	07 03	07 36	12 04	12 29	12 55	13 24
S 50	06 37	07 18	07 56	12 01	12 23	12 45	13 11
52	06 42	07 25	08 05	12 00	12 20	12 41	13 05
54	06 47	07 32	08 15	11 59	12 17	12 36	12 59
56	06 52	07 41	08 26	11 57	12 13	12 31	12 52
58	06 59	07 50	08 40	11 56	12 10	12 25	12 44
S 60	07 05	08 01	08 56	11 54	12 05	12 19	12 35

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	23 26	23 12	22 54	22 26
N 70	▭	▭	▭	23 34	23 27	23 19	23 08
68	▭	▭	▭	23 40	23 39	23 37	23 37
66	22 55	////	////	23 46	23 48	23 52	23 59
64	22 08	////	////	23 50	23 57	24 05	00 05
62	21 38	////	////	23 54	24 04	00 04	00 15
60	21 15	22 40	////	23 58	24 10	00 10	00 24
N 58	20 57	22 05	////	24 01	00 01	00 16	00 32
56	20 42	21 40	////	24 04	00 04	00 21	00 39
54	20 29	21 21	22 47	24 06	00 06	00 25	00 46
52	20 18	21 05	22 15	24 09	00 09	00 29	00 51
50	20 08	20 51	21 52	24 11	00 11	00 33	00 57
45	19 47	20 24	21 11	24 15	00 15	00 40	01 08
N 40	19 30	20 02	20 43	24 19	00 19	00 47	01 17
35	19 16	19 45	20 21	24 22	00 22	00 53	01 25
30	19 04	19 31	20 04	24 25	00 25	00 58	01 32
20	18 43	19 08	19 36	24 30	00 30	01 07	01 44
N 10	18 25	18 48	19 15	24 35	00 35	01 14	01 55
0	18 09	18 31	18 57	24 39	00 39	01 22	02 05
S 10	17 52	18 15	18 41	24 43	00 43	01 29	02 15
20	17 35	17 59	18 26	24 48	00 48	01 37	02 26
30	17 15	17 41	18 11	00 00	00 53	01 45	02 38
35	17 04	17 31	18 03	00 01	00 56	01 51	02 45
40	16 50	17 20	17 54	00 02	00 59	01 56	02 53
45	16 35	17 08	17 45	00 03	01 03	02 03	03 03
S 50	16 15	16 53	17 34	00 04	01 08	02 11	03 15
52	16 06	16 46	17 29	00 04	01 10	02 15	03 20
54	15 56	16 39	17 24	00 05	01 12	02 19	03 26
56	15 44	16 30	17 18	00 05	01 15	02 24	03 32
58	15 31	16 21	17 12	00 06	01 18	02 29	03 40
S 60	15 15	16 10	17 06	00 07	01 21	02 35	03 48

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
9	05 03	05 08	12 05	18 29	06 08	08	◐
10	05 12	05 17	12 05	19 11	06 50	09	
11	05 21	05 25	12 05	19 54	07 33	10	

GMT		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.5		SATURN +1.2	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12	00	289 48.1	152 04.0	N17 57.6	204 31.7	N23 46.9	106 15.2	S 0 09.9	105 05.2	N 0 32.0
	01	304 50.5	167 03.4	56.7	219 32.3	47.0	121 17.4	10.1	120 07.5	31.9
	02	319 53.0	182 02.8	55.9	234 32.9	47.1	136 19.6	10.2	135 09.9	31.9
	03	334 55.5	197 02.3	55.0	249 33.5	47.2	151 21.8	10.3	150 12.2	31.8
	04	349 57.9	212 01.7	54.1	264 34.1	47.3	166 24.0	10.4	165 14.5	31.7
	05	5 00.4	227 01.1	53.2	279 34.7	47.4	181 26.2	10.6	180 16.9	31.7
	06	20 02.8	242 00.5	N17 52.3	294 35.3	N23 47.4	196 28.4	S 0 10.7	195 19.2	N 0 31.6
	07	35 05.3	256 59.9	51.4	309 35.9	47.5	211 30.6	10.8	210 21.5	31.5
	08	50 07.8	271 59.4	50.5	324 36.5	47.6	226 32.8	10.9	225 23.9	31.5
SUNDAY	09	65 10.2	286 58.8	49.6	339 37.1	47.7	241 34.9	11.1	240 26.2	31.4
	10	80 12.7	301 58.2	48.7	354 37.7	47.8	256 37.1	11.2	255 28.5	31.3
	11	95 15.2	316 57.6	47.8	9 38.3	47.8	271 39.3	11.3	270 30.9	31.3
	12	110 17.6	331 57.1	N17 46.9	24 38.9	N23 47.9	286 41.5	S 0 11.5	285 33.2	N 0 31.2
	13	125 20.1	346 56.5	46.0	39 39.5	48.0	301 43.7	11.6	300 35.5	31.1
	14	140 22.6	1 55.9	45.1	54 40.1	48.1	316 45.9	11.7	315 37.8	31.1
	15	155 25.0	16 55.3	44.2	69 40.8	48.1	331 48.1	11.8	330 40.2	31.0
	16	170 27.5	31 54.8	43.3	84 41.4	48.2	346 50.3	12.0	345 42.5	30.9
	17	185 29.9	46 54.2	42.4	99 42.0	48.3	1 52.5	12.1	0 44.8	30.9
	18	200 32.4	61 53.6	N17 41.5	114 42.6	N23 48.4	16 54.7	S 0 12.2	15 47.2	N 0 30.8
	19	215 34.9	76 53.1	40.6	129 43.2	48.4	31 56.8	12.4	30 49.5	30.7
	20	230 37.3	91 52.5	39.7	144 43.8	48.5	46 59.0	12.5	45 51.8	30.7
	21	245 39.8	106 51.9	38.8	159 44.4	48.6	62 01.2	12.6	60 54.2	30.6
	22	260 42.3	121 51.3	37.9	174 45.0	48.7	77 03.4	12.7	75 56.5	30.5
	23	275 44.7	136 50.8	37.0	189 45.6	48.7	92 05.6	12.9	90 58.8	30.5
13	00	290 47.2	151 50.2	N17 36.1	204 46.2	N23 48.8	107 07.8	S 0 13.0	106 01.1	N 0 30.4
	01	305 49.7	166 49.6	35.1	219 46.8	48.9	122 10.0	13.1	121 03.5	30.3
	02	320 52.1	181 49.1	34.2	234 47.4	49.0	137 12.2	13.3	136 05.8	30.3
	03	335 54.6	196 48.5	33.3	249 48.0	49.0	152 14.3	13.4	151 08.1	30.2
	04	350 57.1	211 47.9	32.4	264 48.6	49.1	167 16.5	13.5	166 10.5	30.1
	05	5 59.5	226 47.4	31.5	279 49.2	49.2	182 18.7	13.6	181 12.8	30.1
	06	21 02.0	241 46.8	N17 30.6	294 49.8	N23 49.3	197 20.9	S 0 13.8	196 15.1	N 0 30.0
	07	36 04.4	256 46.2	29.7	309 50.4	49.3	212 23.1	13.9	211 17.4	29.9
	08	51 06.9	271 45.7	28.8	324 51.0	49.4	227 25.3	14.0	226 19.8	29.9
MONDAY	09	66 09.4	286 45.1	27.8	339 51.6	49.5	242 27.5	14.2	241 22.1	29.8
	10	81 11.8	301 44.6	26.9	354 52.3	49.5	257 29.6	14.3	256 24.4	29.7
	11	96 14.3	316 44.0	26.0	9 52.9	49.6	272 31.8	14.4	271 26.8	29.7
	12	111 16.8	331 43.4	N17 25.1	24 53.5	N23 49.7	287 34.0	S 0 14.6	286 29.1	N 0 29.6
	13	126 19.2	346 42.9	24.2	39 54.1	49.8	302 36.2	14.7	301 31.4	29.5
	14	141 21.7	1 42.3	23.3	54 54.7	49.8	317 38.4	14.8	316 33.7	29.4
	15	156 24.2	16 41.8	22.3	69 55.3	49.9	332 40.6	14.9	331 36.1	29.4
	16	171 26.6	31 41.2	21.4	84 55.9	50.0	347 42.7	15.1	346 38.4	29.3
	17	186 29.1	46 40.6	20.5	99 56.5	50.0	2 44.9	15.2	1 40.7	29.2
	18	201 31.6	61 40.1	N17 19.6	114 57.1	N23 50.1	17 47.1	S 0 15.3	16 43.0	N 0 29.2
	19	216 34.0	76 39.5	18.6	129 57.7	50.2	32 49.3	15.5	31 45.4	29.1
	20	231 36.5	91 39.0	17.7	144 58.3	50.2	47 51.5	15.6	46 47.7	29.0
	21	246 38.9	106 38.4	16.8	159 58.9	50.3	62 53.7	15.7	61 50.0	29.0
	22	261 41.4	121 37.9	15.9	174 59.5	50.4	77 55.8	15.9	76 52.4	28.9
	23	276 43.9	136 37.3	14.9	190 00.1	50.4	92 58.0	16.0	91 54.7	28.8
14	00	291 46.3	151 36.7	N17 14.0	205 00.7	N23 50.5	108 00.2	S 0 16.1	106 57.0	N 0 28.8
	01	306 48.8	166 36.2	13.1	220 01.4	50.6	123 02.4	16.3	121 59.3	28.7
	02	321 51.3	181 35.6	12.2	235 02.0	50.6	138 04.6	16.4	137 01.7	28.6
	03	336 53.7	196 35.1	11.2	250 02.6	50.7	153 06.8	16.5	152 04.0	28.6
	04	351 56.2	211 34.5	10.3	265 03.2	50.7	168 08.9	16.6	167 06.3	28.5
	05	6 58.7	226 34.0	09.4	280 03.8	50.8	183 11.1	16.8	182 08.6	28.4
	06	22 01.1	241 33.4	N17 08.4	295 04.4	N23 50.9	198 13.3	S 0 16.9	197 11.0	N 0 28.3
	07	37 03.6	256 32.9	07.5	310 05.0	50.9	213 15.5	17.0	212 13.3	28.3
	08	52 06.0	271 32.3	06.6	325 05.6	51.0	228 17.7	17.2	227 15.6	28.2
TUESDAY	09	67 08.5	286 31.8	05.6	340 06.2	51.1	243 19.8	17.3	242 17.9	28.1
	10	82 11.0	301 31.2	04.7	355 06.8	51.1	258 22.0	17.4	257 20.3	28.1
	11	97 13.4	316 30.7	03.8	10 07.4	51.2	273 24.2	17.6	272 22.6	28.0
	12	112 15.9	331 30.1	N17 02.8	25 08.0	N23 51.2	288 26.4	S 0 17.7	287 24.9	N 0 27.9
	13	127 18.4	346 29.6	01.9	40 08.6	51.3	303 28.6	17.8	302 27.2	27.9
	14	142 20.8	1 29.0	00.9	55 09.3	51.4	318 30.7	18.0	317 29.6	27.8
	15	157 23.3	16 28.5	17 00.0	70 09.9	51.4	333 32.9	18.1	332 31.9	27.7
	16	172 25.8	31 27.9	16 59.1	85 10.5	51.5	348 35.1	18.2	347 34.2	27.6
	17	187 28.2	46 27.4	58.1	100 11.1	51.5	3 37.3	18.4	2 36.5	27.6
	18	202 30.7	61 26.9	N16 57.2	115 11.7	N23 51.6	18 39.5	S 0 18.5	17 38.8	N 0 27.5
	19	217 33.2	76 26.3	56.2	130 12.3	51.7	33 41.6	18.6	32 41.2	27.4
	20	232 35.6	91 25.8	55.3	145 12.9	51.7	48 43.8	18.8	47 43.5	27.4
	21	247 38.1	106 25.2	54.4	160 13.5	51.8	63 46.0	18.9	62 45.8	27.3
	22	262 40.5	121 24.7	53.4	175 14.1	51.8	78 48.2	19.0	77 48.1	27.2
	23	277 43.0	136 24.1	52.5	190 14.7	51.9	93 50.3	19.2	92 50.5	27.2
Mer. Pass		h m 4 36.1	v −0.6	d 0.9	v 0.6	d 0.1	v 2.2	d 0.1	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.0	S40 22.6
Achernar	335 44.9	S57 19.6
Acrux	173 36.7	S63 00.0
Adhara	255 32.1	S28 56.8
Aldebaran	291 17.6	N16 28.3
Alioth	166 42.1	N56 04.0
Alkaid	153 18.0	N49 24.7
Al Na'ir	28 13.9	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.4	N26 46.9
Alpheratz	358 08.6	N28 59.1
Altair	62 31.6	N 8 49.2
Ankaa	353 39.6	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.2	S68 59.8
Avior	234 28.6	S59 27.1
Bellatrix	278 58.4	N 6 20.0
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.1
Capella	281 10.9	N45 58.6
Deneb	49 47.6	N45 12.8
Denebola	182 58.6	N14 40.7
Diphda	349 20.3	S18 05.2
Dubhe	194 21.9	N61 51.4
Elnath	278 43.8	N28 35.4
Eltanin	90 57.0	N51 29.7
Enif	34 10.8	N 9 47.4
Fomalhaut	15 50.6	S29 43.1
Gacrux	172 28.2	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.4	S60 17.2
Hamal	328 28.4	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.6	N74 14.3
Markab	14 02.4	N15 06.2
Menkar	314 40.7	N 4 01.0
Menkent	148 36.3	S36 16.8
Miaplacidus	221 45.7	S69 38.6
Mirfak	309 15.6	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.7	N12 03.6
Rigel	281 35.8	S 8 13.4
Rigil Kent.	140 24.8	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.3	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.6	S16 41.4
Spica	158 56.9	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	221 03.0	13 53
Mars	273 59.0	10 21
Jupiter	176 20.6	16 49
Saturn	175 13.9	16 53

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
12	00	178 37.8	N22 00.9	59 36.4	14.3	S13 17.2	8.4	54.2
	01	193 37.7	00.5	74 09.7	14.3	13 25.6	8.4	54.2
	02	208 37.7	22 00.2	88 43.0	14.2	13 34.0	8.3	54.2
	03	223 37.6	21 59.8	103 16.2	14.2	13 42.3	8.2	54.2
	04	238 37.5	59.5	117 49.4	14.1	13 50.5	8.2	54.2
	05	253 37.4	59.1	132 22.5	14.1	13 58.7	8.2	54.2
	06	268 37.3	N21 58.8	146 55.6	14.1	S14 06.9	8.0	54.2
	07	283 37.3	58.4	161 28.7	14.0	14 14.9	8.1	54.2
	08	298 37.2	58.1	176 01.7	14.0	14 23.0	7.9	54.2
SUN	09	313 37.1	·· 57.8	190 34.7	13.9	14 30.9	7.9	54.2
	10	328 37.0	57.4	205 07.6	13.9	14 38.8	7.9	54.2
	11	343 36.9	57.1	219 40.5	13.9	14 46.7	7.7	54.2
DAY	12	358 36.9	N21 56.7	234 13.4	13.8	S14 54.4	7.7	54.2
	13	13 36.8	56.4	248 46.2	13.7	15 02.1	7.7	54.2
	14	28 36.7	56.0	263 18.9	13.8	15 09.8	7.6	54.2
	15	43 36.6	·· 55.7	277 51.7	13.6	15 17.4	7.5	54.2
	16	58 36.6	55.3	292 24.3	13.7	15 24.9	7.5	54.2
	17	73 36.5	54.9	306 57.0	13.6	15 32.4	7.4	54.2
	18	88 36.4	N21 54.6	321 29.6	13.5	S15 39.8	7.3	54.2
	19	103 36.3	54.2	336 02.1	13.5	15 47.1	7.3	54.2
	20	118 36.3	53.9	350 34.6	13.5	15 54.4	7.2	54.3
	21	133 36.2	·· 53.5	5 07.1	13.4	16 01.6	7.1	54.3
	22	148 36.1	53.2	19 39.5	13.3	16 08.7	7.1	54.3
	23	163 36.0	52.8	34 11.8	13.3	16 15.8	7.0	54.3
13	00	178 36.0	N21 52.5	48 44.1	13.3	S16 22.8	6.9	54.3
	01	193 35.9	52.1	63 16.4	13.2	16 29.7	6.9	54.3
	02	208 35.8	51.7	77 48.6	13.2	16 36.6	6.8	54.3
	03	223 35.7	·· 51.4	92 20.8	13.1	16 43.4	6.7	54.3
	04	238 35.7	51.0	106 52.9	13.1	16 50.1	6.6	54.3
	05	253 35.6	50.7	121 25.0	13.0	16 56.7	6.6	54.3
	06	268 35.5	N21 50.3	135 57.0	13.0	S17 03.3	6.5	54.3
	07	283 35.4	49.9	150 29.0	12.9	17 09.8	6.4	54.3
	08	298 35.4	49.6	165 00.9	12.9	17 16.2	6.4	54.3
MON	09	313 35.3	·· 49.2	179 32.8	12.8	17 22.6	6.3	54.4
	10	328 35.2	48.8	194 04.6	12.8	17 28.9	6.2	54.4
	11	343 35.1	48.5	208 36.4	12.7	17 35.1	6.1	54.4
DAY	12	358 35.1	N21 48.1	223 08.1	12.7	S17 41.2	6.0	54.4
	13	13 35.0	47.7	237 39.8	12.7	17 47.2	6.0	54.4
	14	28 34.9	47.4	252 11.5	12.6	17 53.2	5.9	54.4
	15	43 34.9	·· 47.0	266 43.1	12.5	17 59.1	5.8	54.4
	16	58 34.8	46.6	281 14.6	12.5	18 04.9	5.7	54.4
	17	73 34.7	46.3	295 46.1	12.4	18 10.6	5.7	54.4
	18	88 34.6	N21 45.9	310 17.5	12.4	S18 16.3	5.6	54.5
	19	103 34.6	45.5	324 48.9	12.4	18 21.9	5.5	54.5
	20	118 34.5	45.2	339 20.3	12.3	18 27.4	5.4	54.5
	21	133 34.4	·· 44.8	353 51.6	12.2	18 32.8	5.3	54.5
	22	148 34.4	44.4	8 22.8	12.2	18 38.1	5.3	54.5
	23	163 34.3	44.1	22 54.0	12.2	18 43.4	5.1	54.5
14	00	178 34.2	N21 43.7	37 25.2	12.1	S18 48.5	5.1	54.5
	01	193 34.2	43.3	51 56.3	12.0	18 53.6	5.0	54.5
	02	208 34.1	42.9	66 27.3	12.0	18 58.6	4.9	54.6
	03	223 34.0	·· 42.6	80 58.3	12.0	19 03.5	4.8	54.6
	04	238 33.9	42.2	95 29.3	11.9	19 08.3	4.8	54.6
	05	253 33.9	41.8	110 00.2	11.9	19 13.1	4.6	54.6
	06	268 33.8	N21 41.4	124 31.1	11.8	S19 17.7	4.6	54.6
	07	283 33.7	41.0	139 01.9	11.7	19 22.3	4.4	54.6
	08	298 33.7	40.7	153 32.6	11.8	19 26.7	4.4	54.6
TUE	09	313 33.6	·· 40.3	168 03.4	11.6	19 31.1	4.3	54.6
	10	328 33.5	39.9	182 34.0	11.7	19 35.4	4.2	54.7
	11	343 33.5	39.5	197 04.7	11.5	19 39.6	4.1	54.7
SDAY	12	358 33.4	N21 39.1	211 35.2	11.6	S19 43.7	4.0	54.7
	13	13 33.3	38.8	226 05.8	11.4	19 47.7	4.0	54.7
	14	28 33.3	38.4	240 36.2	11.5	19 51.7	3.8	54.7
	15	43 33.2	·· 38.0	255 06.7	11.4	19 55.5	3.8	54.7
	16	58 33.1	37.6	269 37.1	11.3	19 59.3	3.6	54.7
	17	73 33.1	37.2	284 07.4	11.3	20 02.9	3.6	54.8
	18	88 33.0	N21 36.9	298 37.7	11.3	S20 06.5	3.4	54.8
	19	103 32.9	36.5	313 08.0	11.2	20 09.9	3.4	54.8
	20	118 32.9	36.1	327 38.2	11.2	20 13.3	3.2	54.8
	21	133 32.8	·· 35.7	342 08.4	11.1	20 16.5	3.2	54.8
	22	148 32.7	35.3	356 38.5	11.1	20 19.7	3.1	54.8
	23	163 32.7	34.9	11 08.6	11.0	20 22.8	3.0	54.9
		S.D. 15.8	d 0.4	S.D. 14.8		14.8		14.9

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
12	05 29	05 32	12 06	20 39	08 16	11	
13	05 36	05 40	12 06	21 25	09 02	12	◐
14	05 43	05 46	12 06	22 14	09 49	13	

G.M.T.		ARIES	VENUS −3.3		MARS +1.7		JUPITER −1.5		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15	00	292 45.5	151 23.6	N16 51.5	205 15.3	N23 51.9	108 52.5	S 0 19.3	107 52.8	N 0 27.1
	01	307 47.9	166 23.1	50.6	220 15.9	52.0	123 54.7	19.4	122 55.1	27.0
	02	322 50.4	181 22.5	49.6	235 16.6	52.1	138 56.9	19.6	137 57.4	26.9
	03	337 52.9	196 22.0	·· 48.7	250 17.2	·· 52.1	153 59.1	·· 19.7	152 59.8	·· 26.9
	04	352 55.3	211 21.4	47.7	265 17.8	52.2	169 01.2	19.8	168 02.1	26.8
	05	7 57.8	226 20.9	46.8	280 18.4	52.2	184 03.4	20.0	183 04.4	26.7
	06	23 00.3	241 20.4	N16 45.8	295 19.0	N23 52.3	199 05.6	S 0 20.1	198 06.7	N 0 26.7
	07	38 02.7	256 19.8	44.9	310 19.6	52.3	214 07.8	20.2	213 09.0	26.6
W	08	53 05.2	271 19.3	43.9	325 20.2	52.4	229 09.9	20.4	228 11.4	26.5
E	09	68 07.7	286 18.8	·· 43.0	340 20.8	·· 52.4	244 12.1	·· 20.5	243 13.7	·· 26.5
D	10	83 10.1	301 18.2	42.0	355 21.4	52.5	259 14.3	20.6	258 16.0	26.4
N	11	98 12.6	316 17.7	41.1	10 22.0	52.5	274 16.5	20.8	273 18.3	26.3
E	12	113 15.0	331 17.2	N16 40.1	25 22.6	N23 52.6	289 18.6	S 0 20.9	288 20.7	N 0 26.2
S	13	128 17.5	346 16.6	39.1	40 23.3	52.6	304 20.8	21.0	303 23.0	26.2
D	14	143 20.0	1 16.1	38.2	55 23.9	52.7	319 23.0	21.2	318 25.3	26.1
A	15	158 22.4	16 15.6	·· 37.2	70 24.5	·· 52.7	334 25.2	·· 21.3	333 27.6	·· 26.0
Y	16	173 24.9	31 15.0	36.3	85 25.1	52.8	349 27.3	21.4	348 29.9	26.0
	17	188 27.4	46 14.5	35.3	100 25.7	52.8	4 29.5	21.6	3 32.3	25.9
	18	203 29.8	61 14.0	N16 34.4	115 26.3	N23 52.9	19 31.7	S 0 21.7	18 34.6	N 0 25.8
	19	218 32.3	76 13.4	33.4	130 26.9	52.9	34 33.9	21.8	33 36.9	25.7
	20	233 34.8	91 12.9	32.4	145 27.5	53.0	49 36.0	22.0	48 39.2	25.7
	21	248 37.2	106 12.4	·· 31.5	160 28.1	·· 53.0	64 38.2	·· 22.1	63 41.5	·· 25.6
	22	263 39.7	121 11.8	30.5	175 28.7	53.1	79 40.4	22.2	78 43.9	25.5
	23	278 42.1	136 11.3	29.5	190 29.4	53.1	94 42.6	22.4	93 46.2	25.5
16	00	293 44.6	151 10.8	N16 28.6	205 30.0	N23 53.2	109 44.7	S 0 22.5	108 48.5	N 0 25.4
	01	308 47.1	166 10.3	27.6	220 30.6	53.2	124 46.9	22.6	123 50.8	25.3
	02	323 49.5	181 09.7	26.6	235 31.2	53.3	139 49.1	22.8	138 53.1	25.2
	03	338 52.0	196 09.2	·· 25.7	250 31.8	·· 53.3	154 51.2	·· 22.9	153 55.5	·· 25.2
	04	353 54.5	211 08.7	24.7	265 32.4	53.4	169 53.4	23.1	168 57.8	25.1
	05	8 56.9	226 08.2	23.7	280 33.0	53.4	184 55.6	23.2	184 00.1	25.0
	06	23 59.4	241 07.6	N16 22.8	295 33.6	N23 53.5	199 57.8	S 0 23.3	199 02.4	N 0 25.0
	07	39 01.9	256 07.1	21.8	310 34.2	53.5	214 59.9	23.5	214 04.7	24.9
T	08	54 04.3	271 06.6	20.8	325 34.9	53.6	230 02.1	23.6	229 07.0	24.8
H	09	69 06.8	286 06.1	·· 19.9	340 35.5	·· 53.6	245 04.3	·· 23.7	244 09.4	·· 24.7
U	10	84 09.3	301 05.5	18.9	355 36.1	53.6	260 06.4	23.9	259 11.7	24.7
R	11	99 11.7	316 05.0	17.9	10 36.7	53.7	275 08.6	24.0	274 14.0	24.6
S	12	114 14.2	331 04.5	N16 16.9	25 37.3	N23 53.7	290 10.8	S 0 24.1	289 16.3	N 0 24.5
D	13	129 16.6	346 04.0	16.0	40 37.9	53.8	305 13.0	24.3	304 18.6	24.4
A	14	144 19.1	1 03.5	15.0	55 38.5	53.8	320 15.1	24.4	319 21.0	24.4
Y	15	159 21.6	16 02.9	·· 14.0	70 39.1	·· 53.9	335 17.3	·· 24.5	334 23.3	·· 24.3
	16	174 24.0	31 02.4	13.0	85 39.7	53.9	350 19.5	24.7	349 25.6	24.2
	17	189 26.5	46 01.9	12.1	100 40.4	53.9	5 21.6	24.8	4 27.9	24.2
	18	204 29.0	61 01.4	N16 11.1	115 41.0	N23 54.0	20 23.8	S 0 25.0	19 30.2	N 0 24.1
	19	219 31.4	76 00.9	10.1	130 41.6	54.0	35 26.0	25.1	34 32.5	24.0
	20	234 33.9	91 00.4	09.1	145 42.2	54.1	50 28.1	25.2	49 34.9	23.9
	21	249 36.4	105 59.8	·· 08.1	160 42.8	·· 54.1	65 30.3	·· 25.4	64 37.2	·· 23.9
	22	264 38.8	120 59.3	07.2	175 43.4	54.1	80 32.5	25.5	79 39.5	23.8
	23	279 41.3	135 58.8	06.2	190 44.0	54.2	95 34.7	25.6	94 41.8	23.7
17	00	294 43.8	150 58.3	N16 05.2	205 44.6	N23 54.2	110 36.8	S 0 25.8	109 44.1	N 0 23.7
	01	309 46.2	165 57.8	04.2	220 45.3	54.3	125 39.0	25.9	124 46.4	23.6
	02	324 48.7	180 57.3	03.2	235 45.9	54.3	140 41.2	26.0	139 48.8	23.5
	03	339 51.1	195 56.8	·· 02.3	250 46.5	·· 54.3	155 43.3	·· 26.2	154 51.1	·· 23.4
	04	354 53.6	210 56.2	01.3	265 47.1	54.4	170 45.5	26.3	169 53.4	23.4
	05	9 56.1	225 55.7	16 00.3	280 47.7	54.4	185 47.7	26.5	184 55.7	23.3
	06	24 58.5	240 55.2	N15 59.3	295 48.3	N23 54.4	200 49.8	S 0 26.6	199 58.0	N 0 23.2
	07	40 01.0	255 54.7	58.3	310 48.9	54.5	215 52.0	26.7	215 00.3	23.1
	08	55 03.5	270 54.2	57.3	325 49.5	54.5	230 54.2	26.9	230 02.7	23.1
F	09	70 05.9	285 53.7	·· 56.3	340 50.2	·· 54.6	245 56.3	·· 27.0	245 05.0	·· 23.0
R	10	85 08.4	300 53.2	55.3	355 50.8	54.6	260 58.5	27.1	260 07.3	22.9
I	11	100 10.9	315 52.7	54.3	10 51.4	54.6	276 00.7	27.3	275 09.6	22.8
D	12	115 13.3	330 52.2	N15 53.4	25 52.0	N23 54.7	291 02.8	S 0 27.4	290 11.9	N 0 22.8
A	13	130 15.8	345 51.7	52.4	40 52.6	54.7	306 05.0	27.6	305 14.2	22.7
Y	14	145 18.2	0 51.2	51.4	55 53.2	54.7	321 07.2	27.7	320 16.5	22.6
	15	160 20.7	15 50.6	·· 50.4	70 53.8	·· 54.8	336 09.3	·· 27.8	335 18.9	·· 22.6
	16	175 23.2	30 50.1	49.4	85 54.5	54.8	351 11.5	28.0	350 21.2	22.5
	17	190 25.6	45 49.6	48.4	100 55.1	54.8	6 13.6	28.1	5 23.5	22.4
	18	205 28.1	60 49.1	N15 47.4	115 55.7	N23 54.9	21 15.8	S 0 28.3	20 25.8	N 0 22.3
	19	220 30.6	75 48.6	46.4	130 56.3	54.9	36 18.0	28.4	35 28.1	22.3
	20	235 33.0	90 48.1	45.4	145 56.9	54.9	51 20.1	28.5	50 30.4	22.2
	21	250 35.5	105 47.6	·· 44.4	160 57.5	·· 54.9	66 22.3	·· 28.7	65 32.7	·· 22.1
	22	265 38.0	120 47.1	43.4	175 58.1	55.0	81 24.5	28.8	80 35.1	22.0
	23	280 40.4	135 46.6	42.4	190 58.8	55.0	96 26.6	28.9	95 37.4	22.0
Mer. Pass.		h m 4 24.3	v −0.5	d 1.0	v 0.6	d 0.0	v 2.2	d 0.1	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 37.0	S40 22.6
Achernar	335 44.9	S57 19.6
Acrux	173 36.8	S63 00.0
Adhara	255 32.0	S28 56.8
Aldebaran	291 17.6	N16 28.3
Alioth	166 42.1	N56 04.0
Alkaid	153 18.0	N49 24.7
Al Na'ir	28 13.8	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.4	N26 46.9
Alpheratz	358 08.6	N28 59.1
Altair	62 31.6	N 8 49.2
Ankaa	353 39.6	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.2	S68 59.8
Avior	234 28.6	S59 27.0
Bellatrix	278 58.4	N 6 20.0
Betelgeuse	271 28.0	N 7 24.2
Canopus	264 07.5	S52 41.1
Capella	281 10.9	N45 58.6
Deneb	49 47.6	N45 12.8
Denebola	182 58.6	N14 40.7
Diphda	349 20.2	S18 05.2
Dubhe	194 21.9	N61 51.4
Elnath	278 43.7	N28 35.4
Eltanin	90 57.0	N51 29.7
Enif	34 10.7	N 9 47.4
Fomalhaut	15 50.5	S29 43.1
Gacrux	172 28.2	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.4	S60 17.2
Hamal	328 28.3	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.6	N74 14.3
Markab	14 02.4	N15 06.3
Menkar	314 40.7	N 4 01.0
Menkent	148 36.3	S36 16.8
Miaplacidus	221 45.7	S69 38.6
Mirfak	309 15.5	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.9	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.7	N12 03.6
Rigel	281 35.7	S 8 13.4
Rigil Kent.	140 24.8	S60 45.6
Sabik	102 40.2	S15 42.1
Schedar	350 08.2	N56 25.8
Shaula	96 54.6	S37 05.4
Sirius	258 55.5	S16 41.4
Spica	158 56.9	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	217 26.2	13 56
Mars	271 45.4	10 18
Jupiter	176 00.1	16 39
Saturn	175 03.9	16 42

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
15	00	178 32.6	N21 34.5	25 38.6	11.0	S20 25.8	2.8	54.9
	01	193 32.5	34.1	40 08.6	11.0	20 28.6	2.8	54.9
	02	208 32.5	33.7	54 38.6	10.9	20 31.4	2.7	54.9
	03	223 32.4	33.4	69 08.5	10.9	20 34.1	2.6	54.9
	04	238 32.4	33.0	83 38.4	10.8	20 36.7	2.4	54.9
	05	253 32.3	32.6	98 08.2	10.8	20 39.1	2.4	55.0
	06	268 32.2	N21 32.2	112 38.0	10.8	S20 41.5	2.3	55.0
W	07	283 32.2	31.8	127 07.8	10.7	20 43.8	2.2	55.0
E	08	298 32.1	31.4	141 37.5	10.7	20 46.0	2.0	55.0
D	09	313 32.0	31.0	156 07.2	10.6	20 48.0	2.0	55.0
N	10	328 32.0	30.6	170 36.8	10.6	20 50.0	1.9	55.0
E	11	343 31.9	30.2	185 06.4	10.6	20 51.9	1.8	55.1
S	12	358 31.8	N21 29.8	199 36.0	10.6	S20 53.7	1.6	55.1
D	13	13 31.8	29.4	214 05.6	10.5	20 55.3	1.6	55.1
A	14	28 31.7	29.0	228 35.1	10.4	20 56.9	1.4	55.1
Y	15	43 31.7	28.6	243 04.5	10.5	20 58.3	1.4	55.1
	16	58 31.6	28.2	257 34.0	10.4	20 59.7	1.2	55.2
	17	73 31.5	27.8	272 03.4	10.3	21 00.9	1.1	55.2
	18	88 31.5	N21 27.4	286 32.7	10.4	S21 02.0	1.1	55.2
	19	103 31.4	27.0	301 02.1	10.3	21 03.1	0.9	55.2
	20	118 31.4	26.6	315 31.4	10.3	21 04.0	0.8	55.2
	21	133 31.3	26.2	330 00.7	10.2	21 04.8	0.7	55.2
	22	148 31.2	25.8	344 29.9	10.2	21 05.5	0.6	55.3
	23	163 31.2	25.4	358 59.1	10.2	21 06.1	0.5	55.3
16	00	178 31.1	N21 25.0	13 28.3	10.2	S21 06.6	0.4	55.3
	01	193 31.1	24.6	27 57.5	10.1	21 07.0	0.3	55.3
	02	208 31.0	24.2	42 26.6	10.1	21 07.3	0.2	55.3
	03	223 30.9	23.8	56 55.7	10.1	21 07.5	0.0	55.4
	04	238 30.9	23.4	71 24.8	10.1	21 07.5	0.0	55.4
	05	253 30.8	23.0	85 53.9	10.0	21 07.5	0.2	55.4
	06	268 30.8	N21 22.6	100 22.9	10.0	S21 07.3	0.2	55.4
	07	283 30.7	22.2	114 51.9	10.0	21 07.1	0.4	55.4
T	08	298 30.7	21.8	129 20.9	10.0	21 06.7	0.5	55.5
H	09	313 30.6	21.3	143 49.9	9.9	21 06.2	0.6	55.5
U	10	328 30.5	20.9	158 18.8	9.9	21 05.6	0.7	55.5
R	11	343 30.5	20.5	172 47.7	10.0	21 04.9	0.8	55.5
S	12	358 30.4	N21 20.1	187 16.7	9.8	S21 04.1	0.9	55.5
D	13	13 30.4	19.7	201 45.5	9.9	21 03.2	1.1	55.6
A	14	28 30.3	19.3	216 14.4	9.9	21 02.1	1.1	55.6
Y	15	43 30.3	18.9	230 43.3	9.8	21 01.0	1.3	55.6
	16	58 30.2	18.5	245 12.1	9.8	20 59.7	1.3	55.6
	17	73 30.1	18.0	259 40.9	9.9	20 58.4	1.5	55.6
	18	88 30.1	N21 17.6	274 09.8	9.8	S20 56.9	1.6	55.7
	19	103 30.0	17.2	288 38.6	9.7	20 55.3	1.7	55.7
	20	118 30.0	16.8	303 07.3	9.8	20 53.6	1.8	55.7
	21	133 29.9	16.4	317 36.1	9.8	20 51.8	2.0	55.7
	22	148 29.9	16.0	332 04.9	9.7	20 49.8	2.0	55.7
	23	163 29.8	15.5	346 33.6	9.8	20 47.8	2.1	55.8
17	00	178 29.8	N21 15.1	1 02.4	9.7	S20 45.7	2.3	55.8
	01	193 29.7	14.7	15 31.1	9.7	20 43.4	2.4	55.8
	02	208 29.7	14.3	29 59.8	9.7	20 41.0	2.4	55.8
	03	223 29.6	13.9	44 28.5	9.8	20 38.6	2.6	55.8
	04	238 29.5	13.4	58 57.3	9.7	20 36.0	2.7	55.9
	05	253 29.5	13.0	73 26.0	9.7	20 33.3	2.9	55.9
	06	268 29.4	N21 12.6	87 54.7	9.7	S20 30.4	2.9	55.9
	07	283 29.4	12.2	102 23.4	9.7	20 27.5	3.0	55.9
	08	298 29.3	11.8	116 52.1	9.6	20 24.5	3.2	55.9
F	09	313 29.3	11.3	131 20.7	9.7	20 21.3	3.2	56.0
R	10	328 29.2	10.9	145 49.4	9.7	20 18.1	3.4	56.0
I	11	343 29.2	10.5	160 18.1	9.7	20 14.7	3.5	56.0
D	12	358 29.1	N21 10.0	174 46.8	9.7	S20 11.2	3.6	56.0
A	13	13 29.1	09.6	189 15.5	9.7	20 07.6	3.6	56.0
Y	14	28 29.0	09.2	203 44.2	9.7	20 04.0	3.9	56.1
	15	43 29.0	08.8	218 12.9	9.7	20 00.1	3.9	56.1
	16	58 28.9	08.3	232 41.6	9.7	19 56.2	4.0	56.1
	17	73 28.9	07.9	247 10.3	9.7	19 52.2	4.1	56.1
	18	88 28.8	N21 07.5	261 39.0	9.7	S19 48.1	4.3	56.2
	19	103 28.8	07.0	276 07.7	9.7	19 43.8	4.3	56.2
	20	118 28.7	06.6	290 36.4	9.7	19 39.5	4.5	56.2
	21	133 28.7	06.2	305 05.1	9.7	19 35.0	4.6	56.2
	22	148 28.6	05.8	319 33.8	9.8	19 30.4	4.6	56.2
	23	163 28.6	05.3	334 02.6	9.7	19 25.8	4.8	56.3
		S.D. 15.8	d 0.4	S.D. 15.0		15.1		15.3

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
15	05 49	05 52	12 06	23 04	10 39	14	○
16	05 55	05 58	12 06	23 56	11 30	15	
17	06 01	06 03	12 06	24 48	12 22	16	

G.M.T.		ARIES	VENUS −3.3		MARS +1.8		JUPITER −1.4		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
18	00	295 42.9	150 46.1	N15 41.4	205 59.4	N23 55.0	111 28.8	S 0 29.1	110 39.7	N 0 21.9
	01	310 45.4	165 45.6	40.4	221 00.0	55.1	126 31.0	29.2	125 42.0	21.8
	02	325 47.8	180 45.1	39.4	236 00.6	55.1	141 33.1	29.4	140 44.3	21.7
	03	340 50.3	195 44.6	·· 38.4	251 01.2	·· 55.1	156 35.3	·· 29.5	155 46.6	·· 21.7
	04	355 52.7	210 44.1	37.4	266 01.8	55.2	171 37.5	29.6	170 48.9	21.6
	05	10 55.2	225 43.6	36.4	281 02.4	55.2	186 39.6	29.8	185 51.2	21.5
	06	25 57.7	240 43.1	N15 35.4	296 03.1	N23 55.2	201 41.8	S 0 29.9	200 53.6	N 0 21.4
	07	41 00.1	255 42.6	34.4	311 03.7	55.2	216 43.9	30.1	215 55.9	21.4
S	08	56 02.6	270 42.1	33.4	326 04.3	55.3	231 46.1	30.2	230 58.2	21.3
A	09	71 05.1	285 41.6	·· 32.4	341 04.9	·· 55.3	246 48.3	·· 30.3	246 00.5	·· 21.2
T	10	86 07.5	300 41.1	31.4	356 05.5	55.3	261 50.4	30.5	261 02.8	21.1
U	11	101 10.0	315 40.6	30.4	11 06.1	55.3	276 52.6	30.6	276 05.1	21.1
R	12	116 12.5	330 40.2	N15 29.4	26 06.7	N23 55.4	291 54.7	S 0 30.8	291 07.4	N 0 21.0
D	13	131 14.9	345 39.7	28.4	41 07.4	55.4	306 56.9	30.9	306 09.7	20.9
A	14	146 17.4	0 39.2	27.3	56 08.0	55.4	321 59.1	31.0	321 12.1	20.8
Y	15	161 19.9	15 38.7	·· 26.3	71 08.6	·· 55.4	337 01.2	·· 31.2	336 14.4	·· 20.8
	16	176 22.3	30 38.2	25.3	86 09.2	55.5	352 03.4	31.3	351 16.7	20.7
	17	191 24.8	45 37.7	24.3	101 09.8	55.5	7 05.5	31.5	6 19.0	20.6
	18	206 27.2	60 37.2	N15 23.3	116 10.4	N23 55.5	22 07.7	S 0 31.6	21 21.3	N 0 20.5
	19	221 29.7	75 36.7	22.3	131 11.1	55.5	37 09.9	31.7	36 23.6	20.5
	20	236 32.2	90 36.2	21.3	146 11.7	55.6	52 12.0	31.9	51 25.9	20.4
	21	251 34.6	105 35.7	·· 20.3	161 12.3	·· 55.6	67 14.2	·· 32.0	66 28.2	·· 20.3
	22	266 37.1	120 35.2	19.2	176 12.9	55.6	82 16.3	32.2	81 30.5	20.2
	23	281 39.6	135 34.8	18.2	191 13.5	55.6	97 18.5	32.3	96 32.9	20.2
19	00	296 42.0	150 34.3	N15 17.2	206 14.1	N23 55.7	112 20.7	S 0 32.4	111 35.2	N 0 20.1
	01	311 44.5	165 33.8	16.2	221 14.8	55.7	127 22.8	32.6	126 37.5	20.0
	02	326 47.0	180 33.3	15.2	236 15.4	55.7	142 25.0	32.7	141 39.8	19.9
	03	341 49.4	195 32.8	·· 14.2	251 16.0	·· 55.7	157 27.1	·· 32.9	156 42.1	·· 19.9
	04	356 51.9	210 32.3	13.1	266 16.6	55.7	172 29.3	33.0	171 44.4	19.8
	05	11 54.3	225 31.8	12.1	281 17.2	55.8	187 31.5	33.1	186 46.7	19.7
	06	26 56.8	240 31.3	N15 11.1	296 17.8	N23 55.8	202 33.6	S 0 33.3	201 49.0	N 0 19.6
	07	41 59.3	255 30.9	10.1	311 18.5	55.8	217 35.8	33.4	216 51.3	19.6
	08	57 01.7	270 30.4	09.1	326 19.1	55.8	232 37.9	33.6	231 53.6	19.5
S	09	72 04.2	285 29.9	·· 08.0	341 19.7	·· 55.8	247 40.1	·· 33.7	246 55.9	·· 19.4
U	10	87 06.7	300 29.4	07.0	356 20.3	55.8	262 42.2	33.8	261 58.3	19.3
N	11	102 09.1	315 28.9	06.0	11 20.9	55.9	277 44.4	34.0	277 00.6	19.3
D	12	117 11.6	330 28.4	N15 05.0	26 21.5	N23 55.9	292 46.6	S 0 34.1	292 02.9	N 0 19.2
A	13	132 14.1	345 28.0	03.9	41 22.2	55.9	307 48.7	34.3	307 05.2	19.1
Y	14	147 16.5	0 27.5	02.9	56 22.8	55.9	322 50.9	34.4	322 07.5	19.0
	15	162 19.0	15 27.0	·· 01.9	71 23.4	·· 55.9	337 53.0	·· 34.6	337 09.8	·· 19.0
	16	177 21.5	30 26.5	15 00.9	86 24.0	55.9	352 55.2	34.7	352 12.1	18.9
	17	192 23.9	45 26.1	14 59.8	101 24.6	56.0	7 57.3	34.8	7 14.4	18.8
	18	207 26.4	60 25.6	N14 58.8	116 25.2	N23 56.0	22 59.5	S 0 35.0	22 16.7	N 0 18.7
	19	222 28.8	75 25.1	57.8	131 25.9	56.0	38 01.7	35.1	37 19.0	18.7
	20	237 31.3	90 24.6	56.7	146 26.5	56.0	53 03.8	35.3	52 21.3	18.6
	21	252 33.8	105 24.1	·· 55.7	161 27.1	·· 56.0	68 06.0	·· 35.4	67 23.6	·· 18.5
	22	267 36.2	120 23.7	54.7	176 27.7	56.0	83 08.1	35.5	82 26.0	18.4
	23	282 38.7	135 23.2	53.6	191 28.3	56.0	98 10.3	35.7	97 28.3	18.3
20	00	297 41.2	150 22.7	N14 52.6	206 29.0	N23 56.1	113 12.4	S 0 35.8	112 30.6	N 0 18.3
	01	312 43.6	165 22.2	51.6	221 29.6	56.1	128 14.6	36.0	127 32.9	18.2
	02	327 46.1	180 21.8	50.5	236 30.2	56.1	143 16.7	36.1	142 35.2	18.1
	03	342 48.6	195 21.3	·· 49.5	251 30.8	·· 56.1	158 18.9	·· 36.3	157 37.5	·· 18.0
	04	357 51.0	210 20.8	48.5	266 31.4	56.1	173 21.0	36.4	172 39.8	18.0
	05	12 53.5	225 20.3	47.4	281 32.0	56.1	188 23.2	36.5	187 42.1	17.9
	06	27 56.0	240 19.9	N14 46.4	296 32.7	N23 56.1	203 25.3	S 0 36.7	202 44.4	N 0 17.8
	07	42 58.4	255 19.4	45.4	311 33.3	56.1	218 27.5	36.8	217 46.7	17.7
	08	58 00.9	270 18.9	44.3	326 33.9	56.1	233 29.7	37.0	232 49.0	17.7
M	09	73 03.3	285 18.5	·· 43.3	341 34.5	·· 56.2	248 31.8	·· 37.1	247 51.3	·· 17.6
O	10	88 05.8	300 18.0	42.3	356 35.1	56.2	263 34.0	37.3	262 53.6	17.5
N	11	103 08.3	315 17.5	41.2	11 35.8	56.2	278 36.1	37.4	277 55.9	17.4
D	12	118 10.7	330 17.1	N14 40.2	26 36.4	N23 56.2	293 38.3	S 0 37.5	292 58.2	N 0 17.3
A	13	133 13.2	345 16.6	39.1	41 37.0	56.2	308 40.4	37.7	308 00.6	17.3
Y	14	148 15.7	0 16.1	38.1	56 37.6	56.2	323 42.6	37.8	323 02.9	17.2
	15	163 18.1	15 15.7	·· 37.0	71 38.2	·· 56.2	338 44.7	·· 38.0	338 05.2	·· 17.1
	16	178 20.6	30 15.2	36.0	86 38.9	56.2	353 46.9	38.1	353 07.5	17.0
	17	193 23.1	45 14.7	35.0	101 39.5	56.2	8 49.0	38.3	8 09.8	17.0
	18	208 25.5	60 14.3	N14 33.9	116 40.1	N23 56.2	23 51.2	S 0 38.4	23 12.1	N 0 16.9
	19	223 28.0	75 13.8	32.9	131 40.7	56.2	38 53.3	38.6	38 14.4	16.8
	20	238 30.4	90 13.3	31.8	146 41.3	56.2	53 55.5	38.7	53 16.7	16.7
	21	253 32.9	105 12.9	·· 30.8	161 42.0	·· 56.2	68 57.6	·· 38.8	68 19.0	·· 16.6
	22	268 35.4	120 12.4	29.7	176 42.6	56.2	83 59.8	39.0	83 21.3	16.6
	23	283 37.8	135 11.9	28.7	191 43.2	56.2	99 01.9	39.1	98 23.6	16.5
Mer. Pass.		h m 4 12.5	v −0.5	d 1.0	v 0.6	d 0.0	v 2.2	d 0.1	v 2.3	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 36.9	S40 22.6
Achernar	335 44.8	S57 19.6
Acrux	173 36.8	S63 00.0
Adhara	255 32.0	S28 56.8
Aldebaran	291 17.6	N16 28.3
Alioth	166 42.1	N56 04.0
Alkaid	153 18.0	N49 24.7
Al Na'ir	28 13.8	S47 02.9
Alnilam	276 11.4	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.4	N26 46.9
Alpheratz	358 08.6	N28 59.1
Altair	62 31.6	N 8 49.2
Ankaa	353 39.5	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.2	S68 59.8
Avior	234 28.6	S59 27.0
Bellatrix	278 58.4	N 6 20.0
Betelgeuse	271 27.9	N 7 24.2
Canopus	264 07.5	S52 41.1
Capella	281 10.8	N45 58.6
Deneb	49 47.6	N45 12.8
Denebola	182 58.6	N14 40.7
Diphda	349 20.2	S18 05.2
Dubhe	194 21.9	N61 51.4
Elnath	278 43.7	N28 35.4
Eltanin	90 57.0	N51 29.7
Enif	34 10.7	N 9 47.4
Fomalhaut	15 50.5	S29 43.1
Gacrux	172 28.3	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.4	S60 17.2
Hamal	328 28.3	N23 22.3
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.7	N74 14.3
Markab	14 02.4	N15 06.3
Menkar	314 40.6	N 4 01.0
Menkent	148 36.3	S36 16.8
Miaplacidus	221 45.7	S69 38.6
Mirfak	309 15.5	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.8	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.5
Regulus	208 09.7	N12 03.6
Rigel	281 35.7	S 8 13.3
Rigil Kent.	140 24.9	S60 45.7
Sabik	102 40.2	S15 42.1
Schedar	350 08.2	N56 25.8
Shaula	96 54.6	S37 05.5
Sirius	258 55.5	S16 41.4
Spica	158 57.0	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	213 52.2	13 58
Mars	269 32.1	10 15
Jupiter	175 38.6	16 28
Saturn	174 53.1	16 31

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
18	00	178 28.5	N21 04.9	348 31.3	9.8	S19 21.0	4.9	56.3
	01	193 28.5	04.4	3 00.1	9.7	19 16.1	5.0	56.3
	02	208 28.4	04.0	17 28.8	9.8	19 11.1	5.1	56.3
	03	223 28.4	·· 03.6	31 57.6	9.8	19 06.0	5.2	56.3
	04	238 28.3	03.1	46 26.4	9.8	19 00.8	5.3	56.4
	05	253 28.3	02.7	60 55.2	9.8	18 55.5	5.4	56.4
	06	268 28.2	N21 02.3	75 24.0	9.8	S18 50.1	5.6	56.4
	07	283 28.2	01.8	89 52.8	9.8	18 44.5	5.6	56.4
S	08	298 28.1	01.4	104 21.6	9.8	18 38.9	5.7	56.5
A	09	313 28.1	·· 00.9	118 50.4	9.9	18 33.2	5.9	56.5
T	10	328 28.1	00.5	133 19.3	9.9	18 27.3	5.9	56.5
U	11	343 28.0	21 00.1	147 48.2	9.8	18 21.4	6.0	56.5
R	12	358 28.0	N20 59.6	162 17.0	9.9	S18 15.4	6.2	56.5
D	13	13 27.9	59.2	176 45.9	9.9	18 09.2	6.2	56.6
A	14	28 27.9	58.7	191 14.8	10.0	18 03.0	6.4	56.6
Y	15	43 27.8	·· 58.3	205 43.8	9.9	17 56.6	6.4	56.6
	16	58 27.8	57.9	220 12.7	10.0	17 50.2	6.5	56.6
	17	73 27.7	57.4	234 41.7	10.0	17 43.7	6.7	56.6
	18	88 27.7	N20 57.0	249 10.7	10.0	S17 37.0	6.7	56.7
	19	103 27.6	56.5	263 39.7	10.0	17 30.3	6.9	56.7
	20	118 27.6	56.1	278 08.7	10.0	17 23.4	6.9	56.7
	21	133 27.6	·· 55.6	292 37.7	10.1	17 16.5	7.0	56.7
	22	148 27.5	55.2	307 06.8	10.1	17 09.5	7.2	56.7
	23	163 27.5	54.7	321 35.9	10.0	17 02.3	7.2	56.8
19	00	178 27.4	N20 54.3	336 04.9	10.2	S16 55.1	7.3	56.8
	01	193 27.4	53.8	350 34.1	10.1	16 47.8	7.4	56.8
	02	208 27.3	53.4	5 03.2	10.1	16 40.4	7.5	56.8
	03	223 27.3	·· 52.9	19 32.3	10.2	16 32.9	7.6	56.9
	04	238 27.3	52.5	34 01.5	10.2	16 25.3	7.7	56.9
	05	253 27.2	52.0	48 30.7	10.2	16 17.6	7.8	56.9
	06	268 27.2	N20 51.6	62 59.9	10.3	S16 09.8	7.9	56.9
	07	283 27.1	51.1	77 29.2	10.2	16 01.9	8.0	56.9
	08	298 27.1	50.7	91 58.4	10.3	15 53.9	8.0	57.0
S	09	313 27.0	·· 50.2	106 27.7	10.3	15 45.9	8.2	57.0
U	10	328 27.0	49.8	120 57.0	10.3	15 37.7	8.2	57.0
N	11	343 27.0	49.3	135 26.3	10.4	15 29.5	8.3	57.0
D	12	358 26.9	N20 48.8	149 55.7	10.4	S15 21.2	8.4	57.0
A	13	13 26.9	48.4	164 25.1	10.3	15 12.8	8.5	57.1
Y	14	28 26.8	47.9	178 54.4	10.5	15 04.3	8.6	57.1
	15	43 26.8	·· 47.5	193 23.9	10.4	14 55.7	8.7	57.1
	16	58 26.8	47.0	207 53.3	10.5	14 47.0	8.7	57.1
	17	73 26.7	46.6	222 22.8	10.4	14 38.3	8.9	57.1
	18	88 26.7	N20 46.1	236 52.2	10.5	S14 29.4	8.9	57.2
	19	103 26.7	45.6	251 21.7	10.6	14 20.5	9.0	57.2
	20	118 26.6	45.2	265 51.3	10.5	14 11.5	9.1	57.2
	21	133 26.6	·· 44.7	280 20.8	10.6	14 02.4	9.1	57.2
	22	148 26.5	44.3	294 50.4	10.6	13 53.3	9.3	57.3
	23	163 26.5	43.8	309 20.0	10.6	13 44.0	9.3	57.3
20	00	178 26.5	N20 43.3	323 49.6	10.6	S13 34.7	9.4	57.3
	01	193 26.4	42.9	338 19.2	10.7	13 25.3	9.5	57.3
	02	208 26.4	42.4	352 48.9	10.7	13 15.8	9.5	57.3
	03	223 26.3	·· 41.9	7 18.6	10.7	13 06.3	9.6	57.4
	04	238 26.3	41.5	21 48.3	10.7	12 56.7	9.7	57.4
	05	253 26.3	41.0	36 18.0	10.7	12 47.0	9.8	57.4
	06	268 26.2	N20 40.5	50 47.7	10.8	S12 37.2	9.8	57.4
	07	283 26.2	40.1	65 17.5	10.8	12 27.4	9.9	57.4
	08	298 26.2	39.6	79 47.3	10.8	12 17.5	10.0	57.5
M	09	313 26.1	·· 39.1	94 17.1	10.8	12 07.5	10.1	57.5
O	10	328 26.1	38.7	108 46.9	10.9	11 57.4	10.1	57.5
N	11	343 26.1	38.2	123 16.8	10.8	11 47.3	10.2	57.5
D	12	358 26.0	N20 37.7	137 46.6	10.9	S11 37.1	10.3	57.5
A	13	13 26.0	37.2	152 16.5	10.9	11 26.8	10.3	57.6
Y	14	28 26.0	36.8	166 46.4	10.9	11 16.5	10.4	57.6
	15	43 25.9	·· 36.3	181 16.3	11.0	11 06.1	10.4	57.6
	16	58 25.9	35.8	195 46.3	10.9	10 55.7	10.6	57.6
	17	73 25.9	35.4	210 16.2	11.0	10 45.1	10.5	57.6
	18	88 25.8	N20 34.9	224 46.2	11.0	S10 34.6	10.7	57.7
	19	103 25.8	34.4	239 16.2	11.0	10 23.9	10.7	57.7
	20	118 25.8	33.9	253 46.2	11.1	10 13.2	10.7	57.7
	21	133 25.7	·· 33.5	268 16.3	11.0	10 02.5	10.9	57.7
	22	148 25.7	33.0	282 46.3	11.1	9 51.6	10.9	57.7
	23	163 25.7	32.5	297 16.4	11.1	9 40.7	10.9	57.8
		S.D. 15.8	d 0.5	S.D. 15.4		15.5		15.7

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	06 06	06 08	12 06	00 48	13 13	17	○
19	06 10	06 12	12 06	01 39	14 05	18	
20	06 14	06 16	12 06	02 30	14 55	19	

G.M.T.		ARIES	VENUS −3.3		MARS +1.8		JUPITER −1.4		SATURN +1.2	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
21	00	298 40.3	150 11.5	N14 27.6	206 43.8	N23 56.3	114 04.1	S 0 39.3	113 25.9	N 0 16.4
	01	313 42.8	165 11.0	26.6	221 44.4	56.3	129 06.2	39.4	128 28.2	16.3
	02	328 45.2	180 10.5	25.5	236 45.1	56.3	144 08.4	39.6	143 30.5	16.3
	03	343 47.7	195 10.1	·· 24.5	251 45.7	·· 56.3	159 10.5	·· 39.7	158 32.8	·· 16.2
	04	358 50.2	210 09.6	23.4	266 46.3	56.3	174 12.7	39.9	173 35.1	16.1
	05	13 52.6	225 09.2	22.4	281 46.9	56.3	189 14.8	40.0	188 37.4	16.0
	06	28 55.1	240 08.7	N14 21.3	296 47.5	N23 56.3	204 17.0	S 0 40.1	203 39.7	N 0 15.9
	07	43 57.6	255 08.2	20.3	311 48.2	56.3	219 19.1	40.3	218 42.0	15.9
	08	59 00.0	270 07.8	19.2	326 48.8	56.3	234 21.3	40.4	233 44.3	15.8
TUESDAY	09	74 02.5	285 07.3	·· 18.2	341 49.4	·· 56.3	249 23.4	·· 40.6	248 46.6	·· 15.7
	10	89 04.9	300 06.9	17.1	356 50.0	56.3	264 25.6	40.7	263 48.9	15.6
	11	104 07.4	315 06.4	16.1	11 50.7	56.3	279 27.7	40.9	278 51.2	15.6
	12	119 09.9	330 06.0	N14 15.0	26 51.3	N23 56.3	294 29.9	S 0 41.0	293 53.5	N 0 15.5
	13	134 12.3	345 05.5	13.9	41 51.9	56.3	309 32.0	41.2	308 55.8	15.4
	14	149 14.8	0 05.1	12.9	56 52.5	56.3	324 34.2	41.3	323 58.2	15.3
	15	164 17.3	15 04.6	·· 11.8	71 53.1	·· 56.3	339 36.3	·· 41.4	339 00.5	·· 15.2
	16	179 19.7	30 04.1	10.8	86 53.8	56.3	354 38.5	41.6	354 02.8	15.2
	17	194 22.2	45 03.7	09.7	101 54.4	56.3	9 40.6	41.7	9 05.1	15.1
	18	209 24.7	60 03.2	N14 08.7	116 55.0	N23 56.3	24 42.7	S 0 41.9	24 07.4	N 0 15.0
	19	224 27.1	75 02.8	07.6	131 55.6	56.3	39 44.9	42.0	39 09.7	14.9
	20	239 29.6	90 02.3	06.5	146 56.3	56.3	54 47.0	42.2	54 12.0	14.8
	21	254 32.1	105 01.9	·· 05.5	161 56.9	·· 56.3	69 49.2	·· 42.3	69 14.3	·· 14.8
	22	269 34.5	120 01.4	04.4	176 57.5	56.3	84 51.3	42.5	84 16.6	14.7
	23	284 37.0	135 01.0	03.3	191 58.1	56.2	99 53.5	42.6	99 18.9	14.6
22	00	299 39.4	150 00.5	N14 02.3	206 58.7	N23 56.2	114 55.6	S 0 42.8	114 21.2	N 0 14.5
	01	314 41.9	165 00.1	01.2	221 59.4	56.2	129 57.8	42.9	129 23.5	14.5
	02	329 44.4	179 59.6	14 00.2	237 00.0	56.2	144 59.9	43.1	144 25.8	14.4
	03	344 46.8	194 59.2	13 59.1	252 00.6	·· 56.2	160 02.1	·· 43.2	159 28.1	·· 14.3
	04	359 49.3	209 58.7	58.0	267 01.2	56.2	175 04.2	43.3	174 30.4	14.2
	05	14 51.8	224 58.3	57.0	282 01.9	56.2	190 06.3	43.5	189 32.7	14.1
	06	29 54.2	239 57.8	N13 55.9	297 02.5	N23 56.2	205 08.5	S 0 43.6	204 35.0	N 0 14.1
	07	44 56.7	254 57.4	54.8	312 03.1	56.2	220 10.6	43.8	219 37.3	14.0
WEDNESDAY	08	59 59.2	269 56.9	53.8	327 03.7	56.2	235 12.8	43.9	234 39.6	13.9
	09	75 01.6	284 56.5	·· 52.7	342 04.4	·· 56.2	250 14.9	·· 44.1	249 41.9	·· 13.8
	10	90 04.1	299 56.1	51.6	357 05.0	56.2	265 17.1	44.2	264 44.2	13.7
	11	105 06.5	314 55.6	50.5	12 05.6	56.2	280 19.2	44.4	279 46.5	13.7
	12	120 09.0	329 55.2	N13 49.5	27 06.2	N23 56.2	295 21.4	S 0 44.5	294 48.8	N 0 13.6
	13	135 11.5	344 54.7	48.4	42 06.9	56.2	310 23.5	44.7	309 51.1	13.5
	14	150 13.9	359 54.3	47.3	57 07.5	56.1	325 25.6	44.8	324 53.4	13.4
	15	165 16.4	14 53.8	·· 46.3	72 08.1	·· 56.1	340 27.8	·· 45.0	339 55.7	·· 13.3
	16	180 18.9	29 53.4	45.2	87 08.7	56.1	355 29.9	45.1	354 58.0	13.3
	17	195 21.3	44 53.0	44.1	102 09.3	56.1	10 32.1	45.3	10 00.3	13.2
	18	210 23.8	59 52.5	N13 43.0	117 10.0	N23 56.1	25 34.2	S 0 45.4	25 02.6	N 0 13.1
	19	225 26.3	74 52.1	42.0	132 10.6	56.1	40 36.4	45.5	40 04.9	13.0
	20	240 28.7	89 51.6	40.9	147 11.2	56.1	55 38.5	45.7	55 07.2	12.9
	21	255 31.2	104 51.2	·· 39.8	162 11.8	·· 56.1	70 40.6	·· 45.8	70 09.5	·· 12.9
	22	270 33.7	119 50.8	38.7	177 12.5	56.1	85 42.8	46.0	85 11.8	12.8
	23	285 36.1	134 50.3	37.7	192 13.1	56.0	100 44.9	46.1	100 14.1	12.7
23	00	300 38.6	149 49.9	N13 36.6	207 13.7	N23 56.0	115 47.1	S 0 46.3	115 16.4	N 0 12.6
	01	315 41.0	164 49.4	35.5	222 14.3	56.0	130 49.2	46.4	130 18.7	12.5
	02	330 43.5	179 49.0	34.4	237 15.0	56.0	145 51.3	46.6	145 21.0	12.5
	03	345 46.0	194 48.6	·· 33.3	252 15.6	·· 56.0	160 53.5	·· 46.7	160 23.3	·· 12.4
	04	0 48.4	209 48.1	32.3	267 16.2	56.0	175 55.6	46.9	175 25.6	12.3
	05	15 50.9	224 47.7	31.2	282 16.9	56.0	190 57.8	47.0	190 27.8	12.2
	06	30 53.4	239 47.3	N13 30.1	297 17.5	N23 55.9	205 59.9	S 0 47.2	205 30.1	N 0 12.1
	07	45 55.8	254 46.8	29.0	312 18.1	55.9	221 02.1	47.3	220 32.4	12.1
THURSDAY	08	60 58.3	269 46.4	27.9	327 18.7	55.9	236 04.2	47.5	235 34.7	12.0
	09	76 00.8	284 46.0	·· 26.8	342 19.4	·· 55.9	251 06.3	·· 47.6	250 37.0	·· 11.9
	10	91 03.2	299 45.5	25.8	357 20.0	55.9	266 08.5	47.8	265 39.3	11.8
	11	106 05.7	314 45.1	24.7	12 20.6	55.9	281 10.6	47.9	280 41.6	11.7
	12	121 08.2	329 44.7	N13 23.6	27 21.2	N23 55.8	296 12.7	S 0 48.1	295 43.9	N 0 11.7
	13	136 10.6	344 44.2	22.5	42 21.9	55.8	311 14.9	48.2	310 46.2	11.6
	14	151 13.1	359 43.8	21.4	57 22.5	55.8	326 17.0	48.4	325 48.5	11.5
	15	166 15.5	14 43.4	·· 20.3	72 23.1	·· 55.8	341 19.2	·· 48.5	340 50.8	·· 11.4
	16	181 18.0	29 42.9	19.2	87 23.7	55.8	356 21.3	48.7	355 53.1	11.3
	17	196 20.5	44 42.5	18.2	102 24.4	55.7	11 23.4	48.8	10 55.4	11.3
	18	211 22.9	59 42.1	N13 17.1	117 25.0	N23 55.7	26 25.6	S 0 49.0	25 57.7	N 0 11.2
	19	226 25.4	74 41.7	16.0	132 25.6	55.7	41 27.7	49.1	41 00.0	11.1
	20	241 27.9	89 41.2	14.9	147 26.3	55.7	56 29.9	49.3	56 02.3	11.0
	21	256 30.3	104 40.8	·· 13.8	162 26.9	·· 55.7	71 32.0	·· 49.4	71 04.6	·· 10.9
	22	271 32.8	119 40.4	12.7	177 27.5	55.6	86 34.1	49.6	86 06.9	10.8
	23	286 35.3	134 39.9	11.6	192 28.1	55.6	101 36.3	49.7	101 09.2	10.8
Mer. Pass.		h m 4 00.7	v −0.4	d 1.1	v 0.6	d 0.0	v 2.1	d 0.1	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 36.9	S40 22.6
Achernar	335 44.8	S57 19.6
Acrux	173 36.8	S63 00.0
Adhara	255 32.0	S28 56.7
Aldebaran	291 17.6	N16 28.3
Alioth	166 42.1	N56 04.0
Alkaid	153 18.1	N49 24.7
Al Na'ir	28 13.8	S47 02.9
Alnilam	276 11.3	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.5	N26 46.9
Alpheratz	358 08.5	N28 59.1
Altair	62 31.6	N 8 49.2
Ankaa	353 39.5	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.2	S68 59.8
Avior	234 28.6	S59 27.0
Bellatrix	278 58.4	N 6 20.0
Betelgeuse	271 27.9	N 7 24.2
Canopus	264 07.5	S52 41.0
Capella	281 10.8	N45 58.6
Deneb	49 47.6	N45 12.8
Denebola	182 58.6	N14 40.7
Diphda	349 20.2	S18 05.2
Dubhe	194 21.9	N61 51.4
Elnath	278 43.7	N28 35.4
Eltanin	90 57.0	N51 29.7
Enif	34 10.7	N 9 47.4
Fomalhaut	15 50.5	S29 43.1
Gacrux	172 28.3	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.5	S60 17.2
Hamal	328 28.3	N23 22.4
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.7	N74 14.3
Markab	14 02.4	N15 06.3
Menkar	314 40.6	N 4 01.0
Menkent	148 36.3	S36 16.8
Miaplacidus	221 45.7	S69 38.5
Mirfak	309 15.5	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.8	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.6
Regulus	208 09.7	N12 03.6
Rigel	281 35.7	S 8 13.3
Rigil Kent.	140 24.9	S60 45.7
Sabik	102 40.2	S15 42.1
Schedar	350 08.2	N56 25.9
Shaula	96 54.6	S37 05.5
Sirius	258 55.5	S16 41.4
Spica	158 57.0	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.1
Zuben'ubi	137 32.3	S15 57.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	210 21.1	14 00
Mars	267 19.3	10 12
Jupiter	175 16.2	16 18
Saturn	174 41.7	16 20

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
21 00	178 25.6	N20 32.0	311 46.5	11.1	S 9 29.8	11.0	57.8
01	193 25.6	31.5	326 16.6	11.1	9 18.8	11.0	57.8
02	208 25.6	31.1	340 46.7	11.1	9 07.8	11.1	57.8
03	223 25.5	·· 30.6	355 16.8	11.1	8 56.7	11.2	57.8
04	238 25.5	30.1	9 46.9	11.2	8 45.5	11.2	57.8
05	253 25.5	29.6	24 17.1	11.1	8 34.3	11.3	57.9
06	268 25.4	N20 29.1	38 47.2	11.2	S 8 23.0	11.3	57.9
07	283 25.4	28.7	53 17.4	11.2	8 11.7	11.3	57.9
08	298 25.4	28.2	67 47.6	11.2	8 00.4	11.5	57.9
09	313 25.3	·· 27.7	82 17.8	11.2	7 48.9	11.4	57.9
10	328 25.3	27.2	96 48.0	11.2	7 37.5	11.5	58.0
11	343 25.3	26.7	111 18.2	11.3	7 26.0	11.6	58.0
12	358 25.3	N20 26.2	125 48.5	11.2	S 7 14.4	11.6	58.0
13	13 25.2	25.8	140 18.7	11.2	7 02.8	11.6	58.0
14	28 25.2	25.3	154 48.9	11.3	6 51.2	11.7	58.0
15	43 25.2	·· 24.8	169 19.2	11.2	6 39.5	11.7	58.1
16	58 25.1	24.3	183 49.4	11.3	6 27.8	11.8	58.1
17	73 25.1	23.8	198 19.7	11.3	6 16.0	11.8	58.1
18	88 25.1	N20 23.3	212 50.0	11.3	S 6 04.2	11.8	58.1
19	103 25.1	22.8	227 20.3	11.3	5 52.4	11.9	58.1
20	118 25.0	22.3	241 50.6	11.2	5 40.5	11.9	58.2
21	133 25.0	·· 21.8	256 20.8	11.3	5 28.6	11.9	58.2
22	148 25.0	21.4	270 51.1	11.3	5 16.7	12.0	58.2
23	163 25.0	20.9	285 21.4	11.3	5 04.7	12.0	58.2
22 00	178 24.9	N20 20.4	299 51.7	11.3	S 4 52.7	12.1	58.2
01	193 24.9	19.9	314 22.0	11.3	4 40.6	12.1	58.2
02	208 24.9	19.4	328 52.3	11.3	4 28.5	12.1	58.3
03	223 24.8	·· 18.9	343 22.6	11.3	4 16.4	12.1	58.3
04	238 24.8	18.4	357 52.9	11.3	4 04.3	12.2	58.3
05	253 24.8	17.9	12 23.2	11.3	3 52.1	12.2	58.3
06	268 24.8	N20 17.4	26 53.5	11.3	S 3 39.9	12.2	58.3
07	283 24.7	16.9	41 23.8	11.2	3 27.7	12.2	58.4
08	298 24.7	16.4	55 54.0	11.3	3 15.5	12.3	58.4
09	313 24.7	·· 15.9	70 24.3	11.3	3 03.2	12.3	58.4
10	328 24.7	15.4	84 54.6	11.3	2 50.9	12.3	58.4
11	343 24.7	14.9	99 24.9	11.2	2 38.6	12.3	58.4
12	358 24.6	N20 14.4	113 55.1	11.3	S 2 26.3	12.4	58.4
13	13 24.6	13.9	128 25.4	11.2	2 13.9	12.4	58.5
14	28 24.6	13.4	142 55.6	11.3	2 01.5	12.3	58.5
15	43 24.6	·· 12.9	157 25.9	11.2	1 49.2	12.5	58.5
16	58 24.5	12.4	171 56.1	11.2	1 36.7	12.4	58.5
17	73 24.5	11.9	186 26.3	11.2	1 24.3	12.4	58.5
18	88 24.5	N20 11.4	200 56.5	11.2	S 1 11.9	12.5	58.5
19	103 24.5	10.9	215 26.7	11.2	0 59.4	12.4	58.6
20	118 24.4	10.4	229 56.9	11.1	0 47.0	12.5	58.6
21	133 24.4	·· 09.9	244 27.0	11.2	0 34.5	12.5	58.6
22	148 24.4	09.4	258 57.2	11.1	0 22.0	12.5	58.6
23	163 24.4	08.9	273 27.3	11.1	S 0 09.5	12.4	58.6
23 00	178 24.4	N20 08.4	287 57.4	11.1	N 0 02.9	12.5	58.6
01	193 24.3	07.9	302 27.5	11.1	0 15.4	12.6	58.7
02	208 24.3	07.4	316 57.6	11.1	0 28.0	12.5	58.7
03	223 24.3	·· 06.9	331 27.7	11.0	0 40.5	12.5	58.7
04	238 24.3	06.4	345 57.7	11.1	0 53.0	12.5	58.7
05	253 24.3	05.8	0 27.8	11.0	1 05.5	12.5	58.7
06	268 24.2	N20 05.3	14 57.8	10.9	N 1 18.0	12.5	58.7
07	283 24.2	04.8	29 27.7	11.0	1 30.5	12.5	58.8
08	298 24.2	04.3	43 57.7	10.9	1 43.0	12.5	58.8
09	313 24.2	·· 03.8	58 27.6	10.9	1 55.5	12.6	58.8
10	328 24.2	03.3	72 57.5	10.9	2 08.1	12.5	58.8
11	343 24.2	02.8	87 27.4	10.9	2 20.6	12.5	58.8
12	358 24.1	N20 02.3	101 57.3	10.8	N 2 33.1	12.4	58.8
13	13 24.1	01.7	116 27.1	10.8	2 45.5	12.5	58.9
14	28 24.1	01.2	130 56.9	10.8	2 58.0	12.5	58.9
15	43 24.1	·· 00.7	145 26.7	10.7	3 10.5	12.4	58.9
16	58 24.1	20 00.2	159 56.4	10.7	3 22.9	12.5	58.9
17	73 24.1	19 59.7	174 26.1	10.7	3 35.4	12.4	58.9
18	88 24.0	N19 59.2	188 55.8	10.7	N 3 47.8	12.4	58.9
19	103 24.0	58.7	203 25.5	10.6	4 00.2	12.5	58.9
20	118 24.0	58.1	217 55.1	10.6	4 12.7	12.3	59.0
21	133 24.0	·· 57.6	232 24.7	10.5	4 25.0	12.4	59.0
22	148 24.0	57.1	246 54.2	10.5	4 37.4	12.4	59.0
23	163 24.0	56.6	261 23.7	10.5	4 49.8	12.3	59.0
	S.D. 15.8	d 0.5	S.D. 15.8		15.9		16.0

TUESDAY

WEDNESDAY

THURSDAY

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

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

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
21	06 17	06 19	12 06	03 20	15 44	20	◑
22	06 20	06 21	12 06	04 09	16 33	21	
23	06 22	06 23	12 06	04 58	17 23	22	

	G.M.T.	ARIES	VENUS −3.4		MARS +1.8		JUPITER −1.4		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	24 00	301 37.7	149 39.5	N13 10.5	207 28.8	N23 55.6	116 38.4	S 0 49.9	116 11.5	N 0 10.7
	01	316 40.2	164 39.1	09.4	222 29.4	55.6	131 40.5	50.0	131 13.8	10.6
	02	331 42.6	179 38.7	08.3	237 30.0	55.6	146 42.7	50.2	146 16.1	10.5
	03	346 45.1	194 38.2	·· 07.2	252 30.6	·· 55.5	161 44.8	·· 50.3	161 18.4	·· 10.4
	04	1 47.6	209 37.8	06.1	267 31.3	55.5	176 47.0	50.5	176 20.7	10.4
	05	16 50.0	224 37.4	05.0	282 31.9	55.5	191 49.1	50.6	191 23.0	10.3
	06	31 52.5	239 37.0	N13 04.0	297 32.5	N23 55.5	206 51.2	S 0 50.8	206 25.3	N 0 10.2
	07	46 55.0	254 36.6	02.9	312 33.2	55.4	221 53.4	50.9	221 27.5	10.1
	08	61 57.4	269 36.1	01.8	327 33.8	55.4	236 55.5	51.1	236 29.8	10.0
F	09	76 59.9	284 35.7	13 00.7	342 34.4	·· 55.4	251 57.6	·· 51.2	251 32.1	·· 10.0
R	10	92 02.4	299 35.3	12 59.6	357 35.0	55.4	266 59.8	51.4	266 34.4	09.9
I	11	107 04.8	314 34.9	58.5	12 35.7	55.3	282 01.9	51.5	281 36.7	09.8
D	12	122 07.3	329 34.4	N12 57.4	27 36.3	N23 55.3	297 04.0	S 0 51.7	296 39.0	N 0 09.7
A	13	137 09.8	344 34.0	56.3	42 36.9	55.3	312 06.2	51.8	311 41.3	09.6
Y	14	152 12.2	359 33.6	55.2	57 37.6	55.3	327 08.3	52.0	326 43.6	09.5
	15	167 14.7	14 33.2	·· 54.1	72 38.2	·· 55.2	342 10.4	·· 52.1	341 45.9	·· 09.5
	16	182 17.1	29 32.8	53.0	87 38.8	55.2	357 12.6	52.3	356 48.2	09.4
	17	197 19.6	44 32.4	51.9	102 39.5	55.2	12 14.7	52.4	11 50.5	09.3
	18	212 22.1	59 31.9	N12 50.8	117 40.1	N23 55.2	27 16.8	S 0 52.6	26 52.8	N 0 09.2
	19	227 24.5	74 31.5	49.7	132 40.7	55.1	42 19.0	52.7	41 55.1	09.1
	20	242 27.0	89 31.1	48.5	147 41.3	55.1	57 21.1	52.9	56 57.4	09.0
	21	257 29.5	104 30.7	·· 47.4	162 42.0	·· 55.1	72 23.2	·· 53.0	71 59.7	·· 09.0
	22	272 31.9	119 30.3	46.3	177 42.6	55.0	87 25.4	53.2	87 01.9	08.9
	23	287 34.4	134 29.9	45.2	192 43.2	55.0	102 27.5	53.3	102 04.2	08.8
	25 00	302 36.9	149 29.4	N12 44.1	207 43.9	N23 55.0	117 29.6	S 0 53.5	117 06.5	N 0 08.7
	01	317 39.3	164 29.0	43.0	222 44.5	54.9	132 31.8	53.6	132 08.8	08.6
	02	332 41.8	179 28.6	41.9	237 45.1	54.9	147 33.9	53.8	147 11.1	08.6
	03	347 44.3	194 28.2	·· 40.8	252 45.8	·· 54.9	162 36.0	·· 53.9	162 13.4	·· 08.5
	04	2 46.7	209 27.8	39.7	267 46.4	54.9	177 38.2	54.1	177 15.7	08.4
	05	17 49.2	224 27.4	38.6	282 47.0	54.8	192 40.3	54.2	192 18.0	08.3
	06	32 51.6	239 27.0	N12 37.5	297 47.6	N23 54.8	207 42.4	S 0 54.4	207 20.3	N 0 08.2
	07	47 54.1	254 26.6	36.4	312 48.3	54.8	222 44.6	54.5	222 22.6	08.1
S	08	62 56.6	269 26.2	35.3	327 48.9	54.7	237 46.7	54.7	237 24.9	08.1
A	09	77 59.0	284 25.7	·· 34.1	342 49.5	·· 54.7	252 48.8	·· 54.8	252 27.2	·· 08.0
T	10	93 01.5	299 25.3	33.0	357 50.2	54.7	267 51.0	55.0	267 29.5	07.9
U	11	108 04.0	314 24.9	31.9	12 50.8	54.6	282 53.1	55.1	282 31.7	07.8
R	12	123 06.4	329 24.5	N12 30.8	27 51.4	N23 54.6	297 55.2	S 0 55.3	297 34.0	N 0 07.7
D	13	138 08.9	344 24.1	29.7	42 52.1	54.6	312 57.4	55.4	312 36.3	07.6
A	14	153 11.4	359 23.7	28.6	57 52.7	54.5	327 59.5	55.6	327 38.6	07.6
Y	15	168 13.8	14 23.3	·· 27.5	72 53.3	·· 54.5	343 01.6	·· 55.7	342 40.9	·· 07.5
	16	183 16.3	29 22.9	26.4	87 54.0	54.4	358 03.7	55.9	357 43.2	07.4
	17	198 18.7	44 22.5	25.2	102 54.6	54.4	13 05.9	56.0	12 45.5	07.3
	18	213 21.2	59 22.1	N12 24.1	117 55.2	N23 54.4	28 08.0	S 0 56.2	27 47.8	N 0 07.2
	19	228 23.7	74 21.7	23.0	132 55.9	54.3	43 10.1	56.3	42 50.1	07.1
	20	243 26.1	89 21.3	21.9	147 56.5	54.3	58 12.3	56.5	57 52.4	07.1
	21	258 28.6	104 20.9	·· 20.8	162 57.1	·· 54.3	73 14.4	·· 56.7	72 54.6	·· 07.0
	22	273 31.1	119 20.5	19.7	177 57.8	54.2	88 16.5	56.8	87 56.9	06.9
	23	288 33.5	134 20.1	18.5	192 58.4	54.2	103 18.7	57.0	102 59.2	06.8
	26 00	303 36.0	149 19.7	N12 17.4	207 59.0	N23 54.2	118 20.8	S 0 57.1	118 01.5	N 0 06.7
	01	318 38.5	164 19.2	16.3	222 59.7	54.1	133 22.9	57.3	133 03.8	06.6
	02	333 40.9	179 18.8	15.2	238 00.3	54.1	148 25.0	57.4	148 06.1	06.6
	03	348 43.4	194 18.4	·· 14.1	253 00.9	·· 54.0	163 27.2	·· 57.6	163 08.4	·· 06.5
	04	3 45.9	209 18.0	12.9	268 01.6	54.0	178 29.3	57.7	178 10.7	06.4
	05	18 48.3	224 17.6	11.8	283 02.2	54.0	193 31.4	57.9	193 13.0	06.3
	06	33 50.8	239 17.2	N12 10.7	298 02.8	N23 53.9	208 33.5	S 0 58.0	208 15.2	N 0 06.2
	07	48 53.2	254 16.8	09.6	313 03.5	53.9	223 35.7	58.2	223 17.5	06.1
	08	63 55.7	269 16.4	08.4	328 04.1	53.8	238 37.8	58.3	238 19.8	06.1
S	09	78 58.2	284 16.0	·· 07.3	343 04.7	·· 53.8	253 39.9	·· 58.5	253 22.1	·· 06.0
U	10	94 00.6	299 15.6	06.2	358 05.4	53.7	268 42.1	58.6	268 24.4	05.9
N	11	109 03.1	314 15.3	05.1	13 06.0	53.7	283 44.2	58.8	283 26.7	05.8
D	12	124 05.6	329 14.9	N12 03.9	28 06.6	N23 53.7	298 46.3	S 0 59.0	298 29.0	N 0 05.7
A	13	139 08.0	344 14.5	02.8	43 07.3	53.6	313 48.4	59.1	313 31.3	05.6
Y	14	154 10.5	359 14.1	01.7	58 07.9	53.6	328 50.6	59.3	328 33.6	05.6
	15	169 13.0	14 13.7	12 00.6	73 08.5	·· 53.5	343 52.7	·· 59.4	343 35.8	·· 05.5
	16	184 15.4	29 13.3	11 59.4	88 09.2	53.5	358 54.8	59.6	358 38.1	05.4
	17	199 17.9	44 12.9	58.3	103 09.8	53.4	13 56.9	59.7	13 40.4	05.3
	18	214 20.4	59 12.5	N11 57.2	118 10.4	N23 53.4	28 59.1	S 0 59.9	28 42.7	N 0 05.2
	19	229 22.8	74 12.1	56.0	133 11.1	53.4	44 01.2	1 00.0	43 45.0	05.1
	20	244 25.3	89 11.7	54.9	148 11.7	53.3	59 03.3	00.2	58 47.3	05.0
	21	259 27.7	104 11.3	·· 53.8	163 12.3	·· 53.3	74 05.4	·· 00.3	73 49.6	·· 05.0
	22	274 30.2	119 10.9	52.6	178 13.0	53.2	89 07.6	00.5	88 51.9	04.9
	23	289 32.7	134 10.5	51.5	193 13.6	53.2	104 09.7	00.6	103 54.1	04.8
	Mer. Pass.	h m 3 48.9	v −0.4	d 1.1	v 0.6	d 0.0	v 2.1	d 0.2	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 36.9	S40 22.5
Achernar	335 44.8	S57 19.6
Acrux	173 36.9	S63 00.0
Adhara	255 32.0	S28 56.7
Aldebaran	291 17.5	N16 28.3
Alioth	166 42.2	N56 04.0
Alkaid	153 18.1	N49 24.7
Al Na'ir	28 13.8	S47 02.9
Alnilam	276 11.3	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.5	N26 46.9
Alpheratz	358 08.5	N28 59.2
Altair	62 31.6	N 8 49.2
Ankaa	353 39.5	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.2	S68 59.8
Avior	234 28.6	S59 27.0
Bellatrix	278 58.4	N 6 20.0
Betelgeuse	271 27.9	N 7 24.2
Canopus	264 07.4	S52 41.0
Capella	281 10.8	N45 58.6
Deneb	49 47.6	N45 12.9
Denebola	182 58.6	N14 40.7
Diphda	349 20.2	S18 05.2
Dubhe	194 21.9	N61 51.4
Elnath	278 43.7	N28 35.4
Eltanin	90 57.0	N51 29.7
Enif	34 10.7	N 9 47.4
Fomalhaut	15 50.5	S29 43.1
Gacrux	172 28.3	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.5	S60 17.2
Hamal	328 28.3	N23 22.4
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.8	N74 14.3
Markab	14 02.3	N15 06.3
Menkar	314 40.6	N 4 01.0
Menkent	148 36.3	S36 16.8
Miaplacidus	221 45.7	S69 38.5
Mirfak	309 15.4	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.9	S56 47.6
Pollux	243 57.8	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.6
Regulus	208 09.7	N12 03.6
Rigel	281 35.7	S 8 13.3
Rigil Kent.	140 24.9	S60 45.7
Sabik	102 40.2	S15 42.1
Schedar	350 08.1	N56 25.9
Shaula	96 54.6	S37 05.5
Sirius	258 55.5	S16 41.4
Spica	158 57.0	S11 03.8
Suhail	223 10.8	S43 21.5
Vega	80 55.0	N38 46.2
Zuben'ubi	137 32.3	S15 57.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	206 52.6	14 02
Mars	265 07.0	10 09
Jupiter	174 52.8	16 08
Saturn	174 29.7	16 09

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
24 00	178 23.9	N19 56.1	275 53.2	10.5	N 5 02.1	12.3	59.0
01	193 23.9	55.5	290 22.7	10.4	5 14.4	12.3	59.0
02	208 23.9	55.0	304 52.1	10.3	5 26.7	12.2	59.0
03	223 23.9	54.5	319 21.4	10.4	5 38.9	12.3	59.1
04	238 23.9	54.0	333 50.8	10.3	5 51.2	12.2	59.1
05	253 23.9	53.4	348 20.1	10.2	6 03.4	12.1	59.1
06	268 23.9	N19 52.9	2 49.3	10.2	N 6 15.5	12.2	59.1
07	283 23.8	52.4	17 18.5	10.2	6 27.7	12.1	59.1
08	298 23.8	51.9	31 47.7	10.1	6 39.8	12.1	59.1
F 09	313 23.8	51.3	46 16.8	10.1	6 51.9	12.1	59.1
R 10	328 23.8	50.8	60 45.9	10.0	7 04.0	12.0	59.2
I 11	343 23.8	50.3	75 14.9	10.0	7 16.0	12.0	59.2
D 12	358 23.8	N19 49.8	89 43.9	9.9	N 7 28.0	11.9	59.2
A 13	13 23.8	49.2	104 12.8	9.9	7 39.9	11.9	59.2
Y 14	28 23.8	48.7	118 41.7	9.9	7 51.8	11.9	59.2
15	43 23.8	48.2	133 10.6	9.8	8 03.7	11.8	59.2
16	58 23.7	47.7	147 39.4	9.7	8 15.5	11.8	59.2
17	73 23.7	47.1	162 08.1	9.7	8 27.3	11.8	59.3
18	88 23.7	N19 46.6	176 36.8	9.7	N 8 39.1	11.7	59.3
19	103 23.7	46.1	191 05.5	9.6	8 50.8	11.6	59.3
20	118 23.7	45.5	205 34.1	9.6	9 02.4	11.6	59.3
21	133 23.7	45.0	220 02.7	9.5	9 14.0	11.6	59.3
22	148 23.7	44.5	234 31.2	9.4	9 25.6	11.5	59.3
23	163 23.7	43.9	248 59.6	9.4	9 37.1	11.5	59.3
25 00	178 23.7	N19 43.4	263 28.0	9.4	N 9 48.6	11.4	59.3
01	193 23.7	42.9	277 56.4	9.2	10 00.0	11.3	59.3
02	208 23.6	42.3	292 24.6	9.3	10 11.3	11.3	59.4
03	223 23.6	41.8	306 52.9	9.2	10 22.6	11.3	59.4
04	238 23.6	41.3	321 21.1	9.1	10 33.9	11.2	59.4
05	253 23.6	40.7	335 49.2	9.1	10 45.1	11.1	59.4
06	268 23.6	N19 40.2	350 17.3	9.0	N10 56.2	11.1	59.4
07	283 23.6	39.6	4 45.3	8.9	11 07.3	11.0	59.4
S 08	298 23.6	39.1	19 13.2	8.9	11 18.3	10.9	59.4
A 09	313 23.6	38.6	33 41.1	8.9	11 29.2	10.9	59.4
T 10	328 23.6	38.0	48 09.0	8.8	11 40.1	10.8	59.4
U 11	343 23.6	37.5	62 36.8	8.7	11 50.9	10.8	59.5
R 12	358 23.6	N19 36.9	77 04.5	8.6	N12 01.7	10.6	59.5
D 13	13 23.6	36.4	91 32.1	8.7	12 12.3	10.7	59.5
A 14	28 23.6	35.9	105 59.8	8.5	12 23.0	10.5	59.5
Y 15	43 23.6	35.3	120 27.3	8.5	12 33.5	10.5	59.5
16	58 23.6	34.8	134 54.8	8.4	12 44.0	10.4	59.5
17	73 23.6	34.2	149 22.2	8.4	12 54.4	10.3	59.5
18	88 23.5	N19 33.7	163 49.6	8.3	N13 04.7	10.2	59.5
19	103 23.5	33.1	178 16.9	8.2	13 14.9	10.2	59.5
20	118 23.5	32.6	192 44.1	8.2	13 25.1	10.1	59.5
21	133 23.5	32.1	207 11.3	8.1	13 35.2	10.0	59.5
22	148 23.5	31.5	221 38.4	8.1	13 45.2	9.9	59.6
23	163 23.5	31.0	236 05.5	8.0	13 55.1	9.9	59.6
26 00	178 23.5	N19 30.4	250 32.5	7.9	N14 05.0	9.8	59.6
01	193 23.5	29.9	264 59.4	7.9	14 14.8	9.6	59.6
02	208 23.5	29.3	279 26.3	7.8	14 24.4	9.6	59.6
03	223 23.5	28.8	293 53.1	7.8	14 34.0	9.6	59.6
04	238 23.5	28.2	308 19.9	7.7	14 43.6	9.4	59.6
05	253 23.5	27.7	322 46.6	7.6	14 53.0	9.3	59.6
06	268 23.5	N19 27.1	337 13.2	7.6	N15 02.3	9.2	59.6
07	283 23.5	26.6	351 39.8	7.5	15 11.5	9.2	59.6
08	298 23.5	26.0	6 06.3	7.4	15 20.7	9.0	59.6
S 09	313 23.5	25.5	20 32.7	7.4	15 29.7	9.0	59.6
U 10	328 23.5	24.9	34 59.1	7.3	15 38.7	8.9	59.6
N 11	343 23.5	24.3	49 25.4	7.3	15 47.6	8.7	59.6
D 12	358 23.5	N19 23.8	63 51.7	7.2	N15 56.3	8.7	59.6
A 13	13 23.5	23.2	78 17.9	7.1	16 05.0	8.5	59.7
Y 14	28 23.5	22.7	92 44.0	7.1	16 13.5	8.5	59.7
15	43 23.5	22.1	107 10.1	7.0	16 22.0	8.4	59.7
16	58 23.5	21.6	121 36.1	7.0	16 30.4	8.2	59.7
17	73 23.5	21.0	136 02.1	6.9	16 38.6	8.2	59.7
18	88 23.5	N19 20.5	150 28.0	6.8	N16 46.8	8.0	59.7
19	103 23.5	19.9	164 53.8	6.8	16 54.8	8.0	59.7
20	118 23.5	19.3	179 19.6	6.8	17 02.8	7.8	59.7
21	133 23.5	18.8	193 45.4	6.6	17 10.6	7.7	59.7
22	148 23.5	18.2	208 11.0	6.6	17 18.3	7.6	59.7
23	163 23.5	17.7	222 36.6	6.6	17 25.9	7.5	59.7
	S.D. 15.8	d 0.5	S.D. 16.1		16.2		16.3

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
24	06 24	06 25	12 06	05 48	18 14	23	◑
25	06 25	06 26	12 06	06 40	19 07	24	
26	06 26	06 26	12 06	07 35	20 03	25	

G.M.T.		ARIES	VENUS −3.4		MARS +1.8		JUPITER −1.4		SATURN +1.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27	00	304 35.1	149 10.1	N11 50.4	208 14.3	N23 53.1	119 11.8	S 1 00.8	118 56.4	N 0 04.7
	01	319 37.6	164 09.7	49.3	223 14.9	53.1	134 13.9	01.0	133 58.7	04.6
	02	334 40.1	179 09.3	48.1	238 15.5	53.0	149 16.1	01.1	149 01.0	04.5
	03	349 42.5	194 09.0	·· 47.0	253 16.2	·· 53.0	164 18.2	·· 01.3	164 03.3	·· 04.5
	04	4 45.0	209 08.6	45.9	268 16.8	52.9	179 20.3	01.4	179 05.6	04.4
	05	19 47.5	224 08.2	44.7	283 17.4	52.9	194 22.4	01.6	194 07.9	04.3
	06	34 49.9	239 07.8	N11 43.6	298 18.1	N23 52.8	209 24.6	S 1 01.7	209 10.1	N 0 04.2
	07	49 52.4	254 07.4	42.4	313 18.7	52.8	224 26.7	01.9	224 12.4	04.1
	08	64 54.9	269 07.0	41.3	328 19.3	52.7	239 28.8	02.0	239 14.7	04.0
MONDAY	09	79 57.3	284 06.6	·· 40.2	343 20.0	·· 52.7	254 30.9	·· 02.2	254 17.0	·· 03.9
	10	94 59.8	299 06.2	39.0	358 20.6	52.6	269 33.1	02.3	269 19.3	03.9
	11	110 02.2	314 05.8	37.9	13 21.3	52.6	284 35.2	02.5	284 21.6	03.8
	12	125 04.7	329 05.5	N11 36.8	28 21.9	N23 52.5	299 37.3	S 1 02.7	299 23.9	N 0 03.7
	13	140 07.2	344 05.1	35.6	43 22.5	52.5	314 39.4	02.8	314 26.1	03.6
	14	155 09.6	359 04.7	34.5	58 23.2	52.4	329 41.5	03.0	329 28.4	03.5
	15	170 12.1	14 04.3	·· 33.3	73 23.8	·· 52.4	344 43.7	·· 03.1	344 30.7	·· 03.4
	16	185 14.6	29 03.9	32.2	88 24.4	52.3	359 45.8	03.3	359 33.0	03.3
	17	200 17.0	44 03.5	31.1	103 25.1	52.3	14 47.9	03.4	14 35.3	03.3
	18	215 19.5	59 03.2	N11 29.9	118 25.7	N23 52.2	29 50.0	S 1 03.6	29 37.6	N 0 03.2
	19	230 22.0	74 02.8	28.8	133 26.4	52.2	44 52.2	03.7	44 39.9	03.1
	20	245 24.4	89 02.4	27.6	148 27.0	52.1	59 54.3	03.9	59 42.1	03.0
	21	260 26.9	104 02.0	·· 26.5	163 27.6	·· 52.1	74 56.4	·· 04.1	74 44.4	·· 02.9
	22	275 29.3	119 01.6	25.3	178 28.3	52.0	89 58.5	04.2	89 46.7	02.8
	23	290 31.8	134 01.2	24.2	193 28.9	51.9	105 00.6	04.4	104 49.0	02.7
28	00	305 34.3	149 00.9	N11 23.1	208 29.6	N23 51.9	120 02.8	S 1 04.5	119 51.3	N 0 02.7
	01	320 36.7	164 00.5	21.9	223 30.2	51.8	135 04.9	04.7	134 53.6	02.6
	02	335 39.2	179 00.1	20.8	238 30.8	51.8	150 07.0	04.8	149 55.8	02.5
	03	350 41.7	193 59.7	·· 19.6	253 31.5	·· 51.7	165 09.1	·· 05.0	164 58.1	·· 02.4
	04	5 44.1	208 59.3	18.5	268 32.1	51.7	180 11.2	05.2	180 00.4	02.3
	05	20 46.6	223 59.0	17.3	283 32.8	51.6	195 13.4	05.3	195 02.7	02.2
	06	35 49.1	238 58.6	N11 16.2	298 33.4	N23 51.6	210 15.5	S 1 05.5	210 05.0	N 0 02.1
	07	50 51.5	253 58.2	15.0	313 34.0	51.5	225 17.6	05.6	225 07.3	02.1
	08	65 54.0	268 57.8	13.9	328 34.7	51.4	240 19.7	05.8	240 09.5	02.0
TUESDAY	09	80 56.5	283 57.5	·· 12.7	343 35.3	·· 51.4	255 21.8	·· 05.9	255 11.8	·· 01.9
	10	95 58.9	298 57.1	11.6	358 36.0	51.3	270 24.0	06.1	270 14.1	01.8
	11	111 01.4	313 56.7	10.4	13 36.6	51.3	285 26.1	06.2	285 16.4	01.7
	12	126 03.8	328 56.3	N11 09.3	28 37.2	N23 51.2	300 28.2	S 1 06.4	300 18.7	N 0 01.6
	13	141 06.3	343 56.0	08.1	43 37.9	51.1	315 30.3	06.6	315 21.0	01.5
	14	156 08.8	358 55.6	07.0	58 38.5	51.1	330 32.4	06.7	330 23.2	01.5
	15	171 11.2	13 55.2	·· 05.8	73 39.2	·· 51.0	345 34.5	·· 06.9	345 25.5	·· 01.4
	16	186 13.7	28 54.8	04.7	88 39.8	51.0	0 36.7	07.0	0 27.8	01.3
	17	201 16.2	43 54.5	03.5	103 40.4	50.9	15 38.8	07.2	15 30.1	01.2
	18	216 18.6	58 54.1	N11 02.4	118 41.1	N23 50.8	30 40.9	S 1 07.3	30 32.4	N 0 01.1
	19	231 21.1	73 53.7	01.2	133 41.7	50.8	45 43.0	07.5	45 34.6	01.0
	20	246 23.6	88 53.3	11 00.1	148 42.4	50.7	60 45.1	07.7	60 36.9	00.9
	21	261 26.0	103 53.0	10 58.9	163 43.0	·· 50.6	75 47.3	·· 07.8	75 39.2	·· 00.9
	22	276 28.5	118 52.6	57.8	178 43.6	50.6	90 49.4	08.0	90 41.5	00.8
	23	291 31.0	133 52.2	56.6	193 44.3	50.5	105 51.5	08.1	105 43.8	00.7
29	00	306 33.4	148 51.9	N10 55.4	208 44.9	N23 50.5	120 53.6	S 1 08.3	120 46.1	N 0 00.6
	01	321 35.9	163 51.5	54.3	223 45.6	50.4	135 55.7	08.5	135 48.3	00.5
	02	336 38.3	178 51.1	53.1	238 46.2	50.3	150 57.8	08.6	150 50.6	00.4
	03	351 40.8	193 50.8	·· 52.0	253 46.9	·· 50.3	165 59.9	·· 08.8	165 52.9	·· 00.3
	04	6 43.3	208 50.4	50.8	268 47.5	50.2	181 02.1	08.9	180 55.2	00.2
	05	21 45.7	223 50.0	49.7	283 48.1	50.1	196 04.2	09.1	195 57.5	00.2
	06	36 48.2	238 49.7	N10 48.5	298 48.8	N23 50.1	211 06.3	S 1 09.2	210 59.7	N 0 00.1
	07	51 50.7	253 49.3	47.3	313 49.4	50.0	226 08.4	09.4	226 02.0	0 00.0
	08	66 53.1	268 48.9	46.2	328 50.1	49.9	241 10.5	09.6	241 04.3	S 0 00.1
WEDNESDAY	09	81 55.6	283 48.6	·· 45.0	343 50.7	·· 49.9	256 12.6	·· 09.7	256 06.6	·· 00.2
	10	96 58.1	298 48.2	43.9	358 51.4	49.8	271 14.8	09.9	271 08.9	00.3
	11	112 00.5	313 47.8	42.7	13 52.0	49.7	286 16.9	10.0	286 11.1	00.4
	12	127 03.0	328 47.5	N10 41.5	28 52.6	N23 49.7	301 19.0	S 1 10.2	301 13.4	S 0 00.5
	13	142 05.4	343 47.1	40.4	43 53.3	49.6	316 21.1	10.3	316 15.7	00.5
	14	157 07.9	358 46.7	39.2	58 53.9	49.5	331 23.2	10.5	331 18.0	00.6
	15	172 10.4	13 46.4	·· 38.1	73 54.6	·· 49.5	346 25.3	·· 10.7	346 20.3	·· 00.7
	16	187 12.8	28 46.0	36.9	88 55.2	49.4	1 27.4	10.8	1 22.5	00.8
	17	202 15.3	43 45.6	35.7	103 55.9	49.3	16 29.6	11.0	16 24.8	00.9
	18	217 17.8	58 45.3	N10 34.6	118 56.5	N23 49.3	31 31.7	S 1 11.1	31 27.1	S 0 01.0
	19	232 20.2	73 44.9	33.4	133 57.1	49.2	46 33.8	11.3	46 29.4	01.1
	20	247 22.7	88 44.6	32.2	148 57.8	49.1	61 35.9	11.5	61 31.7	01.2
	21	262 25.2	103 44.2	·· 31.1	163 58.4	·· 49.0	76 38.0	·· 11.6	76 33.9	·· 01.2
	22	277 27.6	118 43.8	29.9	178 59.1	49.0	91 40.1	11.8	91 36.2	01.3
	23	292 30.1	133 43.5	28.7	193 59.7	48.9	106 42.2	11.9	106 38.5	01.4
Mer. Pass.		h m 3 37.1	v −0.4	d 1.2	v 0.6	d 0.1	v 2.1	d 0.2	v 2.3	d 0.1

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 36.9	S40 22.5
Achernar	335 44.7	S57 19.6
Acrux	173 36.9	S63 00.0
Adhara	255 32.0	S28 56.7
Aldebaran	291 17.5	N16 28.3
Alioth	166 42.2	N56 04.0
Alkaid	153 18.1	N49 24.7
Al Na'ir	28 13.8	S47 02.9
Alnilam	276 11.3	S 1 12.8
Alphard	218 20.3	S 8 34.6
Alphecca	126 31.5	N26 46.9
Alpheratz	358 08.5	N28 59.2
Altair	62 31.6	N 8 49.2
Ankaa	353 39.4	S42 24.2
Antares	112 55.9	S26 23.5
Arcturus	146 17.9	N19 17.0
Atria	108 19.3	S68 59.8
Avior	234 28.6	S59 27.0
Bellatrix	278 58.4	N 6 20.0
Betelgeuse	271 27.9	N 7 24.2
Canopus	264 07.4	S52 41.0
Capella	281 10.8	N45 58.6
Deneb	49 47.6	N45 12.9
Denebola	182 58.6	N14 40.7
Diphda	349 20.1	S18 05.2
Dubhe	194 21.9	N61 51.3
Elnath	278 43.7	N28 35.4
Eltanin	90 57.0	N51 29.7
Enif	34 10.7	N 9 47.4
Fomalhaut	15 50.5	S29 43.1
Gacrux	172 28.3	S57 00.7
Gienah	176 17.5	S17 26.3
Hadar	149 22.5	S60 17.2
Hamal	328 28.2	N23 22.4
Kaus Aust.	84 15.7	S34 23.6
Kochab	137 18.8	N74 14.3
Markab	14 02.3	N15 06.3
Menkar	314 40.6	N 4 01.0
Menkent	148 36.3	S36 16.8
Miaplacidus	221 45.7	S69 38.5
Mirfak	309 15.4	N49 47.5
Nunki	76 28.1	S26 19.2
Peacock	53 56.8	S56 47.6
Pollux	243 57.8	N28 04.3
Procyon	245 25.5	N 5 16.4
Rasalhague	96 28.8	N12 34.6
Regulus	208 09.7	N12 03.6
Rigel	281 35.7	S 8 13.3
Rigil Kent.	140 24.9	S60 45.7
Sabik	102 40.2	S15 42.1
Schedar	350 08.1	N56 25.9
Shaula	96 54.6	S37 05.5
Sirius	258 55.5	S16 41.4
Spica	158 57.0	S11 03.8
Suhail	223 10.8	S43 21.4
Vega	80 55.0	N38 46.2
Zuben'ubi	137 32.3	S15 57.8

	S.H.A. ° ′	Mer. Pass. h m
Venus	203 26.6	14 04
Mars	262 55.3	10 06
Jupiter	174 28.5	15 58
Saturn	174 17.0	15 58

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
27	00	178 23.5	N19 17.1	237 02.2	6.5	N17 33.4	7.4	59.7
	01	193 23.5	16.5	251 27.7	6.4	17 40.8	7.3	59.7
	02	208 23.5	16.0	265 53.1	6.4	17 48.1	7.1	59.7
	03	223 23.5	15.4	280 18.5	6.3	17 55.2	7.1	59.7
	04	238 23.6	14.8	294 43.8	6.3	18 02.3	6.9	59.7
	05	253 23.6	14.3	309 09.1	6.3	18 09.2	6.8	59.7
	06	268 23.6	N19 13.7	323 34.4	6.1	N18 16.0	6.7	59.7
	07	283 23.6	13.2	337 59.5	6.2	18 22.7	6.5	59.7
	08	298 23.6	12.6	352 24.7	6.0	18 29.2	6.5	59.7
MONDAY	09	313 23.6	12.0	6 49.7	6.1	18 35.7	6.3	59.7
	10	328 23.6	11.5	21 14.8	5.9	18 42.0	6.2	59.7
	11	343 23.6	10.9	35 39.7	6.0	18 48.2	6.1	59.7
	12	358 23.6	N19 10.3	50 04.7	5.8	N18 54.3	5.9	59.7
	13	13 23.6	09.8	64 29.5	5.9	19 00.2	5.8	59.7
	14	28 23.6	09.2	78 54.4	5.8	19 06.0	5.7	59.7
	15	43 23.6	08.6	93 19.2	5.7	19 11.7	5.6	59.7
	16	58 23.6	08.0	107 43.9	5.7	19 17.3	5.4	59.7
	17	73 23.6	07.5	122 08.6	5.7	19 22.7	5.3	59.7
	18	88 23.6	N19 06.9	136 33.3	5.6	N19 28.0	5.2	59.7
	19	103 23.6	06.3	150 57.9	5.6	19 33.2	5.0	59.7
	20	118 23.7	05.8	165 22.5	5.5	19 38.2	4.9	59.7
	21	133 23.7	05.2	179 47.0	5.6	19 43.1	4.8	59.7
	22	148 23.7	04.6	194 11.6	5.4	19 47.9	4.6	59.7
	23	163 23.7	04.0	208 36.0	5.5	19 52.5	4.6	59.7
28	00	178 23.7	N19 03.5	223 00.5	5.4	N19 57.1	4.3	59.7
	01	193 23.7	02.9	237 24.9	5.4	20 01.4	4.3	59.7
	02	208 23.7	02.3	251 49.3	5.3	20 05.7	4.1	59.7
	03	223 23.7	01.7	266 13.6	5.3	20 09.8	3.9	59.7
	04	238 23.7	01.2	280 37.9	5.3	20 13.7	3.8	59.7
	05	253 23.7	00.6	295 02.2	5.3	20 17.5	3.7	59.7
	06	268 23.8	N19 00.0	309 26.5	5.2	N20 21.2	3.6	59.6
	07	283 23.8	18 59.4	323 50.7	5.2	20 24.8	3.4	59.6
	08	298 23.8	58.9	338 14.9	5.2	20 28.2	3.3	59.6
TUESDAY	09	313 23.8	58.3	352 39.1	5.2	20 31.5	3.1	59.6
	10	328 23.8	57.7	7 03.3	5.1	20 34.6	3.0	59.6
	11	343 23.8	57.1	21 27.4	5.1	20 37.6	2.8	59.6
	12	358 23.8	N18 56.5	35 51.5	5.2	N20 40.4	2.7	59.6
	13	13 23.8	56.0	50 15.7	5.1	20 43.1	2.6	59.6
	14	28 23.9	55.4	64 39.8	5.0	20 45.7	2.4	59.6
	15	43 23.9	54.8	79 03.8	5.1	20 48.1	2.3	59.6
	16	58 23.9	54.2	93 27.9	5.1	20 50.4	2.1	59.6
	17	73 23.9	53.6	107 52.0	5.0	20 52.5	2.0	59.6
	18	88 23.9	N18 53.0	122 16.0	5.1	N20 54.5	1.8	59.6
	19	103 23.9	52.5	136 40.1	5.0	20 56.3	1.7	59.5
	20	118 23.9	51.9	151 04.1	5.1	20 58.0	1.6	59.5
	21	133 23.9	51.3	165 28.2	5.0	20 59.6	1.4	59.5
	22	148 24.0	50.7	179 52.2	5.1	21 01.0	1.3	59.5
	23	163 24.0	50.1	194 16.3	5.0	21 02.3	1.1	59.5
29	00	178 24.0	N18 49.5	208 40.3	5.0	N21 03.4	1.0	59.5
	01	193 24.0	48.9	223 04.3	5.1	21 04.4	0.8	59.5
	02	208 24.0	48.3	237 28.4	5.1	21 05.2	0.7	59.5
	03	223 24.0	47.8	251 52.5	5.0	21 05.9	0.5	59.5
	04	238 24.1	47.2	266 16.5	5.1	21 06.4	0.4	59.4
	05	253 24.1	46.6	280 40.6	5.1	21 06.8	0.3	59.4
	06	268 24.1	N18 46.0	295 04.7	5.1	N21 07.1	0.1	59.4
	07	283 24.1	45.4	309 28.8	5.1	21 07.2	0.0	59.4
WEDNESDAY	08	298 24.1	44.8	323 52.9	5.1	21 07.2	0.2	59.4
	09	313 24.1	44.2	338 17.0	5.2	21 07.0	0.3	59.4
	10	328 24.2	43.6	352 41.2	5.1	21 06.7	0.5	59.4
	11	343 24.2	43.0	7 05.3	5.2	21 06.2	0.6	59.4
	12	358 24.2	N18 42.4	21 29.5	5.2	N21 05.6	0.7	59.3
	13	13 24.2	41.8	35 53.7	5.2	21 04.9	0.9	59.3
	14	28 24.2	41.2	50 17.9	5.3	21 04.0	1.0	59.3
	15	43 24.3	40.7	64 42.2	5.3	21 03.0	1.2	59.3
	16	58 24.3	40.1	79 06.5	5.3	21 01.8	1.3	59.3
	17	73 24.3	39.5	93 30.8	5.4	21 00.5	1.5	59.3
	18	88 24.3	N18 38.9	107 55.2	5.3	N20 59.0	1.6	59.2
	19	103 24.3	38.3	122 19.5	5.4	20 57.4	1.7	59.2
	20	118 24.4	37.7	136 43.9	5.5	20 55.7	1.9	59.2
	21	133 24.4	37.1	151 08.4	5.5	20 53.8	2.0	59.2
	22	148 24.4	36.5	165 32.9	5.5	20 51.8	2.1	59.2
	23	163 24.4	35.9	179 57.4	5.6	20 49.7	2.3	59.2
		S.D. 15.8	d 0.6	S.D. 16.3		16.2		16.2

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	06 26	06 26	12 06	08 32	21 01	26	
28	06 25	06 25	12 06	09 31	22 01	27	◐
29	06 24	06 23	12 06	10 30	23 00	28	