A2 ALTITUDE CORRECTION TABLES 10°-90°—SUN, STARS, PLANETS

SUN

OCT.—MAR. App. Alt.	Lower Limb	Upper Limb	APR.—SEPT. App. Alt.	Lower Limb	Upper Limb
° ′	′	′	° ′	′	′
9 34	+10·8	−21·5	9 39	+10·6	−21·2
9 45	+10·9	−21·4	9 51	+10·7	−21·1
9 56	+11·0	−21·3	10 03	+10·8	−21·0
10 08	+11·1	−21·2	10 15	+10·9	−20·9
10 21	+11·2	−21·1	10 27	+11·0	−20·8
10 34	+11·3	−21·0	10 40	+11·1	−20·7
10 47	+11·4	−20·9	10 54	+11·2	−20·6
11 01	+11·5	−20·8	11 08	+11·3	−20·5
11 15	+11·6	−20·7	11 23	+11·4	−20·4
11 30	+11·7	−20·6	11 38	+11·5	−20·3
11 46	+11·8	−20·5	11 54	+11·6	−20·2
12 02	+11·9	−20·4	12 10	+11·7	−20·1
12 19	+12·0	−20·3	12 28	+11·8	−20·0
12 37	+12·1	−20·2	12 46	+11·9	−19·9
12 55	+12·2	−20·1	13 05	+12·0	−19·8
13 14	+12·3	−20·0	13 24	+12·1	−19·7
13 35	+12·4	−19·9	13 45	+12·2	−19·6
13 56	+12·5	−19·8	14 07	+12·3	−19·5
14 18	+12·6	−19·7	14 30	+12·4	−19·4
14 42	+12·7	−19·6	14 54	+12·5	−19·3
15 06	+12·8	−19·5	15 19	+12·6	−19·2
15 32	+12·9	−19·4	15 46	+12·7	−19·1
15 59	+13·0	−19·3	16 14	+12·8	−19·0
16 28	+13·1	−19·2	16 44	+12·9	−18·9
16 59	+13·2	−19·1	17 15	+13·0	−18·8
17 32	+13·3	−19·0	17 48	+13·1	−18·7
18 06	+13·4	−18·9	18 24	+13·2	−18·6
18 42	+13·5	−18·8	19 01	+13·3	−18·5
19 21	+13·6	−18·7	19 42	+13·4	−18·4
20 03	+13·7	−18·6	20 25	+13·5	−18·3
20 48	+13·8	−18·5	21 11	+13·6	−18·2
21 35	+13·9	−18·4	22 00	+13·7	−18·1
22 26	+14·0	−18·3	22 54	+13·8	−18·0
23 22	+14·1	−18·2	23 51	+13·9	−17·9
24 21	+14·2	−18·1	24 53	+14·0	−17·8
25 26	+14·3	−18·0	26 00	+14·1	−17·7
26 36	+14·4	−17·9	27 13	+14·2	−17·6
27 52	+14·5	−17·8	28 33	+14·3	−17·5
29 15	+14·6	−17·7	30 00	+14·4	−17·4
30 46	+14·7	−17·6	31 35	+14·5	−17·3
32 26	+14·8	−17·5	33 20	+14·6	−17·2
34 17	+14·9	−17·4	35 17	+14·7	−17·1
36 20	+15·0	−17·3	37 26	+14·8	−17·0
38 36	+15·1	−17·2	39 50	+14·9	−16·9
41 08	+15·2	−17·1	42 31	+15·0	−16·8
43 59	+15·3	−17·0	45 31	+15·1	−16·7
47 10	+15·4	−16·9	48 55	+15·2	−16·6
50 46	+15·5	−16·8	52 44	+15·3	−16·5
54 49	+15·6	−16·7	57 02	+15·4	−16·4
59 23	+15·7	−16·6	61 51	+15·5	−16·3
64 30	+15·8	−16·5	67 17	+15·6	−16·2
70 12	+15·9	−16·4	73 16	+15·7	−16·1
76 26	+16·0	−16·3	79 43	+15·8	−16·0
83 05	+16·1	−16·2	86 32	+15·9	−15·9
90 00			90 00		

STARS AND PLANETS

App Alt.	Corrⁿ
° ′	′
9 56	−5·3
10 08	−5·2
10 20	−5·1
10 33	−5·0
10 46	−4·9
11 00	−4·8
11 14	−4·7
11 29	−4·6
11 45	−4·5
12 01	−4·4
12 18	−4·3
12 35	−4·2
12 54	−4·1
13 13	−4·0
13 33	−3·9
13 54	−3·8
14 16	−3·7
14 40	−3·6
15 04	−3·5
15 30	−3·4
15 57	−3·3
16 26	−3·2
16 56	−3·1
17 28	−3·0
18 02	−2·9
18 38	−2·8
19 17	−2·7
19 58	−2·6
20 42	−2·5
21 28	−2·4
22 19	−2·3
23 13	−2·2
24 11	−2·1
25 14	−2·0
26 22	−1·9
27 36	−1·8
28 56	−1·7
30 24	−1·6
32 00	−1·5
33 45	−1·4
35 40	−1·3
37 48	−1·2
40 08	−1·1
42 44	−1·0
45 36	−0·9
48 47	−0·8
52 18	−0·7
56 11	−0·6
60 28	−0·5
65 08	−0·4
70 11	−0·3
75 34	−0·2
81 13	−0·1
87 03	0·0
90 00	

App. Alt.	Additional Corrⁿ
1999	
VENUS	
Jan. 1–May 8	
Dec. 9–Dec. 31	
°	′
0	
60	+0·1
May 9–June 26	
Oct. 18–Dec. 8	
°	′
0	
41	+0·2
76	+0·1
June 27–July 19	
Sept. 24–Oct. 17	
°	′
0	
34	+0·3
60	+0·2
80	+0·1
July 20–Aug. 4	
Sept. 7–Sept. 23	
°	′
0	
29	+0·4
51	+0·3
68	+0·2
83	+0·1
Aug. 5–Sept. 6	
°	′
0	
26	+0·5
46	+0·4
60	+0·3
73	+0·2
84	+0·1
MARS	
Jan. 1–Feb. 21	
July 28–Dec. 31	
°	′
0	
60	+0·1
Feb. 22–Apr. 22	
May 11–July 27	
°	′
0	
41	+0·2
76	+0·1
Apr. 23–May 10	
°	′
0	
34	+0·3
60	+0·2
80	+0·1

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ
m	′	ft.	m	′
2·4	−2·8	8·0	1·0	−1·8
2·6	−2·9	8·6	1·5	−2·2
2·8	−3·0	9·2	2·0	−2·5
3·0	−3·1	9·8	2·5	−2·8
3·2	−3·2	10·5	3·0	−3·0
3·4	−3·3	11·2	See table ←	
3·6	−3·4	11·9		
3·8	−3·5	12·6		
4·0	−3·6	13·3	m	′
4·3	−3·7	14·1	20	−7·9
4·5	−3·8	14·9	22	−8·3
4·7	−3·9	15·7	24	−8·6
5·0	−4·0	16·5	26	−9·0
5·2	−4·1	17·4	28	−9·3
5·5	−4·2	18·3	30	−9·6
5·8	−4·3	19·1	32	−10·0
6·1	−4·4	20·1	34	−10·3
6·3	−4·5	21·0	36	−10·6
6·6	−4·6	22·0	38	−10·8
6·9	−4·7	22·9	40	−11·1
7·2	−4·8	23·9	42	−11·4
7·5	−4·9	24·9	44	−11·7
7·9	−5·0	26·0	46	−11·9
8·2	−5·1	27·1	48	−12·2
8·5	−5·2	28·1	ft.	′
8·8	−5·3	29·2	2	−1·4
9·2	−5·4	30·4	4	−1·9
9·5	−5·5	31·5	6	−2·4
9·9	−5·6	32·7	8	−2·7
10·3	−5·7	33·9	10	−3·1
10·6	−5·8	35·1	See table ←	
11·0	−5·9	36·3		
11·4	−6·0	37·6		
11·8	−6·1	38·9	ft.	′
12·2	−6·2	40·1	70	−8·1
12·6	−6·3	41·5	75	−8·4
13·0	−6·4	42·8	80	−8·7
13·4	−6·5	44·2	85	−8·9
13·8	−6·6	45·5	90	−9·2
14·2	−6·7	46·9	95	−9·5
14·7	−6·8	48·4	100	−9·7
15·1	−6·9	49·8	105	−9·9
15·5	−7·0	51·3	110	−10·2
16·0	−7·1	52·8	115	−10·4
16·5	−7·2	54·3	120	−10·6
16·9	−7·3	55·8	125	−10·8
17·4	−7·4	57·4	130	−11·1
17·9	−7·5	58·9	135	−11·3
18·4	−7·6	60·5	140	−11·5
18·8	−7·7	62·1	145	−11·7
19·3	−7·8	63·8	150	−11·9
19·8	−7·9	65·4	155	−12·1
20·4	−8·0	67·1		
20·9	−8·1	68·8		
21·4		70·5		

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

UT		ARIES	VENUS −4.2		MARS −1.1		JUPITER −2.1		SATURN +0.4	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	28 00	245 05.6	132 01.5	N24 26.6	42 08.8	S 9 40.1	222 17.6	N 8 18.9	206 14.0	N12 54.5
	01	260 08.1	147 01.1	26.2	57 11.6	40.1	237 19.6	19.1	221 16.2	54.6
	02	275 10.5	162 00.8	25.8	72 14.3	40.1	252 21.6	19.3	236 18.4	54.6
	03	290 13.0	177 00.4	25.3	87 17.0	40.1	267 23.5	19.5	251 20.5	54.7
	04	305 15.5	192 00.0	24.9	102 19.7	40.1	282 25.5	19.7	266 22.7	54.8
	05	320 17.9	206 59.7	24.5	117 22.5	40.1	297 27.5	19.8	281 24.9	54.9
	06	335 20.4	221 59.3	N24 24.0	132 25.2	S 9 40.2	312 29.4	N 8 20.0	296 27.1	N12 55.0
	07	350 22.8	236 59.0	23.6	147 27.9	40.2	327 31.4	20.2	311 29.2	55.1
	08	5 25.3	251 58.6	23.2	162 30.6	40.2	342 33.4	20.4	326 31.4	55.2
F	09	20 27.8	266 58.3	22.7	177 33.3	40.2	357 35.4	20.6	341 33.6	55.3
R	10	35 30.2	281 57.9	22.3	192 36.1	40.2	12 37.3	20.8	356 35.8	55.4
I	11	50 32.7	296 57.6	21.8	207 38.8	40.2	27 39.3	21.0	11 37.9	55.5
D	12	65 35.2	311 57.2	N24 21.4	222 41.5	S 9 40.2	42 41.3	N 8 21.1	26 40.1	N12 55.5
A	13	80 37.6	326 56.9	20.9	237 44.2	40.2	57 43.3	21.3	41 42.3	55.6
Y	14	95 40.1	341 56.5	20.5	252 46.9	40.2	72 45.2	21.5	56 44.4	55.7
	15	110 42.6	356 56.2	20.1	267 49.6	40.2	87 47.2	21.7	71 46.6	55.8
	16	125 45.0	11 55.8	19.6	282 52.3	40.2	102 49.2	21.9	86 48.8	55.9
	17	140 47.5	26 55.5	19.2	297 55.0	40.2	117 51.2	22.1	101 51.0	56.0
	18	155 50.0	41 55.1	N24 18.7	312 57.7	S 9 40.2	132 53.1	N 8 22.3	116 53.1	N12 56.1
	19	170 52.4	56 54.8	18.3	328 00.5	40.3	147 55.1	22.4	131 55.3	56.2
	20	185 54.9	71 54.4	17.8	343 03.2	40.3	162 57.1	22.6	146 57.5	56.3
	21	200 57.3	86 54.1	17.4	358 05.9	40.3	177 59.1	22.8	161 59.7	56.3
	22	215 59.8	101 53.8	16.9	13 08.6	40.3	193 01.0	23.0	177 01.8	56.4
	23	231 02.3	116 53.4	16.5	28 11.3	40.3	208 03.0	23.2	192 04.0	56.5
	29 00	246 04.7	131 53.1	N24 16.0	43 14.0	S 9 40.3	223 05.0	N 8 23.4	207 06.2	N12 56.6
	01	261 07.2	146 52.7	15.6	58 16.7	40.3	238 07.0	23.6	222 08.3	56.7
	02	276 09.7	161 52.4	15.1	73 19.3	40.3	253 08.9	23.7	237 10.5	56.8
	03	291 12.1	176 52.1	14.6	88 22.0	40.4	268 10.9	23.9	252 12.7	56.9
	04	306 14.6	191 51.7	14.2	103 24.7	40.4	283 12.9	24.1	267 14.9	57.0
	05	321 17.1	206 51.4	13.7	118 27.4	40.4	298 14.9	24.3	282 17.0	57.1
	06	336 19.5	221 51.1	N24 13.3	133 30.1	S 9 40.4	313 16.8	N 8 24.5	297 19.2	N12 57.1
	07	351 22.0	236 50.7	12.8	148 32.8	40.4	328 18.8	24.7	312 21.4	57.2
S	08	6 24.5	251 50.4	12.3	163 35.5	40.4	343 20.8	24.8	327 23.6	57.3
A	09	21 26.9	266 50.1	11.9	178 38.2	40.5	358 22.8	25.0	342 25.7	57.4
T	10	36 29.4	281 49.7	11.4	193 40.9	40.5	13 24.7	25.2	357 27.9	57.5
U	11	51 31.8	296 49.4	11.0	208 43.5	40.5	28 26.7	25.4	12 30.1	57.6
R	12	66 34.3	311 49.1	N24 10.5	223 46.2	S 9 40.5	43 28.7	N 8 25.6	27 32.2	N12 57.7
D	13	81 36.8	326 48.8	10.0	238 48.9	40.5	58 30.7	25.8	42 34.4	57.8
A	14	96 39.2	341 48.4	09.6	253 51.6	40.5	73 32.6	26.0	57 36.6	57.9
Y	15	111 41.7	356 48.1	09.1	268 54.3	40.6	88 34.6	26.1	72 38.8	57.9
	16	126 44.2	11 47.8	08.6	283 56.9	40.6	103 36.6	26.3	87 40.9	58.0
	17	141 46.6	26 47.5	08.2	298 59.6	40.6	118 38.6	26.5	102 43.1	58.1
	18	156 49.1	41 47.1	N24 07.7	314 02.3	S 9 40.6	133 40.6	N 8 26.7	117 45.3	N12 58.2
	19	171 51.6	56 46.8	07.2	329 05.0	40.6	148 42.5	26.9	132 47.5	58.3
	20	186 54.0	71 46.5	06.7	344 07.6	40.7	163 44.5	27.1	147 49.6	58.4
	21	201 56.5	86 46.2	06.3	359 10.3	40.7	178 46.5	27.2	162 51.8	58.5
	22	216 59.0	101 45.9	05.8	14 13.0	40.7	193 48.5	27.4	177 54.0	58.6
	23	232 01.4	116 45.5	05.3	29 15.6	40.7	208 50.4	27.6	192 56.2	58.7
	30 00	247 03.9	131 45.2	N24 04.8	44 18.3	S 9 40.8	223 52.4	N 8 27.8	207 58.3	N12 58.7
	01	262 06.3	146 44.9	04.4	59 21.0	40.8	238 54.4	28.0	223 00.5	58.8
	02	277 08.8	161 44.6	03.9	74 23.6	40.8	253 56.4	28.2	238 02.7	58.9
	03	292 11.3	176 44.3	03.4	89 26.3	40.8	268 58.4	28.3	253 04.9	59.0
	04	307 13.7	191 44.0	02.9	104 28.9	40.9	284 00.3	28.5	268 07.0	59.1
	05	322 16.2	206 43.7	02.5	119 31.6	40.9	299 02.3	28.7	283 09.2	59.2
	06	337 18.7	221 43.3	N24 02.0	134 34.3	S 9 40.9	314 04.3	N 8 28.9	298 11.4	N12 59.3
	07	352 21.1	236 43.0	01.5	149 36.9	40.9	329 06.3	29.1	313 13.6	59.4
	08	7 23.6	251 42.7	01.0	164 39.6	41.0	344 08.3	29.3	328 15.7	59.5
S	09	22 26.1	266 42.4	00.5	179 42.2	41.0	359 10.2	29.4	343 17.9	59.5
U	10	37 28.5	281 42.1	24 00.0	194 44.9	41.0	14 12.2	29.6	358 20.1	59.6
N	11	52 31.0	296 41.8	23 59.6	209 47.5	41.1	29 14.2	29.8	13 22.3	59.7
D	12	67 33.4	311 41.5	N23 59.1	224 50.2	S 9 41.1	44 16.2	N 8 30.0	28 24.4	N12 59.8
A	13	82 35.9	326 41.2	58.6	239 52.8	41.1	59 18.1	30.2	43 26.6	12 59.9
Y	14	97 38.4	341 40.9	58.1	254 55.5	41.1	74 20.1	30.4	58 28.8	13 00.0
	15	112 40.8	356 40.6	57.6	269 58.1	41.2	89 22.1	30.5	73 31.0	00.1
	16	127 43.3	11 40.3	57.1	285 00.8	41.2	104 24.1	30.7	88 33.1	00.2
	17	142 45.8	26 40.0	56.6	300 03.4	41.2	119 26.1	30.9	103 35.3	00.2
	18	157 48.2	41 39.7	N23 56.1	315 06.0	S 9 41.3	134 28.0	N 8 31.1	118 37.5	N13 00.3
	19	172 50.7	56 39.4	55.6	330 08.7	41.3	149 30.0	31.3	133 39.7	00.4
	20	187 53.2	71 39.1	55.1	345 11.3	41.3	164 32.0	31.5	148 41.8	00.5
	21	202 55.6	86 38.8	54.7	0 14.0	41.4	179 34.0	31.6	163 44.0	00.6
	22	217 58.1	101 38.5	54.2	15 16.6	41.4	194 36.0	31.8	178 46.2	00.7
	23	233 00.6	116 38.2	53.7	30 19.2	41.4	209 37.9	32.0	193 48.4	00.8
		h m								
	Mer. Pass.	7 34.4	v −0.3	d 0.5	v 2.7	d 0.0	v 2.0	d 0.2	v 2.2	d 0.1

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 27.0	S40 18.5
Achernar	335 35.4	S57 14.3
Acrux	173 21.1	S63 05.9
Adhara	255 21.4	S28 58.5
Aldebaran	291 02.3	N16 30.3
Alioth	166 30.0	N55 58.1
Alkaid	153 07.1	N49 19.2
Al Na'ir	27 57.4	S46 57.6
Alnilam	275 57.8	S 1 12.3
Alphard	218 06.9	S 8 39.5
Alphecca	126 19.9	N26 43.1
Alpheratz	357 54.9	N29 04.9
Altair	62 18.6	N 8 52.0
Ankaa	353 26.7	S42 18.5
Antares	112 39.3	S26 25.8
Arcturus	146 05.4	N19 11.3
Atria	107 50.4	S69 01.5
Avior	234 22.8	S59 30.8
Bellatrix	278 44.0	N 6 20.8
Betelgeuse	271 13.4	N 7 24.3
Canopus	264 01.5	S52 42.0
Capella	280 51.1	N45 59.7
Deneb	49 38.7	N45 16.5
Denebola	182 44.7	N14 34.6
Diphda	349 07.0	S17 59.5
Dubhe	194 05.0	N61 45.6
Elnath	278 26.8	N28 36.3
Eltanin	90 50.7	N51 29.3
Enif	33 57.7	N 9 52.2
Fomalhaut	15 36.0	S29 37.5
Gacrux	172 12.8	S57 06.8
Gienah	176 03.4	S17 32.4
Hadar	149 02.9	S60 22.3
Hamal	328 13.4	N23 27.3
Kaus Aust.	83 57.9	S34 22.9
Kochab	137 18.6	N74 09.7
Markab	13 49.2	N15 11.9
Menkar	314 26.8	N 4 05.0
Menkent	148 20.1	S36 22.1
Miaplacidus	221 42.2	S69 43.2
Mirfak	308 56.5	N49 51.3
Nunki	76 11.5	S26 17.7
Peacock	53 36.1	S56 44.0
Pollux	243 41.3	N28 01.7
Procyon	245 11.4	N 5 13.5
Rasalhague	96 16.2	N12 33.7
Regulus	207 55.2	N11 58.2
Rigel	281 22.9	S 8 12.3
Rigil Kent.	140 06.1	S60 50.0
Sabik	102 24.7	S15 43.4
Schedar	349 53.3	N56 31.7
Shaula	96 36.3	S37 06.1
Sirius	258 43.6	S16 43.1
Spica	158 42.5	S11 09.5
Suhail	223 00.6	S43 26.1
Vega	80 46.0	N38 46.9
Zuben'ubi	137 17.2	S16 02.3

	SHA	Mer. Pass.
	° ′	h m
Venus	245 48.3	15 13
Mars	157 09.2	21 03
Jupiter	337 00.2	9 06
Saturn	321 01.4	10 10

UT	SUN		MOON				
	GHA	Dec	GHA	v	Dec	d	HP
d h	° ′	° ′	° ′	′	° ′	′	′
28 00	180 42.8	N21 21.0	24 34.1	14.7	S10 28.4	8.8	54.0
01	195 42.8	21.4	39 07.8	14.7	10 37.2	8.7	54.0
02	210 42.7	21.8	53 41.5	14.6	10 45.9	8.7	54.0
03	225 42.6	22.2	68 15.1	14.6	10 54.6	8.7	54.0
04	240 42.5	22.7	82 48.7	14.6	11 03.3	8.6	54.0
05	255 42.5	23.1	97 22.3	14.6	11 11.9	8.5	54.0
06	270 42.4	N21 23.5	111 55.9	14.5	S11 20.4	8.5	54.0
07	285 42.3	23.9	126 29.4	14.5	11 28.9	8.5	54.0
08	300 42.2	24.3	141 02.9	14.5	11 37.4	8.4	54.0
F 09	315 42.2	24.7	155 36.4	14.5	11 45.8	8.3	54.0
R 10	330 42.1	25.1	170 09.9	14.4	11 54.1	8.4	54.0
I 11	345 42.0	25.5	184 43.3	14.4	12 02.5	8.2	54.0
D 12	0 41.9	N21 25.9	199 16.7	14.4	S12 10.7	8.2	54.0
A 13	15 41.9	26.3	213 50.1	14.4	12 18.9	8.2	54.0
Y 14	30 41.8	26.7	228 23.5	14.3	12 27.1	8.1	54.0
15	45 41.7	27.1	242 56.8	14.3	12 35.2	8.0	54.0
16	60 41.6	27.5	257 30.1	14.2	12 43.2	8.0	54.0
17	75 41.6	27.9	272 03.3	14.3	12 51.2	8.0	54.0
18	90 41.5	N21 28.3	286 36.6	14.2	S12 59.2	7.9	54.0
19	105 41.4	28.7	301 09.8	14.1	13 07.1	7.8	54.0
20	120 41.3	29.1	315 42.9	14.2	13 14.9	7.8	54.0
21	135 41.2	29.5	330 16.1	14.1	13 22.7	7.7	54.0
22	150 41.2	29.9	344 49.2	14.1	13 30.4	7.7	54.0
23	165 41.1	30.3	359 22.3	14.0	13 38.1	7.6	54.0
29 00	180 41.0	N21 30.7	13 55.3	14.1	S13 45.7	7.6	54.0
01	195 40.9	31.1	28 28.4	13.9	13 53.3	7.5	54.0
02	210 40.9	31.5	43 01.3	14.0	14 00.8	7.4	54.0
03	225 40.8	31.9	57 34.3	13.9	14 08.2	7.4	54.0
04	240 40.7	32.3	72 07.2	13.9	14 15.6	7.3	54.0
05	255 40.6	32.7	86 40.1	13.9	14 22.9	7.2	54.0
06	270 40.5	N21 33.1	101 13.0	13.8	S14 30.1	7.2	54.0
07	285 40.5	33.5	115 45.8	13.8	14 37.3	7.2	54.0
S 08	300 40.4	33.9	130 18.6	13.7	14 44.5	7.0	54.0
A 09	315 40.3	34.3	144 51.3	13.8	14 51.5	7.0	54.0
T 10	330 40.2	34.7	159 24.1	13.7	14 58.5	7.0	54.0
U 11	345 40.1	35.1	173 56.8	13.6	15 05.5	6.9	54.0
R 12	0 40.1	N21 35.4	188 29.4	13.7	S15 12.4	6.8	54.0
D 13	15 40.0	35.8	203 02.1	13.5	15 19.2	6.7	54.0
A 14	30 39.9	36.2	217 34.6	13.6	15 25.9	6.7	54.0
Y 15	45 39.8	36.6	232 07.2	13.5	15 32.6	6.6	54.0
16	60 39.7	37.0	246 39.7	13.5	15 39.2	6.6	54.0
17	75 39.7	37.4	261 12.2	13.5	15 45.8	6.5	54.0
18	90 39.6	N21 37.8	275 44.7	13.4	S15 52.3	6.4	54.0
19	105 39.5	38.2	290 17.1	13.4	15 58.7	6.3	54.0
20	120 39.4	38.5	304 49.5	13.3	16 05.0	6.3	54.0
21	135 39.3	38.9	319 21.8	13.4	16 11.3	6.2	54.0
22	150 39.3	39.3	333 54.2	13.3	16 17.5	6.1	54.0
23	165 39.2	39.7	348 26.5	13.2	16 23.6	6.1	54.0
30 00	180 39.1	N21 40.1	2 58.7	13.2	S16 29.7	6.0	54.0
01	195 39.0	40.4	17 30.9	13.2	16 35.7	5.9	54.0
02	210 38.9	40.8	32 03.1	13.2	16 41.6	5.9	54.0
03	225 38.8	41.2	46 35.3	13.1	16 47.5	5.7	54.0
04	240 38.8	41.6	61 07.4	13.0	16 53.2	5.7	54.0
05	255 38.7	42.0	75 39.4	13.1	16 58.9	5.7	54.0
06	270 38.6	N21 42.3	90 11.5	13.0	S17 04.6	5.5	54.0
07	285 38.5	42.7	104 43.5	13.0	17 10.1	5.5	54.0
08	300 38.4	43.1	119 15.5	12.9	17 15.6	5.4	54.0
S 09	315 38.3	43.5	133 47.4	12.9	17 21.0	5.3	54.0
U 10	330 38.3	43.8	148 19.3	12.9	17 26.3	5.3	54.0
N 11	345 38.2	44.2	162 51.2	12.8	17 31.6	5.2	54.0
D 12	0 38.1	N21 44.6	177 23.0	12.9	S17 36.8	5.1	54.0
A 13	15 38.0	45.0	191 54.9	12.7	17 41.9	5.0	54.0
Y 14	30 37.9	45.3	206 26.6	12.8	17 46.9	4.9	54.0
15	45 37.8	45.7	220 58.4	12.7	17 51.8	4.9	54.0
16	60 37.7	46.1	235 30.1	12.6	17 56.7	4.7	54.0
17	75 37.7	46.5	250 01.7	12.7	18 01.4	4.8	54.0
18	90 37.6	N21 46.8	264 33.4	12.6	S18 06.2	4.6	54.0
19	105 37.5	47.2	279 05.0	12.6	18 10.8	4.5	54.0
20	120 37.4	47.6	293 36.6	12.5	18 15.3	4.5	54.1
21	135 37.3	47.9	308 08.1	12.5	18 19.8	4.3	54.1
22	150 37.2	48.3	322 39.6	12.5	18 24.1	4.3	54.1
23	165 37.1	48.7	337 11.1	12.5	S18 28.4	4.3	54.1
	SD 15.8	d 0.4	SD 14.7		14.7		14.7

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

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

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
d	m s	m s	h m	h m	h m	d	%
28	02 51	02 48	11 57	23 03	10 41	13	97
29	02 44	02 40	11 57	23 48	11 25	14	99
30	02 37	02 33	11 57	24 34	12 11	15	100

UT		ARIES	VENUS −4.2		MARS −1.0		JUPITER −2.1		SATURN +0.4	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
31	00	248 03.0	131 37.9	N23 53.2	45 21.9	S 9 41.5	224 39.9	N 8 32.2	208 50.5	N13 00.9
	01	263 05.5	146 37.6	52.7	60 24.5	41.5	239 41.9	32.4	223 52.7	00.9
	02	278 07.9	161 37.3	52.2	75 27.1	41.6	254 43.9	32.6	238 54.9	01.0
	03	293 10.4	176 37.0	51.7	90 29.8	41.6	269 45.9	32.7	253 57.1	01.1
	04	308 12.9	191 36.7	51.2	105 32.4	41.6	284 47.9	32.9	268 59.2	01.2
	05	323 15.3	206 36.4	50.7	120 35.0	41.7	299 49.8	33.1	284 01.4	01.3
	06	338 17.8	221 36.2	N23 50.2	135 37.6	S 9 41.7	314 51.8	N 8 33.3	299 03.6	N13 01.4
	07	353 20.3	236 35.9	49.7	150 40.3	41.7	329 53.8	33.5	314 05.8	01.5
	08	8 22.7	251 35.6	49.2	165 42.9	41.8	344 55.8	33.6	329 07.9	01.6
M	09	23 25.2	266 35.3	48.7	180 45.5	41.8	359 57.8	33.8	344 10.1	01.6
O	10	38 27.7	281 35.0	48.1	195 48.1	41.9	14 59.7	34.0	359 12.3	01.7
N	11	53 30.1	296 34.7	47.6	210 50.7	41.9	30 01.7	34.2	14 14.5	01.8
D	12	68 32.6	311 34.5	N23 47.1	225 53.4	S 9 41.9	45 03.7	N 8 34.4	29 16.6	N13 01.9
A	13	83 35.1	326 34.2	46.6	240 56.0	42.0	60 05.7	34.6	44 18.8	02.0
Y	14	98 37.5	341 33.9	46.1	255 58.6	42.0	75 07.7	34.7	59 21.0	02.1
	15	113 40.0	356 33.6	45.6	271 01.2	42.1	90 09.7	34.9	74 23.2	02.2
	16	128 42.4	11 33.3	45.1	286 03.8	42.1	105 11.6	35.1	89 25.3	02.3
	17	143 44.9	26 33.1	44.6	301 06.4	42.1	120 13.6	35.3	104 27.5	02.3
	18	158 47.4	41 32.8	N23 44.1	316 09.0	S 9 42.2	135 15.6	N 8 35.5	119 29.7	N13 02.4
	19	173 49.8	56 32.5	43.6	331 11.6	42.2	150 17.6	35.6	134 31.9	02.5
	20	188 52.3	71 32.2	43.0	346 14.2	42.3	165 19.6	35.8	149 34.1	02.6
	21	203 54.8	86 32.0	42.5	1 16.8	42.3	180 21.5	36.0	164 36.2	02.7
	22	218 57.2	101 31.7	42.0	16 19.5	42.4	195 23.5	36.2	179 38.4	02.8
	23	233 59.7	116 31.4	41.5	31 22.1	42.4	210 25.5	36.4	194 40.6	02.9
1	00	249 02.2	131 31.1	N23 41.0	46 24.7	S 9 42.5	225 27.5	N 8 36.5	209 42.8	N13 03.0
	01	264 04.6	146 30.9	40.5	61 27.3	42.5	240 29.5	36.7	224 44.9	03.0
	02	279 07.1	161 30.6	39.9	76 29.9	42.6	255 31.5	36.9	239 47.1	03.1
	03	294 09.6	176 30.3	39.4	91 32.5	42.6	270 33.4	37.1	254 49.3	03.2
	04	309 12.0	191 30.1	38.9	106 35.0	42.7	285 35.4	37.3	269 51.5	03.3
	05	324 14.5	206 29.8	38.4	121 37.6	42.7	300 37.4	37.4	284 53.6	03.4
	06	339 16.9	221 29.5	N23 37.9	136 40.2	S 9 42.7	315 39.4	N 8 37.6	299 55.8	N13 03.5
	07	354 19.4	236 29.3	37.3	151 42.8	42.8	330 41.4	37.8	314 58.0	03.6
T	08	9 21.9	251 29.0	36.8	166 45.4	42.8	345 43.4	38.0	330 00.2	03.7
U	09	24 24.3	266 28.8	36.3	181 48.0	42.9	0 45.4	38.2	345 02.4	03.7
E	10	39 26.8	281 28.5	35.8	196 50.6	42.9	15 47.3	38.4	0 04.5	03.8
S	11	54 29.3	296 28.2	35.2	211 53.2	43.0	30 49.3	38.5	15 06.7	03.9
D	12	69 31.7	311 28.0	N23 34.7	226 55.8	S 9 43.1	45 51.3	N 8 38.7	30 08.9	N13 04.0
A	13	84 34.2	326 27.7	34.2	241 58.3	43.1	60 53.3	38.9	45 11.1	04.1
Y	14	99 36.7	341 27.5	33.6	257 00.9	43.2	75 55.3	39.1	60 13.2	04.2
	15	114 39.1	356 27.2	33.1	272 03.5	43.2	90 57.3	39.3	75 15.4	04.3
	16	129 41.6	11 26.9	32.6	287 06.1	43.3	105 59.2	39.4	90 17.6	04.3
	17	144 44.0	26 26.7	32.0	302 08.7	43.3	121 01.2	39.6	105 19.8	04.4
	18	159 46.5	41 26.4	N23 31.5	317 11.2	S 9 43.4	136 03.2	N 8 39.8	120 21.9	N13 04.5
	19	174 49.0	56 26.2	31.0	332 13.8	43.4	151 05.2	40.0	135 24.1	04.6
	20	189 51.4	71 25.9	30.4	347 16.4	43.5	166 07.2	40.1	150 26.3	04.7
	21	204 53.9	86 25.7	29.9	2 19.0	43.5	181 09.2	40.3	165 28.5	04.8
	22	219 56.4	101 25.4	29.4	17 21.5	43.6	196 11.2	40.5	180 30.7	04.9
	23	234 58.8	116 25.2	28.8	32 24.1	43.7	211 13.1	40.7	195 32.8	05.0
2	00	250 01.3	131 25.0	N23 28.3	47 26.7	S 9 43.7	226 15.1	N 8 40.9	210 35.0	N13 05.0
	01	265 03.8	146 24.7	27.8	62 29.2	43.8	241 17.1	41.0	225 37.2	05.1
	02	280 06.2	161 24.5	27.2	77 31.8	43.8	256 19.1	41.2	240 39.4	05.2
	03	295 08.7	176 24.2	26.7	92 34.4	43.9	271 21.1	41.4	255 41.6	05.3
	04	310 11.2	191 24.0	26.1	107 36.9	43.9	286 23.1	41.6	270 43.7	05.4
	05	325 13.6	206 23.7	25.6	122 39.5	44.0	301 25.1	41.8	285 45.9	05.5
	06	340 16.1	221 23.5	N23 25.0	137 42.1	S 9 44.1	316 27.1	N 8 41.9	300 48.1	N13 05.6
W	07	355 18.5	236 23.3	24.5	152 44.6	44.1	331 29.0	42.1	315 50.3	05.6
E	08	10 21.0	251 23.0	24.0	167 47.2	44.2	346 31.0	42.3	330 52.4	05.7
D	09	25 23.5	266 22.8	23.4	182 49.7	44.2	1 33.0	42.5	345 54.6	05.8
N	10	40 25.9	281 22.5	22.9	197 52.3	44.3	16 35.0	42.7	0 56.8	05.9
E	11	55 28.4	296 22.3	22.3	212 54.9	44.4	31 37.0	42.8	15 59.0	06.0
S	12	70 30.9	311 22.1	N23 21.8	227 57.4	S 9 44.4	46 39.0	N 8 43.0	31 01.2	N13 06.1
D	13	85 33.3	326 21.8	21.2	243 00.0	44.5	61 41.0	43.2	46 03.3	06.2
A	14	100 35.8	341 21.6	20.7	258 02.5	44.6	76 42.9	43.4	61 05.5	06.2
Y	15	115 38.3	356 21.4	20.1	273 05.1	44.6	91 44.9	43.5	76 07.7	06.3
	16	130 40.7	11 21.1	19.6	288 07.6	44.7	106 46.9	43.7	91 09.9	06.4
	17	145 43.2	26 20.9	19.0	303 10.2	44.7	121 48.9	43.9	106 12.1	06.5
	18	160 45.7	41 20.7	N23 18.5	318 12.7	S 9 44.8	136 50.9	N 8 44.1	121 14.2	N13 06.6
	19	175 48.1	56 20.5	17.9	333 15.2	44.9	151 52.9	44.3	136 16.4	06.7
	20	190 50.6	71 20.2	17.4	348 17.8	44.9	166 54.9	44.4	151 18.6	06.8
	21	205 53.0	86 20.0	16.8	3 20.3	45.0	181 56.9	44.6	166 20.8	06.8
	22	220 55.5	101 19.8	16.2	18 22.9	45.1	196 58.9	44.8	181 22.9	06.9
	23	235 58.0	116 19.6	15.7	33 25.4	45.1	212 00.8	45.0	196 25.1	07.0
		h m								
Mer. Pass.		7 22.6	v −0.3	d 0.5	v 2.6	d 0.1	v 2.0	d 0.2	v 2.2	d 0.1

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 27.0	S40 18.5
Achernar	335 35.3	S57 14.3
Acrux	173 21.1	S63 05.9
Adhara	255 21.4	S28 58.5
Aldebaran	291 02.3	N16 30.3
Alioth	166 30.0	N55 58.1
Alkaid	153 07.1	N49 19.3
Al Na'ir	27 57.3	S46 57.6
Alnilam	275 57.8	S 1 12.3
Alphard	218 06.9	S 8 39.5
Alphecca	126 19.9	N26 43.2
Alpheratz	357 54.9	N29 05.0
Altair	62 18.6	N 8 52.0
Ankaa	353 26.7	S42 18.5
Antares	112 39.3	S26 25.8
Arcturus	146 05.4	N19 11.3
Atria	107 50.3	S69 01.5
Avior	234 22.8	S59 30.8
Bellatrix	278 44.0	N 6 20.8
Betelgeuse	271 13.4	N 7 24.3
Canopus	264 01.5	S52 42.0
Capella	280 51.0	N45 59.7
Deneb	49 38.6	N45 16.5
Denebola	182 44.7	N14 34.6
Diphda	349 07.0	S17 59.4
Dubhe	194 05.0	N61 45.6
Elnath	278 26.8	N28 36.3
Eltanin	90 50.7	N51 29.4
Enif	33 57.7	N 9 52.2
Fomalhaut	15 36.0	S29 37.4
Gacrux	172 12.8	S57 06.8
Gienah	176 03.4	S17 32.4
Hadar	149 02.9	S60 22.3
Hamal	328 13.3	N23 27.3
Kaus Aust.	83 57.9	S34 22.9
Kochab	137 18.6	N74 09.8
Markab	13 49.2	N15 11.9
Menkar	314 26.8	N 4 05.0
Menkent	148 20.1	S36 22.1
Miaplacidus	221 42.3	S69 43.2
Mirfak	308 56.5	N49 51.3
Nunki	76 11.5	S26 17.7
Peacock	53 36.0	S56 44.0
Pollux	243 41.3	N28 01.7
Procyon	245 11.4	N 5 13.5
Rasalhague	96 16.2	N12 33.7
Regulus	207 55.2	N11 58.2
Rigel	281 22.9	S 8 12.3
Rigil Kent.	140 06.1	S60 50.0
Sabik	102 24.7	S15 43.4
Schedar	349 53.2	N56 31.7
Shaula	96 36.3	S37 06.1
Sirius	258 43.6	S16 43.1
Spica	158 42.5	S11 09.5
Suhail	223 00.6	S43 26.1
Vega	80 45.9	N38 47.0
Zuben'ubi	137 17.2	S16 02.3

	SHA	Mer. Pass.
	° ′	h m
Venus	242 29.0	15 14
Mars	157 22.5	20 51
Jupiter	336 25.3	8 57
Saturn	320 40.6	10 00

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
31 00	180 37.1	N21 49.0	351 42.6	12.4	S18 32.7	4.1	54.1
01	195 37.0	49.4	6 14.0	12.4	18 36.8	4.0	54.1
02	210 36.9	49.8	20 45.4	12.3	18 40.8	4.0	54.1
03	225 36.8	50.1	35 16.7	12.3	18 44.8	3.9	54.1
04	240 36.7	50.5	49 48.0	12.3	18 48.7	3.8	54.1
05	255 36.6	50.9	64 19.3	12.3	18 52.5	3.7	54.1
06	270 36.5	N21 51.2	78 50.6	12.2	S18 56.2	3.6	54.1
07	285 36.4	51.6	93 21.8	12.2	18 59.8	3.5	54.1
08	300 36.4	51.9	107 53.0	12.2	19 03.3	3.5	54.1
09	315 36.3	52.3	122 24.2	12.1	19 06.8	3.3	54.1
10	330 36.2	52.7	136 55.3	12.2	19 10.1	3.3	54.1
11	345 36.1	53.0	151 26.5	12.0	19 13.4	3.2	54.2
12	0 36.0	N21 53.4	165 57.5	12.1	S19 16.6	3.1	54.2
13	15 35.9	53.7	180 28.6	12.0	19 19.7	3.0	54.2
14	30 35.8	54.1	194 59.6	12.0	19 22.7	2.9	54.2
15	45 35.7	54.4	209 30.6	12.0	19 25.6	2.8	54.2
16	60 35.6	54.8	224 01.6	12.0	19 28.4	2.8	54.2
17	75 35.5	55.2	238 32.6	11.9	19 31.2	2.6	54.2
18	90 35.5	N21 55.5	253 03.5	11.9	S19 33.8	2.6	54.2
19	105 35.4	55.9	267 34.4	11.9	19 36.4	2.5	54.2
20	120 35.3	56.2	282 05.3	11.8	19 38.9	2.3	54.2
21	135 35.2	56.6	296 36.1	11.8	19 41.2	2.3	54.2
22	150 35.1	56.9	311 06.9	11.8	19 43.5	2.2	54.3
23	165 35.0	57.3	325 37.7	11.8	19 45.7	2.1	54.3
1 00	180 34.9	N21 57.6	340 08.5	11.7	S19 47.8	2.0	54.3
01	195 34.8	58.0	354 39.2	11.8	19 49.8	1.9	54.3
02	210 34.7	58.3	9 10.0	11.7	19 51.7	1.9	54.3
03	225 34.6	58.7	23 40.7	11.7	19 53.6	1.7	54.3
04	240 34.5	59.0	38 11.4	11.6	19 55.3	1.7	54.3
05	255 34.5	59.4	52 42.0	11.7	19 57.0	1.5	54.3
06	270 34.4	N21 59.7	67 12.7	11.6	S19 58.5	1.5	54.3
07	285 34.3	22 00.1	81 43.3	11.6	20 00.0	1.3	54.3
08	300 34.2	00.4	96 13.9	11.6	20 01.3	1.3	54.4
09	315 34.1	00.7	110 44.5	11.5	20 02.6	1.1	54.4
10	330 34.0	01.1	125 15.0	11.6	20 03.7	1.1	54.4
11	345 33.9	01.4	139 45.6	11.5	20 04.8	1.0	54.4
12	0 33.8	N22 01.8	154 16.1	11.5	S20 05.8	0.9	54.4
13	15 33.7	02.1	168 46.6	11.5	20 06.7	0.8	54.4
14	30 33.6	02.5	183 17.1	11.4	20 07.5	0.7	54.4
15	45 33.5	02.8	197 47.5	11.5	20 08.2	0.6	54.4
16	60 33.4	03.1	212 18.0	11.4	20 08.8	0.5	54.4
17	75 33.3	03.5	226 48.4	11.4	20 09.3	0.4	54.5
18	90 33.2	N22 03.8	241 18.8	11.4	S20 09.7	0.3	54.5
19	105 33.1	04.2	255 49.2	11.4	20 10.0	0.2	54.5
20	120 33.0	04.5	270 19.6	11.4	20 10.2	0.1	54.5
21	135 33.0	04.8	284 50.0	11.4	20 10.3	0.1	54.5
22	150 32.9	05.2	299 20.4	11.3	20 10.4	0.1	54.5
23	165 32.8	05.5	313 50.7	11.4	20 10.3	0.2	54.5
2 00	180 32.7	N22 05.8	328 21.1	11.3	S20 10.1	0.3	54.6
01	195 32.6	06.2	342 51.4	11.3	20 09.8	0.3	54.6
02	210 32.5	06.5	357 21.7	11.3	20 09.5	0.5	54.6
03	225 32.4	06.8	11 52.0	11.3	20 09.0	0.5	54.6
04	240 32.3	07.2	26 22.3	11.3	20 08.5	0.7	54.6
05	255 32.2	07.5	40 52.6	11.2	20 07.8	0.8	54.6
06	270 32.1	N22 07.8	55 22.8	11.3	S20 07.0	0.8	54.6
07	285 32.0	08.1	69 53.1	11.2	20 06.2	1.0	54.7
08	300 31.9	08.5	84 23.3	11.3	20 05.2	1.0	54.7
09	315 31.8	08.8	98 53.6	11.2	20 04.2	1.2	54.7
10	330 31.7	09.1	113 23.8	11.2	20 03.0	1.2	54.7
11	345 31.6	09.5	127 54.0	11.3	20 01.8	1.3	54.7
12	0 31.5	N22 09.8	142 24.3	11.2	S20 00.5	1.5	54.7
13	15 31.4	10.1	156 54.5	11.2	19 59.0	1.5	54.7
14	30 31.3	10.4	171 24.7	11.2	19 57.5	1.6	54.8
15	45 31.2	10.8	185 54.9	11.2	19 55.9	1.8	54.8
16	60 31.1	11.1	200 25.1	11.2	19 54.1	1.8	54.8
17	75 31.0	11.4	214 55.3	11.2	19 52.3	1.9	54.8
18	90 30.9	N22 11.7	229 25.5	11.1	S19 50.4	2.0	54.8
19	105 30.8	12.1	243 55.6	11.2	19 48.4	2.2	54.8
20	120 30.7	12.4	258 25.8	11.2	19 46.2	2.2	54.9
21	135 30.6	12.7	272 56.0	11.2	19 44.0	2.3	54.9
22	150 30.5	13.0	287 26.2	11.1	19 41.7	2.4	54.9
23	165 30.4	13.3	301 56.3	11.2	S19 39.3	2.5	54.9
	SD 15.8	d 0.3	SD 14.8		14.8		14.9

MONDAY — TUESDAY — WEDNESDAY

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

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

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
d	m s	m s	h m	h m	h m	d	%
31	02 28	02 24	11 58	00 34	12 58	16	99
1	02 20	02 15	11 58	01 22	13 46	17	95
2	02 11	02 06	11 58	02 11	14 36	18	91

POLARIS (POLE STAR) TABLES, 1999

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

LHA ARIES	0° – 9°	10° – 19°	20° – 29°	30° – 39°	40° – 49°	50° – 59°	60° – 69°	70° – 79°	80° – 89°	90° – 99°	100° – 109°	110° – 119°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	0 23·9	0 19·6	0 16·6	0 14·8	0 14·4	0 15·4	0 17·7	0 21·3	0 26·0	0 31·8	0 38·3	0 45·5
1	23·4	19·3	16·3	14·7	14·5	15·6	18·0	21·7	26·6	32·4	39·0	46·2
2	22·9	18·9	16·1	14·6	14·5	15·8	18·3	22·2	27·1	33·0	39·7	47·0
3	22·5	18·6	15·9	14·6	14·6	16·0	18·7	22·6	27·6	33·6	40·4	47·7
4	22·0	18·3	15·7	14·5	14·7	16·2	19·0	23·1	28·2	34·3	41·1	48·5
5	0 21·6	0 17·9	0 15·5	0 14·5	0 14·7	0 16·4	0 19·4	0 23·5	0 28·8	0 34·9	0 41·8	0 49·2
6	21·2	17·6	15·4	14·4	14·9	16·6	19·7	24·0	29·4	35·6	42·6	50·0
7	20·8	17·4	15·2	14·4	15·0	16·9	20·1	24·5	29·9	36·3	43·3	50·8
8	20·4	17·1	15·1	14·4	15·1	17·2	20·5	25·0	30·5	36·9	44·0	51·5
9	20·0	16·8	14·9	14·4	15·2	17·4	20·9	25·5	31·1	37·6	44·7	52·3
10	0 19·6	0 16·6	0 14·8	0 14·4	0 15·4	0 17·7	0 21·3	0 26·0	0 31·8	0 38·3	0 45·5	0 53·1
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
°	′	′	′	′	′	′	′	′	′	′	′	′
0	0·5	0·5	0·6	0·6	0·6	0·6	0·5	0·5	0·4	0·4	0·3	0·3
10	·5	·6	·6	·6	·6	·6	·5	·5	·4	·4	·4	·3
20	·5	·6	·6	·6	·6	·6	·6	·5	·5	·4	·4	·4
30	·5	·6	·6	·6	·6	·6	·6	·5	·5	·5	·5	·4
40	0·6	0·6	0·6	0·6	0·6	0·6	0·6	0·6	0·5	0·5	0·5	0·5
45	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·5
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·7	·7
60	·6	·6	·6	·6	·6	·6	·6	·7	·7	·7	·7	·7
62	0·7	0·6	0·6	0·6	0·6	0·6	0·6	0·7	0·7	0·7	0·8	0·8
64	·7	·6	·6	·6	·6	·6	·7	·7	·7	·8	·8	·8
66	·7	·6	·6	·6	·6	·6	·7	·7	·8	·8	·9	·9
68	0·7	0·7	0·6	0·6	0·6	0·6	0·7	0·7	0·8	0·9	0·9	0·9
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
	′	′	′	′	′	′	′	′	′	′	′	′
Jan.	0·8	0·8	0·8	0·8	0·8	0·8	0·8	0·7	0·7	0·7	0·7	0·6
Feb.	·7	·7	·8	·8	·8	·8	·8	·8	·8	·8	·8	·8
Mar.	·5	·6	·7	·7	·8	·8	·8	·9	·9	·9	·9	·9
Apr.	0·4	0·4	0·5	0·6	0·6	0·7	0·7	0·8	0·8	0·9	0·9	0·9
May	·3	·3	·4	·4	·5	·5	·6	·7	·7	·8	·8	·9
June	·2	·3	·3	·3	·4	·4	·5	·5	·6	·6	·7	·8
July	0·3	0·3	0·3	0·3	0·3	0·3	0·4	0·4	0·4	0·5	0·6	0·6
Aug.	·4	·4	·3	·3	·3	·3	·3	·3	·3	·4	·4	·5
Sept.	·6	·5	·5	·4	·4	·4	·3	·3	·3	·3	·3	·3
Oct.	0·8	0·7	0·7	0·6	0·6	0·5	0·4	0·4	0·4	0·3	0·3	0·3
Nov.	0·9	0·9	0·9	0·8	·7	·7	·6	·5	·5	·4	·3	·3
Dec.	1·1	1·0	1·0	1·0	0·9	0·8	0·8	0·7	0·6	0·5	0·5	0·4
Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·4	0·3	0·2	0·0	359·9	359·8	359·7	359·6	359·5	359·4	359·3	359·3
20	0·4	0·3	0·2	0·0	359·9	359·8	359·6	359·5	359·4	359·3	359·3	359·2
40	0·5	0·4	0·2	0·0	359·9	359·7	359·6	359·4	359·3	359·2	359·1	359·1
50	0·6	0·5	0·3	0·1	359·9	359·7	359·5	359·3	359·1	359·0	358·9	358·9
55	0·7	0·5	0·3	0·1	359·8	359·6	359·4	359·2	359·0	358·9	358·8	358·7
60	0·8	0·6	0·3	0·1	359·8	359·6	359·3	359·1	358·9	358·7	358·6	358·5
65	1·0	0·7	0·4	0·1	359·8	359·5	359·2	358·9	358·7	358·5	358·4	358·3

Latitude = Apparent altitude (corrected for refraction) $-1° + a_0 + a_1 + a_2$

The table is entered with LHA Aries to determine the column to be used; each column refers to a range of 10°. a_0 is taken, with mental interpolation, from the upper table with the units of LHA Aries in degrees as argument; a_1, a_2 are taken, without interpolation, from the second and third tables with arguments latitude and month respectively. a_0, a_1, a_2, are always positive. The final table gives the azimuth of *Polaris*.

POLARIS (POLE STAR) TABLES, 1999

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

LHA ARIES	120° – 129°	130° – 139°	140° – 149°	150° – 159°	160° – 169°	170° – 179°	180° – 189°	190° – 199°	200° – 209°	210° – 219°	220° – 229°	230° – 239°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	0 53·1	1 00·8	1 08·5	1 15·8	1 22·7	1 28·8	1 34·0	1 38·1	1 41·1	1 42·8	1 43·2	1 42·2
1	53·8	01·6	09·2	16·5	23·3	29·3	34·4	38·5	41·3	42·9	43·1	42·1
2	54·6	02·3	10·0	17·2	23·9	29·9	34·9	38·8	41·5	43·0	43·1	41·9
3	55·4	03·1	10·7	17·9	24·6	30·4	35·3	39·1	41·7	43·0	43·0	41·7
4	56·1	03·9	11·5	18·6	25·2	31·0	35·8	39·5	41·9	43·1	42·9	41·5
5	0 56·9	1 04·6	1 12·2	1 19·3	1 25·8	1 31·5	1 36·2	1 39·8	1 42·1	1 43·1	1 42·9	1 41·3
6	57·7	05·4	12·9	20·0	26·4	32·0	36·6	40·1	42·3	43·2	42·8	41·0
7	58·5	06·2	13·7	20·7	27·0	32·5	37·0	40·3	42·4	43·2	42·6	40·8
8	0 59·2	06·9	14·4	21·3	27·6	33·0	37·4	40·6	42·6	43·2	42·5	40·5
9	1 00·0	07·7	15·1	22·0	28·2	33·5	37·8	40·9	42·7	43·2	42·4	40·3
10	1 00·8	1 08·5	1 15·8	1 22·7	1 28·8	1 34·0	1 38·1	1 41·1	1 42·8	1 43·2	1 42·2	1 40·0
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
°	′	′	′	′	′	′	′	′	′	′	′	′
0	0·3	0·3	0·3	0·3	0·4	0·4	0·5	0·5	0·6	0·6	0·6	0·6
10	·3	·3	·3	·4	·4	·5	·5	·6	·6	·6	·6	·6
20	·4	·4	·4	·4	·4	·5	·5	·6	·6	·6	·6	·6
30	·4	·4	·4	·5	·5	·5	·5	·6	·6	·6	·6	·6
40	0·5	0·5	0·5	0·5	0·5	0·6	0·6	0·6	0·6	0·6	0·6	0·6
45	·5	·5	·5	·6	·6	·6	·6	·6	·6	·6	·6	·6
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·7	·7	·7	·7	·6	·6	·6	·6	·6	·6	·6	·6
60	·8	·8	·7	·7	·7	·7	·6	·6	·6	·6	·6	·6
62	0·8	0·8	0·8	0·8	0·7	0·7	0·7	0·6	0·6	0·6	0·6	0·6
64	·8	·8	·8	·8	·8	·7	·7	·6	·6	·6	·6	·6
66	0·9	0·9	·9	·8	·8	·7	·7	·6	·6	·6	·6	·6
68	1·0	1·0	0·9	0·9	0·8	0·8	0·7	0·7	0·6	0·6	0·6	0·6
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
	′	′	′	′	′	′	′	′	′	′	′	′
Jan.	0·6	0·6	0·5	0·5	0·5	0·5	0·4	0·4	0·4	0·4	0·4	0·4
Feb.	·8	·7	·7	·6	·6	·6	·5	·5	·4	·4	·4	·4
Mar.	0·9	0·9	·8	·8	·8	·7	·7	·6	·5	·5	·4	·4
Apr.	1·0	1·0	0·9	0·9	0·9	0·9	0·8	0·8	0·7	0·6	0·6	0·5
May	0·9	1·0	1·0	1·0	1·0	0·9	0·9	·9	·8	·8	·7	·7
June	·8	0·9	0·9	0·9	1·0	1·0	1·0	·9	·9	·9	·8	·8
July	0·7	0·7	0·8	0·8	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·9
Aug.	·5	·6	·6	·7	·7	·7	·8	·8	·9	·9	·9	·9
Sept.	·4	·4	·4	·5	·5	·6	·6	·7	·7	·8	·8	·8
Oct.	0·3	0·3	0·3	0·3	0·3	0·4	0·4	0·5	0·5	0·6	0·6	0·7
Nov.	·2	·2	·2	·2	·2	·2	·3	·3	·3	·4	·5	·5
Dec.	0·3	0·3	0·2	0·2	0·2	0·1	0·1	0·2	0·2	0·2	0·3	0·4
Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	359·3	359·3	359·3	359·3	359·4	359·5	359·6	359·7	359·8	0·0	0·1	0·2
20	359·2	359·2	359·2	359·3	359·4	359·5	359·6	359·7	359·8	0·0	0·1	0·2
40	359·0	359·0	359·1	359·1	359·2	359·3	359·5	359·6	359·8	0·0	0·1	0·3
50	358·8	358·9	358·9	359·0	359·1	359·2	359·4	359·6	359·7	359·9	0·1	0·3
55	358·7	358·7	358·8	358·9	359·0	359·1	359·3	359·5	359·7	359·9	0·2	0·4
60	358·5	358·5	358·6	358·7	358·8	359·0	359·2	359·4	359·7	359·9	0·2	0·4
65	358·2	358·3	358·3	358·5	358·6	358·8	359·1	359·3	359·6	359·9	0·2	0·5

ILLUSTRATION

On 1999 April 21 at $23^h\ 18^m\ 56^s$ UT in longitude W 37° 14′ the apparent altitude (corrected for refraction), H_O, of *Polaris* was 49° 31′·6

From the daily pages:	° ′
GHA Aries (23^h)	194 34·1
Increment ($18^m\ 56^s$)	4 44·8
Longitude (west)	−37 14
LHA Aries	162 05

	° ′
H_O	49 31·6
a_0 (argument 162° 05′)	1 24·0
a_1 (Lat 50° approx.)	0·6
a_2 (April)	0·9
Sum − 1° = Lat =	49 57·1

POLARIS (POLE STAR) TABLES, 1999

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

LHA ARIES	240° – 249°	250° – 259°	260° – 269°	270° – 279°	280° – 289°	290° – 299°	300° – 309°	310° – 319°	320° – 329°	330° – 339°	340° – 349°	350° – 359°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	1 40·0	1 36·5	1 31·9	1 26·3	1 19·8	1 12·7	1 05·2	0 57·5	0 49·8	0 42·4	0 35·4	0 29·2
1	39·7	36·1	31·4	25·7	19·1	12·0	04·4	56·7	49·0	41·6	34·8	28·6
2	39·4	35·7	30·8	25·0	18·4	11·3	03·7	55·9	48·3	40·9	34·1	28·1
3	39·1	35·2	30·3	24·4	17·8	10·5	02·9	55·2	47·5	40·2	33·5	27·5
4	38·7	34·8	29·7	23·8	17·1	09·8	02·1	54·4	46·8	39·5	32·8	27·0
5	1 38·4	1 34·3	1 29·2	1 23·1	1 16·3	1 09·0	1 01·4	0 53·6	0 46·0	0 38·8	0 32·2	0 26·4
6	38·0	33·9	28·6	22·5	15·6	08·3	1 00·6	52·9	45·3	38·1	31·6	25·9
7	37·7	33·4	28·0	21·8	14·9	07·5	0 59·8	52·1	44·6	37·4	31·0	25·4
8	37·3	32·9	27·5	21·2	14·2	06·7	59·0	51·3	43·8	36·8	30·4	24·9
9	36·9	32·4	26·9	20·5	13·5	06·0	58·3	50·6	43·1	36·1	29·8	24·4
10	1 36·5	1 31·9	1 26·3	1 19·8	1 12·7	1 05·2	0 57·5	0 49·8	0 42·4	0 35·4	0 29·2	0 23·9
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
°	′	′	′	′	′	′	′	′	′	′	′	′
0	0·5	0·5	0·4	0·4	0·3	0·3	0·3	0·3	0·3	0·3	0·4	0·4
10	·5	·5	·4	·4	·4	·3	·3	·3	·3	·4	·4	·5
20	·6	·5	·5	·4	·4	·4	·4	·4	·4	·4	·4	·5
30	·6	·5	·5	·5	·5	·4	·4	·4	·4	·5	·5	·5
40	0·6	0·6	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·6
45	·6	·6	·6	·6	·6	·5	·5	·5	·5	·6	·6	·6
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·6	·6	·7	·7	·7	·7	·7	·7	·6	·6
60	·6	·7	·7	·7	·7	·7	·8	·8	·7	·7	·7	·7
62	0·6	0·7	0·7	0·7	0·8	0·8	0·8	0·8	0·8	0·8	0·7	0·7
64	·7	·7	·7	·8	·8	·8	·8	·8	·8	·8	·8	·7
66	·7	·7	·8	·8	·9	·9	0·9	0·9	·9	·8	·8	·7
68	0·7	0·7	0·8	0·9	0·9	0·9	1·0	1·0	0·9	0·9	0·8	0·8
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
	′	′	′	′	′	′	′	′	′	′	′	′
Jan.	0·4	0·5	0·5	0·5	0·5	0·6	0·6	0·6	0·7	0·7	0·7	0·7
Feb.	·4	·4	·4	·4	·4	·4	·4	·5	·5	·6	·6	·6
Mar.	·4	·3	·3	·3	·3	·3	·3	·3	·4	·4	·4	·5
Apr.	0·5	0·4	0·4	0·3	0·3	0·3	0·2	0·2	0·3	0·3	0·3	0·3
May	·6	·5	·5	·4	·4	·3	·3	·2	·2	·2	·2	·3
June	·7	·7	·6	·6	·5	·4	·4	·3	·3	·3	·2	·2
July	0·8	0·8	0·8	0·7	0·6	0·6	0·5	0·5	0·4	0·4	0·3	0·3
Aug.	·9	·9	·9	·8	·8	·7	·7	·6	·6	·5	·5	·5
Sept.	·9	·9	·9	·9	·9	·9	·8	·8	·8	·7	·7	·6
Oct.	0·8	0·8	0·8	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·8
Nov.	·6	·7	·7	·8	·9	·9	1·0	1·0	1·0	1·0	1·0	1·0
Dec.	0·4	0·5	0·6	0·7	0·7	0·8	0·9	0·9	1·0	1·0	1·0	1·1
Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·3	0·4	0·5	0·6	0·7	0·7	0·7	0·7	0·7	0·7	0·6	0·5
20	0·4	0·5	0·6	0·7	0·7	0·8	0·8	0·8	0·8	0·7	0·6	0·5
40	0·4	0·6	0·7	0·8	0·9	0·9	1·0	1·0	0·9	0·9	0·8	0·7
50	0·5	0·7	0·8	1·0	1·1	1·1	1·1	1·1	1·1	1·0	0·9	0·8
55	0·6	0·8	0·9	1·1	1·2	1·3	1·3	1·3	1·2	1·2	1·0	0·9
60	0·7	0·9	1·1	1·2	1·4	1·4	1·5	1·5	1·4	1·3	1·2	1·0
65	0·8	1·0	1·3	1·4	1·6	1·7	1·7	1·7	1·7	1·6	1·4	1·2

Latitude = Apparent altitude (corrected for refraction) $-1° + a_0 + a_1 + a_2$

The table is entered with LHA Aries to determine the column to be used; each column refers to a range of 10°. a_0 is taken, with mental interpolation, from the upper table with the units of LHA Aries in degrees as argument; a_1, a_2 are taken, without interpolation, from the second and third tables with arguments latitude and month respectively. a_0, a_1, a_2, are always positive. The final table gives the azimuth of *Polaris*.

ALTITUDE CORRECTION TABLES 0°–35°—MOON

App. Alt.	0°–4°	5°–9°	10°–14°	15°–19°	20°–24°	25°–29°	30°–34°	App. Alt.
	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	
′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	′
00	0 33·8	5 58·2	10 62·1	15 62·8	20 62·2	25 60·8	30 58·9	00
10	35·9	58·5	62·2	62·8	62·1	60·8	58·8	10
20	37·8	58·7	62·2	62·8	62·1	60·7	58·8	20
30	39·6	58·9	62·3	62·8	62·1	60·7	58·7	30
40	41·2	59·1	62·3	62·8	62·0	60·6	58·6	40
50	42·6	59·3	62·4	62·7	62·0	60·6	58·5	50
00	1 44·0	6 59·5	11 62·4	16 62·7	21 62·0	26 60·5	31 58·5	00
10	45·2	59·7	62·4	62·7	61·9	60·4	58·4	10
20	46·3	59·9	62·5	62·7	61·9	60·4	58·3	20
30	47·3	60·0	62·5	62·7	61·9	60·3	58·2	30
40	48·3	60·2	62·5	62·7	61·8	60·3	58·2	40
50	49·2	60·3	62·6	62·7	61·8	60·2	58·1	50
00	2 50·0	7 60·5	12 62·6	17 62·7	22 61·7	27 60·1	32 58·0	00
10	50·8	60·6	62·6	62·6	61·7	60·1	57·9	10
20	51·4	60·7	62·6	62·6	61·6	60·0	57·8	20
30	52·1	60·9	62·7	62·6	61·6	59·9	57·8	30
40	52·7	61·0	62·7	62·6	61·5	59·9	57·7	40
50	53·3	61·1	62·7	62·6	61·5	59·8	57·6	50
00	3 53·8	8 61·2	13 62·7	18 62·5	23 61·5	28 59·7	33 57·5	00
10	54·3	61·3	62·7	62·5	61·4	59·7	57·4	10
20	54·8	61·4	62·7	62·5	61·4	59·6	57·4	20
30	55·2	61·5	62·8	62·5	61·3	59·6	57·3	30
40	55·6	61·6	62·8	62·4	61·3	59·5	57·2	40
50	56·0	61·6	62·8	62·4	61·2	59·4	57·1	50
00	4 56·4	9 61·7	14 62·8	19 62·4	24 61·2	29 59·3	34 57·0	00
10	56·7	61·8	62·8	62·3	61·1	59·3	56·9	10
20	57·1	61·9	62·8	62·3	61·1	59·2	56·9	20
30	57·4	61·9	62·8	62·3	61·0	59·1	56·8	30
40	57·7	62·0	62·8	62·2	60·9	59·1	56·7	40
50	57·9	62·1	62·8	62·2	60·9	59·0	56·6	50

H.P.	L	U	L	U	L	U	L	U	L	U	L	U	L	U	H.P.
′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
54·0	0·3	0·9	0·3	0·9	0·4	1·0	0·5	1·1	0·6	1·2	0·7	1·3	0·9	1·5	54·0
54·3	0·7	1·1	0·7	1·2	0·7	1·2	0·8	1·3	0·9	1·4	1·1	1·5	1·2	1·7	54·3
54·6	1·1	1·4	1·1	1·4	1·1	1·4	1·2	1·5	1·3	1·6	1·4	1·7	1·5	1·8	54·6
54·9	1·4	1·6	1·5	1·6	1·5	1·6	1·6	1·7	1·6	1·8	1·8	1·9	1·9	2·0	54·9
55·2	1·8	1·8	1·8	1·8	1·9	1·9	1·9	1·9	2·0	2·0	2·1	2·1	2·2	2·2	55·2
55·5	2·2	2·0	2·2	2·0	2·3	2·1	2·3	2·1	2·4	2·2	2·4	2·3	2·5	2·4	55·5
55·8	2·6	2·2	2·6	2·2	2·6	2·3	2·7	2·3	2·7	2·4	2·8	2·4	2·9	2·5	55·8
56·1	3·0	2·4	3·0	2·5	3·0	2·5	3·0	2·5	3·1	2·6	3·1	2·6	3·2	2·7	56·1
56·4	3·4	2·7	3·4	2·7	3·4	2·7	3·4	2·7	3·4	2·8	3·5	2·8	3·5	2·9	56·4
56·7	3·7	2·9	3·7	2·9	3·8	2·9	3·8	2·9	3·8	3·0	3·8	3·0	3·9	3·0	56·7
57·0	4·1	3·1	4·1	3·1	4·1	3·1	4·1	3·1	4·2	3·1	4·2	3·2	4·2	3·2	57·0
57·3	4·5	3·3	4·5	3·3	4·5	3·3	4·5	3·3	4·5	3·3	4·5	3·4	4·6	3·4	57·3
57·6	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·6	57·6
57·9	5·3	3·8	5·3	3·8	5·2	3·8	5·2	3·7	5·2	3·7	5·2	3·7	5·2	3·7	57·9
58·2	5·6	4·0	5·6	4·0	5·6	4·0	5·6	4·0	5·6	3·9	5·6	3·9	5·6	3·9	58·2
58·5	6·0	4·2	6·0	4·2	6·0	4·2	6·0	4·2	6·0	4·1	5·9	4·1	5·9	4·1	58·5
58·8	6·4	4·4	6·4	4·4	6·4	4·4	6·3	4·4	6·3	4·3	6·3	4·3	6·2	4·2	58·8
59·1	6·8	4·6	6·8	4·6	6·7	4·6	6·7	4·6	6·7	4·5	6·6	4·5	6·6	4·4	59·1
59·4	7·2	4·8	7·1	4·8	7·1	4·8	7·1	4·8	7·0	4·7	7·0	4·7	6·9	4·6	59·4
59·7	7·5	5·1	7·5	5·0	7·5	5·0	7·5	5·0	7·4	4·9	7·3	4·8	7·2	4·7	59·7
60·0	7·9	5·3	7·9	5·3	7·9	5·2	7·8	5·2	7·8	5·1	7·7	5·0	7·6	4·9	60·0
60·3	8·3	5·5	8·3	5·5	8·2	5·4	8·2	5·4	8·1	5·3	8·0	5·2	7·9	5·1	60·3
60·6	8·7	5·7	8·7	5·7	8·6	5·7	8·6	5·6	8·5	5·5	8·4	5·4	8·2	5·3	60·6
60·9	9·1	5·9	9·0	5·9	9·0	5·9	8·9	5·8	8·8	5·7	8·7	5·6	8·6	5·4	60·9
61·2	9·5	6·2	9·4	6·1	9·4	6·1	9·3	6·0	9·2	5·9	9·1	5·8	8·9	5·6	61·2
61·5	9·8	6·4	9·8	6·3	9·7	6·3	9·7	6·2	9·5	6·1	9·4	5·9	9·2	5·8	61·5

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ	Ht. of Eye
m	′	ft.	m	′	ft.
2·4	−2·8	8·0	9·5	−5·5	31·5
2·6	−2·9	8·6	9·9	−5·6	32·7
2·8	−3·0	9·2	10·3	−5·7	33·9
3·0	−3·1	9·8	10·6	−5·8	35·1
3·2	−3·2	10·5	11·0	−5·9	36·3
3·4	−3·3	11·2	11·4	−6·0	37·6
3·6	−3·4	11·9	11·8	−6·1	38·9
3·8	−3·5	12·6	12·2	−6·2	40·1
4·0	−3·6	13·3	12·6	−6·3	41·5
4·3	−3·7	14·1	13·0	−6·4	42·8
4·5	−3·8	14·9	13·4	−6·5	44·2
4·7	−3·9	15·7	13·8	−6·6	45·5
5·0	−4·0	16·5	14·2	−6·7	46·9
5·2	−4·1	17·4	14·7	−6·8	48·4
5·5	−4·2	18·3	15·1	−6·9	49·8
5·8	−4·3	19·1	15·5	−7·0	51·3
6·1	−4·4	20·1	16·0	−7·1	52·8
6·3	−4·5	21·0	16·5	−7·2	54·3
6·6	−4·6	22·0	16·9	−7·3	55·8
6·9	−4·7	22·9	17·4	−7·4	57·4
7·2	−4·8	23·9	17·9	−7·5	58·9
7·5	−4·9	24·9	18·4	−7·6	60·5
7·9	−5·0	26·0	18·8	−7·7	62·1
8·2	−5·1	27·1	19·3	−7·8	63·8
8·5	−5·2	28·1	19·8	−7·9	65·4
8·8	−5·3	29·2	20·4	−8·0	67·1
9·2	−5·4	30·4	20·9	−8·1	68·8
9·5		31·5	21·4		70·5

MOON CORRECTION TABLE

The correction is in two parts; the first correction is taken from the upper part of the table with argument apparent altitude, and the second from the lower part, with argument H.P., in the same column as that from which the first correction was taken. Separate corrections are given in the lower part for lower (L) and upper (U) limbs. All corrections are to be **added** to apparent altitude, *but 30′ is to be subtracted from the altitude of the upper limb.*

For corrections for pressure and temperature see page A4.

For bubble sextant observations ignore dip, take the mean of upper and lower limb corrections and subtract 15′ from the altitude.

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.