THE NAUTICAL ALMANAC

FOR THE YEAR

1981

FOR TRAINING PURPOSES ONLY

THE

NAUTICAL ALMANAC

FOR THE YEAR

1981

Printed and distributed by
www.starpathpublications.com
for use with USCG Exam Questions
and other training applications

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

SUN

OCT.—MAR.

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 34	+10·8	−21·5
9 45	+10·9	−21·4
9 56	+11·0	−21·3
10 08	+11·1	−21·2
10 21	+11·2	−21·1
10 34	+11·3	−21·0
10 47	+11·4	−20·9
11 01	+11·5	−20·8
11 15	+11·6	−20·7
11 30	+11·7	−20·6
11 46	+11·8	−20·5
12 02	+11·9	−20·4
12 19	+12·0	−20·3
12 37	+12·1	−20·2
12 55	+12·2	−20·1
13 14	+12·3	−20·0
13 35	+12·4	−19·9
13 56	+12·5	−19·8
14 18	+12·6	−19·7
14 42	+12·7	−19·6
15 06	+12·8	−19·5
15 32	+12·9	−19·4
15 59	+13·0	−19·3
16 28	+13·1	−19·2
16 59	+13·2	−19·1
17 32	+13·3	−19·0
18 06	+13·4	−18·9
18 42	+13·5	−18·8
19 21	+13·6	−18·7
20 03	+13·7	−18·6
20 48	+13·8	−18·5
21 35	+13·9	−18·4
22 26	+14·0	−18·3
23 22	+14·1	−18·2
24 21	+14·2	−18·1
25 26	+14·3	−18·0
26 36	+14·4	−17·9
27 52	+14·5	−17·8
29 15	+14·6	−17·7
30 46	+14·7	−17·6
32 26	+14·8	−17·5
34 17	+14·9	−17·4
36 20	+15·0	−17·3
38 36	+15·1	−17·2
41 08	+15·2	−17·1
43 59	+15·3	−17·0
47 10	+15·4	−16·9
50 46	+15·5	−16·8
54 49	+15·6	−16·7
59 23	+15·7	−16·6
64 30	+15·8	−16·5
70 12	+15·9	−16·4
76 26	+16·0	−16·3
83 05	+16·1	−16·2
90 00		

APR.—SEPT.

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 39	+10·6	−21·2
9 51	+10·7	−21·1
10 03	+10·8	−21·0
10 15	+10·9	−20·9
10 27	+11·0	−20·8
10 40	+11·1	−20·7
10 54	+11·2	−20·6
11 08	+11·3	−20·5
11 23	+11·4	−20·4
11 38	+11·5	−20·3
11 54	+11·6	−20·2
12 10	+11·7	−20·1
12 28	+11·8	−20·0
12 46	+11·9	−19·9
13 05	+12·0	−19·8
13 24	+12·1	−19·7
13 45	+12·2	−19·6
14 07	+12·3	−19·5
14 30	+12·4	−19·4
14 54	+12·5	−19·3
15 19	+12·6	−19·2
15 46	+12·7	−19·1
16 14	+12·8	−19·0
16 44	+12·9	−18·9
17 15	+13·0	−18·8
17 48	+13·1	−18·7
18 24	+13·2	−18·6
19 01	+13·3	−18·5
19 42	+13·4	−18·4
20 25	+13·5	−18·3
21 11	+13·6	−18·2
22 00	+13·7	−18·1
22 54	+13·8	−18·0
23 51	+13·9	−17·9
24 53	+14·0	−17·8
26 00	+14·1	−17·7
27 13	+14·2	−17·6
28 33	+14·3	−17·5
30 00	+14·4	−17·4
31 35	+14·5	−17·3
33 20	+14·6	−17·2
35 17	+14·7	−17·1
37 26	+14·8	−17·0
39 50	+14·9	−16·9
42 31	+15·0	−16·8
45 31	+15·1	−16·7
48 55	+15·2	−16·6
52 44	+15·3	−16·5
57 02	+15·4	−16·4
61 51	+15·5	−16·3
67 17	+15·6	−16·2
73 16	+15·7	−16·1
79 43	+15·8	−16·0
86 32	+15·9	−15·9
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
	1981
	VENUS
Jan. 1-Sept. 27	
° ′	
42 + 0·1	
Sept. 28-Nov. 13	
° ′	
47 + 0·2	
Nov. 14-Dec. 10	
° ′	
46 + 0·3	
Dec. 11-Dec. 26	
° ′	
11 + 0·4	
41 + 0·5	
Dec. 27-Dec. 31	
° ′	
6 + 0·5	
20 + 0·6	
31 + 0·7	
	MARS
Jan. 1-Dec. 31	
° ′	
60 + 0·1	

DIP

Ht. of Eye	Corrⁿ
m	′
2·4	−2·8
2·6	−2·9
2·8	−3·0
3·0	−3·1
3·2	−3·2
3·4	−3·3
3·6	−3·4
3·8	−3·5
4·0	−3·6
4·3	−3·7
4·5	−3·8
4·7	−3·9
5·0	−4·0
5·2	−4·1
5·5	−4·2
5·8	−4·3
6·1	−4·4
6·3	−4·5
6·6	−4·6
6·9	−4·7
7·2	−4·8
7·5	−4·9
7·9	−5·0
8·2	−5·1
8·5	−5·2
8·8	−5·3
9·2	−5·4
9·5	−5·5
9·9	−5·6
10·3	−5·7
10·6	−5·8
11·0	−5·9
11·4	−6·0
11·8	−6·1
12·2	−6·2
12·6	−6·3
13·0	−6·4
13·4	−6·5
13·8	−6·6
14·2	−6·7
14·7	−6·8
15·1	−6·9
15·5	−7·0
16·0	−7·1
16·5	−7·2
16·9	−7·3
17·4	−7·4
17·9	−7·5
18·4	−7·6
18·8	−7·7
19·3	−7·8
19·8	−7·9
20·4	−8·0
20·9	−8·1
21·4	

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

Corrⁿ
m
1·0 — 1·8
1·5 — 2·2
2·0 — 2·5
2·5 — 2·8
3·0 — 3·0
See table ←
m
20 — 7·9
22 — 8·3
24 — 8·6
26 — 9·0
28 — 9·3
30 — 9·6
32 — 10·0
34 — 10·3
36 — 10·6
38 — 10·8
40 — 11·1
42 — 11·4
44 — 11·7
46 — 11·9
48 — 12·2
ft.
2 — 1·4
4 — 1·9
6 — 2·4
8 — 2·7
10 — 3·1
See table ←
ft.
70 — 8·1
75 — 8·4
80 — 8·7
85 — 8·9
90 — 9·2
95 — 9·5
100 — 9·7
105 — 9·9
110 — 10·2
115 — 10·4
120 — 10·6
125 — 10·8
130 — 11·1
135 — 11·3
140 — 11·5
145 — 11·7
150 — 11·9
155 — 12·1

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

For daylight observations of Venus, see page 260.

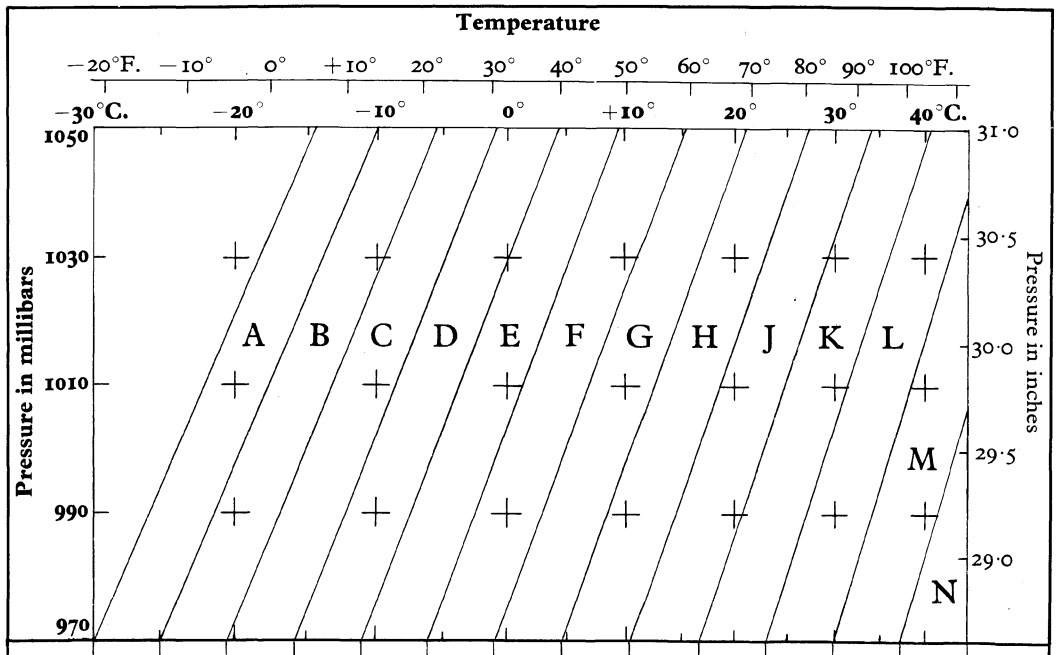
App. Alt.	OCT.–MAR. SUN Lower Limb	OCT.–MAR. SUN Upper Limb	APR.–SEPT. SUN Lower Limb	APR.–SEPT. SUN Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
0 00	−18·2	−50·5	−18·4	−50·2	−34·5
03	17·5	49·8	17·8	49·6	33·8
06	16·9	49·2	17·1	48·9	33·2
09	16·3	48·6	16·5	48·3	32·6
12	15·7	48·0	15·9	47·7	32·0
15	15·1	47·4	15·3	47·1	31·4
0 18	−14·5	−46·8	−14·8	−46·6	−30·8
21	14·0	46·3	14·2	46·0	30·3
24	13·5	45·8	13·7	45·5	29·8
27	12·9	45·2	13·2	45·0	29·2
30	12·4	44·7	12·7	44·5	28·7
33	11·9	44·2	12·2	44·0	28·2
0 36	−11·5	−43·8	−11·7	−43·5	−27·8
39	11·0	43·3	11·2	43·0	27·3
42	10·5	42·8	10·8	42·6	26·8
45	10·1	42·4	10·3	42·1	26·4
48	9·6	41·9	9·9	41·7	25·9
51	9·2	41·5	9·5	41·3	25·5
0 54	− 8·8	−41·1	− 9·1	−40·9	−25·1
0 57	8·4	40·7	8·7	40·5	24·7
1 00	8·0	40·3	8·3	40·1	24·3
03	7·7	40·0	7·9	39·7	24·0
06	7·3	39·6	7·5	39·3	23·6
09	6·9	39·2	7·2	39·0	23·2
1 12	− 6·6	−38·9	− 6·8	−38·6	−22·9
15	6·2	38·5	6·5	38·3	22·5
18	5·9	38·2	6·2	38·0	22·2
21	5·6	37·9	5·8	37·6	21·9
24	5·3	37·6	5·5	37·3	21·6
27	4·9	37·2	5·2	37·0	21·2
1 30	− 4·6	−36·9	− 4·9	−36·7	−20·9
35	4·2	36·5	4·4	36·2	20·5
40	3·7	36·0	4·0	35·8	20·0
45	3·2	35·5	3·5	35·3	19·5
50	2·8	35·1	3·1	34·9	19·1
1 55	2·4	34·7	2·6	34·4	18·7
2 00	− 2·0	−34·3	− 2·2	−34·0	−18·3
05	1·6	33·9	1·8	33·6	17·9
10	1·2	33·5	1·5	33·3	17·5
15	0·9	33·2	1·1	32·9	17·2
20	0·5	32·8	0·8	32·6	16·8
25	− 0·2	32·5	0·4	32·2	16·5
2 30	+ 0·2	−32·1	− 0·1	−31·9	−16·1
35	0·5	31·8	+ 0·2	31·6	15·8
40	0·8	31·5	0·5	31·3	15·5
45	1·1	31·2	0·8	31·0	15·2
50	1·4	30·9	1·1	30·7	14·9
2 55	1·6	30·7	1·4	30·4	14·7
3 00	+ 1·9	−30·4	+ 1·7	−30·1	−14·4
05	2·2	30·1	1·9	29·9	14·1
10	2·4	29·9	2·1	29·7	13·9
15	2·6	29·7	2·4	29·4	13·7
20	2·9	29·4	2·6	29·2	13·4
25	3·1	29·2	2·9	28·9	13·2
3 30	+ 3·3	−29·0	+ 3·1	−28·7	−13·0

App. Alt.	OCT.–MAR. SUN Lower Limb	OCT.–MAR. SUN Upper Limb	APR.–SEPT. SUN Lower Limb	APR.–SEPT. SUN Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
3 30	+ 3·3	−29·0	+ 3·1	−28·7	−13·0
35	3·6	28·7	3·3	28·5	12·7
40	3·8	28·5	3·5	28·3	12·5
45	4·0	28·3	3·7	28·1	12·3
50	4·2	28·1	3·9	27·9	12·1
3 55	4·4	27·9	4·1	27·7	11·9
4 00	+ 4·5	−27·8	+ 4·3	−27·5	−11·8
05	4·7	27·6	4·5	27·3	11·6
10	4·9	27·4	4·6	27·2	11·4
15	5·1	27·2	4·8	27·0	11·2
20	5·2	27·1	5·0	26·8	11·1
25	5·4	26·9	5·1	26·7	10·9
4 30	+ 5·6	−26·7	+ 5·3	−26·5	−10·7
35	5·7	26·6	5·5	26·3	10·6
40	5·9	26·4	5·6	26·2	10·4
45	6·0	26·3	5·8	26·0	10·3
50	6·2	26·1	5·9	25·9	10·1
4 55	6·3	26·0	6·0	25·8	10·0
5 00	+ 6·4	−25·9	+ 6·2	−25·6	− 9·9
05	6·6	25·7	6·3	25·5	9·7
10	6·7	25·6	6·4	25·4	9·6
15	6·8	25·5	6·6	25·2	9·5
20	6·9	25·4	6·7	25·1	9·4
25	7·1	25·2	6·8	25·0	9·2
5 30	+ 7·2	−25·1	+ 6·9	−24·9	− 9·1
35	7·3	25·0	7·0	24·8	9·0
40	7·4	24·9	7·2	24·6	8·9
45	7·5	24·8	7·3	24·5	8·8
50	7·6	24·7	7·4	24·4	8·7
5 55	7·7	24·6	7·5	24·3	8·6
6 00	+ 7·8	−24·5	+ 7·6	−24·2	− 8·5
10	8·0	24·3	7·8	24·0	8·3
20	8·2	24·1	8·0	23·8	8·1
30	8·4	23·9	8·1	23·7	7·9
40	8·6	23·7	8·3	23·5	7·7
6 50	8·7	23·6	8·5	23·3	7·6
7 00	+ 8·9	−23·4	+ 8·6	−23·2	− 7·4
10	9·1	23·2	8·8	23·0	7·2
20	9·2	23·1	9·0	22·8	7·1
30	9·3	23·0	9·1	22·7	7·0
40	9·5	22·8	9·2	22·6	6·8
7 50	9·6	22·7	9·4	22·4	6·7
8 00	+ 9·7	−22·6	+ 9·5	−22·3	− 6·6
10	9·9	22·4	9·6	22·2	6·4
20	10·0	22·3	9·7	22·1	6·3
30	10·1	22·2	9·8	22·0	6·2
40	10·2	22·1	10·0	21·8	6·1
8 50	10·3	22·0	10·1	21·7	6·0
9 00	+10·4	−21·9	+10·2	−21·6	− 5·9
10	10·5	21·8	10·3	21·5	5·8
20	10·6	21·7	10·4	21·4	5·7
30	10·7	21·6	10·5	21·3	5·6
40	10·8	21·5	10·6	21·2	5·5
9 50	10·9	21·4	10·6	21·2	5·4
10 00	+11·0	−21·3	+10·7	−21·1	− 5·3

Additional corrections for temperature and pressure are given on the following page.
For bubble sextant observations ignore dip and use the star corrections for Sun, planets, and stars.

A4 ALTITUDE CORRECTION TABLES—ADDITIONAL CORRECTIONS

ADDITIONAL REFRACTION CORRECTIONS FOR NON-STANDARD CONDITIONS



App. Alt.	A	B	C	D	E	F	G	H	J	K	L	M	N	App. Alt.
° ′	′	′	′	′	′	′	′	′	′	′	′	′	′	° ′
0 00	−6·9	−5·7	−4·6	−3·4	−2·3	−1·1	0·0	+1·1	+2·3	+3·4	+4·6	+5·7	+6·9	0 00
0 30	5·2	4·4	3·5	2·6	1·7	0·9	0·0	0·9	1·7	2·6	3·5	4·4	5·2	0 30
1 00	4·3	3·5	2·8	2·1	1·4	0·7	0·0	0·7	1·4	2·1	2·8	3·5	4·3	1 00
1 30	3·5	2·9	2·4	1·8	1·2	0·6	0·0	0·6	1·2	1·8	2·4	2·9	3·5	1 30
2 00	3·0	2·5	2·0	1·5	1·0	0·5	0·0	0·5	1·0	1·5	2·0	2·5	3·0	2 00
2 30	−2·5	−2·1	−1·6	−1·2	−0·8	−0·4	0·0	+0·4	+0·8	+1·2	+1·6	+2·1	+2·5	2 30
3 00	2·2	1·8	1·5	1·1	0·7	0·4	0·0	0·4	0·7	1·1	1·5	1·8	2·2	3 00
3 30	2·0	1·6	1·3	1·0	0·7	0·3	0·0	0·3	0·7	1·0	1·3	1·6	2·0	3 30
4 00	1·8	1·5	1·2	0·9	0·6	0·3	0·0	0·3	0·6	0·9	1·2	1·5	1·8	4 00
4 30	1·6	1·4	1·1	0·8	0·5	0·3	0·0	0·3	0·5	0·8	1·1	1·4	1·6	4 30
5 00	−1·5	−1·3	−1·0	−0·8	−0·5	−0·2	0·0	+0·2	+0·5	+0·8	+1·0	+1·3	+1·5	5 00
6	1·3	1·1	0·9	0·6	0·4	0·2	0·0	0·2	0·4	0·6	0·9	1·1	1·3	6
7	1·1	0·9	0·7	0·6	0·4	0·2	0·0	0·2	0·4	0·6	0·7	0·9	1·1	7
8	1·0	0·8	0·7	0·5	0·3	0·2	0·0	0·2	0·3	0·5	0·7	0·8	1·0	8
9	0·9	0·7	0·6	0·4	0·3	0·1	0·0	0·1	0·3	0·4	0·6	0·7	0·9	9
10 00	−0·8	−0·7	−0·5	−0·4	−0·3	−0·1	0·0	+0·1	+0·3	+0·4	+0·5	+0·7	+0·8	10 00
12	0·7	0·6	0·5	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·5	0·6	0·7	12
14	0·6	0·5	0·4	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·4	0·5	0·6	14
16	0·5	0·4	0·3	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·3	0·4	0·5	16
18	0·4	0·4	0·3	0·2	0·2	0·1	0·0	0·1	0·2	0·2	0·3	0·4	0·4	18
20 00	−0·4	−0·3	−0·3	−0·2	−0·1	−0·1	0·0	+0·1	+0·1	+0·2	+0·3	+0·3	+0·4	20 00
25	0·3	0·3	0·2	0·2	0·1	−0·1	0·0	+0·1	0·1	0·2	0·2	0·3	0·3	25
30	0·3	0·2	0·2	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·2	0·2	0·3	30
35	0·2	0·2	0·1	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·1	0·2	0·2	35
40	0·2	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	+0·1	0·1	0·1	0·1	0·2	40
50 00	−0·1	−0·1	−0·1	−0·1	0·0	0·0	0·0	0·0	0·0	+0·1	+0·1	+0·1	+0·1	50 00

The graph is entered with arguments temperature and pressure to find a zone letter; using as arguments this zone letter and apparent altitude (sextant altitude corrected for dip), a correction is taken from the table. This correction is to be applied to the sextant altitude in addition to the corrections for standard conditions (for the Sun, stars and planets from page A2 and for the Moon from pages xxxiv and xxxv).

PREFACE

The British and American editions of *The Nautical Almanac*, which are identical in content, are produced jointly by H. M. Nautical Almanac Office, Royal Greenwich Observatory, under the supervision of the Superintendent, and by the Nautical Almanac Office, United States Naval Observatory, under the supervision of P. K. Seidelmann and P. M. Janiczek, to the general requirements of the Royal Navy and of the United States Navy. The Almanac is printed separately in the United Kingdom and in the United States of America.

The data in this Almanac can be made available, in a form suitable for direct photographic reproduction, to the appropriate almanac-producing agency in any country; language changes in the headings of the ephemeral pages can be introduced, if desired, during reproduction. Under this arrangement, this Almanac, with minor modifications and changes of language, has been adopted for the Brazilian, Danish, Greek, Indian, Indonesian, Italian, Korean, Mexican, Norwegian, Peruvian and Swedish almanacs.

F. GRAHAM SMITH,
Director,
Royal Greenwich Observatory,
Herstmonceux Castle, East Sussex,
BN27 1RP, England

JOSEPH C. SMITH,
Captain, U.S. Navy,
Superintendent, U.S. Naval Observatory,
Washington, D.C. 20390,
U.S.A.

April 1979

RELIGIOUS CALENDARS

Epiphany	Jan. 6	Low Sunday	Apr. 26
Septuagesima Sunday	Feb. 15	Rogation Sunday	May 24
Quinquagesima Sunday	Mar. 1	Ascension Day—Holy Thursday	May 28
Ash Wednesday	Mar. 4	Whit Sunday—Pentecost	June 7
Quadragesima Sunday	Mar. 8	Trinity Sunday	June 14
Palm Sunday	Apr. 12	Corpus Christi	June 18
Good Friday	Apr. 17	First Sunday in Advent	Nov. 29
Easter Day	Apr. 19	Christmas Day	Dec. 25
Passover, First day of (Pesach)	Apr. 19	Day of Atonement (Yom Kippur)	Oct. 8
Feast of Weeks (Shebuoth)	June 8	Tabernacles, First day of (Succoth)	Oct. 13
Jewish New Year 5742 (Rosh Hashanah)	Sept. 29		
Islamic New Year (1402)	Oct. 30	Ramadân, First day of (tabular)	July 3

CIVIL CALENDAR—UNITED KINGDOM

Accession of Queen Elizabeth II	Feb. 6	Birthday of Prince Philip, Duke of Edinburgh	June 10
St. David (Wales)	Mar. 1	The Queen's Official Birthday	June 13
Commonwealth Day	Mar. 9	Remembrance Sunday	Nov. 8
St. Patrick (Ireland)	Mar. 17	Birthday of the Prince of Wales	Nov. 14
Birthday of Queen Elizabeth II	Apr. 21	St. Andrew (Scotland)	Nov. 30
St. George (England)	Apr. 23		
Coronation Day	June 2		

Bank Holidays in England and Wales—Jan. 1, Apr. 20, May 4, May 25, Aug. 31, Dec. 26
Northern Ireland—Jan. 1, Mar. 17, Apr. 20, May 4, May 25, July 13, Aug. 31, Dec. 26
Scotland—Jan. 1, Jan. 2, Apr. 17, May 4, May 25, Aug. 3, Dec. 25, Dec. 26

CIVIL CALENDAR—UNITED STATES OF AMERICA

New Year's Day	Jan. 1	Labor Day	Sept. 7
Lincoln's Birthday	Feb. 12	Columbus Day	Oct. 12
Washington's Birthday	Feb. 16	Election Day (in certain States)	Nov. 3
Memorial Day	May 25	Veterans Day	Nov. 11
Independence Day	July 4	Thanksgiving Day	Nov. 26

PHASES OF THE MOON

New Moon	d h m	First Quarter	d h m	Full Moon	d h m	Last Quarter	d h m
Jan.	6 07 24	Jan.	13 10 10	Jan.	20 07 39	Jan.	28 04 19
Feb.	4 22 14	Feb.	11 17 49	Feb.	18 22 58	Feb.	27 01 14
Mar.	6 10 31	Mar.	13 01 50	Mar.	20 15 22	Mar.	28 19 34
Apr.	4 20 19	Apr.	11 11 11	Apr.	19 07 59	Apr.	27 10 14
May	4 04 19	May	10 22 22	May	19 00 04	May	26 21 00
June	2 11 32	June	9 11 33	June	17 15 04	June	25 04 25
July	1 19 03	July	9 02 39	July	17 04 39	July	24 09 40
July	31 03 52	Aug.	7 19 26	Aug.	15 16 37	Aug.	22 14 16
Aug.	29 14 43	Sept.	6 13 26	Sept.	14 03 09	Sept.	20 19 47
Sept.	28 04 07	Oct.	6 07 45	Oct.	13 12 49	Oct.	20 03 40
Oct.	27 20 13	Nov.	5 01 09	Nov.	11 22 26	Nov.	18 14 54
Nov.	26 14 38	Dec.	4 16 22	Dec.	11 08 41	Dec.	18 05 47
Dec.	26 10 10						

DAYS OF THE WEEK AND DAYS OF THE YEAR

Day of Month	JAN.		FEB.		MAR.		APR.		MAY		JUNE		JULY		AUG.		SEPT.		OCT.		NOV.		DEC.	
	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year
1	Th.	1	♑.	32	♑.	60	W.	91	F.	121	M.	152	W.	182	S.	213	Tu.	244	Th.	274	♑.	305	Tu.	335
2	F.	2	M.	33	M.	61	Th.	92	S.	122	Tu.	153	Th.	183	♑.	214	W.	245	F.	275	M.	306	W.	336
3	S.	3	Tu.	34	Tu.	62	F.	93	♑.	123	W.	154	F.	184	M.	215	Th.	246	S.	276	Tu.	307	Th.	337
4	♑.	4	W.	35	W.	63	S.	94	M.	124	Th.	155	S.	185	Tu.	216	F.	247	♑.	277	W.	308	F.	338
5	M.	5	Th.	36	Th.	64	♑.	95	Tu.	125	F.	156	♑.	186	W.	217	S.	248	M.	278	Th.	309	S.	339
6	Tu.	6	F.	37	F.	65	M.	96	W.	126	S.	157	M.	187	Th.	218	♑.	249	Tu.	279	F.	310	♑.	340
7	W.	7	S.	38	S.	66	Tu.	97	Th.	127	♑.	158	Tu.	188	F.	219	M.	250	W.	280	S.	311	M.	341
8	Th.	8	♑.	39	♑.	67	W.	98	F.	128	M.	159	W.	189	S.	220	Tu.	251	Th.	281	♑.	312	Tu.	342
9	F.	9	M.	40	M.	68	Th.	99	S.	129	Tu.	160	Th.	190	♑.	221	W.	252	F.	282	M.	313	W.	343
10	S.	10	Tu.	41	Tu.	69	F.	100	♑.	130	W.	161	F.	191	M.	222	Th.	253	S.	283	Tu.	314	Th.	344
11	♑.	11	W.	42	W.	70	S.	101	M.	131	Th.	162	S.	192	Tu.	223	F.	254	♑.	284	W.	315	F.	345
12	M.	12	Th.	43	Th.	71	♑.	102	Tu.	132	F.	163	♑.	193	W.	224	S.	255	M.	285	Th.	316	S.	346
13	Tu.	13	F.	44	F.	72	M.	103	W.	133	S.	164	M.	194	Th.	225	♑.	256	Tu.	286	F.	317	♑.	347
14	W.	14	S.	45	S.	73	Tu.	104	Th.	134	♑.	165	Tu.	195	F.	226	M.	257	W.	287	S.	318	M.	348
15	Th.	15	♑.	46	♑.	74	W.	105	F.	135	M.	166	W.	196	S.	227	Tu.	258	Th.	288	♑.	319	Tu.	349
16	F.	16	M.	47	M.	75	Th.	106	S.	136	Tu.	167	Th.	197	♑.	228	W.	259	F.	289	M.	320	W.	350
17	S.	17	Tu.	48	Tu.	76	F.	107	♑.	137	W.	168	F.	198	M.	229	Th.	260	S.	290	Tu.	321	Th.	351
18	♑.	18	W.	49	W.	77	S.	108	M.	138	Th.	169	S.	199	Tu.	230	F.	261	♑.	291	W.	322	F.	352
19	M.	19	Th.	50	Th.	78	♑.	109	Tu.	139	F.	170	♑.	200	W.	231	S.	262	M.	292	Th.	323	S.	353
20	Tu.	20	F.	51	F.	79	M.	110	W.	140	S.	171	M.	201	Th.	232	♑.	263	Tu.	293	F.	324	♑.	354
21	W.	21	S.	52	S.	80	Tu.	111	Th.	141	♑.	172	Tu.	202	F.	233	M.	264	W.	294	S.	325	M.	355
22	Th.	22	♑.	53	♑.	81	W.	112	F.	142	M.	173	W.	203	S.	234	Tu.	265	Th.	295	♑.	326	Tu.	356
23	F.	23	M.	54	M.	82	Th.	113	S.	143	Tu.	174	Th.	204	♑.	235	W.	266	F.	296	M.	327	W.	357
24	S.	24	Tu.	55	Tu.	83	F.	114	♑.	144	W.	175	F.	205	M.	236	Th.	267	S.	297	Tu.	328	Th.	358
25	♑.	25	W.	56	W.	84	S.	115	M.	145	Th.	176	S.	206	Tu.	237	F.	268	♑.	298	W.	329	F.	359
26	M.	26	Th.	57	Th.	85	♑.	116	Tu.	146	F.	177	♑.	207	W.	238	S.	269	M.	299	Th.	330	S.	360
27	Tu.	27	F.	58	F.	86	M.	117	W.	147	S.	178	M.	208	Th.	239	♑.	270	Tu.	300	F.	331	♑.	361
28	W.	28	S.	59	S.	87	Tu.	118	Th.	148	♑.	179	Tu.	209	F.	240	M.	271	W.	301	S.	332	M.	362
29	Th.	29			♑.	88	W.	119	F.	149	M.	180	W.	210	S.	241	Tu.	272	Th.	302	♑.	333	Tu.	363
30	F.	30			M.	89	Th.	120	S.	150	Tu.	181	Th.	211	♑.	242	W.	273	F.	303	M.	334	W.	364
31	S.	31			Tu.	90			♑.	151			F.	212	M.	243			S.	304			Th.	365

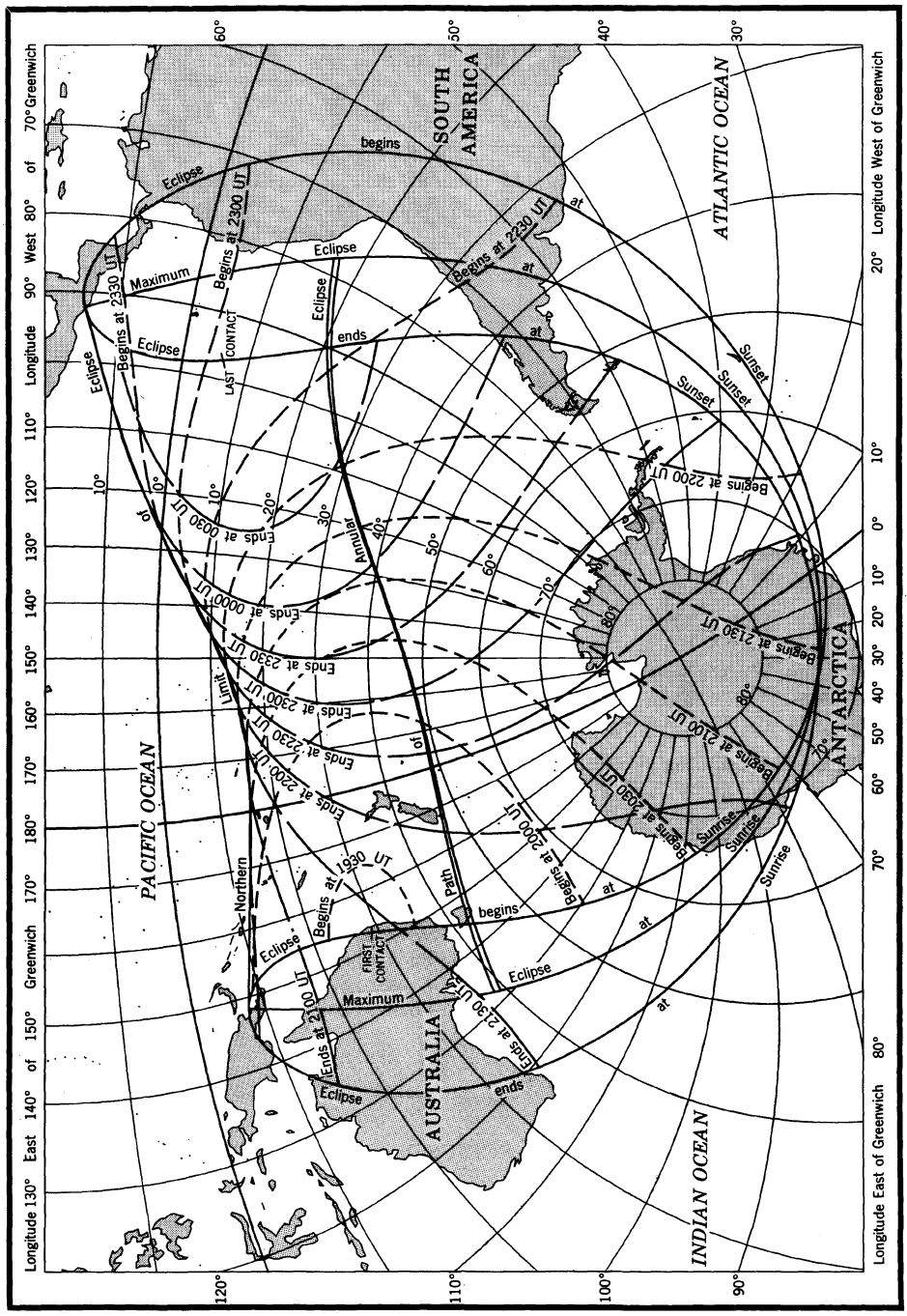
ECLIPSES

There are three eclipses, two of the Sun and one of the Moon.

1. *An Annular Eclipse of the Sun*, February 4-5. See map on page 6. The eclipse begins at $4^d\ 19^h\ 28^m$ and ends at $5^d\ 00^h\ 49^m$; the annular phase begins at $4^d\ 20^h\ 33^m$ and ends at $4^d\ 23^h\ 44^m$. The maximum duration of the annular phase is $1^m\ 11^s$.

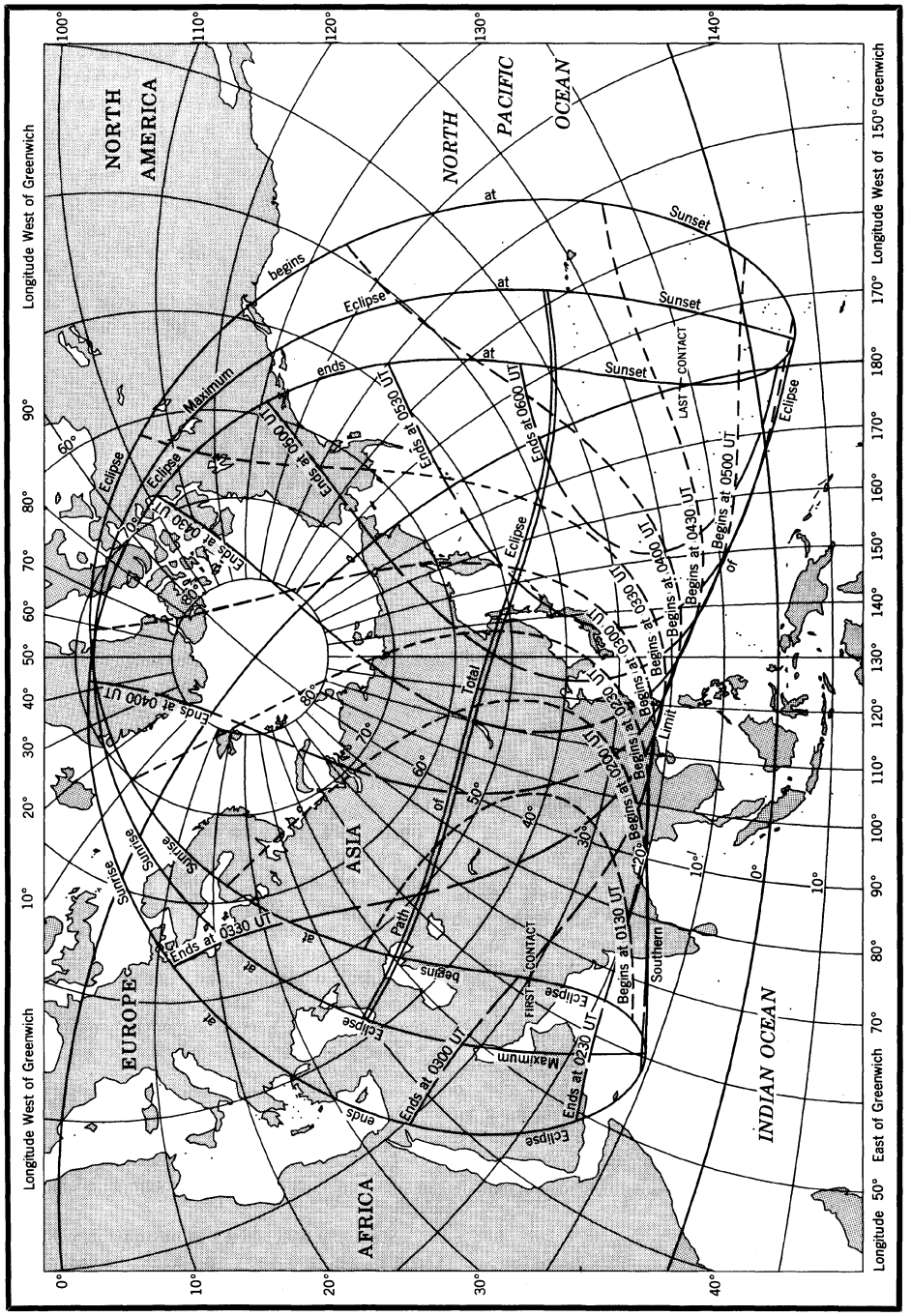
2. *A Partial Eclipse of the Moon*, July 17. The eclipse begins at $03^h\ 25^m$ and ends at $06^h\ 09^m$. It is visible from Africa except the north-eastern part, south-western Europe, the Atlantic Ocean, Antarctica, South America, North America except the north-western part, the eastern Pacific Ocean and New Zealand. At the time of maximum eclipse 0·55 of the Moon's diameter is obscured.

3. *A Total Eclipse of the Sun*, July 31. See map on page 7. The eclipse begins at $01^h\ 11^m$ and ends at $06^h\ 20^m$; the total phase begins at $02^h\ 18^m$ and ends at $05^h\ 14^m$. The maximum duration of the total phase is $2^m\ 02^s$.



SOLAR ECLIPSE DIAGRAMS

The principal features shown on the above diagrams are: the paths of total and annular eclipses; the northern and southern limits of partial eclipse; the sunrise and sunset curves ; and contour lines showing the time of middle of eclipse and the semi-duration of partial eclipse. The times of beginning and end of partial eclipse at any place can be found by applying the semi-duration to the time of middle of the eclipse, both being interpolated for that place from the contour lines.



SOLAR ECLIPSE DIAGRAMS

For total and annular eclipses the mid-times of the total and annular phases are generally within 5 minutes of those given for the middle of eclipse ; but semi-durations, which depend on the precise position relative to the path, are not given. Further details of the paths and times of central eclipse are given in the *Astronomical Almanac*.

VISIBILITY OF PLANETS

VENUS is a brilliant object in the morning sky from the beginning of the year until mid-February (when it becomes too close to the Sun for observation), and in the evening sky from late May until the end of the year. Venus is in conjunction with Mercury on June 9, with Saturn on August 25 and Jupiter on August 28.

MARS is visible as a reddish object in Capricornus shortly after sunset in January; it then becomes too close to the Sun for observation until early in June, when it can be seen in Taurus. The western elongation gradually increases while it moves through Taurus (passing 6° N. of *Aldebaran* on June 19), Gemini (passing 6° S. of *Pollux* on August 23), Cancer, Leo (passing 1°·1 N. of *Regulus* on October 19), and into Virgo in early December. Mars is in conjunction with Mercury on January 23 and February 10.

JUPITER and SATURN both rise at about midnight at the beginning of the year and are at opposition on March 26 and March 27 respectively, when they can both be seen throughout the night. From late June until late September they are visible only in the evening sky, and then become too close to the Sun for observation. They can be seen only in the morning sky from late October until the end of the year. Both planets remain in Virgo throughout the year, and are in conjunction with each other on January 14, February 19 and July 30. Jupiter is in conjunction with Venus on August 28, and Mercury on September 13 and November 6, while Saturn is in conjunction with Venus on August 25 and Mercury on September 10.

MERCURY can only be seen low in the east before sunrise, or low in the west after sunset (about the time of beginning or end of civil twilight). It is visible in the mornings between the following approximate dates: February 23 (+1·9) to April 20 (−1·1), June 30 (+2·2) to August 2 (−1·4), October 25 (+1·1) to November 24 (−0·7); the planet is brighter at the end of each period. It is visible in the evenings between the following approximate dates: January 15 (−0·9) to February 12 (+1·5), May 5 (−1·4) to June 14 (+2·3), August 19 (−0·9) to October 13 (+1·7), December 26 (−0·7) to December 31 (−0·7); the planet is brighter at the beginning of each period. The figures in parentheses are the magnitudes.

PLANET DIAGRAM

General Description. The diagram on the opposite page shows, in graphical form for any date during the year, the local mean time of meridian passage of the Sun, of the five planets Mercury, Venus, Mars, Jupiter, and Saturn, and of each 30° of S.H.A.; intermediate lines, corresponding to particular stars, may be drawn in by the user if he so desires. It is intended to provide a general picture of the availability of planets and stars for observation.

On each side of the line marking the time of meridian passage of the Sun a band, 45^m wide, is shaded to indicate that planets and most stars crossing the meridian within 45^m of the Sun are too close to the Sun for observation.

Method of use and interpretation. For any date the diagram provides immediately the local mean times of meridian passage of the Sun, planets and stars, and thus the following information:

(a) whether a planet or star is too close to the Sun for observation;

(b) some indication of its position in the sky, especially during twilight;

(c) the proximity of other planets.

When the meridian passage of an outer planet occurs at midnight the body is in opposition to the Sun and is visible all night; a planet may then be observable during both morning and evening twilights. As the time of meridian passage decreases, the body eventually ceases to be observable in the morning, but its altitude above the eastern horizon at sunset gradually increases; this continues until the body is on the meridian during evening twilight. From then onwards the body is observable above the western horizon and its altitude at sunset gradually decreases; eventually the body becomes too close to the Sun for observation. When the body again becomes visible it is seen low in the east during morning twilight; its altitude at sunrise increases until meridian passage occurs during morning twilight. Then, as the time of meridian passage decreases to 0^h, the body is observable in the west during morning twilight with a gradually decreasing altitude, until it once again reaches opposition.

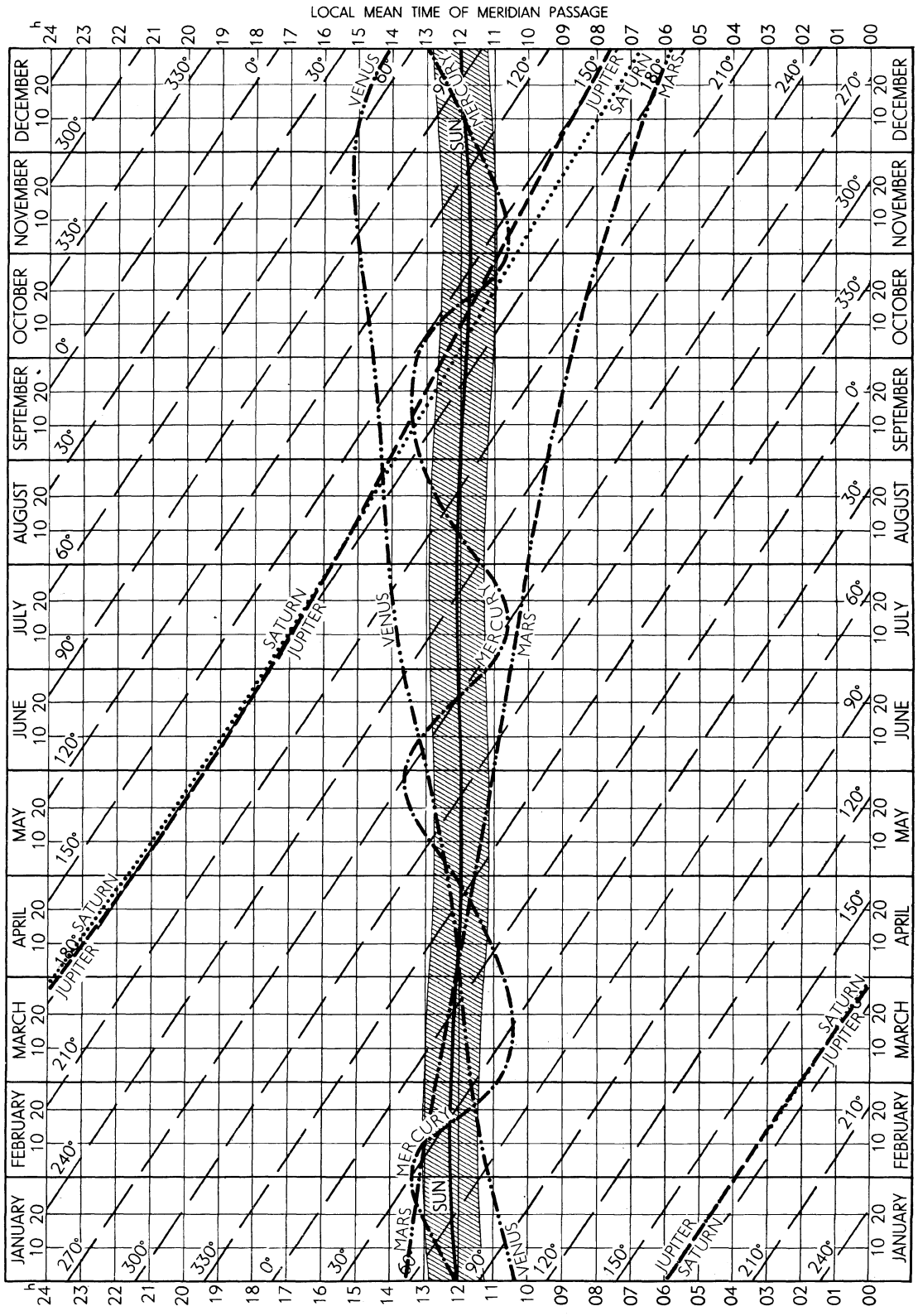
DO NOT CONFUSE

Jupiter with Saturn from the beginning of the year until mid-September; Jupiter is always the brighter object.

Mercury with Mars in late January when Mercury is the brighter object, and again in early February when it is only slightly brighter. The reddish tint of Mars should assist in its identification.

Venus with Mercury in early June, and with Saturn and Jupiter in late August; on all occasions Venus is the brighter object.

Mercury with Saturn in early September when Mercury is the brighter object, and with Jupiter in mid-September and early November; on both occasions Mercury is fainter than Jupiter.


LOCAL MEAN TIME OF MERIDIAN PASSAGE
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
SUN
MERCURY
VENUS
MARS
JUPITER
SATURN

G.M.T.	ARIES	VENUS −3.4		MARS +1.4		JUPITER −1.6		SATURN +1.0		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
1 00	100 33.4	204 26.5	S21 57.7	157 14.8	S21 04.5	271 18.5	S 2 33.9	270 54.0	S 1 36.0	Acamar	315 36.9	S40 23.2
01	115 35.9	219 25.6	58.1	172 15.2	04.1	286 20.8	34.0	285 56.4	36.1	Achernar	335 45.0	S57 20.4
02	130 38.4	234 24.7	58.5	187 15.6	03.6	301 23.1	34.1	300 58.8	36.1	Acrux	173 36.9	S62 59.3
03	145 40.8	249 23.9	·· 58.9	202 16.1	·· 03.2	316 25.4	·· 34.1	316 01.2	·· 36.1	Adhara	255 31.6	S28 56.8
04	160 43.3	264 23.0	59.3	217 16.5	02.8	331 27.7	34.2	331 03.6	36.1	Aldebaran	291 17.5	N16 28.2
05	175 45.8	279 22.1	21 59.7	232 16.9	02.3	346 30.0	34.2	346 06.0	36.1			
06	190 48.2	294 21.2	S22 00.1	247 17.3	S21 01.9	1 32.3	S 2 34.3	1 08.4	S 1 36.2	Alioth	166 42.4	N56 03.6
07	205 50.7	309 20.3	00.5	262 17.7	01.5	16 34.6	34.4	16 10.8	36.2	Alkaid	153 18.5	N49 24.3
T 08	220 53.1	324 19.5	00.9	277 18.1	01.0	31 36.9	34.4	31 13.1	36.2	Al Na'ir	28 15.0	S47 03.4
H 09	235 55.6	339 18.6	·· 01.2	292 18.5	·· 00.6	46 39.2	·· 34.5	46 15.5	·· 36.2	Alnilam	276 11.1	S 1 12.9
U 10	250 58.1	354 17.7	01.6	307 19.0	21 00.2	61 41.5	34.5	61 17.9	36.2	Alphard	218 20.1	S 8 34.5
R 11	266 00.5	9 16.8	02.0	322 19.4	20 59.7	76 43.7	34.6	76 20.3	36.3			
S 12	281 03.0	24 15.9	S22 02.4	337 19.8	S20 59.3	91 46.0	S 2 34.7	91 22.7	S 1 36.3	Alphecca	126 32.2	N26 46.7
D 13	296 05.5	39 15.1	02.8	352 20.2	58.9	106 48.3	34.7	106 25.1	36.3	Alpheratz	358 09.2	N28 59.2
A 14	311 07.9	54 14.2	03.2	7 20.6	58.4	121 50.6	34.8	121 27.5	36.3	Altair	62 32.7	N 8 49.1
Y 15	326 10.4	69 13.3	·· 03.6	22 21.0	·· 58.0	136 52.9	·· 34.8	136 29.9	·· 36.3	Ankaa	353 40.1	S42 24.9
16	341 12.9	84 12.4	03.9	37 21.4	57.6	151 55.2	34.9	151 32.3	36.4	Antares	112 56.9	S26 23.3
17	356 15.3	99 11.5	04.3	52 21.9	57.1	166 57.5	35.0	166 34.6	36.4			
18	11 17.8	114 10.6	S22 04.7	67 22.3	S20 56.7	181 59.8	S 2 35.0	181 37.0	S 1 36.4	Arcturus	146 18.4	N19 16.9
19	26 20.3	129 09.8	05.1	82 22.7	56.3	197 02.1	35.1	196 39.4	36.4	Atria	108 21.5	S68 59.4
20	41 22.7	144 08.9	05.5	97 23.1	55.8	212 04.4	35.1	211 41.8	36.4	Avior	234 27.5	S59 26.8
21	56 25.2	159 08.0	·· 05.8	112 23.5	·· 55.4	227 06.7	·· 35.2	226 44.2	·· 36.4	Bellatrix	278 58.2	N 6 19.9
22	71 27.6	174 07.1	06.2	127 23.9	54.9	242 09.0	35.3	241 46.6	36.5	Betelgeuse	271 27.7	N 7 24.1
23	86 30.1	189 06.2	06.6	142 24.4	54.5	257 11.3	35.3	256 49.0	36.5			
2 00	101 32.6	204 05.3	S22 07.0	157 24.8	S20 54.1	272 13.6	S 2 35.4	271 51.4	S 1 36.5	Canopus	264 06.6	S52 41.2
01	116 35.0	219 04.4	07.3	172 25.2	53.6	287 15.9	35.4	286 53.8	36.5	Capella	281 10.6	N45 58.8
02	131 37.5	234 03.5	07.7	187 25.6	53.2	302 18.2	35.5	301 56.2	36.5	Deneb	49 48.7	N45 12.9
03	146 40.0	249 02.7	·· 08.1	202 26.0	·· 52.7	317 20.5	·· 35.6	316 58.5	·· 36.6	Denebola	182 58.8	N14 40.7
04	161 42.4	264 01.8	08.4	217 26.4	52.3	332 22.8	35.6	332 00.9	36.6	Diphda	349 20.7	S18 05.7
05	176 44.9	279 00.9	08.8	232 26.9	51.9	347 25.1	35.7	347 03.3	36.6			
06	191 47.4	294 00.0	S22 09.2	247 27.3	S20 51.4	2 27.4	S 2 35.7	2 05.7	S 1 36.6	Dubhe	194 21.6	N61 51.0
07	206 49.8	308 59.1	09.5	262 27.7	51.0	17 29.7	35.8	17 08.1	36.6	Elnath	278 43.5	N28 35.5
08	221 52.3	323 58.2	09.9	277 28.1	50.5	32 32.0	35.8	32 10.5	36.6	Eltanin	90 58.2	N51 29.5
F 09	236 54.7	338 57.3	·· 10.3	292 28.5	·· 50.1	47 34.3	·· 35.9	47 12.9	·· 36.7	Enif	34 11.6	N 9 47.3
R 10	251 57.2	353 56.4	10.6	307 29.0	49.6	62 36.6	36.0	62 15.3	36.7	Fomalhaut	15 51.4	S29 43.6
I 11	266 59.7	8 55.6	11.0	322 29.4	49.2	77 38.9	36.0	77 17.7	36.7			
D 12	282 02.1	23 54.7	S22 11.3	337 29.8	S20 48.8	92 41.2	S 2 36.1	92 20.1	S 1 36.7	Gacrux	172 28.4	S57 00.0
A 13	297 04.6	38 53.8	11.7	352 30.2	48.3	107 43.5	36.1	107 22.5	36.7	Gienah	176 17.7	S17 26.0
Y 14	312 07.1	53 52.9	12.1	7 30.6	47.9	122 45.8	36.2	122 24.9	36.8	Hadar	149 23.3	S60 16.5
15	327 09.5	68 52.0	·· 12.4	22 31.1	·· 47.4	137 48.1	·· 36.2	137 27.3	·· 36.8	Hamal	328 28.6	N23 22.4
16	342 12.0	83 51.1	12.8	37 31.5	47.0	152 50.4	36.3	152 29.6	36.8	Kaus Aust.	84 17.0	S34 23.6
17	357 14.5	98 50.2	13.1	52 31.9	46.5	167 52.7	36.4	167 32.0	36.8			
18	12 16.9	113 49.3	S22 13.5	67 32.3	S20 46.1	182 55.0	S 2 36.4	182 34.4	S 1 36.8	Kochab	137 19.8	N74 13.8
19	27 19.4	128 48.4	13.8	82 32.7	45.6	197 57.3	36.5	197 36.8	36.8	Markab	14 03.1	N15 06.2
20	42 21.9	143 47.5	14.2	97 33.1	45.2	212 59.6	36.5	212 39.2	36.9	Menkar	314 40.7	N 4 00.8
21	57 24.3	158 46.6	·· 14.5	112 33.6	·· 44.7	228 01.9	·· 36.6	227 41.6	·· 36.9	Menkent	148 36.9	S36 16.3
22	72 26.8	173 45.7	14.9	127 34.0	44.3	243 04.3	36.6	242 44.0	36.9	Miaplacidus	221 44.1	S69 38.2
23	87 29.2	188 44.9	15.2	142 34.4	43.9	258 06.6	36.7	257 46.4	36.9			
3 00	102 31.7	203 44.0	S22 15.6	157 34.8	S20 43.4	273 08.9	S 2 36.8	272 48.8	S 1 36.9	Mirfak	309 15.5	N49 47.7
01	117 34.2	218 43.1	15.9	172 35.3	43.0	288 11.2	36.8	287 51.2	36.9	Nunki	76 29.3	S26 19.2
02	132 36.6	233 42.2	16.2	187 35.7	42.5	303 13.5	36.9	302 53.6	37.0	Peacock	53 58.7	S56 47.9
03	147 39.1	248 41.3	·· 16.6	202 36.1	·· 42.1	318 15.8	·· 36.9	317 56.0	·· 37.0	Pollux	243 57.6	N28 04.3
04	162 41.6	263 40.4	16.9	217 36.5	41.6	333 18.1	37.0	332 58.4	37.0	Procyon	245 25.3	N 5 16.4
05	177 44.0	278 39.5	17.3	232 36.9	41.2	348 20.4	37.0	348 00.8	37.0			
06	192 46.5	293 38.6	S22 17.6	247 37.4	S20 40.7	3 22.7	S 2 37.1	3 03.2	S 1 37.0	Rasalhague	96 29.7	N12 34.5
07	207 49.0	308 37.7	17.9	262 37.8	40.3	18 25.0	37.1	18 05.6	37.0	Regulus	208 09.6	N12 03.6
S 08	222 51.4	323 36.8	18.3	277 38.2	39.8	33 27.3	37.2	33 08.0	37.1	Rigel	281 35.5	S 8 13.5
A 09	237 53.9	338 35.9	·· 18.6	292 38.6	·· 39.3	48 29.6	·· 37.2	48 10.4	·· 37.1	Rigil Kent.	140 25.9	S60 45.0
T 10	252 56.4	353 35.0	18.9	307 39.0	38.9	63 31.9	37.3	63 12.8	37.1	Sabik	102 41.2	S15 42.0
U 11	267 58.8	8 34.1	19.3	322 39.5	38.4	78 34.2	37.4	78 15.2	37.1			
R 12	283 01.3	23 33.2	S22 19.6	337 39.9	S20 38.0	93 36.6	S 2 37.4	93 17.5	S 1 37.1	Schedar	350 08.8	N56 26.2
D 13	298 03.7	38 32.3	19.9	352 40.3	37.5	108 38.9	37.5	108 19.9	37.1	Shaula	96 55.9	S37 05.3
A 14	313 06.2	53 31.4	20.3	7 40.7	37.1	123 41.2	37.5	123 22.3	37.2	Sirius	258 55.2	S16 41.5
Y 15	328 08.7	68 30.5	·· 20.6	22 41.2	·· 36.6	138 43.5	·· 37.6	138 24.7	·· 37.2	Spica	158 57.4	S11 03.6
16	343 11.1	83 29.6	20.9	37 41.6	36.2	153 45.8	37.6	153 27.1	37.2	Suhail	223 10.2	S43 21.2
17	358 13.6	98 28.7	21.3	52 42.0	35.7	168 48.1	37.7	168 29.5	37.2			
18	13 16.1	113 27.8	S22 21.6	67 42.4	S20 35.3	183 50.4	S 2 37.7	183 31.9	S 1 37.2	Vega	80 56.1	N38 46.0
19	28 18.5	128 26.9	21.9	82 42.9	34.8	198 52.7	37.8	198 34.3	37.2	Zuben'ubi	137 33.0	S15 57.6
20	43 21.0	143 26.0	22.2	97 43.3	34.3	213 55.0	37.8	213 36.7	37.2			
21	58 23.5	158 25.1	·· 22.5	112 43.7	·· 33.9	228 57.3	·· 37.9	228 39.1	·· 37.3		S.H.A.	Mer. Pass.
22	73 25.9	173 24.2	22.9	127 44.1	33.4	243 59.7	37.9	243 41.5	37.3		° ′	h m
23	88 28.4	188 23.3	23.2	142 44.5	33.0	259 02.0	38.0	258 43.9	37.3	Venus	102 32.8	10 24
	h m									Mars	55 52.2	13 30
Mer. Pass.	17 11.0	v −0.9	d 0.4	v 0.4	d 0.4	v 2.3	d 0.1	v 2.4	d 0.0	Jupiter	170 41.0	5 50
										Saturn	170 18.8	5 52

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
1 00	179 08.9	S23 01.5	241 12.2	14.7	S 9 54.2	9.1	54.3
01	194 08.6	01.3	255 45.9	14.8	10 03.3	9.0	54.3
02	209 08.3	01.1	270 19.7	14.7	10 12.3	9.0	54.3
03	224 08.0	·· 00.9	284 53.4	14.6	10 21.3	9.0	54.3
04	239 07.7	00.7	299 27.0	14.6	10 30.3	8.9	54.3
05	254 07.4	00.5	314 00.6	14.6	10 39.2	8.9	54.3
06	269 07.1	S23 00.3	328 34.2	14.6	S10 48.1	8.9	54.3
07	284 06.8	23 00.1	343 07.8	14.5	10 57.0	8.8	54.3
T 08	299 06.5	22 59.9	357 41.3	14.4	11 05.8	8.8	54.3
H 09	314 06.2	·· 59.7	12 14.7	14.4	11 14.6	8.7	54.3
U 10	329 05.9	59.5	26 48.1	14.4	11 23.3	8.7	54.3
R 11	344 05.6	59.3	41 21.5	14.4	11 32.0	8.6	54.4
S 12	359 05.3	S22 59.1	55 54.9	14.2	S11 40.6	8.6	54.4
D 13	14 05.0	58.8	70 28.1	14.3	11 49.2	8.6	54.4
A 14	29 04.7	58.6	85 01.4	14.2	11 57.8	8.5	54.4
Y 15	44 04.4	·· 58.4	99 34.6	14.1	12 06.3	8.4	54.4
16	59 04.1	58.2	114 07.7	14.1	12 14.7	8.5	54.4
17	74 03.8	58.0	128 40.8	14.1	12 23.2	8.3	54.4
18	89 03.5	S22 57.8	143 13.9	14.0	S12 31.5	8.3	54.4
19	104 03.2	57.6	157 46.9	14.0	12 39.8	8.3	54.4
20	119 02.9	57.3	172 19.9	13.9	12 48.1	8.2	54.5
21	134 02.7	·· 57.1	186 52.8	13.9	12 56.3	8.2	54.5
22	149 02.4	56.9	201 25.7	13.8	13 04.5	8.1	54.5
23	164 02.1	56.7	215 58.5	13.8	13 12.6	8.0	54.5
2 00	179 01.8	S22 56.5	230 31.3	13.7	S13 20.6	8.0	54.5
01	194 01.5	56.3	245 04.0	13.7	13 28.6	8.0	54.5
02	209 01.2	56.0	259 36.7	13.6	13 36.6	7.9	54.5
03	224 00.9	·· 55.8	274 09.3	13.6	13 44.5	7.8	54.5
04	239 00.6	55.6	288 41.9	13.5	13 52.3	7.8	54.6
05	254 00.3	55.4	303 14.4	13.5	14 00.1	7.7	54.6
06	269 00.0	S22 55.1	317 46.9	13.4	S14 07.8	7.7	54.6
07	283 59.7	54.9	332 19.3	13.4	14 15.5	7.6	54.6
08	298 59.4	54.7	346 51.7	13.3	14 23.1	7.6	54.6
F 09	313 59.1	·· 54.5	1 24.0	13.2	14 30.7	7.5	54.6
R 10	328 58.8	54.2	15 56.2	13.2	14 38.2	7.4	54.6
I 11	343 58.6	54.0	30 28.4	13.2	14 45.6	7.4	54.7
D 12	358 58.3	S22 53.8	45 00.6	13.1	S14 53.0	7.3	54.7
A 13	13 58.0	53.6	59 32.7	13.0	15 00.3	7.2	54.7
Y 14	28 57.7	53.3	74 04.7	13.0	15 07.5	7.2	54.7
15	43 57.4	·· 53.1	88 36.7	12.9	15 14.7	7.2	54.7
16	58 57.1	52.9	103 08.6	12.9	15 21.9	7.0	54.7
17	73 56.8	52.6	117 40.5	12.8	15 28.9	7.0	54.8
18	88 56.5	S22 52.4	132 12.3	12.8	S15 35.9	6.9	54.8
19	103 56.2	52.2	146 44.1	12.7	15 42.8	6.9	54.8
20	118 55.9	51.9	161 15.8	12.7	15 49.7	6.8	54.8
21	133 55.6	·· 51.7	175 47.5	12.6	15 56.5	6.7	54.8
22	148 55.4	51.5	190 19.1	12.5	16 03.2	6.7	54.8
23	163 55.1	51.2	204 50.6	12.5	16 09.9	6.6	54.9
3 00	178 54.8	S22 51.0	219 22.1	12.4	S16 16.5	6.5	54.9
01	193 54.5	50.7	233 53.5	12.4	16 23.0	6.4	54.9
02	208 54.2	50.5	248 24.9	12.3	16 29.4	6.4	54.9
03	223 53.9	·· 50.3	262 56.2	12.2	16 35.8	6.3	54.9
04	238 53.6	50.0	277 27.4	12.2	16 42.1	6.3	54.9
05	253 53.3	49.8	291 58.6	12.2	16 48.4	6.1	55.0
06	268 53.0	S22 49.5	306 29.8	12.0	S16 54.5	6.1	55.0
07	283 52.7	49.3	321 00.8	12.1	17 00.6	6.0	55.0
S 08	298 52.5	49.0	335 31.9	11.9	17 06.6	5.9	55.0
A 09	313 52.2	·· 48.8	350 02.8	11.9	17 12.5	5.9	55.0
T 10	328 51.9	48.6	4 33.7	11.9	17 18.4	5.8	55.1
U 11	343 51.6	48.3	19 04.6	11.8	17 24.2	5.7	55.1
R 12	358 51.3	S22 48.1	33 35.4	11.7	S17 29.9	5.6	55.1
D 13	13 51.0	47.8	48 06.1	11.7	17 35.5	5.5	55.1
A 14	28 50.7	47.6	62 36.8	11.6	17 41.0	5.5	55.1
Y 15	43 50.4	·· 47.3	77 07.4	11.6	17 46.5	5.3	55.2
16	58 50.2	47.1	91 38.0	11.5	17 51.8	5.3	55.2
17	73 49.9	46.8	106 08.5	11.4	17 57.1	5.3	55.2
18	88 49.6	S22 46.6	120 38.9	11.4	S18 02.4	5.1	55.2
19	103 49.3	46.3	135 09.3	11.3	18 07.5	5.0	55.2
20	118 49.0	46.0	149 39.6	11.3	18 12.5	5.0	55.3
21	133 48.7	·· 45.8	164 09.9	11.2	18 17.5	4.9	55.3
22	148 48.4	45.5	178 40.1	11.2	18 22.4	4.7	55.3
23	163 48.1	45.3	193 10.3	11.1	18 27.1	4.7	55.3
	S.D. 16.3	d 0.2	S.D. 14.8		14.9		15.0

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

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

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	03 24	03 38	12 04	08 10	20 32	25	
2	03 52	04 06	12 04	08 54	21 17	26	◑
3	04 20	04 34	12 05	09 41	22 06	27	

G.M.T.	ARIES	VENUS −3.4		MARS +1.4		JUPITER −1.6		SATURN +1.0	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
4 00	103 30.8	203 22.4	S22 23.5	157 45.0	S20 32.5	274 04.3	S 2 38.1	273 46.3	S 1 37.3
01	118 33.3	218 21.5	23.8	172 45.4	32.1	289 06.6	38.1	288 48.7	37.3
02	133 35.8	233 20.6	24.1	187 45.8	31.6	304 08.9	38.2	303 51.1	37.3
03	148 38.2	248 19.7	·· 24.4	202 46.2	·· 31.1	319 11.2	·· 38.2	318 53.5	·· 37.4
04	163 40.7	263 18.8	24.8	217 46.7	30.7	334 13.5	38.3	333 55.9	37.4
05	178 43.2	278 17.9	25.1	232 47.1	30.2	349 15.8	38.3	348 58.3	37.4
06	193 45.6	293 17.0	S22 25.4	247 47.5	S20 29.8	4 18.2	S 2 38.4	4 00.7	S 1 37.4
07	208 48.1	308 16.1	25.7	262 47.9	29.3	19 20.5	38.4	19 03.1	37.4
08	223 50.6	323 15.2	26.0	277 48.4	28.8	34 22.8	38.5	34 05.5	37.4
S 09	238 53.0	338 14.3	·· 26.3	292 48.8	·· 28.4	49 25.1	·· 38.5	49 07.9	·· 37.4
U 10	253 55.5	353 13.4	26.6	307 49.2	27.9	64 27.4	38.6	64 10.3	37.5
N 11	268 58.0	8 12.5	26.9	322 49.7	27.4	79 29.7	38.6	79 12.7	37.5
D 12	284 00.4	23 11.6	S22 27.2	337 50.1	S20 27.0	94 32.0	S 2 38.7	94 15.1	S 1 37.5
A 13	299 02.9	38 10.7	27.5	352 50.5	26.5	109 34.4	38.7	109 17.5	37.5
Y 14	314 05.3	53 09.8	27.8	7 50.9	26.1	124 36.7	38.8	124 19.9	37.5
15	329 07.8	68 08.9	·· 28.1	22 51.4	·· 25.6	139 39.0	·· 38.8	139 22.3	·· 37.5
16	344 10.3	83 08.0	28.4	37 51.8	25.1	154 41.3	38.9	154 24.7	37.5
17	359 12.7	98 07.1	28.7	52 52.2	24.7	169 43.6	38.9	169 27.1	37.6
18	14 15.2	113 06.2	S22 29.0	67 52.6	S20 24.2	184 45.9	S 2 39.0	184 29.5	S 1 37.6
19	29 17.7	128 05.3	29.3	82 53.1	23.7	199 48.3	39.0	199 31.9	37.6
20	44 20.1	143 04.3	29.6	97 53.5	23.3	214 50.6	39.1	214 34.3	37.6
21	59 22.6	158 03.4	·· 29.9	112 53.9	·· 22.8	229 52.9	·· 39.1	229 36.7	·· 37.6
22	74 25.1	173 02.5	30.2	127 54.3	22.3	244 55.2	39.2	244 39.1	37.6
23	89 27.5	188 01.6	30.5	142 54.8	21.9	259 57.5	39.2	259 41.5	37.6
5 00	104 30.0	203 00.7	S22 30.8	157 55.2	S20 21.4	274 59.9	S 2 39.3	274 43.9	S 1 37.6
01	119 32.5	217 59.8	31.1	172 55.6	20.9	290 02.2	39.3	289 46.3	37.7
02	134 34.9	232 58.9	31.4	187 56.1	20.5	305 04.5	39.4	304 48.7	37.7
03	149 37.4	247 58.0	·· 31.6	202 56.5	·· 20.0	320 06.8	·· 39.4	319 51.1	·· 37.7
04	164 39.8	262 57.1	31.9	217 56.9	19.5	335 09.1	39.5	334 53.6	37.7
05	179 42.3	277 56.2	32.2	232 57.3	19.1	350 11.4	39.5	349 56.0	37.7
06	194 44.8	292 55.3	S22 32.5	247 57.8	S20 18.6	5 13.8	S 2 39.6	4 58.4	S 1 37.7
07	209 47.2	307 54.4	32.8	262 58.2	18.1	20 16.1	39.6	20 00.8	37.7
08	224 49.7	322 53.5	33.1	277 58.6	17.6	35 18.4	39.7	35 03.2	37.8
M 09	239 52.2	337 52.5	·· 33.3	292 59.1	·· 17.2	50 20.7	·· 39.7	50 05.6	·· 37.8
O 10	254 54.6	352 51.6	33.6	307 59.5	16.7	65 23.1	39.8	65 08.0	37.8
N 11	269 57.1	7 50.7	33.9	322 59.9	16.2	80 25.4	39.8	80 10.4	37.8
D 12	284 59.6	22 49.8	S22 34.2	338 00.4	S20 15.8	95 27.7	S 2 39.9	95 12.8	S 1 37.8
A 13	300 02.0	37 48.9	34.4	353 00.8	15.3	110 30.0	39.9	110 15.2	37.8
Y 14	315 04.5	52 48.0	34.7	8 01.2	14.8	125 32.3	40.0	125 17.6	37.8
15	330 07.0	67 47.1	·· 35.0	23 01.6	·· 14.3	140 34.7	·· 40.0	140 20.0	·· 37.8
16	345 09.4	82 46.2	35.3	38 02.1	13.9	155 37.0	40.1	155 22.4	37.9
17	0 11.9	97 45.3	35.5	53 02.5	13.4	170 39.3	40.1	170 24.8	37.9
18	15 14.3	112 44.4	S22 35.8	68 02.9	S20 12.9	185 41.6	S 2 40.2	185 27.2	S 1 37.9
19	30 16.8	127 43.4	36.1	83 03.4	12.4	200 44.0	40.2	200 29.6	37.9
20	45 19.3	142 42.5	36.3	98 03.8	12.0	215 46.3	40.3	215 32.0	37.9
21	60 21.7	157 41.6	·· 36.6	113 04.2	·· 11.5	230 48.6	·· 40.3	230 34.4	·· 37.9
22	75 24.2	172 40.7	36.9	128 04.7	11.0	245 50.9	40.4	245 36.8	37.9
23	90 26.7	187 39.8	37.1	143 05.1	10.5	260 53.3	40.4	260 39.2	37.9
6 00	105 29.1	202 38.9	S22 37.4	158 05.5	S20 10.1	275 55.6	S 2 40.5	275 41.7	S 1 37.9
01	120 31.6	217 38.0	37.6	173 06.0	09.6	290 57.9	40.5	290 44.1	38.0
02	135 34.1	232 37.1	37.9	188 06.4	09.1	306 00.2	40.5	305 46.5	38.0
03	150 36.5	247 36.1	·· 38.2	203 06.8	·· 08.6	321 02.6	·· 40.6	320 48.9	·· 38.0
04	165 39.0	262 35.2	38.4	218 07.3	08.1	336 04.9	40.6	335 51.3	38.0
05	180 41.4	277 34.3	38.7	233 07.7	07.7	351 07.2	40.7	350 53.7	38.0
06	195 43.9	292 33.4	S22 38.9	248 08.1	S20 07.2	6 09.5	S 2 40.7	5 56.1	S 1 38.0
07	210 46.4	307 32.5	39.2	263 08.6	06.7	21 11.9	40.8	20 58.5	38.0
08	225 48.8	322 31.6	39.4	278 09.0	06.2	36 14.2	40.8	36 00.9	38.0
T 09	240 51.3	337 30.7	·· 39.7	293 09.4	·· 05.7	51 16.5	·· 40.9	51 03.3	·· 38.0
U 10	255 53.8	352 29.7	39.9	308 09.9	05.3	66 18.9	40.9	66 05.7	38.1
E 11	270 56.2	7 28.8	40.2	323 10.3	04.8	81 21.2	41.0	81 08.1	38.1
S 12	285 58.7	22 27.9	S22 40.4	338 10.7	S20 04.3	96 23.5	S 2 41.0	96 10.6	S 1 38.1
D 13	301 01.2	37 27.0	40.7	353 11.2	03.8	111 25.8	41.1	111 13.0	38.1
A 14	316 03.6	52 26.1	40.9	8 11.6	03.3	126 28.2	41.1	126 15.4	38.1
Y 15	331 06.1	67 25.2	·· 41.2	23 12.0	·· 02.8	141 30.5	·· 41.1	141 17.8	·· 38.1
16	346 08.6	82 24.2	41.4	38 12.5	02.4	156 32.8	41.2	156 20.2	38.1
17	1 11.0	97 23.3	41.6	53 12.9	01.9	171 35.2	41.2	171 22.6	38.1
18	16 13.5	112 22.4	S22 41.9	68 13.3	S20 01.4	186 37.5	S 2 41.3	186 25.0	S 1 38.1
19	31 15.9	127 21.5	42.1	83 13.8	00.9	201 39.8	41.3	201 27.4	38.2
20	46 18.4	142 20.6	42.4	98 14.2	20 00.4	216 42.2	41.4	216 29.8	38.2
21	61 20.9	157 19.7	·· 42.6	113 14.6	19 59.9	231 44.5	·· 41.4	231 32.2	·· 38.2
22	76 23.3	172 18.7	42.8	128 15.1	59.5	246 46.8	41.5	246 34.7	38.2
23	91 25.8	187 17.8	43.1	143 15.5	59.0	261 49.1	41.5	261 37.1	38.2
	h m								
Mer. Pass.	16 59.2	*v* −0.9	*d* 0.3	*v* 0.4	*d* 0.5	*v* 2.3	*d* 0.0	*v* 2.4	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 36.9	S40 23.2
Achernar	335 45.0	S57 20.4
Acrux	173 36.8	S62 59.3
Adhara	255 31.6	S28 56.8
Aldebaran	291 17.5	N16 28.2
Alioth	166 42.4	N56 03.6
Alkaid	153 18.5	N49 24.3
Al Na'ir	28 15.0	S47 03.4
Alnilam	276 11.1	S 1 12.9
Alphard	218 20.1	S 8 34.6
Alphecca	126 32.2	N26 46.7
Alpheratz	358 09.2	N28 59.2
Altair	62 32.7	N 8 49.1
Ankaa	353 40.1	S42 24.9
Antares	112 56.9	S26 23.3
Arcturus	146 18.4	N19 16.8
Atria	108 21.5	S68 59.4
Avior	234 27.5	S59 26.8
Bellatrix	278 58.2	N 6 19.9
Betelgeuse	271 27.7	N 7 24.1
Canopus	264 06.6	S52 41.3
Capella	281 10.5	N45 58.8
Deneb	49 48.7	N45 12.8
Denebola	182 58.8	N14 40.7
Diphda	349 20.7	S18 05.7
Dubhe	194 21.6	N61 51.0
Elnath	278 43.5	N28 35.5
Eltanin	90 58.2	N51 29.5
Enif	34 11.6	N 9 47.2
Fomalhaut	15 51.4	S29 43.6
Gacrux	172 28.4	S57 00.1
Gienah	176 17.7	S17 26.0
Hadar	149 23.2	S60 16.5
Hamal	328 28.6	N23 22.4
Kaus Aust.	84 17.0	S34 23.6
Kochab	137 19.7	N74 13.8
Markab	14 03.1	N15 06.2
Menkar	314 40.7	N 4 00.8
Menkent	148 36.9	S36 16.3
Miaplacidus	221 44.0	S69 38.2
Mirfak	309 15.5	N49 47.7
Nunki	76 29.3	S26 19.2
Peacock	53 58.7	S56 47.9
Pollux	243 57.6	N28 04.3
Procyon	245 25.2	N 5 16.4
Rasalhague	96 29.7	N12 34.4
Regulus	208 09.6	N12 03.6
Rigel	281 35.5	S 8 13.5
Rigil Kent.	140 25.8	S60 45.0
Sabik	102 41.2	S15 42.0
Schedar	350 08.8	N56 26.2
Shaula	96 55.9	S37 05.3
Sirius	258 55.2	S16 41.5
Spica	158 57.4	S11 03.6
Suhail	223 10.2	S43 21.2
Vega	80 56.1	N38 46.0
Zuben'ubi	137 33.0	S15 57.6

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	98 30.7	10 29
Mars	53 25.2	13 28
Jupiter	170 29.9	5 39
Saturn	170 14.0	5 40

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
4 00	178 47.9	S22 45.0	207 40.4	11.0	S18 31.8	4.7	55.3
01	193 47.6	44.8	222 10.4	11.0	18 36.5	4.5	55.4
02	208 47.3	44.5	236 40.4	10.9	18 41.0	4.4	55.4
03	223 47.0	·· 44.2	251 10.3	10.9	18 45.4	4.3	55.4
04	238 46.7	44.0	265 40.2	10.8	18 49.7	4.3	55.4
05	253 46.4	43.7	280 10.0	10.8	18 54.0	4.2	55.4
06	268 46.2	S22 43.5	294 39.8	10.7	S18 58.2	4.0	55.5
07	283 45.9	43.2	309 09.5	10.7	19 02.2	4.0	55.5
08	298 45.6	42.9	323 39.2	10.6	19 06.2	3.9	55.5
S 09	313 45.3	·· 42.7	338 08.8	10.5	19 10.1	3.8	55.5
U 10	328 45.0	42.4	352 38.3	10.5	19 13.9	3.7	55.6
N 11	343 44.7	42.1	7 07.8	10.5	19 17.6	3.6	55.6
D 12	358 44.4	S22 41.9	21 37.3	10.3	S19 21.2	3.5	55.6
A 13	13 44.2	41.6	36 06.6	10.4	19 24.7	3.4	55.6
Y 14	28 43.9	41.3	50 36.0	10.3	19 28.1	3.3	55.6
15	43 43.6	·· 41.1	65 05.3	10.2	19 31.4	3.2	55.7
16	58 43.3	40.8	79 34.5	10.2	19 34.6	3.1	55.7
17	73 43.0	40.5	94 03.7	10.1	19 37.7	3.0	55.7
18	88 42.7	S22 40.3	108 32.8	10.1	S19 40.7	2.9	55.7
19	103 42.5	40.0	123 01.9	10.1	19 43.6	2.8	55.8
20	118 42.2	39.7	137 31.0	10.0	19 46.4	2.8	55.8
21	133 41.9	·· 39.4	152 00.0	9.9	19 49.2	2.6	55.8
22	148 41.6	39.2	166 28.9	9.9	19 51.8	2.5	55.8
23	163 41.3	38.9	180 57.8	9.9	19 54.3	2.4	55.8
5 00	178 41.1	S22 38.6	195 26.7	9.8	S19 56.7	2.3	55.9
01	193 40.8	38.3	209 55.5	9.7	19 59.0	2.2	55.9
02	208 40.5	38.1	224 24.2	9.8	20 01.2	2.1	55.9
03	223 40.2	·· 37.8	238 53.0	9.6	20 03.3	2.0	55.9
04	238 39.9	37.5	253 21.6	9.7	20 05.3	1.8	56.0
05	253 39.6	37.2	267 50.3	9.5	20 07.1	1.8	56.0
06	268 39.4	S22 37.0	282 18.8	9.6	S20 08.9	1.7	56.0
07	283 39.1	36.7	296 47.4	9.5	20 10.6	1.6	56.0
08	298 38.8	36.4	311 15.9	9.5	20 12.2	1.4	56.1
M 09	313 38.5	·· 36.1	325 44.4	9.4	20 13.6	1.4	56.1
O 10	328 38.2	35.8	340 12.8	9.4	20 15.0	1.2	56.1
N 11	343 38.0	35.5	354 41.2	9.3	20 16.2	1.1	56.1
D 12	358 37.7	S22 35.3	9 09.5	9.3	S20 17.3	1.1	56.1
A 13	13 37.4	35.0	23 37.8	9.3	20 18.4	0.9	56.2
Y 14	28 37.1	34.7	38 06.1	9.3	20 19.3	0.8	56.2
15	43 36.9	·· 34.4	52 34.4	9.2	20 20.1	0.7	56.2
16	58 36.6	34.1	67 02.6	9.1	20 20.8	0.5	56.2
17	73 36.3	33.8	81 30.7	9.2	20 21.3	0.5	56.3
18	88 36.0	S22 33.5	95 58.9	9.1	S20 21.8	0.4	56.3
19	103 35.7	33.2	110 27.0	9.1	20 22.2	0.2	56.3
20	118 35.5	32.9	124 55.1	9.0	20 22.4	0.2	56.3
21	133 35.2	·· 32.7	139 23.1	9.0	20 22.6	0.0	56.4
22	148 34.9	32.4	153 51.1	9.0	20 22.6	0.1	56.4
23	163 34.6	32.1	168 19.1	9.0	20 22.5	0.2	56.4
6 00	178 34.4	S22 31.8	182 47.1	8.9	S20 22.3	0.3	56.4
01	193 34.1	31.5	197 15.0	8.9	20 22.0	0.4	56.4
02	208 33.8	31.2	211 42.9	8.9	20 21.6	0.6	56.5
03	223 33.5	·· 30.9	226 10.8	8.8	20 21.0	0.6	56.5
04	238 33.2	30.6	240 38.6	8.9	20 20.4	0.8	56.5
05	253 33.0	30.3	255 06.5	8.8	20 19.6	0.9	56.5
06	268 32.7	S22 30.0	269 34.3	8.8	S20 18.7	1.0	56.6
07	283 32.4	29.7	284 02.1	8.7	20 17.7	1.1	56.6
08	298 32.1	29.4	298 29.8	8.8	20 16.6	1.2	56.6
T 09	313 31.9	·· 29.1	312 57.6	8.7	20 15.4	1.4	56.6
U 10	328 31.6	28.8	327 25.3	8.7	20 14.0	1.4	56.7
E 11	343 31.3	28.5	341 53.0	8.7	20 12.6	1.6	56.7
S 12	358 31.0	S22 28.2	356 20.7	8.7	S20 11.0	1.7	56.7
D 13	13 30.8	27.9	10 48.4	8.7	20 09.3	1.8	56.7
A 14	28 30.5	27.6	25 16.1	8.6	20 07.5	1.9	56.7
Y 15	43 30.2	·· 27.3	39 43.7	8.7	20 05.6	2.0	56.8
16	58 29.9	27.0	54 11.4	8.6	20 03.6	2.2	56.8
17	73 29.7	26.6	68 39.0	8.6	20 01.4	2.2	56.8
18	88 29.4	S22 26.3	83 06.6	8.6	S19 59.2	2.4	56.8
19	103 29.1	26.0	97 34.2	8.6	19 56.8	2.5	56.9
20	118 28.9	25.7	112 01.8	8.6	19 54.3	2.6	56.9
21	133 28.6	·· 25.4	126 29.4	8.6	19 51.7	2.7	56.9
22	148 28.3	25.1	140 57.0	8.6	19 49.0	2.9	56.9
23	163 28.0	24.8	155 24.6	8.6	19 46.1	2.9	56.9
	S.D. 16.3	d 0.3	S.D. 15.1		15.3		15.4

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

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

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	04 48	05 02	12 05	10 30	22 56	28	
5	05 15	05 29	12 05	11 22	23 48	29	●
6	05 42	05 55	12 06	12 15	24 42	00	

G.M.T.	ARIES	VENUS −3.4		MARS +1.4		JUPITER −1.7		SATURN +1.0		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
7 00	106 28.3	202 16.9	S22 43.3	158 16.0	S19 58.5	276 51.5	S 2 41.5	276 39.5	S 1 38.2	Acamar	315 36.9	S40 23.2
01	121 30.7	217 16.0	43.5	173 16.4	58.0	291 53.8	41.6	291 41.9	38.2	Achernar	335 45.1	S57 20.4
02	136 33.2	232 15.1	43.8	188 16.8	57.5	306 56.1	41.6	306 44.3	38.2	Acrux	173 36.8	S62 59.3
03	151 35.7	247 14.2	·· 44.0	203 17.3	·· 57.0	321 58.5	·· 41.7	321 46.7	·· 38.2	Adhara	255 31.6	S28 56.9
04	166 38.1	262 13.2	44.2	218 17.7	56.5	337 00.8	41.7	336 49.1	38.2	Aldebaran	291 17.5	N16 28.2
05	181 40.6	277 12.3	44.4	233 18.1	56.0	352 03.1	41.8	351 51.5	38.2			
06	196 43.1	292 11.4	S22 44.7	248 18.6	S19 55.6	7 05.5	S 2 41.8	6 53.9	S 1 38.3	Alioth	166 42.3	N56 03.6
07	211 45.5	307 10.5	44.9	263 19.0	55.1	22 07.8	41.9	21 56.4	38.3	Alkaid	153 18.5	N49 24.3
W 08	226 48.0	322 09.6	45.1	278 19.4	54.6	37 10.1	41.9	36 58.8	38.3	Al Na'ir	28 15.1	S47 03.4
E 09	241 50.4	337 08.6	·· 45.3	293 19.9	·· 54.1	52 12.5	·· 41.9	52 01.2	·· 38.3	Alnilam	276 11.1	S 1 13.0
D 10	256 52.9	352 07.7	45.6	308 20.3	53.6	67 14.8	42.0	67 03.6	38.3	Alphard	218 20.1	S 8 34.6
N 11	271 55.4	7 06.8	45.8	323 20.8	53.1	82 17.2	42.0	82 06.0	38.3			
E 12	286 57.8	22 05.9	S22 46.0	338 21.2	S19 52.6	97 19.5	S 2 42.1	97 08.4	S 1 38.3	Alphecca	126 32.2	N26 46.7
S 13	302 00.3	37 05.0	46.2	353 21.6	52.1	112 21.8	42.1	112 10.8	38.3	Alpheratz	358 09.2	N28 59.2
D 14	317 02.8	52 04.0	46.4	8 22.1	51.6	127 24.2	42.1	127 13.2	38.3	Altair	62 32.7	N 8 49.1
A 15	332 05.2	67 03.1	·· 46.7	23 22.5	·· 51.1	142 26.5	·· 42.2	142 15.7	·· 38.3	Ankaa	353 40.1	S42 24.9
Y 16	347 07.7	82 02.2	46.9	38 23.0	50.7	157 28.8	42.2	157 18.1	38.3	Antares	112 56.9	S26 23.3
17	2 10.2	97 01.3	47.1	53 23.4	50.2	172 31.2	42.3	172 20.5	38.4			
18	17 12.6	112 00.4	S22 47.3	68 23.8	S19 49.7	187 33.5	S 2 42.3	187 22.9	S 1 38.4	Arcturus	146 18.4	N19 16.8
19	32 15.1	126 59.4	47.5	83 24.3	49.2	202 35.8	42.4	202 25.3	38.4	Atria	108 21.4	S68 59.4
20	47 17.5	141 58.5	47.7	98 24.7	48.7	217 38.2	42.4	217 27.7	38.4	Avior	234 27.4	S59 26.9
21	62 20.0	156 57.6	·· 47.9	113 25.2	·· 48.2	232 40.5	·· 42.4	232 30.1	·· 38.4	Bellatrix	278 58.2	N 6 19.9
22	77 22.5	171 56.7	48.1	128 25.6	47.7	247 42.9	42.5	247 32.6	38.4	Betelgeuse	271 27.7	N 7 24.1
23	92 24.9	186 55.7	48.3	143 26.0	47.2	262 45.2	42.5	262 35.0	38.4			
8 00	107 27.4	201 54.8	S22 48.5	158 26.5	S19 46.7	277 47.5	S 2 42.6	277 37.4	S 1 38.4	Canopus	264 06.6	S52 41.3
01	122 29.9	216 53.9	48.7	173 26.9	46.2	292 49.9	42.6	292 39.8	38.4	Capella	281 10.5	N45 58.8
02	137 32.3	231 53.0	48.9	188 27.4	45.7	307 52.2	42.6	307 42.2	38.4	Deneb	49 48.7	N45 12.8
03	152 34.8	246 52.0	·· 49.1	203 27.8	·· 45.2	322 54.6	·· 42.7	322 44.6	·· 38.4	Denebola	182 58.7	N14 40.6
04	167 37.3	261 51.1	49.3	218 28.2	44.7	337 56.9	42.7	337 47.0	38.4	Diphda	349 20.7	S18 05.7
05	182 39.7	276 50.2	49.5	233 28.7	44.2	352 59.2	42.8	352 49.5	38.4			
06	197 42.2	291 49.3	S22 49.7	248 29.1	S19 43.7	8 01.6	S 2 42.8	7 51.9	S 1 38.5	Dubhe	194 21.6	N61 51.0
07	212 44.7	306 48.4	49.9	263 29.6	43.2	23 03.9	42.9	22 54.3	38.5	Elnath	278 43.5	N28 35.5
T 08	227 47.1	321 47.4	50.1	278 30.0	42.7	38 06.3	42.9	37 56.7	38.5	Eltanin	90 58.2	N51 29.4
H 09	242 49.6	336 46.5	·· 50.3	293 30.4	·· 42.2	53 08.6	·· 42.9	52 59.1	·· 38.5	Enif	34 11.6	N 9 47.2
U 10	257 52.0	351 45.6	50.5	308 30.9	41.7	68 10.9	43.0	68 01.5	38.5	Fomalhaut	15 51.4	S29 43.6
R 11	272 54.5	6 44.7	50.7	323 31.3	41.2	83 13.3	43.0	83 04.0	38.5			
S 12	287 57.0	21 43.7	S22 50.9	338 31.8	S19 40.7	98 15.6	S 2 43.1	98 06.4	S 1 38.5	Gacrux	172 28.4	S57 00.1
D 13	302 59.4	36 42.8	51.1	353 32.2	40.2	113 18.0	43.1	113 08.8	38.5	Gienah	176 17.7	S17 26.1
A 14	318 01.9	51 41.9	51.3	8 32.7	39.7	128 20.3	43.1	128 11.2	38.5	Hadar	149 23.2	S60 16.5
Y 15	333 04.4	66 41.0	·· 51.5	23 33.1	·· 39.2	143 22.7	·· 43.2	143 13.6	·· 38.5	Hamal	328 28.6	N23 22.4
16	348 06.8	81 40.0	51.6	38 33.5	38.7	158 25.0	43.2	158 16.0	38.5	Kaus Aust.	84 17.0	S34 23.6
17	3 09.3	96 39.1	51.8	53 34.0	38.2	173 27.3	43.2	173 18.5	38.5			
18	18 11.8	111 38.2	S22 52.0	68 34.4	S19 37.7	188 29.7	S 2 43.3	188 20.9	S 1 38.5	Kochab	137 19.6	N74 13.8
19	33 14.2	126 37.3	52.2	83 34.9	37.2	203 32.0	43.3	203 23.3	38.5	Markab	14 03.1	N15 06.2
20	48 16.7	141 36.3	52.4	98 35.3	36.7	218 34.4	43.4	218 25.7	38.6	Menkar	314 40.7	N 4 00.8
21	63 19.2	156 35.4	·· 52.6	113 35.8	·· 36.2	233 36.7	·· 43.4	233 28.1	·· 38.6	Menkent	148 36.9	S36 16.3
22	78 21.6	171 34.5	52.7	128 36.2	35.7	248 39.1	43.4	248 30.6	38.6	Miaplacidus	221 44.0	S69 38.2
23	93 24.1	186 33.5	52.9	143 36.6	35.2	263 41.4	43.5	263 33.0	38.6			
9 00	108 26.5	201 32.6	S22 53.1	158 37.1	S19 34.7	278 43.8	S 2 43.5	278 35.4	S 1 38.6	Mirfak	309 15.5	N49 47.7
01	123 29.0	216 31.7	53.3	173 37.5	34.2	293 46.1	43.6	293 37.8	38.6	Nunki	76 29.3	S26 19.2
02	138 31.5	231 30.8	53.4	188 38.0	33.7	308 48.5	43.6	308 40.2	38.6	Peacock	53 58.7	S56 47.9
03	153 33.9	246 29.8	·· 53.6	203 38.4	·· 33.2	323 50.8	·· 43.6	323 42.7	·· 38.6	Pollux	243 57.5	N28 04.3
04	168 36.4	261 28.9	53.8	218 38.9	32.7	338 53.2	43.7	338 45.1	38.6	Procyon	245 25.2	N 5 16.4
05	183 38.9	276 28.0	53.9	233 39.3	32.2	353 55.5	43.7	353 47.5	38.6			
06	198 41.3	291 27.1	S22 54.1	248 39.8	S19 31.7	8 57.8	S 2 43.7	8 49.9	S 1 38.6	Rasalhague	96 29.7	N12 34.4
07	213 43.8	306 26.1	54.3	263 40.2	31.1	24 00.2	43.8	23 52.3	38.6	Regulus	208 09.5	N12 03.6
08	228 46.3	321 25.2	54.4	278 40.7	30.6	39 02.5	43.8	38 54.8	38.6	Rigel	281 35.5	S 8 13.6
F 09	243 48.7	336 24.3	·· 54.6	293 41.1	·· 30.1	54 04.9	·· 43.9	53 57.2	·· 38.6	Rigil Kent.	140 25.8	S60 45.0
R 10	258 51.2	351 23.3	54.8	308 41.5	29.6	69 07.2	43.9	68 59.6	38.6	Sabik	102 41.2	S15 42.0
I 11	273 53.6	6 22.4	54.9	323 42.0	29.1	84 09.6	43.9	84 02.0	38.6			
D 12	288 56.1	21 21.5	S22 55.1	338 42.4	S19 28.6	99 11.9	S 2 44.0	99 04.4	S 1 38.6	Schedar	350 08.8	N56 26.2
A 13	303 58.6	36 20.6	55.3	353 42.9	28.1	114 14.3	44.0	114 06.9	38.7	Shaula	96 55.9	S37 05.3
Y 14	319 01.0	51 19.6	55.4	8 43.3	27.6	129 16.6	44.0	129 09.3	38.7	Sirius	258 55.2	S16 41.5
15	334 03.5	66 18.7	·· 55.6	23 43.8	·· 27.1	144 19.0	·· 44.1	144 11.7	·· 38.7	Spica	158 57.3	S11 03.6
16	349 06.0	81 17.8	55.7	38 44.2	26.6	159 21.3	44.1	159 14.1	38.7	Suhail	223 10.2	S43 21.3
17	4 08.4	96 16.8	55.9	53 44.7	26.1	174 23.7	44.1	174 16.5	38.7			
18	19 10.9	111 15.9	S22 56.0	68 45.1	S19 25.5	189 26.0	S 2 44.2	189 19.0	S 1 38.7	Vega	80 56.1	N38 46.0
19	34 13.4	126 15.0	56.2	83 45.6	25.0	204 28.4	44.2	204 21.4	38.7	Zuben'ubi	137 33.0	S15 57.6
20	49 15.8	141 14.1	56.3	98 46.0	24.5	219 30.7	44.3	219 23.8	38.7			
21	64 18.3	156 13.1	·· 56.5	113 46.5	·· 24.0	234 33.1	·· 44.3	234 26.2	·· 38.7		S.H.A.	Mer. Pass.
22	79 20.8	171 12.2	56.6	128 46.9	23.5	249 35.5	44.3	249 28.7	38.7	Venus	° ′ 94 27.4	h m 10 33
23	94 23.2	186 11.3	56.8	143 47.4	23.0	264 37.8	44.4	264 31.1	38.7	Mars	50 59.1	13 26
	h m									Jupiter	170 20.1	5 28
Mer. Pass.	16 47.4	*v* −0.9	*d* 0.2	*v* 0.4	*d* 0.5	*v* 2.3	*d* 0.0	*v* 2.4	*d* 0.0	Saturn	170 10.0	5 29

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
7 00	178 27.8	S22 24.5	169 52.2	8.5	S19 43.2	3.1	57.0
01	193 27.5	24.2	184 19.7	8.6	19 40.1	3.2	57.0
02	208 27.2	23.8	198 47.3	8.5	19 36.9	3.3	57.0
03	223 26.9	·· 23.5	213 14.8	8.6	19 33.6	3.4	57.0
04	238 26.7	23.2	227 42.4	8.6	19 30.2	3.5	57.1
05	253 26.4	22.9	242 10.0	8.5	19 26.7	3.6	57.1
06	268 26.1	S22 22.6	256 37.5	8.6	S19 23.1	3.8	57.1
07	283 25.9	22.3	271 05.1	8.5	19 19.3	3.8	57.1
W 08	298 25.6	21.9	285 32.6	8.6	19 15.5	4.0	57.1
E 09	313 25.3	·· 21.6	300 00.2	8.6	19 11.5	4.1	57.2
D 10	328 25.1	21.3	314 27.8	8.5	19 07.4	4.2	57.2
N 11	343 24.8	21.0	328 55.3	8.6	19 03.2	4.3	57.2
E 12	358 24.5	S22 20.7	343 22.9	8.6	S18 58.9	4.4	57.2
S 13	13 24.2	20.3	357 50.5	8.6	18 54.5	4.6	57.3
D 14	28 24.0	20.0	12 18.1	8.6	18 49.9	4.6	57.3
A 15	43 23.7	·· 19.7	26 45.7	8.6	18 45.3	4.8	57.3
Y 16	58 23.4	19.4	41 13.3	8.6	18 40.5	4.9	57.3
17	73 23.2	19.0	55 40.9	8.6	18 35.6	4.9	57.3
18	88 22.9	S22 18.7	70 08.5	8.6	S18 30.7	5.1	57.4
19	103 22.6	18.4	84 36.1	8.7	18 25.6	5.2	57.4
20	118 22.4	18.1	99 03.8	8.6	18 20.4	5.3	57.4
21	133 22.1	·· 17.7	113 31.4	8.7	18 15.1	5.4	57.4
22	148 21.8	17.4	127 59.1	8.7	18 09.7	5.6	57.4
23	163 21.6	17.1	142 26.8	8.7	18 04.1	5.6	57.5
8 00	178 21.3	S22 16.7	156 54.5	8.7	S17 58.5	5.7	57.5
01	193 21.0	16.4	171 22.2	8.7	17 52.8	5.9	57.5
02	208 20.8	16.1	185 49.9	8.8	17 46.9	5.9	57.5
03	223 20.5	·· 15.7	200 17.7	8.7	17 41.0	6.1	57.5
04	238 20.2	15.4	214 45.4	8.8	17 34.9	6.1	57.6
05	253 20.0	15.1	229 13.2	8.8	17 28.8	6.3	57.6
06	268 19.7	S22 14.7	243 41.0	8.8	S17 22.5	6.3	57.6
07	283 19.4	14.4	258 08.8	8.8	17 16.2	6.5	57.6
T 08	298 19.2	14.1	272 36.6	8.9	17 09.7	6.6	57.6
H 09	313 18.9	·· 13.7	287 04.5	8.8	17 03.1	6.6	57.7
U 10	328 18.6	13.4	301 32.3	8.9	16 56.5	6.8	57.7
R 11	343 18.4	13.0	316 00.2	8.9	16 49.7	6.9	57.7
S 12	358 18.1	S22 12.7	330 28.1	9.0	S16 42.8	7.0	57.7
D 13	13 17.9	12.4	344 56.1	8.9	16 35.8	7.0	57.7
A 14	28 17.6	12.0	359 24.0	9.0	16 28.8	7.2	57.8
Y 15	43 17.3	·· 11.7	13 52.0	9.0	16 21.6	7.3	57.8
16	58 17.1	11.3	28 20.0	9.0	16 14.3	7.3	57.8
17	73 16.8	11.0	42 48.0	9.0	16 07.0	7.5	57.8
18	88 16.5	S22 10.6	57 16.0	9.1	S15 59.5	7.5	57.8
19	103 16.3	10.3	71 44.1	9.1	15 52.0	7.7	57.9
20	118 16.0	10.0	86 12.2	9.1	15 44.3	7.7	57.9
21	133 15.8	·· 09.6	100 40.3	9.2	15 36.6	7.9	57.9
22	148 15.5	09.3	115 08.5	9.1	15 28.7	7.9	57.9
23	163 15.2	08.9	129 36.6	9.2	15 20.8	8.0	57.9
9 00	178 15.0	S22 08.6	144 04.8	9.2	S15 12.8	8.1	57.9
01	193 14.7	08.2	158 33.0	9.3	15 04.7	8.2	58.0
02	208 14.4	07.9	173 01.3	9.2	14 56.5	8.3	58.0
03	223 14.2	·· 07.5	187 29.5	9.3	14 48.2	8.4	58.0
04	238 13.9	07.2	201 57.8	9.3	14 39.8	8.4	58.0
05	253 13.7	06.8	216 26.1	9.4	14 31.4	8.6	58.0
06	268 13.4	S22 06.4	230 54.5	9.3	S14 22.8	8.6	58.0
07	283 13.1	06.1	245 22.8	9.4	14 14.2	8.8	58.1
08	298 12.9	05.7	259 51.2	9.4	14 05.4	8.8	58.1
F 09	313 12.6	·· 05.4	274 19.6	9.5	13 56.6	8.8	58.1
R 10	328 12.4	05.0	288 48.1	9.5	13 47.8	9.0	58.1
I 11	343 12.1	04.7	303 16.6	9.5	13 38.8	9.1	58.1
D 12	358 11.9	S22 04.3	317 45.1	9.5	S13 29.7	9.1	58.1
A 13	13 11.6	03.9	332 13.6	9.6	13 20.6	9.2	58.2
Y 14	28 11.3	03.6	346 42.2	9.5	13 11.4	9.3	58.2
15	43 11.1	·· 03.2	1 10.7	9.6	13 02.1	9.4	58.2
16	58 10.8	02.9	15 39.3	9.7	12 52.7	9.4	58.2
17	73 10.6	02.5	30 08.0	9.6	12 43.3	9.5	58.2
18	88 10.3	S22 02.1	44 36.6	9.7	S12 33.8	9.6	58.2
19	103 10.1	01.8	59 05.3	9.7	12 24.2	9.7	58.3
20	118 09.8	01.4	73 34.0	9.8	12 14.5	9.7	58.3
21	133 09.5	·· 01.0	88 02.8	9.7	12 04.8	9.8	58.3
22	148 09.3	00.7	102 31.5	9.8	11 55.0	9.9	58.3
23	163 09.0	00.3	117 00.3	9.8	11 45.1	10.0	58.3
	S.D. 16.3	d 0.3	S.D. 15.6		15.7		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	08 15	10 19	▬	▬	12 32	12 02	11 45
N 70	07 58	09 36	▬	11 55	11 43	11 36	11 31
68	07 44	09 08	11 10	11 02	11 12	11 17	11 19
66	07 33	08 46	10 13	10 29	10 49	11 01	11 09
64	07 23	08 29	09 40	10 05	10 30	10 48	11 00
62	07 14	08 14	09 16	09 46	10 15	10 37	10 53
60	07 07	08 02	08 57	09 30	10 03	10 27	10 47
N 58	07 00	07 51	08 41	09 17	09 52	10 19	10 41
56	06 54	07 42	08 28	09 06	09 42	10 11	10 36
54	06 48	07 34	08 16	08 55	09 33	10 05	10 32
52	06 43	07 26	08 06	08 46	09 26	09 59	10 28
50	06 38	07 19	07 57	08 38	09 19	09 54	10 24
45	06 28	07 04	07 38	08 21	09 04	09 42	10 16
N 40	06 18	06 52	07 22	08 07	08 52	09 32	10 09
35	06 09	06 41	07 09	07 55	08 41	09 24	10 04
30	06 01	06 31	06 57	07 44	08 32	09 17	09 58
20	05 46	06 13	06 37	07 26	08 17	09 04	09 50
N 10	05 31	05 57	06 20	07 11	08 03	08 53	09 42
0	05 15	05 41	06 03	06 56	07 50	08 43	09 34
S 10	04 57	05 24	05 46	06 41	07 37	08 32	09 27
20	04 35	05 04	05 29	06 26	07 23	08 21	09 19
30	04 08	04 41	05 08	06 08	07 07	08 08	09 10
35	03 50	04 26	04 55	05 57	06 58	08 01	09 05
40	03 28	04 09	04 41	05 45	06 47	07 52	08 59
45	03 00	03 48	04 24	05 31	06 35	07 42	08 52
S 50	02 19	03 20	04 03	05 13	06 20	07 30	08 44
52	01 56	03 07	03 53	05 05	06 12	07 25	08 40
54	01 22	02 50	03 42	04 56	06 04	07 19	08 36
56	////	02 31	03 29	04 46	05 56	07 12	08 31
58	////	02 06	03 14	04 34	05 46	07 04	08 26
S 60	////	01 30	02 56	04 20	05 34	06 55	08 20

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

G.M.T.	ARIES	VENUS −3.3		MARS +1.4		JUPITER −1.7		SATURN +1.0	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
10 00	109 25.7	201 10.3	S22 56.9	158 47.8	S19 22.5	279 40.2	S 2 44.4	279 33.5	S 1 38.7
01	124 28.1	216 09.4	57.1	173 48.3	22.0	294 42.5	44.4	294 35.9	38.7
02	139 30.6	231 08.5	57.2	188 48.7	21.4	309 44.9	44.5	309 38.4	38.7
03	154 33.1	246 07.5	·· 57.4	203 49.2	·· 20.9	324 47.2	·· 44.5	324 40.8	·· 38.7
04	169 35.5	261 06.6	57.5	218 49.6	20.4	339 49.6	44.5	339 43.2	38.7
05	184 38.0	276 05.7	57.7	233 50.1	19.9	354 51.9	44.6	354 45.6	38.7
06	199 40.5	291 04.8	S22 57.8	248 50.5	S19 19.4	9 54.3	S 2 44.6	9 48.1	S 1 38.7
07	214 42.9	306 03.8	57.9	263 51.0	18.9	24 56.6	44.6	24 50.5	38.7
S 08	229 45.4	321 02.9	58.1	278 51.4	18.3	39 59.0	44.7	39 52.9	38.7
A 09	244 47.9	336 02.0	·· 58.2	293 51.9	·· 17.8	55 01.3	·· 44.7	54 55.3	·· 38.7
T 10	259 50.3	351 01.0	58.3	308 52.3	17.3	70 03.7	44.7	69 57.8	38.7
U 11	274 52.8	6 00.1	58.5	323 52.8	16.8	85 06.1	44.8	85 00.2	38.7
R 12	289 55.3	20 59.2	S22 58.6	338 53.2	S19 16.3	100 08.4	S 2 44.8	100 02.6	S 1 38.8
D 13	304 57.7	35 58.2	58.7	353 53.7	15.8	115 10.8	44.8	115 05.0	38.8
A 14	320 00.2	50 57.3	58.9	8 54.1	15.2	130 13.1	44.9	130 07.5	38.8
Y 15	335 02.6	65 56.4	·· 59.0	23 54.6	·· 14.7	145 15.5	·· 44.9	145 09.9	·· 38.8
16	350 05.1	80 55.4	59.1	38 55.0	14.2	160 17.8	44.9	160 12.3	38.8
17	5 07.6	95 54.5	59.2	53 55.5	13.7	175 20.2	45.0	175 14.7	38.8
18	20 10.0	110 53.6	S22 59.4	68 55.9	S19 13.2	190 22.6	S 2 45.0	190 17.2	S 1 38.8
19	35 12.5	125 52.6	59.5	83 56.4	12.6	205 24.9	45.0	205 19.6	38.8
20	50 15.0	140 51.7	59.6	98 56.8	12.1	220 27.3	45.1	220 22.0	38.8
21	65 17.4	155 50.8	·· 59.7	113 57.3	·· 11.6	235 29.6	·· 45.1	235 24.4	·· 38.8
22	80 19.9	170 49.8	22 59.9	128 57.7	11.1	250 32.0	45.1	250 26.9	38.8
23	95 22.4	185 48.9	23 00.0	143 58.2	10.6	265 34.4	45.2	265 29.3	38.8
11 00	110 24.8	200 48.0	S23 00.1	158 58.6	S19 10.0	280 36.7	S 2 45.2	280 31.7	S 1 38.8
01	125 27.3	215 47.0	00.2	173 59.1	09.5	295 39.1	45.2	295 34.1	38.8
02	140 29.7	230 46.1	00.3	188 59.5	09.0	310 41.4	45.3	310 36.6	38.8
03	155 32.2	245 45.2	·· 00.4	204 00.0	·· 08.5	325 43.8	·· 45.3	325 39.0	·· 38.8
04	170 34.7	260 44.2	00.5	219 00.4	07.9	340 46.2	45.3	340 41.4	38.8
05	185 37.1	275 43.3	00.7	234 00.9	07.4	355 48.5	45.4	355 43.9	38.8
06	200 39.6	290 42.4	S23 00.8	249 01.4	S19 06.9	10 50.9	S 2 45.4	10 46.3	S 1 38.8
07	215 42.1	305 41.4	00.9	264 01.8	06.4	25 53.2	45.4	25 48.7	38.8
08	230 44.5	320 40.5	01.0	279 02.3	05.8	40 55.6	45.5	40 51.1	38.8
S 09	245 47.0	335 39.6	·· 01.1	294 02.7	·· 05.3	55 58.0	·· 45.5	55 53.6	·· 38.8
U 10	260 49.5	350 38.6	01.2	309 03.2	04.8	71 00.3	45.5	70 56.0	38.8
N 11	275 51.9	5 37.7	01.3	324 03.6	04.3	86 02.7	45.5	85 58.4	38.8
D 12	290 54.4	20 36.8	S23 01.4	339 04.1	S19 03.7	101 05.1	S 2 45.6	101 00.9	S 1 38.8
A 13	305 56.9	35 35.8	01.5	354 04.5	03.2	116 07.4	45.6	116 03.3	38.8
Y 14	320 59.3	50 34.9	01.6	9 05.0	02.7	131 09.8	45.6	131 05.7	38.8
15	336 01.8	65 34.0	·· 01.7	24 05.4	·· 02.2	146 12.1	·· 45.7	146 08.2	·· 38.8
16	351 04.2	80 33.0	01.8	39 05.9	01.6	161 14.5	45.7	161 10.6	38.8
17	6 06.7	95 32.1	01.9	54 06.4	01.1	176 16.9	45.7	176 13.0	38.8
18	21 09.2	110 31.2	S23 02.0	69 06.8	S19 00.6	191 19.2	S 2 45.8	191 15.4	S 1 38.8
19	36 11.6	125 30.2	02.1	84 07.3	19 00.0	206 21.6	45.8	206 17.9	38.8
20	51 14.1	140 29.3	02.2	99 07.7	18 59.5	221 24.0	45.8	221 20.3	38.8
21	66 16.6	155 28.4	·· 02.3	114 08.2	·· 59.0	236 26.3	·· 45.8	236 22.7	·· 38.8
22	81 19.0	170 27.4	02.4	129 08.6	58.5	251 28.7	45.9	251 25.2	38.8
23	96 21.5	185 26.5	02.5	144 09.1	57.9	266 31.1	45.9	266 27.6	38.8
12 00	111 24.0	200 25.6	S23 02.5	159 09.6	S18 57.4	281 33.4	S 2 45.9	281 30.0	S 1 38.8
01	126 26.4	215 24.6	02.6	174 10.0	56.9	296 35.8	46.0	296 32.5	38.8
02	141 28.9	230 23.7	02.7	189 10.5	56.3	311 38.2	46.0	311 34.9	38.8
03	156 31.4	245 22.7	·· 02.8	204 10.9	·· 55.8	326 40.5	·· 46.0	326 37.3	·· 38.8
04	171 33.8	260 21.8	02.9	219 11.4	55.3	341 42.9	46.1	341 39.8	38.8
05	186 36.3	275 20.9	03.0	234 11.8	54.7	356 45.3	46.1	356 42.2	38.8
06	201 38.7	290 19.9	S23 03.1	249 12.3	S18 54.2	11 47.6	S 2 46.1	11 44.6	S 1 38.8
07	216 41.2	305 19.0	03.1	264 12.8	53.7	26 50.0	46.1	26 47.1	38.8
08	231 43.7	320 18.1	03.2	279 13.2	53.1	41 52.4	46.2	41 49.5	38.8
M 09	246 46.1	335 17.1	·· 03.3	294 13.7	·· 52.6	56 54.8	·· 46.2	56 51.9	·· 38.8
O 10	261 48.6	350 16.2	03.4	309 14.1	52.1	71 57.1	46.2	71 54.4	38.8
N 11	276 51.1	5 15.3	03.4	324 14.6	51.5	86 59.5	46.2	86 56.8	38.8
D 12	291 53.5	20 14.3	S23 03.5	339 15.1	S18 51.0	102 01.9	S 2 46.3	101 59.2	S 1 38.8
A 13	306 56.0	35 13.4	03.6	354 15.5	50.5	117 04.2	46.3	117 01.7	38.8
Y 14	321 58.5	50 12.5	03.7	9 16.0	49.9	132 06.6	46.3	132 04.1	38.8
15	337 00.9	65 11.5	·· 03.7	24 16.4	·· 49.4	147 09.0	·· 46.4	147 06.5	·· 38.8
16	352 03.4	80 10.6	03.8	39 16.9	48.8	162 11.4	46.4	162 09.0	38.8
17	7 05.8	95 09.6	03.9	54 17.4	48.3	177 13.7	46.4	177 11.4	38.8
18	22 08.3	110 08.7	S23 03.9	69 17.8	S18 47.8	192 16.1	S 2 46.4	192 13.8	S 1 38.8
19	37 10.8	125 07.8	04.0	84 18.3	47.2	207 18.5	46.5	207 16.3	38.8
20	52 13.2	140 06.8	04.1	99 18.7	46.7	222 20.8	46.5	222 18.7	38.8
21	67 15.7	155 05.9	·· 04.1	114 19.2	·· 46.2	237 23.2	·· 46.5	237 21.1	·· 38.8
22	82 18.2	170 05.0	04.2	129 19.7	45.6	252 25.6	46.5	252 23.6	38.8
23	97 20.6	185 04.0	04.2	144 20.1	45.1	267 28.0	46.6	267 26.0	38.8
	h m								
Mer. Pass.	16 35.6	v −0.9	d 0.1	v 0.5	d 0.5	v 2.4	d 0.0	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 36.9	S40 23.2
Achernar	335 45.1	S57 20.4
Acrux	173 36.8	S62 59.3
Adhara	255 31.6	S28 56.9
Aldebaran	291 17.5	N16 28.2
Alioth	166 42.3	N56 03.6
Alkaid	153 18.4	N49 24.3
Al Na'ir	28 15.1	S47 03.4
Alnilam	276 11.1	S 1 13.0
Alphard	218 20.1	S 8 34.6
Alphecca	126 32.2	N26 46.6
Alpheratz	358 09.2	N28 59.2
Altair	62 32.7	N 8 49.1
Ankaa	353 40.2	S42 24.9
Antares	112 56.9	S26 23.3
Arcturus	146 18.4	N19 16.8
Atria	108 21.4	S68 59.4
Avior	234 27.4	S59 26.9
Bellatrix	278 58.2	N 6 19.9
Betelgeuse	271 27.7	N 7 24.1
Canopus	264 06.6	S52 41.3
Capella	281 10.6	N45 58.8
Deneb	49 48.7	N45 12.8
Denebola	182 58.7	N14 40.6
Diphda	349 20.7	S18 05.7
Dubhe	194 21.5	N61 51.0
Elnath	278 43.5	N28 35.5
Eltanin	90 58.1	N51 29.4
Enif	34 11.6	N 9 47.2
Fomalhaut	15 51.4	S29 43.6
Gacrux	172 28.3	S57 00.1
Gienah	176 17.6	S17 26.1
Hadar	149 23.1	S60 16.5
Hamal	328 28.6	N23 22.4
Kaus Aust.	84 17.0	S34 23.6
Kochab	137 19.6	N74 13.8
Markab	14 03.1	N15 06.2
Menkar	314 40.8	N 4 00.8
Menkent	148 36.8	S36 16.4
Miaplacidus	221 44.0	S69 38.2
Mirfak	309 15.5	N49 47.7
Nunki	76 29.3	S26 19.2
Peacock	53 58.7	S56 47.9
Pollux	243 57.5	N28 04.3
Procyon	245 25.2	N 5 16.4
Rasalhague	96 29.7	N12 34.4
Regulus	208 09.5	N12 03.5
Rigel	281 35.5	S 8 13.6
Rigil Kent.	140 25.7	S60 45.0
Sabik	102 41.2	S15 42.0
Schedar	350 08.8	N56 26.2
Shaula	96 55.8	S37 05.3
Sirius	258 55.2	S16 41.5
Spica	158 57.3	S11 03.6
Suhail	223 10.2	S43 21.3
Vega	80 56.1	N38 45.9
Zuben'ubi	137 32.9	S15 57.6

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	90 23.2	10 37
Mars	48 33.8	13 24
Jupiter	170 11.9	5 17
Saturn	170 06.9	5 17