सत्यमेव जयते
भारत सरकार / GOVERNMENT OF INDIA
पोत परिवहन मंत्रालय / MINISTRY OF SHIPPING

नौवहन महानिदेशालय, मुंबई
DIRECTORATE GENERAL OF SHIPPING, MUMBAI

No. 13 - Admn(1)/2019 Dated: 14.01.2020

Subject: - Quotation for printing /supply 136 nos. of Nautical Almanac (1992) books (approx 65 pages) (as per sample) to this Directorate-reg.

Sir,

Sealed quotations are invited for print/supply of 136 nos. of Nautical Almanac (1992) books (approx 65 pages) for the use of the Directorate and allied offices.

In view of above, the interested firms may furnish the sealed cover quotations by 24th January, 2020. The sample copy of books may be inspected in this Directorate during the office hours on 27.01.2020 at 1500 hrs.

Yours faithfully,

(Rajesh Kumar)
Assistant Hydrographic Surveyor

To

1. (As per list attached)
2. Copy forwarded to computer cell with a request to place this quotation on DGS website for wide publicity.

बीटा बिल्डिंग, 9वीं मंज़िल, आई थिंक टेक्नो कैम्पस,कांजूर गाँव रोड, कांजूरमार्ग (पूर्व) मुंबई-400042
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OCT.—MAR. SUN			APR.—SEPT. SUN		
App. Alt.	Lower Limb	Upper Limb	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	App. Alt.	Additional Corrⁿ
° ′	′		
9 56	−5·3		1992
10 08	−5·2		VENUS
10 20	−5·1		Jan. 1–Dec. 10
10 33	−5·0		° ′
10 46	−4·9		60 + 0·1
11 00	−4·8		
11 14	−4·7		Dec. 11–Dec. 31
11 29	−4·6		° ′
11 45	−4·5		41 + 0·2
12 01	−4·4		76 + 0·1
12 18	−4·3		
12 35	−4·2		MARS
12 54	−4·1		Jan. 1–Oct. 24
13 13	−4·0		° ′
13 33	−3·9		60 + 0·1
13 54	−3·8		
14 16	−3·7		Oct. 25–Dec. 31
14 40	−3·6		° ′
15 04	−3·5		41 + 0·2
15 30	−3·4		76 + 0·1
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			

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

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

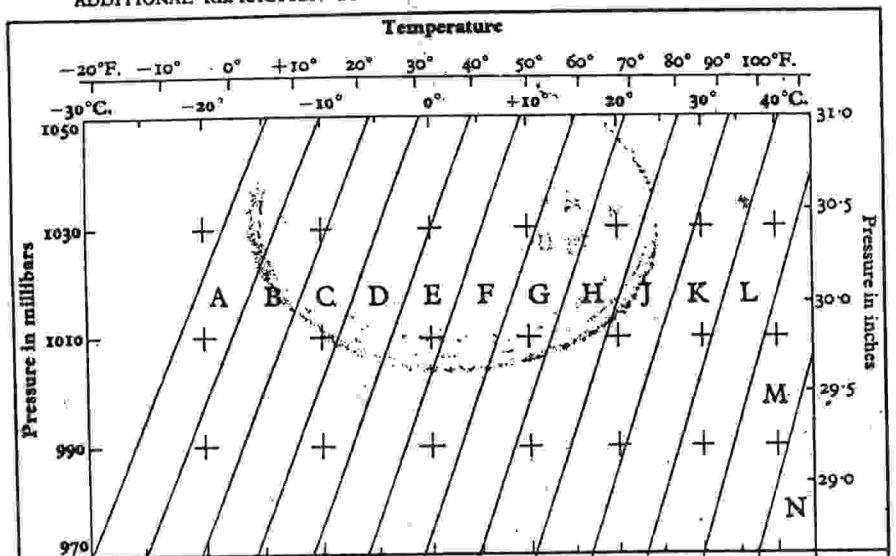
App. Alt.	OCT.–MAR. SUN Lower Limb	OCT.–MAR. SUN Upper Limb	APR.–SEPT. SUN Lower Limb	APR.–SEPT. SUN Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
0 00	−18·2	−50·5	−18·4	−50·2	−34·5
03	17·5	49·8	17·8	49·6	33·8
06	16·9	49·2	17·1	48·9	33·2
09	16·3	48·6	16·5	48·3	32·6
12	15·7	48·0	15·9	47·7	32·0
15	15·1	47·4	15·3	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	−42·1	− 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	31·2	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	−21·2	− 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).

भारतीय वाणिज्य विभाग
सं/No. 54
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MERCANTILE MARINE DEPTT.

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CALENDAR, 1992

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	W.	1	Sa.	32	Su.	61	W.	92	F.	122	M.	153	W.	183	Sa.	214	Tu.	245	Th.	275	Su.	306	Tu.	336
2	Th.	2	Su.	33	M.	62	Th.	93	Sa.	123	Tu.	154	Th.	184	Su.	215	W.	246	F.	276	M.	307	W.	337
3	F.	3	M.	34	Tu.	63	F.	94	Su.	124	W.	155	F.	185	M.	216	Th.	247	Sa.	277	Tu.	308	Th.	338
4	Sa.	4	Tu.	35	W.	64	Sa.	95	M.	125	Th.	156	Sa.	186	Tu.	217	F.	248	Su.	278	W.	309	F.	339
5	Su.	5	W.	36	Th.	65	Su.	96	Tu.	126	F.	157	Su.	187	W.	218	Sa.	249	M.	279	Th.	310	Sa.	340
6	M.	6	Th.	37	F.	66	M.	97	W.	127	Sa.	158	M.	188	Th.	219	Su.	250	Tu.	280	F.	311	Su.	341
7	Tu.	7	F.	38	Sa.	67	Tu.	98	Th.	128	Su.	159	Tu.	189	F.	220	M.	251	W.	281	Sa.	312	M.	342
8	W.	8	Sa.	39	Su.	68	W.	99	F.	129	M.	160	W.	190	Sa.	221	Tu.	252	Th.	282	Su.	313	Tu.	343
9	Th.	9	Su.	40	M.	69	Th.	100	Sa.	130	Tu.	161	Th.	191	Su.	222	W.	253	F.	283	M.	314	W.	344
10	F.	10	M.	41	Tu.	70	F.	101	Su.	131	W.	162	F.	192	M.	223	Th.	254	Sa.	284	Tu.	315	Th.	345
11	Sa.	11	Tu.	42	W.	71	Sa.	102	M.	132	Th.	163	Sa.	193	Tu.	224	F.	255	Su.	285	W.	316	F.	346
12	Su.	12	W.	43	Th.	72	Su.	103	Tu.	133	F.	164	Su.	194	W.	225	Sa.	256	M.	286	Th.	317	Sa.	347
13	M.	13	Th.	44	F.	73	M.	104	W.	134	Sa.	165	M.	195	Th.	226	Su.	257	Tu.	287	F.	318	Su.	348
14	Tu.	14	F.	45	Sa.	74	Tu.	105	Th.	135	Su.	166	Tu.	196	F.	227	M.	258	W.	288	Sa.	319	M.	349
15	W.	15	Sa.	46	Su.	75	W.	106	F.	136	M.	167	W.	197	Sa.	228	Tu.	259	Th.	289	Su.	320	Tu.	350
16	Th.	16	Su.	47	M.	76	Th.	107	Sa.	137	Tu.	168	Th.	198	Su.	229	W.	260	F.	290	M.	321	W.	351
17	F.	17	M.	48	Tu.	77	F.	108	Su.	138	W.	169	F.	199	M.	230	Th.	261	Sa.	291	Tu.	322	Th.	352
18	Sa.	18	Tu.	49	W.	78	Sa.	109	M.	139	Th.	170	Sa.	200	Tu.	231	F.	262	Su.	292	W.	323	F.	353
19	Su.	19	W.	50	Th.	79	Su.	110	Tu.	140	F.	171	Su.	201	W.	232	Sa.	263	M.	293	Th.	324	Sa.	354
20	M.	20	Th.	51	F.	80	M.	111	W.	141	Sa.	172	M.	202	Th.	233	Su.	264	Tu.	294	F.	325	Su.	355
21	Tu.	21	F.	52	Sa.	81	Tu.	112	Th.	142	Su.	173	Tu.	203	F.	234	M.	265	W.	295	Sa.	326	M.	356
22	W.	22	Sa.	53	Su.	82	W.	113	F.	143	M.	174	W.	204	Sa.	235	Tu.	266	Th.	296	Su.	327	Tu.	357
23	Th.	23	Su.	54	M.	83	Th.	114	Sa.	144	Tu.	175	Th.	205	Su.	236	W.	267	F.	297	M.	328	W.	358
24	F.	24	M.	55	Tu.	84	F.	115	Su.	145	W.	176	F.	206	M.	237	Th.	268	Sa.	298	Tu.	329	Th.	359
25	Sa.	25	Tu.	56	W.	85	Sa.	116	M.	146	Th.	177	Sa.	207	Tu.	238	F.	269	Su.	299	W.	330	F.	360
26	Su.	26	W.	57	Th.	86	Su.	117	Tu.	147	F.	178	Su.	208	W.	239	Sa.	270	M.	300	Th.	331	Sa.	361
27	M.	27	Th.	58	F.	87	M.	118	W.	148	Sa.	179	M.	209	Th.	240	Su.	271	Tu.	301	F.	332	Su.	362
28	Tu.	28	F.	59	Sa.	88	Tu.	119	Th.	149	Su.	180	Tu.	210	F.	241	M.	272	W.	302	Sa.	333	M.	363
29	W.	29	Sa.	60	Su.	89	W.	120	F.	150	M.	181	W.	211	Sa.	242	Tu.	273	Th.	303	Su.	334	Tu.	364
30	Th.	30			M.	90	Th.	121	Sa.	151	Tu.	182	Th.	212	Su.	243	W.	274	F.	304	M.	335	W.	365
31	F.	31			Tu.	91			Su.	152			F.	213	M.	244			Sa.	305			Th.	366

ECLIPSES

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

1. *An Annular Eclipse of the Sun*, January 4–5. See map on page 6. The eclipse begins on January 4 at $20^h\ 04^m$ and ends on January 5 at $02^h\ 06^m$; the annular phase begins on January 4 at $21^h\ 16^m$ and ends on January 5 at $00^h\ 53^m$. The maximum duration of the annular phase is $11^m\ 36^s$.

2. *A Partial Eclipse of the Moon*, June 15. The eclipse begins at $03^h\ 27^m$ and ends at $06^h\ 27^m$. The time of maximum eclipse is $04^h\ 57^m$ when 0·68 of the Moon's diameter is obscured. It is visible from Antarctica, eastern Africa, southern tip of Greenland, South America, North America except the north-west, Central America, part of the Pacific Ocean and east New Zealand.

3. *A Total Eclipse of the Sun*, June 30. See map on page 7. The eclipse begins at $09^h\ 51^m$ and ends at $14^h\ 30^m$; the total phase begins at $11^h\ 02^m$ and ends at $13^h\ 19^m$. The maximum duration of totality is $5^m\ 26^s$.

4. *A Total Eclipse of the Moon*, December 9–10. The eclipse begins on December 9 at $22^h\ 00^m$ and ends on December 10 at $01^h\ 28^m$; the total phase begins on December 9 at $23^h\ 07^m$ and ends on December 10 at $00^h\ 21^m$. It is visible from Asia except the extreme east, Europe including the British Isles, Africa, Atlantic Ocean, Iceland, Greenland, South America except the south, Central America, North America except the western coast.

5. *A Partial Eclipse of the Sun*, December 23–24. The eclipse begins on December 23 at $22^h\ 21^m$ and ends on December 24 at $02^h\ 41^m$; at time of maximum eclipse 0·84 of the Sun's diameter is obscured. It is visible from eastern China, Korea, Japan, the extreme east of U.S.S.R. and south-west Alaska.

VISIBILITY OF PLANETS

VENUS is a brilliant object in the morning sky from the beginning of the year until the second week in May when it becomes too close to the Sun for observation. During the second half of July it reappears in the evening sky where it stays until the end of the year. Venus is in conjunction with Mars on February 19, with Saturn on February 29 and December 21, with Mercury on April 5 and July 25 and with Jupiter on August 23.

MARS can be seen at the very beginning of January in the morning sky in Ophiuchus then it passes through Sagittarius, Capricornus, Aquarius, Pisces, briefly into Cetus and back into Pisces, on to Aries and Taurus (passing 5°N of *Aldebaran* on August 11), Gemini (passing 5°S of *Pollux* on November 4 by which time it can be seen for more than half the night), Cancer and back into Gemini in mid December where it remains for the rest of the year (passing 3°S of *Pollux* on December 22). Mars is in conjunction with Mercury on January 10, with Venus on February 19 and with Saturn on March 6.

JUPITER can be seen in January for more than half of the night in Leo, its westward elongation gradually increases until it is at opposition on February 29 when it can be seen throughout the night. Its eastward elongation then gradually decreases until by early June it can be seen only in the evening sky. In early September it becomes too close to the Sun for observation until the beginning of October when it reappears in the morning sky in Virgo in which constellation it remains for the rest of the year. Jupiter is in conjunction with Venus on August 23.

SATURN can be seen in the evening sky in Capricornus until mid-January then it becomes too close to the Sun for observation. It reappears in the morning sky in mid-February still in Capricornus in which constellation it remains throughout the year. Its westward elongation gradually increases until it is at opposition on August 7 when it is visible throughout the night. Its eastward elongation then gradually decreases until from early November it can only be seen in the evening sky. Saturn is in conjunction with Venus on February 29 and December 21 and with Mars on March 6.

MERCURY can only be seen low in the east before sunrise, or low in the west after sunset (about the time of the beginning or end of civil twilight). It is visible in the mornings between the following approximate dates: January 1 (−0·3) to January 30 (−0·7); April 3 (+2·8) to May 24 (−1·3); August 11 (+2·4) to September 6 (−1·4) and November 28 (+1·4) to December 31 (−0·5). The planet is brighter at the end of each period. It is visible in the evenings between the following approximate dates: February 23 (−1·3) to March 19 (+2·1); June 8 (−1·4) to July 26 (+2·9) and September 27 (−0·8) to November 16 (+1·8). 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.

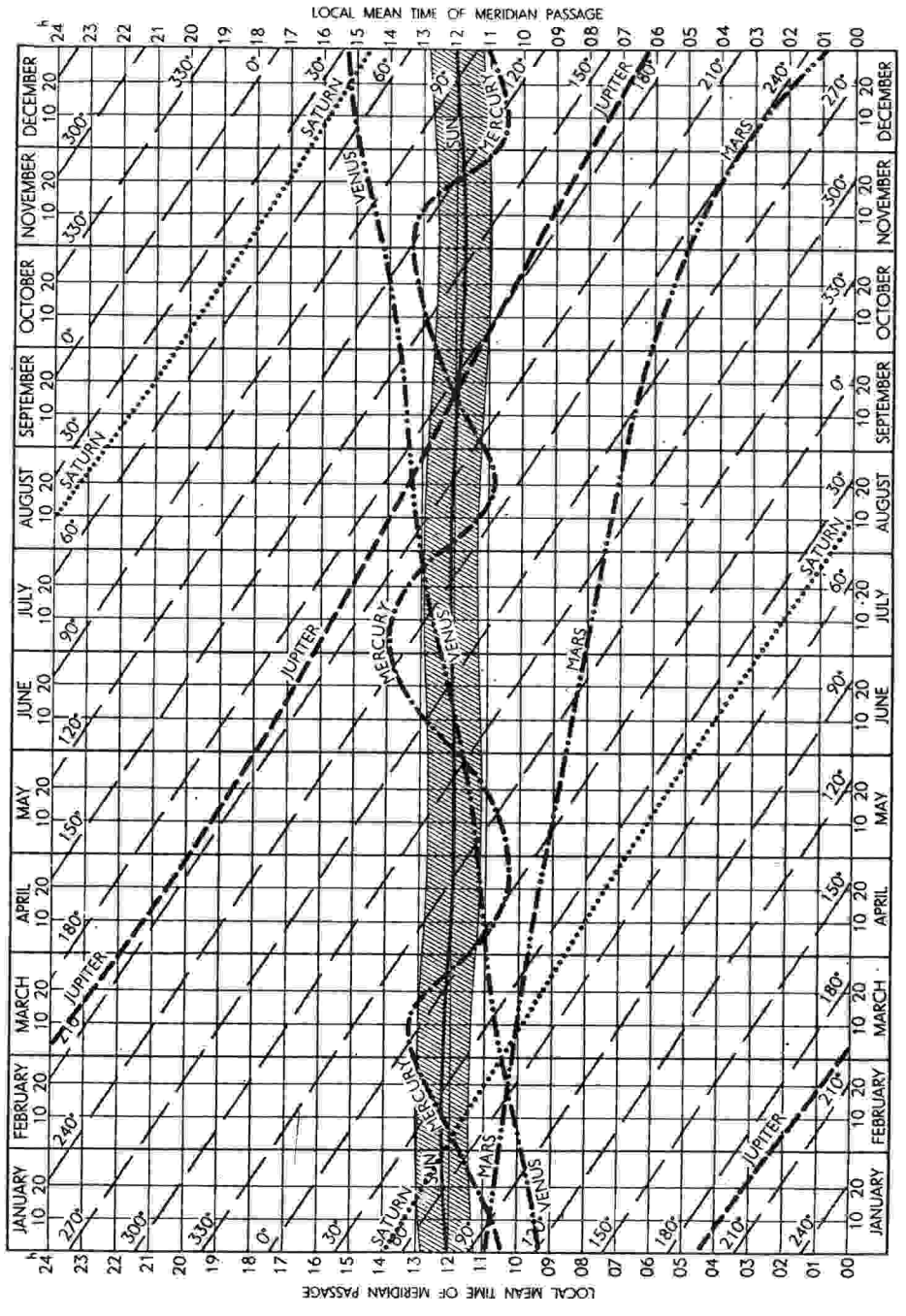
When the meridian passage of an outer planet occurs at midnight the body is in opposition to the Sun and is visible all night; a planet may then be observable during both morning and evening twilights. As the time of meridian passage decreases, the body eventually ceases to be observable in the morning, 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

Mercury with Mars during the first half of January, the reddish tint of Mars should assist in its identification.

Venus with Mars from mid-February to early March, with Saturn from late February to early March and mid-December to late December, with Mercury in early April and in the third week of May and with Jupiter late August, on all occasions Venus is the brighter object.

Mars with Saturn for the first half of March when Mars is the brighter object.



UT (GMT)	ARIES	VENUS −4.0		MARS +1.4		JUPITER −2.4		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
16 00	114 41.7	216 54.7	S21 21.9	199 19.7	S23 57.8	308 45.5	N 7 21.5	164 32.7	S18 57.1
01	129 44.2	231 53.9	22.3	214 20.2	57.8	323 48.1	21.6	179 34.8	57.1
02	144 46.6	246 53.1	22.6	229 20.6	57.7	338 50.7	21.6	194 37.0	57.0
03	159 49.1	261 52.3	·· 23.0	244 21.0	·· 57.7	353 53.2	·· 21.7	209 39.1	·· 56.9
04	174 51.6	276 51.5	23.4	259 21.4	57.6	8 55.8	21.7	224 41.3	56.8
05	189 54.0	291 50.7	23.7	274 21.8	57.6	23 58.4	21.8	239 43.5	56.8
06	204 56.5	306 49.9	S21 24.1	289 22.3	S23 57.5	39 01.0	N 7 21.9	254 45.6	S18 56.7
07	219 59.0	321 49.2	24.4	304 22.7	57.5	54 03.6	21.9	269 47.8	56.6
T 08	235 01.4	336 48.4	24.8	319 23.1	57.4	69 06.1	22.0	284 50.0	56.5
H 09	250 03.9	351 47.6	·· 25.1	334 23.5	·· 57.4	84 08.7	·· 22.0	299 52.1	·· 56.5
U 10	265 06.4	6 46.8	25.5	349 24.0	57.4	99 11.3	22.1	314 54.3	56.4
R 11	280 08.8	21 46.0	25.8	4 24.4	57.3	114 13.9	22.2	329 56.4	56.3
S 12	295 11.3	36 45.2	S21 26.2	19 24.8	S23 57.3	129 16.5	N 7 22.2	344 58.6	S18 56.2
D 13	310 13.8	51 44.4	26.5	34 25.2	57.2	144 19.1	22.3	0 00.8	56.2
A 14	325 16.2	66 43.6	26.9	49 25.7	57.2	159 21.6	22.3	15 02.9	56.1
Y 15	340 18.7	81 42.8	·· 27.2	64 26.1	·· 57.1	174 24.2	·· 22.4	30 05.1	·· 56.0
16	355 21.1	96 42.0	27.6	79 26.5	57.1	189 26.8	22.5	45 07.2	56.0
17	10 23.6	111 41.3	27.9	94 26.9	57.0	204 29.4	22.5	60 09.4	55.9
18	25 26.1	126 40.5	S21 28.3	109 27.4	S23 56.9	219 32.0	N 7 22.6	75 11.6	S18 55.8
19	40 28.5	141 39.7	28.6	124 27.8	56.9	234 34.6	22.7	90 13.7	55.7
20	55 31.0	156 38.9	29.0	139 28.2	56.8	249 37.1	22.7	105 15.9	55.7
21	70 33.5	171 38.1	·· 29.3	154 28.6	·· 56.8	264 39.7	·· 22.8	120 18.1	·· 55.6
22	85 35.9	186 37.3	29.6	169 29.0	56.7	279 42.3	22.8	135 20.2	55.5
23	100 38.4	201 36.5	30.0	184 29.5	56.7	294 44.9	22.9	150 22.4	55.4
17 00	115 40.9	216 35.7	S21 30.3	199 29.9	S23 56.6	309 47.5	N 7 23.0	165 24.5	S18 55.4
01	130 43.3	231 34.9	30.7	214 30.3	56.6	324 50.1	23.0	180 26.7	55.3
02	145 45.8	246 34.1	31.0	229 30.7	56.5	339 52.7	23.1	195 28.9	55.2
03	160 48.3	261 33.3	·· 31.3	244 31.2	·· 56.5	354 55.2	·· 23.2	210 31.0	·· 55.1
04	175 50.7	276 32.5	31.7	259 31.6	56.4	9 57.8	23.2	225 33.2	55.1
05	190 53.2	291 31.7	32.0	274 32.0	56.3	25 00.4	23.3	240 35.4	55.0
06	205 55.6	306 30.9	S21 32.3	289 32.4	S23 56.3	40 03.0	N 7 23.3	255 37.5	S18 54.9
07	220 58.1	321 30.1	32.7	304 32.8	56.2	55 05.6	23.4	270 39.7	54.9
08	236 00.6	336 29.3	33.0	319 33.3	56.2	70 08.2	23.5	285 41.8	54.8
F 09	251 03.0	351 28.5	·· 33.3	334 33.7	·· 56.1	85 10.8	·· 23.5	300 44.0	·· 54.7
R 10	266 05.5	6 27.7	33.6	349 34.1	56.1	100 13.4	23.6	315 46.2	54.6
I 11	281 08.0	21 26.9	34.0	4 34.5	56.0	115 16.0	23.7	330 48.3	54.6
D 12	296 10.4	36 26.1	S21 34.3	19 35.0	S23 55.9	130 18.5	N 7 23.7	345 50.5	S18 54.5
A 13	311 12.9	51 25.3	34.6	34 35.4	55.9	145 21.1	23.8	0 52.6	54.4
Y 14	326 15.4	66 24.5	34.9	49 35.8	55.8	160 23.7	23.9	15 54.8	54.3
15	341 17.8	81 23.7	·· 35.3	64 36.2	·· 55.8	175 26.3	·· 23.9	30 57.0	·· 54.3
16	356 20.3	96 22.9	35.6	79 36.6	55.7	190 28.9	24.0	45 59.1	54.2
17	11 22.8	111 22.1	35.9	94 37.1	55.6	205 31.5	24.1	61 01.3	54.1
18	26 25.2	126 21.3	S21 36.2	109 37.5	S23 55.6	220 34.1	N 7 24.1	76 03.5	S18 54.0
19	41 27.7	141 20.5	36.5	124 37.9	55.5	235 36.7	24.2	91 05.6	54.0
20	56 30.1	156 19.7	36.9	139 38.3	55.4	250 39.3	24.2	106 07.8	53.9
21	71 32.6	171 18.9	·· 37.2	154 38.8	·· 55.4	265 41.9	·· 24.3	121 09.9	·· 53.8
22	86 35.1	186 18.1	37.5	169 39.2	55.3	280 44.5	24.4	136 12.1	53.7
23	101 37.5	201 17.3	37.8	184 39.6	55.2	295 47.1	24.4	151 14.3	53.7
18 00	116 40.0	216 16.5	S21 38.1	199 40.0	S23 55.2	310 49.7	N 7 24.5	166 16.4	S18 53.6
01	131 42.5	231 15.7	38.4	214 40.4	55.1	325 52.2	24.6	181 18.6	53.5
02	146 44.9	246 14.9	38.7	229 40.9	55.0	340 54.8	24.6	196 20.7	53.5
03	161 47.4	261 14.1	·· 39.1	244 41.3	·· 55.0	355 57.4	·· 24.7	211 22.9	·· 53.4
04	176 49.9	276 13.3	39.4	259 41.7	54.9	11 00.0	24.8	226 25.1	53.3
05	191 52.3	291 12.5	39.7	274 42.1	54.8	26 02.6	24.8	241 27.2	53.2
06	206 54.8	306 11.7	S21 40.0	289 42.6	S23 54.8	41 05.2	N 7 24.9	256 29.4	S18 53.2
07	221 57.2	321 10.9	40.3	304 43.0	54.7	56 07.8	25.0	271 31.6	53.1
S 08	236 59.7	336 10.1	40.6	319 43.4	54.6	71 10.4	25.0	286 33.7	53.0
A 09	252 02.2	351 09.3	·· 40.9	334 43.8	·· 54.6	86 13.0	·· 25.1	301 35.9	·· 52.9
T 10	267 04.6	6 08.5	41.2	349 44.2	54.5	101 15.6	25.2	316 38.0	52.9
U 11	282 07.1	21 07.7	41.5	4 44.7	54.4	116 18.2	25.2	331 40.2	52.8
R 12	297 09.6	36 06.9	S21 41.8	19 45.1	S23 54.4	131 20.8	N 7 25.3	346 42.4	S18 52.7
D 13	312 12.0	51 06.1	42.1	34 45.5	54.3	146 23.4	25.4	1 44.5	52.6
A 14	327 14.5	66 05.3	42.4	49 45.9	54.2	161 26.0	25.4	16 46.7	52.6
Y 15	342 17.0	81 04.5	·· 42.7	64 46.3	·· 54.1	176 28.6	·· 25.5	31 48.8	·· 52.5
16	357 19.4	96 03.7	43.0	79 46.8	54.1	191 31.2	25.6	46 51.0	52.4
17	12 21.9	111 02.8	43.3	94 47.2	54.0	206 33.8	25.6	61 53.2	52.3
18	27 24.4	126 02.0	S21 43.6	109 47.6	S23 53.9	221 36.4	N 7 25.7	76 55.3	S18 52.3
19	42 26.8	141 01.2	43.9	124 48.0	53.9	236 39.0	25.8	91 57.5	52.2
20	57 29.3	156 00.4	44.2	139 48.4	53.8	251 41.6	25.8	106 59.7	52.1
21	72 31.7	170 59.6	·· 44.4	154 48.9	·· 53.7	266 44.2	·· 25.9	122 01.8	·· 52.0
22	87 34.2	185 58.8	44.7	169 49.3	53.6	281 46.8	26.0	137 04.0	52.0
23	102 36.7	200 58.0	45.0	184 49.7	53.6	296 49.4	26.0	152 06.1	51.9
	h m								
Mer. Pass.	16 14.6	v −0.8	d 0.3	v 0.4	d 0.1	v 2.6	d 0.1	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.2	S40 20.3
Achernar	335 38.5	S57 16.8
Acrux	173 27.2	S63 03.2
Adhara	255 24.7	S28 57.8
Aldebaran	291 07.5	N16 29.7
Alioth	166 34.4	N55 59.7
Alkaid	153 11.4	N49 20.8
Al Na'ir	28 04.0	S47 00.1
Alnilam	276 02.3	S 1 12.4
Alphard	218 11.5	S 8 37.6
Alphecca	126 24.7	N26 44.2
Alpheratz	358 00.3	N29 03.0
Altair	62 24.2	N 8 50.8
Ankaa	353 31.5	S42 21.1
Antares	112 46.2	S26 24.9
Arcturus	146 10.3	N19 13.1
Atria	108 02.9	S69 00.7
Avior	234 24.0	S59 29.1
Bellatrix	278 48.9	N 6 20.6
Betelgeuse	271 18.3	N 7 24.3
Canopus	264 02.7	S52 41.6
Capella	280 57.7	N45 59.6
Deneb	49 42.9	N45 15.2
Denebola	182 49.7	N14 36.7
Diphda	349 12.0	S18 01.9
Dubhe	194 10.6	N61 47.3
Elnath	278 32.5	N28 36.1
Eltanin	90 54.1	N51 29.2
Enif	34 03.1	N 9 50.4
Fomalhaut	15 41.8	S29 39.9
Gacrux	172 18.7	S57 04.0
Gienah	176 08.7	S17 30.0
Hadar	149 10.9	S60 19.9
Hamal	328 18.8	N23 25.7
Kaus Aust.	84 05.4	S34 23.3
Kochab	137 19.5	N74 10.9
Markab	13 54.5	N15 09.9
Menkar	314 31.7	N 4 03.6
Menkent	148 26.6	S36 19.8
Miaplacidus	221 42.3	S69 41.0
Mirfak	309 03.1	N49 50.3
Nunki	76 18.5	S26 18.4
Peacock	53 44.8	S56 45.7
Pollux	243 46.8	N28 02.7
Procyon	245 16.1	N 5 14.7
Rasalhague	96 21.6	N12 33.8
Regulus	208 00.2	N12 00.2
Rigel	281 27.1	S 8 12.7
Rigil Kent.	140 13.8	S60 48.0
Sabik	102 31.2	S15 43.0
Schedar	349 59.1	N56 30.0
Shaula	96 44.0	S37 05.9
Sirius	258 47.4	S16 42.4
Spica	158 48.1	S11 07.3
Suhail	223 03.8	S43 24.0
Vega	80 50.2	N38 46.5
Zuben'ubi	137 23.3	S16 00.6

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	100 54.8	9 34
Mars	83 49.0	10 42
Jupiter	194 06.6	3 20
Saturn	49 43.7	12 56

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
16 00	177 38.8	S21 06.9	56 19.8	5.2	N23 38.2	4.8	59.2	N 72	07 58	09 46		□	□	□	□
01	192 38.6	06.4	70 44.0	5.0	23 43.0	4.7	59.3	N 70	07 43	09 14	12 06	□	□	□	□
02	207 38.4	06.0	85 08.0	5.0	23 47.7	4.5	59.3	68	07 32	08 50	10 27	□	□	□	13 37
03	222 38.1	.. 05.5	99 32.0	4.8	23 52.2	4.3	59.4	66	07 22	08 32	09 49	□	□	11 47	14 17
04	237 37.9	05.0	113 55.8	4.8	23 56.5	4.2	59.4	64	07 13	08 17	09 23	10 11	11 01	12 43	14 45
05	252 37.7	04.6	128 19.6	4.7	24 00.7	4.1	59.4	62	07 06	08 04	09 02	10 50	11 45	13 16	15 06
06	267 37.5	S21 04.1	142 43.3	4.5	N24 04.8	3.8	59.5	60	07 00	07 53	08 46	11 17	12 15	13 40	15 23
07	282 37.3	03.6	157 06.8	4.5	24 08.6	3.8	59.5	N 58	06 54	07 44	08 32	11 38	12 37	14 00	15 37
T 08	297 37.0	03.2	171 30.3	4.4	24 12.4	3.5	59.6	56	06 48	07 36	08 20	11 56	12 56	14 16	15 49
H 09	312 36.8	.. 02.7	185 53.7	4.3	24 15.9	3.4	59.6	54	06 43	07 28	08 09	12 11	13 11	14 29	16 00
U 10	327 36.6	02.3	200 17.0	4.2	24 19.3	3.3	59.6	52	06 39	07 21	08 00	12 24	13 25	14 41	16 09
R 11	342 36.4	01.8	214 40.2	4.2	24 22.6	3.0	59.7	50	06 35	07 15	07 52	12 35	13 36	14 52	16 18
S 12	357 36.2	S21 01.3	229 03.4	4.0	N24 25.6	2.9	59.7	45	06 25	07 01	07 34	12 59	14 01	15 14	16 35
D 13	12 36.0	00.8	243 26.4	4.0	24 28.5	2.8	59.7	N 40	06 17	06 50	07 20	13 18	14 20	15 32	16 50
A 14	27 35.7	21 00.4	257 49.4	3.9	24 31.3	2.6	59.8	35	06 09	06 40	07 07	13 34	14 37	15 47	17 02
Y 15	42 35.5	20 59.9	272 12.3	3.8	24 33.9	2.4	59.8	30	06 01	06 31	06 57	13 48	14 51	16 00	17 13
16	57 35.3	59.4	286 35.1	3.7	24 36.3	2.2	59.9	20	05 47	06 14	06 38	14 12	15 15	16 22	17 31
17	72 35.1	59.0	300 57.8	3.7	24 38.5	2.1	59.9	N 10	05 33	05 59	06 22	14 32	15 35	16 41	17 47
18	87 34.9	S20 58.5	315 20.5	3.5	N24 40.6	1.8	59.9	0	05 18	05 44	06 06	14 52	15 55	16 59	18 02
19	102 34.7	58.0	329 43.0	3.6	24 42.4	1.8	60.0	S 10	05 02	05 28	05 51	15 11	16 14	17 17	18 16
20	117 34.5	57.5	344 05.6	3.4	24 44.2	1.5	60.0	20	04 42	05 10	05 34	15 32	16 35	17 36	18 32
21	132 34.2	.. 57.1	358 28.0	3.4	24 45.7	1.4	60.0	30	04 16	04 48	05 15	15 56	16 59	17 58	18 50
22	147 34.0	56.6	12 50.4	3.3	24 47.1	1.2	60.1	35	03 59	04 35	05 03	16 10	17 13	18 11	19 00
23	162 33.8	56.1	27 12.7	3.3	24 48.3	1.0	60.1	40	03 39	04 19	04 50	16 26	17 30	18 25	19 12
17 00	177 33.6	S20 55.6	41 35.0	3.2	N24 49.3	0.8	60.1	45	03 13	03 59	04 35	16 46	17 49	18 43	19 26
01	192 33.4	55.2	55 57.2	3.1	24 50.1	0.7	60.2	S 50	02 37	03 34	04 15	17 10	18 14	19 04	19 43
02	207 33.2	54.7	70 19.3	3.1	24 50.8	0.4	60.2	52	02 17	03 21	04 06	17 22	18 25	19 14	19 51
03	222 33.0	.. 54.2	84 41.4	3.0	24 51.2	0.3	60.2	54	01 51	03 07	03 56	17 36	18 39	19 26	20 00
04	237 32.8	53.7	99 03.4	3.0	24 51.5	0.1	60.3	56	01 11	02 50	03 44	17 52	18 54	19 39	20 09
05	252 32.5	53.2	113 25.4	2.9	24 51.6	0.0	60.3	58	////	02 28	03 30	18 10	19 13	19 54	20 21
06	267 32.3	S20 52.8	127 47.3	2.9	N24 51.6	0.3	60.3	S 60	////	02 00	03 14	18 34	19 35	20 12	20 33
07	282 32.1	52.3	142 09.2	2.8	24 51.3	0.4	60.4								
08	297 31.9	51.8	156 31.0	2.8	24 50.9	0.6	60.4								
F 09	312 31.7	.. 51.3	170 52.8	2.8	24 50.3	0.8	60.4								
R 10	327 31.5	50.8	185 14.6	2.7	24 49.5	1.0	60.5								
I 11	342 31.3	50.4	199 36.3	2.7	24 48.5	1.2	60.5								
D 12	357 31.1	S20 49.9	213 58.0	2.7	N24 47.3	1.4	60.5								
A 13	12 30.9	49.4	228 19.7	2.6	24 45.9	1.5	60.6								
Y 14	27 30.7	48.9	242 41.3	2.7	24 44.4	1.7	60.6								
15	42 30.5	.. 48.4	257 03.0	2.6	24 42.7	2.0	60.6								
16	57 30.2	47.9	271 24.6	2.5	24 40.7	2.1	60.7								
17	72 30.0	47.4	285 46.1	2.6	24 38.6	2.3	60.7								
18	87 29.8	S20 46.9	300 07.7	2.5	N24 36.3	2.4	60.7								
19	102 29.6	46.5	314 29.2	2.5	24 33.9	2.7	60.7								
20	117 29.4	46.0	328 50.7	2.6	24 31.2	2.8	60.8								
21	132 29.2	.. 45.5	343 12.3	2.5	24 28.4	3.1	60.8								
22	147 29.0	45.0	357 33.8	2.5	24 25.3	3.2	60.8								
23	162 28.8	44.5	11 55.3	2.5	24 22.1	3.4	60.8								
18 00	177 28.6	S20 44.0	26 16.8	2.5	N24 18.7	3.6	60.9								
01	192 28.4	43.5	40 38.3	2.5	24 15.1	3.8	60.9								
02	207 28.2	43.0	54 59.8	2.5	24 11.3	3.9	60.9								
03	222 28.0	.. 42.5	69 21.3	2.5	24 07.4	4.2	60.9								
04	237 27.8	42.0	83 42.8	2.6	24 03.2	4.3	61.0								
05	252 27.6	41.5	98 04.4	2.5	23 58.9	4.6	61.0								
06	267 27.4	S20 41.0	112 25.9	2.6	N23 54.3	4.7	61.0								
07	282 27.2	40.5	126 47.5	2.5	23 49.6	4.8	61.0								
S 08	297 27.0	40.0	141 09.0	2.6	23 44.8	5.1	61.1								
A 09	312 26.8	.. 39.5	155 30.6	2.7	23 39.7	5.3	61.1								
T 10	327 26.6	39.0	169 52.3	2.6	23 34.4	5.4	61.1								
U 11	342 26.4	38.5	184 13.9	2.7	23 29.0	5.6	61.1								
R 12	357 26.2	S20 38.0	198 35.6	2.7	N23 23.4	5.8	61.1								
D 13	12 26.0	37.5	212 57.3	2.7	23 17.6	6.0	61.2								
A 14	27 25.8	37.0	227 19.0	2.8	23 11.6	6.1	61.2								
Y 15	42 25.6	.. 36.5	241 40.8	2.8	23 05.5	6.4	61.2								
16	57 25.4	36.0	256 02.6	2.9	22 59.1	6.5	61.2								
17	72 25.2	35.5	270 24.5	2.8	22 52.6	6.7	61.2								
18	87 25.0	S20 35.0	284 46.3	3.0	N22 45.9	6.8	61.3								
19	102 24.8	34.5	299 08.3	3.0	22 39.1	7.1	61.3								
20	117 24.6	34.0	313 30.3	3.0	22 32.0	7.2	61.3								
21	132 24.4	.. 33.5	327 52.3	3.1	22 24.8	7.3	61.3								
22	147 24.2	33.0	342 14.4	3.1	22 17.5	7.6	61.3								
23	162 24.0	32.5	356 36.5	3.2	22 09.9	7.7	61.3								
	S.D. 16.3	d 0.5	S.D.	16.3		16.5			16.7						

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

Moonset 16	Moonset 17	Moonset 18	Moonset 19
h m	h m	h m	h m
□	□	□	□
□	□	□	□
□	□	□	10 09
□	□	09 46	09 28
06 54	08 16	08 50	09 00
06 16	07 32	08 16	08 38
05 49	07 02	07 51	08 20
05 28	06 40	07 32	08 05
05 11	06 22	07 15	07 52
04 56	06 06	07 01	07 41
04 44	05 53	06 49	07 31
04 32	05 41	06 38	07 22
04 09	05 16	06 15	07 03
03 50	04 57	05 56	06 48
03 35	04 40	05 41	06 34
03 21	04 26	05 27	06 23
02 58	04 02	05 04	06 03
02 38	03 41	04 44	05 45
02 20	03 21	04 25	05 29
02 01	03 02	04 07	05 13
01 41	02 41	03 46	04 55
01 18	02 17	03 23	04 34
01 05	02 02	03 09	04 22
00 49	01 46	02 53	04 08
00 31	01 26	02 34	03 52
00 08	01 01	02 10	03 31
24 49	00 49	01 58	03 21
24 35	00 35	01 45	03 10
24 20	00 20	01 30	02 58
24 01	00 01	01 11	02 43
23 37	24 49	00 49	02 26

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	09 24	09 35	12 10	21 06	08 35	12	
17	09 45	09 55	12 10	22 10	09 38	13	○
18	10 05	10 15	12 10	23 14	10 42	14	

UT (GMT)	ARIES	VENUS −4.0	MARS +1.4	JUPITER −2.4	SATURN +0.6
	G.H.A.	G.H.A. Dec.	G.H.A. Dec.	G.H.A. Dec.	G.H.A. Dec.
d h	° ′	° ′ ° ′	° ′ ° ′	° ′ ° ′	° ′ ° ′
19 00	117 39.1	215 57.2 S21 45.3	199 50.1 S23 53.5	311 52.0 N 7 26.1	167 08.3 S18 51.8
01	132 41.6	230 56.4 45.6	214 50.6 53.4	326 54.6 26.2	182 10.5 51.7
02	147 44.1	245 55.6 45.9	229 51.0 53.3	341 57.2 26.2	197 12.6 51.7
03	162 46.5	260 54.8 · · 46.2	244 51.4 · · 53.2	356 59.8 · · 26.3	212 14.8 · · 51.6
04	177 49.0	275 53.9 46.4	259 51.8 53.2	12 02.4 26.4	227 16.9 51.5
05	192 51.5	290 53.1 46.7	274 52.2 53.1	27 05.0 26.5	242 19.1 51.5
06	207 53.9	305 52.3 S21 47.0	289 52.7 S23 53.0	42 07.6 N 7 26.5	257 21.3 S18 51.4
07	222 56.4	320 51.5 47.3	304 53.1 52.9	57 10.2 26.6	272 23.4 51.3
08	237 58.9	335 50.7 47.6	319 53.5 52.9	72 12.8 26.7	287 25.6 51.2
S 09	253 01.3	350 49.9 · · 47.8	334 53.9 · · 52.8	87 15.4 · · 26.7	302 27.7 · · 51.2
U 10	268 03.8	5 49.1 48.1	349 54.3 52.7	102 18.0 26.8	317 29.9 51.1
N 11	283 06.2	20 48.3 48.4	4 54.8 52.6	117 20.6 26.9	332 32.1 51.0
D 12	298 08.7	35 47.4 S21 48.7	19 55.2 S23 52.5	132 23.2 N 7 26.9	347 34.2 S18 50.9
A 13	313 11.2	50 46.6 48.9	34 55.6 52.4	147 25.8 27.0	2 36.4 50.9
Y 14	328 13.6	65 45.8 49.2	49 56.0 52.4	162 28.4 27.1	17 38.5 50.8
15	343 16.1	80 45.0 · · 49.5	64 56.4 · · 52.3	177 31.0 · · 27.1	32 40.7 · · 50.7
16	358 18.6	95 44.2 49.8	79 56.9 52.2	192 33.6 27.2	47 42.9 50.6
17	13 21.0	110 43.4 50.0	94 57.3 52.1	207 36.2 27.3	62 45.0 50.6
18	28 23.5	125 42.6 S21 50.3	109 57.7 S23 52.0	222 38.8 N 7 27.4	77 47.2 S18 50.5
19	43 26.0	140 41.7 50.6	124 58.1 51.9	237 41.5 27.4	92 49.3 50.4
20	58 28.4	155 40.9 50.8	139 58.5 51.9	252 44.1 27.5	107 51.5 50.3
21	73 30.9	170 40.1 · · 51.1	154 59.0 · · 51.8	267 46.7 · · 27.6	122 53.7 · · 50.3
22	88 33.3	185 39.3 51.4	169 59.4 51.7	282 49.3 27.6	137 55.8 50.2
23	103 35.8	200 38.5 51.6	184 59.8 51.6	297 51.9 27.7	152 58.0 50.1
20 00	118 38.3	215 37.7 S21 51.9	200 00.2 S23 51.5	312 54.5 N 7 27.8	168 00.2 S18 50.0
01	133 40.7	230 36.8 52.1	215 00.6 51.4	327 57.1 27.9	183 02.3 50.0
02	148 43.2	245 36.0 52.4	230 01.1 51.3	342 59.7 27.9	198 04.5 49.9
03	163 45.7	260 35.2 · · 52.7	245 01.5 · · 51.3	358 02.3 · · 28.0	213 06.6 · · 49.8
04	178 48.1	275 34.4 52.9	260 01.9 51.2	13 04.9 28.1	228 08.8 49.7
05	193 50.6	290 33.6 53.2	275 02.3 51.1	28 07.5 28.1	243 11.0 49.7
06	208 53.1	305 32.8 S21 53.4	290 02.7 S23 51.0	43 10.1 N 7 28.2	258 13.1 S18 49.6
07	223 55.5	320 31.9 53.7	305 03.2 50.9	58 12.8 28.3	273 15.3 49.5
08	238 58.0	335 31.1 53.9	320 03.6 50.8	73 15.4 28.4	288 17.4 49.4
M 09	254 00.5	350 30.3 · · 54.2	335 04.0 · · 50.7	88 18.0 · · 28.4	303 19.6 · · 49.4
O 10	269 02.9	5 29.5 54.4	350 04.4 50.6	103 20.6 28.5	318 21.8 49.3
N 11	284 05.4	20 28.7 54.7	5 04.8 50.5	118 23.2 28.6	333 23.9 49.2
D 12	299 07.8	35 27.8 S21 54.9	20 05.3 S23 50.4	133 25.8 N 7 28.6	348 26.1 S18 49.1
A 13	314 10.3	50 27.0 55.2	35 05.7 50.3	148 28.4 28.7	3 28.2 49.1
Y 14	329 12.8	65 26.2 55.4	50 06.1 50.3	163 31.0 28.8	18 30.4 49.0
15	344 15.2	80 25.4 · · 55.7	65 06.5 · · 50.2	178 33.6 · · 28.9	33 32.6 · · 48.9
16	359 17.7	95 24.6 55.9	80 06.9 50.1	193 36.3 28.9	48 34.7 48.8
17	14 20.2	110 23.7 56.2	95 07.4 50.0	208 38.9 29.0	63 36.9 48.8
18	29 22.6	125 22.9 S21 56.4	110 07.8 S23 49.9	223 41.5 N 7 29.1	78 39.0 S18 48.7
19	44 25.1	140 22.1 56.7	125 08.2 49.8	238 44.1 29.2	93 41.2 48.6
20	59 27.6	155 21.3 56.9	140 08.6 49.7	253 46.7 29.2	108 43.4 48.5
21	74 30.0	170 20.4 · · 57.1	155 09.0 · · 49.6	268 49.3 · · 29.3	123 45.5 · · 48.5
22	89 32.5	185 19.6 57.4	170 09.4 49.5	283 51.9 29.4	138 47.7 48.4
23	104 35.0	200 18.8 57.6	185 09.9 49.4	298 54.5 29.4	153 49.8 48.3
21 00	119 37.4	215 18.0 S21 57.8	200 10.3 S23 49.3	313 57.2 N 7 29.5	168 52.0 S18 48.3
01	134 39.9	230 17.2 58.1	215 10.7 49.2	328 59.8 29.6	183 54.2 48.2
02	149 42.3	245 16.3 58.3	230 11.1 49.1	344 02.4 29.7	198 56.3 48.1
03	164 44.8	260 15.5 · · 58.5	245 11.5 · · 49.0	359 05.0 · · 29.7	213 58.5 · · 48.0
04	179 47.3	275 14.7 58.8	260 12.0 48.9	14 07.6 29.8	229 00.6 48.0
05	194 49.7	290 13.9 59.0	275 12.4 48.8	29 10.2 29.9	244 02.8 47.9
06	209 52.2	305 13.0 S21 59.2	290 12.8 S23 48.7	44 12.9 N 7 30.0	259 05.0 S18 47.8
07	224 54.7	320 12.2 59.5	305 13.2 48.6	59 15.5 30.0	274 07.1 47.7
T 08	239 57.1	335 11.4 59.7	320 13.6 48.5	74 18.1 30.1	289 09.3 47.7
U 09	254 59.6	350 10.6 21 59.9	335 14.1 · · 48.4	89 20.7 · · 30.2	304 11.4 · · 47.6
E 10	270 02.1	5 09.7 22 00.1	350 14.5 48.3	104 23.3 30.3	319 13.6 47.5
S 11	285 04.5	20 08.9 00.4	5 14.9 48.2	119 25.9 30.3	334 15.8 47.4
D 12	300 07.0	35 08.1 S22 00.6	20 15.3 S23 48.1	134 28.6 N 7 30.4	349 17.9 S18 47.4
A 13	315 09.4	50 07.3 00.8	35 15.7 48.0	149 31.2 30.5	4 20.1 47.3
Y 14	330 11.9	65 06.4 01.0	50 16.2 47.9	164 33.8 30.6	19 22.2 47.2
15	345 14.4	80 05.6 · · 01.2	65 16.6 · · 47.8	179 36.4 · · 30.6	34 24.4 · · 47.1
16	0 16.8	95 04.8 01.5	80 17.0 47.7	194 39.0 30.7	49 26.6 47.1
17	15 19.3	110 03.9 01.7	95 17.4 47.6	209 41.6 30.8	64 28.7 47.0
18	30 21.8	125 03.1 S22 01.9	110 17.8 S23 47.5	224 44.3 N 7 30.9	79 30.9 S18 46.9
19	45 24.2	140 02.3 02.1	125 18.3 47.4	239 46.9 30.9	94 33.0 46.8
20	60 26.7	155 01.5 02.3	140 18.7 47.3	254 49.5 31.0	109 35.2 46.8
21	75 29.2	170 00.6 · · 02.5	155 19.1 · · 47.2	269 52.1 · · 31.1	124 37.4 · · 46.7
22	90 31.6	184 59.8 02.7	170 19.5 47.0	284 54.7 31.2	139 39.5 46.6
23	105 34.1	199 59.0 03.0	185 19.9 46.9	299 57.4 31.2	154 41.7 46.5
Mer. Pass.	h m 16 02.8	v −0.8 d 0.2	v 0.4 d 0.1	v 2.6 d 0.1	v 2.2 d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.3	S40 20.3
Achernar	335 38.5	S57 16.8
Acrux	173 27.1	S63 03.2
Adhara	255 24.7	S28 57.8
Aldebaran	291 07.5	N16 29.7
Alioth	166 34.4	N55 59.7
Alkaid	153 11.3	N49 20.8
Al Na'ir	28 04.0	S47 00.1
Alnilam	276 02.3	S 1 12.4
Alphard	218 11.5	S 8 37.6
Alphecca	126 24.7	N26 44.2
Alpheratz	358 00.3	N29 03.0
Altair	62 24.1	N 8 50.8
Ankaa	353 31.5	S42 21.1
Antares	112 46.1	S26 24.9
Arcturus	146 10.3	N19 13.1
Atria	108 02.8	S69 00.7
Avior	234 24.0	S59 29.1
Bellatrix	278 48.9	N 6 20.6
Betelgeuse	271 18.3	N 7 24.3
Canopus	264 02.7	S52 41.6
Capella	280 57.7	N45 59.6
Deneb	49 42.9	N45 15.2
Denebola	182 49.7	N14 36.7
Diphda	349 12.0	S18 01.9
Dubhe	194 10.5	N61 47.3
Elnath	278 32.5	N28 36.1
Eltanin	90 54.0	N51 29.2
Enif	34 03.1	N 9 50.4
Fomalhaut	15 41.8	S29 39.9
Gacrux	172 18.7	S57 04.0
Gienah	176 08.6	S17 30.0
Hadar	149 10.8	S60 20.0
Hamal	328 18.8	N23 25.7
Kaus Aust.	84 05.3	S34 23.3
Kochab	137 19.5	N74 10.8
Markab	13 54.5	N15 09.9
Menkar	314 31.7	N 4 03.6
Menkent	148 26.5	S36 19.8
Miaplacidus	221 42.3	S69 41.1
Mirfak	309 03.1	N49 50.3
Nunki	76 18.4	S26 18.4
Peacock	53 44.8	S56 45.7
Pollux	243 46.8	N28 02.7
Procyon	245 16.1	N 5 14.6
Rasalhague	96 21.6	N12 33.8
Regulus	208 00.2	N12 00.2
Rigel	281 27.1	S 8 12.7
Rigil Kent.	140 13.8	S60 48.0
Sabik	102 31.1	S15 43.0
Schedar	349 59.1	N56 30.0
Shaula	96 43.9	S37 05.9
Sirius	258 47.4	S16 42.4
Spica	158 48.1	S11 07.3
Suhail	223 03.8	S43 24.1
Vega	80 50.2	N38 46.4
Zuben'ubi	137 23.2	S16 00.6

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	96 59.4	9 38
Mars	81 21.9	10 40
Jupiter	194 16.2	3 08
Saturn	49 21.9	12 46

UT (GMT)	SUN		MOON				Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.							
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
19 00	177 23.8	S20 31.9	10 58.7	3.2	N22 02.2	7.9	61.3	N 72	07 50	09 34	▬	▭	15 11	18 00	20 23
01	192 23.6	31.4	25 20.9	3.3	21 54.3	8.0	61.4	N 70	07 37	09 05	11 12	▭	15 47	18 14	20 26
02	207 23.4	30.9	39 43.2	3.3	21 46.3	8.2	61.4	68	07 26	08 43	10 13	13 37	16 12	18 25	20 28
03	222 23.2 · ·	30.4	54 05.5	3.5	21 38.1	8.4	61.4	66	07 17	08 26	09 40	14 17	16 31	18 34	20 30
04	237 23.0	29.9	68 28.0	3.4	21 29.7	8.5	61.4	64	07 09	08 11	09 15	14 45	16 46	18 42	20 31
05	252 22.8	29.4	82 50.4	3.6	21 21.2	8.7	61.4	62	07 02	08 00	08 56	15 06	16 59	18 48	20 33
06	267 22.6	S20 28.9	97 13.0	3.6	N21 12.5	8.9	61.4	60	06 56	07 49	08 41	15 23	17 10	18 54	20 34
07	282 22.4	28.4	111 35.6	3.6	21 03.6	9.0	61.4	N 58	06 51	07 40	08 27	15 37	17 19	18 59	20 35
08	297 22.2	27.8	125 58.2	3.8	20 54.6	9.2	61.4	56	06 46	07 32	08 16	15 49	17 27	19 03	20 36
S 09	312 22.0 · ·	27.3	140 21.0	3.8	20 45.4	9.3	61.4	54	06 41	07 25	08 06	16 00	17 34	19 07	20 37
U 10	327 21.8	26.8	154 43.8	3.9	20 36.1	9.5	61.5	52	06 37	07 19	07 57	16 09	17 41	19 11	20 38
N 11	342 21.6	26.3	169 06.7	3.9	20 26.6	9.6	61.5	50	06 33	07 13	07 49	16 18	17 46	19 14	20 38
D 12	357 21.4	S20 25.8	183 29.6	4.0	N20 17.0	9.8	61.5	45	06 24	07 00	07 32	16 35	17 59	19 21	20 40
A 13	12 21.2	25.3	197 52.6	4.1	20 07.2	9.9	61.5	N 40	06 16	06 49	07 18	16 50	18 09	19 27	20 41
Y 14	27 21.0	24.7	212 15.7	4.2	19 57.3	10.1	61.5	35	06 08	06 39	07 06	17 02	18 18	19 31	20 42
15	42 20.8 · ·	24.2	226 38.9	4.3	19 47.2	10.2	61.5	30	06 01	06 30	06 56	17 13	18 25	19 36	20 43
16	57 20.6	23.7	241 02.2	4.3	19 37.0	10.3	61.5	20	05 48	06 14	06 38	17 31	18 39	19 43	20 45
17	72 20.4	23.2	255 25.5	4.4	19 26.7	10.5	61.5	N 10	05 34	06 00	06 22	17 47	18 50	19 50	20 47
18	87 20.3	S20 22.7	269 48.9	4.5	N19 16.2	10.7	61.5	0	05 20	05 45	06 07	18 02	19 01	19 56	20 48
19	102 20.1	22.1	284 12.4	4.6	19 05.5	10.7	61.5	S 10	05 03	05 30	05 52	18 16	19 11	20 02	20 49
20	117 19.9	21.6	298 36.0	4.6	18 54.8	11.0	61.5	20	04 44	05 12	05 36	18 32	19 23	20 09	20 51
21	132 19.7 · ·	21.1	312 59.6	4.8	18 43.8	11.0	61.5	30	04 19	04 51	05 17	18 50	19 35	20 16	20 53
22	147 19.5	20.6	327 23.4	4.8	18 32.8	11.2	61.5	35	04 03	04 38	05 06	19 00	19 43	20 20	20 54
23	162 19.3	20.0	341 47.2	4.9	18 21.6	11.3	61.5	40	03 43	04 22	04 54	19 12	19 51	20 25	20 55
20 00	177 19.1	S20 19.5	356 11.1	5.0	N18 10.3	11.4	61.5	45	03 18	04 03	04 39	19 26	20 01	20 30	20 56
01	192 18.9	19.0	10 35.1	5.0	17 58.9	11.6	61.5	S 50	02 44	03 39	04 20	19 43	20 13	20 37	20 58
02	207 18.7	18.5	24 59.1	5.2	17 47.3	11.6	61.5	52	02 25	03 27	04 11	19 51	20 18	20 40	20 59
03	222 18.5 · ·	17.9	39 23.3	5.3	17 35.7	11.8	61.5	54	02 01	03 13	04 01	20 00	20 24	20 43	21 00
04	237 18.3	17.4	53 47.6	5.3	17 23.9	11.9	61.5	56	01 27	02 57	03 50	20 09	20 31	20 47	21 00
05	252 18.2	16.9	68 11.9	5.4	17 12.0	12.1	61.5	58	////	02 37	03 37	20 21	20 38	20 51	21 01
06	267 18.0	S20 16.3	82 36.3	5.5	N16 59.9	12.1	61.5	S 60	////	02 12	03 22	20 33	20 47	20 55	21 02
07	282 17.8	15.8	97 00.8	5.6	16 47.8	12.3	61.5								
08	297 17.6	15.3	111 25.4	5.7	16 35.5	12.4	61.5								
M 09	312 17.4 · ·	14.8	125 50.1	5.8	16 23.1	12.5	61.5								
O 10	327 17.2	14.2	140 14.9	5.9	16 10.6	12.5	61.5								
N 11	342 17.0	13.7	154 39.8	5.9	15 58.1	12.7	61.4								
D 12	357 16.8	S20 13.2	169 04.7	6.1	N15 45.4	12.8	61.4								
A 13	12 16.7	12.6	183 29.8	6.1	15 32.6	12.9	61.4								
Y 14	27 16.5	12.1	197 54.9	6.2	15 19.7	13.0	61.4								
15	42 16.3 · ·	11.6	212 20.1	6.3	15 06.7	13.1	61.4								
16	57 16.1	11.0	226 45.4	6.4	14 53.6	13.2	61.4								
17	72 15.9	10.5	241 10.8	6.5	14 40.4	13.3	61.4								
18	87 15.7	S20 09.9	255 36.3	6.6	N14 27.1	13.4	61.4								
19	102 15.6	09.4	270 01.9	6.7	14 13.7	13.4	61.4								
20	117 15.4	08.9	284 27.6	6.7	14 00.3	13.6	61.4								
21	132 15.2 · ·	08.3	298 53.3	6.9	13 46.7	13.6	61.3								
22	147 15.0	07.8	313 19.2	6.9	13 33.1	13.7	61.3								
23	162 14.8	07.2	327 45.1	7.1	13 19.4	13.8	61.3								
21 00	177 14.6	S20 06.7	342 11.2	7.1	N13 05.6	13.9	61.3								
01	192 14.5	06.2	356 37.3	7.2	12 51.7	13.9	61.3								
02	207 14.3	05.6	11 03.5	7.2	12 37.8	14.0	61.3								
03	222 14.1 · ·	05.1	25 29.7	7.4	12 23.8	14.1	61.3								
04	237 13.9	04.5	39 56.1	7.5	12 09.7	14.2	61.2								
05	252 13.7	04.0	54 22.6	7.5	11 55.5	14.2	61.2								
06	267 13.5	S20 03.4	68 49.1	7.7	N11 41.3	14.3	61.2								
07	282 13.4	02.9	83 15.8	7.7	11 27.0	14.3	61.2								
T 08	297 13.2	02.3	97 42.5	7.8	11 12.7	14.4	61.2								
U 09	312 13.0 · ·	01.8	112 09.3	7.8	10 58.3	14.5	61.1								
E 10	327 12.8	01.3	126 36.1	8.0	10 43.8	14.5	61.1								
S 11	342 12.6	00.7	141 03.1	8.0	10 29.3	14.6	61.1								
D 12	357 12.5	S20 00.2	155 30.1	8.2	N10 14.7	14.6	61.1								
A 13	12 12.3	19 59.6	169 57.3	8.2	10 00.1	14.7	61.1								
Y 14	27 12.1	59.1	184 24.5	8.3	9 45.4	14.8	61.0								
15	42 11.9 · ·	58.5	198 51.8	8.3	9 30.6	14.7	61.0								
16	57 11.8	57.9	213 19.1	8.5	9 15.9	14.9	61.0								
17	72 11.6	57.4	227 46.6	8.5	9 01.0	14.8	61.0								
18	87 11.4	S19 56.8	242 14.1	8.6	N 8 46.2	14.9	60.9								
19	102 11.2	56.3	256 41.7	8.7	8 31.3	15.0	60.9								
20	117 11.1	55.7	271 09.4	8.7	8 16.3	14.9	60.9								
21	132 10.9 · ·	55.2	285 37.1	8.8	8 01.4	15.1	60.9								
22	147 10.7	54.6	300 04.9	8.9	7 46.3	15.0	60.8								
23	162 10.5	54.1	314 32.8	9.0	7 31.3	15.1	60.8								
	S.D. 16.3	d 0.5	S.D.	16.7		16.7	16.6								

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
19	10 25	10 34	12 11	24 16	11 45	15	
20	10 43	10 52	12 11	00 16	12 45	16	○
21	11 01	11 10	12 11	01 14	13 42	17	

UT (GMT)	ARIES	VENUS −3.9		MARS +1.3		JUPITER −2.5		SATURN +0.7		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	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
24 00	153 08.1	204 07.4	S18 55.8	206 06.1	S20 06.1	350 45.8	N 8 57.4	198 17.6	S17 45.7	Acamar	315 30.5	S40 20.3
01	168 10.6	219 06.7	55.2	221 06.6	05.7	5 48.5	57.5	213 19.8	45.6	Achernar	335 38.8	S57 16.7
02	183 13.1	234 06.0	54.5	236 07.1	05.3	20 51.3	57.7	228 21.9	45.5	Acrux	173 26.7	S63 03.4
03	198 15.5	249 05.3	-- 53.8	251 07.6	-- 04.8	35 54.1	-- 57.8	243 24.1	-- 45.4	Adhara	255 24.8	S28 57.9
04	213 18.0	264 04.5	53.2	266 08.0	04.4	50 56.8	57.9	258 26.3	45.3	Aldebaran	291 07.6	N16 29.7
05	228 20.5	279 03.8	52.5	281 08.5	03.9	65 59.6	58.0	273 28.5	45.3			
06	243 22.9	294 03.1	S18 51.8	296 09.0	S20 03.5	81 02.4	N 8 58.2	288 30.7	S17 45.2	Alioth	166 34.0	N55 59.8
07	258 25.4	309 02.4	51.2	311 09.5	03.0	96 05.1	58.3	303 32.8	45.1	Alkaid	153 11.0	N49 20.7
08	273 27.9	324 01.7	50.5	326 09.9	02.6	111 07.9	58.4	318 35.0	45.0	Al Na'ir	28 04.0	S46 59.9
M 09	288 30.3	339 00.9	-- 49.8	341 10.4	-- 02.2	126 10.7	-- 58.5	333 37.2	-- 45.0	Alnilam	276 02.4	S 1 12.5
O 10	303 32.8	354 00.2	49.2	356 10.9	01.7	141 13.4	58.7	348 39.4	44.9	Alphard	218 11.4	S 8 37.7
N 11	318 35.2	8 59.5	48.5	11 11.4	01.3	156 16.2	58.8	3 41.5	44.8			
D 12	333 37.7	23 58.8	S18 47.8	26 11.8	S20 00.8	171 19.0	N 8 58.9	18 43.7	S17 44.7	Alphecca	126 24.4	N26 44.1
A 13	348 40.2	38 58.1	47.1	41 12.3	20 00.4	186 21.7	59.1	33 45.9	44.7	Alpheratz	358 00.3	N29 02.9
Y 14	3 42.6	53 57.3	46.5	56 12.8	19 59.9	201 24.5	59.2	48 48.1	44.6	Altair	62 24.0	N 8 50.7
15	18 45.1	68 56.6	-- 45.8	71 13.3	-- 59.5	216 27.3	-- 59.3	63 50.2	-- 44.5	Ankaa	353 31.6	S42 21.0
16	33 47.6	83 55.9	45.1	86 13.8	59.1	231 30.0	59.4	78 52.4	44.4	Antares	112 45.8	S26 24.9
17	48 50.0	98 55.2	44.4	101 14.2	58.6	246 32.8	59.6	93 54.6	44.4			
18	63 52.5	113 54.5	S18 43.8	116 14.7	S19 58.2	261 35.6	N 8 59.7	108 56.8	S17 44.3	Arcturus	146 10.0	N19 13.1
19	78 55.0	128 53.8	43.1	131 15.2	57.7	276 38.3	59.8	123 59.0	44.2	Atria	108 02.1	S69 00.7
20	93 57.4	143 53.1	42.4	146 15.7	57.3	291 41.1	8 59.9	139 01.1	44.1	Avior	234 24.0	S59 29.3
21	108 59.9	158 52.3	-- 41.7	161 16.1	-- 56.8	306 43.9	9 00.1	154 03.3	-- 44.1	Bellatrix	278 49.0	N 6 20.5
22	124 02.3	173 51.6	41.0	176 16.6	56.4	321 46.6	00.2	169 05.5	44.0	Betelgeuse	271 18.4	N 7 24.3
23	139 04.8	188 50.9	40.4	191 17.1	55.9	336 49.4	00.3	184 07.7	43.9			
25 00	154 07.3	203 50.2	S18 39.7	206 17.6	S19 55.5	351 52.2	N 9 00.5	199 09.8	S17 43.8	Canopus	264 02.9	S52 41.7
01	169 09.7	218 49.5	39.0	221 18.1	55.0	6 54.9	00.6	214 12.0	43.8	Capella	280 57.9	N45 59.6
02	184 12.2	233 48.8	38.3	236 18.5	54.6	21 57.7	00.7	229 14.2	43.7	Deneb	49 42.8	N45 15.0
03	199 14.7	248 48.1	-- 37.6	251 19.0	-- 54.1	37 00.5	-- 00.8	244 16.4	-- 43.6	Denebola	182 49.5	N14 36.7
04	214 17.1	263 47.3	36.9	266 19.5	53.7	52 03.3	01.0	259 18.6	43.5	Diphda	349 12.1	S18 01.8
05	229 19.6	278 46.6	36.3	281 20.0	53.2	67 06.0	01.1	274 20.7	43.5			
06	244 22.1	293 45.9	S18 35.6	296 20.5	S19 52.8	82 08.8	N 9 01.2	289 22.9	S17 43.4	Dubhe	194 10.2	N61 47.4
07	259 24.5	308 45.2	34.9	311 20.9	52.3	97 11.6	01.3	304 25.1	43.3	Elnath	278 32.6	N28 36.2
T 08	274 27.0	323 44.5	34.2	326 21.4	51.9	112 14.3	01.5	319 27.3	43.2	Eltanin	90 53.7	N51 29.0
U 09	289 29.5	338 43.8	-- 33.5	341 21.9	-- 51.4	127 17.1	-- 01.6	334 29.4	-- 43.1	Enif	34 03.1	N 9 50.3
E 10	304 31.9	353 43.1	32.8	356 22.4	51.0	142 19.9	01.7	349 31.6	43.1	Fomalhaut	15 41.8	S29 39.9
S 11	319 34.4	8 42.4	32.1	11 22.9	50.5	157 22.6	01.9	4 33.8	43.0			
D 12	334 36.8	23 41.7	S18 31.4	26 23.3	S19 50.1	172 25.4	N 9 02.0	19 36.0	S17 42.9	Gacrux	172 18.3	S57 04.2
A 13	349 39.3	38 41.0	30.7	41 23.8	49.6	187 28.2	02.1	34 38.2	42.8	Gienah	176 08.4	S17 30.1
Y 14	4 41.8	53 40.3	30.0	56 24.3	49.2	202 30.9	02.2	49 40.3	42.8	Hadar	149 10.3	S60 20.1
15	19 44.2	68 39.5	-- 29.3	71 24.8	-- 48.7	217 33.7	-- 02.4	64 42.5	-- 42.7	Hamal	328 18.9	N23 25.6
16	34 46.7	83 38.8	28.6	86 25.3	48.3	232 36.5	02.5	79 44.7	42.6	Kaus Aust.	84 05.1	S34 23.3
17	49 49.2	98 38.1	27.9	101 25.7	47.8	247 39.2	02.6	94 46.9	42.5			
18	64 51.6	113 37.4	S18 27.2	116 26.2	S19 47.4	262 42.0	N 9 02.7	109 49.0	S17 42.5	Kochab	137 18.7	N74 10.8
19	79 54.1	128 36.7	26.5	131 26.7	46.9	277 44.8	02.9	124 51.2	42.4	Markab	13 54.5	N15 09.8
20	94 56.6	143 36.0	25.8	146 27.2	46.5	292 47.5	03.0	139 53.4	42.3	Menkar	314 31.8	N 4 03.6
21	109 59.0	158 35.3	-- 25.1	161 27.7	-- 46.0	307 50.3	-- 03.1	154 55.6	-- 42.2	Menkent	148 26.2	S36 20.0
22	125 01.5	173 34.6	24.4	176 28.1	45.5	322 53.1	03.3	169 57.8	42.2	Miaplacidus	221 42.3	S69 41.3
23	140 04.0	188 33.9	23.7	191 28.6	45.1	337 55.9	03.4	184 59.9	42.1			
26 00	155 06.4	203 33.2	S18 23.0	206 29.1	S19 44.6	352 58.6	N 9 03.5	200 02.1	S17 42.0	Mirfak	309 03.4	N49 50.3
01	170 08.9	218 32.5	22.3	221 29.6	44.2	8 01.4	03.6	215 04.3	41.9	Nunki	76 18.2	S26 18.4
02	185 11.3	233 31.8	21.6	236 30.1	43.7	23 04.2	03.8	230 06.5	41.9	Peacock	53 44.6	S56 45.5
03	200 13.8	248 31.1	-- 20.9	251 30.6	-- 43.3	38 06.9	-- 03.9	245 08.7	-- 41.8	Pollux	243 46.8	N28 02.7
04	215 16.3	263 30.4	20.2	266 31.0	42.8	53 09.7	04.0	260 10.8	41.7	Procyon	245 16.1	N 5 14.6
05	230 18.7	278 29.7	19.5	281 31.5	42.3	68 12.5	04.1	275 13.0	41.6			
06	245 21.2	293 29.0	S18 18.7	296 32.0	S19 41.9	83 15.2	N 9 04.3	290 15.2	S17 41.6	Rasalhague	96 21.3	N12 33.7
W 07	260 23.7	308 28.3	18.0	311 32.5	41.4	98 18.0	04.4	305 17.4	41.5	Regulus	208 00.1	N12 00.1
E 08	275 26.1	323 27.6	17.3	326 33.0	41.0	113 20.8	04.5	320 19.6	41.4	Rigel	281 27.3	S 8 12.7
D 09	290 28.6	338 26.9	-- 16.6	341 33.5	-- 40.5	128 23.5	-- 04.7	335 21.7	-- 41.3	Rigil Kent.	140 13.3	S60 48.1
N 10	305 31.1	353 26.2	15.9	356 33.9	40.0	143 26.3	04.8	350 23.9	41.3	Sabik	102 30.9	S15 43.0
E 11	320 33.5	8 25.5	15.2	11 34.4	39.6	158 29.1	04.9	5 26.1	41.2			
S 12	335 36.0	23 24.8	S18 14.5	26 34.9	S19 39.1	173 31.9	N 9 05.0	20 28.3	S17 41.1	Schedar	349 59.3	N56 29.9
D 13	350 38.4	38 24.1	13.7	41 35.4	38.7	188 34.6	05.2	35 30.5	41.0	Shaula	96 43.6	S37 05.9
A 14	5 40.9	53 23.4	13.0	56 35.9	38.2	203 37.4	05.3	50 32.6	41.0	Sirius	258 47.5	S16 42.5
Y 15	20 43.4	68 22.7	-- 12.3	71 36.4	-- 37.7	218 40.2	-- 05.4	65 34.8	-- 40.9	Spica	158 47.8	S11 07.4
16	35 45.8	83 22.0	11.6	86 36.8	37.3	233 42.9	05.5	80 37.0	40.8	Suhail	223 03.8	S43 24.3
17	50 48.3	98 21.3	10.9	101 37.3	36.8	248 45.7	05.7	95 39.2	40.7			
18	65 50.8	113 20.6	S18 10.1	116 37.8	S19 36.4	263 48.5	N 9 05.8	110 41.4	S17 40.7	Vega	80 50.0	N38 46.3
19	80 53.2	128 19.9	09.4	131 38.3	35.9	278 51.2	05.9	125 43.5	40.6	Zuben'ubi	137 22.9	S16 00.7
20	95 55.7	143 19.2	08.7	146 38.8	35.4	293 54.0	06.0	140 45.7	40.5		S.H.A.	Mer. Pass.
21	110 58.2	158 18.5	-- 08.0	161 39.3	-- 35.0	308 56.8	-- 06.2	155 47.9	-- 40.4		° ′	h m
22	126 00.6	173 17.8	07.2	176 39.8	34.5	323 59.6	06.3	170 50.1	40.4	Venus	49 42.9	10 25
23	141 03.1	188 17.1	06.5	191 40.2	34.0	339 02.3	06.4	185 52.3	40.3	Mars	52 10.3	10 15
	h m									Jupiter	197 44.9	0 32
Mer. Pass.	13 41.3	v −0.7	d 0.7	v 0.5	d 0.5	v 2.8	d 0.1	v 2.2	d 0.1	Saturn	45 02.6	10 42

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26	Moonrise 27
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
24 00	176 39.0	S 9 48.8	287 32.5	9.8	S21 13.9	7.1	56.6	N 72	05 33	06 51	08 02	▬	▬	▬	▬
01	191 39.1	47.9	302 01.3	9.8	21 21.0	7.0	56.5	N 70	05 36	06 46	07 50	▬	▬	▬	▬
02	206 39.1	47.0	316 30.1	9.8	21 28.0	6.9	56.5	68	05 38	06 42	07 39	▬	▬	▬	▬
03	221 39.2	.. 46.1	330 58.9	9.7	21 34.9	6.7	56.5	66	05 39	06 38	07 31	04 33	▬	▬	▬
04	236 39.3	45.2	345 27.6	9.7	21 41.6	6.6	56.4	64	05 40	06 35	07 24	03 10	05 40	▬	▬
05	251 39.4	44.3	359 56.3	9.8	21 48.2	6.5	56.4	62	05 41	06 32	07 18	02 33	04 09	05 25	06 03
06	266 39.5	S 9 43.3	14 25.1	9.7	S21 54.7	6.3	56.4	60	05 42	06 30	07 12	02 07	03 32	04 40	05 23
07	281 39.6	42.4	28 53.8	9.7	22 01.0	6.3	56.3	N 58	05 42	06 28	07 08	01 46	03 06	04 10	04 56
08	296 39.7	41.5	43 22.5	9.7	22 07.3	6.1	56.3	56	05 43	06 26	07 03	01 30	02 45	03 48	04 34
M 09	311 39.8	.. 40.6	57 51.2	9.8	22 13.4	6.0	56.3	54	05 43	06 24	07 00	01 16	02 28	03 29	04 17
O 10	326 39.9	39.7	72 20.0	9.7	22 19.4	5.9	56.2	52	05 43	06 22	06 56	01 03	02 14	03 14	04 02
N 11	341 39.9	38.7	86 48.7	9.7	22 25.3	5.7	56.2	50	05 43	06 20	06 53	00 53	02 01	03 01	03 49
D 12	356 40.0	S 9 37.8	101 17.4	9.6	S22 31.0	5.6	56.2	45	05 43	06 17	06 46	00 43	01 50	02 49	03 38
A 13	11 40.1	36.9	115 46.0	9.7	22 36.6	5.5	56.1	N 40	05 42	06 13	06 41	00 23	01 27	02 25	03 14
Y 14	26 40.2	36.0	130 14.7	9.7	22 42.1	5.4	56.1	35	05 41	06 10	06 36	00 07	01 09	02 05	02 55
15	41 40.3	.. 35.1	144 43.4	9.7	22 47.5	5.2	56.1	30	05 39	06 07	06 31	24 53	00 53	01 49	02 39
16	56 40.4	34.1	159 12.1	9.7	22 52.7	5.2	56.0	20	05 35	06 01	06 23	24 40	00 40	01 35	02 25
17	71 40.5	33.2	173 40.8	9.6	22 57.9	4.9	56.0	N 10	05 31	05 55	06 16	24 27	00 17	01 11	02 02
18	86 40.6	S 9 32.3	188 09.4	9.7	S23 02.8	4.9	56.0	0	05 25	05 49	06 10	24 14	24 31	00 51	01 41
19	101 40.7	31.4	202 38.1	9.7	23 07.7	4.8	55.9	S 10	05 17	05 42	06 03	23 58	24 51	00 31	01 22
20	116 40.8	30.4	217 06.8	9.7	23 12.5	4.6	55.9	20	05 07	05 33	05 56	23 40	24 31	00 11	01 03
21	131 40.9	.. 29.5	231 35.5	9.6	23 17.1	4.5	55.9	30	04 54	05 23	05 47	23 21	24 12	00 12	01 03
22	146 40.9	28.6	246 04.1	9.7	23 21.6	4.3	55.8	35	04 46	05 17	05 43	23 07	23 52	24 43	00 43
23	161 41.0	27.7	260 32.8	9.7	23 25.9	4.3	55.8	40	04 36	05 09	05 37	22 53	23 28	24 19	00 19
25 00	176 41.1	S 9 26.7	275 01.5	9.7	S23 30.2	4.1	55.8	45	04 23	05 00	05 30	22 27	23 14	24 06	00 06
01	191 41.2	25.8	289 30.2	9.6	23 34.3	4.0	55.7	50	04 07	04 48	05 23	22 12	22 58	23 50	24 45
02	206 41.3	24.9	303 58.8	9.7	23 38.3	3.8	55.7	52	03 59	04 43	05 19	22 04	22 55	23 55	24 55
03	221 41.4	.. 24.0	318 27.5	9.7	23 42.1	3.8	55.7	54	03 50	04 37	05 15	21 51	22 42	23 43	24 55
04	236 41.5	23.1	332 56.2	9.7	23 45.9	3.6	55.7	56	03 39	04 30	05 10	21 36	22 27	23 29	23 43
05	251 41.6	22.1	347 24.9	9.7	23 49.5	3.5	55.6	58	03 27	04 23	05 05	21 18	22 09	23 13	23 29
06	266 41.7	S 9 21.2	1 53.6	9.7	S23 53.0	3.3	55.6	S 60	03 13	04 14	05 00	20 56	21 46	22 53	23 13
07	281 41.8	20.3	16 22.3	9.7	23 56.3	3.2	55.6					20 40	21 18	22 09	23 13
T 08	296 41.9	19.3	30 51.0	9.7	23 59.5	3.1	55.5					20 22	20 57	21 48	22 53
U 09	311 42.0	.. 18.4	45 19.7	9.8	24 02.6	3.0	55.5								
E 10	326 42.1	17.5	59 48.5	9.7	24 05.6	2.9	55.5								
S 11	341 42.2	16.6	74 17.2	9.7	24 08.5	2.7	55.4								
D 12	356 42.3	S 9 15.6	88 45.9	9.8	S24 11.2	2.6	55.4								
A 13	11 42.4	14.7	103 14.7	9.8	24 13.8	2.5	55.4								
Y 14	26 42.5	13.8	117 43.5	9.7	24 16.3	2.3	55.4								
15	41 42.6	.. 12.9	132 12.2	9.8	24 18.6	2.2	55.3								
16	56 42.7	11.9	146 41.0	9.8	24 20.8	2.1	55.3								
17	71 42.8	11.0	161 09.8	9.8	24 22.9	2.0	55.3								
18	86 42.9	S 9 10.1	175 38.6	9.9	S24 24.9	1.8	55.3								
19	101 43.0	09.1	190 07.5	9.8	24 26.7	1.8	55.2								
20	116 43.0	08.2	204 36.3	9.9	24 28.5	1.5	55.2								
21	131 43.1	.. 07.3	219 05.2	9.8	24 30.0	1.5	55.2								
22	146 43.2	06.4	233 34.0	9.9	24 31.5	1.4	55.2								
23	161 43.3	05.4	248 02.9	9.9	24 32.9	1.2	55.1								
26 00	176 43.4	S 9 04.5	262 31.8	10.0	S24 34.1	1.1	55.1								
01	191 43.5	03.6	277 00.8	9.9	24 35.2	0.9	55.1								
02	206 43.6	02.6	291 29.7	10.0	24 36.1	0.9	55.1								
03	221 43.7	.. 01.7	305 58.7	10.0	24 37.0	0.7	55.0								
04	236 43.8	9 00.8	320 27.7	10.0	24 37.7	0.6	55.0								
05	251 43.9	8 59.9	334 56.7	10.0	24 38.3	0.5	55.0								
06	266 44.0	S 8 58.9	349 25.7	10.1	S24 38.8	0.3	55.0								
W 07	281 44.1	58.0	3 54.8	10.1	24 39.1	0.2	54.9								
E 08	296 44.2	57.1	18 23.9	10.1	24 39.3	0.1	54.9								
D 09	311 44.3	.. 56.1	32 53.0	10.1	24 39.4	0.0	54.9								
N 10	326 44.4	55.2	47 22.1	10.2	24 39.4	0.1	54.9								
E 11	341 44.5	54.3	61 51.3	10.1	24 39.3	0.3	54.9								
S 12	356 44.6	S 8 53.3	76 20.4	10.3	S24 39.0	0.4	54.8								
D 13	11 44.8	52.4	90 49.7	10.2	24 38.6	0.5	54.8								
A 14	26 44.9	51.5	105 18.9	10.3	24 38.1	0.6	54.8								
Y 15	41 45.0	.. 50.5	119 48.2	10.3	24 37.5	0.8	54.8								
16	56 45.1	49.6	134 17.5	10.3	24 36.7	0.9	54.8								
17	71 45.2	48.7	148 46.8	10.3	24 35.8	0.9	54.7								
18	86 45.3	S 8 47.7	163 16.1	10.4	S24 34.9	1.2	54.7								
19	101 45.4	46.8	177 45.5	10.4	24 33.7	1.2	54.7								
20	116 45.5	45.9	192 14.9	10.5	24 32.5	1.3	54.7								
21	131 45.6	.. 44.9	206 44.4	10.5	24 31.2	1.5	54.7								
22	146 45.7	44.0	221 13.9	10.5	24 29.7	1.6	54.6								
23	161 45.8	43.1	235 43.4	10.6	24 28.1	1.7	54.6								
	S.D. 16.2	d 0.9	S.D.	15.3		15.1			14.9						

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
24	13 24	13 20	12 13	05 00	17 26	21	
25	13 16	13 11	12 13	05 52	18 18	22	◑
26	13 06	13 02	12 13	06 44	19 09	23	

UT (GMT)	ARIES	VENUS −3.9		MARS +1.3		JUPITER −2.5		SATURN +0.7	
d h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27 00	156 05.6	203 16.5	S18 05.8	206 40.7	S19 33.6	354 05.1	N 9 06.6	200 54.4	S17 40.2
01	171 08.0	218 15.8	05.1	221 41.2	33.1	9 07.9	06.7	215 56.6	40.1
02	186 10.5	233 15.1	04.3	236 41.7	32.6	24 10.6	06.8	230 58.8	40.1
03	201 12.9	248 14.4	03.6	251 42.2	32.2	39 13.4	06.9	246 01.0	40.0
04	216 15.4	263 13.7	02.9	266 42.7	31.7	54 16.2	07.1	261 03.2	39.9
05	231 17.9	278 13.0	02.1	281 43.2	31.2	69 18.9	07.2	276 05.3	39.8
06	246 20.3	293 12.3	S18 01.4	296 43.6	S19 30.8	84 21.7	N 9 07.3	291 07.5	S17 39.7
07	261 22.8	308 11.6	18 00.7	311 44.1	30.3	99 24.5	07.4	306 09.7	39.7
T 08	276 25.3	323 10.9	17 59.9	326 44.6	29.8	114 27.2	07.6	321 11.9	39.6
H 09	291 27.7	338 10.2	59.2	341 45.1	29.4	129 30.0	07.7	336 14.1	39.5
U 10	306 30.2	353 09.5	58.5	356 45.6	28.9	144 32.8	07.8	351 16.2	39.4
R 11	321 32.7	8 08.9	57.7	11 46.1	28.4	159 35.6	08.0	6 18.4	39.4
S 12	336 35.1	23 08.2	S17 57.0	26 46.6	S19 28.0	174 38.3	N 9 08.1	21 20.6	S17 39.3
D 13	351 37.6	38 07.5	56.3	41 47.1	27.5	189 41.1	08.2	36 22.8	39.2
A 14	6 40.1	53 06.8	55.5	56 47.5	27.0	204 43.9	08.3	51 25.0	39.1
Y 15	21 42.5	68 06.1	54.8	71 48.0	26.5	219 46.6	08.5	66 27.2	39.1
16	36 45.0	83 05.4	54.0	86 48.5	26.1	234 49.4	08.6	81 29.3	39.0
17	51 47.4	98 04.7	53.3	101 49.0	25.6	249 52.2	08.7	96 31.5	38.9
18	66 49.9	113 04.1	S17 52.5	116 49.5	S19 25.1	264 54.9	N 9 08.8	111 33.7	S17 38.8
19	81 52.4	128 03.4	51.8	131 50.0	24.7	279 57.7	09.0	126 35.9	38.8
20	96 54.8	143 02.7	51.1	146 50.5	24.2	295 00.5	09.1	141 38.1	38.7
21	111 57.3	158 02.0	50.3	161 51.0	23.7	310 03.3	09.2	156 40.2	38.6
22	126 59.8	173 01.3	49.6	176 51.4	23.2	325 06.0	09.4	171 42.4	38.5
23	142 02.2	188 00.6	48.8	191 51.9	22.8	340 08.8	09.5	186 44.6	38.5
28 00	157 04.7	203 00.0	S17 48.1	206 52.4	S19 22.3	355 11.6	N 9 09.6	201 46.8	S17 38.4
01	172 07.2	217 59.3	47.3	221 52.9	21.8	10 14.3	09.7	216 49.0	38.3
02	187 09.6	232 58.6	46.6	236 53.4	21.3	25 17.1	09.9	231 51.1	38.2
03	202 12.1	247 57.9	45.8	251 53.9	20.9	40 19.9	10.0	246 53.3	38.2
04	217 14.6	262 57.2	45.1	266 54.4	20.4	55 22.7	10.1	261 55.5	38.1
05	232 17.0	277 56.5	44.3	281 54.9	19.9	70 25.4	10.2	276 57.7	38.0
06	247 19.5	292 55.9	S17 43.6	296 55.4	S19 19.4	85 28.2	N 9 10.4	291 59.9	S17 37.9
07	262 21.9	307 55.2	42.8	311 55.9	19.0	100 31.0	10.5	307 02.1	37.9
08	277 24.4	322 54.5	42.0	326 56.3	18.5	115 33.7	10.6	322 04.2	37.8
F 09	292 26.9	337 53.8	41.3	341 56.8	18.0	130 36.5	10.7	337 06.4	37.7
R 10	307 29.3	352 53.2	40.5	356 57.3	17.5	145 39.3	10.9	352 08.6	37.6
I 11	322 31.8	7 52.5	39.8	11 57.8	17.1	160 42.0	11.0	7 10.8	37.6
D 12	337 34.3	22 51.8	S17 39.0	26 58.3	S19 16.6	175 44.8	N 9 11.1	22 13.0	S17 37.5
A 13	352 36.7	37 51.1	38.2	41 58.8	16.1	190 47.6	11.3	37 15.2	37.4
Y 14	7 39.2	52 50.4	37.5	56 59.3	15.6	205 50.4	11.4	52 17.3	37.3
15	22 41.7	67 49.8	36.7	71 59.8	15.1	220 53.1	11.5	67 19.5	37.3
16	37 44.1	82 49.1	36.0	87 00.3	14.7	235 55.9	11.6	82 21.7	37.2
17	52 46.6	97 48.4	35.2	102 00.8	14.2	250 58.7	11.8	97 23.9	37.1
18	67 49.0	112 47.7	S17 34.4	117 01.3	S19 13.7	266 01.4	N 9 11.9	112 26.1	S17 37.0
19	82 51.5	127 47.1	33.7	132 01.7	13.2	281 04.2	12.0	127 28.3	37.0
20	97 54.0	142 46.4	32.9	147 02.2	12.7	296 07.0	12.1	142 30.4	36.9
21	112 56.4	157 45.7	32.1	162 02.7	12.3	311 09.8	12.3	157 32.6	36.8
22	127 58.9	172 45.1	31.4	177 03.2	11.8	326 12.5	12.4	172 34.8	36.7
23	143 01.4	187 44.4	30.6	192 03.7	11.3	341 15.3	12.5	187 37.0	36.7
29 00	158 03.8	202 43.7	S17 29.8	207 04.2	S19 10.8	356 18.1	N 9 12.7	202 39.2	S17 36.6
01	173 06.3	217 43.0	29.1	222 04.7	10.3	11 20.8	12.8	217 41.4	36.5
02	188 08.8	232 42.4	28.3	237 05.2	09.9	26 23.6	12.9	232 43.5	36.4
03	203 11.2	247 41.7	27.5	252 05.7	09.4	41 26.4	13.0	247 45.7	36.4
04	218 13.7	262 41.0	26.7	267 06.2	08.9	56 29.1	13.2	262 47.9	36.3
05	233 16.2	277 40.4	26.0	282 06.7	08.4	71 31.9	13.3	277 50.1	36.2
06	248 18.6	292 39.7	S17 25.2	297 07.2	S19 07.9	86 34.7	N 9 13.4	292 52.3	S17 36.1
07	263 21.1	307 39.0	24.4	312 07.7	07.4	101 37.5	13.5	307 54.5	36.1
S 08	278 23.5	322 38.4	23.6	327 08.2	07.0	116 40.2	13.7	322 56.6	36.0
A 09	293 26.0	337 37.7	22.9	342 08.7	06.5	131 43.0	13.8	337 58.8	35.9
T 10	308 28.5	352 37.0	22.1	357 09.1	06.0	146 45.8	13.9	353 01.0	35.8
U 11	323 30.9	7 36.4	21.3	12 09.6	05.5	161 48.5	14.0	8 03.2	35.8
R 12	338 33.4	22 35.7	S17 20.5	27 10.1	S19 05.0	176 51.3	N 9 14.2	23 05.4	S17 35.7
D 13	353 35.9	37 35.0	19.7	42 10.6	04.5	191 54.1	14.3	38 07.6	35.6
A 14	8 38.3	52 34.4	19.0	57 11.1	04.0	206 56.9	14.4	53 09.7	35.6
Y 15	23 40.8	67 33.7	18.2	72 11.6	03.5	221 59.6	14.6	68 11.9	35.5
16	38 43.3	82 33.0	17.4	87 12.1	03.1	237 02.4	14.7	83 14.1	35.4
17	53 45.7	97 32.4	16.6	102 12.6	02.6	252 05.2	14.8	98 16.3	35.3
18	68 48.2	112 31.7	S17 15.8	117 13.1	S19 02.1	267 07.9	N 9 14.9	113 18.5	S17 35.3
19	83 50.7	127 31.0	15.0	132 13.6	01.6	282 10.7	15.1	128 20.7	35.2
20	98 53.1	142 30.4	14.2	147 14.1	01.1	297 13.5	15.2	143 22.8	35.1
21	113 55.6	157 29.7	13.5	162 14.6	00.6	312 16.2	15.3	158 25.0	35.0
22	128 58.0	172 29.0	12.7	177 15.1	19 00.1	327 19.0	15.4	173 27.2	35.0
23	144 00.5	187 28.4	11.9	192 15.6	18 59.6	342 21.8	15.6	188 29.4	34.9
Mer. Pass.	h m 13 29.5	v −0.7	d 0.8	v 0.5	d 0.5	v 2.8	d 0.1	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.5	S40 20.3
Achernar	335 38.8	S57 16.7
Acrux	173 26.7	S63 03.4
Adhara	255 24.8	S28 57.9
Aldebaran	291 07.6	N16 29.7
Alioth	166 34.0	N55 59.8
Alkaid	153 11.0	N49 20.7
Al Na'ir	28 04.0	S46 59.9
Alnilam	276 02.4	S 1 12.5
Alphard	218 11.4	S 8 37.7
Alphecca	126 24.3	N26 44.1
Alpheratz	358 00.3	N29 02.9
Altair	62 24.0	N 8 50.7
Ankaa	353 31.6	S42 21.0
Antares	112 45.8	S26 24.9
Arcturus	146 10.0	N19 13.1
Atria	108 02.1	S69 00.7
Avior	234 24.1	S59 29.3
Bellatrix	278 49.0	N 6 20.5
Betelgeuse	271 18.4	N 7 24.3
Canopus	264 02.9	S52 41.8
Capella	280 57.9	N45 59.6
Deneb	49 42.8	N45 15.0
Denebola	182 49.5	N14 36.7
Diphda	349 12.1	S18 01.8
Dubhe	194 10.2	N61 47.4
Elnath	278 32.6	N28 36.2
Eltanin	90 53.7	N51 29.0
Enif	34 03.0	N 9 50.3
Fomalhaut	15 41.8	S29 39.9
Gacrux	172 18.3	S57 04.2
Gienah	176 08.4	S17 30.1
Hadar	149 10.3	S60 20.1
Hamal	328 19.0	N23 25.6
Kaus Aust.	84 05.0	S34 23.3
Kochab	137 18.6	N74 10.8
Markab	13 54.5	N15 09.8
Menkar	314 31.8	N 4 03.6
Menkent	148 26.2	S36 20.0
Miaplacidus	221 42.3	S69 41.3
Mirfak	309 03.4	N49 50.3
Nunki	76 18.2	S26 18.4
Peacock	53 44.6	S56 45.5
Pollux	243 46.8	N28 02.7
Procyon	245 16.1	N 5 14.6
Rasalhague	96 21.3	N12 33.7
Regulus	208 00.1	N12 00.1
Rigel	281 27.3	S 8 12.7
Rigil Kent.	140 13.2	S60 48.1
Sabik	102 30.8	S15 43.0
Schedar	349 59.3	N56 29.9
Shaula	96 43.6	S37 05.9
Sirius	258 47.5	S16 42.5
Spica	158 47.8	S11 07.4
Suhail	223 03.8	S43 24.3
Vega	80 49.9	N38 46.3
Zuben'ubi	137 22.9	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	45 55.3	10 28
Mars	49 47.7	10 12
Jupiter	198 06.9	0 19
Saturn	44 42.1	10 31

UT (GMT)	SUN		MOON				Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 1
d h	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.							
	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m
27 00	176 45.9	S 8 42.1	250 13.0	10.5	S24 26.4	1.8	54.6	N 72	05 19	06 36	07 46			08 19
01	191 46.0	41.2	264 42.5	10.7	24 24.6	1.9	54.6	N 70	05 23	06 33	07 35			07 34
02	206 46.1	40.3	279 12.2	10.6	24 22.7	2.1	54.6	68	05 26	06 30	07 27		08 53	07 04
03	221 46.2	.. 39.3	293 41.8	10.7	24 20.6	2.2	54.5	66	05 29	06 28	07 20		07 28	07 04
04	236 46.3	38.4	308 11.5	10.7	24 18.4	2.3	54.5	64	05 31	06 25	07 14	06 03	06 49	06 41
05	251 46.4	37.4	322 41.2	10.8	24 16.1	2.4	54.5	62	05 32	06 23	07 08	05 23	06 17	06 22
06	266 46.5	S 8 36.5	337 11.0	10.8	S24 13.7	2.5	54.5	60	05 34	06 22	07 04	04 56	05 48	06 01
07	281 46.6	35.6	351 40.8	10.9	24 11.2	2.6	54.5	58	05 35	06 20	07 00	04 34	05 25	05 44
T 08	296 46.7	34.6	6 10.7	10.9	24 08.6	2.7	54.5	56	05 36	06 19	06 56	04 17	05 07	05 30
H 09	311 46.8	.. 33.7	20 40.6	10.9	24 05.9	2.9	54.5	54	05 36	06 17	06 53	04 02	04 52	05 17
U 10	326 47.0	32.8	35 10.5	10.9	24 03.0	3.0	54.4	52	05 37	06 16	06 50	03 49	04 39	05 06
R 11	341 47.1	31.8	49 40.4	11.1	24 00.0	3.1	54.4	50	05 37	06 15	06 47	03 38	04 27	04 57
S 12	356 47.2	S 8 30.9	64 10.5	11.0	S23 56.9	3.2	54.4	45	05 38	06 12	06 41	03 14	03 55	04 30
D 13	11 47.3	29.9	78 40.5	11.1	23 53.7	3.3	54.4	N 40	05 38	06 09	06 36	02 55	03 38	04 09
A 14	26 47.4	29.0	93 10.6	11.1	23 50.4	3.4	54.4	35	05 37	06 06	06 32	02 39	03 23	04 02
Y 15	41 47.5	.. 28.1	107 40.7	11.2	23 47.0	3.5	54.4	30	05 36	06 04	06 28	02 25	03 10	03 51
16	56 47.6	27.1	122 10.9	11.2	23 43.5	3.6	54.4	20	05 33	05 59	06 21	02 02	02 49	03 32
17	71 47.7	26.2	136 41.1	11.3	23 39.9	3.8	54.3	N 10	05 29	05 54	06 15	01 41	02 30	03 15
18	86 47.8	S 8 25.2	151 11.4	11.3	S23 36.1	3.8	54.3	0	05 24	05 48	06 09	01 22	02 12	02 59
19	101 47.9	24.3	165 41.7	11.3	23 32.3	4.0	54.3	S 10	05 17	05 42	06 03	01 03	01 54	02 44
20	116 48.0	23.4	180 12.0	11.4	23 28.3	4.1	54.3	20	05 09	05 35	05 57	00 43	01 35	02 27
21	131 48.1	.. 22.4	194 42.4	11.4	23 24.2	4.2	54.3	30	04 57	05 25	05 50	00 19	01 13	02 07
22	146 48.3	21.5	209 12.8	11.5	23 20.0	4.2	54.3	35	04 49	05 19	05 45	00 06	01 00	01 56
23	161 48.4	20.6	223 43.3	11.6	23 15.8	4.4	54.3	40	04 39	05 13	05 40	24 45	00 45	01 43
28 00	176 48.5	S 8 19.6	238 13.9	11.5	S23 11.4	4.5	54.3	45	04 28	05 04	05 35	24 27	00 27	01 28
01	191 48.6	18.7	252 44.4	11.7	23 06.9	4.6	54.2	S 50	04 13	04 54	05 28	24 05	00 05	01 08
02	206 48.7	17.7	267 15.1	11.6	23 02.3	4.7	54.2	52	04 05	04 49	05 24	23 55	24 59	00 59
03	221 48.8	.. 16.8	281 45.7	11.7	22 57.6	4.9	54.2	54	03 57	04 44	05 21	23 43	24 49	00 49
04	236 48.9	15.8	296 16.4	11.8	22 52.7	4.9	54.2	56	03 48	04 37	05 17	23 29	24 38	00 38
05	251 49.0	14.9	310 47.2	11.8	22 47.8	5.0	54.2	58	03 37	04 30	05 13	23 13	24 24	00 24
06	266 49.1	S 8 14.0	325 18.0	11.8	S22 42.8	5.1	54.2	S 60	03 24	04 23	05 08	22 53	24 09	00 09
07	281 49.3	13.0	339 48.8	12.0	22 37.7	5.2	54.2							
08	296 49.4	12.1	354 19.8	11.9	22 32.5	5.3	54.2							
F 09	311 49.5	.. 11.1	8 50.7	12.0	22 27.2	5.5	54.2							
R 10	326 49.6	10.2	23 21.7	12.0	22 21.7	5.5	54.2							
I 11	341 49.7	09.2	37 52.7	12.1	22 16.2	5.6	54.2							
D 12	356 49.8	S 8 08.3	52 23.8	12.2	S22 10.6	5.7	54.1							
A 13	11 49.9	07.4	66 55.0	12.2	22 04.9	5.8	54.1							
Y 14	26 50.0	06.4	81 26.2	12.2	21 59.1	6.0	54.1							
15	41 50.2	.. 05.5	95 57.4	12.3	21 53.1	6.0	54.1							
16	56 50.3	04.5	110 28.7	12.3	21 47.1	6.1	54.1							
17	71 50.4	03.6	125 00.0	12.4	21 41.0	6.2	54.1							
18	86 50.5	S 8 02.6	139 31.4	12.5	S21 34.8	6.3	54.1	N 58	17 27	18 06	18 52	10 37	11 46	13 00
19	101 50.6	01.7	154 02.9	12.4	21 28.5	6.4	54.1	56	17 30	18 08	18 51	10 55	12 01	13 12
20	116 50.7	8 00.8	168 34.3	12.6	21 22.1	6.5	54.1	54	17 34	18 09	18 50	11 10	12 14	13 22
21	131 50.8	7 59.8	183 05.9	12.6	21 15.6	6.5	54.1	52	17 36	18 10	18 50	11 22	12 25	13 32
22	146 51.0	58.9	197 37.5	12.6	21 09.1	6.7	54.1	50	17 39	18 12	18 49	11 34	12 35	13 40
23	161 51.1	57.9	212 09.1	12.7	21 02.4	6.8	54.1	45	17 45	18 14	18 48	11 57	12 56	13 57
29 00	176 51.2	S 7 57.0	226 40.8	12.7	S20 55.6	6.8	54.1	N 40	17 50	18 17	18 48	12 16	13 13	14 11
01	191 51.3	56.0	241 12.5	12.8	20 48.8	7.0	54.1	35	17 54	18 20	18 49	12 31	13 27	14 23
02	206 51.4	55.1	255 44.3	12.8	20 41.8	7.0	54.1	30	17 58	18 22	18 50	12 45	13 39	14 34
03	221 51.5	.. 54.1	270 16.1	12.9	20 34.8	7.1	54.1	20	18 04	18 27	18 52	13 08	14 00	14 52
04	236 51.7	53.2	284 48.0	12.9	20 27.7	7.2	54.1	N 10	18 10	18 32	18 56	13 28	14 18	15 07
05	251 51.8	52.2	299 19.9	13.0	20 20.5	7.3	54.0	0	18 16	18 37	19 01	13 46	14 35	15 21
06	266 51.9	S 7 51.3	313 51.9	13.0	S20 13.2	7.4	54.0	S 10	18 22	18 43	19 08	14 05	14 52	15 36
07	281 52.0	50.4	328 23.9	13.1	20 05.8	7.5	54.0	20	18 28	18 50	19 16	14 25	15 10	15 51
08	296 52.1	49.4	342 56.0	13.1	19 58.3	7.5	54.0	30	18 35	19 00	19 28	14 47	15 30	16 08
S 09	311 52.2	.. 48.5	357 28.1	13.2	19 50.8	7.7	54.0	35	18 39	19 05	19 36	15 01	15 42	16 19
A 10	326 52.4	47.5	12 00.3	13.2	19 43.1	7.7	54.0	40	18 44	19 12	19 45	15 16	15 56	16 30
T 11	341 52.5	46.6	26 32.5	13.3	19 35.4	7.8	54.0	45	18 50	19 20	19 56	15 34	16 12	16 44
U 12	356 52.6	S 7 45.6	41 04.8	13.3	S19 27.6	7.9	54.0	S 50	18 57	19 30	20 11	15 57	16 32	17 00
R 13	11 52.7	44.7	55 37.1	13.3	19 19.7	8.0	54.0	52	19 00	19 35	20 18	16 08	16 41	17 08
D 14	26 52.8	43.7	70 09.4	13.5	19 11.7	8.0	54.0	54	19 03	19 40	20 26	16 20	16 52	17 16
A 15	41 53.0	.. 42.8	84 41.9	13.4	19 03.7	8.2	54.0	56	19 07	19 46	20 36	16 34	17 04	17 26
Y 16	56 53.1	41.8	99 14.3	13.5	18 55.5	8.2	54.0	58	19 11	19 53	20 46	16 50	17 17	17 36
17	71 53.2	40.9	113 46.8	13.6	18 47.3	8.3	54.0	S 60	19 16	20 01	20 59	17 10	17 33	17 49
18	86 53.3	S 7 39.9	128 19.4	13.6	S18 39.0	8.4	54.0							
19	101 53.4	39.0	142 52.0	13.6	18 30.6	8.4	54.0							
20	116 53.5	38.0	157 24.6	13.7	18 22.2	8.5	54.0							
21	131 53.7	.. 37.1	171 57.3	13.8	18 13.7	8.7	54.0							
22	146 53.8	36.1	186 30.1	13.7	18 05.0	8.6	54.0							
23	161 53.9	35.2	201 02.8	13.9	17 56.4	8.8	54.0							
	S.D. 16.2	d 0.9	S.D.	14.8		14.8		14.7						

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

Moonset 27	Moonset 28	Moonset 29	Moonset 1
h m	h m	h m	h m
			11 49
		09 41	12 33
		11 05	13 02
	09 53	11 43	13 24
09 09	10 37	12 09	13 41
09 49	11 06	12 30	13 55
10 16	11 28	12 46	14 06
10 37	11 46	13 00	14 16
10 55	12 01	13 12	14 25
11 10	12 14	13 22	14 33
11 22	12 25	13 32	14 40
11 34	12 35	13 40	14 46
11 57	12 56	13 57	15 00
12 16	13 13	14 11	15 11
12 31	13 27	14 23	15 20
12 45	13 39	14 34	15 28
13 08	14 00	14 52	15 42
13 28	14 18	15 07	15 55
13 46	14 35	15 21	16 06
14 05	14 52	15 36	16 17
14 25	15 10	15 51	16 29
14 47	15 30	16 08	16 43
15 01	15 42	16 19	16 51
15 16	15 56	16 30	17 00
15 34	16 12	16 44	17 10
15 57	16 32	17 00	17 23
16 08	16 41	17 08	17 29
16 20	16 52	17 16	17 35
16 34	17 04	17 26	17 42
16 50	17 17	17 36	17 50
17 10	17 33	17 49	17 59

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
27	12 57	12 52	12 13	07 34	19 59	24	
28	12 46	12 41	12 13	08 23	20 47	25	
29	12 35	12 30	12 12	09 10	21 33	26	

UT (GMT)	ARIES	VENUS −3.9		MARS +1.3		JUPITER −2.5		SATURN +0.7		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	159 03.0	202 27.7	S17 11.1	207 16.1	S18 59.1	357 24.6	N 9 15.7	203 31.6	S17 34.8	Acamar	315 30.5	S40 20.3
01	174 05.4	217 27.1	10.3	222 16.6	58.7	12 27.3	15.8	218 33.8	34.7	Achernar	335 38.8	S57 16.7
02	189 07.9	232 26.4	09.5	237 17.1	58.2	27 30.1	15.9	233 36.0	34.7	Acrux	173 26.7	S63 03.4
03	204 10.4	247 25.7	·· 08.7	252 17.6	·· 57.7	42 32.9	·· 16.1	248 38.1	·· 34.6	Adhara	255 24.8	S28 57.9
04	219 12.8	262 25.1	07.9	267 18.1	57.2	57 35.6	16.2	263 40.3	34.5	Aldebaran	291 07.6	N16 29.7
05	234 15.3	277 24.4	07.1	282 18.6	56.7	72 38.4	16.3	278 42.5	34.4			
06	249 17.8	292 23.8	S17 06.3	297 19.1	S18 56.2	87 41.2	N 9 16.4	293 44.7	S17 34.4	Alioth	166 34.0	N55 59.8
07	264 20.2	307 23.1	05.5	312 19.6	55.7	102 44.0	16.6	308 46.9	34.3	Alkaid	153 10.9	N49 20.8
08	279 22.7	322 22.5	04.7	327 20.1	55.2	117 46.7	16.7	323 49.1	34.2	Al Na'ir	28 04.0	S46 59.9
S 09	294 25.1	337 21.8	·· 03.9	342 20.6	·· 54.7	132 49.5	·· 16.8	338 51.3	·· 34.1	Alnilam	276 02.4	S 1 12.5
U 10	309 27.6	352 21.1	03.1	357 21.1	54.2	147 52.3	17.0	353 53.4	34.1	Alphard	218 11.4	S 8 37.7
N 11	324 30.1	7 20.5	02.3	12 21.6	53.7	162 55.0	17.1	8 55.6	34.0			
D 12	339 32.5	22 19.8	S17 01.5	27 22.0	S18 53.2	177 57.8	N 9 17.2	23 57.8	S17 33.9	Alphecca	126 24.3	N26 44.1
A 13	354 35.0	37 19.2	17 00.7	42 22.5	52.7	193 00.6	17.3	39 00.0	33.8	Alpheratz	358 00.3	N29 02.9
Y 14	9 37.5	52 18.5	16 59.9	57 23.0	52.2	208 03.3	17.5	54 02.2	33.8	Altair	62 24.0	N 8 50.7
15	24 39.9	67 17.9	·· 59.1	72 23.5	·· 51.7	223 06.1	·· 17.6	69 04.4	·· 33.7	Ankaa	353 31.6	S42 21.0
16	39 42.4	82 17.2	58.3	87 24.0	51.3	238 08.9	17.7	84 06.6	33.6	Antares	112 45.8	S26 25.0
17	54 44.9	97 16.6	57.5	102 24.5	50.8	253 11.7	17.8	99 08.7	33.5			
18	69 47.3	112 15.9	S16 56.7	117 25.0	S18 50.3	268 14.4	N 9 18.0	114 10.9	S17 33.5	Arcturus	146 10.0	N19 13.1
19	84 49.8	127 15.3	55.9	132 25.5	49.8	283 17.2	18.1	129 13.1	33.4	Atria	108 02.0	S69 00.7
20	99 52.3	142 14.6	55.1	147 26.0	49.3	298 20.0	18.2	144 15.3	33.3	Avior	234 24.1	S59 29.3
21	114 54.7	157 13.9	·· 54.3	162 26.5	·· 48.8	313 22.7	·· 18.3	159 17.5	·· 33.2	Bellatrix	278 49.0	N 6 20.5
22	129 57.2	172 13.3	53.5	177 27.0	48.3	328 25.5	18.5	174 19.7	33.2	Betelgeuse	271 18.4	N 7 24.3
23	144 59.6	187 12.6	52.7	192 27.5	47.8	343 28.3	18.6	189 21.9	33.1			
2 00	160 02.1	202 12.0	S16 51.9	207 28.0	S18 47.3	358 31.1	N 9 18.7	204 24.0	S17 33.0	Canopus	264 03.0	S52 41.8
01	175 04.6	217 11.3	51.1	222 28.5	46.8	13 33.8	18.8	219 26.2	32.9	Capella	280 57.9	N45 59.6
02	190 07.0	232 10.7	50.2	237 29.0	46.3	28 36.6	19.0	234 28.4	32.9	Deneb	49 42.8	N45 15.0
03	205 09.5	247 10.0	·· 49.4	252 29.5	·· 45.8	43 39.4	·· 19.1	249 30.6	·· 32.8	Denebola	182 49.5	N14 36.7
04	220 12.0	262 09.4	48.6	267 30.0	45.3	58 42.1	19.2	264 32.8	32.7	Diphda	349 12.1	S18 01.8
05	235 14.4	277 08.8	47.8	282 30.5	44.8	73 44.9	19.3	279 35.0	32.6			
06	250 16.9	292 08.1	S16 47.0	297 31.0	S18 44.3	88 47.7	N 9 19.5	294 37.2	S17 32.6	Dubhe	194 10.2	N61 47.4
07	265 19.4	307 07.5	46.2	312 31.5	43.8	103 50.4	19.6	309 39.4	32.5	Elnath	278 32.6	N28 36.2
08	280 21.8	322 06.8	45.4	327 32.0	43.3	118 53.2	19.7	324 41.5	32.4	Eltanin	90 53.7	N51 29.0
M 09	295 24.3	337 06.2	·· 44.5	342 32.5	·· 42.8	133 56.0	·· 19.8	339 43.7	·· 32.4	Enif	34 03.0	N 9 50.3
O 10	310 26.8	352 05.5	43.7	357 33.0	42.3	148 58.8	20.0	354 45.9	32.3	Fomalhaut	15 41.8	S29 39.8
N 11	325 29.2	7 04.9	42.9	12 33.5	41.8	164 01.5	20.1	9 48.1	32.2			
D 12	340 31.7	22 04.2	S16 42.1	27 34.1	S18 41.3	179 04.3	N 9 20.2	24 50.3	S17 32.1	Gacrux	172 18.3	S57 04.2
A 13	355 34.1	37 03.6	41.3	42 34.6	40.8	194 07.1	20.4	39 52.5	32.1	Gienah	176 08.4	S17 30.1
Y 14	10 36.6	52 02.9	40.4	57 35.1	40.3	209 09.8	20.5	54 54.7	32.0	Hadar	149 10.2	S60 20.1
15	25 39.1	67 02.3	·· 39.6	72 35.6	·· 39.8	224 12.6	·· 20.6	69 56.8	·· 31.9	Hamal	328 19.0	N23 25.6
16	40 41.5	82 01.7	38.8	87 36.1	39.3	239 15.4	20.7	84 59.0	31.8	Kaus Aust.	84 05.0	S34 23.3
17	55 44.0	97 01.0	38.0	102 36.6	38.7	254 18.2	20.9	100 01.2	31.8			
18	70 46.5	112 00.4	S16 37.1	117 37.1	S18 38.2	269 20.9	N 9 21.0	115 03.4	S17 31.7	Kochab	137 18.6	N74 10.8
19	85 48.9	126 59.7	36.3	132 37.6	37.7	284 23.7	21.1	130 05.6	31.6	Markab	13 54.5	N15 09.8
20	100 51.4	141 59.1	35.5	147 38.1	37.2	299 26.5	21.2	145 07.8	31.5	Menkar	314 31.8	N 4 03.6
21	115 53.9	156 58.4	·· 34.7	162 38.6	·· 36.7	314 29.2	·· 21.4	160 10.0	·· 31.5	Menkent	148 26.2	S36 20.0
22	130 56.3	171 57.8	33.8	177 39.1	36.2	329 32.0	21.5	175 12.2	31.4	Miaplacidus	221 42.4	S69 41.3
23	145 58.8	186 57.2	33.0	192 39.6	35.7	344 34.8	21.6	190 14.4	31.3			
3 00	161 01.2	201 56.5	S16 32.2	207 40.1	S18 35.2	359 37.5	N 9 21.7	205 16.5	S17 31.2	Mirfak	309 03.4	N49 50.3
01	176 03.7	216 55.9	31.3	222 40.6	34.7	14 40.3	21.9	220 18.7	31.2	Nunki	76 18.2	S26 18.4
02	191 06.2	231 55.3	30.5	237 41.1	34.2	29 43.1	22.0	235 20.9	31.1	Peacock	53 44.5	S56 45.5
03	206 08.6	246 54.6	·· 29.7	252 41.6	·· 33.7	44 45.9	·· 22.1	250 23.1	·· 31.0	Pollux	243 46.8	N28 02.7
04	221 11.1	261 54.0	28.8	267 42.1	33.2	59 48.6	22.2	265 25.3	30.9	Procyon	245 16.1	N 5 14.6
05	236 13.6	276 53.3	28.0	282 42.6	32.7	74 51.4	22.4	280 27.5	30.9			
06	251 16.0	291 52.7	S16 27.2	297 43.1	S18 32.2	89 54.2	N 9 22.5	295 29.7	S17 30.8	Rasalhague	96 21.3	N12 33.7
07	266 18.5	306 52.1	26.3	312 43.6	31.6	104 56.9	22.6	310 31.9	30.7	Regulus	208 00.1	N12 00.1
T 08	281 21.0	321 51.4	25.5	327 44.1	31.1	119 59.7	22.7	325 34.0	30.7	Rigel	281 27.3	S 8 12.7
U 09	296 23.4	336 50.8	·· 24.7	342 44.6	·· 30.6	135 02.5	·· 22.9	340 36.2	·· 30.6	Rigil Kent.	140 13.2	S60 48.1
E 10	311 25.9	351 50.2	23.8	357 45.1	30.1	150 05.2	23.0	355 38.4	30.5	Sabik	102 30.8	S15 43.0
S 11	326 28.4	6 49.5	23.0	12 45.6	29.6	165 08.0	23.1	10 40.6	30.4			
D 12	341 30.8	21 48.9	S16 22.1	27 46.1	S18 29.1	180 10.8	N 9 23.2	25 42.8	S17 30.4	Schedar	349 59.3	N56 29.9
A 13	356 33.3	36 48.3	21.3	42 46.6	28.6	195 13.6	23.4	40 45.0	30.3	Shaula	96 43.6	S37 05.9
Y 14	11 35.7	51 47.6	20.5	57 47.2	28.1	210 16.3	23.5	55 47.2	30.2	Sirius	258 47.5	S16 42.5
15	26 38.2	66 47.0	·· 19.6	72 47.7	·· 27.6	225 19.1	·· 23.6	70 49.4	·· 30.1	Spica	158 47.8	S11 07.4
16	41 40.7	81 46.4	18.8	87 48.2	27.1	240 21.9	23.7	85 51.6	30.1	Suhail	223 03.8	S43 24.3
17	56 43.1	96 45.7	17.9	102 48.7	26.5	255 24.6	23.9	100 53.7	30.0			
18	71 45.6	111 45.1	S16 17.1	117 49.2	S18 26.0	270 27.4	N 9 24.0	115 55.9	S17 29.9	Vega	80 49.9	N38 46.3
19	86 48.1	126 44.5	16.2	132 49.7	25.5	285 30.2	24.1	130 58.1	29.8	Zuben'ubi	137 22.9	S16 00.7
20	101 50.5	141 43.8	15.4	147 50.2	25.0	300 32.9	24.2	146 00.3	29.8			
21	116 53.0	156 43.2	·· 14.6	162 50.7	·· 24.5	315 35.7	·· 24.4	161 02.5	·· 29.7		S.H.A.	Mer. Pass.
22	131 55.5	171 42.6	13.7	177 51.2	24.0	330 38.5	24.5	176 04.7	29.6		° ′	h m
23	146 57.9	186 42.0	12.9	192 51.7	23.5	345 41.3	24.6	191 06.9	29.5	Venus	42 09.9	10 32
	h m									Mars	47 25.9	10 10
Mer. Pass.	13 17.7	v −0.6	d 0.8	v 0.5	d 0.5	v 2.8	d 0.1	v 2.2	d 0.1	Jupiter	198 28.9	0 06
										Saturn	44 21.9	10 21

UT (GMT)	SUN			MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
	G.H.A.	Dec.		G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′		° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
1 00	176 54.0	S 7 34.2		215 35.7	13.8	S17 47.6	8.8	54.0	N 72	05 04	06 22	07 30	08 19	07 29	07 00	06 36
01	191 54.2	33.3		230 08.5	14.0	17 38.8	9.0	54.0	N 70	05 09	06 20	07 21	07 34	07 07	06 48	06 31
02	206 54.3	32.3		244 41.5	13.9	17 29.8	8.9	54.0	68	05 14	06 18	07 14	07 04	06 49	06 38	06 28
03	221 54.4	.. 31.4		259 14.4	14.0	17 20.9	9.1	54.0	66	05 18	06 17	07 08	06 41	06 35	06 30	06 24
04	236 54.5	30.4		273 47.4	14.1	17 11.8	9.1	54.0	64	05 21	06 16	07 03	06 24	06 23	06 23	06 22
05	251 54.6	29.5		288 20.5	14.1	17 02.7	9.2	54.0	62	05 23	06 14	06 59	06 09	06 14	06 17	06 19
06	266 54.8	S 7 28.5		302 53.6	14.1	S16 53.5	9.3	54.0	60	05 25	06 13	06 55	05 56	06 05	06 12	06 17
07	281 54.9	27.6		317 26.7	14.2	16 44.2	9.3	54.0	N 58	05 27	06 12	06 52	05 45	05 57	06 07	06 15
08	296 55.0	26.6		331 59.9	14.2	16 34.9	9.4	54.0	56	05 28	06 11	06 48	05 36	05 51	06 03	06 14
S 09	311 55.1	.. 25.7		346 33.1	14.3	16 25.5	9.5	54.0	54	05 30	06 10	06 46	05 28	05 45	05 59	06 12
U 10	326 55.3	24.7		1 06.4	14.3	16 16.0	9.6	54.0	52	05 30	06 09	06 43	05 20	05 39	05 56	06 11
N 11	341 55.4	23.8		15 39.7	14.4	16 06.4	9.6	54.0	50	05 31	06 09	06 41	05 13	05 34	05 53	06 09
D 12	356 55.5	S 7 22.8		30 13.1	14.3	S15 56.8	9.7	54.0	45	05 33	06 07	06 36	04 59	05 24	05 46	06 07
A 13	11 55.6	21.9		44 46.4	14.5	15 47.1	9.7	54.0	N 40	05 33	06 05	06 32	04 46	05 15	05 40	06 04
Y 14	26 55.7	20.9		59 19.9	14.4	15 37.4	9.8	54.1	35	05 33	06 03	06 28	04 36	05 07	05 35	06 02
15	41 55.9	.. 19.9		73 53.3	14.5	15 27.6	9.9	54.1	30	05 33	06 01	06 25	04 27	05 00	05 31	06 01
16	56 56.0	19.0		88 26.8	14.6	15 17.7	9.9	54.1	20	05 31	05 57	06 19	04 11	04 48	05 24	05 58
17	71 56.1	18.0		103 00.4	14.6	15 07.8	10.1	54.1	N 10	05 28	05 53	06 14	03 58	04 38	05 17	05 55
18	86 56.2	S 7 17.1		117 34.0	14.6	S14 57.7	10.0	54.1	0	05 24	05 48	06 09	03 45	04 28	05 11	05 52
19	101 56.4	16.1		132 07.6	14.7	14 47.7	10.1	54.1	S 10	05 18	05 43	06 04	03 32	04 19	05 04	05 50
20	116 56.5	15.2		146 41.3	14.7	14 37.6	10.2	54.1	20	05 10	05 36	05 58	03 18	04 08	04 58	05 47
21	131 56.6	.. 14.2		161 15.0	14.7	14 27.4	10.3	54.1	30	04 59	05 28	05 52	03 02	03 56	04 50	05 44
22	146 56.7	13.3		175 48.7	14.8	14 17.1	10.3	54.1	35	04 52	05 22	05 48	02 53	03 49	04 46	05 42
23	161 56.9	12.3		190 22.5	14.8	14 06.8	10.4	54.1	40	04 43	05 16	05 44	02 42	03 41	04 41	05 40
2 00	176 57.0	S 7 11.4		204 56.3	14.8	S13 56.4	10.4	54.1	45	04 33	05 09	05 39	02 30	03 32	04 35	05 38
01	191 57.1	10.4		219 30.1	14.9	13 46.0	10.5	54.1	S 50	04 19	04 59	05 33	02 14	03 21	04 28	05 35
02	206 57.2	09.5		234 04.0	14.9	13 35.5	10.5	54.1	52	04 12	04 55	05 30	02 07	03 16	04 25	05 34
03	221 57.4	.. 08.5		248 37.9	15.0	13 25.0	10.6	54.1	54	04 05	04 50	05 27	01 59	03 10	04 21	05 32
04	236 57.5	07.5		263 11.9	14.9	13 14.4	10.7	54.1	56	03 56	04 44	05 23	01 50	03 04	04 17	05 31
05	251 57.6	06.6		277 45.8	15.0	13 03.7	10.7	54.1	58	03 46	04 38	05 20	01 40	02 56	04 13	05 29
06	266 57.8	S 7 05.6		292 19.8	15.1	S12 53.0	10.7	54.1	S 60	03 34	04 31	05 15	01 28	02 48	04 08	05 27
07	281 57.9	04.7		306 53.9	15.0	12 42.3	10.9	54.1								
08	296 58.0	03.7		321 27.9	15.2	12 31.4	10.8	54.1								
M 09	311 58.1	.. 02.8		336 02.1	15.1	12 20.6	10.9	54.2								
O 10	326 58.3	01.8		350 36.2	15.1	12 09.7	11.0	54.2								
N 11	341 58.4	7 00.8		5 10.3	15.2	11 58.7	11.0	54.2								
D 12	356 58.5	S 6 59.9		19 44.5	15.3	S11 47.7	11.1	54.2								
A 13	11 58.7	58.9		34 18.8	15.2	11 36.6	11.1	54.2								
Y 14	26 58.8	58.0		48 53.0	15.3	11 25.5	11.2	54.2								
15	41 58.9	.. 57.0		63 27.3	15.3	11 14.3	11.2	54.2								
16	56 59.0	56.1		78 01.6	15.3	11 03.1	11.3	54.2								
17	71 59.2	55.1		92 35.9	15.3	10 51.8	11.3	54.2								
18	86 59.3	S 6 54.1		107 10.2	15.4	S10 40.5	11.3	54.2								
19	101 59.4	53.2		121 44.6	15.4	10 29.2	11.4	54.2								
20	116 59.6	52.2		136 19.0	15.4	10 17.8	11.5	54.2								
21	131 59.7	.. 51.3		150 53.4	15.5	10 06.3	11.5	54.2								
22	146 59.8	50.3		165 27.9	15.5	9 54.8	11.5	54.3								
23	161 59.9	49.4		180 02.4	15.4	9 43.3	11.6	54.3								
3 00	177 00.1	S 6 48.4		194 36.8	15.5	S 9 31.7	11.6	54.3								
01	192 00.2	47.4		209 11.3	15.6	9 20.1	11.7	54.3								
02	207 00.3	46.5		223 45.9	15.5	9 08.4	11.7	54.3								
03	222 00.5	.. 45.5		238 20.4	15.6	8 56.7	11.7	54.3								
04	237 00.6	44.6		252 55.0	15.6	8 45.0	11.8	54.3								
05	252 00.7	43.6		267 29.6	15.6	8 33.2	11.8	54.3								
06	267 00.9	S 6 42.6		282 04.2	15.6	S 8 21.4	11.8	54.3								
07	282 01.0	41.7		296 38.8	15.6	8 09.6	11.9	54.3								
T 08	297 01.1	40.7		311 13.4	15.7	7 57.7	11.9	54.4								
U 09	312 01.3	.. 39.8		325 48.1	15.6	7 45.8	12.0	54.4								
E 10	327 01.4	38.8		340 22.7	15.7	7 33.8	12.0	54.4								
S 11	342 01.5	37.8		354 57.4	15.7	7 21.8	12.0	54.4								
D 12	357 01.7	S 6 36.9		9 32.1	15.7	S 7 09.8	12.0	54.4								
A 13	12 01.8	35.9		24 06.8	15.7	6 57.8	12.1	54.4								
Y 14	27 01.9	35.0		38 41.5	15.7	6 45.7	12.1	54.4								
15	42 02.1	.. 34.0		53 16.2	15.8	6 33.6	12.2	54.4								
16	57 02.2	33.0		67 51.0	15.7	6 21.4	12.2	54.4								
17	72 02.3	32.1		82 25.7	15.8	6 09.2	12.2	54.5								
18	87 02.5	S 6 31.1		97 00.5	15.7	S 5 57.0	12.2	54.5								
19	102 02.6	30.1		111 35.2	15.8	5 44.8	12.3	54.5								
20	117 02.7	29.2		126 10.0	15.7	5 32.5	12.3	54.5								
21	132 02.9	.. 28.2		140 44.7	15.8	5 20.2	12.3	54.5								
22	147 03.0	27.3		155 19.5	15.8	5 07.9	12.3	54.5								
23	162 03.1	26.3		169 54.3	15.8	4 55.6	12.4	54.5								
	S.D. 16.2	d 1.0		S.D. 14.7		14.8		14.6								

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

UT (GMT)	ARIES	VENUS −3.9		MARS +1.3		JUPITER −2.5		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
4 00	162 00.4	201 41.3	S16 12.0	207 52.2	S18 22.9	0 44.0	N 9 24.7	206 09.1	S17 29.5
01	177 02.9	216 40.7	11.2	222 52.7	22.4	15 46.8	24.9	221 11.3	29.4
02	192 05.3	231 40.1	10.3	237 53.2	21.9	30 49.6	25.0	236 13.5	29.3
03	207 07.8	246 39.4	·· 09.5	252 53.7	·· 21.4	45 52.3	·· 25.1	251 15.6	·· 29.3
04	222 10.2	261 38.8	08.6	267 54.3	20.9	60 55.1	25.2	266 17.8	29.2
05	237 12.7	276 38.2	07.7	282 54.8	20.4	75 57.9	25.4	281 20.0	29.1
06	252 15.2	291 37.6	S16 06.9	297 55.3	S18 19.8	91 00.6	N 9 25.5	296 22.2	S17 29.0
W 07	267 17.6	306 36.9	06.0	312 55.8	19.3	106 03.4	25.6	311 24.4	29.0
E 08	282 20.1	321 36.3	05.2	327 56.3	18.8	121 06.2	25.7	326 26.6	28.9
D 09	297 22.6	336 35.7	·· 04.3	342 56.8	·· 18.3	136 08.9	·· 25.9	341 28.8	·· 28.8
N 10	312 25.0	351 35.1	03.5	357 57.3	17.8	151 11.7	26.0	356 31.0	28.7
E 11	327 27.5	6 34.4	02.6	12 57.8	17.3	166 14.5	26.1	11 33.2	28.7
S 12	342 30.0	21 33.8	S16 01.8	27 58.3	S18 16.7	181 17.3	N 9 26.2	26 35.4	S17 28.6
D 13	357 32.4	36 33.2	00.9	42 58.8	16.2	196 20.0	26.4	41 37.5	28.5
A 14	12 34.9	51 32.6	16 00.0	57 59.3	15.7	211 22.8	26.5	56 39.7	28.4
Y 15	27 37.3	66 32.0	15 59.2	72 59.9	·· 15.2	226 25.6	·· 26.6	71 41.9	·· 28.4
16	42 39.8	81 31.3	58.3	88 00.4	14.7	241 28.3	26.7	86 44.1	28.3
17	57 42.3	96 30.7	57.4	103 00.9	14.1	256 31.1	26.8	101 46.3	28.2
18	72 44.7	111 30.1	S15 56.6	118 01.4	S18 13.6	271 33.9	N 9 27.0	116 48.5	S17 28.2
19	87 47.2	126 29.5	55.7	133 01.9	13.1	286 36.6	27.1	131 50.7	28.1
20	102 49.7	141 28.9	54.9	148 02.4	12.6	301 39.4	27.2	146 52.9	28.0
21	117 52.1	156 28.2	·· 54.0	163 02.9	·· 12.1	316 42.2	·· 27.3	161 55.1	·· 27.9
22	132 54.6	171 27.6	53.1	178 03.4	11.5	331 44.9	27.5	176 57.3	27.9
23	147 57.1	186 27.0	52.3	193 03.9	11.0	346 47.7	27.6	191 59.5	27.8
5 00	162 59.5	201 26.4	S15 51.4	208 04.5	S18 10.5	1 50.5	N 9 27.7	207 01.6	S17 27.7
01	178 02.0	216 25.8	50.5	223 05.0	10.0	16 53.3	27.8	222 03.8	27.6
02	193 04.5	231 25.1	49.6	238 05.5	09.4	31 56.0	28.0	237 06.0	27.6
03	208 06.9	246 24.5	·· 48.8	253 06.0	·· 08.9	46 58.8	·· 28.1	252 08.2	·· 27.5
04	223 09.4	261 23.9	47.9	268 06.5	08.4	62 01.6	28.2	267 10.4	27.4
05	238 11.8	276 23.3	47.0	283 07.0	07.9	77 04.3	28.3	282 12.6	27.3
06	253 14.3	291 22.7	S15 46.2	298 07.5	S18 07.3	92 07.1	N 9 28.5	297 14.8	S17 27.3
T 07	268 16.8	306 22.1	45.3	313 08.0	06.8	107 09.9	28.6	312 17.0	27.2
H 08	283 19.2	321 21.5	44.4	328 08.5	06.3	122 12.6	28.7	327 19.2	27.1
U 09	298 21.7	336 20.8	·· 43.5	343 09.1	·· 05.8	137 15.4	·· 28.8	342 21.4	·· 27.1
R 10	313 24.2	351 20.2	42.7	358 09.6	05.2	152 18.2	29.0	357 23.6	27.0
S 11	328 26.6	6 19.6	41.8	13 10.1	04.7	167 20.9	29.1	12 25.8	26.9
D 12	343 29.1	21 19.0	S15 40.9	28 10.6	S18 04.2	182 23.7	N 9 29.2	27 27.9	S17 26.8
A 13	358 31.6	36 18.4	40.0	43 11.1	03.7	197 26.5	29.3	42 30.1	26.8
Y 14	13 34.0	51 17.8	39.2	58 11.6	03.1	212 29.2	29.4	57 32.3	26.7
15	28 36.5	66 17.2	·· 38.3	73 12.1	·· 02.6	227 32.0	·· 29.6	72 34.5	·· 26.6
16	43 39.0	81 16.6	37.4	88 12.7	02.1	242 34.8	29.7	87 36.7	26.5
17	58 41.4	96 16.0	36.5	103 13.2	01.6	257 37.6	29.8	102 38.9	26.5
18	73 43.9	111 15.3	S15 35.6	118 13.7	S18 01.0	272 40.3	N 9 29.9	117 41.1	S17 26.4
19	88 46.3	126 14.7	34.7	133 14.2	00.5	287 43.1	30.1	132 43.3	26.3
20	103 48.8	141 14.1	33.9	148 14.7	18 00.0	302 45.9	30.2	147 45.5	26.2
21	118 51.3	156 13.5	·· 33.0	163 15.2	17 59.4	317 48.6	·· 30.3	162 47.7	·· 26.2
22	133 53.7	171 12.9	32.1	178 15.7	58.9	332 51.4	30.4	177 49.9	26.1
23	148 56.2	186 12.3	31.2	193 16.3	58.4	347 54.2	30.6	192 52.1	26.0
6 00	163 58.7	201 11.7	S15 30.3	208 16.8	S17 57.9	2 56.9	N 9 30.7	207 54.3	S17 26.0
01	179 01.1	216 11.1	29.4	223 17.3	57.3	17 59.7	30.8	222 56.5	25.9
02	194 03.6	231 10.5	28.5	238 17.8	56.8	33 02.5	30.9	237 58.6	25.8
03	209 06.1	246 09.9	·· 27.7	253 18.3	·· 56.3	48 05.2	·· 31.1	253 00.8	·· 25.7
04	224 08.5	261 09.3	26.8	268 18.8	55.7	63 08.0	31.2	268 03.0	25.7
05	239 11.0	276 08.7	25.9	283 19.4	55.2	78 10.8	31.3	283 05.2	25.6
06	254 13.5	291 08.1	S15 25.0	298 19.9	S17 54.7	93 13.5	N 9 31.4	298 07.4	S17 25.5
07	269 15.9	306 07.5	24.1	313 20.4	54.1	108 16.3	31.5	313 09.6	25.4
08	284 18.4	321 06.9	23.2	328 20.9	53.6	123 19.1	31.7	328 11.8	25.4
F 09	299 20.8	336 06.3	·· 22.3	343 21.4	·· 53.1	138 21.8	·· 31.8	343 14.0	·· 25.3
R 10	314 23.3	351 05.7	21.4	358 21.9	52.5	153 24.6	31.9	358 16.2	25.2
I 11	329 25.8	6 05.1	20.5	13 22.5	52.0	168 27.4	32.0	13 18.4	25.2
D 12	344 28.2	21 04.5	S15 19.6	28 23.0	S17 51.5	183 30.1	N 9 32.2	28 20.6	S17 25.1
A 13	359 30.7	36 03.9	18.7	43 23.5	50.9	198 32.9	32.3	43 22.8	25.0
Y 14	14 33.2	51 03.3	17.8	58 24.0	50.4	213 35.7	32.4	58 25.0	24.9
15	29 35.6	66 02.7	·· 16.9	73 24.5	·· 49.9	228 38.4	·· 32.5	73 27.2	·· 24.9
16	44 38.1	81 02.1	16.0	88 25.0	49.3	243 41.2	32.6	88 29.4	24.8
17	59 40.6	96 01.5	15.1	103 25.6	48.8	258 44.0	32.8	103 31.6	24.7
18	74 43.0	111 00.9	S15 14.2	118 26.1	S17 48.3	273 46.7	N 9 32.9	118 33.8	S17 24.6
19	89 45.5	126 00.3	13.3	133 26.6	47.7	288 49.5	33.0	133 35.9	24.6
20	104 47.9	140 59.7	12.4	148 27.1	47.2	303 52.3	33.1	148 38.1	24.5
21	119 50.4	155 59.1	·· 11.5	163 27.6	·· 46.6	318 55.0	·· 33.3	163 40.3	·· 24.4
22	134 52.9	170 58.5	10.6	178 28.2	46.1	333 57.8	33.4	178 42.5	24.4
23	149 55.3	185 57.9	09.7	193 28.7	45.6	349 00.6	33.5	193 44.7	24.3
	h m								
Mer. Pass.	13 05.9	v −0.6	d 0.9	v 0.5	d 0.5	v 2.8	d 0.1	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.5	S40 20.3
Achernar	335 38.8	S57 16.7
Acrux	173 26.7	S63 03.4
Adhara	255 24.8	S28 57.9
Aldebaran	291 07.7	N16 29.7
Alioth	166 33.9	N55 59.8
Alkaid	153 10.9	N49 20.8
Al Na'ir	28 04.0	S46 59.9
Alnilam	276 02.4	S 1 12.5
Alphard	218 11.4	S 8 37.7
Alphecca	126 24.3	N26 44.1
Alpheratz	358 00.4	N29 02.9
Altair	62 23.9	N 8 50.7
Ankaa	353 31.6	S42 21.0
Antares	112 45.7	S26 25.0
Arcturus	146 10.0	N19 13.1
Atria	108 01.9	S69 00.7
Avior	234 24.1	S59 29.3
Bellatrix	278 49.0	N 6 20.5
Betelgeuse	271 18.4	N 7 24.3
Canopus	264 03.0	S52 41.8
Capella	280 57.9	N45 59.6
Deneb	49 42.7	N45 15.0
Denebola	182 49.5	N14 36.7
Diphda	349 12.1	S18 01.8
Dubhe	194 10.2	N61 47.4
Elnath	278 32.7	N28 36.2
Eltanin	90 53.7	N51 29.0
Enif	34 03.0	N 9 50.3
Fomalhaut	15 41.8	S29 39.8
Gacrux	172 18.3	S57 04.2
Gienah	176 08.4	S17 30.1
Hadar	149 10.2	S60 20.1
Hamal	328 19.0	N23 25.6
Kaus Aust.	84 05.0	S34 23.3
Kochab	137 18.5	N74 10.8
Markab	13 54.5	N15 09.8
Menkar	314 31.8	N 4 03.6
Menkent	148 26.1	S36 20.0
Miaplacidus	221 42.4	S69 41.3
Mirfak	309 03.4	N49 50.3
Nunki	76 18.1	S26 18.4
Peacock	53 44.5	S56 45.5
Pollux	243 46.9	N28 02.7
Procyon	245 16.1	N 5 14.6
Rasalhague	96 21.2	N12 33.7
Regulus	208 00.1	N12 00.1
Rigel	281 27.3	S 8 12.7
Rigil Kent.	140 13.2	S60 48.1
Sabik	102 30.8	S15 43.0
Schedar	349 59.4	N56 29.8
Shaula	96 43.6	S37 05.9
Sirius	258 47.5	S16 42.5
Spica	158 47.8	S11 07.5
Suhail	223 03.8	S43 24.3
Vega	80 49.9	N38 46.3
Zuben'ubi	137 22.9	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	38 26.9	10 35
Mars	45 04.9	10 07
Jupiter	198 51.0	23 48
Saturn	44 02.1	10 10

UT (GMT)	SUN			MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
	G.H.A.	Dec.		G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′		° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
4 00	177 03.3	S 6 25.3		184 29.1	15.8	S 4 43.2	12.4	54.5	N 72	04 48	06 07	07 15	06 36	06 14	05 51	05 24
01	192 03.4	24.4		199 03.9	15.8	4 30.8	12.4	54.5	N 70	04 56	06 07	07 08	06 31	06 16	06 00	05 42
02	207 03.5	23.4		213 38.7	15.7	4 18.4	12.4	54.6	68	05 02	06 06	07 02	06 28	06 18	06 08	05 57
03	222 03.7	.. 22.4		228 13.4	15.8	4 06.0	12.5	54.6	66	05 07	06 06	06 57	06 24	06 19	06 14	06 09
04	237 03.8	21.5		242 48.2	15.8	3 53.5	12.4	54.6	64	05 11	06 05	06 53	06 22	06 20	06 20	06 19
05	252 04.0	20.5		257 23.0	15.8	3 41.1	12.5	54.6	62	05 14	06 05	06 49	06 19	06 22	06 24	06 28
06	267 04.1	S 6 19.6		271 57.8	15.8	S 3 28.6	12.6	54.6	60	05 17	06 05	06 46	06 17	06 22	06 28	06 35
W 07	282 04.2	18.6		286 32.6	15.8	3 16.0	12.5	54.6	N 58	05 19	06 04	06 43	06 15	06 23	06 32	06 42
E 08	297 04.4	17.6		301 07.4	15.8	3 03.5	12.5	54.6	56	05 21	06 04	06 41	06 14	06 24	06 35	06 48
D 09	312 04.5	.. 16.7		315 42.2	15.8	2 51.0	12.6	54.7	54	05 23	06 03	06 39	06 12	06 25	06 38	06 53
N 10	327 04.6	15.7		330 17.0	15.7	2 38.4	12.6	54.7	52	05 24	06 03	06 37	06 11	06 25	06 41	06 58
E 11	342 04.8	14.7		344 51.7	15.8	2 25.8	12.6	54.7	50	05 25	06 02	06 35	06 09	06 26	06 43	07 02
S 12	357 04.9	S 6 13.8		359 26.5	15.8	S 2 13.2	12.6	54.7	45	05 27	06 01	06 31	06 07	06 27	06 48	07 12
D 13	12 05.1	12.8		14 01.3	15.7	2 00.6	12.6	54.7	N 40	05 29	06 00	06 27	06 04	06 28	06 53	07 20
A 14	27 05.2	11.8		28 36.0	15.8	1 48.0	12.7	54.7	35	05 30	05 59	06 24	06 02	06 29	06 57	07 26
Y 15	42 05.3	.. 10.9		43 10.8	15.7	1 35.3	12.6	54.7	30	05 30	05 57	06 21	06 01	06 30	07 00	07 32
16	57 05.5	09.9		57 45.5	15.8	1 22.7	12.7	54.7	20	05 29	05 55	06 17	05 58	06 31	07 06	07 43
17	72 05.6	08.9		72 20.3	15.7	1 10.0	12.7	54.8	N 10	05 27	05 51	06 12	05 55	06 33	07 12	07 52
18	87 05.7	S 6 08.0		86 55.0	15.7	S 0 57.3	12.7	54.8	0	05 23	05 47	06 08	05 52	06 34	07 17	08 01
19	102 05.9	07.0		101 29.7	15.7	0 44.6	12.7	54.8	S 10	05 18	05 43	06 04	05 50	06 35	07 22	08 10
20	117 06.0	06.0		116 04.4	15.7	0 31.9	12.7	54.8	20	05 11	05 37	05 59	05 47	06 37	07 27	08 19
21	132 06.2	.. 05.1		130 39.1	15.6	0 19.2	12.7	54.8	30	05 01	05 30	05 54	05 44	06 38	07 33	08 30
22	147 06.3	04.1		145 13.7	15.7	S 0 06.5	12.7	54.8	35	04 55	05 25	05 51	05 42	06 39	07 37	08 36
23	162 06.4	03.2		159 48.4	15.6	N 0 06.2	12.7	54.9	40	04 47	05 20	05 47	05 40	06 40	07 41	08 44
5 00	177 06.6	S 6 02.2		174 23.0	15.7	N 0 18.9	12.7	54.9	45	04 37	05 13	05 43	05 38	06 41	07 46	08 52
01	192 06.7	01.2		188 57.7	15.6	0 31.6	12.8	54.9	S 50	04 25	05 05	05 38	05 35	06 43	07 52	09 02
02	207 06.9	6 00.3		203 32.3	15.6	0 44.4	12.7	54.9	52	04 19	05 01	05 35	05 34	06 43	07 54	09 07
03	222 07.0	5 59.3		218 06.9	15.5	0 57.1	12.7	54.9	54	04 12	04 56	05 33	05 32	06 44	07 57	09 12
04	237 07.1	58.3		232 41.4	15.6	1 09.8	12.8	54.9	56	04 04	04 51	05 30	05 31	06 45	08 01	09 18
05	252 07.3	57.4		247 16.0	15.5	1 22.6	12.7	54.9	58	03 55	04 46	05 27	05 29	06 46	08 04	09 25
06	267 07.4	S 5 56.4		261 50.5	15.5	N 1 35.3	12.8	55.0	S 60	03 44	04 39	05 23	05 27	06 47	08 08	09 32
T 07	282 07.6	55.4		276 25.0	15.5	1 48.1	12.7	55.0								
H 08	297 07.7	54.4		290 59.5	15.5	2 00.8	12.7	55.0								
U 09	312 07.9	.. 53.5		305 34.0	15.4	2 13.5	12.8	55.0								
R 10	327 08.0	52.5		320 08.4	15.4	2 26.3	12.7	55.0								
S 11	342 08.1	51.5		334 42.8	15.4	2 39.0	12.8	55.0								
D 12	357 08.3	S 5 50.6		349 17.2	15.4	N 2 51.8	12.7	55.1								
A 13	12 08.4	49.6		3 51.6	15.3	3 04.5	12.7	55.1								
Y 14	27 08.6	48.6		18 25.9	15.3	3 17.2	12.7	55.1								
15	42 08.7	.. 47.7		33 00.2	15.3	3 29.9	12.7	55.1								
16	57 08.9	46.7		47 34.5	15.3	3 42.6	12.7	55.1								
17	72 09.0	45.7		62 08.8	15.2	3 55.3	12.7	55.1								
18	87 09.1	S 5 44.8		76 43.0	15.2	N 4 08.0	12.7	55.2								
19	102 09.3	43.8		91 17.2	15.1	4 20.7	12.7	55.2								
20	117 09.4	42.8		105 51.3	15.2	4 33.4	12.6	55.2								
21	132 09.6	.. 41.9		120 25.5	15.1	4 46.0	12.7	55.2								
22	147 09.7	40.9		134 59.6	15.0	4 58.7	12.6	55.2								
23	162 09.9	39.9		149 33.6	15.0	5 11.3	12.6	55.2								
6 00	177 10.0	S 5 39.0		164 07.6	15.0	N 5 23.9	12.6	55.3								
01	192 10.1	38.0		178 41.6	15.0	5 36.5	12.6	55.3								
02	207 10.3	37.0		193 15.6	14.9	5 49.1	12.6	55.3								
03	222 10.4	.. 36.0		207 49.5	14.9	6 01.7	12.5	55.3								
04	237 10.6	35.1		222 23.4	14.8	6 14.2	12.5	55.3								
05	252 10.7	34.1		236 57.2	14.8	6 26.7	12.6	55.3								
06	267 10.9	S 5 33.1		251 31.0	14.7	N 6 39.3	12.5	55.4								
F 07	282 11.0	32.2		266 04.7	14.7	6 51.8	12.4	55.4								
R 08	297 11.2	31.2		280 38.4	14.7	7 04.2	12.5	55.4								
I 09	312 11.3	.. 30.2		295 12.1	14.6	7 16.7	12.4	55.4								
D 10	327 11.5	29.2		309 45.7	14.6	7 29.1	12.4	55.4								
A 11	342 11.6	28.3		324 19.3	14.5	7 41.5	12.4	55.4								
Y 12	357 11.7	S 5 27.3		338 52.8	14.5	N 7 53.9	12.3	55.5								
13	12 11.9	26.3		353 26.3	14.5	8 06.2	12.3	55.5								
14	27 12.0	25.4		7 59.8	14.3	8 18.5	12.3	55.5								
15	42 12.2	.. 24.4		22 33.1	14.4	8 30.8	12.3	55.5								
16	57 12.3	23.4		37 06.5	14.3	8 43.1	12.2	55.5								
17	72 12.5	22.4		51 39.8	14.2	8 55.3	12.2	55.6								
18	87 12.6	S 5 21.5		66 13.0	14.2	N 9 07.5	12.2	55.6								
19	102 12.8	20.5		80 46.2	14.1	9 19.7	12.1	55.6								
20	117 12.9	19.5		95 19.3	14.1	9 31.8	12.2	55.6								
21	132 13.1	.. 18.6		109 52.4	14.1	9 44.0	12.0	55.6								
22	147 13.2	17.6		124 25.5	13.9	9 56.0	12.1	55.7								
23	162 13.4	16.6		138 58.4	14.0	10 08.1	12.0	55.7								
	S.D. 16.1	d 1.0		S.D. 14.9		15.0		15.1								

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	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	11 47	11 41	12 12	12 02	24 23	30	
5	11 34	11 27	12 11	12 44	00 23	01	●
6	11 20	11 13	12 11	13 27	01 05	02	

UT (GMT)	ARIES	VENUS −3.9		MARS +1.1		JUPITER −2.2		SATURN +0.8	
d h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27 00	215 13.9	192 14.5	N 8 07.3	220 59.5	S 3 56.4	58 14.2	N11 00.9	254 51.4	S16 16.2
01	230 16.3	207 14.1	08.5	236 00.1	55.6	73 16.7	00.9	269 53.8	16.1
02	245 18.8	222 13.7	09.7	251 00.8	54.9	88 19.2	00.9	284 56.1	16.1
03	260 21.3	237 13.3	10.8	266 01.5	54.1	103 21.7	00.9	299 58.5	16.1
04	275 23.7	252 12.9	12.0	281 02.2	53.4	118 24.2	00.9	315 00.8	16.0
05	290 26.2	267 12.5	13.2	296 02.9	52.6	133 26.7	00.9	330 03.1	16.0
06	305 28.7	282 12.1	N 8 14.3	311 03.6	S 3 51.8	148 29.2	N11 00.9	345 05.5	S16 16.0
07	320 31.1	297 11.6	15.5	326 04.3	51.1	163 31.7	00.9	0 07.8	15.9
08	335 33.6	312 11.2	16.7	341 05.0	50.3	178 34.2	00.9	15 10.2	15.9
M 09	350 36.1	327 10.8	17.8	356 05.7	49.6	193 36.7	00.9	30 12.5	15.9
O 10	5 38.5	342 10.4	19.0	11 06.3	48.8	208 39.1	00.9	45 14.8	15.9
N 11	20 41.0	357 10.0	20.1	26 07.0	48.0	223 41.6	00.9	60 17.2	15.8
D 12	35 43.5	12 09.6	N 8 21.3	41 07.7	S 3 47.3	238 44.1	N11 00.9	75 19.5	S16 15.8
A 13	50 45.9	27 09.1	22.5	56 08.4	46.5	253 46.6	00.9	90 21.9	15.8
Y 14	65 48.4	42 08.7	23.6	71 09.1	45.8	268 49.1	00.9	105 24.2	15.7
15	80 50.8	57 08.3	24.8	86 09.8	45.0	283 51.6	00.9	120 26.5	15.7
16	95 53.3	72 07.9	25.9	101 10.5	44.2	298 54.1	00.9	135 28.9	15.7
17	110 55.8	87 07.5	27.1	116 11.2	43.5	313 56.6	00.9	150 31.2	15.6
18	125 58.2	102 07.1	N 8 28.3	131 11.9	S 3 42.7	328 59.1	N11 00.9	165 33.6	S16 15.6
19	141 00.7	117 06.6	29.4	146 12.6	42.0	344 01.6	00.9	180 35.9	15.6
20	156 03.2	132 06.2	30.6	161 13.2	41.2	359 04.0	00.9	195 38.2	15.5
21	171 05.6	147 05.8	31.7	176 13.9	40.4	14 06.5	00.9	210 40.6	15.5
22	186 08.1	162 05.4	32.9	191 14.6	39.7	29 09.0	00.9	225 42.9	15.5
23	201 10.6	177 05.0	34.1	206 15.3	38.9	44 11.5	00.9	240 45.3	15.4
28 00	216 13.0	192 04.5	N 8 35.2	221 16.0	S 3 38.2	59 14.0	N11 00.9	255 47.6	S16 15.4
01	231 15.5	207 04.1	36.4	236 16.7	37.4	74 16.5	00.9	270 49.9	15.4
02	246 18.0	222 03.7	37.5	251 17.4	36.6	89 19.0	00.9	285 52.3	15.3
03	261 20.4	237 03.3	38.7	266 18.1	35.9	104 21.5	00.9	300 54.6	15.3
04	276 22.9	252 02.9	39.8	281 18.8	35.1	119 23.9	00.9	315 57.0	15.3
05	291 25.3	267 02.4	41.0	296 19.5	34.4	134 26.4	00.9	330 59.3	15.3
06	306 27.8	282 02.0	N 8 42.2	311 20.1	S 3 33.6	149 28.9	N11 00.9	346 01.7	S16 15.2
07	321 30.3	297 01.6	43.3	326 20.8	32.8	164 31.4	00.9	1 04.0	15.2
T 08	336 32.7	312 01.2	44.5	341 21.5	32.1	179 33.9	00.9	16 06.3	15.2
U 09	351 35.2	327 00.8	45.6	356 22.2	31.3	194 36.4	00.9	31 08.7	15.1
E 10	6 37.7	342 00.3	46.8	11 22.9	30.6	209 38.9	00.9	46 11.0	15.1
S 11	21 40.1	356 59.9	47.9	26 23.6	29.8	224 41.3	00.9	61 13.4	15.1
D 12	36 42.6	11 59.5	N 8 49.1	41 24.3	S 3 29.0	239 43.8	N11 00.9	76 15.7	S16 15.0
A 13	51 45.1	26 59.1	50.2	56 25.0	28.3	254 46.3	00.9	91 18.1	15.0
Y 14	66 47.5	41 58.6	51.4	71 25.7	27.5	269 48.8	00.9	106 20.4	15.0
15	81 50.0	56 58.2	52.5	86 26.4	26.8	284 51.3	00.9	121 22.7	14.9
16	96 52.4	71 57.8	53.7	101 27.1	26.0	299 53.8	00.9	136 25.1	14.9
17	111 54.9	86 57.4	54.8	116 27.8	25.2	314 56.2	00.9	151 27.4	14.9
18	126 57.4	101 56.9	N 8 56.0	131 28.4	S 3 24.5	329 58.7	N11 00.9	166 29.8	S16 14.9
19	141 59.8	116 56.5	57.1	146 29.1	23.7	345 01.2	00.9	181 32.1	14.8
20	157 02.3	131 56.1	58.3	161 29.8	23.0	0 03.7	00.9	196 34.5	14.8
21	172 04.8	146 55.7	8 59.4	176 30.5	22.2	15 06.2	00.9	211 36.8	14.8
22	187 07.2	161 55.2	9 00.6	191 31.2	21.4	30 08.6	00.9	226 39.2	14.7
23	202 09.7	176 54.8	01.7	206 31.9	20.7	45 11.1	00.9	241 41.5	14.7
29 00	217 12.2	191 54.4	N 9 02.9	221 32.6	S 3 19.9	60 13.6	N11 00.9	256 43.8	S16 14.7
01	232 14.6	206 54.0	04.0	236 33.3	19.2	75 16.1	00.9	271 46.2	14.6
02	247 17.1	221 53.5	05.2	251 34.0	18.4	90 18.6	00.9	286 48.5	14.6
03	262 19.6	236 53.1	06.3	266 34.7	17.6	105 21.0	00.9	301 50.9	14.6
04	277 22.0	251 52.7	07.5	281 35.4	16.9	120 23.5	00.9	316 53.2	14.6
05	292 24.5	266 52.2	08.6	296 36.1	16.1	135 26.0	00.9	331 55.6	14.5
06	307 26.9	281 51.8	N 9 09.8	311 36.8	S 3 15.4	150 28.5	N11 00.9	346 57.9	S16 14.5
W 07	322 29.4	296 51.4	10.9	326 37.4	14.6	165 31.0	00.9	2 00.3	14.5
E 08	337 31.9	311 51.0	12.1	341 38.1	13.8	180 33.4	00.9	17 02.6	14.4
D 09	352 34.3	326 50.5	13.2	356 38.8	13.1	195 35.9	00.9	32 05.0	14.4
N 10	7 36.8	341 50.1	14.4	11 39.5	12.3	210 38.4	00.9	47 07.3	14.4
E 11	22 39.3	356 49.7	15.5	26 40.2	11.6	225 40.9	00.9	62 09.7	14.3
S 12	37 41.7	11 49.2	N 9 16.7	41 40.9	S 3 10.8	240 43.3	N11 00.9	77 12.0	S16 14.3
D 13	52 44.2	26 48.8	17.8	56 41.6	10.0	255 45.8	00.9	92 14.3	14.3
A 14	67 46.7	41 48.4	18.9	71 42.3	09.3	270 48.3	00.9	107 16.7	14.3
Y 15	82 49.1	56 48.0	20.1	86 43.0	08.5	285 50.8	00.9	122 19.0	14.2
16	97 51.6	71 47.5	21.2	101 43.7	07.8	300 53.2	00.9	137 21.4	14.2
17	112 54.1	86 47.1	22.4	116 44.4	07.0	315 55.7	00.9	152 23.7	14.2
18	127 56.5	101 46.7	N 9 23.5	131 45.1	S 3 06.2	330 58.2	N11 00.9	167 26.1	S16 14.1
19	142 59.0	116 46.2	24.7	146 45.8	05.5	346 00.7	00.9	182 28.4	14.1
20	158 01.4	131 45.8	25.8	161 46.5	04.7	1 03.1	00.9	197 30.8	14.1
21	173 03.9	146 45.4	26.9	176 47.2	03.9	16 05.6	00.9	212 33.1	14.0
22	188 06.4	161 44.9	28.1	191 47.8	03.2	31 08.1	00.9	227 35.5	14.0
23	203 08.8	176 44.5	29.2	206 48.5	02.4	46 10.6	00.9	242 37.8	14.0
Mer. Pass.	h m 9 33.6	v −0.4	d 1.2	v 0.7	d 0.8	v 2.5	d 0.0	v 2.3	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.7	S40 20.1
Achernar	335 38.9	S57 16.4
Acrux	173 26.6	S63 03.7
Adhara	255 25.1	S28 57.9
Aldebaran	291 07.8	N16 29.7
Alioth	166 33.9	N56 00.0
Alkaid	153 10.7	N49 21.0
Al Na'ir	28 03.6	S46 59.7
Alnilam	276 02.6	S 1 12.5
Alphard	218 11.5	S 8 37.7
Alphecca	126 24.0	N26 44.2
Alpheratz	358 00.2	N29 02.8
Altair	62 23.6	N 8 50.7
Ankaa	353 31.5	S42 20.7
Antares	112 45.4	S26 25.0
Arcturus	146 09.8	N19 13.1
Atria	108 01.0	S69 00.8
Avior	234 24.6	S59 29.5
Bellatrix	278 49.2	N 6 20.5
Betelgeuse	271 18.6	N 7 24.3
Canopus	264 03.5	S52 41.7
Capella	280 58.2	N45 59.6
Deneb	49 42.3	N45 14.9
Denebola	182 49.5	N14 36.7
Diphda	349 12.0	S18 01.7
Dubhe	194 10.4	N61 47.6
Elnath	278 32.9	N28 36.1
Eltanin	90 53.1	N51 29.1
Enif	34 02.7	N 9 50.3
Fomalhaut	15 41.5	S29 39.6
Gacrux	172 18.2	S57 04.5
Gienah	176 08.3	S17 30.2
Hadar	149 09.9	S60 20.4
Hamal	328 19.0	N23 25.6
Kaus Aust.	84 04.5	S34 23.3
Kochab	137 18.0	N74 11.1
Markab	13 54.3	N15 09.8
Menkar	314 31.9	N 4 03.6
Menkent	148 25.9	S36 20.2
Miaplacidus	221 43.0	S69 41.5
Mirfak	309 03.6	N49 50.1
Nunki	76 17.7	S26 18.4
Peacock	53 43.9	S56 45.4
Pollux	243 47.1	N28 02.7
Procyon	245 16.3	N 5 14.6
Rasalhague	96 20.9	N12 33.7
Regulus	208 00.2	N12 00.2
Rigel	281 27.5	S 8 12.7
Rigil Kent.	140 12.8	S60 48.3
Sabik	102 30.4	S15 43.0
Schedar	349 59.2	N56 29.6
Shaula	96 43.1	S37 05.9
Sirius	258 47.8	S16 42.5
Spica	158 47.6	S11 07.5
Suhail	223 04.1	S43 24.4
Vega	80 49.4	N38 46.3
Zuben'ubi	137 22.6	S16 00.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	335 51.5	11 12
Mars	5 03.0	9 15
Jupiter	203 01.0	20 00
Saturn	39 34.6	6 56

UT (GMT)	SUN		MOON				Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
d h	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.									
	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m	h m
27 00	180 35.3	N13 50.8	244 49.4	15.7	S 7 29.4	11.7	54.5	N 72	///	///	02 14	03 14	02 53	02 32	02 10
01	195 35.4	51.6	259 24.1	15.8	7 17.7	11.8	54.5	N 70	///	///	02 47	03 05	02 50	02 36	02 21
02	210 35.5	52.4	273 58.9	15.7	7 05.9	11.7	54.5	68	///	01 34	03 10	02 57	02 48	02 39	02 30
03	225 35.6	53.2	288 33.6	15.8	6 54.2	11.8	54.5	66	///	02 12	03 28	02 50	02 46	02 41	02 37
04	240 35.7	54.0	303 08.4	15.8	6 42.4	11.9	54.5	64	///	02 38	03 43	02 44	02 44	02 44	02 44
05	255 35.8	54.8	317 43.2	15.8	6 30.5	11.9	54.5	62	01 22	02 58	03 55	02 39	02 42	02 46	02 49
06	270 35.9	N13 55.6	332 18.0	15.8	S 6 18.6	11.9	54.5	60	01 57	03 14	04 06	02 35	02 41	02 47	02 54
07	285 36.0	56.3	346 52.8	15.8	6 06.7	11.9	54.5	N 58	02 21	03 28	04 15	02 31	02 40	02 49	02 58
08	300 36.1	57.1	1 27.6	15.8	5 54.8	12.0	54.6	56	02 40	03 39	04 23	02 28	02 39	02 50	03 02
M 09	315 36.2	57.9	16 02.4	15.8	5 42.8	12.0	54.6	54	02 56	03 49	04 30	02 24	02 38	02 51	03 06
O 10	330 36.3	58.7	30 37.2	15.8	5 30.8	12.0	54.6	52	03 08	03 58	04 36	02 22	02 37	02 52	03 09
N 11	345 36.4	13 59.5	45 12.0	15.8	5 18.8	12.0	54.6	50	03 20	04 05	04 42	02 19	02 36	02 53	03 12
D 12	0 36.5	N14 00.3	59 46.8	15.8	S 5 06.8	12.1	54.6	45	03 42	04 22	04 54	02 13	02 35	02 56	03 18
A 13	15 36.5	01.1	74 21.6	15.8	4 54.7	12.1	54.6	N 40	03 59	04 35	05 04	02 09	02 33	02 58	03 23
Y 14	30 36.6	01.9	88 56.4	15.8	4 42.6	12.1	54.6	35	04 13	04 45	05 12	02 05	02 32	02 59	03 28
15	45 36.7	02.7	103 31.2	15.8	4 30.5	12.2	54.7	30	04 25	04 55	05 20	02 01	02 31	03 01	03 32
16	60 36.8	03.5	118 06.0	15.8	4 18.3	12.1	54.7	20	04 43	05 10	05 33	01 55	02 29	03 03	03 39
17	75 36.9	04.3	132 40.8	15.8	4 06.2	12.2	54.7	N 10	04 57	05 22	05 44	01 49	02 27	03 05	03 45
18	90 37.0	N14 05.0	147 15.6	15.8	S 3 54.0	12.3	54.7	0	05 08	05 33	05 54	01 44	02 26	03 08	03 51
19	105 37.1	05.8	161 50.4	15.8	3 41.7	12.2	54.7	S 10	05 18	05 43	06 04	01 39	02 24	03 10	03 57
20	120 37.2	06.6	176 25.2	15.8	3 29.5	12.3	54.7	20	05 26	05 52	06 15	01 33	02 22	03 12	04 04
21	135 37.3	07.4	191 00.0	15.8	3 17.2	12.3	54.8	30	05 34	06 03	06 27	01 27	02 20	03 15	04 11
22	150 37.4	08.2	205 34.8	15.7	3 04.9	12.3	54.8	35	05 38	06 08	06 34	01 23	02 19	03 16	04 15
23	165 37.5	09.0	220 09.5	15.8	2 52.6	12.3	54.8	40	05 42	06 14	06 42	01 19	02 18	03 18	04 20
28 00	180 37.6	N14 09.8	234 44.3	15.8	S 2 40.3	12.3	54.8	45	05 46	06 21	06 51	01 14	02 17	03 20	04 26
01	195 37.7	10.6	249 19.1	15.7	2 28.0	12.4	54.8	S 50	05 50	06 28	07 02	01 08	02 15	03 23	04 33
02	210 37.8	11.3	263 53.8	15.7	2 15.6	12.4	54.8	52	05 52	06 32	07 07	01 06	02 14	03 24	04 36
03	225 37.8	12.1	278 28.5	15.7	2 03.2	12.4	54.9	54	05 54	06 36	07 13	01 03	02 13	03 25	04 39
04	240 37.9	12.9	293 03.2	15.7	1 50.8	12.4	54.9	56	05 56	06 40	07 19	00 59	02 12	03 27	04 43
05	255 38.0	13.7	307 37.9	15.7	1 38.4	12.4	54.9	58	05 58	06 44	07 26	00 56	02 11	03 28	04 47
06	270 38.1	N14 14.5	322 12.6	15.7	S 1 26.0	12.5	54.9	S 60	06 00	06 49	07 34	00 51	02 10	03 30	04 52
07	285 38.2	15.3	336 47.3	15.6	1 13.5	12.4	54.9									
T 08	300 38.3	16.0	351 21.9	15.7	1 01.1	12.5	54.9									
U 09	315 38.4	16.8	5 56.6	15.6	0 48.6	12.5	55.0									
E 10	330 38.5	17.6	20 31.2	15.6	0 36.1	12.5	55.0									
S 11	345 38.6	18.4	35 05.8	15.6	0 23.6	12.5	55.0									
D 12	0 38.7	N14 19.2	49 40.4	15.5	S 0 11.1	12.5	55.0									
A 13	15 38.7	20.0	64 14.9	15.5	N 0 01.4	12.5	55.0									
Y 14	30 38.8	20.7	78 49.4	15.5	0 13.9	12.5	55.1									
15	45 38.9	21.5	93 23.9	15.5	0 26.4	12.6	55.1									
16	60 39.0	22.3	107 58.4	15.5	0 39.0	12.5	55.1									
17	75 39.1	23.1	122 32.9	15.4	0 51.5	12.6	55.1									
18	90 39.2	N14 23.9	137 07.3	15.4	N 1 04.1	12.6	55.1									
19	105 39.3	24.6	151 41.7	15.4	1 16.7	12.5	55.2									
20	120 39.4	25.4	166 16.1	15.3	1 29.2	12.6	55.2									
21	135 39.4	26.2	180 50.4	15.3	1 41.8	12.6	55.2									
22	150 39.5	27.0	195 24.7	15.3	1 54.4	12.6	55.2									
23	165 39.6	27.7	209 59.0	15.3	2 07.0	12.6	55.3									
29 00	180 39.7	N14 28.5	224 33.3	15.2	N 2 19.6	12.5	55.3									
01	195 39.8	29.3	239 07.5	15.2	2 32.1	12.6	55.3									
02	210 39.9	30.1	253 41.7	15.1	2 44.7	12.6	55.3									
03	225 40.0	30.8	268 15.8	15.1	2 57.3	12.6	55.3									
04	240 40.0	31.6	282 49.9	15.1	3 09.9	12.6	55.4									
05	255 40.1	32.4	297 24.0	15.0	3 22.5	12.6	55.4									
06	270 40.2	N14 33.2	311 58.0	15.0	N 3 35.1	12.5	55.4									
W 07	285 40.3	33.9	326 32.0	15.0	3 47.6	12.6	55.4									
E 08	300 40.4	34.7	341 06.0	14.9	4 00.2	12.6	55.5									
D 09	315 40.5	35.5	355 39.9	14.9	4 12.8	12.5	55.5									
N 10	330 40.6	36.3	10 13.8	14.8	4 25.3	12.6	55.5									
E 11	345 40.6	37.0	24 47.6	14.8	4 37.9	12.5	55.5									
S 12	0 40.7	N14 37.8	39 21.4	14.7	N 4 50.4	12.6	55.5									
D 13	15 40.8	38.6	53 55.1	14.7	5 03.0	12.5	55.6									
A 14	30 40.9	39.3	68 28.8	14.7	5 15.5	12.5	55.6									
Y 15	45 41.0	40.1	83 02.5	14.6	5 28.0	12.5	55.6									
16	60 41.1	40.9	97 36.1	14.6	5 40.5	12.5	55.6									
17	75 41.1	41.7	112 09.7	14.5	5 53.0	12.5	55.7									
18	90 41.2	N14 42.4	126 43.2	14.4	N 6 05.5	12.4	55.7									
19	105 41.3	43.2	141 16.6	14.4	6 17.9	12.5	55.7									
20	120 41.4	44.0	155 50.0	14.4	6 30.4	12.4	55.7									
21	135 41.5	44.7	170 23.4	14.3	6 42.8	12.5	55.8									
22	150 41.5	45.5	184 56.7	14.2	6 55.3	12.4	55.8									
23	165 41.6	46.3	199 29.9	14.2	7 07.7	12.3	55.8									
	S.D. 15.9	d 0.8	S.D.	14.9		15.0	15.1									

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	02 21	02 26	11 58	07 54	20 15	24	
28	02 30	02 34	11 57	08 36	20 57	25	
29	02 39	02 43	11 57	09 18	21 40	26	

UT (GMT)	ARIES	VENUS −3.9		MARS +1.1		JUPITER −2.2		SATURN +0.8	
d h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
30 00	218 11.3	191 44.1	N 9 30.4	221 49.2	S 3 01.7	61 13.0	N11 00.9	257 40.2	S16 14.0
01	233 13.8	206 43.6	31.5	236 49.9	00.9	76 15.5	00.9	272 42.5	13.9
02	248 16.2	221 43.2	32.6	251 50.6	3 00.1	91 18.0	00.9	287 44.9	13.9
03	263 18.7	236 42.8	33.8	266 51.3	2 59.4	106 20.5	00.9	302 47.2	13.9
04	278 21.2	251 42.3	34.9	281 52.0	58.6	121 22.9	00.8	317 49.6	13.8
05	293 23.6	266 41.9	36.1	296 52.7	57.9	136 25.4	00.8	332 51.9	13.8
06	308 26.1	281 41.5	N 9 37.2	311 53.4	S 2 57.1	151 27.9	N11 00.8	347 54.3	S16 13.8
07	323 28.5	296 41.0	38.3	326 54.1	56.3	166 30.3	00.8	2 56.6	13.8
T 08	338 31.0	311 40.6	39.5	341 54.8	55.6	181 32.8	00.8	17 59.0	13.7
H 09	353 33.5	326 40.2	40.6	356 55.5	54.8	196 35.3	00.8	33 01.3	13.7
U 10	8 35.9	341 39.7	41.8	11 56.2	54.1	211 37.7	00.8	48 03.7	13.7
R 11	23 38.4	356 39.3	42.9	26 56.9	53.3	226 40.2	00.8	63 06.0	13.6
S 12	38 40.9	11 38.8	N 9 44.0	41 57.6	S 2 52.5	241 42.7	N11 00.8	78 08.4	S16 13.6
D 13	53 43.3	26 38.4	45.2	56 58.3	51.8	256 45.2	00.8	93 10.7	13.6
A 14	68 45.8	41 38.0	46.3	71 59.0	51.0	271 47.6	00.8	108 13.1	13.6
Y 15	83 48.3	56 37.5	47.4	86 59.7	50.2	286 50.1	00.8	123 15.4	13.5
16	98 50.7	71 37.1	48.6	102 00.4	49.5	301 52.6	00.8	138 17.8	13.5
17	113 53.2	86 36.7	49.7	117 01.1	48.7	316 55.0	00.8	153 20.1	13.5
18	128 55.7	101 36.2	N 9 50.8	132 01.7	S 2 48.0	331 57.5	N11 00.8	168 22.5	S16 13.4
19	143 58.1	116 35.8	52.0	147 02.4	47.2	347 00.0	00.8	183 24.8	13.4
20	159 00.6	131 35.3	53.1	162 03.1	46.4	2 02.4	00.8	198 27.2	13.4
21	174 03.0	146 34.9	54.2	177 03.8	45.7	17 04.9	00.7	213 29.5	13.4
22	189 05.5	161 34.5	55.4	192 04.5	44.9	32 07.4	00.7	228 31.9	13.3
23	204 08.0	176 34.0	56.5	207 05.2	44.2	47 09.8	00.7	243 34.2	13.3
1 00	219 10.4	191 33.6	N 9 57.6	222 05.9	S 2 43.4	62 12.3	N11 00.7	258 36.6	S16 13.3
01	234 12.9	206 33.1	58.8	237 06.6	42.6	77 14.8	00.7	273 39.0	13.3
02	249 15.4	221 32.7	9 59.9	252 07.3	41.9	92 17.2	00.7	288 41.3	13.2
03	264 17.8	236 32.2	10 01.0	267 08.0	41.1	107 19.7	00.7	303 43.7	13.2
04	279 20.3	251 31.8	02.2	282 08.7	40.3	122 22.1	00.7	318 46.0	13.2
05	294 22.8	266 31.4	03.3	297 09.4	39.6	137 24.6	00.7	333 48.4	13.1
06	309 25.2	281 30.9	N10 04.4	312 10.1	S 2 38.8	152 27.1	N11 00.7	348 50.7	S16 13.1
07	324 27.7	296 30.5	05.5	327 10.8	38.1	167 29.5	00.7	3 53.1	13.1
08	339 30.2	311 30.0	06.7	342 11.5	37.3	182 32.0	00.7	18 55.4	13.1
F 09	354 32.6	326 29.6	07.8	357 12.2	36.5	197 34.5	00.7	33 57.8	13.0
R 10	9 35.1	341 29.1	08.9	12 12.9	35.8	212 36.9	00.6	49 00.1	13.0
I 11	24 37.5	356 28.7	10.0	27 13.6	35.0	227 39.4	00.6	64 02.5	13.0
D 12	39 40.0	11 28.3	N10 11.2	42 14.3	S 2 34.3	242 41.9	N11 00.6	79 04.8	S16 12.9
A 13	54 42.5	26 27.8	12.3	57 15.0	33.5	257 44.3	00.6	94 07.2	12.9
Y 14	69 44.9	41 27.4	13.4	72 15.7	32.7	272 46.8	00.6	109 09.6	12.9
15	84 47.4	56 26.9	14.6	87 16.4	32.0	287 49.2	00.6	124 11.9	12.9
16	99 49.9	71 26.5	15.7	102 17.1	31.2	302 51.7	00.6	139 14.3	12.8
17	114 52.3	86 26.0	16.8	117 17.8	30.4	317 54.2	00.6	154 16.6	12.8
18	129 54.8	101 25.6	N10 17.9	132 18.5	S 2 29.7	332 56.6	N11 00.6	169 19.0	S16 12.8
19	144 57.3	116 25.1	19.1	147 19.2	28.9	347 59.1	00.6	184 21.3	12.8
20	159 59.7	131 24.7	20.2	162 19.9	28.2	3 01.5	00.6	199 23.7	12.7
21	175 02.2	146 24.2	21.3	177 20.6	27.4	18 04.0	00.5	214 26.0	12.7
22	190 04.6	161 23.8	22.4	192 21.3	26.6	33 06.5	00.5	229 28.4	12.7
23	205 07.1	176 23.3	23.5	207 21.9	25.9	48 08.9	00.5	244 30.8	12.7
2 00	220 09.6	191 22.9	N10 24.7	222 22.6	S 2 25.1	63 11.4	N11 00.5	259 33.1	S16 12.6
01	235 12.0	206 22.4	25.8	237 23.3	24.4	78 13.8	00.5	274 35.5	12.6
02	250 14.5	221 22.0	26.9	252 24.0	23.6	93 16.3	00.5	289 37.8	12.6
03	265 17.0	236 21.5	28.0	267 24.7	22.8	108 18.7	00.5	304 40.2	12.5
04	280 19.4	251 21.1	29.2	282 25.4	22.1	123 21.2	00.5	319 42.5	12.5
05	295 21.9	266 20.6	30.3	297 26.1	21.3	138 23.7	00.5	334 44.9	12.5
06	310 24.4	281 20.2	N10 31.4	312 26.8	S 2 20.5	153 26.1	N11 00.5	349 47.3	S16 12.5
07	325 26.8	296 19.7	32.5	327 27.5	19.8	168 28.6	00.4	4 49.6	12.4
S 08	340 29.3	311 19.3	33.6	342 28.2	19.0	183 31.0	00.4	19 52.0	12.4
A 09	355 31.8	326 18.8	34.7	357 28.9	18.3	198 33.5	00.4	34 54.3	12.4
T 10	10 34.2	341 18.4	35.9	12 29.6	17.5	213 35.9	00.4	49 56.7	12.4
U 11	25 36.7	356 17.9	37.0	27 30.3	16.7	228 38.4	00.4	64 59.0	12.3
R 12	40 39.1	11 17.5	N10 38.1	42 31.0	S 2 16.0	243 40.8	N11 00.4	80 01.4	S16 12.3
D 13	55 41.6	26 17.0	39.2	57 31.7	15.2	258 43.3	00.4	95 03.8	12.3
A 14	70 44.1	41 16.6	40.3	72 32.4	14.4	273 45.8	00.4	110 06.1	12.3
Y 15	85 46.5	56 16.1	41.4	87 33.1	13.7	288 48.2	00.4	125 08.5	12.2
16	100 49.0	71 15.7	42.6	102 33.8	12.9	303 50.7	00.3	140 10.8	12.2
17	115 51.5	86 15.2	43.7	117 34.5	12.2	318 53.1	00.3	155 13.2	12.2
18	130 53.9	101 14.8	N10 44.8	132 35.2	S 2 11.4	333 55.6	N11 00.3	170 15.6	S16 12.2
19	145 56.4	116 14.3	45.9	147 35.9	10.6	348 58.0	00.3	185 17.9	12.1
20	160 58.9	131 13.9	47.0	162 36.6	09.9	4 00.5	00.3	200 20.3	12.1
21	176 01.3	146 13.4	48.1	177 37.3	09.1	19 02.9	00.3	215 22.6	12.1
22	191 03.8	161 12.9	49.2	192 38.0	08.3	34 05.4	00.3	230 25.0	12.1
23	206 06.3	176 12.5	50.4	207 38.7	07.6	49 07.8	00.3	245 27.4	12.0
Mer. Pass.	h m 9 21.8	v −0.4	d 1.1	v 0.7	d 0.8	v 2.5	d 0.0	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.7	S40 20.1
Achernar	335 38.9	S57 16.4
Acrux	173 26.6	S63 03.7
Adhara	255 25.1	S28 57.9
Aldebaran	291 07.8	N16 29.6
Alioth	166 33.9	N56 00.1
Alkaid	153 10.7	N49 21.0
Al Na'ir	28 03.6	S46 59.7
Alnilam	276 02.6	S 1 12.5
Alphard	218 11.6	S 8 37.7
Alphecca	126 24.0	N26 44.2
Alpheratz	358 00.2	N29 02.8
Altair	62 23.5	N 8 50.8
Ankaa	353 31.5	S42 20.7
Antares	112 45.3	S26 25.0
Arcturus	146 09.8	N19 13.2
Atria	108 01.0	S69 00.8
Avior	234 24.6	S59 29.5
Bellatrix	278 49.2	N 6 20.5
Betelgeuse	271 18.6	N 7 24.3
Canopus	264 03.5	S52 41.7
Capella	280 58.2	N45 59.6
Deneb	49 42.3	N45 14.9
Denebola	182 49.5	N14 36.8
Diphda	349 12.0	S18 01.7
Dubhe	194 10.4	N61 47.6
Elnath	278 32.9	N28 36.1
Eltanin	90 53.1	N51 29.1
Enif	34 02.7	N 9 50.3
Fomalhaut	15 41.5	S29 39.6
Gacrux	172 18.2	S57 04.5
Gienah	176 08.3	S17 30.2
Hadar	149 09.9	S60 20.4
Hamal	328 19.0	N23 25.6
Kaus Aust.	84 04.5	S34 23.3
Kochab	137 18.0	N74 11.1
Markab	13 54.3	N15 09.8
Menkar	314 31.9	N 4 03.6
Menkent	148 25.9	S36 20.2
Miaplacidus	221 43.1	S69 41.5
Mirfak	309 03.6	N49 50.1
Nunki	76 17.7	S26 18.4
Peacock	53 43.9	S56 45.3
Pollux	243 47.1	N28 02.7
Procyon	245 16.3	N 5 14.6
Rasalhague	96 20.9	N12 33.7
Regulus	208 00.2	N12 00.2
Rigel	281 27.5	S 8 12.7
Rigil Kent.	140 12.7	S60 48.4
Sabik	102 30.4	S15 43.0
Schedar	349 59.2	N56 29.6
Shaula	96 43.1	S37 05.9
Sirius	258 47.8	S16 42.5
Spica	158 47.6	S11 07.5
Suhail	223 04.1	S43 24.4
Vega	80 49.4	N38 46.3
Zuben'ubi	137 22.6	S16 00.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	332 23.1	11 14
Mars	2 55.5	9 11
Jupiter	203 01.9	19 48
Saturn	39 26.2	6 45

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
d h	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
30 00	180 41.7	N14 47.0	214 03.1	14.1	N 7 20.0	12.4	55.8	N 72	///	///	01 51	02 10	01 42	00 53	▭
01	195 41.8	47.8	228 36.2	14.1	7 32.4	12.3	55.9	N 70	///	///	02 30	02 21	02 03	01 37	▭
02	210 41.9	48.6	243 09.3	14.0	7 44.7	12.4	55.9	68	///	01 05	02 56	02 30	02 20	02 07	01 46
03	225 42.0	49.3	257 42.3	14.0	7 57.1	12.3	55.9	66	///	01 54	03 17	02 37	02 33	02 29	02 25
04	240 42.0	50.1	272 15.3	13.9	8 09.4	12.2	55.9	64	///	02 24	03 33	02 44	02 45	02 47	02 53
05	255 42.1	50.9	286 48.2	13.8	8 21.6	12.3	56.0	62	00 57	02 47	03 46	02 49	02 54	03 02	03 15
06	270 42.2	N14 51.6	301 21.0	13.8	N 8 33.9	12.2	56.0	60	01 41	03 04	03 57	02 54	03 03	03 14	03 32
07	285 42.3	52.4	315 53.8	13.7	8 46.1	12.2	56.0	N 58	02 09	03 19	04 07	02 58	03 10	03 25	03 47
T 08	300 42.3	53.1	330 26.5	13.7	8 58.3	12.2	56.0	56	02 30	03 31	04 16	03 02	03 17	03 35	03 59
H 09	315 42.4	53.9	344 59.2	13.6	9 10.5	12.1	56.1	54	02 47	03 42	04 23	03 06	03 22	03 43	04 10
U 10	330 42.5	54.7	359 31.8	13.5	9 22.6	12.1	56.1	52	03 01	03 51	04 30	03 09	03 28	03 51	04 20
R 11	345 42.6	55.4	14 04.3	13.5	9 34.7	12.1	56.1	50	03 13	03 59	04 36	03 12	03 32	03 57	04 29
S 12	0 42.7	N14 56.2	28 36.8	13.3	N 9 46.8	12.0	56.2	45	03 37	04 17	04 49	03 18	03 43	04 12	04 48
D 13	15 42.7	57.0	43 09.1	13.4	9 58.8	12.0	56.2	N 40	03 55	04 31	05 00	03 23	03 52	04 24	05 03
A 14	30 42.8	57.7	57 41.5	13.2	10 10.8	12.0	56.2	35	04 09	04 42	05 09	03 28	03 59	04 35	05 16
Y 15	45 42.9	58.5	72 13.7	13.2	10 22.8	12.0	56.2	30	04 22	04 52	05 17	03 32	04 06	04 44	05 27
16	60 43.0	14 59.2	86 45.9	13.1	10 34.8	11.9	56.3	20	04 41	05 08	05 31	03 39	04 17	05 00	05 47
17	75 43.0	15 00.0	101 18.0	13.1	10 46.7	11.8	56.3	N 10	04 55	05 21	05 43	03 45	04 28	05 14	06 04
18	90 43.1	N15 00.8	115 50.1	13.0	N10 58.5	11.9	56.3	0	05 07	05 32	05 54	03 51	04 37	05 27	06 20
19	105 43.2	01.5	130 22.1	12.9	11 10.4	11.7	56.3	S 10	05 18	05 43	06 05	03 57	04 47	05 40	06 36
20	120 43.3	02.3	144 54.0	12.8	11 22.1	11.8	56.4	20	05 27	05 53	06 16	04 04	04 57	05 54	06 53
21	135 43.4	03.0	159 25.8	12.8	11 33.9	11.7	56.4	30	05 36	06 04	06 29	04 11	05 09	06 10	07 13
22	150 43.4	03.8	173 57.6	12.6	11 45.6	11.7	56.4	35	05 40	06 10	06 37	04 15	05 16	06 20	07 25
23	165 43.5	04.5	188 29.2	12.6	11 57.3	11.6	56.4	40	05 45	06 17	06 45	04 20	05 24	06 31	07 39
1 00	180 43.6	N15 05.3	203 00.8	12.6	N12 08.9	11.5	56.5	45	05 49	06 24	06 55	04 26	05 34	06 44	07 55
01	195 43.7	06.1	217 32.4	12.4	12 20.4	11.6	56.5	S 50	05 54	06 33	07 07	04 33	05 45	06 59	08 14
02	210 43.7	06.8	232 03.8	12.4	12 32.0	11.4	56.5	52	05 56	06 36	07 12	04 36	05 50	07 07	08 24
03	225 43.8	07.6	246 35.2	12.3	12 43.4	11.5	56.5	54	05 59	06 41	07 18	04 39	05 56	07 15	08 35
04	240 43.9	08.3	261 06.5	12.2	12 54.9	11.3	56.6	56	06 01	06 45	07 25	04 43	06 02	07 24	08 47
05	255 44.0	09.1	275 37.7	12.2	13 06.2	11.4	56.6	58	06 03	06 50	07 33	04 47	06 10	07 35	09 01
06	270 44.0	N15 09.8	290 08.9	12.0	N13 17.6	11.2	56.6	S 60	06 06	06 56	07 41	04 52	06 18	07 47	09 17
07	285 44.1	10.6	304 39.9	12.0	13 28.8	11.3	56.7								
08	300 44.2	11.3	319 10.9	11.9	13 40.1	11.1	56.7								
F 09	315 44.2	12.1	333 41.8	11.8	13 51.2	11.1	56.7								
R 10	330 44.3	12.8	348 12.6	11.8	14 02.3	11.1	56.7								
I 11	345 44.4	13.6	2 43.4	11.6	14 13.4	11.0	56.8								
D 12	0 44.5	N15 14.3	17 14.0	11.6	N14 24.4	10.9	56.8								
A 13	15 44.5	15.1	31 44.6	11.5	14 35.3	10.8	56.8								
Y 14	30 44.6	15.8	46 15.1	11.4	14 46.1	10.8	56.8								
15	45 44.7	16.6	60 45.5	11.3	14 56.9	10.8	56.9								
16	60 44.8	17.3	75 15.8	11.2	15 07.7	10.7	56.9								
17	75 44.8	18.1	89 46.0	11.2	15 18.4	10.6	56.9								
18	90 44.9	N15 18.8	104 16.2	11.0	N15 29.0	10.5	57.0								
19	105 45.0	19.6	118 46.2	11.0	15 39.5	10.5	57.0								
20	120 45.0	20.3	133 16.2	10.9	15 50.0	10.3	57.0								
21	135 45.1	21.1	147 46.1	10.8	16 00.3	10.4	57.0								
22	150 45.2	21.8	162 15.9	10.7	16 10.7	10.2	57.1								
23	165 45.2	22.6	176 45.6	10.6	16 20.9	10.2	57.1								
2 00	180 45.3	N15 23.3	191 15.2	10.5	N16 31.1	10.1	57.1								
01	195 45.4	24.1	205 44.7	10.5	16 41.2	10.0	57.1								
02	210 45.5	24.8	220 14.2	10.3	16 51.2	9.9	57.2								
03	225 45.5	25.5	234 43.5	10.3	17 01.1	9.9	57.2								
04	240 45.6	26.3	249 12.8	10.2	17 11.0	9.8	57.2								
05	255 45.7	27.0	263 42.0	10.1	17 20.8	9.7	57.2								
06	270 45.7	N15 27.8	278 11.1	9.9	N17 30.5	9.6	57.3								
07	285 45.8	28.5	292 40.0	10.0	17 40.1	9.5	57.3								
S 08	300 45.9	29.3	307 09.0	9.8	17 49.6	9.4	57.3								
A 09	315 45.9	30.0	321 37.8	9.7	17 59.0	9.4	57.3								
T 10	330 46.0	30.7	336 06.5	9.6	18 08.4	9.2	57.4								
U 11	345 46.1	31.5	350 35.1	9.6	18 17.6	9.2	57.4								
R 12	0 46.1	N15 32.2	5 03.7	9.4	N18 26.8	9.1	57.4								
D 13	15 46.2	33.0	19 32.1	9.4	18 35.9	8.9	57.4								
A 14	30 46.3	33.7	34 00.5	9.2	18 44.8	8.9	57.5								
Y 15	45 46.3	34.4	48 28.7	9.2	18 53.7	8.8	57.5								
16	60 46.4	35.2	62 56.9	9.1	19 02.5	8.7	57.5								
17	75 46.5	35.9	77 25.0	9.0	19 11.2	8.6	57.5								
18	90 46.5	N15 36.7	91 53.0	8.9	N19 19.8	8.5	57.6								
19	105 46.6	37.4	106 20.9	8.8	19 28.3	8.3	57.6								
20	120 46.7	38.1	120 48.7	8.8	19 36.6	8.3	57.6								
21	135 46.7	38.9	135 16.5	8.6	19 44.9	8.2	57.6								
22	150 46.8	39.6	149 44.1	8.5	19 53.1	8.1	57.7								
23	165 46.9	40.3	164 11.6	8.5	20 01.2	7.9	57.7								
	S.D. 15.9	d 0.8	S.D.	15.3		15.5	15.6								

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
30	02 47	02 50	11 57	10 02	22 25	27	
1	02 54	02 58	11 57	10 49	23 13	28	●
2	03 01	03 04	11 57	11 39	24 06	29	

UT (GMT)	ARIES	VENUS −3.9		MARS +1.1		JUPITER −2.2		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
3 00	221 08.7	191 12.0	N10 51.5	222 39.4	S 2 06.8	64 10.3	N11 00.2	260 29.7	S16 12.0
01	236 11.2	206 11.6	52.6	237 40.1	06.1	79 12.7	00.2	275 32.1	12.0
02	251 13.6	221 11.1	53.7	252 40.8	05.3	94 15.2	00.2	290 34.4	11.9
03	266 16.1	236 10.7	·· 54.8	267 41.5	·· 04.5	109 17.6	·· 00.2	305 36.8	·· 11.9
04	281 18.6	251 10.2	55.9	282 42.2	03.8	124 20.1	00.2	320 39.2	11.9
05	296 21.0	266 09.7	57.0	297 42.9	03.0	139 22.5	00.2	335 41.5	11.9
06	311 23.5	281 09.3	N10 58.1	312 43.6	S 2 02.3	154 25.0	N11 00.2	350 43.9	S16 11.8
07	326 26.0	296 08.8	10 59.2	327 44.3	01.5	169 27.4	00.1	5 46.2	11.8
08	341 28.4	311 08.4	11 00.3	342 45.0	00.7	184 29.9	00.1	20 48.6	11.8
SUNDAY 09	356 30.9	326 07.9	·· 01.5	357 45.7	S 00.0	199 32.3	·· 00.1	35 51.0	·· 11.8
10	11 33.4	341 07.4	02.6	12 46.4	1 59.2	214 34.8	00.1	50 53.3	11.7
11	26 35.8	356 07.0	03.7	27 47.1	58.4	229 37.2	00.1	65 55.7	11.7
12	41 38.3	11 06.5	N11 04.8	42 47.8	S 1 57.7	244 39.7	N11 00.1	80 58.0	S16 11.7
13	56 40.7	26 06.1	05.9	57 48.5	56.9	259 42.1	00.1	96 00.4	11.7
14	71 43.2	41 05.6	07.0	72 49.2	56.2	274 44.6	00.0	111 02.8	11.6
15	86 45.7	56 05.1	·· 08.1	87 49.9	·· 55.4	289 47.0	·· 00.0	126 05.1	·· 11.6
16	101 48.1	71 04.7	09.2	102 50.6	54.6	304 49.5	00.0	141 07.5	11.6
17	116 50.6	86 04.2	10.3	117 51.3	53.9	319 51.9	00.0	156 09.9	11.6
18	131 53.1	101 03.8	N11 11.4	132 52.0	S 1 53.1	334 54.3	N11 00.0	171 12.2	S16 11.5
19	146 55.5	116 03.3	12.5	147 52.7	52.3	349 56.8	00.0	186 14.6	11.5
20	161 58.0	131 02.8	13.6	162 53.4	51.6	4 59.2	11 00.0	201 17.0	11.5
21	177 00.5	146 02.4	·· 14.7	177 54.1	·· 50.8	20 01.7	10 59.9	216 19.3	·· 11.5
22	192 02.9	161 01.9	15.8	192 54.8	50.1	35 04.1	59.9	231 21.7	11.5
23	207 05.4	176 01.4	16.9	207 55.5	49.3	50 06.6	59.9	246 24.0	11.4
4 00	222 07.9	191 01.0	N11 18.0	222 56.2	S 1 48.5	65 09.0	N10 59.9	261 26.4	S16 11.4
01	237 10.3	206 00.5	19.1	237 56.9	47.8	80 11.5	59.9	276 28.8	11.4
02	252 12.8	221 00.0	20.2	252 57.6	47.0	95 13.9	59.9	291 31.1	11.4
03	267 15.2	235 59.6	·· 21.3	267 58.3	·· 46.2	110 16.3	·· 59.8	306 33.5	·· 11.3
04	282 17.7	250 59.1	22.4	282 59.0	45.5	125 18.8	59.8	321 35.9	11.3
05	297 20.2	265 58.6	23.5	297 59.7	44.7	140 21.2	59.8	336 38.2	11.3
06	312 22.6	280 58.2	N11 24.6	313 00.4	S 1 44.0	155 23.7	N10 59.8	351 40.6	S16 11.3
07	327 25.1	295 57.7	25.7	328 01.1	43.2	170 26.1	59.8	6 43.0	11.2
08	342 27.6	310 57.2	26.8	343 01.8	42.4	185 28.5	59.8	21 45.3	11.2
MONDAY 09	357 30.0	325 56.8	·· 27.9	358 02.5	·· 41.7	200 31.0	·· 59.7	36 47.7	·· 11.2
10	12 32.5	340 56.3	29.0	13 03.2	40.9	215 33.4	59.7	51 50.1	11.2
11	27 35.0	355 55.8	30.1	28 03.9	40.1	230 35.9	59.7	66 52.4	11.1
12	42 37.4	10 55.4	N11 31.2	43 04.6	S 1 39.4	245 38.3	N10 59.7	81 54.8	S16 11.1
13	57 39.9	25 54.9	32.3	58 05.3	38.6	260 40.8	59.7	96 57.2	11.1
14	72 42.4	40 54.4	33.4	73 06.0	37.9	275 43.2	59.7	111 59.5	11.1
15	87 44.8	55 54.0	·· 34.5	88 06.7	·· 37.1	290 45.6	·· 59.6	127 01.9	·· 11.0
16	102 47.3	70 53.5	35.6	103 07.4	36.3	305 48.1	59.6	142 04.3	11.0
17	117 49.7	85 53.0	36.7	118 08.1	35.6	320 50.5	59.6	157 06.6	11.0
18	132 52.2	100 52.5	N11 37.8	133 08.8	S 1 34.8	335 52.9	N10 59.6	172 09.0	S16 11.0
19	147 54.7	115 52.1	38.9	148 09.6	34.0	350 55.4	59.6	187 11.4	11.0
20	162 57.1	130 51.6	39.9	163 10.3	33.3	5 57.8	59.6	202 13.7	10.9
21	177 59.6	145 51.1	·· 41.0	178 11.0	·· 32.5	21 00.3	·· 59.5	217 16.1	·· 10.9
22	193 02.1	160 50.7	42.1	193 11.7	31.8	36 02.7	59.5	232 18.5	10.9
23	208 04.5	175 50.2	43.2	208 12.4	31.0	51 05.1	59.5	247 20.8	10.9
5 00	223 07.0	190 49.7	N11 44.3	223 13.1	S 1 30.2	66 07.6	N10 59.5	262 23.2	S16 10.8
01	238 09.5	205 49.2	45.4	238 13.8	29.5	81 10.0	59.5	277 25.6	10.8
02	253 11.9	220 48.8	46.5	253 14.5	28.7	96 12.4	59.4	292 27.9	10.8
03	268 14.4	235 48.3	·· 47.6	268 15.2	·· 28.0	111 14.9	·· 59.4	307 30.3	·· 10.8
04	283 16.8	250 47.8	48.7	283 15.9	27.2	126 17.3	59.4	322 32.7	10.7
05	298 19.3	265 47.3	49.8	298 16.6	26.4	141 19.7	59.4	337 35.0	10.7
06	313 21.8	280 46.9	N11 50.8	313 17.3	S 1 25.7	156 22.2	N10 59.4	352 37.4	S16 10.7
07	328 24.2	295 46.4	51.9	328 18.0	24.9	171 24.6	59.3	7 39.8	10.7
08	343 26.7	310 45.9	53.0	343 18.7	24.1	186 27.1	59.3	22 42.1	10.7
TUESDAY 09	358 29.2	325 45.4	·· 54.1	358 19.4	·· 23.4	201 29.5	·· 59.3	37 44.5	·· 10.6
10	13 31.6	340 45.0	55.2	13 20.1	22.6	216 31.9	59.3	52 46.9	10.6
11	28 34.1	355 44.5	56.3	28 20.8	21.9	231 34.4	59.3	67 49.2	10.6
12	43 36.6	10 44.0	N11 57.4	43 21.5	S 1 21.1	246 36.8	N10 59.3	82 51.6	S16 10.6
13	58 39.0	25 43.5	58.4	58 22.2	20.3	261 39.2	59.2	97 54.0	10.5
14	73 41.5	40 43.0	11 59.5	73 22.9	19.6	276 41.7	59.2	112 56.4	10.5
15	88 44.0	55 42.6	12 00.6	88 23.6	·· 18.8	291 44.1	·· 59.2	127 58.7	·· 10.5
16	103 46.4	70 42.1	01.7	103 24.3	18.0	306 46.5	59.2	143 01.1	10.5
17	118 48.9	85 41.6	02.8	118 25.0	17.3	321 48.9	59.1	158 03.5	10.4
18	133 51.3	100 41.1	N12 03.9	133 25.7	S 1 16.5	336 51.4	N10 59.1	173 05.8	S16 10.4
19	148 53.8	115 40.6	04.9	148 26.4	15.8	351 53.8	59.1	188 08.2	10.4
20	163 56.3	130 40.2	06.0	163 27.1	15.0	6 56.2	59.1	203 10.6	10.4
21	178 58.7	145 39.7	·· 07.1	178 27.8	·· 14.2	21 58.7	·· 59.1	218 13.0	·· 10.4
22	194 01.2	160 39.2	08.2	193 28.5	13.5	37 01.1	59.0	233 15.3	10.3
23	209 03.7	175 38.7	09.3	208 29.2	12.7	52 03.5	59.0	248 17.7	10.3
Mer. Pass.	h m 9 10.0	v −0.5	d 1.1	v 0.7	d 0.8	v 2.4	d 0.0	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.7	S40 20.1
Achernar	335 38.9	S57 16.4
Acrux	173 26.6	S63 03.7
Adhara	255 25.1	S28 57.9
Aldebaran	291 07.8	N16 29.6
Alioth	166 33.9	N56 00.1
Alkaid	153 10.7	N49 21.0
Al Na'ir	28 03.5	S46 59.7
Alnilam	276 02.7	S 1 12.5
Alphard	218 11.6	S 8 37.7
Alphecca	126 24.0	N26 44.2
Alpheratz	358 00.2	N29 02.8
Altair	62 23.5	N 8 50.8
Ankaa	353 31.5	S42 20.7
Antares	112 45.3	S26 25.0
Arcturus	146 09.8	N19 13.2
Atria	108 00.9	S69 00.8
Avior	234 24.7	S59 29.5
Bellatrix	278 49.2	N 6 20.5
Betelgeuse	271 18.6	N 7 24.3
Canopus	264 03.5	S52 41.7
Capella	280 58.2	N45 59.5
Deneb	49 42.2	N45 14.9
Denebola	182 49.5	N14 36.8
Diphda	349 12.0	S18 01.6
Dubhe	194 10.5	N61 47.6
Elnath	278 32.9	N28 36.1
Eltanin	90 53.1	N51 29.1
Enif	34 02.7	N 9 50.3
Fomalhaut	15 41.5	S29 39.6
Gacrux	172 18.2	S57 04.5
Gienah	176 08.3	S17 30.2
Hadar	149 09.9	S60 20.4
Hamal	328 19.0	N23 25.6
Kaus Aust.	84 04.5	S34 23.3
Kochab	137 18.0	N74 11.1
Markab	13 54.3	N15 09.8
Menkar	314 31.9	N 4 03.6
Menkent	148 25.9	S36 20.2
Miaplacidus	221 43.1	S69 41.5
Mirfak	309 03.6	N49 50.1
Nunki	76 17.7	S26 18.4
Peacock	53 43.8	S56 45.3
Pollux	243 47.1	N28 02.7
Procyon	245 16.4	N 5 14.6
Rasalhague	96 20.8	N12 33.8
Regulus	208 00.2	N12 00.2
Rigel	281 27.5	S 8 12.7
Rigil Kent.	140 12.7	S60 48.4
Sabik	102 30.4	S15 43.0
Schedar	349 59.2	N56 29.6
Shaula	96 43.0	S37 05.9
Sirius	258 47.8	S16 42.5
Spica	158 47.6	S11 07.5
Suhail	223 04.1	S43 24.4
Vega	80 49.4	N38 46.3
Zuben'ubi	137 22.6	S16 00.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	328 53.1	11 16
Mars	0 48.4	9 08
Jupiter	203 01.2	19 36
Saturn	39 18.6	6 33

UT (GMT)	SUN		MOON				Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.							
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m
3 00	180 46.9	N15 41.1	178 39.1	8.4	N20 09.1	7.9	57.7	N 72	////	////	01 22	□	□	□
01	195 47.0	41.8	193 06.5	8.3	20 17.0	7.7	57.7	N 70	////	////	02 11	□	□	□
02	210 47.0	42.5	207 33.8	8.2	20 24.7	7.6	57.8	68	////	////	02 42	□	□	□
03	225 47.1	·· 43.3	222 01.0	8.1	20 32.3	7.5	57.8	66	////	00 07	03 05	01 46	□	□
04	240 47.2	44.0	236 28.1	8.0	20 39.8	7.4	57.8	64	////	01 34	03 23	02 25	02 22	02 23
05	255 47.2	44.7	250 55.1	7.9	20 47.2	7.3	57.8	62	00 06	02 10	03 37	02 53	03 07	03 43
06	270 47.3	N15 45.5	265 22.0	7.9	N20 54.5	7.2	57.9	60	01 24	02 35	03 49	03 15	03 37	04 20
07	285 47.4	46.2	279 48.9	7.8	21 01.7	7.0	57.9	N 58	01 56	02 54	03 49	03 32	04 00	04 46
08	300 47.4	46.9	294 15.7	7.7	21 08.7	7.0	57.9	56	02 20	03 10	04 00	03 47	04 19	05 07
SUNDAY 09	315 47.5	·· 47.7	308 42.4	7.6	21 15.7	6.8	57.9	54	02 38	03 23	04 09	03 59	04 34	05 24
10	330 47.5	48.4	323 09.0	7.5	21 22.5	6.6	58.0	52	02 53	03 35	04 17	04 10	04 48	05 38
11	345 47.6	49.1	337 35.5	7.4	21 29.1	6.6	58.0	50	03 06	03 45	04 24	04 20	04 59	05 51
12	0 47.7	N15 49.9	352 01.9	7.4	N21 35.7	6.4	58.0	45	03 31	03 54	04 31	04 29	05 10	06 02
13	15 47.7	50.6	6 28.3	7.2	21 42.1	6.3	58.0	N 40	03 51	04 12	04 45	04 48	05 32	06 26
14	30 47.8	51.3	20 54.5	7.2	21 48.4	6.2	58.0	35	04 06	04 27	04 56	05 03	05 49	06 44
15	45 47.8	·· 52.0	35 20.7	7.2	21 54.6	6.1	58.1	30	04 19	04 39	05 06	05 16	06 04	07 00
16	60 47.9	52.8	49 46.9	7.0	22 00.7	5.9	58.1	20	04 39	05 06	05 29	05 37	06 39	07 37
17	75 48.0	53.5	64 12.9	7.0	22 06.6	5.8	58.1	N 10	04 54	05 20	05 42	05 54	06 59	07 57
18	90 48.0	N15 54.2	78 38.9	6.9	N22 12.4	5.7	58.1	0	05 07	05 32	05 53	06 09	07 17	08 16
19	105 48.1	55.0	93 04.8	6.8	22 18.1	5.5	58.2	S 10	05 18	05 43	06 05	06 20	07 37	08 35
20	120 48.1	55.7	107 30.6	6.7	22 23.6	5.4	58.2	20	05 28	05 54	06 17	06 36	07 55	08 55
21	135 48.2	·· 56.4	121 56.3	6.7	22 29.0	5.2	58.2	30	05 38	06 06	06 31	06 53	07 54	08 55
22	150 48.3	57.1	136 22.0	6.6	22 34.2	5.1	58.2	35	05 42	06 13	06 39	07 04	08 13	09 18
23	165 48.3	57.9	150 47.6	6.5	22 39.3	5.0	58.2	40	05 47	06 20	06 48	07 15	08 34	09 39
4 00	180 48.4	N15 58.6	165 13.1	6.5	N22 44.3	4.9	58.3	45	05 53	06 28	06 59	07 28	08 45	09 48
01	195 48.4	15 59.3	179 38.6	6.3	22 49.2	4.7	58.3	52	06 01	06 41	07 17	07 55	09 37	10 42
02	210 48.5	16 00.0	194 03.9	6.4	22 53.9	4.5	58.3	54	06 03	06 46	07 24	08 05	09 50	10 55
03	225 48.6	·· 00.8	208 29.3	6.2	22 58.4	4.4	58.3	56	06 06	06 50	07 31	08 17	10 04	11 10
04	240 48.6	01.5	222 54.5	6.2	23 02.8	4.3	58.3	58	06 09	06 56	07 39	08 30	10 21	11 27
05	255 48.7	02.2	237 19.7	6.2	23 07.1	4.2	58.4	S 60	06 12	07 02	07 49	08 45	10 41	11 49
06	270 48.7	N16 02.9	251 44.9	6.0	N23 11.3	3.9	58.4							
07	285 48.8	03.6	266 09.9	6.0	23 15.2	3.9	58.4							
08	300 48.8	04.4	280 34.9	6.0	23 19.1	3.7	58.4							
MONDAY 09	315 48.9	·· 05.1	294 59.9	5.9	23 22.8	3.5	58.4							
10	330 48.9	05.8	309 24.8	5.8	23 26.3	3.4	58.5							
11	345 49.0	06.5	323 49.6	5.8	23 29.7	3.3	58.5							
12	0 49.1	N16 07.2	338 14.4	5.8	N23 33.0	3.1	58.5							
13	15 49.1	08.0	352 39.2	5.6	23 36.1	2.9	58.5							
14	30 49.2	08.7	7 03.8	5.7	23 39.0	2.8	58.5							
15	45 49.2	·· 09.4	21 28.5	5.6	23 41.8	2.7	58.5							
16	60 49.3	10.1	35 53.1	5.5	23 44.5	2.5	58.6							
17	75 49.3	10.8	50 17.6	5.5	23 47.0	2.3	58.6							
18	90 49.4	N16 11.5	64 42.1	5.5	N23 49.3	2.2	58.6							
19	105 49.4	12.3	79 06.6	5.4	23 51.5	2.0	58.6							
20	120 49.5	13.0	93 31.0	5.4	23 53.5	1.9	58.6							
21	135 49.5	·· 13.7	107 55.4	5.3	23 55.4	1.7	58.6							
22	150 49.6	14.4	122 19.7	5.3	23 57.1	1.6	58.7							
23	165 49.7	15.1	136 44.0	5.3	23 58.7	1.4	58.7							
5 00	180 49.7	N16 15.8	151 08.3	5.2	N24 00.1	1.2	58.7							
01	195 49.8	16.5	165 32.5	5.3	24 01.3	1.1	58.7							
02	210 49.8	17.2	179 56.8	5.1	24 02.4	1.0	58.7							
03	225 49.9	·· 18.0	194 20.9	5.2	24 03.4	0.7	58.7							
04	240 49.9	18.7	208 45.1	5.1	24 04.1	0.7	58.8							
05	255 50.0	19.4	223 09.2	5.2	24 04.8	0.4	58.8							
06	270 50.0	N16 20.1	237 33.4	5.0	N24 05.2	0.3	58.8							
07	285 50.1	20.8	251 57.4	5.1	24 05.5	0.1	58.8							
TUESDAY 08	300 50.1	21.5	266 21.5	5.1	24 05.6	0.0	58.8							
09	315 50.2	·· 22.2	280 45.6	5.0	24 05.6	0.2	58.8							
10	330 50.2	22.9	295 09.6	5.0	24 05.4	0.3	58.8							
11	345 50.3	23.6	309 33.6	5.1	24 05.1	0.5	58.9							
12	0 50.3	N16 24.3	323 57.7	5.0	N24 04.6	0.7	58.9							
13	15 50.4	25.0	338 21.7	5.0	24 03.9	0.8	58.9							
14	30 50.4	25.8	352 45.7	5.0	24 03.1	1.0	58.9							
15	45 50.5	·· 26.5	7 09.7	5.0	24 02.1	1.1	58.9							
16	60 50.5	27.2	21 33.7	5.0	24 01.0	1.3	58.9							
17	75 50.6	27.9	35 57.7	5.0	23 59.7	1.5	58.9							
18	90 50.6	N16 28.6	50 21.7	5.0	N23 58.2	1.6	58.9							
19	105 50.7	29.3	64 45.7	5.0	23 56.6	1.8	59.0							
20	120 50.7	30.0	79 09.7	5.0	23 54.8	2.0	59.0							
21	135 50.8	·· 30.7	93 33.7	5.0	23 52.8	2.1	59.0							
22	150 50.8	31.4	107 57.7	5.0	23 50.7	2.3	59.0							
23	165 50.8	32.1	122 21.7	5.0	23 48.4	2.4	59.0							
	S.D. 15.9	d 0.7	S.D.	15.8		15.9	16.0							

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 41	////	////	□	□	□	□
N 70	21 47	////	////	□	□	□	□
68	21 15	////	////	□	□	□	□
66	20 52	22 26	////	23 34	25 36	01 36	02 09
64	20 33	21 48	////	22 49	24 16	00 16	01 09
62	20 18	21 22	////	22 19	23 40	24 35	00 35
60	20 06	21 02	22 35	21 57	23 13	24 10	00 10
N 58	19 55	20 45	22 01	21 39	22 53	23 50	24 30
56	19 46	20 32	21 37	21 23	22 36	23 34	24 16
54	19 38	20 20	21 18	21 10	22 21	23 19	24 04
52	19 30	20 10	21 02	20 59	22 08	23 07	23 53
50	19 24	20 01	20 49	20 49	21 57	22 56	23 44
45	19 09	19 42	20 23	20 28	21 34	22 33	23 23
N 40	18 58	19 28	20 04	20 10	21 15	22 15	23 07
35	18 48	19 15	19 48	19 56	21 00	21 59	22 53
30	18 39	19 05	19 36	19 44	20 46	21 46	22 40
20	18 25	18 48	19 15	19 22	20 23	21 23	22 19
N 10	18 12	18 34	19 00	19 04	20 03	21 03	22 01
0	18 00	18 22	18 47	18 47	19 45	20 44	21 44
S 10	17 48	18 10	18 36	18 29	19 26	20 26	21 27
20	17 36	17 59	18 25	18 11	19 06	20 06	21 08
30	17 22	17 47	18 16	17 50	18 43	19 43	20 47
35	17 14	17 41	18 11	17 37	18 29	19 29	20 34
40	17 05	17 33	18 06	17 23	18 14	19 13	20 20
45	16 54	17 25	18 00	17 07	17 55	18 54	20 02
S 50	16 42	17 16	17 55	16 46	17 32	18 31	19 41
52	16 36	17 12	17 52	16 36	17 21	18 19	19 30
54	16 29	17 07	17 50	16 25	17 08	18 07	19 19
56	16 22	17 02	17 47	16 13	16 54	17 52	19 05
58	16 13	16 57	17 44	15 58	16 37	17 34	18 50
S 60	16 04	16 51	17 41	15 41	16 17	17 13	18 31

Day	SUN Eqn. of Time 00^h	SUN Eqn. of Time 12^h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	03 08	03 11	11 57	12 33	00 06	01	
4	03 13	03 16	11 57	13 31	01 01	02	
5	03 19	03 21	11 57	14 30	02 00	03	●

UT (GMT)	ARIES	VENUS −3.9		MARS +0.9		JUPITER −1.9		SATURN +0.5	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
14 00	262 32.5	179 52.4	N23 26.2	234 39.3	N10 08.5	102 59.2	N 9 52.0	301 32.8	S16 12.6
01	277 35.0	194 51.6	26.4	249 40.0	09.1	118 01.4	51.9	316 35.3	12.7
02	292 37.5	209 50.7	26.7	264 40.7	09.8	133 03.6	51.8	331 37.8	12.7
03	307 39.9	224 49.8	26.9	279 41.5	10.4	148 05.8	51.7	346 40.4	12.7
04	322 42.4	239 48.9	27.2	294 42.2	11.1	163 08.0	51.5	1 42.9	12.8
05	337 44.9	254 48.1	27.4	309 42.9	11.8	178 10.2	51.4	16 45.4	12.8
06	352 47.3	269 47.2	N23 27.7	324 43.6	N10 12.4	193 12.3	N 9 51.3	31 47.9	S16 12.8
07	7 49.8	284 46.3	27.9	339 44.3	13.1	208 14.5	51.2	46 50.5	12.8
08	22 52.3	299 45.4	28.1	354 45.0	13.8	223 16.7	51.1	61 53.0	12.9
S 09	37 54.7	314 44.6	28.4	9 45.7	14.4	238 18.9	51.0	76 55.5	12.9
U 10	52 57.2	329 43.7	28.6	24 46.5	15.1	253 21.1	50.8	91 58.0	12.9
N 11	67 59.6	344 42.8	28.9	39 47.2	15.7	268 23.3	50.7	107 00.6	12.9
D 12	83 02.1	359 41.9	N23 29.1	54 47.9	N10 16.4	283 25.4	N 9 50.6	122 03.1	S16 13.0
A 13	98 04.6	14 41.1	29.4	69 48.6	17.1	298 27.6	50.5	137 05.6	13.0
Y 14	113 07.0	29 40.2	29.6	84 49.3	17.7	313 29.8	50.4	152 08.2	13.0
15	128 09.5	44 39.3	29.8	99 50.0	18.4	328 32.0	50.2	167 10.7	13.0
16	143 12.0	59 38.4	30.1	114 50.7	19.0	343 34.2	50.1	182 13.2	13.1
17	158 14.4	74 37.6	30.3	129 51.5	19.7	358 36.4	50.0	197 15.7	13.1
18	173 16.9	89 36.7	N23 30.5	144 52.2	N10 20.4	13 38.5	N 9 49.9	212 18.3	S16 13.1
19	188 19.4	104 35.8	30.8	159 52.9	21.0	28 40.7	49.8	227 20.8	13.2
20	203 21.8	119 34.9	31.0	174 53.6	21.7	43 42.9	49.7	242 23.3	13.2
21	218 24.3	134 34.1	31.2	189 54.3	22.3	58 45.1	49.5	257 25.9	13.2
22	233 26.8	149 33.2	31.5	204 55.0	23.0	73 47.3	49.4	272 28.4	13.2
23	248 29.2	164 32.3	31.7	219 55.7	23.6	88 49.5	49.3	287 30.9	13.3
15 00	263 31.7	179 31.4	N23 31.9	234 56.4	N10 24.3	103 51.6	N 9 49.2	302 33.5	S16 13.3
01	278 34.1	194 30.5	32.1	249 57.2	25.0	118 53.8	49.1	317 36.0	13.3
02	293 36.6	209 29.7	32.4	264 57.9	25.6	133 56.0	48.9	332 38.5	13.4
03	308 39.1	224 28.8	32.6	279 58.6	26.3	148 58.2	48.8	347 41.1	13.4
04	323 41.5	239 27.9	32.8	294 59.3	26.9	164 00.4	48.7	2 43.6	13.4
05	338 44.0	254 27.0	33.0	310 00.0	27.6	179 02.5	48.6	17 46.1	13.4
06	353 46.5	269 26.2	N23 33.2	325 00.7	N10 28.3	194 04.7	N 9 48.5	32 48.6	S16 13.5
07	8 48.9	284 25.3	33.5	340 01.4	28.9	209 06.9	48.4	47 51.2	13.5
08	23 51.4	299 24.4	33.7	355 02.2	29.6	224 09.1	48.2	62 53.7	13.5
M 09	38 53.9	314 23.5	33.9	10 02.9	30.2	239 11.3	48.1	77 56.2	13.5
O 10	53 56.3	329 22.6	34.1	25 03.6	30.9	254 13.4	48.0	92 58.8	13.6
N 11	68 58.8	344 21.8	34.3	40 04.3	31.5	269 15.6	47.9	108 01.3	13.6
D 12	84 01.3	359 20.9	N23 34.5	55 05.0	N10 32.2	284 17.8	N 9 47.8	123 03.8	S16 13.6
A 13	99 03.7	14 20.0	34.7	70 05.7	32.8	299 20.0	47.6	138 06.4	13.7
Y 14	114 06.2	29 19.1	35.0	85 06.4	33.5	314 22.2	47.5	153 08.9	13.7
15	129 08.6	44 18.2	35.2	100 07.1	34.2	329 24.3	47.4	168 11.4	13.7
16	144 11.1	59 17.4	35.4	115 07.9	34.8	344 26.5	47.3	183 14.0	13.7
17	159 13.6	74 16.5	35.6	130 08.6	35.5	359 28.7	47.2	198 16.5	13.8
18	174 16.0	89 15.6	N23 35.8	145 09.3	N10 36.1	14 30.9	N 9 47.0	213 19.0	S16 13.8
19	189 18.5	104 14.7	36.0	160 10.0	36.8	29 33.0	46.9	228 21.6	13.8
20	204 21.0	119 13.8	36.2	175 10.7	37.4	44 35.2	46.8	243 24.1	13.9
21	219 23.4	134 12.9	36.4	190 11.4	38.1	59 37.4	46.7	258 26.6	13.9
22	234 25.9	149 12.1	36.6	205 12.1	38.7	74 39.6	46.6	273 29.2	13.9
23	249 28.4	164 11.2	36.8	220 12.8	39.4	89 41.8	46.4	288 31.7	13.9
16 00	264 30.8	179 10.3	N23 37.0	235 13.6	N10 40.0	104 43.9	N 9 46.3	303 34.2	S16 14.0
01	279 33.3	194 09.4	37.2	250 14.3	40.7	119 46.1	46.2	318 36.8	14.0
02	294 35.7	209 08.5	37.4	265 15.0	41.3	134 48.3	46.1	333 39.3	14.0
03	309 38.2	224 07.7	37.6	280 15.7	42.0	149 50.5	46.0	348 41.8	14.1
04	324 40.7	239 06.8	37.8	295 16.4	42.6	164 52.6	45.8	3 44.4	14.1
05	339 43.1	254 05.9	38.0	310 17.1	43.3	179 54.8	45.7	18 46.9	14.1
06	354 45.6	269 05.0	N23 38.1	325 17.8	N10 44.0	194 57.0	N 9 45.6	33 49.4	S16 14.1
07	9 48.1	284 04.1	38.3	340 18.6	44.6	209 59.2	45.5	48 52.0	14.2
T 08	24 50.5	299 03.2	38.5	355 19.3	45.3	225 01.3	45.3	63 54.5	14.2
U 09	39 53.0	314 02.4	38.7	10 20.0	45.9	240 03.5	45.2	78 57.1	14.2
E 10	54 55.5	329 01.5	38.9	25 20.7	46.6	255 05.7	45.1	93 59.6	14.3
S 11	69 57.9	344 00.6	39.1	40 21.4	47.2	270 07.9	45.0	109 02.1	14.3
D 12	85 00.4	358 59.7	N23 39.3	55 22.1	N10 47.9	285 10.0	N 9 44.9	124 04.7	S16 14.3
A 13	100 02.9	13 58.8	39.4	70 22.8	48.5	300 12.2	44.7	139 07.2	14.3
Y 14	115 05.3	28 57.9	39.6	85 23.5	49.2	315 14.4	44.6	154 09.7	14.4
15	130 07.8	43 57.1	39.8	100 24.3	49.8	330 16.6	44.5	169 12.3	14.4
16	145 10.2	58 56.2	40.0	115 25.0	50.5	345 18.7	44.4	184 14.8	14.4
17	160 12.7	73 55.3	40.2	130 25.7	51.1	0 20.9	44.3	199 17.3	14.5
18	175 15.2	88 54.4	N23 40.3	145 26.4	N10 51.8	15 23.1	N 9 44.1	214 19.9	S16 14.5
19	190 17.6	103 53.5	40.5	160 27.1	52.4	30 25.2	44.0	229 22.4	14.5
20	205 20.1	118 52.6	40.7	175 27.8	53.1	45 27.4	43.9	244 25.0	14.6
21	220 22.6	133 51.7	40.9	190 28.5	53.7	60 29.6	43.8	259 27.5	14.6
22	235 25.0	148 50.9	41.0	205 29.2	54.4	75 31.8	43.6	274 30.0	14.6
23	250 27.5	163 50.0	41.2	220 29.9	55.0	90 33.9	43.5	289 32.6	14.6
Mer. Pass.	h m 6 24.8	v −0.9	d 0.2	v 0.7	d 0.7	v 2.2	d 0.1	v 2.5	d 0.0

STARS			
Name	S.H.A.	Dec.	
	° ′	° ′	
Acamar	315 30.5	S40 19.9	
Achernar	335 38.6	S57 16.2	
Acrux	173 26.9	S63 03.9	
Adhara	255 25.2	S28 57.8	
Aldebaran	291 07.7	N16 29.7	
Alioth	166 34.1	N56 00.2	
Alkaid	153 10.9	N49 21.2	
Al Na'ir	28 03.1	S46 59.5	
Alnilam	276 02.6	S 1 12.4	
Alphard	218 11.7	S 8 37.7	
Alphecca	126 23.9	N26 44.4	
Alpheratz	357 59.8	N29 02.9	
Altair	62 23.2	N 8 50.9	
Ankaa	353 31.2	S42 20.5	
Antares	112 45.2	S26 25.0	
Arcturus	146 09.8	N19 13.3	
Atria	108 00.6	S69 01.0	
Avior	234 25.0	S59 29.4	
Bellatrix	278 49.2	N 6 20.6	
Betelgeuse	271 18.6	N 7 24.4	
Canopus	264 03.6	S52 41.6	
Capella	280 58.1	N45 59.4	
Deneb	49 41.9	N45 15.1	
Denebola	182 49.6	N14 36.8	
Diphda	349 11.7	S18 01.5	
Dubhe	194 10.8	N61 47.7	
Elnath	278 32.8	N28 36.1	
Eltanin	90 52.9	N51 29.4	
Enif	34 02.4	N 9 50.4	
Fomalhaut	15 41.1	S29 39.5	
Gacrux	172 18.4	S57 04.7	
Gienah	176 08.4	S17 30.2	
Hadar	149 09.9	S60 20.6	
Hamal	328 18.7	N23 25.6	
Kaus Aust.	84 04.2	S34 23.3	
Kochab	137 18.3	N74 11.3	
Markab	13 53.9	N15 09.9	
Menkar	314 31.7	N 4 03.7	
Menkent	148 25.9	S36 20.3	
Miaplacidus	221 43.7	S69 41.5	
Mirfak	309 03.3	N49 50.0	
Nunki	76 17.4	S26 18.3	
Peacock	53 43.3	S56 45.3	
Pollux	243 47.2	N28 02.7	
Procyon	245 16.4	N 5 14.6	
Rasalhague	96 20.7	N12 33.9	
Regulus	208 00.3	N12 00.2	
Rigel	281 27.5	S 8 12.6	
Rigil Kent.	140 12.8	S60 48.5	
Sabik	102 30.2	S15 43.0	
Schedar	349 58.7	N56 29.6	
Shaula	96 42.8	S37 06.0	
Sirius	258 47.9	S16 42.4	
Spica	158 47.7	S11 07.5	
Suhail	223 04.3	S43 24.4	
Vega	80 49.2	N38 46.5	
Zuben'ubi	137 22.6	S16 00.8	

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	275 59.7	12 03
Mars	331 24.8	8 20
Jupiter	200 20.0	17 02
Saturn	39 01.8	3 49

UT (GMT)	SUN			MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 14	Moonrise 15	Moonrise 16	Moonrise 17
	G.H.A.	Dec.		G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′		° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
14 00	179 57.4	N23 15.9		15 15.1	8.9	S23 45.1	2.1	55.9	N 72							
01	194 57.2	16.0		29 43.0	8.9	23 47.2	1.9	55.9	N 70							
02	209 57.1	16.2		44 10.9	8.8	23 49.1	1.9	55.9	68							
03	224 57.0	16.3		58 38.7	9.0	23 51.0	1.7	55.8	66							
04	239 56.8	16.4		73 06.7	8.9	23 52.7	1.6	55.8	64							
05	254 56.7	16.5		87 34.6	8.9	23 54.3	1.4	55.8	62							
06	269 56.6	N23 16.6		102 02.5	8.9	S23 55.7	1.4	55.8	60							
07	284 56.5	16.7		116 30.4	9.0	23 57.1	1.2	55.8	N 58			01 41				
08	299 56.3	16.9		130 58.4	8.9	23 58.3	1.0	55.7	56			02 11				
S 09	314 56.2	17.0		145 26.3	9.0	23 59.3	1.0	55.7	54	00 48		02 33				
U 10	329 56.1	17.1		159 54.3	9.0	24 00.3	0.8	55.7	52	01 33		02 51				
N 11	344 55.9	17.2		174 22.3	9.0	24 01.1	0.7	55.7	50	02 00		03 06				
D 12	359 55.8	N23 17.3		188 50.3	9.0	S24 01.8	0.5	55.7	45	02 46		03 35				
A 13	14 55.7	17.4		203 18.3	9.0	24 02.3	0.4	55.6	N 40	03 16		03 58				
Y 14	29 55.5	17.6		217 46.3	9.1	24 02.7	0.3	55.6	35	03 39		04 16				
15	44 55.4	17.7		232 14.4	9.1	24 03.0	0.2	55.6	30	03 58		04 31				
16	59 55.3	17.8		246 42.5	9.1	24 03.2	0.0	55.6	20	04 27		04 56				
17	74 55.1	17.9		261 10.6	9.1	24 03.2	0.1	55.6	N 10	04 49		05 16				
18	89 55.0	N23 18.0		275 38.7	9.1	S24 03.1	0.2	55.5	0	05 08		05 34				
19	104 54.9	18.1		290 06.8	9.2	24 02.9	0.3	55.5	S 10	05 25		05 51				
20	119 54.7	18.2		304 35.0	9.2	24 02.6	0.5	55.5	20	05 41		06 09				
21	134 54.6	18.3		319 03.2	9.2	24 02.1	0.6	55.5	30	05 58		06 27				
22	149 54.5	18.4		333 31.4	9.3	24 01.5	0.7	55.5	35	06 06		06 38				
23	164 54.3	18.5		347 59.7	9.3	24 00.8	0.9	55.4	40	06 16		06 50				
15 00	179 54.2	N23 18.6		2 28.0	9.3	S23 59.9	0.9	55.4	45	06 26		07 03				
01	194 54.1	18.8		16 56.3	9.4	23 59.0	1.1	55.4	S 50	06 38		07 19				
02	209 53.9	18.9		31 24.7	9.3	23 57.9	1.3	55.4	52	06 43		07 27				
03	224 53.8	19.0		45 53.0	9.5	23 56.6	1.3	55.4	54	06 49		07 35				
04	239 53.7	19.1		60 21.5	9.4	23 55.3	1.5	55.4	56	06 55		07 44				
05	254 53.6	19.2		74 49.9	9.5	23 53.8	1.6	55.3	58	07 01		07 54				
06	269 53.4	N23 19.3		89 18.4	9.5	S23 52.2	1.7	55.3	S 60	07 09		08 06				
07	284 53.3	19.4		103 46.9	9.6	23 50.5	1.8	55.3								
08	299 53.2	19.5		118 15.5	9.6	23 48.7	2.0	55.3								
M 09	314 53.0	19.6		132 44.1	9.6	23 46.7	2.1	55.3								
O 10	329 52.9	19.7		147 12.7	9.7	23 44.6	2.2	55.2								
N 11	344 52.8	19.8		161 41.4	9.7	23 42.4	2.3	55.2								
D 12	359 52.6	N23 19.9		176 10.1	9.8	S23 40.1	2.5	55.2								
A 13	14 52.5	20.0		190 38.9	9.8	23 37.6	2.6	55.2								
Y 14	29 52.4	20.1		205 07.7	9.8	23 35.0	2.6	55.2								
15	44 52.2	20.1		219 36.5	9.9	23 32.4	2.9	55.2								
16	59 52.1	20.2		234 05.4	10.0	23 29.5	2.9	55.1								
17	74 52.0	20.3		248 34.4	9.9	23 26.6	3.0	55.1								
18	89 51.8	N23 20.4		263 03.3	10.1	S23 23.6	3.2	55.1								
19	104 51.7	20.5		277 32.4	10.1	23 20.4	3.2	55.1								
20	119 51.6	20.6		292 01.5	10.1	23 17.2	3.4	55.1								
21	134 51.4	20.7		306 30.6	10.2	23 13.8	3.5	55.1								
22	149 51.3	20.8		320 59.8	10.2	23 10.3	3.7	55.0								
23	164 51.2	20.9		335 29.0	10.3	23 06.6	3.7	55.0								
16 00	179 51.0	N23 21.0		349 58.3	10.3	S23 02.9	3.8	55.0								
01	194 50.9	21.1		4 27.6	10.4	22 59.1	4.0	55.0								
02	209 50.8	21.1		18 57.0	10.4	22 55.1	4.1	55.0								
03	224 50.6	21.2		33 26.4	10.5	22 51.0	4.1	55.0								
04	239 50.5	21.3		47 55.9	10.6	22 46.9	4.3	54.9								
05	254 50.4	21.4		62 25.5	10.6	22 42.6	4.4	54.9								
06	269 50.2	N23 21.5		76 55.1	10.6	S22 38.2	4.5	54.9								
07	284 50.1	21.6		91 24.7	10.8	22 33.7	4.7	54.9								
T 08	299 50.0	21.7		105 54.5	10.7	22 29.0	4.7	54.9								
U 09	314 49.8	21.7		120 24.2	10.9	22 24.3	4.8	54.9								
E 10	329 49.7	21.8		134 54.1	10.8	22 19.5	5.0	54.8								
S 11	344 49.6	21.9		149 23.9	11.0	22 14.5	5.0	54.8								
D 12	359 49.4	N23 22.0		163 53.9	11.0	S22 09.5	5.1	54.8								
A 13	14 49.3	22.1		178 23.9	11.1	22 04.4	5.3	54.8								
Y 14	29 49.2	22.1		192 54.0	11.1	21 59.1	5.3	54.8								
15	44 49.0	22.2		207 24.1	11.2	21 53.8	5.5	54.8								
16	59 48.9	22.3		221 54.3	11.2	21 48.3	5.5	54.8								
17	74 48.8	22.4		236 24.5	11.3	21 42.8	5.7	54.7								
18	89 48.6	N23 22.4		250 54.8	11.4	S21 37.1	5.8	54.7								
19	104 48.5	22.5		265 25.2	11.4	21 31.3	5.8	54.7								
20	119 48.4	22.6		279 55.6	11.5	21 25.5	6.0	54.7								
21	134 48.2	22.7		294 26.1	11.5	21 19.5	6.0	54.7								
22	149 48.1	22.7		308 56.6	11.6	21 13.5	6.2	54.7								
23	164 48.0	22.8		323 27.2	11.7	21 07.3	6.2	54.7								
	S.D. 15.8	d 0.1		S.D.	15.2		15.0		14.9							

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

Moonset 14	Moonset 15	Moonset 16	Moonset 17
h m	h m	h m	h m

UT (GMT)	ARIES	VENUS −3.9		MARS +0.8		JUPITER −1.8		SATURN +0.3	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
20 00	298 01.5	167 44.3	N19 39.0	244 48.0	N18 11.6	133 22.1	N 7 43.7	338 47.1	S16 50.4
01	313 04.0	182 43.6	38.3	259 48.7	12.1	148 24.1	43.5	353 49.8	50.5
02	328 06.5	197 42.9	37.5	274 49.4	12.5	163 26.2	43.3	8 52.4	50.5
03	343 08.9	212 42.2	·· 36.8	289 50.1	·· 12.9	178 28.2	·· 43.2	23 55.0	·· 50.6
04	358 11.4	227 41.5	36.0	304 50.8	13.4	193 30.3	43.0	38 57.7	50.6
05	13 13.9	242 40.8	35.3	319 51.5	13.8	208 32.3	42.8	54 00.3	50.7
06	28 16.3	257 40.1	N19 34.5	334 52.2	N18 14.3	223 34.3	N 7 42.6	69 02.9	S16 50.8
07	43 18.8	272 39.4	33.8	349 52.9	14.7	238 36.4	42.4	84 05.6	50.8
08	58 21.3	287 38.7	33.0	4 53.6	15.1	253 38.4	42.3	99 08.2	50.9
M 09	73 23.7	302 38.0	·· 32.3	19 54.3	·· 15.6	268 40.5	·· 42.1	114 10.8	·· 50.9
O 10	88 26.2	317 37.3	31.5	34 55.0	16.0	283 42.5	41.9	129 13.5	51.0
N 11	103 28.6	332 36.6	30.8	49 55.7	16.4	298 44.6	41.7	144 16.1	51.0
D 12	118 31.1	347 35.9	N19 30.0	64 56.4	N18 16.9	313 46.6	N 7 41.6	159 18.7	S16 51.1
A 13	133 33.6	2 35.2	29.2	79 57.1	17.3	328 48.7	41.4	174 21.4	51.2
Y 14	148 36.0	17 34.5	28.5	94 57.8	17.7	343 50.7	41.2	189 24.0	51.2
15	163 38.5	32 33.8	·· 27.7	109 58.5	·· 18.2	358 52.8	·· 41.0	204 26.6	·· 51.3
16	178 41.0	47 33.1	27.0	124 59.2	18.6	13 54.8	40.9	219 29.3	51.3
17	193 43.4	62 32.4	26.2	139 59.9	19.1	28 56.8	40.7	234 31.9	51.4
18	208 45.9	77 31.7	N19 25.4	155 00.6	N18 19.5	43 58.9	N 7 40.5	249 34.5	S16 51.4
19	223 48.4	92 31.0	24.7	170 01.3	19.9	59 00.9	40.3	264 37.2	51.5
20	238 50.8	107 30.3	23.9	185 02.0	20.4	74 03.0	40.2	279 39.8	51.5
21	253 53.3	122 29.6	·· 23.2	200 02.7	·· 20.8	89 05.0	·· 40.0	294 42.4	·· 51.6
22	268 55.7	137 29.0	22.4	215 03.4	21.2	104 07.1	39.8	309 45.1	51.7
23	283 58.2	152 28.3	21.6	230 04.1	21.7	119 09.1	39.6	324 47.7	51.7
21 00	299 00.7	167 27.6	N19 20.9	245 04.9	N18 22.1	134 11.2	N 7 39.4	339 50.3	S16 51.8
01	314 03.1	182 26.9	20.1	260 05.6	22.5	149 13.2	39.3	354 53.0	51.8
02	329 05.6	197 26.2	19.3	275 06.3	23.0	164 15.2	39.1	9 55.6	51.9
03	344 08.1	212 25.5	·· 18.5	290 07.0	·· 23.4	179 17.3	·· 38.9	24 58.2	·· 51.9
04	359 10.5	227 24.8	17.8	305 07.7	23.8	194 19.3	38.7	40 00.9	52.0
05	14 13.0	242 24.1	17.0	320 08.4	24.2	209 21.4	38.6	55 03.5	52.1
06	29 15.5	257 23.4	N19 16.2	335 09.1	N18 24.7	224 23.4	N 7 38.4	70 06.1	S16 52.1
T 07	44 17.9	272 22.7	15.5	350 09.8	25.1	239 25.5	38.2	85 08.8	52.2
U 08	59 20.4	287 22.1	14.7	5 10.5	25.5	254 27.5	38.0	100 11.4	52.2
E 09	74 22.9	302 21.4	·· 13.9	20 11.2	·· 26.0	269 29.5	·· 37.9	115 14.1	·· 52.3
S 10	89 25.3	317 20.7	13.1	35 11.9	26.4	284 31.6	37.7	130 16.7	52.3
D 11	104 27.8	332 20.0	12.3	50 12.6	26.8	299 33.6	37.5	145 19.3	52.4
A 12	119 30.2	347 19.3	N19 11.6	65 13.3	N18 27.3	314 35.7	N 7 37.3	160 22.0	S16 52.5
Y 13	134 32.7	2 18.6	10.8	80 14.0	27.7	329 37.7	37.1	175 24.6	52.5
14	149 35.2	17 17.9	10.0	95 14.7	28.1	344 39.8	37.0	190 27.2	52.6
15	164 37.6	32 17.3	·· 09.2	110 15.4	·· 28.5	359 41.8	·· 36.8	205 29.9	·· 52.6
16	179 40.1	47 16.6	08.4	125 16.1	29.0	14 43.8	36.6	220 32.5	52.7
17	194 42.6	62 15.9	07.7	140 16.8	29.4	29 45.9	36.4	235 35.1	52.7
18	209 45.0	77 15.2	N19 06.9	155 17.5	N18 29.8	44 47.9	N 7 36.3	250 37.8	S16 52.8
19	224 47.5	92 14.5	06.1	170 18.2	30.3	59 50.0	36.1	265 40.4	52.9
20	239 50.0	107 13.8	05.3	185 18.9	30.7	74 52.0	35.9	280 43.0	52.9
21	254 52.4	122 13.2	·· 04.5	200 19.6	·· 31.1	89 54.0	·· 35.7	295 45.7	·· 53.0
22	269 54.9	137 12.5	03.7	215 20.3	31.5	104 56.1	35.5	310 48.3	53.0
23	284 57.4	152 11.8	02.9	230 21.0	32.0	119 58.1	35.4	325 51.0	53.1
22 00	299 59.8	167 11.1	N19 02.1	245 21.7	N18 32.4	135 00.2	N 7 35.2	340 53.6	S16 53.1
01	315 02.3	182 10.5	01.3	260 22.4	32.8	150 02.2	35.0	355 56.2	53.2
02	330 04.7	197 09.8	19 00.6	275 23.1	33.2	165 04.3	34.8	10 58.9	53.3
03	345 07.2	212 09.1	18 59.8	290 23.8	·· 33.7	180 06.3	·· 34.6	26 01.5	·· 53.3
04	0 09.7	227 08.4	59.0	305 24.5	34.1	195 08.3	34.5	41 04.1	53.4
05	15 12.1	242 07.7	58.2	320 25.2	34.5	210 10.4	34.3	56 06.8	53.4
06	30 14.6	257 07.1	N18 57.4	335 25.9	N18 34.9	225 12.4	N 7 34.1	71 09.4	S16 53.5
W 07	45 17.1	272 06.4	56.6	350 26.6	35.4	240 14.5	33.9	86 12.0	53.5
E 08	60 19.5	287 05.7	55.8	5 27.3	35.8	255 16.5	33.8	101 14.7	53.6
D 09	75 22.0	302 05.0	·· 55.0	20 28.0	·· 36.2	270 18.5	·· 33.6	116 17.3	·· 53.7
N 10	90 24.5	317 04.4	54.2	35 28.7	36.6	285 20.6	33.4	131 20.0	53.7
E 11	105 26.9	332 03.7	53.4	50 29.4	37.0	300 22.6	33.2	146 22.6	53.8
S 12	120 29.4	347 03.0	N18 52.6	65 30.1	N18 37.5	315 24.7	N 7 33.0	161 25.2	S16 53.8
D 13	135 31.8	2 02.3	51.8	80 30.8	37.9	330 26.7	32.9	176 27.9	53.9
A 14	150 34.3	17 01.7	51.0	95 31.5	38.3	345 28.7	32.7	191 30.5	53.9
Y 15	165 36.8	32 01.0	·· 50.2	110 32.2	·· 38.7	0 30.8	·· 32.5	206 33.1	·· 54.0
16	180 39.2	47 00.3	49.4	125 32.9	39.2	15 32.8	32.3	221 35.8	54.1
17	195 41.7	61 59.7	48.6	140 33.6	39.6	30 34.9	32.1	236 38.4	54.1
18	210 44.2	76 59.0	N18 47.8	155 34.3	N18 40.0	45 36.9	N 7 32.0	251 41.1	S16 54.2
19	225 46.6	91 58.3	46.9	170 35.0	40.4	60 38.9	31.8	266 43.7	54.2
20	240 49.1	106 57.7	46.1	185 35.7	40.8	75 41.0	31.6	281 46.3	54.3
21	255 51.6	121 57.0	·· 45.3	200 36.4	·· 41.3	90 43.0	·· 31.4	296 49.0	·· 54.3
22	270 54.0	136 56.3	44.5	215 37.1	41.7	105 45.1	31.2	311 51.6	54.4
23	285 56.5	151 55.6	43.7	230 37.8	42.1	120 47.1	31.1	326 54.2	54.5
Mer. Pass.	h m 4 03.3	v −0.7	d 0.8	v 0.7	d 0.4	v 2.0	d 0.2	v 2.6	d −0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.2	S40 19.7
Achernar	335 38.2	S57 16.0
Acrux	173 27.2	S63 03.8
Adhara	255 25.2	S28 57.6
Aldebaran	291 07.5	N16 29.7
Alioth	166 34.4	N56 00.2
Alkaid	153 11.1	N49 21.2
Al Na'ir	28 02.8	S46 59.6
Alnilam	276 02.5	S 1 12.3
Alphard	218 11.7	S 8 37.6
Alphecca	126 24.0	N26 44.5
Alpheratz	357 59.5	N29 03.0
Altair	62 23.1	N 8 51.0
Ankaa	353 30.8	S42 20.4
Antares	112 45.2	S26 25.1
Arcturus	146 09.9	N19 13.3
Atria	108 00.7	S69 01.1
Avior	234 25.1	S59 29.2
Bellatrix	278 49.0	N 6 20.7
Betelgeuse	271 18.5	N 7 24.4
Canopus	264 03.6	S52 41.4
Capella	280 57.9	N45 59.4
Deneb	49 41.7	N45 15.3
Denebola	182 49.7	N14 36.8
Diphda	349 11.4	S18 01.4
Dubhe	194 11.0	N61 47.6
Elnath	278 32.7	N28 36.1
Eltanin	90 52.9	N51 29.5
Enif	34 02.1	N 9 50.6
Fomalhaut	15 40.8	S29 39.4
Gacrux	172 18.6	S57 04.6
Gienah	176 08.5	S17 30.2
Hadar	149 10.2	S60 20.6
Hamal	328 18.4	N23 25.7
Kaus Aust.	84 04.1	S34 23.3
Kochab	137 18.9	N74 11.4
Markab	13 53.7	N15 10.0
Menkar	314 31.5	N 4 03.8
Menkent	148 26.0	S36 20.3
Miaplacidus	221 44.0	S69 41.4
Mirfak	309 03.0	N49 50.0
Nunki	76 17.2	S26 18.3
Peacock	53 43.0	S56 45.4
Pollux	243 47.1	N28 02.7
Procyon	245 16.4	N 5 14.7
Rasalhague	96 20.6	N12 34.0
Regulus	208 00.4	N12 00.2
Rigel	281 27.3	S 8 12.5
Rigil Kent.	140 13.0	S60 48.6
Sabik	102 30.2	S15 43.0
Schedar	349 58.3	N56 29.7
Shaula	96 42.7	S37 06.0
Sirius	258 47.8	S16 42.3
Spica	158 47.8	S11 07.5
Suhail	223 04.4	S43 24.3
Vega	80 49.1	N38 46.7
Zuben'ubi	137 22.6	S16 00.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	228 26.9	12 51
Mars	306 04.2	7 39
Jupiter	195 10.5	15 01
Saturn	40 49.7	1 20

UT (GMT)	SUN		MOON				Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 20	Moonrise 21	Moonrise 22	Moonrise 23
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.							
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
20 00	178 25.5	N20 39.4	305 11.8	16.2	N 2 33.3	12.1	54.4	N 72	▭	▭	▭	20 50	20 26	19 49	▭
01	193 25.5	38.9	319 47.0	16.1	2 45.4	12.0	54.4	N 70	▭	▭	▭	21 00	20 44	20 22	19 42
02	208 25.5	38.4	334 22.1	16.0	2 57.4	12.1	54.4	68	////	////	01 07	21 07	20 58	20 47	20 31
03	223 25.4	.. 38.0	348 57.1	16.1	3 09.5	12.1	54.5	66	////	////	02 02	21 14	21 10	21 06	21 03
04	238 25.4	37.5	3 32.2	16.0	3 21.6	12.1	54.5	64	////	////	02 34	21 19	21 20	21 22	21 26
05	253 25.4	37.0	18 07.2	16.0	3 33.7	12.0	54.5	62	////	01 27	02 57	21 24	21 28	21 35	21 45
06	268 25.3	N20 36.5	32 42.2	16.0	N 3 45.7	12.1	54.5	60	////	02 05	03 16	21 28	21 36	21 46	22 01
07	283 25.3	36.1	47 17.2	16.0	3 57.8	12.0	54.5	N 58	////	02 31	03 31	21 32	21 42	21 56	22 14
08	298 25.3	35.6	61 52.2	15.9	4 09.8	12.0	54.5	56	01 19	02 51	03 45	21 35	21 48	22 04	22 25
M 09	313 25.2	.. 35.1	76 27.1	15.9	4 21.8	12.0	54.5	54	01 54	03 08	03 56	21 38	21 53	22 12	22 36
O 10	328 25.2	34.7	91 02.0	15.9	4 33.8	12.0	54.6	52	02 19	03 22	04 06	21 41	21 58	22 19	22 44
N 11	343 25.2	34.2	105 36.9	15.8	4 45.8	12.0	54.6	50	02 38	03 34	04 15	21 43	22 02	22 25	22 53
D 12	358 25.1	N20 33.7	120 11.7	15.8	N 4 57.8	12.0	54.6	45	03 13	03 58	04 33	21 49	22 12	22 38	23 10
A 13	13 25.1	33.2	134 46.5	15.8	5 09.8	12.0	54.6	N 40	03 38	04 17	04 49	21 53	22 19	22 49	23 24
Y 14	28 25.1	32.7	149 21.3	15.7	5 21.8	11.9	54.6	35	03 58	04 33	05 01	21 57	22 26	22 59	23 36
15	43 25.0	.. 32.3	163 56.0	15.7	5 33.7	12.0	54.6	30	04 14	04 46	05 12	22 00	22 32	23 07	23 47
16	58 25.0	31.8	178 30.7	15.7	5 45.7	11.9	54.7	20	04 39	05 07	05 31	22 07	22 42	23 21	24 05
17	73 25.0	31.3	193 05.4	15.6	5 57.6	11.9	54.7	N 10	04 59	05 25	05 48	22 12	22 52	23 34	24 21
18	88 24.9	N20 30.8	207 40.0	15.6	N 6 09.5	11.9	54.7	0	05 15	05 41	06 03	22 17	23 00	23 46	24 36
19	103 24.9	30.4	222 14.6	15.6	6 21.4	11.9	54.7	S 10	05 30	05 55	06 18	22 22	23 09	23 58	24 51
20	118 24.9	29.9	236 49.2	15.5	6 33.3	11.8	54.7	20	05 43	06 10	06 34	22 28	23 18	24 11	00 11
21	133 24.8	.. 29.4	251 23.7	15.5	6 45.1	11.9	54.8	30	05 57	06 26	06 52	22 34	23 29	24 26	00 26
22	148 24.8	28.9	265 58.2	15.4	6 57.0	11.8	54.8	35	06 04	06 35	07 02	22 38	23 35	24 35	00 35
23	163 24.8	28.4	280 32.6	15.4	7 08.8	11.8	54.8	40	06 12	06 45	07 14	22 42	23 42	24 45	00 45
21 00	178 24.8	N20 27.9	295 07.0	15.4	N 7 20.6	11.7	54.8	45	06 20	06 56	07 28	22 47	23 51	24 56	00 56
01	193 24.7	27.5	309 41.4	15.3	7 32.3	11.8	54.8	S 50	06 29	07 09	07 45	22 52	24 01	00 01	01 11
02	208 24.7	27.0	324 15.7	15.2	7 44.1	11.7	54.9	52	06 33	07 15	07 54	22 55	24 05	00 05	01 17
03	223 24.7	.. 26.5	338 49.9	15.2	7 55.8	11.7	54.9	54	06 37	07 22	08 03	22 58	24 10	00 10	01 25
04	238 24.6	26.0	353 24.1	15.2	8 07.5	11.7	54.9	56	06 42	07 29	08 13	23 01	24 16	00 16	01 33
05	253 24.6	25.5	7 58.3	15.1	8 19.2	11.7	54.9	58	06 47	07 37	08 24	23 05	24 23	00 23	01 43
06	268 24.6	N20 25.0	22 32.4	15.1	N 8 30.9	11.6	54.9	S 60	06 53	07 46	08 38	23 09	24 30	00 30	01 54
T 07	283 24.6	24.5	37 06.5	15.0	8 42.5	11.6	55.0								
U 08	298 24.5	24.1	51 40.5	14.9	8 54.1	11.6	55.0								
E 09	313 24.5	.. 23.6	66 14.4	15.0	9 05.7	11.5	55.0								
S 10	328 24.5	23.1	80 48.4	14.8	9 17.2	11.5	55.0								
D 11	343 24.4	22.6	95 22.2	14.8	9 28.7	11.5	55.0								
A 12	358 24.4	N20 22.1	109 56.0	14.8	N 9 40.2	11.5	55.1								
Y 13	13 24.4	21.6	124 29.8	14.7	9 51.7	11.4	55.1								
14	28 24.4	21.1	139 03.5	14.6	10 03.1	11.4	55.1								
15	43 24.3	.. 20.6	153 37.1	14.6	10 14.5	11.3	55.1								
16	58 24.3	20.1	168 10.7	14.5	10 25.8	11.4	55.2								
17	73 24.3	19.6	182 44.2	14.4	10 37.2	11.3	55.2								
18	88 24.3	N20 19.1	197 17.6	14.4	N10 48.5	11.2	55.2								
19	103 24.2	18.7	211 51.0	14.4	10 59.7	11.2	55.2								
20	118 24.2	18.2	226 24.4	14.2	11 10.9	11.2	55.3								
21	133 24.2	.. 17.7	240 57.6	14.2	11 22.1	11.2	55.3								
22	148 24.2	17.2	255 30.8	14.2	11 33.3	11.1	55.3								
23	163 24.1	16.7	270 04.0	14.1	11 44.4	11.0	55.3								
22 00	178 24.1	N20 16.2	284 37.1	14.0	N11 55.4	11.1	55.4								
01	193 24.1	15.7	299 10.1	13.9	12 06.5	10.9	55.4								
02	208 24.1	15.2	313 43.0	13.9	12 17.4	11.0	55.4								
03	223 24.0	.. 14.7	328 15.9	13.8	12 28.4	10.9	55.4								
04	238 24.0	14.2	342 48.7	13.7	12 39.3	10.8	55.5								
05	253 24.0	13.7	357 21.4	13.7	12 50.1	10.8	55.5								
06	268 24.0	N20 13.2	11 54.1	13.6	N13 00.9	10.8	55.5								
W 07	283 23.9	12.7	26 26.7	13.5	13 11.7	10.7	55.6								
E 08	298 23.9	12.2	40 59.2	13.4	13 22.4	10.7	55.6								
D 09	313 23.9	.. 11.7	55 31.6	13.4	13 33.1	10.6	55.6								
N 10	328 23.9	11.2	70 04.0	13.3	13 43.7	10.6	55.6								
E 11	343 23.9	10.7	84 36.3	13.2	13 54.3	10.5	55.7								
S 12	358 23.8	N20 10.2	99 08.5	13.1	N14 04.8	10.4	55.7								
D 13	13 23.8	09.7	113 40.6	13.1	14 15.2	10.4	55.7								
A 14	28 23.8	09.1	128 12.7	12.9	14 25.6	10.4	55.8								
Y 15	43 23.8	.. 08.6	142 44.6	12.9	14 36.0	10.3	55.8								
16	58 23.7	08.1	157 16.5	12.9	14 46.3	10.2	55.8								
17	73 23.7	07.6	171 48.4	12.7	14 56.5	10.2	55.8								
18	88 23.7	N20 07.1	186 20.1	12.6	N15 06.7	10.2	55.9								
19	103 23.7	06.6	200 51.7	12.6	15 16.9	10.0	55.9								
20	118 23.7	06.1	215 23.3	12.5	15 26.9	10.0	55.9								
21	133 23.7	.. 05.6	229 54.8	12.4	15 36.9	10.0	56.0								
22	148 23.6	05.1	244 26.2	12.3	15 46.9	9.9	56.0								
23	163 23.6	04.6	258 57.5	12.2	15 56.8	9.8	56.0								
	S.D. 15.8	d 0.5	S.D.	14.9		15.0		15.2							

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	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	
20	06 18	06 19	12 06	03 45	16 06	20	
21	06 21	06 22	12 06	04 27	16 49	21	
22	06 24	06 25	12 06	05 11	17 34	22	

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

UT (GMT)	ARIES	VENUS −3.9		MARS +0.6		JUPITER −1.7		SATURN +0.3	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
22 00	330 33.1	160 57.2	N 5 56.2	254 23.8	N22 21.5	159 53.9	N 5 11.0	13 42.5	S17 35.9
01	345 35.6	175 56.8	55.0	269 24.6	21.7	174 55.8	10.7	28 45.1	36.0
02	0 38.0	190 56.5	53.7	284 25.4	21.9	189 57.8	10.5	43 47.7	36.0
03	15 40.5	205 56.1	52.5	299 26.2	22.1	204 59.8	10.3	58 50.4	36.1
04	30 43.0	220 55.8	51.2	314 26.9	22.3	220 01.8	10.1	73 53.0	36.1
05	45 45.4	235 55.4	50.0	329 27.7	22.5	235 03.8	09.9	88 55.7	36.2
06	60 47.9	250 55.0	N 5 48.7	344 28.5	N22 22.7	250 05.7	N 5 09.7	103 58.3	S17 36.3
07	75 50.4	265 54.7	47.5	359 29.3	22.9	265 07.7	09.5	119 01.0	36.3
S 08	90 52.8	280 54.3	46.2	14 30.0	23.0	280 09.7	09.3	134 03.6	36.4
A 09	105 55.3	295 54.0	45.0	29 30.8	23.2	295 11.7	09.1	149 06.2	36.4
T 10	120 57.8	310 53.6	43.8	44 31.6	23.4	310 13.7	08.9	164 08.9	36.5
U 11	136 00.2	325 53.2	42.5	59 32.4	23.6	325 15.7	08.7	179 11.5	36.5
R 12	151 02.7	340 52.9	N 5 41.3	74 33.2	N22 23.8	340 17.6	N 5 08.5	194 14.2	S17 36.6
D 13	166 05.2	355 52.5	40.0	89 33.9	24.0	355 19.6	08.3	209 16.8	36.6
A 14	181 07.6	10 52.2	38.8	104 34.7	24.2	10 21.6	08.1	224 19.4	36.7
Y 15	196 10.1	25 51.8	37.5	119 35.5	24.4	25 23.6	07.9	239 22.1	36.7
16	211 12.5	40 51.5	36.3	134 36.3	24.6	40 25.6	07.7	254 24.7	36.8
17	226 15.0	55 51.1	35.0	149 37.0	24.7	55 27.5	07.4	269 27.4	36.8
18	241 17.5	70 50.7	N 5 33.8	164 37.8	N22 24.9	70 29.5	N 5 07.2	284 30.0	S17 36.9
19	256 19.9	85 50.4	32.5	179 38.6	25.1	85 31.5	07.0	299 32.6	36.9
20	271 22.4	100 50.0	31.3	194 39.4	25.3	100 33.5	06.8	314 35.3	37.0
21	286 24.9	115 49.7	30.1	209 40.1	25.5	115 35.5	06.6	329 37.9	37.0
22	301 27.3	130 49.3	28.8	224 40.9	25.7	130 37.4	06.4	344 40.6	37.1
23	316 29.8	145 49.0	27.6	239 41.7	25.8	145 39.4	06.2	359 43.2	37.2
23 00	331 32.3	160 48.6	N 5 26.3	254 42.5	N22 26.0	160 41.4	N 5 06.0	14 45.8	S17 37.2
01	346 34.7	175 48.2	25.1	269 43.3	26.2	175 43.4	05.8	29 48.5	37.3
02	1 37.2	190 47.9	23.8	284 44.0	26.4	190 45.4	05.6	44 51.1	37.3
03	16 39.6	205 47.5	22.6	299 44.8	26.6	205 47.3	05.4	59 53.8	37.4
04	31 42.1	220 47.2	21.3	314 45.6	26.8	220 49.3	05.2	74 56.4	37.4
05	46 44.6	235 46.8	20.1	329 46.4	26.9	235 51.3	05.0	89 59.0	37.5
06	61 47.0	250 46.5	N 5 18.8	344 47.2	N22 27.1	250 53.3	N 5 04.8	105 01.7	S17 37.5
07	76 49.5	265 46.1	17.6	359 47.9	27.3	265 55.3	04.6	120 04.3	37.6
08	91 52.0	280 45.8	16.3	14 48.7	27.5	280 57.3	04.3	135 07.0	37.6
S 09	106 54.4	295 45.4	15.1	29 49.5	27.7	295 59.2	04.1	150 09.6	37.7
U 10	121 56.9	310 45.1	13.8	44 50.3	27.9	311 01.2	03.9	165 12.2	37.7
N 11	136 59.4	325 44.7	12.6	59 51.1	28.0	326 03.2	03.7	180 14.9	37.8
D 12	152 01.8	340 44.3	N 5 11.3	74 51.9	N22 28.2	341 05.2	N 5 03.5	195 17.5	S17 37.8
A 13	167 04.3	355 44.0	10.1	89 52.6	28.4	356 07.2	03.3	210 20.1	37.9
Y 14	182 06.8	10 43.6	08.8	104 53.4	28.6	11 09.1	03.1	225 22.8	37.9
15	197 09.2	25 43.3	07.6	119 54.2	28.8	26 11.1	02.9	240 25.4	38.0
16	212 11.7	40 42.9	06.3	134 55.0	28.9	41 13.1	02.7	255 28.1	38.1
17	227 14.1	55 42.6	05.0	149 55.8	29.1	56 15.1	02.5	270 30.7	38.1
18	242 16.6	70 42.2	N 5 03.8	164 56.5	N22 29.3	71 17.1	N 5 02.3	285 33.3	S17 38.2
19	257 19.1	85 41.9	02.5	179 57.3	29.5	86 19.0	02.1	300 36.0	38.2
20	272 21.5	100 41.5	01.3	194 58.1	29.7	101 21.0	01.9	315 38.6	38.3
21	287 24.0	115 41.2	S 00.0	209 58.9	29.8	116 23.0	01.7	330 41.3	38.3
22	302 26.5	130 40.8	S 01.2	224 59.7	30.0	131 25.0	01.4	345 43.9	38.4
23	317 28.9	145 40.5	02.5	240 00.5	30.2	146 27.0	01.2	0 46.5	38.4
24 00	332 31.4	160 40.1	N 4 03.8	255 01.2	N22 30.4	161 28.9	N 5 01.0	15 49.2	S17 38.5
01	347 33.9	175 39.8	05.0	270 02.0	30.5	176 30.9	00.8	30 51.8	38.5
02	2 36.3	190 39.4	06.3	285 02.8	30.7	191 32.9	00.6	45 54.5	38.6
03	17 38.8	205 39.1	07.5	300 03.6	30.9	206 34.9	00.4	60 57.1	38.6
04	32 41.3	220 38.7	08.8	315 04.4	31.1	221 36.9	00.2	75 59.7	38.7
05	47 43.7	235 38.4	10.0	330 05.2	31.2	236 38.8	S 00.0	91 02.4	38.7
06	62 46.2	250 38.0	N 4 11.3	345 05.9	N22 31.4	251 40.8	N 4 00.2	106 05.0	S17 38.8
07	77 48.6	265 37.7	12.5	0 06.7	31.6	266 42.8	00.4	121 07.6	38.8
08	92 51.1	280 37.3	13.8	15 07.5	31.8	281 44.8	00.6	136 10.3	38.9
M 09	107 53.6	295 37.0	15.0	30 08.3	31.9	296 46.7	00.8	151 12.9	38.9
O 10	122 56.0	310 36.6	16.3	45 09.1	32.1	311 48.7	01.0	166 15.6	39.0
N 11	137 58.5	325 36.3	17.5	60 09.9	32.3	326 50.7	01.2	181 18.2	39.0
D 12	153 01.0	340 35.9	N 4 18.8	75 10.7	N22 32.5	341 52.7	N 4 01.4	196 20.8	S17 39.1
A 13	168 03.4	355 35.6	20.0	90 11.4	32.6	356 54.7	01.6	211 23.5	39.1
Y 14	183 05.9	10 35.2	21.3	105 12.2	32.8	11 56.6	01.8	226 26.1	39.2
15	198 08.4	25 34.9	22.5	120 13.0	33.0	26 58.6	01.9	241 28.7	39.3
16	213 10.8	40 34.5	23.8	135 13.8	33.2	42 00.6	02.1	256 31.4	39.3
17	228 13.3	55 34.2	25.0	150 14.6	33.3	57 02.6	02.3	271 34.0	39.4
18	243 15.7	70 33.8	N 4 26.3	165 15.4	N22 33.5	72 04.6	N 4 02.5	286 36.7	S17 39.4
19	258 18.2	85 33.5	27.5	180 16.2	33.7	87 06.5	02.7	301 39.3	39.5
20	273 20.7	100 33.2	28.8	195 17.0	33.8	102 08.5	02.9	316 41.9	39.5
21	288 23.1	115 32.8	30.0	210 17.7	34.0	117 10.5	03.1	331 44.6	39.6
22	303 25.6	130 32.5	31.3	225 18.5	34.2	132 12.5	03.3	346 47.2	39.6
23	318 28.1	145 32.1	32.5	240 19.3	34.3	147 14.5	03.5	1 49.8	39.7
Mer. Pass.	h m 1 53.5	v −0.4	d 1.3	v 0.8	d 0.2	v 2.0	d 0.2	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 30.0	S40 19.7
Achernar	335 37.8	S57 16.0
Acrux	173 27.4	S63 03.7
Adhara	255 25.0	S28 57.5
Aldebaran	291 07.3	N16 29.8
Alioth	166 34.6	N56 00.1
Alkaid	153 11.3	N49 21.2
Al Na'ir	28 02.6	S46 59.6
Alnilam	276 02.3	S 1 12.2
Alphard	218 11.7	S 8 37.6
Alphecca	126 24.2	N26 44.5
Alpheratz	357 59.3	N29 03.1
Altair	62 23.1	N 8 51.1
Ankaa	353 30.6	S42 20.4
Antares	112 45.3	S26 25.0
Arcturus	146 10.0	N19 13.3
Atria	108 01.0	S69 01.2
Avior	234 25.0	S59 29.0
Bellatrix	278 48.8	N 6 20.7
Betelgeuse	271 18.3	N 7 24.5
Canopus	264 03.3	S52 41.2
Capella	280 57.6	N45 59.4
Deneb	49 41.7	N45 15.5
Denebola	182 49.7	N14 36.8
Diphda	349 11.2	S18 01.3
Dubhe	194 11.1	N61 47.5
Elnath	278 32.4	N28 36.1
Eltanin	90 53.1	N51 29.7
Enif	34 02.0	N 9 50.7
Fomalhaut	15 40.7	S29 39.4
Gacrux	172 18.8	S57 04.5
Gienah	176 08.6	S17 30.1
Hadar	149 10.4	S60 20.6
Hamal	328 18.2	N23 25.8
Kaus Aust.	84 04.1	S34 23.4
Kochab	137 19.5	N74 11.4
Markab	13 53.5	N15 10.1
Menkar	314 31.2	N 4 03.8
Menkent	148 26.1	S36 20.2
Miaplacidus	221 44.0	S69 41.2
Mirfak	309 02.6	N49 50.0
Nunki	76 17.3	S26 18.3
Peacock	53 43.0	S56 45.5
Pollux	243 47.0	N28 02.6
Procyon	245 16.2	N 5 14.7
Rasalhague	96 20.7	N12 34.1
Regulus	208 00.3	N12 00.2
Rigel	281 27.1	S 8 12.4
Rigil Kent.	140 13.3	S60 48.6
Sabik	102 30.2	S15 43.0
Schedar	349 58.0	N56 29.8
Shaula	96 42.8	S37 06.0
Sirius	258 47.6	S16 42.2
Spica	158 47.8	S11 07.4
Suhail	223 04.3	S43 24.1
Vega	80 49.2	N38 46.9
Zuben'ubi	137 22.7	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	189 16.3	13 17
Mars	283 10.2	7 01
Jupiter	189 09.2	13 15
Saturn	43 13.6	22 57

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 22	23	24	25
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
22 00	179 16.6	N11 46.2	266 30.3	7.3	N23 16.6	3.0	57.6	N 72	///	01 02	03 15	□	□	□	23 32
01	194 16.7	45.3	280 56.6	7.1	23 19.6	2.9	57.6	N 70	///	02 03	03 36	□	□	□	□
02	209 16.9	44.5	295 22.7	7.1	23 22.5	2.7	57.7	68	///	02 36	03 53	□	□	22 27	24 56
03	224 17.0	43.7	309 48.8	7.1	23 25.2	2.7	57.7	66	00 54	03 00	04 06	19 38	21 11	23 14	25 19
04	239 17.2	42.8	324 14.9	6.9	23 27.9	2.4	57.8	64	01 47	03 19	04 17	20 45	22 01	23 44	25 38
05	254 17.4	42.0	338 40.8	6.9	23 30.3	2.4	57.8	62	02 18	03 33	04 26	21 20	22 33	24 07	00 07
06	269 17.5	N11 41.1	353 06.7	6.8	N23 32.7	2.2	57.8	60	02 40	03 46	04 34	21 46	22 56	24 25	00 25
07	284 17.7	40.3	7 32.5	6.7	23 34.9	2.0	57.9	N 58	02 58	03 56	04 41	22 06	23 15	24 40	00 40
08	299 17.8	39.5	21 58.2	6.7	23 36.9	2.0	57.9	56	03 12	04 06	04 47	22 23	23 31	24 53	00 53
S 09	314 18.0	38.6	36 23.9	6.6	23 38.9	1.7	57.9	54	03 24	04 14	04 52	22 37	23 44	25 05	01 05
A 10	329 18.2	37.8	50 49.5	6.5	23 40.6	1.7	58.0	52	03 35	04 21	04 57	22 50	23 56	25 14	01 14
T 11	344 18.3	36.9	65 15.0	6.5	23 42.3	1.5	58.0	50	03 44	04 27	05 02	23 01	24 07	00 07	01 23
U 12	359 18.5	N11 36.1	79 40.5	6.4	N23 43.8	1.3	58.1	45	04 02	04 40	05 11	23 24	24 28	00 28	01 42
R 13	14 18.6	35.2	94 05.9	6.4	23 45.1	1.2	58.1	N 40	04 17	04 51	05 19	23 42	24 46	00 46	01 57
D 14	29 18.8	34.4	108 31.3	6.3	23 46.3	1.1	58.1	35	04 28	05 00	05 26	23 58	25 01	01 01	02 10
A 15	44 19.0	33.5	122 56.6	6.2	23 47.4	0.9	58.2	30	04 38	05 07	05 32	24 11	00 11	01 14	02 21
Y 16	59 19.1	32.7	137 21.8	6.2	23 48.3	0.7	58.2	20	04 53	05 20	05 42	24 34	00 34	01 36	02 40
17	74 19.3	31.9	151 47.0	6.1	23 49.0	0.7	58.2	N 10	05 04	05 30	05 51	24 54	00 54	01 54	02 57
18	89 19.5	N11 31.0	166 12.1	6.1	N23 49.7	0.4	58.3	0	05 14	05 38	05 59	00 15	01 13	02 12	03 12
19	104 19.6	30.2	180 37.2	6.0	23 50.1	0.3	58.3	S 10	05 21	05 46	06 07	00 33	01 31	02 30	03 27
20	119 19.8	29.3	195 02.2	5.9	23 50.4	0.2	58.4	20	05 27	05 53	06 16	00 53	01 51	02 49	03 44
21	134 19.9	28.5	209 27.1	5.9	23 50.6	0.0	58.4	30	05 33	06 01	06 25	01 15	02 14	03 11	04 03
22	149 20.1	27.6	223 52.0	5.9	23 50.6	0.1	58.4	35	05 35	06 05	06 31	01 28	02 28	03 23	04 14
23	164 20.3	26.8	238 16.9	5.8	23 50.5	0.3	58.5	40	05 38	06 09	06 37	01 44	02 43	03 38	04 26
23 00	179 20.4	N11 25.9	252 41.7	5.8	N23 50.2	0.5	58.5	45	05 40	06 14	06 44	02 02	03 02	03 55	04 41
01	194 20.6	25.1	267 06.5	5.7	23 49.7	0.6	58.5	S 50	05 42	06 19	06 52	02 25	03 25	04 17	04 59
02	209 20.7	24.2	281 31.2	5.7	23 49.1	0.7	58.6	52	05 43	06 22	06 56	02 36	03 36	04 27	05 07
03	224 20.9	23.4	295 55.9	5.6	23 48.4	0.9	58.6	54	05 43	06 24	07 01	02 48	03 49	04 38	05 16
04	239 21.1	22.5	310 20.5	5.6	23 47.5	1.1	58.7	56	05 44	06 27	07 05	03 02	04 04	04 52	05 27
05	254 21.2	21.7	324 45.1	5.5	23 46.4	1.2	58.7	58	05 44	06 30	07 11	03 19	04 21	05 07	05 39
06	269 21.4	N11 20.8	339 09.6	5.5	N23 45.2	1.4	58.7	S 60	05 45	06 33	07 17	03 39	04 41	05 25	05 53
07	284 21.6	20.0	353 34.1	5.5	23 43.8	1.5	58.8								
08	299 21.7	19.1	7 58.6	5.4	23 42.3	1.7	58.8								
M 09	314 21.9	18.3	22 23.0	5.4	23 40.6	1.9	58.9								
O 10	329 22.1	17.4	36 47.4	5.4	23 38.7	2.0	58.9								
N 11	344 22.2	16.6	51 11.8	5.3	23 36.7	2.1	58.9								
D 12	359 22.4	N11 15.7	65 36.1	5.3	N23 34.6	2.4	59.0								
A 13	14 22.6	14.9	80 00.4	5.3	23 32.2	2.4	59.0								
Y 14	29 22.7	14.0	94 24.7	5.3	23 29.8	2.7	59.0								
15	44 22.9	13.2	108 49.0	5.2	23 27.1	2.8	59.1								
16	59 23.0	12.3	123 13.2	5.2	23 24.3	2.9	59.1								
17	74 23.2	11.5	137 37.4	5.2	23 21.4	3.1	59.2								
18	89 23.4	N11 10.6	152 01.6	5.2	N23 18.3	3.3	59.2								
19	104 23.5	09.8	166 25.8	5.1	23 15.0	3.4	59.2								
20	119 23.7	08.9	180 49.9	5.2	23 11.6	3.6	59.3								
21	134 23.9	08.0	195 14.1	5.1	23 08.0	3.8	59.3								
22	149 24.0	07.2	209 38.2	5.1	23 04.2	3.9	59.3								
23	164 24.2	06.3	224 02.3	5.1	23 00.3	4.0	59.4								
24 00	179 24.4	N11 05.5	238 26.4	5.1	N22 56.3	4.3	59.4								
01	194 24.5	04.6	252 50.5	5.0	22 52.0	4.4	59.4								
02	209 24.7	03.8	267 14.5	5.1	22 47.6	4.5	59.5								
03	224 24.9	02.9	281 38.6	5.0	22 43.1	4.7	59.5								
04	239 25.0	02.1	296 02.6	5.1	22 38.4	4.9	59.6								
05	254 25.2	01.2	310 26.7	5.1	22 33.5	5.0	59.6								
06	269 25.4	N11 00.3	324 50.8	5.0	N22 28.5	5.1	59.6								
07	284 25.6	10 59.5	339 14.8	5.1	22 23.4	5.4	59.7								
08	299 25.7	58.6	353 38.9	5.0	22 18.0	5.5	59.7								
M 09	314 25.9	57.8	8 02.9	5.1	22 12.5	5.6	59.7								
O 10	329 26.1	56.9	22 27.0	5.0	22 06.9	5.8	59.8								
N 11	344 26.2	56.1	36 51.0	5.1	22 01.1	6.0	59.8								
D 12	359 26.4	N10 55.2	51 15.1	5.1	N21 55.1	6.1	59.8								
A 13	14 26.6	54.3	65 39.2	5.1	21 49.0	6.3	59.9								
Y 14	29 26.7	53.5	80 03.3	5.1	21 42.7	6.4	59.9								
15	44 26.9	52.6	94 27.4	5.1	21 36.3	6.6	59.9								
16	59 27.1	51.8	108 51.5	5.1	21 29.7	6.7	60.0								
17	74 27.2	50.9	123 15.6	5.1	21 23.0	6.9	60.0								
18	89 27.4	N10 50.0	137 39.7	5.2	N21 16.1	7.0	60.0								
19	104 27.6	49.2	152 03.9	5.1	21 09.1	7.2	60.1								
20	119 27.8	48.3	166 28.0	5.2	21 01.9	7.3	60.1								
21	134 27.9	47.5	180 52.2	5.2	20 54.6	7.5	60.1								
22	149 28.1	46.6	195 16.4	5.2	20 47.1	7.7	60.2								
23	164 28.3	45.7	209 40.6	5.3	20 39.4	7.8	60.2								
	S.D. 15.8	d 0.9	S.D.	15.8	16.1		16.3								

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
22	02 54	02 46	12 03	06 29	18 57	24	
23	02 39	02 31	12 03	07 27	19 57	25	
24	02 23	02 15	12 02	08 26	20 56	26	

UT (GMT)	ARIES	VENUS −3.9		MARS +0.6		JUPITER −1.7		SATURN +0.3	
d h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
31 00	339 25.4	159 43.5	N 1 22.8	257 16.0	N22 55.9	167 01.0	N 4 25.9	23 11.4	S17 46.9
01	354 27.8	174 43.2	21.5	272 16.8	56.1	182 02.9	25.7	38 14.0	46.9
02	9 30.3	189 42.9	20.2	287 17.7	56.2	197 04.9	25.5	53 16.7	47.0
03	24 32.8	204 42.5	·· 19.0	302 18.5	·· 56.3	212 06.9	·· 25.3	68 19.3	·· 47.0
04	39 35.2	219 42.2	17.7	317 19.3	56.4	227 08.8	25.1	83 21.9	47.1
05	54 37.7	234 41.9	16.4	332 20.1	56.6	242 10.8	24.9	98 24.5	47.1
06	69 40.2	249 41.6	N 1 15.1	347 21.0	N22 56.7	257 12.8	N 4 24.7	113 27.2	S17 47.2
07	84 42.6	264 41.2	13.8	2 21.8	56.8	272 14.8	24.5	128 29.8	47.2
08	99 45.1	279 40.9	12.5	17 22.6	56.9	287 16.7	24.2	143 32.4	47.3
M 09	114 47.5	294 40.6	·· 11.3	32 23.4	·· 57.1	302 18.7	·· 24.0	158 35.0	·· 47.3
O 10	129 50.0	309 40.3	10.0	47 24.3	57.2	317 20.7	23.8	173 37.7	47.4
N 11	144 52.5	324 39.9	08.7	62 25.1	57.3	332 22.7	23.6	188 40.3	47.4
D 12	159 54.9	339 39.6	N 1 07.4	77 25.9	N22 57.4	347 24.6	N 4 23.4	203 42.9	S17 47.5
A 13	174 57.4	354 39.3	06.1	92 26.7	57.6	2 26.6	23.2	218 45.5	47.5
Y 14	189 59.9	9 39.0	04.8	107 27.6	57.7	17 28.6	23.0	233 48.2	47.5
15	205 02.3	24 38.6	·· 03.6	122 28.4	·· 57.8	32 30.5	·· 22.8	248 50.8	·· 47.6
16	220 04.8	39 38.3	02.3	137 29.2	57.9	47 32.5	22.6	263 53.4	47.6
17	235 07.3	54 38.0	1 01.0	152 30.0	58.1	62 34.5	22.3	278 56.0	47.7
18	250 09.7	69 37.7	N 0 59.7	167 30.9	N22 58.2	77 36.5	N 4 22.1	293 58.7	S17 47.7
19	265 12.2	84 37.3	58.4	182 31.7	58.3	92 38.4	21.9	309 01.3	47.8
20	280 14.6	99 37.0	57.1	197 32.5	58.4	107 40.4	21.7	324 03.9	47.8
21	295 17.1	114 36.7	·· 55.9	212 33.3	·· 58.6	122 42.4	·· 21.5	339 06.5	·· 47.9
22	310 19.6	129 36.4	54.6	227 34.2	58.7	137 44.4	21.3	354 09.2	47.9
23	325 22.0	144 36.0	53.3	242 35.0	58.8	152 46.3	21.1	9 11.8	48.0
1 00	340 24.5	159 35.7	N 0 52.0	257 35.8	N22 58.9	167 48.3	N 4 20.9	24 14.4	S17 48.0
01	355 27.0	174 35.4	50.7	272 36.7	59.0	182 50.3	20.7	39 17.0	48.1
02	10 29.4	189 35.1	49.4	287 37.5	59.2	197 52.2	20.5	54 19.7	48.1
03	25 31.9	204 34.7	·· 48.1	302 38.3	·· 59.3	212 54.2	·· 20.2	69 22.3	·· 48.2
04	40 34.4	219 34.4	46.9	317 39.1	59.4	227 56.2	20.0	84 24.9	48.2
05	55 36.8	234 34.1	45.6	332 40.0	59.5	242 58.2	19.8	99 27.5	48.3
06	70 39.3	249 33.8	N 0 44.3	347 40.8	N22 59.6	258 00.1	N 4 19.6	114 30.2	S17 48.3
07	85 41.8	264 33.4	43.0	2 41.6	59.8	273 02.1	19.4	129 32.8	48.3
T 08	100 44.2	279 33.1	41.7	17 42.5	22 59.9	288 04.1	19.2	144 35.4	48.4
U 09	115 46.7	294 32.8	·· 40.4	32 43.3	23 00.0	303 06.1	·· 19.0	159 38.0	·· 48.4
E 10	130 49.1	309 32.5	39.1	47 44.1	00.1	318 08.0	18.8	174 40.6	48.5
S 11	145 51.6	324 32.1	37.9	62 45.0	00.2	333 10.0	18.6	189 43.3	48.5
D 12	160 54.1	339 31.8	N 0 36.6	77 45.8	N23 00.4	348 12.0	N 4 18.3	204 45.9	S17 48.6
A 13	175 56.5	354 31.5	35.3	92 46.6	00.5	3 13.9	18.1	219 48.5	48.6
Y 14	190 59.0	9 31.2	34.0	107 47.5	00.6	18 15.9	17.9	234 51.1	48.7
15	206 01.5	24 30.8	·· 32.7	122 48.3	·· 00.7	33 17.9	·· 17.7	249 53.8	·· 48.7
16	221 03.9	39 30.5	31.4	137 49.1	00.8	48 19.9	17.5	264 56.4	48.8
17	236 06.4	54 30.2	30.1	152 49.9	00.9	63 21.8	17.3	279 59.0	48.8
18	251 08.9	69 29.9	N 0 28.9	167 50.8	N23 01.1	78 23.8	N 4 17.1	295 01.6	S17 48.9
19	266 11.3	84 29.5	27.6	182 51.6	01.2	93 25.8	16.9	310 04.2	48.9
20	281 13.8	99 29.2	26.3	197 52.4	01.3	108 27.7	16.7	325 06.9	49.0
21	296 16.3	114 28.9	·· 25.0	212 53.3	·· 01.4	123 29.7	·· 16.4	340 09.5	·· 49.0
22	311 18.7	129 28.6	23.7	227 54.1	01.5	138 31.7	16.2	355 12.1	49.0
23	326 21.2	144 28.2	22.4	242 54.9	01.6	153 33.7	16.0	10 14.7	49.1
2 00	341 23.6	159 27.9	N 0 21.1	257 55.8	N23 01.8	168 35.6	N 4 15.8	25 17.4	S17 49.1
01	356 26.1	174 27.6	19.9	272 56.6	01.9	183 37.6	15.6	40 20.0	49.2
02	11 28.6	189 27.3	18.6	287 57.5	02.0	198 39.6	15.4	55 22.6	49.2
03	26 31.0	204 27.0	·· 17.3	302 58.3	·· 02.1	213 41.5	·· 15.2	70 25.2	·· 49.3
04	41 33.5	219 26.6	16.0	317 59.1	02.2	228 43.5	15.0	85 27.8	49.3
05	56 36.0	234 26.3	14.7	333 00.0	02.3	243 45.5	14.8	100 30.5	49.4
06	71 38.4	249 26.0	N 0 13.4	348 00.8	N23 02.4	258 47.5	N 4 14.5	115 33.1	S17 49.4
W 07	86 40.9	264 25.7	12.1	3 01.6	02.5	273 49.4	14.3	130 35.7	49.5
E 08	101 43.4	279 25.3	10.8	18 02.5	02.7	288 51.4	14.1	145 38.3	49.5
D 09	116 45.8	294 25.0	·· 09.6	33 03.3	·· 02.8	303 53.4	·· 13.9	160 40.9	·· 49.6
N 10	131 48.3	309 24.7	08.3	48 04.1	02.9	318 55.3	13.7	175 43.6	49.6
E 11	146 50.7	324 24.4	07.0	63 05.0	03.0	333 57.3	13.5	190 46.2	49.6
S 12	161 53.2	339 24.0	N 0 05.7	78 05.8	N23 03.1	348 59.3	N 4 13.3	205 48.8	S17 49.7
D 13	176 55.7	354 23.7	04.4	93 06.7	03.2	4 01.3	13.1	220 51.4	49.7
A 14	191 58.1	9 23.4	03.1	108 07.5	03.3	19 03.2	12.9	235 54.0	49.8
Y 15	207 00.6	24 23.1	·· 01.8	123 08.3	·· 03.4	34 05.2	·· 12.6	250 56.7	·· 49.8
16	222 03.1	39 22.7	N 0 00.6	138 09.2	03.6	49 07.2	12.4	265 59.3	49.9
17	237 05.5	54 22.4	S 0 00.7	153 10.0	03.7	64 09.1	12.2	281 01.9	49.9
18	252 08.0	69 22.1	S 0 02.0	168 10.9	N23 03.8	79 11.1	N 4 12.0	296 04.5	S17 50.0
19	267 10.5	84 21.8	03.3	183 11.7	03.9	94 13.1	11.8	311 07.1	50.0
20	282 12.9	99 21.5	04.6	198 12.5	04.0	109 15.1	11.6	326 09.8	50.1
21	297 15.4	114 21.1	·· 05.9	213 13.4	·· 04.1	124 17.0	·· 11.4	341 12.4	·· 50.1
22	312 17.9	129 20.8	07.2	228 14.2	04.2	139 19.0	11.2	356 15.0	50.1
23	327 20.3	144 20.5	08.5	243 15.1	04.3	154 21.0	10.9	11 17.6	50.2
Mer. Pass.	h m 1 18.2	v −0.3	d 1.3	v 0.8	d 0.1	v 2.0	d 0.2	v -2.6	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 29.9	S40 19.7
Achernar	335 37.7	S57 16.1
Acrux	173 27.4	S63 03.7
Adhara	255 24.9	S28 57.5
Aldebaran	291 07.2	N16 29.8
Alioth	166 34.6	N56 00.1
Alkaid	153 11.3	N49 21.1
Al Na'ir	28 02.6	S46 59.6
Alnilam	276 02.2	S 1 12.2
Alphard	218 11.6	S 8 37.6
Alphecca	126 24.2	N26 44.5
Alpheratz	357 59.3	N29 03.2
Altair	62 23.1	N 8 51.1
Ankaa	353 30.5	S42 20.4
Antares	112 45.3	S26 25.0
Arcturus	146 10.0	N19 13.3
Atria	108 01.1	S69 01.2
Avior	234 24.9	S59 29.0
Bellatrix	278 48.7	N 6 20.7
Betelgeuse	271 18.2	N 7 24.5
Canopus	264 03.3	S52 41.2
Capella	280 57.5	N45 59.4
Deneb	49 41.7	N45 15.5
Denebola	182 49.7	N14 36.8
Diphda	349 11.1	S18 01.3
Dubhe	194 11.1	N61 47.4
Elnath	278 32.3	N28 36.1
Eltanin	90 53.2	N51 29.7
Enif	34 02.0	N 9 50.7
Fomalhaut	15 40.6	S29 39.4
Gacrux	172 18.9	S57 04.5
Gienah	176 08.6	S17 30.1
Hadar	149 10.5	S60 20.5
Hamal	328 18.1	N23 25.8
Kaus Aust.	84 04.2	S34 23.4
Kochab	137 19.7	N74 11.3
Markab	13 53.5	N15 10.2
Menkar	314 31.2	N 4 03.9
Menkent	148 26.2	S36 20.2
Miaplacidus	221 43.9	S69 41.2
Mirfak	309 02.5	N49 50.1
Nunki	76 17.3	S26 18.4
Peacock	53 43.0	S56 45.5
Pollux	243 46.9	N28 02.6
Procyon	245 16.2	N 5 14.7
Rasalhague	96 20.8	N12 34.1
Regulus	208 00.3	N12 00.2
Rigel	281 27.0	S 8 12.4
Rigil Kent.	140 13.3	S60 48.5
Sabik	102 30.3	S15 43.0
Schedar	349 57.9	N56 29.9
Shaula	96 42.9	S37 06.0
Sirius	258 47.5	S16 42.2
Spica	158 47.9	S11 07.4
Suhail	223 04.3	S43 24.1
Vega	80 49.3	N38 46.9
Zuben'ubi	137 22.8	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	179 11.2	13 22
Mars	277 11.3	6 49
Jupiter	187 23.8	12 47
Saturn	43 49.9	22 19

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
d h	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
31 00	179 54.8	N 8 37.8	144 21.9	9.1	S31 33.1	12.8	59.8	N 72	///	02 32	04 02	12 14	▬	▬	▬
01	194 55.0	36.9	158 50.0	9.1	11 45.9	12.7	59.7	N 70	///	03 00	04 16	11 42	14 19	▬	▬
02	209 55.2	36.0	173 18.1	9.0	11 58.6	12.7	59.7	68	01 33	03 21	04 27	11 20	13 28	16 13	▬
03	224 55.4	.. 35.1	187 46.1	9.0	12 11.3	12.6	59.7	66	02 11	03 37	04 36	11 02	12 57	14 52	16 43
04	239 55.6	34.2	202 14.1	9.0	12 23.9	12.5	59.6	64	02 37	03 50	04 43	10 48	12 34	14 15	15 43
05	254 55.7	33.3	216 42.1	9.1	12 36.4	12.4	59.6	62	02 56	04 01	04 50	10 36	12 15	13 48	15 09
06	269 55.9	N 8 32.4	231 10.2	9.0	S12 48.8	12.3	59.5	60	03 12	04 10	04 55	10 26	12 00	13 28	14 44
07	284 56.1	31.5	245 38.2	8.9	13 01.1	12.2	59.5	N 58	03 25	04 18	05 00	10 17	11 48	13 11	14 24
08	299 56.3	30.5	260 06.1	9.0	13 13.3	12.1	59.5	56	03 35	04 25	05 05	10 10	11 37	12 57	14 08
M 09	314 56.5	.. 29.6	274 34.1	9.0	13 25.4	12.0	59.4	54	03 45	04 31	05 08	10 03	11 27	12 45	13 54
O 10	329 56.7	28.7	289 02.1	8.9	13 37.4	12.0	59.4	52	03 53	04 37	05 12	09 57	11 18	12 34	13 42
N 11	344 56.9	27.8	303 30.0	9.0	13 49.4	11.8	59.4	50	04 00	04 41	05 15	09 52	11 11	12 25	13 31
D 12	359 57.1	N 8 26.9	317 58.0	8.9	S14 01.2	11.7	59.3	45	04 15	04 52	05 22	09 40	10 54	12 05	13 08
A 13	14 57.3	26.0	332 25.9	8.9	14 12.9	11.7	59.3	N 40	04 27	05 00	05 28	09 30	10 41	11 48	12 50
Y 14	29 57.5	25.1	346 53.8	8.9	14 24.6	11.5	59.2	35	04 36	05 07	05 33	09 22	10 30	11 35	12 35
15	44 57.7	.. 24.2	1 21.7	8.9	14 36.1	11.5	59.2	30	04 44	05 13	05 37	09 15	10 20	11 23	12 22
16	59 57.9	23.3	15 49.6	8.9	14 47.6	11.3	59.2	20	04 56	05 22	05 44	09 02	10 03	11 03	12 00
17	74 58.1	22.4	30 17.5	8.8	14 58.9	11.2	59.1	N 10	05 05	05 29	05 51	08 52	09 49	10 45	11 41
18	89 58.3	N 8 21.5	44 45.3	8.9	S15 10.1	11.1	59.1	0	05 11	05 36	05 57	08 42	09 35	10 29	11 23
19	104 58.5	20.6	59 13.2	8.8	15 21.2	11.1	59.0	S 10	05 17	05 41	06 02	08 32	09 22	10 13	11 05
20	119 58.7	19.7	73 41.0	8.9	15 32.3	10.9	59.0	20	05 21	05 46	06 08	08 21	09 07	09 55	10 46
21	134 58.9	.. 18.8	88 08.9	8.8	15 43.2	10.8	59.0	30	05 23	05 51	06 15	08 09	08 51	09 36	10 24
22	149 59.1	17.9	102 36.7	8.8	15 54.0	10.7	58.9	35	05 24	05 53	06 19	08 03	08 42	09 24	10 11
23	164 59.3	17.0	117 04.5	8.8	16 04.7	10.6	58.9	40	05 25	05 56	06 23	07 55	08 31	09 11	09 56
1 00	179 59.5	N 8 16.1	131 32.3	8.7	S16 15.3	10.5	58.8	45	05 25	05 59	06 28	07 46	08 18	08 56	09 39
01	194 59.7	15.2	146 00.0	8.8	16 25.8	10.4	58.8	S 50	05 24	06 02	06 34	07 35	08 03	08 37	09 17
02	209 59.9	14.3	160 27.8	8.7	16 36.2	10.2	58.8	52	05 24	06 03	06 37	07 30	07 56	08 28	09 07
03	225 00.1	.. 13.3	174 55.5	8.8	16 46.4	10.2	58.7	54	05 23	06 04	06 40	07 25	07 48	08 18	08 55
04	240 00.3	12.4	189 23.3	8.7	16 56.6	10.0	58.7	56	05 23	06 05	06 43	07 19	07 40	08 07	08 42
05	255 00.5	11.5	203 51.0	8.7	17 06.6	9.9	58.7	58	05 22	06 07	06 47	07 12	07 30	07 54	08 27
06	270 00.6	N 8 10.6	218 18.7	8.7	S17 16.5	9.9	58.6	S 60	05 21	06 09	06 51	07 04	07 19	07 39	08 08
07	285 00.8	09.7	232 46.4	8.7	17 26.4	9.7	58.6								
T 08	300 01.0	08.8	247 14.1	8.7	17 36.1	9.5	58.5								
U 09	315 01.2	.. 07.9	261 41.8	8.6	17 45.6	9.5	58.5								
E 10	330 01.4	07.0	276 09.4	8.7	17 55.1	9.4	58.5								
S 11	345 01.6	06.1	290 37.1	8.6	18 04.5	9.2	58.4								
D 12	0 01.8	N 8 05.2	305 04.7	8.6	S18 13.7	9.1	58.4								
A 13	15 02.0	04.3	319 32.3	8.6	18 22.8	9.0	58.3								
Y 14	30 02.2	03.4	333 59.9	8.6	18 31.8	8.9	58.3								
15	45 02.4	.. 02.4	348 27.5	8.6	18 40.7	8.7	58.3								
16	60 02.6	01.5	2 55.1	8.6	18 49.4	8.7	58.2								
17	75 02.8	8 00.6	17 22.7	8.6	18 58.1	8.5	58.2								
18	90 03.0	N 7 59.7	31 50.3	8.6	S19 06.6	8.4	58.1								
19	105 03.2	58.8	46 17.9	8.5	19 15.0	8.2	58.1								
20	120 03.4	57.9	60 45.4	8.6	19 23.2	8.2	58.1								
21	135 03.6	.. 57.0	75 13.0	8.5	19 31.4	8.0	58.0								
22	150 03.8	56.1	89 40.5	8.5	19 39.4	7.9	58.0								
23	165 04.0	55.2	104 08.0	8.5	19 47.3	7.8	57.9								
2 00	180 04.2	N 7 54.2	118 35.5	8.6	S19 55.1	7.6	57.9								
01	195 04.4	53.3	133 03.1	8.5	20 02.7	7.6	57.9								
02	210 04.6	52.4	147 30.6	8.5	20 10.3	7.4	57.8								
03	225 04.8	.. 51.5	161 58.1	8.5	20 17.7	7.2	57.8								
04	240 05.0	50.6	176 25.6	8.5	20 24.9	7.2	57.7								
05	255 05.2	49.7	190 53.1	8.4	20 32.1	7.0	57.7								
06	270 05.4	N 7 48.8	205 20.5	8.5	S20 39.1	6.9	57.7								
W 07	285 05.6	47.8	219 48.0	8.5	20 46.0	6.7	57.6								
E 08	300 05.8	46.9	234 15.5	8.5	20 52.7	6.7	57.6								
D 09	315 06.0	.. 46.0	248 43.0	8.5	20 59.4	6.5	57.5								
N 10	330 06.2	45.1	263 10.5	8.4	21 05.9	6.4	57.5								
E 11	345 06.4	44.2	277 37.9	8.5	21 12.3	6.2	57.5								
S 12	0 06.6	N 7 43.3	292 05.4	8.5	S21 18.5	6.1	57.4								
D 13	15 06.8	42.4	306 32.9	8.4	21 24.6	6.0	57.4								
A 14	30 07.0	41.4	321 00.3	8.5	21 30.6	5.9	57.3								
Y 15	45 07.2	.. 40.5	335 27.8	8.5	21 36.5	5.7	57.3								
16	60 07.5	39.6	349 55.3	8.5	21 42.2	5.6	57.3								
17	75 07.7	38.7	4 22.8	8.4	21 47.8	5.5	57.2								
18	90 07.9	N 7 37.8	18 50.2	8.5	S21 53.3	5.3	57.2								
19	105 08.1	36.9	33 17.7	8.5	21 58.6	5.2	57.2								
20	120 08.3	36.0	47 45.2	8.5	22 03.8	5.1	57.1								
21	135 08.5	.. 35.0	62 12.7	8.5	22 08.9	5.0	57.1								
22	150 08.7	34.1	76 40.2	8.5	22 13.9	4.8	57.0								
23	165 08.9	33.2	91 07.7	8.5	22 18.7	4.7	57.0								
	S.D. 15.9	d 0.9	S.D.	16.2		15.9		15.6							

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

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

Day	SUN Eqn. of Time 00^h	SUN Eqn. of Time 12^h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
31	00 21	00 12	12 00	14 54	02 28	03	
1	0003	0007	12 00	15 48	03 21	04	●
2	00 17	00 26	12 00	16 42	04 15	05	

UT (GMT)	ARIES	VENUS −3.9		MARS +0.5		JUPITER −1.7		SATURN +0.4	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12 00	351 15.0	158 09.9	S 4 47.2	261 24.5	N23 21.7	176 28.2	N 3 24.8	35 43.5	S17 59.2
01	6 17.5	173 09.5	48.5	276 25.4	21.8	191 30.2	24.6	50 46.1	59.2
02	21 20.0	188 09.2	49.7	291 26.3	21.8	206 32.2	24.4	65 48.6	59.3
03	36 22.4	203 08.8	·· 51.0	306 27.2	·· 21.9	221 34.1	·· 24.2	80 51.2	·· 59.3
04	51 24.9	218 08.5	52.3	321 28.1	21.9	236 36.1	24.0	95 53.8	59.3
05	66 27.4	233 08.2	53.6	336 29.0	22.0	251 38.1	23.7	110 56.4	59.4
06	81 29.8	248 07.8	S 4 54.8	351 29.9	N23 22.0	266 40.0	N 3 23.5	125 59.0	S17 59.4
07	96 32.3	263 07.5	56.1	6 30.8	22.1	281 42.0	23.3	141 01.6	59.5
S 08	111 34.7	278 07.2	57.4	21 31.8	22.1	296 44.0	23.1	156 04.2	59.5
A 09	126 37.2	293 06.8	·· 58.7	36 32.7	·· 22.2	311 45.9	·· 22.9	171 06.8	·· 59.5
T 10	141 39.7	308 06.5	5 59.9	51 33.6	22.2	326 47.9	22.7	186 09.4	59.6
U 11	156 42.1	323 06.2	5 01.2	66 34.5	22.3	341 49.9	22.5	201 12.0	59.6
R 12	171 44.6	338 05.8	S 5 02.5	81 35.4	N23 22.3	356 51.8	N 3 22.3	216 14.6	S17 59.6
D 13	186 47.1	353 05.5	03.7	96 36.3	22.4	11 53.8	22.0	231 17.2	59.7
A 14	201 49.5	8 05.2	05.0	111 37.2	22.4	26 55.8	21.8	246 19.8	59.7
Y 15	216 52.0	23 04.8	·· 06.3	126 38.1	·· 22.5	41 57.7	·· 21.6	261 22.4	·· 59.7
16	231 54.5	38 04.5	07.6	141 39.0	22.5	56 59.7	21.4	276 25.0	59.8
17	246 56.9	53 04.1	08.8	156 40.0	22.6	72 01.7	21.2	291 27.6	59.8
18	261 59.4	68 03.8	S 5 10.1	171 40.9	N23 22.6	87 03.6	N 3 21.0	306 30.1	S17 59.9
19	277 01.9	83 03.5	11.4	186 41.8	22.7	102 05.6	20.8	321 32.7	59.9
20	292 04.3	98 03.1	12.7	201 42.7	22.7	117 07.6	20.5	336 35.3	17 59.9
21	307 06.8	113 02.8	·· 13.9	216 43.6	·· 22.8	132 09.5	·· 20.3	351 37.9	18 00.0
22	322 09.2	128 02.5	15.2	231 44.5	22.8	147 11.5	20.1	6 40.5	00.0
23	337 11.7	143 02.1	16.5	246 45.4	22.9	162 13.5	19.9	21 43.1	00.0
13 00	352 14.2	158 01.8	S 5 17.7	261 46.4	N23 22.9	177 15.4	N 3 19.7	36 45.7	S18 00.1
01	7 16.6	173 01.4	19.0	276 47.3	23.0	192 17.4	19.5	51 48.3	00.1
02	22 19.1	188 01.1	20.3	291 48.2	23.0	207 19.4	19.3	66 50.9	00.1
03	37 21.6	203 00.8	·· 21.6	306 49.1	·· 23.1	222 21.3	·· 19.1	81 53.5	·· 00.2
04	52 24.0	218 00.4	22.8	321 50.0	23.1	237 23.3	18.8	96 56.1	00.2
05	67 26.5	233 00.1	24.1	336 50.9	23.2	252 25.3	18.6	111 58.7	00.3
06	82 29.0	247 59.8	S 5 25.4	351 51.9	N23 23.2	267 27.2	N 3 18.4	127 01.2	S18 00.3
07	97 31.4	262 59.4	26.6	6 52.8	23.2	282 29.2	18.2	142 03.8	00.3
08	112 33.9	277 59.1	27.9	21 53.7	23.3	297 31.2	18.0	157 06.4	00.4
S 09	127 36.3	292 58.7	·· 29.2	36 54.6	·· 23.3	312 33.1	·· 17.8	172 09.0	·· 00.4
U 10	142 38.8	307 58.4	30.4	51 55.5	23.4	327 35.1	17.6	187 11.6	00.4
N 11	157 41.3	322 58.1	31.7	66 56.4	23.4	342 37.1	17.3	202 14.2	00.5
D 12	172 43.7	337 57.7	S 5 33.0	81 57.4	N23 23.5	357 39.0	N 3 17.1	217 16.8	S18 00.5
A 13	187 46.2	352 57.4	34.2	96 58.3	23.5	12 41.0	16.9	232 19.4	00.5
Y 14	202 48.7	7 57.0	35.5	111 59.2	23.6	27 43.0	16.7	247 22.0	00.6
15	217 51.1	22 56.7	·· 36.8	127 00.1	·· 23.6	42 44.9	·· 16.5	262 24.6	·· 00.6
16	232 53.6	37 56.4	38.0	142 01.0	23.7	57 46.9	16.3	277 27.2	00.7
17	247 56.1	52 56.0	39.3	157 02.0	23.7	72 48.9	16.1	292 29.7	00.7
18	262 58.5	67 55.7	S 5 40.6	172 02.9	N23 23.7	87 50.8	N 3 15.8	307 32.3	S18 00.7
19	278 01.0	82 55.3	41.9	187 03.8	23.8	102 52.8	15.6	322 34.9	00.8
20	293 03.5	97 55.0	43.1	202 04.7	23.8	117 54.8	15.4	337 37.5	00.8
21	308 05.9	112 54.7	·· 44.4	217 05.7	·· 23.9	132 56.7	·· 15.2	352 40.1	·· 00.8
22	323 08.4	127 54.3	45.7	232 06.6	23.9	147 58.7	15.0	7 42.7	00.9
23	338 10.8	142 54.0	46.9	247 07.5	24.0	163 00.7	14.8	22 45.3	00.9
14 00	353 13.3	157 53.6	S 5 48.2	262 08.4	N23 24.0	178 02.6	N 3 14.6	37 47.9	S18 00.9
01	8 15.8	172 53.3	49.5	277 09.3	24.0	193 04.6	14.4	52 50.5	01.0
02	23 18.2	187 53.0	50.7	292 10.3	24.1	208 06.6	14.1	67 53.0	01.0
03	38 20.7	202 52.6	·· 52.0	307 11.2	·· 24.1	223 08.5	·· 13.9	82 55.6	·· 01.0
04	53 23.2	217 52.3	53.3	322 12.1	24.2	238 10.5	13.7	97 58.2	01.1
05	68 25.6	232 51.9	54.5	337 13.0	24.2	253 12.5	13.5	113 00.8	01.1
06	83 28.1	247 51.6	S 5 55.8	352 14.0	N23 24.2	268 14.4	N 3 13.3	128 03.4	S18 01.1
07	98 30.6	262 51.2	57.0	7 14.9	24.3	283 16.4	13.1	143 06.0	01.2
08	113 33.0	277 50.9	58.3	22 15.8	24.3	298 18.4	12.9	158 08.6	01.2
M 09	128 35.5	292 50.6	5 59.6	37 16.8	·· 24.4	313 20.3	·· 12.6	173 11.2	·· 01.3
O 10	143 38.0	307 50.2	6 00.8	52 17.7	24.4	328 22.3	12.4	188 13.7	01.3
N 11	158 40.4	322 49.9	02.1	67 18.6	24.4	343 24.3	12.2	203 16.3	01.3
D 12	173 42.9	337 49.5	S 6 03.4	82 19.5	N23 24.5	358 26.2	N 3 12.0	218 18.9	S18 01.4
A 13	188 45.3	352 49.2	04.6	97 20.5	24.5	13 28.2	11.8	233 21.5	01.4
Y 14	203 47.8	7 48.8	05.9	112 21.4	24.6	28 30.2	11.6	248 24.1	01.4
15	218 50.3	22 48.5	·· 07.2	127 22.3	·· 24.6	43 32.1	·· 11.4	263 26.7	·· 01.5
16	233 52.7	37 48.1	08.4	142 23.2	24.6	58 34.1	11.1	278 29.3	01.5
17	248 55.2	52 47.8	09.7	157 24.2	24.7	73 36.1	10.9	293 31.9	01.5
18	263 57.7	67 47.5	S 6 11.0	172 25.1	N23 24.7	88 38.0	N 3 10.7	308 34.4	S18 01.6
19	279 00.1	82 47.1	12.2	187 26.0	24.8	103 40.0	10.5	323 37.0	01.6
20	294 02.6	97 46.8	13.5	202 27.0	24.8	118 42.0	10.3	338 39.6	01.6
21	309 05.1	112 46.4	·· 14.7	217 27.9	·· 24.8	133 43.9	·· 10.1	353 42.2	·· 01.7
22	324 07.5	127 46.1	16.0	232 28.8	24.9	148 45.9	09.9	8 44.8	01.7
23	339 10.0	142 45.7	17.3	247 29.8	24.9	163 47.9	09.7	23 47.4	01.7
Mer. Pass.	h m 0 31.0	v −0.3	d 1.3	v 0.9	d 0.0	v 2.0	d 0.2	v 2.6	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 29.8	S40 19.7
Achernar	335 37.7	S57 16.1
Acrux	173 27.5	S63 03.7
Adhara	255 24.9	S28 57.5
Aldebaran	291 07.1	N16 29.8
Alioth	166 34.6	N56 00.0
Alkaid	153 11.4	N49 21.1
Al Na'ir	28 02.6	S46 59.7
Alnilam	276 02.1	S 1 12.2
Alphard	218 11.6	S 8 37.5
Alphecca	126 24.3	N26 44.5
Alpheratz	357 59.2	N29 03.2
Altair	62 23.2	N 8 51.1
Ankaa	353 30.5	S42 20.5
Antares	112 45.4	S26 25.0
Arcturus	146 10.1	N19 13.3
Atria	108 01.3	S69 01.2
Avior	234 24.8	S59 29.0
Bellatrix	278 48.6	N 6 20.7
Betelgeuse	271 18.1	N 7 24.5
Canopus	264 03.2	S52 41.2
Capella	280 57.4	N45 59.4
Deneb	49 41.7	N45 15.6
Denebola	182 49.7	N14 36.8
Diphda	349 11.1	S18 01.3
Dubhe	194 11.1	N61 47.4
Elnath	278 32.2	N28 36.1
Eltanin	90 53.3	N51 29.7
Enif	34 02.0	N 9 50.7
Fomalhaut	15 40.6	S29 39.5
Gacrux	172 18.9	S57 04.5
Gienah	176 08.6	S17 30.1
Hadar	149 10.5	S60 20.5
Hamal	328 18.0	N23 25.8
Kaus Aust.	84 04.2	S34 23.4
Kochab	137 19.9	N74 11.3
Markab	13 53.5	N15 10.2
Menkar	314 31.1	N 4 03.9
Menkent	148 26.2	S36 20.2
Miaplacidus	221 43.8	S69 41.1
Mirfak	309 02.4	N49 50.1
Nunki	76 17.3	S26 18.4
Peacock	53 43.1	S56 45.6
Pollux	243 46.8	N28 02.6
Procyon	245 16.1	N 5 14.7
Rasalhague	96 20.8	N12 34.1
Regulus	208 00.3	N12 00.2
Rigel	281 26.9	S 8 12.4
Rigil Kent.	140 13.4	S60 48.5
Sabik	102 30.3	S15 43.0
Schedar	349 57.8	N56 29.9
Shaula	96 42.9	S37 06.0
Sirius	258 47.5	S16 42.2
Spica	158 47.9	S11 07.4
Suhail	223 04.3	S43 24.0
Vega	80 49.3	N38 46.9
Zuben'ubi	137 22.8	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	165 47.6	13 28
Mars	269 32.2	6 33
Jupiter	185 01.3	12 09
Saturn	44 31.5	21 29

UT (GMT)	SUN		MOON				Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.							
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
12 00	180 55.2	N 4 09.9	3 48.9	16.1	S 0 01.4	12.0	54.2	N 72	01 51	03 45	04 59	17 32	17 11	16 46	16 04
01	195 55.4	08.9	18 24.0	16.0	N 0 10.6	12.0	54.2	N 70	02 28	04 00	05 05	17 37	17 23	17 07	16 45
02	210 55.6	08.0	32 59.0	16.1	0 22.6	12.0	54.2	68	02 52	04 11	05 10	17 40	17 33	17 24	17 14
03	225 55.9	·· 07.0	47 34.1	16.1	0 34.6	12.0	54.3	66	03 11	04 21	05 14	17 43	17 40	17 38	17 35
04	240 56.1	06.1	62 09.2	16.0	0 46.6	12.0	54.3	64	03 26	04 29	05 18	17 46	17 47	17 49	17 53
05	255 56.3	05.1	76 44.2	16.0	0 58.6	12.0	54.3	62	03 38	04 35	05 21	17 49	17 53	17 59	18 07
06	270 56.5	N 4 04.2	91 19.2	16.0	N 1 10.6	12.0	54.3	60	03 48	04 41	05 23	17 51	17 58	18 07	18 19
07	285 56.7	03.2	105 54.2	16.0	1 22.6	12.0	54.3	N 58	03 57	04 46	05 26	17 52	18 03	18 14	18 30
S 08	300 57.0	02.2	120 29.2	16.0	1 34.6	12.0	54.3	56	04 04	04 50	05 28	17 54	18 07	18 21	18 39
A 09	315 57.2	·· 01.3	135 04.2	16.0	1 46.6	12.0	54.3	54	04 11	04 54	05 30	17 56	18 10	18 27	18 47
T 10	330 57.4	4 00.3	149 39.2	15.9	1 58.6	12.0	54.3	52	04 16	04 57	05 31	17 57	18 14	18 32	18 54
U 11	345 57.6	3 59.4	164 14.1	16.0	2 10.6	12.0	54.3	50	04 21	05 00	05 33	17 58	18 17	18 37	19 01
R 12	0 57.9	N 3 58.4	178 49.1	15.9	N 2 22.6	12.0	54.3	45	04 32	05 07	05 36	18 01	18 23	18 47	19 15
D 13	15 58.1	57.5	193 24.0	15.9	2 34.6	12.0	54.4	N 40	04 40	05 12	05 39	18 03	18 29	18 56	19 27
A 14	30 58.3	56.5	207 58.9	15.9	2 46.6	12.0	54.4	35	04 46	05 16	05 41	18 05	18 33	19 04	19 37
Y 15	45 58.5	·· 55.6	222 33.8	15.8	2 58.6	11.9	54.4	30	04 51	05 19	05 43	18 07	18 38	19 10	19 46
16	60 58.7	54.6	237 08.6	15.9	3 10.5	12.0	54.4	20	04 59	05 25	05 47	18 10	18 45	19 22	20 02
17	75 59.0	53.6	251 43.5	15.8	3 22.5	11.9	54.4	N 10	05 04	05 29	05 50	18 13	18 52	19 32	20 15
18	90 59.2	N 3 52.7	266 18.3	15.8	N 3 34.4	12.0	54.4	0	05 08	05 32	05 53	18 16	18 58	19 42	20 28
19	105 59.4	51.7	280 53.1	15.7	3 46.4	11.9	54.4	S 10	05 10	05 34	05 55	18 18	19 04	19 51	20 41
20	120 59.6	50.8	295 27.8	15.8	3 58.3	11.9	54.4	20	05 10	05 36	05 58	18 21	19 11	20 02	20 54
21	135 59.9	·· 49.8	310 02.6	15.7	4 10.2	11.9	54.4	30	05 09	05 37	06 01	18 24	19 18	20 13	21 10
22	151 00.1	48.9	324 37.3	15.7	4 22.1	11.9	54.4	35	05 08	05 37	06 02	18 26	19 23	20 20	21 20
23	166 00.3	47.9	339 12.0	15.6	4 34.0	11.9	54.5	40	05 06	05 37	06 04	18 28	19 28	20 28	21 30
13 00	181 00.5	N 3 47.0	353 46.6	15.7	N 4 45.9	11.9	54.5	45	05 03	05 37	06 06	18 31	19 34	20 38	21 43
01	196 00.7	46.0	8 21.3	15.6	4 57.8	11.8	54.5	S 50	04 59	05 36	06 08	18 34	19 41	20 49	21 58
02	211 01.0	45.0	22 55.9	15.6	5 09.6	11.8	54.5	52	04 57	05 36	06 09	18 35	19 44	20 54	22 05
03	226 01.2	·· 44.1	37 30.5	15.5	5 21.4	11.9	54.5	54	04 54	05 35	06 11	18 37	19 48	21 00	22 13
04	241 01.4	43.1	52 05.0	15.6	5 33.3	11.8	54.5	56	04 52	05 35	06 12	18 39	19 52	21 06	22 22
05	256 01.6	42.2	66 39.6	15.5	5 45.1	11.7	54.5	58	04 49	05 34	06 13	18 40	19 56	21 13	22 32
06	271 01.8	N 3 41.2	81 14.1	15.4	N 5 56.8	11.8	54.5	S 60	04 45	05 33	06 15	18 43	20 01	21 22	22 44
07	286 02.1	40.3	95 48.5	15.4	6 08.6	11.8	54.6								
08	301 02.3	39.3	110 22.9	15.4	6 20.4	11.7	54.6								
S 09	316 02.5	·· 38.3	124 57.3	15.4	6 32.1	11.7	54.6								
U 10	331 02.7	37.4	139 31.7	15.3	6 43.8	11.7	54.6								
N 11	346 03.0	36.4	154 06.0	15.3	6 55.5	11.6	54.6								
D 12	1 03.2	N 3 35.5	168 40.3	15.3	N 7 07.1	11.7	54.6								
A 13	16 03.4	34.5	183 14.6	15.2	7 18.8	11.6	54.6								
Y 14	31 03.6	33.5	197 48.8	15.2	7 30.4	11.5	54.6								
15	46 03.9	·· 32.6	212 23.0	15.1	7 41.9	11.6	54.7								
16	61 04.1	31.6	226 57.1	15.1	7 53.5	11.5	54.7								
17	76 04.3	30.7	241 31.2	15.1	8 05.0	11.5	54.7								
18	91 04.5	N 3 29.7	256 05.3	15.0	N 8 16.5	11.5	54.7								
19	106 04.7	28.8	270 39.3	15.0	8 28.0	11.4	54.7								
20	121 05.0	27.8	285 13.3	14.9	8 39.4	11.5	54.7								
21	136 05.2	·· 26.8	299 47.2	14.9	8 50.9	11.3	54.7								
22	151 05.4	25.9	314 21.1	14.8	9 02.2	11.4	54.8								
23	166 05.6	24.9	328 54.9	14.8	9 13.6	11.3	54.8								
14 00	181 05.9	N 3 24.0	343 28.7	14.8	N 9 24.9	11.3	54.8								
01	196 06.1	23.0	358 02.5	14.7	9 36.2	11.3	54.8								
02	211 06.3	22.0	12 36.2	14.7	9 47.5	11.2	54.8								
03	226 06.5	·· 21.1	27 09.9	14.6	9 58.7	11.1	54.8								
04	241 06.7	20.1	41 43.5	14.6	10 09.8	11.2	54.8								
05	256 07.0	19.2	56 17.1	14.5	10 21.0	11.1	54.9								
06	271 07.2	N 3 18.2	70 50.6	14.5	N10 32.1	11.1	54.9								
07	286 07.4	17.2	85 24.1	14.4	10 43.2	11.0	54.9								
08	301 07.6	16.3	99 57.5	14.4	10 54.2	11.0	54.9								
M 09	316 07.9	·· 15.3	114 30.9	14.3	11 05.2	10.9	54.9								
O 10	331 08.1	14.4	129 04.2	14.3	11 16.1	10.9	54.9								
N 11	346 08.3	13.4	143 37.5	14.2	11 27.0	10.9	55.0								
D 12	1 08.5	N 3 12.4	158 10.7	14.1	N11 37.9	10.8	55.0								
A 13	16 08.8	11.5	172 43.8	14.2	11 48.7	10.8	55.0								
Y 14	31 09.0	10.5	187 17.0	14.0	11 59.5	10.7	55.0								
15	46 09.2	·· 09.6	201 50.0	14.0	12 10.2	10.7	55.0								
16	61 09.4	08.6	216 23.0	13.9	12 20.9	10.6	55.0								
17	76 09.6	07.6	230 55.9	13.9	12 31.5	10.6	55.1								
18	91 09.9	N 3 06.7	245 28.8	13.9	N12 42.1	10.5	55.1								
19	106 10.1	05.7	260 01.7	13.7	12 52.6	10.5	55.1								
20	121 10.3	04.7	274 34.4	13.7	13 03.1	10.4	55.1								
21	136 10.5	·· 03.8	289 07.1	13.7	13 13.5	10.4	55.1								
22	151 10.8	02.8	303 39.8	13.6	13 23.9	10.3	55.1								
23	166 11.0	01.9	318 12.4	13.5	13 34.2	10.3	55.2								
	S.D. 15.9	d 1.0	S.D.	14.8		14.9		15.0							

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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
12	03 40	03 51	11 56	24 26	12 05	15	
13	04 02	04 12	11 56	00 26	12 47	16	○
14	04 23	04 34	11 55	01 08	13 30	17	

UT (GMT)	ARIES	VENUS −3.9		MARS +0.4		JUPITER −1.7		SATURN +0.4	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
21 00	0 07.3	156 53.2	S 9 17.5	264 48.8	N23 28.0	183 33.0	N 2 38.7	45 00.8	S18 06.3
01	15 09.7	171 52.8	18.7	279 49.8	28.0	198 35.0	38.5	60 03.4	06.3
02	30 12.2	186 52.4	19.9	294 50.8	28.0	213 36.9	38.2	75 06.0	06.3
03	45 14.7	201 52.1	·· 21.2	309 51.8	·· 28.0	228 38.9	·· 38.0	90 08.5	·· 06.4
04	60 17.1	216 51.7	22.4	324 52.8	28.0	243 40.9	37.8	105 11.1	06.4
05	75 19.6	231 51.3	23.6	339 53.8	28.0	258 42.8	37.6	120 13.6	06.4
06	90 22.1	246 50.9	S 9 24.8	354 54.8	N23 28.0	273 44.8	N 2 37.4	135 16.2	S18 06.4
07	105 24.5	261 50.5	26.0	9 55.8	28.1	288 46.8	37.2	150 18.8	06.5
08	120 27.0	276 50.1	27.3	24 56.8	28.1	303 48.7	37.0	165 21.3	06.5
M 09	135 29.5	291 49.8	·· 28.5	39 57.7	·· 28.1	318 50.7	·· 36.7	180 23.9	·· 06.5
O 10	150 31.9	306 49.4	29.7	54 58.7	28.1	333 52.7	36.5	195 26.5	06.6
N 11	165 34.4	321 49.0	30.9	69 59.7	28.1	348 54.6	36.3	210 29.0	06.6
D 12	180 36.9	336 48.6	S 9 32.1	85 00.7	N23 28.1	3 56.6	N 2 36.1	225 31.6	S18 06.6
A 13	195 39.3	351 48.2	33.3	100 01.7	28.1	18 58.6	35.9	240 34.2	06.6
Y 14	210 41.8	6 47.8	34.6	115 02.7	28.1	34 00.5	35.7	255 36.7	06.7
15	225 44.2	21 47.4	·· 35.8	130 03.7	·· 28.1	49 02.5	·· 35.5	270 39.3	·· 06.7
16	240 46.7	36 47.1	37.0	145 04.7	28.1	64 04.5	35.3	285 41.8	06.7
17	255 49.2	51 46.7	38.2	160 05.7	28.1	79 06.4	35.0	300 44.4	06.7
18	270 51.6	66 46.3	S 9 39.4	175 06.7	N23 28.1	94 08.4	N 2 34.8	315 47.0	S18 06.8
19	285 54.1	81 45.9	40.6	190 07.7	28.1	109 10.4	34.6	330 49.5	06.8
20	300 56.6	96 45.5	41.9	205 08.7	28.1	124 12.3	34.4	345 52.1	06.8
21	315 59.0	111 45.1	·· 43.1	220 09.7	·· 28.1	139 14.3	·· 34.2	0 54.7	·· 06.9
22	331 01.5	126 44.7	44.3	235 10.7	28.1	154 16.3	34.0	15 57.2	06.9
23	346 04.0	141 44.3	45.5	250 11.7	28.1	169 18.2	33.8	30 59.8	06.9
22 00	1 06.4	156 44.0	S 9 46.7	265 12.7	N23 28.1	184 20.2	N 2 33.5	46 02.3	S18 06.9
01	16 08.9	171 43.6	47.9	280 13.7	28.1	199 22.2	33.3	61 04.9	07.0
02	31 11.3	186 43.2	49.1	295 14.7	28.1	214 24.1	33.1	76 07.5	07.0
03	46 13.8	201 42.8	·· 50.3	310 15.7	·· 28.1	229 26.1	·· 32.9	91 10.0	·· 07.0
04	61 16.3	216 42.4	51.6	325 16.7	28.1	244 28.1	32.7	106 12.6	07.0
05	76 18.7	231 42.0	52.8	340 17.7	28.1	259 30.0	32.5	121 15.1	07.1
06	91 21.2	246 41.6	S 9 54.0	355 18.7	N23 28.1	274 32.0	N 2 32.3	136 17.7	S18 07.1
07	106 23.7	261 41.2	55.2	10 19.7	28.1	289 34.0	32.1	151 20.3	07.1
T 08	121 26.1	276 40.8	56.4	25 20.7	28.1	304 35.9	31.8	166 22.8	07.2
U 09	136 28.6	291 40.4	·· 57.6	40 21.7	·· 28.1	319 37.9	·· 31.6	181 25.4	·· 07.2
E 10	151 31.1	306 40.1	9 58.8	55 22.7	28.1	334 39.9	31.4	196 27.9	07.2
S 11	166 33.5	321 39.7	10 00.0	70 23.7	28.1	349 41.8	31.2	211 30.5	07.2
D 12	181 36.0	336 39.3	S10 01.2	85 24.7	N23 28.1	4 43.8	N 2 31.0	226 33.1	S18 07.3
A 13	196 38.5	351 38.9	02.4	100 25.7	28.1	19 45.8	30.8	241 35.6	07.3
Y 14	211 40.9	6 38.5	03.7	115 26.7	28.1	34 47.7	30.6	256 38.2	07.3
15	226 43.4	21 38.1	·· 04.9	130 27.7	·· 28.1	49 49.7	·· 30.3	271 40.7	·· 07.3
16	241 45.8	36 37.7	06.1	145 28.7	28.1	64 51.7	30.1	286 43.3	07.4
17	256 48.3	51 37.3	07.3	160 29.7	28.1	79 53.6	29.9	301 45.9	07.4
18	271 50.8	66 36.9	S10 08.5	175 30.7	N23 28.1	94 55.6	N 2 29.7	316 48.4	S18 07.4
19	286 53.2	81 36.5	09.7	190 31.7	28.1	109 57.6	29.5	331 51.0	07.4
20	301 55.7	96 36.1	10.9	205 32.7	28.1	124 59.5	29.3	346 53.5	07.5
21	316 58.2	111 35.7	·· 12.1	220 33.7	·· 28.1	140 01.5	·· 29.1	1 56.1	·· 07.5
22	332 00.6	126 35.3	13.3	235 34.7	28.1	155 03.5	28.8	16 58.7	07.5
23	347 03.1	141 34.9	14.5	250 35.7	28.1	170 05.4	28.6	32 01.2	07.5
23 00	2 05.6	156 34.5	S10 15.7	265 36.7	N23 28.1	185 07.4	N 2 28.4	47 03.8	S18 07.6
01	17 08.0	171 34.1	16.9	280 37.8	28.1	200 09.4	28.2	62 06.3	07.6
02	32 10.5	186 33.7	18.1	295 38.8	28.1	215 11.3	28.0	77 08.9	07.6
03	47 13.0	201 33.3	·· 19.3	310 39.8	·· 28.1	230 13.3	·· 27.8	92 11.4	·· 07.6
04	62 15.4	216 32.9	20.5	325 40.8	28.1	245 15.3	27.6	107 14.0	07.7
05	77 17.9	231 32.5	21.7	340 41.8	28.1	260 17.2	27.4	122 16.6	07.7
06	92 20.3	246 32.1	S10 22.9	355 42.8	N23 28.1	275 19.2	N 2 27.1	137 19.1	S18 07.7
W 07	107 22.8	261 31.8	24.1	10 43.8	28.1	290 21.2	26.9	152 21.7	07.8
E 08	122 25.3	276 31.4	25.3	25 44.8	28.1	305 23.1	26.7	167 24.2	07.8
D 09	137 27.7	291 31.0	·· 26.5	40 45.8	·· 28.1	320 25.1	·· 26.5	182 26.8	·· 07.8
N 10	152 30.2	306 30.6	27.7	55 46.9	28.1	335 27.1	26.3	197 29.3	07.8
E 11	167 32.7	321 30.2	28.9	70 47.9	28.1	350 29.0	26.1	212 31.9	07.9
S 12	182 35.1	336 29.8	S10 30.1	85 48.9	N23 28.1	5 31.0	N 2 25.9	227 34.5	S18 07.9
D 13	197 37.6	351 29.4	31.3	100 49.9	28.1	20 33.0	25.7	242 37.0	07.9
A 14	212 40.1	6 29.0	32.5	115 50.9	28.1	35 34.9	25.4	257 39.6	07.9
Y 15	227 42.5	21 28.5	·· 33.7	130 51.9	·· 28.1	50 36.9	·· 25.2	272 42.1	·· 08.0
16	242 45.0	36 28.1	34.9	145 52.9	28.1	65 38.9	25.0	287 44.7	08.0
17	257 47.4	51 27.7	36.1	160 54.0	28.1	80 40.8	24.8	302 47.2	08.0
18	272 49.9	66 27.3	S10 37.3	175 55.0	N23 28.1	95 42.8	N 2 24.6	317 49.8	S18 08.0
19	287 52.4	81 26.9	38.5	190 56.0	28.0	110 44.8	24.4	332 52.3	08.1
20	302 54.8	96 26.5	39.7	205 57.0	28.0	125 46.7	24.2	347 54.9	08.1
21	317 57.3	111 26.1	·· 40.9	220 58.0	·· 28.0	140 48.7	·· 23.9	2 57.5	·· 08.1
22	332 59.8	126 25.7	42.1	235 59.0	28.0	155 50.7	23.7	18 00.0	08.1
23	348 02.2	141 25.3	43.3	251 00.1	28.0	170 52.6	23.5	33 02.6	08.2
Mer. Pass.	h m 23 51.7	v −0.4	d 1.2	v 1.0	d 0.0	v 2.0	d 0.2	v 2.6	d 0.0

STARS			
Name	S.H.A.	Dec.	
	° ′	° ′	
Acamar	315 29.7	S40 19.7	
Achernar	335 37.6	S57 16.1	
Acrux	173 27.5	S63 03.6	
Adhara	255 24.8	S28 57.5	
Aldebaran	291 07.0	N16 29.8	
Alioth	166 34.7	N56 00.0	
Alkaid	153 11.4	N49 21.1	
Al Na'ir	28 02.6	S46 59.7	
Alnilam	276 02.0	S 1 12.2	
Alphard	218 11.5	S 8 37.5	
Alphecca	126 24.3	N26 44.5	
Alpheratz	357 59.2	N29 03.2	
Altair	62 23.2	N 8 51.2	
Ankaa	353 30.4	S42 20.5	
Antares	112 45.4	S26 25.0	
Arcturus	146 10.1	N19 13.3	
Atria	108 01.4	S69 01.2	
Avior	234 24.8	S59 28.9	
Bellatrix	278 48.6	N 6 20.7	
Betelgeuse	271 18.0	N 7 24.5	
Canopus	264 03.1	S52 41.2	
Capella	280 57.3	N45 59.4	
Deneb	49 41.8	N45 15.6	
Denebola	182 49.7	N14 36.8	
Diphda	349 11.0	S18 01.3	
Dubhe	194 11.1	N61 47.3	
Elnath	278 32.1	N28 36.1	
Eltanin	90 53.3	N51 29.7	
Enif	34 02.1	N 9 50.7	
Fomalhaut	15 40.6	S29 39.5	
Gacrux	172 18.9	S57 04.4	
Gienah	176 08.6	S17 30.1	
Hadar	149 10.6	S60 20.5	
Hamal	328 18.0	N23 25.9	
Kaus Aust.	84 04.3	S34 23.4	
Kochab	137 20.0	N74 11.3	
Markab	13 53.5	N15 10.2	
Menkar	314 31.0	N 4 03.9	
Menkent	148 26.2	S36 20.2	
Miaplacidus	221 43.7	S69 41.1	
Mirfak	309 02.3	N49 50.1	
Nunki	76 17.4	S26 18.4	
Peacock	53 43.1	S56 45.6	
Pollux	243 46.8	N28 02.6	
Procyon	245 16.0	N 5 14.7	
Rasalhague	96 20.8	N12 34.1	
Regulus	208 00.2	N12 00.2	
Rigel	281 26.9	S 8 12.4	
Rigil Kent.	140 13.5	S60 48.5	
Sabik	102 30.4	S15 45.0	
Schedar	349 57.8	N56 30.0	
Shaula	96 43.0	S37 06.0	
Sirius	258 47.4	S16 42.2	
Spica	158 47.9	S11 07.4	
Suhail	223 04.2	S43 24.0	
Vega	80 49.4	N38 46.9	
Zuben'ubi	137 22.8	S16 00.7	

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	155 37.5	13 33
Mars	264 06.2	6 19
Jupiter	183 13.8	11 41
Saturn	44 55.9	20 52

UT (GMT)	SUN			MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
	G.H.A.	Dec.		G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′		° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
									N 72	02 59	04 31	05 39	▭	23 30	26 02	02 02
21 00	181 43.3	N 0 41.6		255 53.9	6.5	N21 17.1	6.4	59.0	N 70	03 19	04 39	05 41	21 23	23 59	26 15	02 15
01	196 43.5	40.6		270 19.4	6.4	21 10.7	6.6	59.0	68	03 35	04 46	05 42	22 09	24 20	00 20	02 25
02	211 43.7	39.6		284 44.8	6.5	21 04.1	6.7	59.1	66	03 47	04 51	05 43	22 39	24 37	00 37	02 33
03	226 43.9	·· 38.6		299 10.3	6.5	20 57.4	6.8	59.1	64	03 57	04 56	05 43	23 01	24 50	00 50	02 40
04	241 44.1	37.7		313 35.8	6.5	20 50.6	7.0	59.1	62	04 06	05 00	05 44	23 19	25 02	01 02	02 45
05	256 44.4	36.7		328 01.3	6.6	20 43.6	7.1	59.2	60	04 13	05 03	05 45	23 33	25 11	01 11	02 51
06	271 44.6	N 0 35.7		342 26.9	6.5	N20 36.5	7.2	59.2	N 58	04 19	05 06	05 45	23 46	25 19	01 19	02 55
07	286 44.8	34.7		356 52.4	6.6	20 29.3	7.4	59.2	56	04 24	05 08	05 45	23 57	25 27	01 27	02 59
08	301 45.0	33.8		11 18.0	6.6	20 21.9	7.5	59.3	54	04 28	05 10	05 46	24 06	00 06	01 33	03 02
M 09	316 45.2	·· 32.8		25 43.6	6.6	20 14.4	7.7	59.3	52	04 33	05 12	05 46	24 14	00 14	01 39	03 06
O 10	331 45.5	31.8		40 09.2	6.6	20 06.7	7.8	59.3	50	04 36	05 14	05 46	24 22	00 22	01 44	03 08
N 11	346 45.7	30.9		54 34.8	6.6	19 58.9	7.9	59.3	45	04 43	05 18	05 47	24 38	00 38	01 56	03 15
D 12	1 45.9	N 0 29.9		69 00.4	6.7	N19 51.0	8.1	59.4	N 40	04 49	05 21	05 48	24 51	00 51	02 05	03 20
A 13	16 46.1	28.9		83 26.1	6.7	19 42.9	8.2	59.4	35	04 53	05 23	05 48	25 02	01 02	02 13	03 24
Y 14	31 46.3	27.9		97 51.8	6.7	19 34.7	8.3	59.4	30	04 57	05 24	05 48	00 05	01 12	02 20	03 28
15	46 46.6	·· 27.0		112 17.5	6.8	19 26.4	8.5	59.5	20	05 01	05 27	05 49	00 26	01 28	02 32	03 35
16	61 46.8	26.0		126 43.3	6.8	19 17.9	8.6	59.5	N 10	05 04	05 28	05 49	00 43	01 43	02 42	03 41
17	76 47.0	25.0		141 09.1	6.8	19 09.3	8.7	59.5	0	05 05	05 29	05 49	00 59	01 56	02 52	03 47
18	91 47.2	N 0 24.1		155 34.9	6.8	N19 00.6	8.9	59.6	S 10	05 04	05 28	05 49	01 16	02 10	03 02	03 52
19	106 47.4	23.1		170 00.7	6.9	18 51.7	8.9	59.6	20	05 02	05 27	05 49	01 33	02 24	03 12	03 58
20	121 47.7	22.1		184 26.6	6.8	18 42.8	9.2	59.6	30	04 58	05 25	05 49	01 53	02 41	03 24	04 05
21	136 47.9	·· 21.1		198 52.4	6.9	18 33.6	9.2	59.6	35	04 55	05 24	05 49	02 05	02 50	03 31	04 09
22	151 48.1	20.2		213 18.3	7.0	18 24.4	9.4	59.7	40	04 50	05 22	05 49	02 18	03 01	03 39	04 13
23	166 48.3	19.2		227 44.3	7.0	18 15.0	9.4	59.7	45	04 45	05 20	05 49	02 34	03 13	03 48	04 18
22 00	181 48.5	N 0 18.2		242 10.3	7.0	N18 05.6	9.6	59.7	S 50	04 38	05 16	05 48	02 53	03 29	03 58	04 24
01	196 48.8	17.2		256 36.3	7.0	17 56.0	9.8	59.8	52	04 35	05 15	05 48	03 02	03 36	04 03	04 27
02	211 49.0	16.3		271 02.3	7.0	17 46.2	9.8	59.8	54	04 31	05 13	05 48	03 12	03 44	04 09	04 30
03	226 49.2	·· 15.3		285 28.3	7.1	17 36.4	10.0	59.8	56	04 27	05 11	05 48	03 24	03 53	04 15	04 33
04	241 49.4	14.3		299 54.4	7.2	17 26.4	10.1	59.8	58	04 22	05 09	05 48	03 37	04 03	04 22	04 37
05	256 49.6	13.3		314 20.6	7.1	17 16.3	10.2	59.9	S 60	04 16	05 06	05 47	03 52	04 14	04 29	04 41
06	271 49.9	N 0 12.4		328 46.7	7.2	N17 06.1	10.3	59.9								
07	286 50.1	11.4		343 12.9	7.2	16 55.8	10.5	59.9								
T 08	301 50.3	10.4		357 39.1	7.3	16 45.3	10.5	59.9								
U 09	316 50.5	·· 09.5		12 05.4	7.2	16 34.8	10.7	60.0								
E 10	331 50.7	08.5		26 31.6	7.4	16 24.1	10.8	60.0								
S 11	346 51.0	07.5		40 58.0	7.3	16 13.3	10.9	60.0								
D 12	1 51.2	N 0 06.5		55 24.3	7.4	N16 02.4	11.0	60.0								
A 13	16 51.4	05.6		69 50.7	7.4	15 51.4	11.1	60.1								
Y 14	31 51.6	04.6		84 17.1	7.4	15 40.3	11.3	60.1								
15	46 51.8	·· 03.6		98 43.5	7.5	15 29.0	11.3	60.1								
16	61 52.1	02.6		113 10.0	7.5	15 17.7	11.4	60.1								
17	76 52.3	01.7		127 36.5	7.6	15 06.3	11.6	60.2								
18	91 52.5	N 0 00.7		142 03.1	7.6	N14 54.7	11.6	60.2	N 58	17 59	18 38	19 25	15 48	16 10	16 27	16 41
19	106 52.7	S 0 00.3		156 29.7	7.6	14 43.1	11.8	60.2	56	17 59	18 36	19 20	15 36	16 02	16 22	16 39
20	121 52.9	01.3		170 56.3	7.6	14 31.3	11.8	60.2	54	17 58	18 33	19 15	15 26	15 54	16 17	16 37
21	136 53.1	·· 02.2		185 22.9	7.7	14 19.5	12.0	60.3	52	17 58	18 32	19 11	15 17	15 48	16 13	16 35
22	151 53.4	03.2		199 49.6	7.7	14 07.5	12.0	60.3	50	17 58	18 30	19 08	15 09	15 42	16 09	16 34
23	166 53.6	04.2		214 16.3	7.8	13 55.5	12.1	60.3	45	17 57	18 27	19 01	14 52	15 29	16 01	16 30
23 00	181 53.8	S 0 05.1		228 43.1	7.8	N13 43.4	12.3	60.3	N 40	17 57	18 24	18 55	14 38	15 18	15 54	16 27
01	196 54.0	06.1		243 09.9	7.8	13 31.1	12.3	60.4	35	17 57	18 22	18 51	14 26	15 09	15 48	16 25
02	211 54.2	07.1		257 36.7	7.8	13 18.8	12.4	60.4	30	17 56	18 20	18 48	14 16	15 01	15 43	16 23
03	226 54.5	·· 08.1		272 03.5	7.9	13 06.4	12.5	60.4	20	17 56	18 18	18 44	13 58	14 47	15 34	16 19
04	241 54.7	09.0		286 30.4	7.9	12 53.9	12.6	60.4	N 10	17 56	18 17	18 41	13 42	14 35	15 26	16 15
05	256 54.9	10.0		300 57.3	8.0	12 41.3	12.7	60.4	0	17 56	18 17	18 40	13 27	14 23	15 18	16 12
06	271 55.1	S 0 11.0		315 24.3	8.0	N12 28.6	12.8	60.5	S 10	17 56	18 17	18 41	13 12	14 11	15 10	16 09
W 07	286 55.3	12.0		329 51.3	8.0	12 15.8	12.8	60.5	20	17 56	18 18	18 44	12 55	13 59	15 02	16 05
E 08	301 55.5	12.9		344 18.3	8.0	12 03.0	13.0	60.5	30	17 56	18 20	18 48	12 37	13 44	14 52	16 01
D 09	316 55.8	·· 13.9		358 45.3	8.1	11 50.0	13.0	60.5	35	17 57	18 22	18 51	12 26	13 36	14 47	15 58
N 10	331 56.0	14.9		13 12.4	8.1	11 37.0	13.1	60.5	40	17 57	18 24	18 55	12 13	13 26	14 40	15 56
E 11	346 56.2	15.9		27 39.5	8.2	11 23.9	13.2	60.5	45	17 57	18 26	19 01	11 58	13 14	14 33	15 52
S 12	1 56.4	S 0 16.8		42 06.7	8.1	N11 10.7	13.3	60.6	S 50	17 58	18 30	19 08	11 40	13 00	14 24	15 48
D 13	16 56.6	17.8		56 33.8	8.2	10 57.4	13.3	60.6	52	17 58	18 32	19 11	11 31	12 54	14 20	15 47
A 14	31 56.8	18.8		71 01.0	8.3	10 44.1	13.4	60.6	54	17 58	18 33	19 15	11 21	12 47	14 15	15 45
Y 15	46 57.1	·· 19.8		85 28.3	8.2	10 30.7	13.5	60.6	56	17 58	18 36	19 20	11 10	12 38	14 10	15 42
16	61 57.3	20.7		99 55.5	8.3	10 17.2	13.5	60.6	58	17 59	18 38	19 25	10 58	12 29	14 04	15 40
17	76 57.5	21.7		114 22.8	8.3	10 03.7	13.7	60.6	S 60	17 59	18 41	19 31	10 43	12 19	13 58	15 37
18	91 57.7	S 0 22.7		128 50.1	8.4	N 9 50.0	13.6	60.7								
19	106 57.9	23.7		143 17.5	8.3	9 36.4	13.8	60.7								
20	121 58.2	24.6		157 44.8	8.4	9 22.6	13.8	60.7								
21	136 58.4	·· 25.6		172 12.2	8.5	9 08.8	13.9	60.7								
22	151 58.6	26.6		186 39.7	8.4	8 54.9	14.0	60.7								
23	166 58.8	27.5		201 07.1	8.5	8 40.9	14.0	60.7								
	S.D. 16.0	d 1.0		S.D. 16.2		16.4		16.5								

Lat.	Sunset	Twilight Civil	Twilight Naut.
	h m	h m	h m
N 72	18 03	19 11	20 41
N 70	18 02	19 04	20 22
68	18 02	18 57	20 07
66	18 01	18 52	19 55
64	18 00	18 48	19 46
62	18 00	18 44	19 38
60	17 59	18 41	19 31
N 58	17 59	18 38	19 25
56	17 59	18 36	19 20
54	17 58	18 33	19 15
52	17 58	18 32	19 11
50	17 58	18 30	19 08
45	17 57	18 27	19 01
N 40	17 57	18 24	18 55
35	17 57	18 22	18 51
30	17 56	18 20	18 48
20	17 56	18 18	18 44
N 10	17 56	18 17	18 41
0	17 56	18 17	18 40
S 10	17 56	18 17	18 41
20	17 56	18 18	18 44
30	17 56	18 20	18 48
35	17 57	18 22	18 51
40	17 57	18 24	18 55
45	17 57	18 26	19 01
S 50	17 58	18 30	19 08
52	17 58	18 32	19 11
54	17 58	18 33	19 15
56	17 58	18 36	19 20
58	17 59	18 38	19 25
S 60	17 59	18 41	19 31

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

UT (GMT)	ARIES	VENUS −3.9		MARS +0.2		JUPITER −1.7		SATURN +0.5	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
9 00	17 51.8	153 32.8	S17 20.8	272 40.4	N23 16.4	197 44.2	N 1 07.3	63 14.1	S18 14.0
01	32 54.2	168 32.3	21.8	287 41.6	16.3	212 46.2	07.1	78 16.6	14.0
02	47 56.7	183 31.7	22.8	302 42.8	16.3	227 48.1	06.9	93 19.1	14.0
03	62 59.2	198 31.2	23.8	317 44.0	16.2	242 50.1	06.7	108 21.5	14.0
04	78 01.6	213 30.6	24.8	332 45.2	16.2	257 52.1	06.5	123 24.0	14.0
05	93 04.1	228 30.0	25.8	347 46.4	16.1	272 54.1	06.2	138 26.5	14.0
06	108 06.6	243 29.5	S17 26.8	2 47.6	N23 16.1	287 56.1	N 1 06.0	153 29.0	S18 14.0
07	123 09.0	258 28.9	27.7	17 48.8	16.0	302 58.0	05.8	168 31.5	14.1
08	138 11.5	273 28.3	28.7	32 50.0	16.0	318 00.0	05.6	183 34.0	14.1
F 09	153 14.0	288 27.8	29.7	47 51.2	15.9	333 02.0	05.4	198 36.5	14.1
R 10	168 16.4	303 27.2	30.7	62 52.5	15.9	348 04.0	05.2	213 39.0	14.1
I 11	183 18.9	318 26.7	31.7	77 53.7	15.8	3 05.9	05.0	228 41.5	14.1
D 12	198 21.3	333 26.1	S17 32.6	92 54.9	N23 15.8	18 07.9	N 1 04.8	243 44.0	S18 14.1
A 13	213 23.8	348 25.5	33.6	107 56.1	15.7	33 09.9	04.6	258 46.5	14.1
Y 14	228 26.3	3 25.0	34.6	122 57.3	15.7	48 11.9	04.4	273 49.0	14.1
15	243 28.7	18 24.4	35.6	137 58.5	15.6	63 13.8	04.2	288 51.5	14.1
16	258 31.2	33 23.8	36.6	152 59.7	15.5	78 15.8	04.0	303 54.0	14.1
17	273 33.7	48 23.3	37.5	168 01.0	15.5	93 17.8	03.8	318 56.4	14.1
18	288 36.1	63 22.7	S17 38.5	183 02.2	N23 15.4	108 19.8	N 1 03.5	333 58.9	S18 14.1
19	303 38.6	78 22.1	39.5	198 03.4	15.4	123 21.8	03.3	349 01.4	14.1
20	318 41.1	93 21.5	40.4	213 04.6	15.3	138 23.7	03.1	4 03.9	14.1
21	333 43.5	108 21.0	41.4	228 05.8	15.3	153 25.7	02.9	19 06.4	14.1
22	348 46.0	123 20.4	42.4	243 07.0	15.2	168 27.7	02.7	34 08.9	14.2
23	3 48.5	138 19.8	43.4	258 08.3	15.2	183 29.7	02.5	49 11.4	14.2
10 00	18 50.9	153 19.3	S17 44.3	273 09.5	N23 15.1	198 31.6	N 1 02.3	64 13.9	S18 14.2
01	33 53.4	168 18.7	45.3	288 10.7	15.1	213 33.6	02.1	79 16.4	14.2
02	48 55.8	183 18.1	46.3	303 11.9	15.0	228 35.6	01.9	94 18.9	14.2
03	63 58.3	198 17.5	47.2	318 13.2	15.0	243 37.6	01.7	109 21.4	14.2
04	79 00.8	213 17.0	48.2	333 14.4	14.9	258 39.6	01.5	124 23.8	14.2
05	94 03.2	228 16.4	49.2	348 15.6	14.9	273 41.5	01.3	139 26.3	14.2
06	109 05.7	243 15.8	S17 50.1	3 16.8	N23 14.8	288 43.5	N 1 01.0	154 28.8	S18 14.2
07	124 08.2	258 15.2	51.1	18 18.1	14.7	303 45.5	00.8	169 31.3	14.2
S 08	139 10.6	273 14.7	52.1	33 19.3	14.7	318 47.5	00.6	184 33.8	14.2
A 09	154 13.1	288 14.1	53.0	48 20.5	14.6	333 49.4	00.4	199 36.3	14.2
T 10	169 15.6	303 13.5	54.0	63 21.7	14.6	348 51.4	00.2	214 38.8	14.2
U 11	184 18.0	318 12.9	55.0	78 23.0	14.5	3 53.4	1 00.0	229 41.3	14.2
R 12	199 20.5	333 12.4	S17 55.9	93 24.2	N23 14.5	18 55.4	N 0 59.8	244 43.8	S18 14.2
D 13	214 23.0	348 11.8	56.9	108 25.4	14.4	33 57.4	59.6	259 46.2	14.2
A 14	229 25.4	3 11.2	57.8	123 26.6	14.4	48 59.3	59.4	274 48.7	14.2
Y 15	244 27.9	18 10.6	58.8	138 27.9	14.3	64 01.3	59.2	289 51.2	14.3
16	259 30.3	33 10.1	17 59.7	153 29.1	14.3	79 03.3	59.0	304 53.7	14.3
17	274 32.8	48 09.5	18 00.7	168 30.3	14.2	94 05.3	58.8	319 56.2	14.3
18	289 35.3	63 08.9	S18 01.7	183 31.6	N23 14.1	109 07.2	N 0 58.6	334 58.7	S18 14.3
19	304 37.7	78 08.3	02.6	198 32.8	14.1	124 09.2	58.4	350 01.2	14.3
20	319 40.2	93 07.7	03.6	213 34.0	14.0	139 11.2	58.1	5 03.7	14.3
21	334 42.7	108 07.1	04.5	228 35.3	14.0	154 13.2	57.9	20 06.1	14.3
22	349 45.1	123 06.6	05.5	243 36.5	13.9	169 15.2	57.7	35 08.6	14.3
23	4 47.6	138 06.0	06.4	258 37.7	13.9	184 17.1	57.5	50 11.1	14.3
11 00	19 50.1	153 05.4	S18 07.4	273 39.0	N23 13.8	199 19.1	N 0 57.3	65 13.6	S18 14.3
01	34 52.5	168 04.8	08.3	288 40.2	13.8	214 21.1	57.1	80 16.1	14.3
02	49 55.0	183 04.2	09.3	303 41.4	13.7	229 23.1	56.9	95 18.6	14.3
03	64 57.5	198 03.6	10.2	318 42.7	13.6	244 25.1	56.7	110 21.1	14.3
04	79 59.9	213 03.1	11.2	333 43.9	13.6	259 27.0	56.5	125 23.5	14.3
05	95 02.4	228 02.5	12.1	348 45.2	13.5	274 29.0	56.3	140 26.0	14.3
06	110 04.8	243 01.9	S18 13.1	3 46.4	N23 13.5	289 31.0	N 0 56.1	155 28.5	S18 14.3
07	125 07.3	258 01.3	14.0	18 47.6	13.4	304 33.0	55.9	170 31.0	14.3
08	140 09.8	273 00.7	15.0	33 48.9	13.4	319 35.0	55.7	185 33.5	14.3
S 09	155 12.2	288 00.1	15.9	48 50.1	13.3	334 36.9	55.5	200 36.0	14.3
U 10	170 14.7	302 59.5	16.9	63 51.4	13.3	349 38.9	55.2	215 38.5	14.3
N 11	185 17.2	317 58.9	17.8	78 52.6	13.2	4 40.9	55.0	230 40.9	14.4
D 12	200 19.6	332 58.4	S18 18.7	93 53.8	N23 13.1	19 42.9	N 0 54.8	245 43.4	S18 14.4
A 13	215 22.1	347 57.8	19.7	108 55.1	13.1	34 44.9	54.6	260 45.9	14.4
Y 14	230 24.6	2 57.2	20.6	123 56.3	13.0	49 46.8	54.4	275 48.4	14.4
15	245 27.0	17 56.6	21.6	138 57.6	13.0	64 48.8	54.2	290 50.9	14.4
16	260 29.5	32 56.0	22.5	153 58.8	12.9	79 50.8	54.0	305 53.4	14.4
17	275 31.9	47 55.4	23.4	169 00.1	12.9	94 52.8	53.8	320 55.8	14.4
18	290 34.4	62 54.8	S18 24.4	184 01.3	N23 12.8	109 54.7	N 0 53.6	335 58.3	S18 14.4
19	305 36.9	77 54.2	25.3	199 02.6	12.8	124 56.7	53.4	351 00.8	14.4
20	320 39.3	92 53.6	26.2	214 03.8	12.7	139 58.7	53.2	6 03.3	14.4
21	335 41.8	107 53.0	27.2	229 05.1	12.6	155 00.7	53.0	21 05.8	14.4
22	350 44.3	122 52.4	28.1	244 06.3	12.6	170 02.7	52.8	36 08.3	14.4
23	5 46.7	137 51.8	29.0	259 07.6	12.5	185 04.6	52.6	51 10.7	14.4
Mer. Pass.	h m 22 40.9	v −0.6	d 1.0	v 1.2	d 0.1	v 2.0	d 0.2	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 29.6	S40 19.7
Achernar	335 37.5	S57 16.2
Acrux	173 27.4	S63 03.5
Adhara	255 24.6	S28 57.5
Aldebaran	291 06.9	N16 29.8
Alioth	166 34.7	N55 59.9
Alkaid	153 11.4	N49 21.0
Al Na'ir	28 02.7	S46 59.8
Alnilam	276 01.9	S 1 12.2
Alphard	218 11.4	S 8 37.5
Alphecca	126 24.4	N26 44.5
Alpheratz	357 59.2	N29 03.3
Altair	62 23.3	N 8 51.2
Ankaa	353 30.4	S42 20.6
Antares	112 45.5	S26 25.0
Arcturus	146 10.1	N19 13.2
Atria	108 01.6	S69 01.1
Avior	234 24.6	S59 28.9
Bellatrix	278 48.4	N 6 20.7
Betelgeuse	271 17.9	N 7 24.5
Canopus	264 02.9	S52 41.2
Capella	280 57.1	N45 59.4
Deneb	49 41.9	N45 15.6
Denebola	182 49.7	N14 36.7
Diphda	349 11.0	S18 01.4
Dubhe	194 11.0	N61 47.2
Elnath	278 32.0	N28 36.1
Eltanin	90 53.5	N51 29.7
Enif	34 02.1	N 9 50.8
Fomalhaut	15 40.6	S29 39.5
Gacrux	172 18.9	S57 04.3
Gienah	176 08.6	S17 30.1
Hadar	149 10.6	S60 20.4
Hamal	328 17.9	N23 25.9
Kaus Aust.	84 04.4	S34 23.4
Kochab	137 20.3	N74 11.2
Markab	13 53.5	N15 10.3
Menkar	314 30.9	N 4 03.9
Menkent	148 26.3	S36 20.1
Miaplacidus	221 43.5	S69 41.0
Mirfak	309 02.2	N49 50.2
Nunki	76 17.5	S26 18.4
Peacock	53 43.3	S56 45.6
Pollux	243 46.6	N28 02.6
Procyon	245 15.9	N 5 14.7
Rasalhague	96 20.9	N12 34.1
Regulus	208 00.1	N12 00.1
Rigel	281 26.7	S 8 12.4
Rigil Kent.	140 13.5	S60 48.4
Sabik	102 30.4	S15 43.0
Schedar	349 57.7	N56 30.1
Shaula	96 43.1	S37 06.0
Sirius	258 47.3	S16 42.2
Spica	158 47.9	S11 07.4
Suhail	223 04.1	S43 24.0
Vega	80 49.5	N38 46.9
Zuben'ubi	137 22.9	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	134 28.3	13 47
Mars	254 18.6	5 47
Jupiter	179 40.7	10 44
Saturn	45 23.0	19 40

UT (GMT)	SUN			MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
	G.H.A.	Dec.		G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′		° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
9 00	183 10.2	S 6 16.6		33 30.1	16.0	S 1 17.1	11.9	54.3	N 72	04 34	05 52	07 01	15 51	15 31	15 09	14 36
01	198 10.3	17.5		48 05.1	16.0	1 05.2	11.9	54.3	N 70	04 40	05 51	06 53	15 53	15 40	15 26	15 08
02	213 10.5	18.5		62 40.1	16.0	0 53.3	11.9	54.3	68	04 45	05 50	06 46	15 55	15 48	15 40	15 32
03	228 10.7	19.4		77 15.1	16.0	0 41.4	11.9	54.3	66	04 49	05 49	06 40	15 57	15 54	15 52	15 50
04	243 10.9	20.4		91 50.1	16.0	0 29.5	11.9	54.3	64	04 53	05 48	06 35	15 58	15 59	16 01	16 05
05	258 11.0	21.3		106 25.1	16.0	0 17.6	11.9	54.3	62	04 55	05 47	06 31	15 59	16 04	16 10	16 18
06	273 11.2	S 6 22.3		121 00.1	16.0	S 0 05.7	11.9	54.4	60	04 58	05 46	06 28	16 00	16 08	16 17	16 28
07	288 11.4	23.2		135 35.1	15.9	N 0 06.2	12.0	54.4	N 58	04 59	05 45	06 24	16 01	16 11	16 23	16 38
08	303 11.5	24.2		150 10.0	16.0	0 18.2	11.9	54.4	56	05 01	05 44	06 21	16 02	16 15	16 29	16 46
F 09	318 11.7	25.1		164 45.0	15.9	0 30.1	11.9	54.4	54	05 02	05 43	06 19	16 03	16 18	16 34	16 53
R 10	333 11.9	26.1		179 19.9	15.9	0 42.0	12.0	54.4	52	05 03	05 43	06 16	16 04	16 20	16 38	17 00
I 11	348 12.0	27.0		193 54.8	15.9	0 54.0	11.9	54.4	50	05 04	05 42	06 14	16 04	16 23	16 43	17 06
D 12	3 12.2	S 6 28.0		208 29.7	15.9	N 1 05.9	11.9	54.4	45	05 06	05 40	06 09	16 06	16 28	16 52	17 19
A 13	18 12.4	28.9		223 04.6	15.9	1 17.8	12.0	54.4	N 40	05 07	05 38	06 05	16 07	16 32	16 59	17 30
Y 14	33 12.5	29.9		237 39.5	15.8	1 29.8	11.9	54.4	35	05 07	05 37	06 02	16 08	16 36	17 06	17 39
15	48 12.7	30.8		252 14.3	15.8	1 41.7	11.9	54.5	30	05 07	05 35	05 59	16 09	16 39	17 12	17 47
16	63 12.9	31.8		266 49.1	15.8	1 53.6	12.0	54.5	20	05 06	05 31	05 53	16 11	16 45	17 22	18 01
17	78 13.1	32.7		281 23.9	15.8	2 05.6	11.9	54.5	N 10	05 03	05 27	05 48	16 12	16 51	17 31	18 14
18	93 13.2	S 6 33.7		295 58.7	15.8	N 2 17.5	11.9	54.5	0	04 59	05 23	05 44	16 13	16 56	17 39	18 25
19	108 13.4	34.6		310 33.5	15.7	2 29.4	12.0	54.5	S 10	04 53	05 18	05 39	16 15	17 01	17 48	18 37
20	123 13.6	35.5		325 08.2	15.7	2 41.4	11.9	54.5	20	04 45	05 11	05 34	16 16	17 06	17 57	18 50
21	138 13.7	36.5		339 42.9	15.7	2 53.3	11.9	54.5	30	04 35	05 03	05 27	16 18	17 12	18 07	19 04
22	153 13.9	37.4		354 17.6	15.7	3 05.2	11.9	54.5	35	04 28	04 58	05 24	16 19	17 16	18 13	19 13
23	168 14.1	38.4		8 52.3	15.6	3 17.1	11.9	54.5	40	04 20	04 52	05 20	16 20	17 20	18 20	19 22
10 00	183 14.2	S 6 39.3		23 26.9	15.6	N 3 29.0	11.9	54.6	45	04 09	04 45	05 15	16 22	17 24	18 28	19 34
01	198 14.4	40.3		38 01.5	15.6	3 40.9	11.9	54.6	S 50	03 56	04 36	05 09	16 23	17 30	18 38	19 48
02	213 14.6	41.2		52 36.1	15.6	3 52.8	11.9	54.6	52	03 49	04 32	05 07	16 24	17 33	18 43	19 54
03	228 14.7	42.2		67 10.7	15.5	4 04.7	11.8	54.6	54	03 42	04 27	05 04	16 25	17 36	18 48	20 01
04	243 14.9	43.1		81 45.2	15.5	4 16.5	11.9	54.6	56	03 34	04 22	05 01	16 26	17 39	18 53	20 09
05	258 15.1	44.1		96 19.7	15.5	4 28.4	11.8	54.6	58	03 24	04 16	04 57	16 27	17 42	19 00	20 19
06	273 15.2	S 6 45.0		110 54.2	15.4	N 4 40.2	11.8	54.6	S 60	03 13	04 09	04 53	16 28	17 46	19 07	20 29
07	288 15.4	46.0		125 28.6	15.4	4 52.0	11.9	54.7								
S 08	303 15.6	46.9		140 03.0	15.4	5 03.9	11.8	54.7								
A 09	318 15.7	47.8		154 37.4	15.3	5 15.7	11.7	54.7								
T 10	333 15.9	48.8		169 11.7	15.4	5 27.4	11.8	54.7								
U 11	348 16.0	49.7		183 46.1	15.2	5 39.2	11.8	54.7								
R 12	3 16.2	S 6 50.7		198 20.3	15.3	N 5 51.0	11.7	54.7								
D 13	18 16.4	51.6		212 54.6	15.2	6 02.7	11.7	54.7								
A 14	33 16.5	52.6		227 28.8	15.1	6 14.4	11.7	54.8								
Y 15	48 16.7	53.5		242 02.9	15.1	6 26.1	11.7	54.8								
16	63 16.9	54.5		256 37.0	15.1	6 37.8	11.7	54.8								
17	78 17.0	55.4		271 11.1	15.1	6 49.5	11.6	54.8								
18	93 17.2	S 6 56.3		285 45.2	15.0	N 7 01.1	11.6	54.8								
19	108 17.4	57.3		300 19.2	15.0	7 12.7	11.6	54.8								
20	123 17.5	58.2		314 53.2	14.9	7 24.3	11.6	54.8								
21	138 17.7	6 59.2		329 27.1	14.9	7 35.9	11.5	54.9								
22	153 17.8	7 00.1		344 01.0	14.8	7 47.4	11.6	54.9								
23	168 18.0	01.1		358 34.8	14.8	7 59.0	11.4	54.9								
11 00	183 18.2	S 7 02.0		13 08.6	14.7	N 8 10.4	11.5	54.9								
01	198 18.3	02.9		27 42.3	14.7	8 21.9	11.4	54.9								
02	213 18.5	03.9		42 16.0	14.7	8 33.3	11.5	54.9								
03	228 18.7	04.8		56 49.7	14.6	8 44.8	11.3	54.9								
04	243 18.8	05.8		71 23.3	14.6	8 56.1	11.4	55.0								
05	258 19.0	06.7		85 56.9	14.5	9 07.5	11.3	55.0								
06	273 19.1	S 7 07.6		100 30.4	14.5	N 9 18.8	11.3	55.0								
07	288 19.3	08.6		115 03.9	14.4	9 30.1	11.2	55.0								
08	303 19.5	09.5		129 37.3	14.3	9 41.3	11.3	55.0								
S 09	318 19.6	10.5		144 10.6	14.3	9 52.6	11.1	55.0								
U 10	333 19.8	11.4		158 43.9	14.3	10 03.7	11.2	55.1								
N 11	348 19.9	12.4		173 17.2	14.2	10 14.9	11.1	55.1								
D 12	3 20.1	S 7 13.3		187 50.4	14.2	N10 26.0	11.1	55.1								
A 13	18 20.3	14.2		202 23.6	14.1	10 37.1	11.0	55.1								
Y 14	33 20.4	15.2		216 56.7	14.0	10 48.1	11.0	55.1								
15	48 20.6	16.1		231 29.7	14.0	10 59.1	10.9	55.1								
16	63 20.7	17.1		246 02.7	14.0	11 10.0	10.9	55.2								
17	78 20.9	18.0		260 35.7	13.9	11 20.9	10.9	55.2								
18	93 21.0	S 7 18.9		275 08.6	13.8	N11 31.8	10.8	55.2								
19	108 21.2	19.9		289 41.4	13.8	11 42.6	10.8	55.2								
20	123 21.4	20.8		304 14.2	13.7	11 53.4	10.7	55.2								
21	138 21.5	21.8		318 46.9	13.6	12 04.1	10.7	55.2								
22	153 21.7	22.7		333 19.5	13.6	12 14.8	10.7	55.3								
23	168 21.8	23.6		347 52.1	13.5	12 25.5	10.5	55.3								
	S.D. 16.0	d 0.9		S.D.	14.8		14.9	15.0								

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

Day	SUN Eqn. of Time 00^h	SUN Eqn. of Time 12^h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
9	12 40	12 49	11 47	22 23	10 03	13	
10	12 57	13 05	11 47	23 06	10 44	14	○
11	13 12	13 20	11 47	23 50	11 28	15	

UT (GMT)	ARIES	VENUS −4.0		MARS +0.1		JUPITER −1.7		SATURN +0.5	
d h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12 00	20 49.2	152 51.2	S18 30.0	274 08.8	N23 12.5	200 06.6	N 0 52.4	66 13.2	S18 14.4
01	35 51.7	167 50.6	30.9	289 10.1	12.4	215 08.6	52.1	81 15.7	14.4
02	50 54.1	182 50.1	31.8	304 11.3	12.4	230 10.6	51.9	96 18.2	14.4
03	65 56.6	197 49.5	·· 32.8	319 12.6	·· 12.3	245 12.6	·· 51.7	111 20.7	·· 14.4
04	80 59.1	212 48.9	33.7	334 13.8	12.2	260 14.5	51.5	126 23.1	14.4
05	96 01.5	227 48.3	34.6	349 15.1	12.2	275 16.5	51.3	141 25.6	14.4
06	111 04.0	242 47.7	S18 35.5	4 16.3	N23 12.1	290 18.5	N 0 51.1	156 28.1	S18 14.4
07	126 06.4	257 47.1	36.5	19 17.6	12.1	305 20.5	50.9	171 30.6	14.4
08	141 08.9	272 46.5	37.4	34 18.8	12.0	320 22.5	50.7	186 33.1	14.4
M 09	156 11.4	287 45.9	·· 38.3	49 20.1	·· 12.0	335 24.4	·· 50.5	201 35.6	·· 14.4
O 10	171 13.8	302 45.3	39.2	64 21.3	11.9	350 26.4	50.3	216 38.0	14.4
N 11	186 16.3	317 44.7	40.2	79 22.6	11.8	5 28.4	50.1	231 40.5	14.4
D 12	201 18.8	332 44.1	S18 41.1	94 23.9	N23 11.8	20 30.4	N 0 49.9	246 43.0	S18 14.5
A 13	216 21.2	347 43.5	42.0	109 25.1	11.7	35 32.4	49.7	261 45.5	14.5
Y 14	231 23.7	2 42.9	42.9	124 26.4	11.7	50 34.4	49.5	276 48.0	14.5
15	246 26.2	17 42.2	·· 43.9	139 27.6	·· 11.6	65 36.3	·· 49.3	291 50.4	·· 14.5
16	261 28.6	32 41.6	44.8	154 28.9	11.6	80 38.3	49.0	306 52.9	14.5
17	276 31.1	47 41.0	45.7	169 30.2	11.5	95 40.3	48.8	321 55.4	14.5
18	291 33.6	62 40.4	S18 46.6	184 31.4	N23 11.4	110 42.3	N 0 48.6	336 57.9	S18 14.5
19	306 36.0	77 39.8	47.5	199 32.7	11.4	125 44.3	48.4	352 00.3	14.5
20	321 38.5	92 39.2	48.4	214 33.9	11.3	140 46.2	48.2	7 02.8	14.5
21	336 40.9	107 38.6	·· 49.4	229 35.2	·· 11.3	155 48.2	·· 48.0	22 05.3	·· 14.5
22	351 43.4	122 38.0	50.3	244 36.5	11.2	170 50.2	47.8	37 07.8	14.5
23	6 45.9	137 37.4	51.2	259 37.7	11.2	185 52.2	47.6	52 10.3	14.5
13 00	21 48.3	152 36.8	S18 52.1	274 39.0	N23 11.1	200 54.2	N 0 47.4	67 12.7	S18 14.5
01	36 50.8	167 36.2	53.0	289 40.3	11.0	215 56.1	47.2	82 15.2	14.5
02	51 53.3	182 35.6	53.9	304 41.5	11.0	230 58.1	47.0	97 17.7	14.5
03	66 55.7	197 35.0	·· 54.8	319 42.8	·· 10.9	246 00.1	·· 46.8	112 20.2	·· 14.5
04	81 58.2	212 34.4	55.7	334 44.1	10.9	261 02.1	46.6	127 22.6	14.5
05	97 00.7	227 33.7	56.6	349 45.3	10.8	276 04.1	46.4	142 25.1	14.5
06	112 03.1	242 33.1	S18 57.6	4 46.6	N23 10.8	291 06.0	N 0 46.2	157 27.6	S18 14.5
07	127 05.6	257 32.5	58.5	19 47.9	10.7	306 08.0	46.0	172 30.1	14.5
T 08	142 08.0	272 31.9	18 59.4	34 49.1	10.6	321 10.0	45.8	187 32.6	14.5
U 09	157 10.5	287 31.3	19 00.3	49 50.4	·· 10.6	336 12.0	·· 45.5	202 35.0	·· 14.5
E 10	172 13.0	302 30.7	01.2	64 51.7	10.5	351 14.0	45.3	217 37.5	14.5
S 11	187 15.4	317 30.1	02.1	79 53.0	10.5	6 16.0	45.1	232 40.0	14.5
D 12	202 17.9	332 29.5	S19 03.0	94 54.2	N23 10.4	21 17.9	N 0 44.9	247 42.5	S18 14.5
A 13	217 20.4	347 28.8	03.9	109 55.5	10.4	36 19.9	44.7	262 44.9	14.5
Y 14	232 22.8	2 28.2	04.8	124 56.8	10.3	51 21.9	44.5	277 47.4	14.5
15	247 25.3	17 27.6	·· 05.7	139 58.1	·· 10.2	66 23.9	·· 44.3	292 49.9	·· 14.5
16	262 27.8	32 27.0	06.6	154 59.3	10.2	81 25.9	44.1	307 52.4	14.5
17	277 30.2	47 26.4	07.5	170 00.6	10.1	96 27.8	43.9	322 54.8	14.5
18	292 32.7	62 25.8	S19 08.4	185 01.9	N23 10.1	111 29.8	N 0 43.7	337 57.3	S18 14.5
19	307 35.2	77 25.1	09.3	200 03.2	10.0	126 31.8	43.5	352 59.8	14.5
20	322 37.6	92 24.5	10.2	215 04.4	09.9	141 33.8	43.3	8 02.3	14.5
21	337 40.1	107 23.9	·· 11.1	230 05.7	·· 09.9	156 35.8	·· 43.1	23 04.7	·· 14.5
22	352 42.5	122 23.3	12.0	245 07.0	09.8	171 37.8	42.9	38 07.2	14.5
23	7 45.0	137 22.7	12.8	260 08.3	09.8	186 39.7	42.7	53 09.7	14.5
14 00	22 47.5	152 22.0	S19 13.7	275 09.6	N23 09.7	201 41.7	N 0 42.5	68 12.2	S18 14.5
01	37 49.9	167 21.4	14.6	290 10.9	09.7	216 43.7	42.3	83 14.6	14.5
02	52 52.4	182 20.8	15.5	305 12.1	09.6	231 45.7	42.0	98 17.1	14.5
03	67 54.9	197 20.2	·· 16.4	320 13.4	·· 09.5	246 47.7	·· 41.8	113 19.6	·· 14.5
04	82 57.3	212 19.5	17.3	335 14.7	09.5	261 49.7	41.6	128 22.1	14.5
05	97 59.8	227 18.9	18.2	350 16.0	09.4	276 51.6	41.4	143 24.5	14.5
06	113 02.3	242 18.3	S19 19.1	5 17.3	N23 09.4	291 53.6	N 0 41.2	158 27.0	S18 14.6
W 07	128 04.7	257 17.7	20.0	20 18.6	09.3	306 55.6	41.0	173 29.5	14.6
E 08	143 07.2	272 17.0	20.8	35 19.9	09.2	321 57.6	40.8	188 31.9	14.6
D 09	158 09.7	287 16.4	·· 21.7	50 21.1	·· 09.2	336 59.6	·· 40.6	203 34.4	·· 14.6
N 10	173 12.1	302 15.8	22.6	65 22.4	09.1	352 01.5	40.4	218 36.9	14.6
E 11	188 14.6	317 15.2	23.5	80 23.7	09.1	7 03.5	40.2	233 39.4	14.6
S 12	203 17.0	332 14.5	S19 24.4	95 25.0	N23 09.0	22 05.5	N 0 40.0	248 41.8	S18 14.6
D 13	218 19.5	347 13.9	25.3	110 26.3	08.9	37 07.5	39.8	263 44.3	14.6
A 14	233 22.0	2 13.3	26.1	125 27.6	08.9	52 09.5	39.6	278 46.8	14.6
Y 15	248 24.4	17 12.6	·· 27.0	140 28.9	·· 08.8	67 11.5	·· 39.4	293 49.2	·· 14.6
16	263 26.9	32 12.0	27.9	155 30.2	08.8	82 13.4	39.2	308 51.7	14.6
17	278 29.4	47 11.4	28.8	170 31.5	08.7	97 15.4	39.0	323 54.2	14.6
18	293 31.8	62 10.8	S19 29.6	185 32.8	N23 08.7	112 17.4	N 0 38.8	338 56.7	S18 14.6
19	308 34.3	77 10.1	30.5	200 34.1	08.6	127 19.4	38.6	353 59.1	14.6
20	323 36.8	92 09.5	31.4	215 35.4	08.5	142 21.4	38.4	9 01.6	14.6
21	338 39.2	107 08.9	·· 32.3	230 36.7	·· 08.5	157 23.4	·· 38.2	24 04.1	·· 14.6
22	353 41.7	122 08.2	33.1	245 38.0	08.4	172 25.3	37.9	39 06.5	14.6
23	8 44.1	137 07.6	34.0	260 39.2	08.4	187 27.3	37.7	54 09.0	14.6
Mer. Pass.	h m 22 29.1	v −0.6	d 0.9	v 1.3	d 0.1	v 2.0	d 0.2	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 29.6	S40 19.8
Achernar	335 37.5	S57 16.2
Acrux	173 27.4	S63 03.5
Adhara	255 24.6	S28 57.5
Aldebaran	291 06.9	N16 29.8
Alioth	166 34.7	N55 59.9
Alkaid	153 11.5	N49 21.0
Al Na'ir	28 02.7	S46 59.8
Alnilam	276 01.9	S 1 12.2
Alphard	218 11.4	S 8 37.5
Alphecca	126 24.4	N26 44.5
Alpheratz	357 59.2	N29 03.3
Altair	62 23.3	N 8 51.2
Ankaa	353 30.4	S42 20.6
Antares	112 45.5	S26 25.0
Arcturus	146 10.1	N19 13.2
Atria	108 01.6	S69 01.1
Avior	234 24.5	S59 28.9
Bellatrix	278 48.4	N 6 20.7
Betelgeuse	271 17.9	N 7 24.5
Canopus	264 02.8	S52 41.2
Capella	280 57.1	N45 59.4
Deneb	49 41.9	N45 15.6
Denebola	182 49.7	N14 36.7
Diphda	349 11.0	S18 01.4
Dubhe	194 10.9	N61 47.2
Elnath	278 32.0	N28 36.1
Eltanin	90 53.5	N51 29.7
Enif	34 02.1	N 9 50.8
Fomalhaut	15 40.7	S29 39.5
Gacrux	172 18.9	S57 04.3
Gienah	176 08.6	S17 30.1
Hadar	149 10.6	S60 20.4
Hamal	328 17.9	N23 25.9
Kaus Aust.	84 04.4	S34 23.4
Kochab	137 20.3	N74 11.2
Markab	13 53.5	N15 10.3
Menkar	314 30.9	N 4 03.9
Menkent	148 26.3	S36 20.1
Miaplacidus	221 43.4	S69 41.0
Mirfak	309 02.2	N49 50.2
Nunki	76 17.5	S26 18.4
Peacock	53 43.3	S56 45.6
Pollux	243 46.6	N28 02.6
Procyon	245 15.9	N 5 14.7
Rasalhague	96 20.9	N12 34.1
Regulus	208 00.1	N12 00.1
Rigel	281 26.7	S 8 12.4
Rigil Kent.	140 13.6	S60 48.4
Sabik	102 30.5	S15 42.9
Schedar	349 57.7	N56 30.1
Shaula	96 43.1	S37 06.0
Sirius	258 47.2	S16 42.2
Spica	158 47.9	S11 07.4
Suhail	223 04.0	S43 24.0
Vega	80 49.5	N38 46.9
Zuben'ubi	137 22.9	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	130 48.5	13 50
Mars	252 50.7	5 41
Jupiter	179 05.8	10 35
Saturn	45 24.4	19 28

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
d h	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
12 00	183 22.0	S 7 24.6	2 24.6	13.5	N12 36.0	10.6	55.3	N 72	04 47	06 06	07 15	14 36	▭	▭	▭
01	198 22.1	25.5	16 57.1	13.4	12 46.6	10.5	55.3	N 70	04 52	06 03	07 05	15 08	14 37	▭	▭
02	213 22.3	26.4	31 29.5	13.4	12 57.1	10.4	55.3	68	04 56	06 00	06 57	15 32	15 20	14 58	▭
03	228 22.5	·· 27.4	46 01.9	13.3	13 07.5	10.4	55.4	66	04 59	05 58	06 50	15 50	15 49	15 52	16 03
04	243 22.6	28.3	60 34.2	13.2	13 17.9	10.3	55.4	64	05 01	05 56	06 44	16 05	16 12	16 24	16 51
05	258 22.8	29.3	75 06.4	13.2	13 28.2	10.3	55.4	62	05 03	05 54	06 39	16 18	16 29	16 49	17 21
06	273 22.9	S 7 30.2	89 38.6	13.1	N13 38.5	10.2	55.4	60	05 05	05 53	06 35	16 28	16 44	17 08	17 44
07	288 23.1	31.1	104 10.7	13.0	13 48.7	10.2	55.4	N 58	05 06	05 51	06 31	16 38	16 57	17 24	18 03
08	303 23.2	32.1	118 42.7	13.0	13 58.9	10.1	55.4	56	05 07	05 50	06 27	16 46	17 08	17 38	18 19
M 09	318 23.4	·· 33.0	133 14.7	12.9	14 09.0	10.1	55.5	54	05 08	05 49	06 24	16 53	17 18	17 50	18 32
O 10	333 23.5	33.9	147 46.6	12.8	14 19.1	10.0	55.5	52	05 08	05 48	06 22	17 00	17 26	18 00	18 44
N 11	348 23.7	34.9	162 18.4	12.8	14 29.1	9.9	55.5	50	05 09	05 46	06 19	17 06	17 34	18 10	18 54
D 12	3 23.9	S 7 35.8	176 50.2	12.7	N14 39.0	9.9	55.5	45	05 10	05 44	06 13	17 19	17 51	18 29	19 16
A 13	18 24.0	36.8	191 21.9	12.7	14 48.9	9.8	55.5	N 40	05 10	05 41	06 08	17 30	18 05	18 45	19 34
Y 14	33 24.2	37.7	205 53.6	12.6	14 58.7	9.7	55.6	35	05 10	05 39	06 04	17 39	18 16	18 59	19 49
15	48 24.3	·· 38.6	220 25.2	12.5	15 08.4	9.7	55.6	30	05 09	05 37	06 01	17 47	18 27	19 11	20 01
16	63 24.5	39.6	234 56.7	12.4	15 18.1	9.6	55.6	20	05 06	05 32	05 54	18 01	18 44	19 32	20 24
17	78 24.6	40.5	249 28.1	12.4	15 27.7	9.6	55.6	N 10	05 03	05 27	05 48	18 14	19 00	19 49	20 43
18	93 24.8	S 7 41.4	263 59.5	12.3	N15 37.3	9.5	55.6	0	04 58	05 22	05 43	18 25	19 14	20 06	21 01
19	108 24.9	42.4	278 30.8	12.3	15 46.8	9.4	55.6	S 10	04 51	05 16	05 37	18 37	19 29	20 23	21 19
20	123 25.1	43.3	293 02.1	12.1	15 56.2	9.3	55.7	20	04 43	05 09	05 31	18 50	19 45	20 41	21 38
21	138 25.2	·· 44.2	307 33.2	12.1	16 05.5	9.3	55.7	30	04 31	05 00	05 24	19 04	20 03	21 02	22 00
22	153 25.4	45.2	322 04.3	12.1	16 14.8	9.2	55.7	35	04 24	04 54	05 20	19 13	20 13	21 14	22 13
23	168 25.5	46.1	336 35.4	11.9	16 24.0	9.1	55.7	40	04 15	04 47	05 15	19 22	20 25	21 28	22 29
13 00	183 25.7	S 7 47.0	351 06.3	11.9	N16 33.1	9.1	55.7	45	04 03	04 39	05 10	19 34	20 40	21 45	22 47
01	198 25.8	48.0	5 37.2	11.8	16 42.2	9.0	55.8	S 50	03 49	04 30	05 03	19 48	20 58	22 06	23 09
02	213 26.0	48.9	20 08.0	11.8	16 51.2	8.9	55.8	52	03 42	04 25	05 00	19 54	21 06	22 16	23 20
03	228 26.1	·· 49.8	34 38.8	11.7	17 00.1	8.8	55.8	54	03 34	04 20	04 57	20 01	21 15	22 27	23 32
04	243 26.3	50.8	49 09.5	11.6	17 08.9	8.8	55.8	56	03 25	04 14	04 53	20 09	21 26	22 39	23 46
05	258 26.4	51.7	63 40.1	11.5	17 17.7	8.6	55.8	58	03 14	04 07	04 49	20 19	21 38	22 54	24 02
06	273 26.6	S 7 52.6	78 10.6	11.5	N17 26.3	8.6	55.9	S 60	03 02	03 59	04 44	20 29	21 52	23 12	24 22
07	288 26.7	53.6	92 41.1	11.4	17 34.9	8.5	55.9								
T 08	303 26.9	54.5	107 11.5	11.3	17 43.4	8.5	55.9								
U 09	318 27.0	·· 55.4	121 41.8	11.3	17 51.9	8.3	55.9								
E 10	333 27.2	56.4	136 12.1	11.1	18 00.2	8.3	55.9								
S 11	348 27.3	57.3	150 42.2	11.2	18 08.5	8.2	56.0								
D 12	3 27.5	S 7 58.2	165 12.4	11.0	N18 16.7	8.1	56.0								
A 13	18 27.6	7 59.2	179 42.4	11.0	18 24.8	8.0	56.0								
Y 14	33 27.8	8 00.1	194 12.4	10.9	18 32.8	7.9	56.0								
15	48 27.9	·· 01.0	208 42.3	10.8	18 40.7	7.8	56.0								
16	63 28.1	02.0	223 12.1	10.7	18 48.5	7.7	56.1								
17	78 28.2	02.9	237 41.8	10.7	18 56.2	7.7	56.1								
18	93 28.4	S 8 03.8	252 11.5	10.6	N19 03.9	7.6	56.1								
19	108 28.5	04.8	266 41.1	10.6	19 11.5	7.4	56.1								
20	123 28.7	05.7	281 10.7	10.4	19 18.9	7.4	56.1								
21	138 28.8	·· 06.6	295 40.1	10.4	19 26.3	7.3	56.2								
22	153 29.0	07.5	310 09.5	10.3	19 33.6	7.1	56.2								
23	168 29.1	08.5	324 38.8	10.3	19 40.7	7.1	56.2								
14 00	183 29.2	S 8 09.4	339 08.1	10.2	N19 47.8	7.0	56.2								
01	198 29.4	10.3	353 37.3	10.1	19 54.8	6.9	56.2								
02	213 29.5	11.3	8 06.4	10.0	20 01.7	6.8	56.3								
03	228 29.7	·· 12.2	22 35.4	10.0	20 08.5	6.6	56.3								
04	243 29.8	13.1	37 04.4	9.9	20 15.1	6.6	56.3								
05	258 30.0	14.1	51 33.3	9.8	20 21.7	6.5	56.3								
06	273 30.1	S 8 15.0	66 02.1	9.8	N20 28.2	6.4	56.3								
W 07	288 30.3	15.9	80 30.9	9.7	20 34.6	6.2	56.4								
E 08	303 30.4	16.8	94 59.6	9.6	20 40.8	6.2	56.4								
D 09	318 30.6	·· 17.8	109 28.2	9.6	20 47.0	6.1	56.4								
N 10	333 30.7	18.7	123 56.8	9.5	20 53.1	5.9	56.4								
E 11	348 30.8	19.6	138 25.3	9.4	20 59.0	5.8	56.4								
S 12	3 31.0	S 8 20.6	152 53.7	9.3	N21 04.8	5.8	56.5								
D 13	18 31.1	21.5	167 22.0	9.3	21 10.6	5.6	56.5								
A 14	33 31.3	22.4	181 50.3	9.3	21 16.2	5.5	56.5								
Y 15	48 31.4	·· 23.3	196 18.6	9.1	21 21.7	5.4	56.5								
16	63 31.5	24.3	210 46.7	9.1	21 27.1	5.2	56.5								
17	78 31.7	25.2	225 14.8	9.1	21 32.3	5.2	56.6								
18	93 31.8	S 8 26.1	239 42.9	8.9	N21 37.5	5.1	56.6								
19	108 32.0	27.0	254 10.8	8.9	21 42.6	4.9	56.6								
20	123 32.1	28.0	268 38.7	8.9	21 47.5	4.8	56.6								
21	138 32.3	·· 28.9	283 06.6	8.8	21 52.3	4.7	56.6								
22	153 32.4	29.8	297 34.4	8.7	21 57.0	4.6	56.7								
23	168 32.5	30.7	312 02.1	8.7	22 01.6	4.4	56.7								
	S.D. 16.1	d 0.9	S.D.	15.1		15.3	15.4								

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

UT (GMT)	ARIES	VENUS −4.1		MARS −0.8		JUPITER −1.8		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
29 00	68 07.9	137 45.2	S24 27.8	307 54.4	N23 02.6	239 02.0	S 2 38.0	111 57.0	S17 46.3
01	83 10.3	152 44.4	27.4	322 56.9	02.8	254 04.1	38.2	126 59.3	46.3
02	98 12.8	167 43.7	27.0	337 59.3	02.9	269 06.1	38.3	142 01.6	46.2
03	113 15.3	182 42.9	- - 26.6	353 01.7	- - 03.0	284 08.2	- - 38.5	157 03.9	- - 46.2
04	128 17.7	197 42.1	26.2	8 04.2	03.1	299 10.3	38.6	172 06.1	46.1
05	143 20.2	212 41.4	25.8	23 06.6	03.2	314 12.4	38.8	187 08.4	46.1
06	158 22.7	227 40.6	S24 25.4	38 09.1	N23 03.3	329 14.5	S 2 38.9	202 10.7	S17 46.0
07	173 25.1	242 39.9	25.0	53 11.5	03.5	344 16.6	39.1	217 13.0	46.0
08	188 27.6	257 39.1	24.6	68 14.0	03.6	359 18.7	39.2	232 15.3	45.9
S 09	203 30.0	272 38.3	- - 24.2	83 16.4	- - 03.7	14 20.8	- - 39.4	247 17.6	- - 45.9
U 10	218 32.5	287 37.6	23.8	98 18.9	03.8	29 22.9	39.5	262 19.9	45.8
N 11	233 35.0	302 36.8	23.4	113 21.3	03.9	44 25.0	39.7	277 22.2	45.8
D 12	248 37.4	317 36.0	S24 23.0	128 23.8	N23 04.0	59 27.1	S 2 39.8	292 24.5	S17 45.7
A 13	263 39.9	332 35.3	22.6	143 26.3	04.2	74 29.2	40.0	307 26.7	45.7
Y 14	278 42.4	347 34.5	22.2	158 28.7	04.3	89 31.3	40.1	322 29.0	45.6
15	293 44.8	2 33.8	- - 21.8	173 31.2	- - 04.4	104 33.4	- - 40.3	337 31.3	- - 45.5
16	308 47.3	17 33.0	21.4	188 33.6	04.5	119 35.5	40.4	352 33.6	45.5
17	323 49.8	32 32.2	21.0	203 36.1	04.6	134 37.6	40.5	7 35.9	45.4
18	338 52.2	47 31.5	S24 20.6	218 38.6	N23 04.8	149 39.7	S 2 40.7	22 38.2	S17 45.4
19	353 54.7	62 30.7	20.2	233 41.0	04.9	164 41.8	40.8	37 40.5	45.3
20	8 57.1	77 30.0	19.7	248 43.5	05.0	179 43.9	41.0	52 42.7	45.3
21	23 59.6	92 29.2	- - 19.3	263 46.0	- - 05.1	194 46.0	- - 41.1	67 45.0	- - 45.2
22	39 02.1	107 28.5	18.9	278 48.4	05.3	209 48.1	41.3	82 47.3	45.2
23	54 04.5	122 27.7	18.5	293 50.9	05.4	224 50.2	41.4	97 49.6	45.1
30 00	69 07.0	137 26.9	S24 18.1	308 53.4	N23 05.5	239 52.3	S 2 41.6	112 51.9	S17 45.1
01	84 09.5	152 26.2	17.6	323 55.9	05.6	254 54.4	41.7	127 54.2	45.0
02	99 11.9	167 25.4	17.2	338 58.3	05.7	269 56.5	41.9	142 56.5	45.0
03	114 14.4	182 24.7	- - 16.8	354 00.8	- - 05.9	284 58.6	- - 42.0	157 58.7	- - 44.9
04	129 16.9	197 23.9	16.4	9 03.3	06.0	300 00.7	42.2	173 01.0	44.9
05	144 19.3	212 23.2	15.9	24 05.8	06.1	315 02.8	42.3	188 03.3	44.8
06	159 21.8	227 22.4	S24 15.5	39 08.3	N23 06.2	330 04.9	S 2 42.5	203 05.6	S17 44.8
07	174 24.3	242 21.7	15.1	54 10.8	06.4	345 07.0	42.6	218 07.9	44.7
08	189 26.7	257 20.9	14.7	69 13.2	06.5	0 09.1	42.7	233 10.2	44.7
M 09	204 29.2	272 20.2	- - 14.2	84 15.7	- - 06.6	15 11.3	- - 42.9	248 12.5	- - 44.6
O 10	219 31.6	287 19.4	13.8	99 18.2	06.7	30 13.4	43.0	263 14.7	44.6
N 11	234 34.1	302 18.7	13.4	114 20.7	06.9	45 15.5	43.2	278 17.0	44.5
D 12	249 36.6	317 17.9	S24 12.9	129 23.2	N23 07.0	60 17.6	S 2 43.3	293 19.3	S17 44.5
A 13	264 39.0	332 17.2	12.5	144 25.7	07.1	75 19.7	43.5	308 21.6	44.4
Y 14	279 41.5	347 16.4	12.1	159 28.2	07.2	90 21.8	43.6	323 23.9	44.4
15	294 44.0	2 15.7	- - 11.6	174 30.7	- - 07.4	105 23.9	- - 43.8	338 26.2	- - 44.3
16	309 46.4	17 14.9	11.2	189 33.2	07.5	120 26.0	43.9	353 28.4	44.2
17	324 48.9	32 14.2	10.7	204 35.7	07.6	135 28.1	44.1	8 30.7	44.2
18	339 51.4	47 13.4	S24 10.3	219 38.2	N23 07.8	150 30.2	S 2 44.2	23 33.0	S17 44.1
19	354 53.8	62 12.7	09.9	234 40.7	07.9	165 32.3	44.3	38 35.3	44.1
20	9 56.3	77 11.9	09.4	249 43.2	08.0	180 34.4	44.5	53 37.6	44.0
21	24 58.8	92 11.2	- - 09.0	264 45.7	- - 08.1	195 36.5	- - 44.6	68 39.9	- - 44.0
22	40 01.2	107 10.5	08.5	279 48.2	08.3	210 38.6	44.8	83 42.1	43.9
23	55 03.7	122 09.7	08.1	294 50.7	08.4	225 40.7	44.9	98 44.4	43.9
1 00	70 06.1	137 09.0	S24 07.6	309 53.2	N23 08.5	240 42.8	S 2 45.1	113 46.7	S17 43.8
01	85 08.6	152 08.2	07.2	324 55.8	08.7	255 44.9	45.2	128 49.0	43.8
02	100 11.1	167 07.5	06.7	339 58.3	08.8	270 47.0	45.4	143 51.3	43.7
03	115 13.5	182 06.7	- - 06.3	355 00.8	- - 08.9	285 49.1	- - 45.5	158 53.5	- - 43.7
04	130 16.0	197 06.0	05.8	10 03.3	09.0	300 51.2	45.6	173 55.8	43.6
05	145 18.5	212 05.3	05.4	25 05.8	09.2	315 53.3	45.8	188 58.1	43.6
06	160 20.9	227 04.5	S24 04.9	40 08.3	N23 09.3	330 55.4	S 2 45.9	204 00.4	S17 43.5
07	175 23.4	242 03.8	04.5	55 10.9	09.4	345 57.5	46.1	219 02.7	43.5
T 08	190 25.9	257 03.1	04.0	70 13.4	09.6	0 59.7	46.2	234 05.0	43.4
U 09	205 28.3	272 02.3	- - 03.5	85 15.9	- - 09.7	16 01.8	- - 46.4	249 07.2	- - 43.3
E 10	220 30.8	287 01.6	03.1	100 18.4	09.8	31 03.9	46.5	264 09.5	43.3
S 11	235 33.2	302 00.8	02.6	115 21.0	10.0	46 06.0	46.7	279 11.8	43.2
D 12	250 35.7	317 00.1	S24 02.2	130 23.5	N23 10.1	61 08.1	S 2 46.8	294 14.1	S17 43.2
A 13	265 38.2	331 59.4	01.7	145 26.0	10.2	76 10.2	46.9	309 16.4	43.1
Y 14	280 40.6	346 58.6	01.2	160 28.6	10.4	91 12.3	47.1	324 18.6	43.1
15	295 43.1	1 57.9	- - 00.8	175 31.1	- - 10.5	106 14.4	- - 47.2	339 20.9	- - 43.0
16	310 45.6	16 57.2	24 00.3	190 33.6	10.6	121 16.5	47.4	354 23.2	43.0
17	325 48.0	31 56.4	23 59.8	205 36.2	10.8	136 18.6	47.5	9 25.5	42.9
18	340 50.5	46 55.7	S23 59.4	220 38.7	N23 10.9	151 20.7	S 2 47.7	24 27.8	S17 42.9
19	355 53.0	61 55.0	58.9	235 41.2	11.0	166 22.8	47.8	39 30.0	42.8
20	10 55.4	76 54.2	58.4	250 43.8	11.2	181 24.9	47.9	54 32.3	42.8
21	25 57.9	91 53.5	- - 58.0	265 46.3	- - 11.3	196 27.1	- - 48.1	69 34.6	- - 42.7
22	41 00.4	106 52.8	57.5	280 48.9	11.5	211 29.2	48.2	84 36.9	42.6
23	56 02.8	121 52.0	57.0	295 51.4	11.6	226 31.3	48.4	99 39.2	42.6
	h m								
Mer. Pass.	19 20.4	v −0.7	d 0.4	v 2.5	d 0.1	v 2.1	d 0.1	v 2.3	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 29.5	S40 20.0
Achernar	335 37.8	S57 16.4
Acrux	173 26.9	S63 03.4
Adhara	255 24.3	S28 57.6
Aldebaran	291 06.7	N16 29.8
Alioth	166 34.4	N55 59.6
Alkaid	153 11.3	N49 20.7
Al Na'ir	28 03.0	S46 59.8
Alnilam	276 01.6	S 1 12.3
Alphard	218 11.1	S 8 37.7
Alphecca	126 24.4	N26 44.3
Alpheratz	357 59.3	N29 03.4
Altair	62 23.4	N 8 51.1
Ankaa	353 30.6	S42 20.7
Antares	112 45.5	S26 25.0
Arcturus	146 10.0	N19 13.0
Atria	108 01.7	S69 00.9
Avior	234 23.9	S59 29.0
Bellatrix	278 48.1	N 6 20.7
Betelgeuse	271 17.6	N 7 24.4
Canopus	264 02.4	S52 41.4
Capella	280 56.7	N45 59.5
Deneb	49 42.2	N45 15.6
Denebola	182 49.4	N14 36.6
Diphda	349 11.1	S18 01.5
Dubhe	194 10.4	N61 47.0
Elnath	278 31.7	N28 36.1
Eltanin	90 53.8	N51 29.5
Enif	34 02.3	N 9 50.7
Fomalhaut	15 40.8	S29 39.6
Gacrux	172 18.4	S57 04.2
Gienah	176 08.3	S17 30.1
Hadar	149 10.3	S60 20.2
Hamal	328 17.8	N23 26.0
Kaus Aust.	84 04.5	S34 23.3
Kochab	137 20.4	N74 10.9
Markab	13 53.6	N15 10.3
Menkar	314 30.8	N 4 03.9
Menkent	148 26.1	S36 20.0
Miaplacidus	221 42.6	S69 41.1
Mirfak	309 01.9	N49 50.4
Nunki	76 17.6	S26 18.3
Peacock	53 43.6	S56 45.6
Pollux	243 46.2	N28 02.5
Procyon	245 15.5	N 5 14.6
Rasalhague	96 21.0	N12 34.0
Regulus	207 59.8	N12 00.0
Rigel	281 26.5	S 8 12.5
Rigil Kent.	140 13.3	S60 48.2
Sabik	102 30.5	S15 43.0
Schedar	349 57.8	N56 30.3
Shaula	96 43.2	S37 05.9
Sirius	258 46.9	S16 42.3
Spica	158 47.7	S11 07.5
Suhail	223 03.6	S43 24.1
Vega	80 49.7	N38 46.8
Zuben'ubi	137 22.8	S16 00.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	68 19.9	14 51
Mars	239 46.4	3 24
Jupiter	170 45.3	7 59
Saturn	43 44.9	16 26

UT (GMT)	SUN		MOON					Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 29	Moonrise 30	Moonrise 1	Moonrise 2
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.								
d h	° ′	° ′	° ′	′	° ′	′	′	°	h m	h m	h m	h m	h m	h m	h m
29 00	182 55.9	S21 29.0	125 18.7	13.1	S16 33.2	8.6	54.9	N 72	07 49	09 47	▬	13 37	13 07	12 45	12 27
01	197 55.7	29.4	139 50.8	13.2	16 24.6	8.8	54.9	N 70	07 33	09 08	▬	13 07	12 50	12 36	12 24
02	212 55.5	29.8	154 23.0	13.2	16 15.8	8.8	54.9	68	07 20	08 42	10 32	12 45	12 36	12 29	12 22
03	227 55.2	30.2	168 55.2	13.3	16 07.0	8.9	54.8	66	07 09	08 21	09 44	12 27	12 25	12 23	12 21
04	242 55.0	30.7	183 27.5	13.3	15 58.1	8.9	54.8	64	07 00	08 05	09 14	12 13	12 16	12 18	12 19
05	257 54.8	31.1	197 59.8	13.4	15 49.2	9.0	54.8	62	06 52	07 51	08 51	12 00	12 08	12 13	12 18
06	272 54.6	S21 31.5	212 32.2	13.5	S15 40.2	9.1	54.8	60	06 45	07 39	08 33	11 50	12 01	12 09	12 17
07	287 54.3	31.9	227 04.7	13.6	15 31.1	9.1	54.8	N 58	06 38	07 29	08 18	11 41	11 55	12 06	12 16
08	302 54.1	32.3	241 37.3	13.6	15 22.0	9.2	54.8	56	06 32	07 20	08 06	11 33	11 49	12 03	12 15
09	317 53.9	32.7	256 09.9	13.7	15 12.8	9.2	54.7	54	06 27	07 12	07 54	11 26	11 44	12 00	12 14
10	332 53.7	33.2	270 42.6	13.7	15 03.6	9.3	54.7	52	06 22	07 05	07 45	11 20	11 40	11 57	12 14
11	347 53.5	33.6	285 15.3	13.8	14 54.3	9.4	54.7	50	06 18	06 58	07 36	11 14	11 36	11 55	12 13
12	2 53.2	S21 34.0	299 48.1	13.9	S14 44.9	9.4	54.7	45	06 07	06 44	07 17	11 01	11 27	11 50	12 11
13	17 53.0	34.4	314 21.0	13.9	14 35.5	9.5	54.7	N 40	05 58	06 32	07 02	10 51	11 20	11 46	12 10
14	32 52.8	34.8	328 53.9	14.0	14 26.0	9.5	54.7	35	05 50	06 21	06 49	10 42	11 13	11 42	12 09
15	47 52.6	35.2	343 26.9	14.1	14 16.5	9.6	54.6	30	05 42	06 12	06 38	10 34	11 08	11 39	12 08
16	62 52.3	35.6	358 00.0	14.1	14 06.9	9.6	54.6	20	05 27	05 54	06 18	10 21	10 58	11 33	12 07
17	77 52.1	36.1	12 33.1	14.1	13 57.3	9.7	54.6	N 10	05 13	05 39	06 01	10 09	10 49	11 28	12 05
18	92 51.9	S21 36.5	27 06.2	14.3	S13 47.6	9.8	54.6	0	04 57	05 23	05 45	09 57	10 41	11 23	12 04
19	107 51.7	36.9	41 39.5	14.3	13 37.8	9.8	54.6	S 10	04 40	05 06	05 29	09 46	10 33	11 18	12 03
20	122 51.4	37.3	56 12.8	14.3	13 28.0	9.8	54.6	20	04 19	04 47	05 12	09 34	10 25	11 13	12 01
21	137 51.2	37.7	70 46.1	14.4	13 18.2	9.9	54.6	30	03 52	04 24	04 51	09 20	10 15	11 08	12 00
22	152 51.0	38.1	85 19.5	14.5	13 08.3	9.9	54.5	35	03 35	04 10	04 39	09 12	10 09	11 04	11 59
23	167 50.8	38.5	99 53.0	14.5	12 58.4	10.0	54.5	40	03 14	03 54	04 26	09 03	10 02	11 00	11 58
30 00	182 50.5	S21 38.9	114 26.5	14.5	S12 48.4	10.1	54.5	45	02 47	03 33	04 09	08 53	09 55	10 56	11 57
01	197 50.3	39.3	129 00.0	14.6	12 38.3	10.0	54.5	S 50	02 08	03 07	03 49	08 39	09 46	10 51	11 55
02	212 50.1	39.7	143 33.6	14.7	12 28.3	10.2	54.5	52	01 46	02 54	03 40	08 33	09 41	10 48	11 55
03	227 49.9	40.1	158 07.3	14.7	12 18.1	10.1	54.5	54	01 17	02 38	03 29	08 27	09 37	10 46	11 54
04	242 49.6	40.5	172 41.0	14.8	12 08.0	10.2	54.5	56	00 23	02 20	03 16	08 19	09 31	10 43	11 53
05	257 49.4	40.9	187 14.8	14.8	11 57.8	10.3	54.5	58	////	01 57	03 02	08 11	09 26	10 39	11 52
06	272 49.2	S21 41.3	201 48.6	14.9	S11 47.5	10.3	54.4	S 60	////	01 25	02 45	08 01	09 19	10 36	11 51
07	287 48.9	41.7	216 22.5	14.9	11 37.2	10.4	54.4								
08	302 48.7	42.1	230 56.4	15.0	11 26.8	10.3	54.4								
M 09	317 48.5	42.5	245 30.4	15.0	11 16.5	10.5	54.4								
O 10	332 48.3	42.9	260 04.4	15.1	11 06.0	10.4	54.4								
N 11	347 48.0	43.3	274 38.5	15.1	10 55.6	10.5	54.4								
D 12	2 47.8	S21 43.7	289 12.6	15.1	S10 45.1	10.6	54.4								
A 13	17 47.6	44.1	303 46.7	15.2	10 34.5	10.6	54.4								
Y 14	32 47.3	44.5	318 20.9	15.3	10 23.9	10.6	54.4								
15	47 47.1	44.9	332 55.2	15.3	10 13.3	10.6	54.3								
16	62 46.9	45.3	347 29.5	15.3	10 02.7	10.7	54.3								
17	77 46.6	45.7	2 03.8	15.4	9 52.0	10.8	54.3								
18	92 46.4	S21 46.1	16 38.2	15.4	S 9 41.2	10.7	54.3								
19	107 46.2	46.5	31 12.6	15.4	9 30.5	10.8	54.3								
20	122 45.9	46.9	45 47.0	15.5	9 19.7	10.8	54.3								
21	137 45.7	47.3	60 21.5	15.5	9 08.9	10.9	54.3								
22	152 45.5	47.7	74 56.0	15.5	8 58.0	10.9	54.3								
23	167 45.2	48.0	89 30.5	15.6	8 47.1	10.9	54.3								
1 00	182 45.0	S21 48.4	104 05.1	15.7	S 8 36.2	11.0	54.3								
01	197 44.8	48.8	118 39.8	15.6	8 25.2	10.9	54.3								
02	212 44.5	49.2	133 14.4	15.7	8 14.3	11.1	54.3								
03	227 44.3	49.6	147 49.1	15.7	8 03.2	11.0	54.3								
04	242 44.1	50.0	162 23.8	15.8	7 52.2	11.1	54.3								
05	257 43.8	50.4	176 58.6	15.7	7 41.1	11.1	54.3								
06	272 43.6	S21 50.8	191 33.3	15.9	S 7 30.0	11.1	54.3								
07	287 43.4	51.1	206 08.2	15.8	7 18.9	11.1	54.2								
T 08	302 43.1	51.5	220 43.0	15.9	7 07.8	11.2	54.2								
U 09	317 42.9	51.9	235 17.9	15.9	6 56.6	11.2	54.2								
E 10	332 42.7	52.3	249 52.8	15.9	6 45.4	11.2	54.2								
S 11	347 42.4	52.7	264 27.7	15.9	6 34.2	11.3	54.2								
D 12	2 42.2	S21 53.0	279 02.6	16.0	S 6 22.9	11.2	54.2								
A 13	17 42.0	53.4	293 37.6	16.0	6 11.7	11.3	54.2								
Y 14	32 41.7	53.8	308 12.6	16.0	6 00.4	11.3	54.2								
15	47 41.5	54.2	322 47.6	16.0	5 49.1	11.4	54.2								
16	62 41.2	54.6	337 22.6	16.0	5 37.7	11.3	54.2								
17	77 41.0	54.9	351 57.6	16.1	5 26.4	11.4	54.2								
18	92 40.8	S21 55.3	6 32.7	16.1	S 5 15.0	11.4	54.2								
19	107 40.5	55.7	21 07.8	16.1	5 03.6	11.4	54.2								
20	122 40.3	56.1	35 42.9	16.1	4 52.2	11.5	54.2								
21	137 40.1	56.4	50 18.0	16.1	4 40.7	11.4	54.2								
22	152 39.8	56.8	64 53.1	16.2	4 29.3	11.5	54.2								
23	167 39.6	57.2	79 28.3	16.2	4 17.8	11.5	54.2								
	S.D. 16.2	d 0.4	S.D.	14.9		14.8									

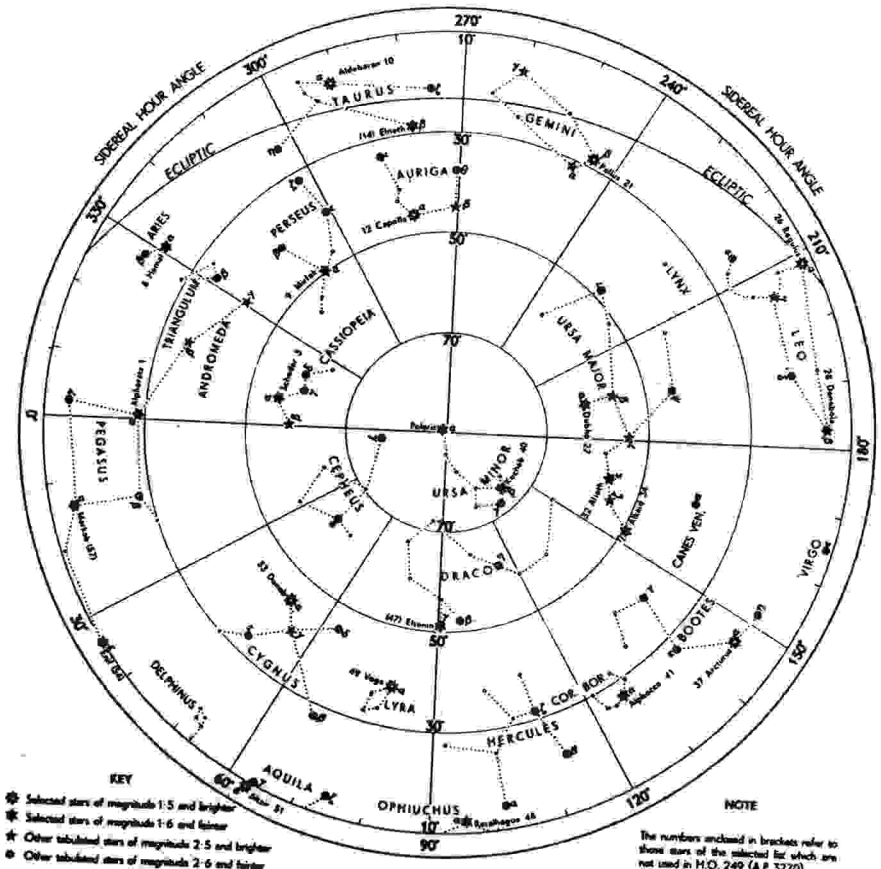
Lat.	Sunset	Twilight Civil	Twilight Naut.
°	h m	h m	h m
N 72	▬	13 50	15 48
N 70	▬	14 29	16 04
68	13 05	14 55	16 17
66	13 53	15 16	16 28
64	14 23	15 32	16 37
62	14 46	15 46	16 45
60	15 04	15 58	16 52
N 58	15 19	16 08	16 59
56	15 32	16 17	17 05
54	15 43	16 25	17 10
52	15 53	16 32	17 15
50	16 02	16 39	17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

Day	SUN Eqn. of Time 00 h	SUN Eqn. of Time 12 h	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	
29	11 44	11 33	11 48	16 08	03 46	05	
30	11 23	11 12	11 49	16 52	04 30	06	
1	11 01	10 49	11 49	17 33	05 12	07	

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

STAR CHARTS

NORTHERN STARS



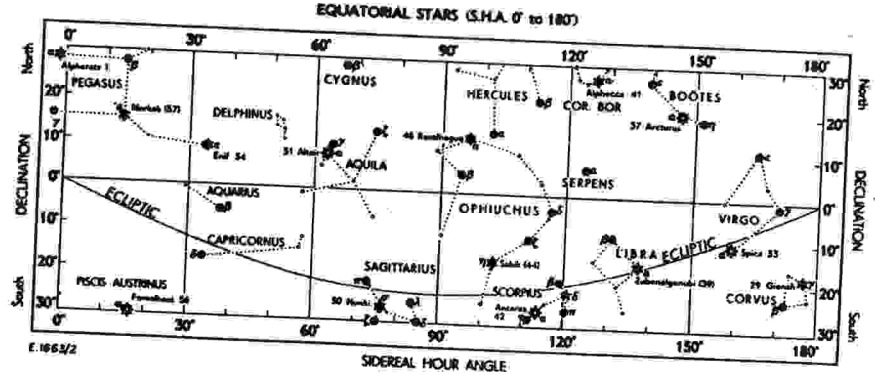
KEY

- Selected stars of magnitude 1·5 and brighter
- Selected stars of magnitude 1·6 and fainter
- Other tabulated stars of magnitude 2·5 and brighter
- Other tabulated stars of magnitude 2·6 and fainter
- Untabulated stars

NOTE

The numbers enclosed in brackets refer to those stars of the selected list which are not used in H.O. 249 (A.P. 3270).

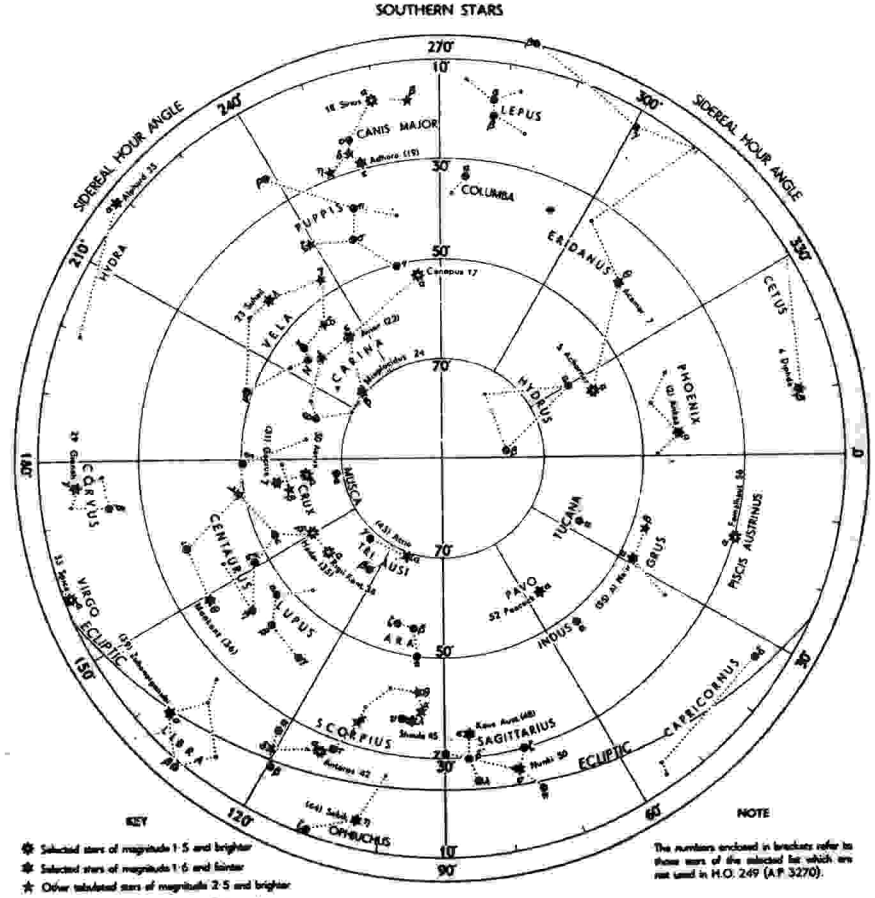
EQUATORIAL STARS (S.H.A. 0° to 180°)



E.1662/2

STAR CHARTS

SOUTHERN STARS



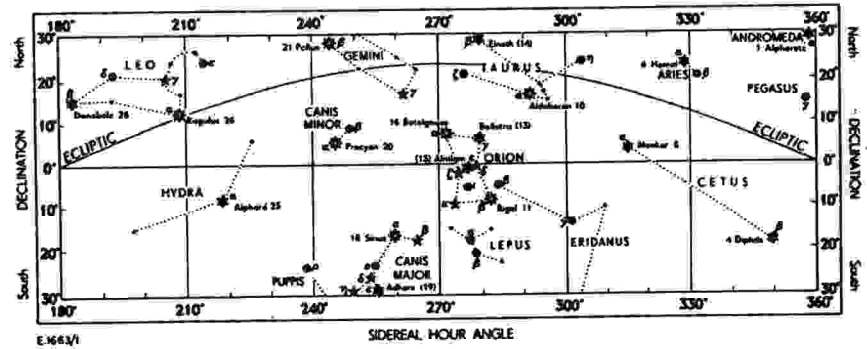
KEY

- Selected stars of magnitude 1·5 and brighter
- Selected stars of magnitude 1·6 and fainter
- Other tabulated stars of magnitude 2·5 and brighter
- Other tabulated stars of magnitude 2·6 and fainter
- Untabulated stars

NOTE

The numbers enclosed in brackets refer to those stars of the selected list which are not used in H.O. 249 (A.P. 3270).

EQUATORIAL STARS (S.H.A. 180° to 360°)



E.1663/1

STARS, 1992 JANUARY—JUNE

Mag.	Name and Number		S.H.A. JAN.	S.H.A. FEB.	S.H.A. MAR.	S.H.A. APR.	S.H.A. MAY	S.H.A. JUNE	Declination JAN.	Declination FEB.	Declination MAR.	Declination APR.	Declination MAY	Declination JUNE
			°	′	′	′	′	′	°	′	′	′	′	′	′
3·4	γ Cephei		5	15·4	15·9	16·0	15·8	15·1	14·3	N. 77	35·7	35·6	35·4	35·3	35·2	35·2
2·6	α Pegasi	57	13	54·5	54·5	54·5	54·4	54·2	53·9	N. 15	09·9	09·8	09·8	09·7	09·8	09·9
2·6	β Pegasi		14	09·2	09·2	09·2	09·1	08·8	08·6	N. 28	02·6	02·5	02·4	02·3	02·4	02·4
1·3	α Piscis Aust.	56	15	41·8	41·8	41·7	41·6	41·4	41·1	S. 29	39·9	39·9	39·8	39·7	39·6	39·5
2·2	β Gruis		19	27·1	27·1	27·0	26·9	26·6	26·3	S. 46	55·7	55·6	55·5	55·3	55·2	55·1
2·9	α Tucanæ		25	30·7	30·7	30·6	30·3	30·0	29·6	S. 60	18·1	18·0	17·8	17·7	17·5	17·5
2·2	α Gruis	55	28	04·0	04·0	03·9	03·7	03·4	03·1	S. 46	60·1	60·0	59·9	59·7	59·6	59·5
3·0	δ Capricorni		33	21·0	20·9	20·8	20·7	20·4	20·2	S. 16	09·8	09·8	09·8	09·7	09·6	09·5
2·5	ϵ Pegasi	54	34	03·1	03·1	03·0	02·8	02·6	02·4	N. 9	50·4	50·3	50·3	50·3	50·3	50·4
3·1	β Aquarii		37	12·9	12·9	12·8	12·6	12·4	12·1	S. 5	36·4	36·4	36·4	36·3	36·3	36·2
2·6	α Cephei		40	24·7	24·7	24·6	24·2	23·8	23·5	N. 62	33·3	33·1	33·0	32·9	32·9	33·0
2·6	ϵ Cygni		48	31·9	31·8	31·6	31·4	31·2	30·9	N. 33	56·5	56·4	56·3	56·2	56·3	56·4
1·3	α Cygni	53	49	42·9	42·8	42·7	42·4	42·1	41·9	N. 45	15·2	15·1	14·9	14·9	15·0	15·1
3·2	α Indi		50	45·0	44·8	44·6	44·3	44·0	43·7	S. 47	19·2	19·1	19·0	18·9	18·9	18·9
2·1	α Pavonis	52	53	44·8	44·7	44·4	44·1	43·7	43·3	S. 56	45·7	45·6	45·5	45·4	45·3	45·3
2·3	γ Cygni		54	31·1	31·0	30·9	30·6	30·4	30·1	N. 40	13·9	13·8	13·7	13·7	13·7	13·9
0·9	α Aquilæ	51	62	24·2	24·1	23·9	23·7	23·4	23·2	N. 8	50·8	50·7	50·7	50·7	50·8	50·9
2·8	γ Aquilæ		63	31·9	31·8	31·6	31·4	31·2	31·0	N. 10	35·6	35·5	35·5	35·5	35·6	35·7
3·0	δ Cygni		63	49·4	49·3	49·1	48·8	48·6	48·3	N. 45	06·7	06·5	06·4	06·4	06·5	06·6
3·2	β Cygni		67	24·2	24·0	23·9	23·6	23·4	23·2	N. 27	56·5	56·4	56·3	56·4	56·4	56·6
3·0	π Sagittarii		72	40·7	40·5	40·3	40·1	39·8	39·6	S. 21	02·2	02·2	02·2	02·2	02·1	02·1
3·0	ζ Aquilæ		73	44·4	44·3	44·1	43·9	43·7	43·5	N. 13	51·0	50·9	50·9	50·9	51·0	51·1
2·7	ζ Sagittarii		74	28·5	28·3	28·1	27·8	27·5	27·3	S. 29	53·5	53·5	53·5	53·5	53·4	53·4
2·1	σ Sagittarii	50	76	18·5	18·3	18·1	17·8	17·6	17·4	S. 26	18·4	18·4	18·4	18·4	18·3	18·3
0·1	α Lyræ	49	80	50·2	50·0	49·8	49·6	49·3	49·2	N. 38	46·5	46·3	46·3	46·3	46·4	46·5
2·9	λ Sagittarii		83	07·8	07·6	07·4	07·2	06·9	06·7	S. 25	25·6	25·6	25·6	25·6	25·6	25·5
2·0	ϵ Sagittarii	48	84	05·4	05·2	04·9	04·6	04·4	04·2	S. 34	23·3	23·3	23·3	23·3	23·3	23·3
2·8	δ Sagittarii		84	52·8	52·6	52·3	52·0	51·8	51·6	S. 29	49·9	49·9	49·9	49·9	49·9	49·9
3·1	γ Sagittarii		88	40·6	40·4	40·1	39·8	39·6	39·4	S. 30	25·5	25·5	25·5	25·5	25·5	25·5
2·4	γ Draconis	47	90	54·1	53·8	53·6	53·3	53·0	52·9	N. 51	29·2	29·1	29·0	29·1	29·2	29·4
2·9	β Ophiuchi		94	13·9	13·7	13·4	13·2	13·0	12·9	N. 4	34·1	34·0	34·0	34·0	34·1	34·2
2·5	κ Scorpii		94	31·0	30·7	30·4	30·2	29·9	29·7	S. 39	01·6	01·5	01·5	01·6	01·6	01·6
2·0	θ Scorpii		95	48·8	48·6	48·3	48·0	47·7	47·5	S. 42	59·6	59·5	59·5	59·5	59·6	59·6
2·1	α Ophiuchi	46	96	21·6	21·4	21·2	21·0	20·8	20·7	N. 12	33·8	33·7	33·7	33·7	33·8	33·9
1·7	λ Scorpii	45	96	44·0	43·7	43·5	43·2	43·0	42·8	S. 37	05·9	05·9	05·9	05·9	05·9	06·0
3·0	α Aræ		97	11·7	11·4	11·0	10·7	10·4	10·2	S. 49	52·2	52·1	52·1	52·2	52·2	52·3
3·0	β Draconis		97	26·6	26·3	26·0	25·7	25·5	25·4	N. 52	18·2	18·1	18·0	18·1	18·2	18·4
2·8	υ Scorpii		97	26·7	26·4	26·1	25·9	25·6	25·5	S. 37	17·4	17·4	17·4	17·4	17·4	17·4
2·8	β Aræ		98	50·5	50·2	49·8	49·4	49·1	48·9	S. 55	31·3	31·3	31·3	31·3	31·4	31·4
Var.‡	α Herculis		101	25·8	25·6	25·3	25·1	25·0	24·9	N. 14	23·8	23·7	23·7	23·7	23·8	23·9
2·6	η Ophiuchi	44	102	31·2	31·0	30·7	30·5	30·3	30·2	S. 15	43·0	43·0	43·0	43·0	43·0	43·0
3·1	ζ Aræ		105	30·7	30·3	29·9	29·5	29·2	29·1	S. 55	58·6	58·6	58·6	58·6	58·7	58·8
2·4	ϵ Scorpii		107	35·3	35·0	34·7	34·5	34·3	34·2	S. 34	16·7	16·7	16·8	16·8	16·8	16·9
1·9	α Triang. Aust.	43	108	02·9	02·3	01·7	01·2	00·8	00·6	S. 69	00·7	00·7	00·7	00·7	00·9	01·0
3·0	ζ Herculis		109	45·3	45·1	44·8	44·6	44·5	44·4	N. 31	36·8	36·7	36·7	36·7	36·8	37·0
2·7	ζ Ophiuchi		110	49·2	48·9	48·7	48·5	48·3	48·2	S. 10	33·2	33·2	33·3	33·3	33·2	33·2
2·9	τ Scorpii		111	09·2	08·9	08·6	08·4	08·2	08·1	S. 28	12·0	12·0	12·1	12·1	12·1	12·1
2·8	β Herculis		112	31·9	31·6	31·4	31·2	31·1	31·0	N. 21	30·2	30·1	30·1	30·1	30·2	30·3
1·2	α Scorpii	42	112	46·2	45·9	45·7	45·4	45·3	45·2	S. 26	24·9	24·9	25·0	25·0	25·0	25·0
2·9	η Draconis		114	02·2	01·8	01·4	01·1	01·0	01·0	N. 61	31·6	31·5	31·5	31·6	31·7	31·9
3·0	δ Ophiuchi		116	31·0	30·8	30·6	30·4	30·2	30·2	S. 3	40·6	40·6	40·7	40·7	40·6	40·6
2·8	β Scorpii		118	45·3	45·1	44·8	44·6	44·5	44·4	S. 19	47·1	47·1	47·2	47·2	47·2	47·2
2·5	δ Scorpii		120	02·0	01·7	01·5	01·3	01·1	01·1	S. 22	36·0	36·0	36·1	36·1	36·1	36·2
3·0	π Scorpii		120	24·4	24·1	23·9	23·7	23·5	23·4	S. 26	05·5	05·5	05·6	05·6	05·7	05·7
3·0	β Trianguli Aust.		121	23·5	23·0	22·5	22·1	21·9	21·8	S. 63	24·3	24·3	24·3	24·4	24·5	24·7
2·8	α Serpentis		124	01·8	01·6	01·3	01·2	01·1	01·0	N. 6	26·9	26·8	26·7	26·8	26·8	26·9
3·0	γ Lupi		126	20·8	20·5	20·2	19·9	19·8	19·7	S. 41	08·4	08·4	08·5	08·6	08·6	08·7
2·3	α Coronæ Bor.	41	126	24·7	24·5	24·2	24·1	24·0	23·9	N. 26	44·2	44·1	44·1	44·2	44·3	44·4

‡ 3·0—3·7

STARS, 1992 JULY—DECEMBER

Mag.	Name and Number		S.H.A. JULY	S.H.A. AUG.	S.H.A. SEPT.	S.H.A. OCT.	S.H.A. NOV.	S.H.A. DEC.	Declination JULY	Declination AUG.	Declination SEPT.	Declination OCT.	Declination NOV.	Declination DEC.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3·4	γ Cephei		5	13·5	12·9	12·7	12·8	13·2	13·8	N. 77	35·3	35·4	35·6	35·8	36·0	36·0
2·6	*Markab*	57	13	53·7	53·5	53·5	53·5	53·6	53·6	N. 15	10·0	10·1	10·2	10·3	10·3	10·3
2·6	*Scheat*		14	08·3	08·2	08·1	08·1	08·2	08·3	N. 28	02·6	02·7	02·8	02·9	03·0	03·0
1·3	*Fomalhaut*	56	15	40·9	40·7	40·6	40·7	40·8	40·9	S. 29	39·4	39·4	39·5	39·5	39·6	39·6
2·2	β Gruis		19	26·0	25·8	25·7	25·8	25·9	26·1	S. 46	55·1	55·1	55·2	55·3	55·4	55·4
2·9	α Tucanæ		25	29·2	29·0	28·9	29·1	29·3	29·6	S. 60	17·5	17·6	17·7	17·8	17·9	17·9
2·2	*Al Na'ir*	55	28	02·8	02·6	02·6	02·7	02·9	03·0	S. 46	59·5	59·6	59·7	59·8	59·8	59·8
3·0	δ Capricorni		33	20·0	19·9	19·8	19·9	20·0	20·1	S. 16	09·5	09·4	09·5	09·5	09·5	09·5
2·5	*Enif*	54	34	02·2	02·1	02·0	02·1	02·2	02·3	N. 9	50·6	50·7	50·7	50·8	50·8	50·7
3·1	β Aquarii		37	11·9	11·8	11·8	11·9	12·0	12·1	S. 5	36·1	36·0	36·0	36·0	36·0	36·1
2·6	*Alderamin*		40	23·2	23·1	23·2	23·5	23·8	24·1	N. 62	33·2	33·4	33·6	33·7	33·7	33·7
2·6	ϵ Cygni		48	30·8	30·7	30·8	30·9	31·1	31·2	N. 33	56·6	56·7	56·9	56·9	56·9	56·9
1·3	*Deneb*	53	49	41·7	41·7	41·7	41·9	42·1	42·3	N. 45	15·3	15·4	15·6	15·6	15·7	15·6
3·2	α Indi		50	43·5	43·4	43·5	43·6	43·8	43·9	S. 47	18·9	19·0	19·0	19·1	19·1	19·1
2·1	*Peacock*	52	53	43·1	43·0	43·1	43·3	43·5	43·7	S. 56	45·4	45·5	45·6	45·6	45·6	45·6
2·3	γ Cygni		54	30·0	29·9	30·0	30·2	30·4	30·5	N. 40	14·0	14·2	14·3	14·4	14·4	14·3
0·9	*Altair*	51	62	23·1	23·1	23·2	23·3	23·4	23·5	N. 8	51·0	51·1	51·1	51·2	51·1	51·1
2·8	γ Aquilæ		63	30·8	30·8	30·9	31·0	31·1	31·2	N. 10	35·8	35·9	35·9	36·0	35·9	35·9
3·0	δ Cygni		63	48·2	48·2	48·4	48·6	48·8	48·9	N. 45	06·8	07·0	07·1	07·1	07·1	07·0
3·2	*Albireo*		67	23·1	23·1	23·2	23·4	23·5	23·6	N. 27	56·7	56·8	56·9	57·0	56·9	56·8
3·0	π Sagittarii		72	39·5	39·5	39·6	39·7	39·8	39·9	S. 21	02·1	02·1	02·1	02·1	02·1	02·1
3·0	ζ Aquilæ		73	43·4	43·4	43·5	43·6	43·8	43·8	N. 13	51·2	51·3	51·4	51·4	51·3	51·3
2·7	ζ Sagittarii		74	27·2	27·2	27·3	27·5	27·6	27·6	S. 29	53·4	53·4	53·5	53·5	53·5	53·4
2·1	*Nunki*	50	76	17·3	17·3	17·4	17·5	17·6	17·6	S. 26	18·3	18·3	18·4	18·4	18·4	18·3
0·1	*Vega*	49	80	49·1	49·2	49·3	49·5	49·7	49·8	N. 38	46·7	46·8	46·9	46·9	46·8	46·7
2·9	λ Sagittarii		83	06·7	06·7	06·8	06·9	07·0	07·0	S. 25	25·5	25·6	25·6	25·6	25·6	25·5
2·0	*Kaus Australis*	48	84	04·1	04·1	04·2	04·4	04·5	04·5	S. 34	23·3	23·3	23·4	23·4	23·3	23·3
2·8	δ Sagittarii		84	51·5	51·6	51·7	51·8	51·9	51·9	S. 29	49·9	49·9	49·9	49·9	49·9	49·9
3·1	γ Sagittarii		88	39·4	39·4	39·5	39·7	39·8	39·7	S. 30	25·5	25·5	25·5	25·5	25·5	25·5
2·4	*Eltanin*	47	90	52·9	53·0	53·3	53·5	53·7	53·8	N. 51	29·5	29·6	29·7	29·7	29·6	29·4
2·9	β Ophiuchi		94	12·9	12·9	13·0	13·2	13·3	13·2	N. 4	34·3	34·3	34·3	34·3	34·3	34·2
2·5	κ Scorpii		94	29·7	29·7	29·9	30·0	30·1	30·1	S. 39	01·7	01·7	01·7	01·7	01·6	01·6
2·0	θ Scorpii		95	47·5	47·5	47·7	47·9	48·0	47·9	S. 42	59·7	59·7	59·8	59·7	59·7	59·6
2·1	*Rasalhague*	46	96	20·6	20·7	20·8	21·0	21·0	21·0	N. 12	34·0	34·1	34·1	34·1	34·0	33·9
1·7	*Shaula*	45	96	42·7	42·8	43·0	43·1	43·2	43·1	S. 37	06·0	06·0	06·0	06·0	06·0	05·9
3·0	α Aræ		97	10·2	10·2	10·4	10·6	10·7	10·7	S. 49	52·4	52·4	52·4	52·4	52·3	52·2
3·0	β Draconis		97	25·4	25·6	25·9	26·1	26·3	26·4	N. 52	18·6	18·7	18·7	18·7	18·6	18·4
2·8	υ Scorpii		97	25·4	25·5	25·6	25·8	25·9	25·8	S. 37	17·5	17·5	17·5	17·5	17·5	17·4
2·8	β Aræ		98	48·9	49·0	49·2	49·4	49·5	49·5	S. 55	31·5	31·6	31·6	31·6	31·5	31·4
Var.‡	α Herculis		101	24·9	24·9	25·1	25·2	25·3	25·2	N. 14	24·0	24·1	24·1	24·1	24·0	23·9
2·6	*Sabik*	44	102	30·2	30·2	30·3	30·5	30·5	30·5	S. 15	43·0	43·0	43·0	42·9	42·9	43·0
3·1	ζ Aræ		105	29·1	29·2	29·4	29·6	29·7	29·6	S. 55	58·9	59·0	59·0	58·9	58·8	58·7
2·4	ϵ Scorpii		107	34·1	34·2	34·4	34·5	34·6	34·5	S. 34	16·9	16·9	16·9	16·9	16·8	16·8
1·9	*Atria*	43	108	00·6	00·9	01·3	01·6	01·8	01·6	S. 69	01·1	01·2	01·2	01·1	01·0	00·9
3·0	ζ Herculis		109	44·4	44·5	44·7	44·9	44·9	44·9	N. 31	37·1	37·2	37·2	37·1	37·0	36·9
2·7	ζ Ophiuchi		110	48·2	48·3	48·4	48·6	48·6	48·5	S. 10	33·2	33·1	33·1	33·1	33·1	33·2
2·9	τ Scorpii		111	08·1	08·2	08·4	08·5	08·5	08·4	S. 28	12·2	12·2	12·2	12·1	12·1	12·1
2·8	β Herculis		112	31·0	31·1	31·3	31·4	31·4	31·4	N. 21	30·4	30·5	30·5	30·5	30·4	30·2
1·2	*Antares*	42	112	45·2	45·2	45·4	45·5	45·5	45·4	S. 26	25·1	25·1	25·0	25·0	25·0	25·0
2·9	η Draconis		114	01·1	01·4	01·8	02·1	02·2	02·2	N. 61	32·1	32·1	32·1	32·0	31·9	31·7
3·0	δ Ophiuchi		116	30·2	30·3	30·4	30·5	30·5	30·4	S. 3	40·5	40·5	40·5	40·5	40·5	40·6
2·8	β Scorpii		118	44·4	44·5	44·6	44·7	44·7	44·6	S. 19	47·2	47·2	47·2	47·2	47·1	47·2
2·5	*Dschubba*		120	01·1	01·2	01·3	01·4	01·4	01·3	S. 22	36·2	36·1	36·1	36·1	36·1	36·1
3·0	π Scorpii		120	23·4	23·5	23·7	23·8	23·8	23·7	S. 26	05·7	05·7	05·7	05·6	05·6	05·6
3·0	β Trianguli Aust.		121	21·9	22·1	22·4	22·6	22·7	22·5	S. 63	24·8	24·8	24·8	24·7	24·6	24·5
2·8	α Serpentis		124	01·0	01·1	01·3	01·4	01·4	01·3	N. 6	26·9	27·0	27·0	27·0	26·9	26·8
3·0	γ Lupi		126	19·8	19·9	20·1	20·2	20·2	20·0	S. 41	08·7	08·7	08·7	08·6	08·6	08·5
2·3	*Alphecca*	41	126	24·0	24·1	24·3	24·4	24·4	24·3	N. 26	44·5	44·5	44·5	44·4	44·3	44·2

‡ 3·0—3·7

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			°	′	′	′	′	′	°	′	′	′	′	′	′
3·1	γ Ursæ Minoris		129	49·4	48·9	48·4	48·0	47·9	48·1	N. 71	51·4	51·3	51·3	51·4	51·6	51·8
3·1	γ Trianguli Aust.		130	27·6	27·0	26·4	26·0	25·8	25·8	S. 68	38·9	38·9	39·0	39·1	39·3	39·4
2·7	β Libræ		130	51·2	51·0	50·7	50·6	50·5	50·4	S. 9	21·3	21·4	21·5	21·5	21·5	21·4
2·8	β Lupi		135	29·7	29·4	29·1	28·9	28·8	28·8	S. 43	06·1	06·1	06·2	06·3	06·4	06·5
2·2	β Ursæ Minoris	40	137	19·6	18·9	18·4	18·0	18·0	18·3	N. 74	10·9	10·8	10·9	11·0	11·2	11·3
2·9	α Libræ	39	137	23·3	23·0	22·8	22·7	22·6	22·6	S. 16	00·6	00·7	00·8	00·8	00·8	00·8
2·6	ε Bootis		138	50·3	50·0	49·8	49·7	49·6	49·6	N. 27	06·2	06·1	06·1	06·1	06·3	06·4
2·9	α Lupi		139	38·9	38·5	38·2	38·0	37·9	37·9	S. 47	21·2	21·2	21·3	21·4	21·5	21·6
0·1	α Centauri	38	140	13·9	13·4	13·1	12·8	12·7	12·8	S. 60	48·0	48·0	48·1	48·3	48·4	48·5
2·6	η Centauri		141	14·8	14·5	14·2	14·1	14·0	14·0	S. 42	07·3	07·4	07·5	07·6	07·7	07·8
3·0	γ Bootis		142	03·5	03·3	03·0	02·9	02·8	02·9	N. 38	20·2	20·2	20·2	20·3	20·4	20·5
0·2	α Bootis	37	146	10·3	10·1	09·9	09·8	09·8	09·8	N. 19	13·1	13·1	13·1	13·1	13·2	13·3
2·3	θ Centauri	36	148	26·6	26·3	26·1	25·9	25·9	25·9	S. 36	19·8	19·9	20·0	20·1	20·2	20·3
0·9	β Centauri	35	149	10·9	10·5	10·1	09·9	09·9	09·9	S. 60	19·9	20·0	20·2	20·3	20·4	20·5
3·1	ζ Centauri		151	14·1	13·8	13·6	13·4	13·4	13·4	S. 47	14·9	15·0	15·1	15·2	15·3	15·4
2·8	η Bootis		151	25·2	25·0	24·8	24·7	24·6	24·7	N. 18	26·0	25·9	25·9	25·9	26·0	26·1
1·9	η Ursæ Majoris	34	153	11·4	11·1	10·9	10·7	10·8	10·9	N. 49	20·8	20·7	20·8	20·9	21·0	21·2
2·6	ε Centauri		155	09·0	08·7	08·4	08·2	08·2	08·3	S. 53	25·4	25·5	25·7	25·8	25·9	26·0
1·2	α Virginis	33	158	48·1	47·9	47·7	47·6	47·6	47·7	S. 11	07·3	07·4	07·5	07·5	07·5	07·5
2·2	ζ Ursæ Majoris		159	05·7	05·3	05·1	05·0	05·0	05·2	N. 54	57·6	57·6	57·6	57·8	57·9	58·0
2·9	ι Centauri		159	57·5	57·2	57·0	56·9	56·9	57·0	S. 36	40·2	40·3	40·4	40·5	40·6	40·7
3·0	ε Virginis		164	33·0	32·8	32·6	32·5	32·6	32·6	N. 10	59·9	59·8	59·8	59·8	59·9	59·9
2·9	α Canum Venat.		166	04·8	04·6	04·4	04·3	04·4	04·5	N. 38	21·3	21·3	21·3	21·4	21·5	21·6
1·7	ε Ursæ Majoris	32	166	34·4	34·1	33·9	33·8	33·9	34·1	N. 55	59·7	59·8	59·8	60·0	60·1	60·2
1·5	β Crucis		168	10·8	10·4	10·2	10·1	10·2	10·3	S. 59	38·6	38·7	38·9	39·0	39·2	39·2
2·9	γ Virginis		169	40·8	40·6	40·5	40·4	40·4	40·5	S. 1	24·5	24·6	24·7	24·7	24·6	24·6
2·4	γ Centauri		169	43·5	43·2	43·0	43·0	43·0	43·1	S. 48	54·9	55·0	55·2	55·3	55·4	55·5
2·9	α Muscæ		170	49·0	48·5	48·2	48·1	48·3	48·5	S. 69	05·3	05·5	05·6	05·8	06·0	06·1
2·8	β Corvi		171	30·1	29·9	29·8	29·7	29·7	29·8	S. 23	21·2	21·3	21·4	21·5	21·5	21·6
1·6	γ Crucis	31	172	18·8	18·4	18·2	18·2	18·3	18·4	S. 57	04·0	04·1	04·3	04·5	04·6	04·7
1·1	α Crucis	30	173	27·2	26·8	26·6	26·6	26·7	26·9	S. 63	03·2	03·3	03·5	03·7	03·8	03·9
2·8	γ Corvi	29	176	08·7	08·5	08·3	08·3	08·4	08·4	S. 17	29·9	30·1	30·2	30·2	30·2	30·2
2·9	δ Centauri		178	00·4	00·1	00·0	00·0	00·0	00·2	S. 50	40·6	40·7	40·9	41·1	41·2	41·2
2·5	γ Ursæ Majoris		181	38·3	38·0	37·8	37·8	38·0	38·2	N. 53	43·9	44·0	44·1	44·2	44·3	44·4
2·2	β Leonis	28	182	49·8	49·6	49·5	49·5	49·5	49·6	N. 14	36·7	36·7	36·7	36·7	36·8	36·8
2·6	δ Leonis		191	34·2	34·0	34·0	34·0	34·1	34·2	N. 20	33·8	33·7	33·8	33·8	33·9	33·9
3·2	ψ Ursæ Majoris		192	41·1	40·9	40·8	40·9	41·0	41·2	N. 44	32·2	32·2	32·3	32·4	32·5	32·5
2·0	α Ursæ Majoris	27	194	10·6	10·3	10·2	10·3	10·5	10·8	N. 61	47·3	47·3	47·5	47·6	47·7	47·7
2·4	β Ursæ Majoris		194	38·8	38·6	38·5	38·6	38·7	39·0	N. 56	25·1	25·2	25·3	25·4	25·5	25·5
2·8	μ Velorum		198	23·1	22·9	22·8	22·9	23·1	23·2	S. 49	22·6	22·8	23·0	23·1	23·2	23·2
3·0	θ Carinæ		199	19·3	19·0	19·0	19·2	19·4	19·7	S. 64	21·1	21·2	21·4	21·6	21·7	21·7
2·3	γ Leonis		205	06·4	06·3	06·2	06·3	06·4	06·5	N. 19	52·7	52·7	52·7	52·7	52·8	52·8
1·3	α Leonis	26	208	00·2	00·1	00·1	00·1	00·2	00·3	N. 12	00·2	00·1	00·1	00·2	00·2	00·2
3·1	ε Leonis		213	38·4	38·2	38·2	38·3	38·4	38·5	N. 23	48·5	48·4	48·5	48·5	48·6	48·6
3·0	*N* Velorum		217	14·6	14·5	14·6	14·8	15·1	15·3	S. 56	59·9	60·1	60·3	60·4	60·4	60·4
2·2	α Hydræ	25	218	11·5	11·4	11·4	11·5	11·6	11·7	S. 8	37·5	37·6	37·7	37·7	37·7	37·7
2·6	κ Velorum		219	31·3	31·2	31·3	31·3	31·5	31·7	32·0	S. 54	58·6	58·8	58·9	59·0	59·1	59·0
2·2	ι Carinæ		220	46·1	46·0	46·2	46·4	46·7	46·9	S. 59	14·5	14·7	14·8	14·9	15·0	14·9
1·8	β Carinæ	24	221	42·3	42·3	42·5	42·8	43·3	43·7	S. 69	41·0	41·2	41·4	41·5	41·6	41·5
2·2	λ Velorum	23	223	03·8	03·8	03·8	04·0	04·2	04·3	S. 43	24·0	24·2	24·3	24·4	24·4	24·4
3·1	ι Ursæ Majoris		225	19·2	19·1	19·1	19·3	19·5	19·6	N. 48	04·2	04·3	04·4	04·4	04·4	04·4
2·0	δ Velorum		228	52·0	52·0	52·1	52·4	52·6	52·8	S. 54	40·7	40·9	41·1	41·2	41·2	41·1
1·7	ε Carinæ	22	234	24·0	24·0	24·2	24·5	24·8	25·0	S. 59	29·0	29·2	29·4	29·5	29·4	29·4
1·9	γ Velorum		237	40·0	40·0	40·2	40·4	40·6	40·7	S. 47	18·8	19·0	19·1	19·2	19·2	19·1
2·9	ρ Puppis		238	11·3	11·3	11·4	11·5	11·7	11·7	S. 24	16·9	17·1	17·2	17·2	17·2	17·1
2·3	ζ Puppis		239	09·8	09·8	09·9	10·1	10·3	10·4	S. 39	58·9	59·0	59·2	59·2	59·2	59·1
1·2	β Geminorum	21	243	46·8	46·8	46·9	47·0	47·1	47·2	N. 28	02·7	02·7	02·7	02·7	02·7	02·7
0·5	α Canis Minoris	20	245	16·1	16·1	16·1	16·3	16·4	16·4	N. 5	14·7	14·6	14·6	14·6	14·6	14·6

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			°	′	′	′	′	′	°	′	′	′	′	′	′
3·1	γ Ursæ Minoris		129	48·5	49·0	49·5	49·9	50·1	50·0	N. 71	51·9	51·9	51·8	51·7	51·5	51·3
3·1	γ Trianguli Aust.		130	25·9	26·3	26·7	26·9	26·9	26·6	S. 68	39·5	39·5	39·5	39·3	39·2	39·1
2·7	β Libræ		130	50·5	50·6	50·7	50·8	50·7	50·6	S. 9	21·4	21·4	21·4	21·4	21·4	21·4
2·8	β Lupi		135	28·9	29·0	29·2	29·2	29·2	29·0	S. 43	06·5	06·5	06·5	06·4	06·3	06·3
2·2	*Kochab*	40	137	18·8	19·4	19·9	20·3	20·5	20·2	N. 74	11·4	11·4	11·3	11·2	11·0	10·8
2·9	*Zubenelgenubi*	39	137	22·6	22·7	22·8	22·9	22·8	22·7	S. 16	00·8	00·8	00·7	00·7	00·7	00·8
2·6	ε Bootis		138	49·7	49·8	50·0	50·1	50·0	49·9	N. 27	06·4	06·5	06·4	06·3	06·2	06·1
2·9	α Lupi		139	38·0	38·2	38·3	38·4	38·3	38·1	S. 47	21·7	21·7	21·6	21·5	21·4	21·4
0·1	*Rigil Kent.*	38	140	12·9	13·2	13·4	13·6	13·5	13·2	S. 60	48·6	48·6	48·5	48·4	48·3	48·2
2·6	η Centauri		141	14·1	14·2	14·3	14·4	14·3	14·1	S. 42	07·8	07·8	07·7	07·6	07·6	07·5
3·0	γ Bootis		142	03·0	03·2	03·3	03·4	03·4	03·2	N. 38	20·6	20·6	20·5	20·4	20·3	20·1
0·2	*Arcturus*	37	146	09·9	10·0	10·1	10·1	10·1	09·9	N. 19	13·3	13·3	13·3	13·2	13·1	13·0
2·3	*Menkent*	36	148	26·0	26·1	26·2	26·3	26·2	26·0	S. 36	20·3	20·2	20·2	20·1	20·0	20·0
0·9	*Hadar*	35	149	10·1	10·3	10·6	10·6	10·5	10·2	S. 60	20·6	20·6	20·5	20·4	20·3	20·2
3·1	ζ Centauri		151	13·5	13·7	13·8	13·9	13·7	13·5	S. 47	15·4	15·4	15·3	15·2	15·1	15·1
2·8	η Bootis		151	24·8	24·9	25·0	25·0	24·9	24·7	N. 18	26·1	26·2	26·1	26·1	25·9	25·8
1·9	*Alkaid*	34	153	11·0	11·2	11·4	11·5	11·4	11·2	N. 49	21·2	21·2	21·1	21·0	20·8	20·6
2·6	ε Centauri		155	08·4	08·6	08·8	08·8	08·7	08·4	S. 53	26·1	26·0	25·9	25·8	25·7	25·7
1·2	*Spica*	33	158	47·7	47·8	47·9	47·9	47·8	47·6	S. 11	07·5	07·4	07·4	07·4	07·4	07·5
2·2	*Mizar*		159	05·4	05·6	05·8	05·8	05·7	05·5	N. 54	58·0	58·0	57·9	57·7	57·5	57·4
2·9	ι Centauri		159	57·1	57·2	57·3	57·3	57·1	56·9	S. 36	40·7	40·6	40·5	40·4	40·4	40·4
3·0	ε Virginis		164	32·7	32·8	32·8	32·8	32·7	32·5	N. 10	59·9	60·0	59·9	59·9	59·8	59·7
2·9	*Cor Caroli*		166	04·6	04·7	04·8	04·8	04·7	04·5	N. 38	21·6	21·6	21·5	21·4	21·2	21·1
1·7	*Alioth*	32	166	34·3	34·5	34·6	34·7	34·5	34·2	N. 55	60·2	60·1	60·0	59·9	59·7	59·5
1·5	*Mimosa*		168	10·5	10·8	10·9	10·9	10·6	10·3	S. 59	39·3	39·2	39·1	38·9	38·8	38·8
2·9	γ Virginis		169	40·6	40·6	40·7	40·7	40·5	40·3	S. 1	24·6	24·6	24·5	24·6	24·6	24·7
2·4	*Muhlifain*		169	43·2	43·4	43·5	43·5	43·3	42·9	S. 48	55·5	55·4	55·3	55·2	55·1	55·1
2·9	α Muscæ		170	48·9	49·2	49·4	49·3	49·0	48·5	S. 69	06·1	06·0	05·9	05·7	05·6	05·6
2·8	β Corvi		171	29·9	30·0	30·0	30·0	29·8	29·6	S. 23	21·5	21·5	21·4	21·4	21·4	21·4
1·6	*Gacrux*	31	172	18·6	18·8	18·9	18·8	18·6	18·2	S. 57	04·7	04·6	04·5	04·3	04·2	04·2
1·1	*Acrux*	30	173	27·1	27·4	27·5	27·4	27·1	26·7	S. 63	03·9	03·8	03·6	03·5	03·4	03·4
2·8	*Gienah*	29	176	08·5	08·6	08·6	08·6	08·4	08·1	S. 17	30·2	30·1	30·1	30·1	30·1	30·2
2·9	δ Centauri		177	60·3	60·5	60·5	60·5	60·2	59·9	S. 50	41·2	41·1	41·0	40·9	40·8	40·8
2·5	*Phecda*		181	38·3	38·5	38·5	38·4	38·2	37·9	N. 53	44·3	44·2	44·1	43·9	43·8	43·7
2·2	*Denebola*	28	182	49·7	49·7	49·7	49·7	49·5	49·3	N. 14	36·8	36·8	36·8	36·7	36·6	36·5
2·6	δ Leonis		191	34·2	34·3	34·2	34·1	33·9	33·7	N. 20	33·9	33·9	33·8	33·7	33·6	33·5
3·2	ψ Ursæ Majoris		192	41·3	41·3	41·3	41·2	41·0	40·7	N. 44	32·5	32·4	32·3	32·1	32·0	31·9
2·0	*Dubhe*	27	194	11·0	11·1	11·1	10·9	10·6	10·2	N. 61	47·6	47·5	47·3	47·2	47·0	46·9
2·4	*Merak*		194	39·1	39·2	39·2	39·0	38·7	38·4	N. 56	25·5	25·4	25·2	25·1	24·9	24·8
2·8	μ Velorum		198	23·4	23·5	23·4	23·3	23·0	22·7	S. 49	23·1	23·0	22·9	22·8	22·7	22·8
3·0	θ Carinæ		199	20·0	20·1	20·1	19·9	19·5	19·0	S. 64	21·6	21·5	21·4	21·2	21·2	21·2
2·3	*Algeiba*		205	06·5	06·5	06·5	06·3	06·1	05·8	N. 19	52·8	52·8	52·7	52·6	52·5	52·4
1·3	*Regulus*	26	207	60·3	60·3	60·3	60·1	59·9	59·6	N. 11	60·2	60·2	60·2	60·1	60·0	59·9
3·1	ε Leonis		213	38·6	38·5	38·4	38·3	38·0	37·8	N. 23	48·6	48·5	48·5	48·4	48·3	48·2
3·0	*N* Velorum		217	15·4	15·5	15·3	15·1	14·7	14·4	S. 56	60·3	60·2	60·0	59·9	59·9	60·0
2·2	*Alphard*	25	218	11·7	11·7	11·6	11·4	11·2	10·9	S. 8	37·6	37·6	37·5	37·6	37·6	37·7
2·6	κ Velorum		219	32·1	32·1	32·0	31·7	31·4	31·0	S. 54	58·9	58·8	58·6	58·6	58·6	58·7
2·2	ι Carinæ		220	47·1	47·1	46·9	46·7	46·3	45·9	S. 59	14·8	14·7	14·5	14·5	14·5	14·6
1·8	*Miaplacidus*	24	221	43·9	44·0	43·8	43·4	42·9	42·4	S. 69	41·4	41·2	41·1	41·0	41·0	41·1
2·2	*Suhail*	23	223	04·4	04·4	04·2	04·0	03·7	03·5	S. 43	24·3	24·2	24·0	24·0	24·0	24·1
3·1	ι Ursæ Majoris		225	19·6	19·5	19·4	19·1	18·8	18·4	N. 48	04·3	04·2	04·1	04·0	03·9	03·9
2·0	δ Velorum		228	52·9	52·9	52·7	52·4	52·1	51·8	S. 54	41·0	40·8	40·7	40·7	40·7	40·8
1·7	*Avior*	22	234	25·1	25·0	24·8	24·5	24·1	23·8	S. 59	29·2	29·1	29·0	28·9	29·0	29·1
1·9	γ Velorum		237	40·8	40·7	40·5	40·3	39·9	39·7	S. 47	18·9	18·8	18·7	18·7	18·7	18·9
2·9	ρ Puppis		238	11·7	11·7	11·5	11·3	11·0	10·8	S. 24	17·0	16·9	16·8	16·8	16·9	17·0
2·3	ζ Puppis		239	10·4	10·3	10·2	09·9	09·6	09·4	S. 39	59·0	58·8	58·7	58·7	58·8	58·9
1·2	*Pollux*	21	243	47·1	47·0	46·8	46·6	46·3	46·1	N. 28	02·7	02·6	02·6	02·6	02·5	02·5
0·5	*Procyon*	20	245	16·4	16·3	16·1	15·9	15·6	15·4	N. 5	14·7	14·7	14·7	14·7	14·6	14·5

STARS, 1992 JANUARY—JUNE

Mag.		Name and Number	S.H.A. JAN.	S.H.A. FEB.	S.H.A. MAR.	S.H.A. APR.	S.H.A. MAY	S.H.A. JUNE	Declination JAN.	Declination FEB.	Declination MAR.	Declination APR.	Declination MAY	Declination JUNE
			° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1·6	α	Geminorum	246 27·9	27·8	27·9	28·1	28·2	28·2	N. 31 54·3	54·3	54·4	54·4	54·4	54·4
3·3	σ	Puppis	247 44·7	44·7	44·9	45·1	45·3	45·4	S. 43 17·2	17·3	17·4	17·5	17·4	17·3
3·1	β	Canis Minoris	248 18·6	18·6	18·6	18·8	18·9	18·9	N. 8 18·3	18·2	18·2	18·2	18·2	18·3
2·4	η	Canis Majoris	249 02·7	02·7	02·8	03·0	03·1	03·2	S. 29 17·3	17·4	17·5	17·5	17·5	17·4
2·7	π	Puppis	250 46·5	46·5	46·6	46·8	47·0	47·1	S. 37 05·1	05·2	05·3	05·3	05·3	05·2
2·0	δ	Canis Majoris	252 58·4	58·4	58·5	58·7	58·8	58·9	S. 26 22·9	23·0	23·1	23·1	23·1	23·0
3·1	ο	Canis Majoris	254 19·0	19·1	19·2	19·3	19·4	19·5	S. 23 49·4	49·5	49·5	49·6	49·5	49·4
1·6	ε	Canis Majoris 19	255 24·7	24·7	24·9	25·0	25·2	25·2	S. 28 57·7	57·9	57·9	57·9	57·9	57·8
2·8	τ	Puppis	257 33·3	33·4	33·6	33·8	34·0	34·1	S. 50 36·4	36·5	36·6	36·6	36·6	36·5
−1·6	α	Canis Majoris 18	258 47·4	47·5	47·6	47·7	47·8	47·9	S. 16 42·4	42·5	42·5	42·5	42·5	42·4
1·9	γ	Geminorum	260 40·6	40·6	40·7	40·8	40·9	40·9	N. 16 24·4	24·3	24·3	24·4	24·4	24·4
−0·9	α	Carinæ 17	264 02·7	02·8	03·1	03·4	03·6	03·6	S. 52 41·6	41·7	41·8	41·8	41·7	41·6
2·0	β	Canis Majoris	264 24·2	24·2	24·4	24·5	24·6	24·6	S. 17 57·2	57·3	57·3	57·3	57·3	57·2
2·7	θ	Aurigæ	270 11·6	11·6	11·8	11·9	12·0	12·0	N. 37 12·8	12·8	12·9	12·8	12·8	12·7
2·1	β	Aurigæ	270 15·0	15·1	15·2	15·4	15·5	15·5	N. 44 56·9	57·0	57·0	57·0	56·9	56·8
Var.‡	α	Orionis 16	271 18·3	18·3	18·4	18·6	18·6	18·6	N. 7 24·3	24·3	24·3	24·3	24·3	24·4
2·2	κ	Orionis	273 08·8	08·8	08·9	09·1	09·2	09·1	S. 9 40·4	40·4	40·5	40·5	40·4	40·3
1·9	ξ	Orionis	274 54·1	54·1	54·3	54·4	54·5	54·4	S. 1 56·8	56·9	56·9	56·9	56·8	56·8
2·8	α	Columbæ	275 09·0	09·1	09·3	09·5	09·6	09·6	S. 34 04·8	04·9	04·9	04·9	04·8	04·7
3·0	ζ	Tauri	275 41·8	41·9	42·0	42·1	42·2	42·2	N. 21 08·3	08·3	08·3	08·3	08·3	08·3
1·8	ε	Orionis 15	276 02·3	02·4	02·5	02·6	02·7	02·6	S. 1 12·4	12·5	12·5	12·5	12·4	12·4
2·9	ι	Orionis	276 13·8	13·9	14·0	14·1	14·2	14·1	S. 5 54·9	55·0	55·0	55·0	54·9	54·9
2·7	α	Leporis	276 53·8	53·8	54·0	54·1	54·2	54·2	S. 17 49·7	49·8	49·8	49·8	49·7	49·6
2·5	δ	Orionis	277 05·4	05·5	05·6	05·7	05·8	05·8	S. 0 18·3	18·3	18·4	18·4	18·3	18·3
3·0	β	Leporis	278 00·9	01·0	01·1	01·3	01·3	01·3	S. 20 46·0	46·1	46·1	46·1	46·0	45·9
1·8	β	Tauri 14	278 32·5	32·6	32·7	32·8	32·9	32·8	N. 28 36·1	36·2	36·2	36·1	36·1	36·1
1·7	γ	Orionis 13	278 48·9	48·9	49·0	49·2	49·2	49·2	N. 6 20·6	20·5	20·5	20·5	20·6	20·6
0·2	α	Aurigæ 12	280 57·7	57·8	58·0	58·1	58·2	58·1	N. 45 59·6	59·6	59·6	59·6	59·5	59·4
0·3	β	Orionis 11	281 27·1	27·2	27·3	27·5	27·5	27·5	S. 8 12·7	12·7	12·7	12·7	12·7	12·6
2·9	β	Eridani	283 07·6	07·7	07·8	07·9	08·0	07·9	S. 5 05·8	05·9	05·9	05·9	05·8	05·7
2·9	ι	Aurigæ	285 52·2	52·3	52·5	52·6	52·6	52·5	N. 33 09·4	09·4	09·4	09·3	09·3	09·3
1·1	α	Tauri 10	291 07·5	07·6	07·7	07·8	07·8	07·7	N. 16 29·7	29·7	29·7	29·7	29·7	29·7
3·2	γ	Eridani	300 34·7	34·8	34·9	35·0	35·0	34·9	S. 13 31·9	31·9	31·9	31·9	31·8	31·7
3·0	ε	Persei	300 39·6	39·7	39·9	40·0	40·0	39·9	N. 39 59·5	59·5	59·5	59·4	59·3	59·3
2·9	ζ	Persei	301 35·0	35·1	35·2	35·3	35·3	35·2	N. 31 51·8	51·8	51·8	51·7	51·7	51·7
3·0	η	Tauri	303 14·3	14·4	14·5	14·6	14·6	14·5	N. 24 05·0	05·0	05·0	04·9	04·9	04·9
1·9	α	Persei 9	309 03·1	03·3	03·5	03·6	03·5	03·4	N. 49 50·3	50·3	50·2	50·2	50·1	50·0
Var.§	β	Persei	313 04·8	04·9	05·0	05·1	05·1	04·9	N. 40 55·8	55·8	55·7	55·7	55·6	55·5
2·8	α	Ceti 8	314 31·7	31·7	31·9	31·9	31·9	31·7	N. 4 03·6	03·6	03·6	03·6	03·6	03·7
3·1	θ	Eridani 7	315 30·2	30·4	30·6	30·7	30·7	30·5	S. 40 20·3	20·4	20·3	20·2	20·0	19·9
2·1	α	Ursæ Minoris	324 00·8	11·9	21·2	25·7	22·8	14·3	N. 89 14·1	14·2	14·1	13·9	13·8	13·7
3·1	β	Trianguli	327 43·6	43·7	43·8	43·9	43·8	43·6	N. 34 57·2	57·2	57·2	57·1	57·0	57·0
2·2	α	Arietis 6	328 18·8	18·9	19·0	19·0	18·9	18·7	N. 23 25·7	25·7	25·6	25·6	25·6	25·6
2·2	γ	Andromedæ	329 08·5	08·6	08·8	08·8	08·7	08·4	N. 42 17·8	17·8	17·7	17·6	17·5	17·5
3·0	α	Hydri	330 21·9	22·2	22·4	22·6	22·5	22·3	S. 61 36·7	36·7	36·6	36·4	36·2	36·1
2·7	β	Arietis	331 26·7	26·8	26·9	26·9	26·8	26·6	N. 20 46·3	46·3	46·3	46·2	46·2	46·3
0·6	α	Eridani 5	335 38·5	38·7	38·9	38·9	38·8	38·6	S. 57 16·8	16·8	16·7	16·5	16·3	16·2
2·8	δ	Cassiopeiæ	338 40·3	40·6	40·7	40·8	40·6	40·2	N. 60 12·0	12·0	11·9	11·7	11·6	11·6
2·4	β	Andromedæ	342 40·5	40·6	40·7	40·7	40·5	40·3	N. 35 35·0	34·9	34·8	34·8	34·7	34·8
Var.‖	γ	Cassiopeiæ	345 56·5	56·7	56·8	56·8	56·6	56·2	N. 60 40·8	40·7	40·6	40·5	40·4	40·4
2·2	β	Ceti 4	349 12·0	12·0	12·1	12·0	11·9	11·7	S. 18 01·9	01·8	01·8	01·7	01·6	01·5
2·5	α	Cassiopeiæ 3	349 59·1	59·3	59·4	59·3	59·1	58·7	N. 56 30·0	29·9	29·8	29·7	29·6	29·6
2·4	α	Phœnicis 2	353 31·5	31·6	31·6	31·6	31·4	31·2	S. 42 21·1	21·0	20·9	20·8	20·6	20·5
2·9	β	Hydri	353 40·0	40·5	40·8	40·7	40·3	39·6	S. 77 18·2	18·0	17·9	17·7	17·5	17·4
2·9	γ	Pegasi	356 47·5	47·5	47·6	47·5	47·3	47·1	N. 15 08·5	08·5	08·4	08·4	08·4	08·5
2·4	β	Cassiopeiæ	357 48·7	48·9	49·0	48·9	48·6	48·2	N. 59 06·7	06·6	06·5	06·4	06·3	06·3
2·2	α	Andromedæ 1	357 60·2	60·3	60·3	60·3	60·1	59·8	N. 29 03·0	02·9	02·9	02·8	02·8	02·9

‡ 0·1—1·2 § 2·3—3·5 ‖ Irregular variable, 1989 mag. 2·5

STARS, 1992 JULY—DECEMBER

Mag.		Name and Number	S.H.A. JULY	S.H.A. AUG.	S.H.A. SEPT.	S.H.A. OCT.	S.H.A. NOV.	S.H.A. DEC.	Declination JULY	Declination AUG.	Declination SEPT.	Declination OCT.	Declination NOV.	Declination DEC.
			° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1·6		*Castor*	246 28·2	28·0	27·8	27·6	27·3	27·1	N. 31 54·3	54·3	54·2	54·2	54·1	54·1
3·3	σ	Puppis	247 45·4	45·3	45·1	44·8	44·5	44·3	S. 43 17·2	17·0	16·9	16·9	17·0	17·2
3·1	β	Canis Minoris	248 18·9	18·7	18·5	18·3	18·1	17·9	N. 8 18·3	18·3	18·3	18·3	18·2	18·2
2·4	η	Canis Majoris	249 03·2	03·1	02·9	02·6	02·4	02·2	S. 29 17·3	17·2	17·1	17·1	17·2	17·3
2·7	π	Puppis	250 47·0	46·9	46·7	46·5	46·2	46·0	S. 37 05·0	04·9	04·8	04·8	04·9	05·0
2·0		*Wezen*	252 58·8	58·7	58·5	58·3	58·0	57·9	S. 26 22·8	22·7	22·7	22·7	22·8	22·9
3·1	ο	Canis Majoris	254 19·4	19·3	19·1	18·9	18·7	18·5	S. 23 49·3	49·2	49·1	49·1	49·2	49·4
1·6		*Adhara* 19	255 25·2	25·0	24·8	24·6	24·4	24·2	S. 28 57·7	57·6	57·5	57·5	57·6	57·7
2·8	τ	Puppis	257 34·1	34·0	33·7	33·4	33·1	32·9	S. 50 36·3	36·2	36·1	36·1	36·2	36·3
−1·6		*Sirius* 18	258 47·8	47·6	47·5	47·2	47·0	46·8	S. 16 42·3	42·2	42·2	42·2	42·3	42·4
1·9		*Alhena*	260 40·8	40·6	40·4	40·2	40·0	39·8	N. 16 24·4	24·4	24·4	24·4	24·3	24·3
−0·9		*Canopus* 17	264 03·6	03·4	03·1	02·8	02·5	02·4	S. 52 41·4	41·3	41·2	41·2	41·3	41·5
2·0		*Mirzam*	264 24·5	24·4	24·2	24·0	23·7	23·6	S. 17 57·1	57·0	56·9	56·9	57·0	57·1
2·7	θ	Aurigæ	270 11·8	11·6	11·3	11·1	10·8	10·6	N. 37 12·7	12·7	12·7	12·7	12·7	12·7
2·1		*Menkalinan*	270 15·3	15·1	14·8	14·5	14·2	14·0	N. 44 56·8	56·7	56·7	56·7	56·7	56·8
Var.‡		*Betelgeuse* 16	271 18·5	18·3	18·1	17·9	17·7	17·5	N. 7 24·4	24·4	24·5	24·5	24·4	24·4
2·2	κ	Orionis	273 09·0	08·8	08·6	08·4	08·2	08·1	S. 9 40·2	40·2	40·1	40·1	40·2	40·3
1·9		*Alnitak*	274 54·3	54·1	53·9	53·7	53·5	53·4	S. 1 56·7	56·6	56·6	56·6	56·7	56·8
2·8		*Phact*	275 09·5	09·3	09·1	08·8	08·6	08·5	S. 34 04·5	04·4	04·4	04·4	04·5	04·7
3·0	ζ	Tauri	275 42·0	41·8	41·6	41·3	41·1	41·0	N. 21 08·3	08·3	08·3	08·3	08·3	08·3
1·8		*Alnilam* 15	276 02·5	02·3	02·1	01·9	01·7	01·6	S. 1 12·3	12·2	12·2	12·2	12·3	12·4
2·9	ι	Orionis	276 14·0	13·8	13·6	13·4	13·2	13·1	S. 5 54·8	54·7	54·7	54·7	54·8	54·9
2·7	α	Leporis	276 54·1	53·9	53·7	53·4	53·3	53·1	S. 17 49·5	49·4	49·4	49·4	49·5	49·6
2·5	δ	Orionis	277 05·6	05·5	05·2	05·0	04·8	04·7	S. 0 18·2	18·1	18·1	18·1	18·2	18·2
3·0	β	Leporis	278 01·2	01·0	00·8	00·6	00·4	00·3	S. 20 45·8	45·7	45·6	45·7	45·8	45·9
1·8		*Elnath* 14	278 32·7	32·5	32·2	32·0	31·7	31·6	N. 28 36·1	36·1	36·1	36·1	36·1	36·1
1·7		*Bellatrix* 13	278 49·0	48·8	48·6	48·4	48·2	48·1	N. 6 20·6	20·7	20·7	20·7	20·7	20·6
0·2		*Capella* 12	280 57·9	57·7	57·4	57·0	56·8	56·6	N. 45 59·4	59·4	59·4	59·4	59·4	59·5
0·3		*Rigel* 11	281 27·3	27·1	26·9	26·7	26·5	26·4	S. 8 12·5	12·4	12·4	12·4	12·5	12·6
2·9	β	Eridani	283 07·8	07·6	07·4	07·2	07·0	06·9	S. 5 05·7	05·6	05·5	05·6	05·6	05·7
2·9	ι	Aurigæ	285 52·4	52·1	51·8	51·6	51·4	51·3	N. 33 09·2	09·3	09·3	09·3	09·3	09·4
1·1		*Aldebaran* 10	291 07·6	07·3	07·1	06·9	06·7	06·6	N. 16 29·7	29·8	29·8	29·8	29·8	29·8
3·2	γ	Eridani	300 34·7	34·5	34·3	34·1	34·0	33·9	S. 13 31·6	31·5	31·5	31·5	31·6	31·7
3·0	ε	Persei	300 39·6	39·3	39·1	38·8	38·6	38·6	N. 39 59·3	59·3	59·4	59·4	59·5	59·6
2·9	ζ	Persei	301 35·0	34·7	34·4	34·2	34·1	34·0	N. 31 51·7	51·7	51·8	51·8	51·9	51·9
3·0		*Alcyone*	303 14·3	14·0	13·8	13·6	13·4	13·4	N. 24 04·9	05·0	05·0	05·1	05·1	05·1
1·9		*Mirfak* 9	309 03·1	02·7	02·4	02·1	02·0	01·9	N. 49 50·0	50·0	50·1	50·2	50·3	50·4
Var.§		*Algol*	313 04·6	04·3	04·0	03·8	03·7	03·7	N. 40 55·6	55·6	55·6	55·7	55·8	55·9
2·8		*Menkar* 8	314 31·5	31·3	31·1	30·9	30·8	30·8	N. 4 03·8	03·8	03·9	03·9	03·9	03·8
3·1		*Acamar* 7	315 30·3	30·0	29·8	29·6	29·5	29·6	S. 40 19·7	19·7	19·7	19·8	19·9	20·0
2·1		*Polaris*	323 62·4	49·4	38·1	30·7	28·5	33·0	N. 89 13·6	13·7	13·8	14·0	14·1	14·3
3·1	β	Trianguli	327 43·3	43·0	42·8	42·6	42·6	42·6	N. 34 57·1	57·2	57·3	57·4	57·5	57·5
2·2		*Hamal* 6	328 18·5	18·2	18·0	17·9	17·8	17·9	N. 23 25·7	25·7	25·8	25·9	25·9	26·0
2·2		*Almak*	329 08·2	07·9	07·6	07·5	07·4	07·4	N. 42 17·6	17·7	17·8	17·9	18·0	18·0
3·0	α	Hydri	330 21·9	21·5	21·2	21·0	21·1	21·2	S. 61 35·9	35·9	36·0	36·1	36·3	36·4
2·7		*Sheratan*	331 26·3	26·1	25·9	25·8	25·7	25·8	N. 20 46·3	46·4	46·5	46·6	46·6	46·6
0·6		*Achernar* 5	335 38·3	37·9	37·6	37·5	37·6	37·7	S. 57 16·1	16·0	16·1	16·2	16·4	16·5
2·8		*Ruchbah*	338 39·8	39·4	39·1	38·9	38·9	39·0	N. 60 11·7	11·8	11·9	12·1	12·2	12·3
2·4		*Mirach*	342 40·0	39·7	39·5	39·4	39·4	39·5	N. 35 34·8	34·9	35·1	35·2	35·3	35·3
Var.‖	γ	Cassiopeiæ	345 55·8	55·4	55·1	55·0	55·1	55·2	N. 60 40·4	40·6	40·7	40·9	41·0	41·1
2·2		*Diphda* 4	349 11·4	11·2	11·1	11·0	11·0	11·1	S. 18 01·4	01·3	01·3	01·4	01·4	01·5
2·5		*Schedar* 3	349 58·4	58·0	57·8	57·7	57·8	57·9	N. 56 29·7	29·8	30·0	30·1	30·2	30·3
2·4		*Ankaa* 2	353 30·9	30·6	30·5	30·4	30·5	30·6	S. 42 20·4	20·4	20·5	20·6	20·7	20·8
2·9	β	Hydri	353 38·8	38·1	37·7	37·7	38·1	38·7	S. 77 17·3	17·4	17·5	17·7	17·8	17·9
2·9		*Algenib*	356 46·8	46·6	46·5	46·5	46·5	46·6	N. 15 08·6	08·7	08·8	08·9	08·9	08·9
2·4		*Caph*	357 47·8	47·5	47·3	47·3	47·4	47·6	N. 59 06·4	06·5	06·7	06·9	07·0	07·1
2·2		*Alpheratz* 1	357 59·6	59·4	59·2	59·2	59·2	59·3	N. 29 03·0	03·1	03·2	03·3	03·4	03·4

‡ 0·1—1·2 § 2·3—3·5 ‖ Irregular variable, 1989 mag. 2·5

POLARIS (POLE STAR) TABLES, 1992

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. 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 21·7	0 17·5	0 14·6	0 13·1	0 12·9	0 14·2	0 16·8	0 20·8	0 25·9	0 32·0	0 38·9	0 46·4
1	21·3	17·2	14·4	13·0	13·0	14·4	17·2	21·2	26·4	32·6	39·6	47·2
2	20·8	16·9	14·2	12·9	13·1	14·6	17·5	21·7	27·0	33·3	40·4	48·0
3	20·4	16·5	14·0	12·9	13·1	14·8	17·9	22·2	27·6	34·0	41·1	48·8
4	19·9	16·2	13·8	12·8	13·2	15·1	18·2	22·7	28·2	34·7	41·8	49·5
5	0 19·5	0 15·9	0 13·7	0 12·8	0 13·4	0 15·3	0 18·6	0 23·2	0 28·8	0 35·3	0 42·6	0 50·3
6	19·1	15·6	13·5	12·8	13·5	15·6	19·0	23·7	29·4	36·0	43·4	51·1
7	18·7	15·4	13·4	12·8	13·7	15·9	19·4	24·2	30·0	36·7	44·1	51·9
8	18·3	15·1	13·3	12·8	13·8	16·2	19·9	24·8	30·7	37·5	44·9	52·7
9	17·9	14·9	13·2	12·9	14·0	16·5	20·3	25·3	31·3	38·2	45·6	53·5
10	0 17·5	0 14·6	0 13·1	0 12·9	0 14·2	0 16·8	0 20·8	0 25·9	0 32·0	0 38·9	0 46·4	0 54·3
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	0·6	0·6	0·6	0·6	0·6	0·5	0·5	0·4	0·3	0·3	0·2
10	·5	·6	·6	·6	·6	·6	·5	·5	·4	·4	·3	·3
20	·5	·6	·6	·6	·6	·6	·5	·5	·5	·4	·4	·4
30	·5	·6	·6	·6	·6	·6	·6	·5	·5	·5	·4	·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	·5	·5
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·6	·6	·6	·6	·6	·6	·6	·7	·7	·7
60	·6	·6	·6	·6	·6	·6	·6	·7	·7	·7	·7	·8
62	0·7	0·6	0·6	0·6	0·6	0·6	0·6	0·7	0·7	0·8	0·8	0·8
64	·7	·6	·6	·6	·6	·6	·7	·7	·8	·8	·8	·9
66	·7	·6	·6	·6	·6	·6	·7	·7	·8	·8	·9	0·9
68	0·7	0·7	0·6	0·6	0·6	0·6	0·7	0·8	0·8	0·9	0·9	1·0
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.	0·7	0·7	0·7	0·7	0·8	0·8	0·8	0·7	0·7	0·7	0·7	0·7
Feb.	·6	·7	·7	·8	·8	·8	·8	·8	·9	·9	·8	·8
Mar.	·5	·5	·6	·7	·7	·8	·8	·9	·9	·9	·9	·9
Apr.	0·3	0·4	0·5	0·5	0·6	0·7	0·7	0·8	0·8	0·9	0·9	1·0
May	·2	·3	·3	·4	·4	·5	·6	·6	·7	·8	·8	0·9
June	·2	·2	·2	·3	·3	·4	·4	·5	·6	·6	·7	·8
July	0·3	0·2	0·2	0·2	0·3	0·3	0·3	0·4	0·4	0·5	0·5	0·6
Aug.	·4	·3	·3	·3	·3	·3	·3	·3	·3	·3	·4	·4
Sept.	·5	·5	·4	·4	·4	·3	·3	·3	·3	·3	·3	·3
Oct.	0·7	0·7	0·6	0·6	0·5	0·4	0·4	0·3	0·3	0·3	0·3	0·2
Nov.	0·9	0·9	·8	·7	·7	·6	·5	·5	·4	·3	·3	·3
Dec.	1·0	1·0	0·9	0·9	0·8	0·8	0·7	0·6	0·6	0·5	0·4	0·3

Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·4	0·3	0·1	0·0	359·9	359·8	359·6	359·5	359·4	359·3	359·3	359·2
20	0·4	0·3	0·2	0·0	359·9	359·7	359·6	359·5	359·4	359·3	359·2	359·2
40	0·5	0·4	0·2	0·0	359·8	359·7	359·5	359·4	359·2	359·1	359·1	359·0
50	0·6	0·4	0·2	0·0	359·8	359·6	359·4	359·2	359·1	359·0	358·9	358·8
55	0·7	0·5	0·3	0·0	359·8	359·6	359·3	359·1	359·0	358·8	358·7	358·7
60	0·8	0·6	0·3	0·0	359·8	359·5	359·2	359·0	358·8	358·7	358·6	358·5
65	1·0	0·7	0·4	0·0	359·7	359·4	359·1	358·8	358·6	358·4	358·3	358·2

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

The table is entered with L.H.A. 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 L.H.A. 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*.

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FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. 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 54·3	1 02·3	1 10·2	1 17·8	1 24·7	1 30·9	1 36·1	1 40·2	1 43·0	1 44·5	1 44·7	1 43·5
1	55·1	03·1	11·0	18·5	25·4	31·5	36·6	40·5	43·2	44·6	44·6	43·3
2	55·9	03·9	11·8	19·2	26·0	32·0	37·0	40·9	43·4	44·7	44·6	43·1
3	56·7	04·7	12·5	19·9	26·7	32·6	37·5	41·2	43·6	44·7	44·5	42·8
4	57·5	05·5	13·3	20·6	27·3	33·1	37·9	41·5	43·8	44·8	44·4	42·6
5	0 58·3	1 06·3	1 14·1	1 21·3	1 27·9	1 33·6	1 38·3	1 41·8	1 44·0	1 44·8	1 44·2	1 42·3
6	59·1	07·1	14·8	22·0	28·6	34·2	38·7	42·1	44·1	44·8	44·1	42·1
7	0 59·9	07·9	15·6	22·7	29·2	34·7	39·1	42·3	44·2	44·8	44·0	41·8
8	1 00·7	08·7	16·3	23·4	29·8	35·2	39·5	42·6	44·4	44·8	43·8	41·5
9	01·5	09·5	17·0	24·1	30·3	35·6	39·8	42·8	44·5	44·7	43·6	41·2
10	1 02·3	1 10·2	1 17·8	1 24·7	1 30·9	1 36·1	1 40·2	1 43·0	1 44·5	1 44·7	1 43·5	1 40·9
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	0·2	0·2	0·3	0·3	0·4	0·4	0·5	0·6	0·6	0·6	0·6	0·6
10	·3	·3	·3	·4	·4	·5	·5	·6	·6	·6	·6	·6
20	·3	·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	·9	·9	·8	·8	·8	·7	·7	·6	·6	·6	·6	·6
66	0·9	0·9	0·9	·8	·8	·7	·7	·6	·6	·6	·6	·6
68	1·0	1·0	1·0	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.	0·7	0·6	0·6	0·6	0·5	0·5	0·5	0·5	0·5	0·5	0·4	0·4
Feb.	·8	·8	·7	·7	·7	·6	·6	·5	·5	·4	·4	·4
Mar.	0·9	0·9	0·9	0·8	·8	·8	·7	·7	·6	·5	·5	·4
Apr.	1·0	1·0	1·0	1·0	0·9	0·9	0·9	0·8	0·7	0·7	0·6	0·5
May	0·9	1·0	1·0	1·0	1·0	1·0	1·0	0·9	0·9	·8	·8	·7
June	·8	0·9	0·9	1·0	1·0	1·0	1·0	1·0	1·0	0·9	·9	·8
July	0·7	0·7	0·8	0·8	0·9	0·9	0·9	1·0	1·0	1·0	0·9	0·9
Aug.	·5	·5	·6	·7	·7	·8	·8	0·9	0·9	0·9	·9	·9
Sept.	·3	·4	·4	·5	·5	·6	·7	·7	·8	·8	·8	·9
Oct.	0·2	0·3	0·3	0·3	0·4	0·4	0·5	0·5	0·6	0·6	0·7	0·8
Nov.	·2	·2	·2	·2	·2	·2	·3	·3	·4	·5	·5	·6
Dec.	0·3	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·4	0·4

Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	359·2	359·2	359·3	359·3	359·4	359·5	359·6	359·7	359·9	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	0·3
40	359·0	359·0	359·1	359·1	359·2	359·3	359·5	359·6	359·8	0·0	0·2	0·3
50	358·8	358·8	358·9	359·0	359·1	359·2	359·4	359·6	359·8	0·0	0·2	0·4
55	358·7	358·7	358·7	358·8	359·0	359·1	359·3	359·5	359·7	0·0	0·2	0·4
60	358·5	358·5	358·6	358·7	358·8	359·0	359·2	359·5	359·7	0·0	0·2	0·5
65	358·2	358·2	358·3	358·4	358·6	358·8	359·1	359·4	359·7	0·0	0·3	0·6

ILLUSTRATION

On 1992 April 21 at 23h 18m 56s UT in longitude W. 37° 14′ the apparent altitude (corrected for refraction), *Ho*, of *Polaris* was 49° 31′·6

From the daily pages:	°	′
G.H.A. Aries (23h)	195	15·7
Increment (18m 56s)	4	44·8
Longitude (west)	−37	14
L.H.A. Aries	162	46

	°	′
Ho	49	31·6
a_0 (argument 162° 46′)	1	26·5
a_1 (lat. 50° approx)		0·6
a_2 (April)		0·9
Sum − 1° = Lat. =	49	59·6

POLARIS (POLE STAR) TABLES, 1992

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. 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 40·9	1 37·1	1 32·1	1 26·1	1 19·3	1 11·9	1 04·0	0 56·0	0 48·1	0 40·4	0 33·4	0 27·1
1	40·6	36·6	31·5	25·5	18·6	11·1	03·2	55·2	47·3	39·7	32·7	26·5
2	40·2	36·2	31·0	24·8	17·9	10·3	02·4	54·4	46·5	39·0	32·0	25·9
3	39·9	35·7	30·4	24·1	17·1	09·5	01·6	53·6	45·7	38·2	31·4	25·4
4	39·5	35·2	29·8	23·5	16·4	08·8	00·8	52·8	45·0	37·5	30·7	24·8
5	1 39·1	1 34·7	1 29·2	1 22·8	1 15·6	1 08·0	1 00·0	0 52·0	0 44·2	0 36·8	0 30·1	0 24·3
6	38·7	34·2	28·6	22·1	14·9	07·2	0 59·2	51·2	43·4	36·1	29·5	23·7
7	38·3	33·7	28·0	21·4	14·1	06·4	58·4	50·4	42·7	35·4	28·9	23·2
8	37·9	33·2	27·4	20·7	13·4	05·6	57·6	49·6	41·9	34·7	28·3	22·7
9	37·5	32·6	26·7	20·0	12·6	04·8	56·8	48·8	41·2	34·0	27·7	22·2
10	1 37·1	1 32·1	1 26·1	1 19·3	1 11·9	1 04·0	0 56·0	0 48·1	0 40·4	0 33·4	0 27·1	0 21·7
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	0·3	0·3	0·2	0·2	0·2	0·3	0·3	0·4	0·4
10	·5	·5	·4	·4	·3	·3	·3	·3	·3	·4	·4	·5
20	·5	·5	·5	·4	·4	·4	·3	·4	·4	·4	·4	·5
30	·6	·5	·5	·5	·4	·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	·5	·5	·5	·5	·5	·6	·6	·6
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·6	·7	·7	·7	·7	·7	·7	·7	·6	·6
60	·6	·7	·7	·7	·7	·8	·8	·8	·7	·7	·7	·7
62	0·6	0·7	0·7	0·8	0·8	0·8	0·8	0·8	0·8	0·8	0·7	0·7
64	·7	·7	·8	·8	·8	·9	·9	·9	·8	·8	·8	·7
66	·7	·7	·8	·8	·9	0·9	0·9	0·9	0·9	·8	·8	·7
68	0·7	0·8	0·8	0·9	0·9	1·0	1·0	1·0	1·0	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	0·5	0·5	0·6	0·6	0·6	0·7	0·7
Feb.	·4	·4	·3	·3	·4	·4	·4	·4	·5	·5	·5	·6
Mar.	·4	·3	·3	·3	·3	·3	·3	·3	·3	·4	·4	·4
Apr.	0·5	0·4	0·4	0·3	0·3	0·2	0·2	0·2	0·2	0·2	0·3	0·3
May	·6	·6	·5	·4	·4	·3	·3	·2	·2	·2	·2	·2
June	·8	·7	·6	·6	·5	·4	·4	·3	·3	·2	·2	·2
July	0·9	0·8	0·8	0·7	0·7	0·6	0·5	0·5	0·4	0·4	0·3	0·3
Aug.	·9	·9	·9	·9	·8	·8	·7	·7	·6	·5	·5	·4
Sept.	·9	·9	·9	·9	·9	0·9	0·9	·8	·8	·7	·7	·6
Oct.	0·8	0·9	0·9	0·9	0·9	1·0	1·0	0·9	0·9	0·9	0·8	0·8
Nov.	·7	·7	·8	·9	·9	0·9	1·0	1·0	1·0	1·0	1·0	1·0
Dec.	0·5	0·6	0·6	0·7	0·8	0·9	0·9	1·0	1·0	1·0	1·0	1·0

AZIMUTH

Lat.												
°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·4	0·5	0·6	0·7	0·7	0·8	0·8	0·8	0·7	0·7	0·6	0·5
20	0·4	0·5	0·6	0·7	0·8	0·8	0·8	0·8	0·8	0·7	0·6	0·5
40	0·5	0·6	0·7	0·9	0·9	1·0	1·0	1·0	1·0	0·9	0·8	0·7
50	0·6	0·7	0·9	1·0	1·1	1·2	1·2	1·2	1·1	1·1	0·9	0·8
55	0·6	0·8	1·0	1·1	1·2	1·3	1·3	1·3	1·3	1·2	1·1	0·9
60	0·7	0·9	1·1	1·3	1·4	1·5	1·5	1·5	1·5	1·4	1·2	1·0
65	0·9	1·1	1·3	1·5	1·7	1·8	1·8	1·8	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 L.H.A. 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 L.H.A. 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*.

SIGHT REDUCTION PROCEDURES

METHODS AND FORMULAE FOR DIRECT COMPUTATION

1. *Introduction.* Formulae and method are provided for use with an electronic calculator or microcomputer for the determination of position at sea from altitudes observed with a marine sextant. The calculator must have trigonometric functions, and preferably it should be programmable and retain the contents of its memory when switched off. The formulae have been expressed in algebraic notation and it is assumed that the user will be able to translate them into the code or language used by the calculator. The astronomical data, such as the *GHA* and *Dec* of a body, are assumed to be taken from the main tabular pages of the current *Nautical Almanac* and entered into the calculator for interpolation. All subsequent calculations for the sight reduction are then made with the calculator. The estimated longitude and latitude at the time of observation are entered into the calculator to determine the calculated altitude and azimuth. The calculator may also be used to reduce the sextant altitudes to observed altitudes by applying the corrections for dip, refraction, parallax and semi-diameter. Each observation provides an intercept and an azimuth that may be used to plot a position line on a chart. Several position lines are required to determine a fix. A method is given for calculating a fix from several observations by direct calculation using a programmable calculator. The method, which is based on least squares, has the advantage that further observations may be included in the solution and doubtful observations may be removed from the solution.

2. *Notation.*

GHA = Greenwich hour angle. The range of *GHA* is from 0° to 360° starting at 0° on the Greenwich meridian increasing to the west, back to 360° on the Greenwich meridian.

SHA = sidereal hour angle. The range is 0° to 360°.

Dec = declination. The sign convention for declination is north is positive, south is negative. The range is from −90° at the south celestial pole to +90° at the north celestial pole.

Long = longitude. The sign convention is east is positive, west is negative. The range is −180° to +180°.

Lat = latitude. The sign convention is north is positive, south is negative. The range is from −90° to +90°.

LHA = *GHA* + *Long* = local hour angle. The *LHA* increases to the west from 0° on the local meridian to 360°.

H_C = calculated altitude. Above the horizon is positive, below the horizon is negative. The range is from −90° in the nadir to +90° in the zenith.

H_S = sextant altitude.

H = apparent altitude = sextant altitude corrected for instrumental error and dip.

H_O = observed altitude = apparent altitude corrected for refraction and, in appropriate cases, corrected for parallax and semi-diameter.

Z = Z_n = true azimuth. *Z* is measured from true north through east, south, west and back to north. The range is from 0° to 360°.

I = sextant index error.

D = dip of horizon.

R = atmospheric refraction.

HP = horizontal parallax of the Sun, Moon, Venus or Mars.

PA = parallax in altitude of the Sun, Moon, Venus or Mars.

S = semi-diameter of the Sun or Moon.
p = intercept = $H_O - H_C$. Towards is positive, away is negative.
T = course or track, measured as for azimuth from the north.
V = speed in knots.

3. *Entering Basic Data.* When entering into the calculator quantities such as *GHA*, which in the *Nautical Almanac* are given in degrees and minutes, convert them to degrees and decimals of a degree by dividing the minutes by 60 and adding to the degrees; for example, if *GHA* = 123° 45·6, enter the two numbers 123 and 45·6 into the memory and set *GHA* = 123 + 45·6/60 = 123°·7600. Although four decimal places of a degree are sufficient, it is assumed in the examples that full precision is maintained inside the calculator.

Most calculators have a special key for converting degrees, minutes and seconds to degrees and decimals. With programmable calculators it is often possible to write a subroutine that does the conversion automatically. For quantities like *Dec* which has a minus sign for southern declination, change the sign from plus to minus after the value has been converted to degrees and decimals, *e.g.* *Dec* = S 0° 12·3 = S 0°·2050 = −0°·2050. Other quantities which require conversion are semi-diameter, horizontal parallax, longitude and latitude.

4. *Interpolation of GHA and Dec.* The *GHA* and *Dec* of the Sun, Moon and planets are interpolated to the time of observation with a calculator as follows: If the universal time is $a^h\ b^m\ c^s$, form the interpolation factor $x = b/60 + c/3600$. Enter the tabular value GHA_0 for the preceeding hour (a) and the tabular value GHA_1 for the following hour ($a+1$) then the interpolated value *GHA* is given by

$$GHA = GHA_0 + x(GHA_1 - GHA_0)$$

If the *GHA* passes through 360° between tabular values add 360° to GHA_1 before interpolation. If the interpolated value exceeds 360°, subtract 360° from *GHA*.

Similarly for declination, enter the tabular value Dec_0 for the preceeding hour (a) and the tabular value Dec_1 for the following hour ($a+1$), then the interpolated value *Dec* is given by

$$Dec = Dec_0 + x(Dec_1 - Dec_0)$$

5. *Example.* (a) Find the *GHA* and *Dec* of the Sun on 1992 December 3 at $15^h\ 47^m\ 13^s$ UT.

The interpolation factor $x = 47/60 + 13/3600 = 0^h·7869$

page 235
15^h $GHA_0 = 47° 29'·8 = 47°·4967$
16^h $GHA_1 = 62° 29'·5 = 62°·4917$
$15^h·7869$ $GHA = 47·4967 + 0·7869(62·4917 - 47·4967) = 59°·2969$
15^h $Dec_0 = \text{S}\,22° 11'·4 = -22°·1900$
16^h $Dec_1 = \text{S}\,22° 11'·8 = -22°·1967$
$15^h·7869$ $Dec = -22·1900 + 0·7869(-22·1967 + 22·1900) = -22°·1952$

GHA Aries is interpolated in the same way as *GHA* of a body. For a star the *SHA* and *Dec* are taken from the tabular page and do not require interpolation, then

$$GHA = GHA\ \text{Aries} + SHA$$

where *GHA* Aries is interpolated to the time of observation.

(b) Find the *GHA* and *Dec* of *Vega* on 1992 December 6 at $18^h\ 47^m\ 13^s$ UT.

The interpolation factor $x = 0^h·7869$ as in the previous example

page 236
18^h $GHA\ \text{Aries}_0 = 345° 46'·2 = 345°·7700$
19^h $GHA\ \text{Aries}_1 = 0° 48'·7 = 360°·8117$ (360° added)
$18^h·7869$ $GHA\ \text{Aries} = 345·7700 + 0·7869(360·8117 - 345·7700) = 357°·6070$
$SHA = 80° 49'·8 = 80°·8300$
$GHA = GHA\ \text{Aries} + SHA = 78°·4370$ (multiple of 360° removed)
$Dec = \text{N}\,38° 46'·8 = +38°·7800$

6. *The calculated altitude and azimuth.* The calculated altitude H_C and true azimuth Z are determined from the *GHA* and *Dec* interpolated to the time of observation and from the *Long* and *Lat* estimated at the time of observation as follows:

Step 1. Calculate the local hour angle

$$LHA = GHA + Long$$

Add or subtract multiples of 360° to set *LHA* in the range 0° to 360°.

Step 2. Calculate S, C and the altitude H_C from

$$S = \sin Dec$$
$$C = \cos Dec \cos LHA$$
$$H_C = \sin^{-1}(S \sin Lat + C \cos Lat)$$

where $\sin^{-1}$ is the inverse function of sine.

Step 3. Calculate X and A from

$$X = (S \cos Lat - C \sin Lat)/\cos H_C$$
If $X > +1$ set $X = +1$
If $X < -1$ set $X = -1$
$$A = \cos^{-1} X$$

where $\cos^{-1}$ is the inverse function of cosine.

Step 4. Determine the azimuth Z

If $LHA > 180°$ then $Z = A$
Otherwise $Z = 360° - A$

7. *Example.* Find the calculated altitude H_C and azimuth Z when

$$GHA = 53°\quad Dec = \text{S}\,15°\quad Lat = \text{N}\,32°\quad Long = \text{W}\,16°$$

For the calculation

$$GHA = 53°·0000\quad Dec = -15°·0000\quad Lat = +32°·0000\quad Long = -16°·0000$$

Step 1. $LHA = 53·0000 - 16·0000 = 37·0000$
Step 2. $S = -0·2588$
$C = +0·9659 \times 0·7986 = 0·7714$
$\sin H_C = -0·2588 \times 0·5299 + 0·7714 \times 0·8480 = 0·5171$
$H_C = 31°·1346$

Step 3. $X = (-0{\cdot}2588 \times 0{\cdot}8480 - 0{\cdot}7714 \times 0{\cdot}5299)/0{\cdot}8560 = -0{\cdot}7340$
$A = 137°2239$

Step 4. Since $LHA \leq 180°$ then $Z = 360° - A = 222°7761$

8. ***Reduction from sextant altitude to observed altitude.*** The sextant altitude H_S is corrected for both dip and index error to produce the apparent altitude. The observed altitude H_O is calculated by applying a correction for refraction. For the Sun, Moon, Venus and Mars a correction for parallax is also applied to H, and for the Sun and Moon a further correction for semi-diameter is required. The corrections are calculated as follows:

Step 1. Calculate dip

$$D = 0°0293\sqrt{h}$$

where h is the height of eye above the horizon in metres.

Step 2. Calculate apparent altitude

$$H = H_S + I - D$$

where I is the sextant index error.

Step 3. Calculate refraction (R) at a standard temperature of 10° Celsius (C) and pressure of 1010 millibars (mb)

$$R_0 = 0°0167/\tan(H + 7{\cdot}31/(H + 4{\cdot}4))$$

If the temperature $T°$ C and pressure P mb are known calculate the refraction from

$$R = fR_0 \quad \text{where} \quad f = 0{\cdot}28P/(T + 273)$$

otherwise set $R = R_0$

Step 4. Calculate the parallax in altitude (PA) from the horizontal parallax (HP) and the apparent altitude (H) for the Sun, Moon, Venus and Mars as follows:

$$PA = HP\cos H$$

For the Sun $HP = 0°0024$. This correction is very small and could be ignored.

For the Moon HP is taken for the nearest hour from the main tabular page and converted to degrees.

For Venus and Mars the HP is taken from the critical table at the bottom of page 259 and converted to degrees.

For the navigational stars and the remaining planets, Jupiter and Saturn set $PA = 0$.

If an error of 0′2 is significant the expression for the parallax in altitude for the Moon should include a small correction OB for the oblateness of the Earth as follows:

$$PA = HP\cos H + OB$$

where $OB = -0°0032\sin^2 Lat\cos H + 0°0032\sin(2Lat)\cos Z\sin H$

At mid-latitudes and for altitudes of the Moon below 60° a simple approximation to OB is

$$OB = -0°0017\cos H$$

Step 5. Calculate the semi-diameter for the Sun and Moon as follows:

Sun: S is taken from the main tabular page and converted to degrees.

Moon: $S = 0°2724HP$ where HP is taken for the nearest hour from the main tabular page and converted to degrees.

Step 6. Calculate the observed altitude

$$H_O = H - R + PA \pm S$$

where the plus sign is used if the lower limb of the Sun or Moon was observed and the minus sign if the upper limb was observed.

9. ***Example.*** The following example illustrates how to use a calculator to reduce the sextant altitude (H_S) to observed altitude (H_O); the sextant altitudes given are assumed to be taken on 1992 December 3 with a marine sextant, zero index error, at height 5·4 m, temperature −3° C and pressure 982 mb, the Moon sights are assumed to be taken at 10^h UT.

Body limb	Sun lower	Sun upper	Moon lower	Moon upper	Venus –	*Polaris* –
Sextant altitude: H_S	21·3283	3·3367	33·4600	26·1117	4·5433	49·6083
Step 1. Dip: $D = 0{\cdot}0293\sqrt{h}$	0·0681	0·0681	0·0681	0·0681	0·0681	0·0681
Step 2. Apparent altitude: $H = H_S + I - D$	21·2602	3·2686	33·3919	26·0436	4·4752	49·5402
Step 3. Refraction: R_0	0·0423	0·2262	0·0251	0·0338	0·1801	0·0142
f	1·0184	1·0184	1·0184	1·0184	1·0184	1·0184
$R = fR_0$	0·0431	0·2304	0·0256	0·0344	0·1834	0·0144
Step 4. Parallax: HP	0·0024	0·0024	(54′4) 0·9067	(54′4) 0·9067	(0′1) 0·0017	–
Parallax in altitude: $PA = HP\cos H$	0·0022	0·0024	0·7570	0·8146	0·0017	–
Step 5. Semi-diameter: Sun : $S = 16{\cdot}3/60$	0·2717	0·2717	–	–	–	–
Moon : $S = 0{\cdot}2724HP$	–	–	0·2470	0·2470	–	–
Step 6. Observed altitude: $H_O = H - R + PA \pm S$	21·4910	2·7690	34·3703	26·5768	4·2935	49·5258

Note that for the Moon the correction for the oblateness of the Earth of about $-0°0017\cos H$, which equals $-0°0014$ for the lower limb and $-0°0015$ for the upper limb, has been ignored in the above calculation.

10. ***Position from intercept and azimuth using a chart.*** An estimate is made of the position at the adopted time of fix. The position at the time of observation is then calculated by dead reckoning from the time of fix. For example if the course (track) T and the speed V (in knots) of the observer are constant then *Long* and *Lat* at the time of observation are calculated from

$$Long = L_F + t\,(V/60)\sin T/\cos B_F$$
$$Lat = B_F + t\,(V/60)\cos T$$

where L_F and B_F are the estimated longitude and latitude at the time of fix and t is the time interval in hours from the time of fix to the time of observation, t is positive if the time of observation is after the time of fix and negative if it was before.

The position line of an observation is plotted on a chart using the intercept

$$p = H_O - H_C$$

and azimuth Z with origin at the calculated position (*Long*, *Lat*) at the time of observation, where H_C and Z are calculated using the method in section 6, page 279. Starting from this calculated position a line is drawn on the chart along the direction of the azimuth to the body. Convert p to nautical miles by multiplying by 60. The position line is drawn at right angles to the azimuth line, distance p from (*Long*, *Lat*) towards the body if p is positive and distance p away from the body if p is negative. Provided there are no gross errors the navigator should be somewhere on or near the position line at the time of observation. Two or more position lines are required to determine a fix.

11. ***Position from intercept and azimuth using a calculator.*** The position of the fix may be calculated from two or more sextant observations as follows:

If p_1, Z_1, are the intercept and azimuth of the first observation, p_2, Z_2, of the second observation and so on, form the summations

$$A = \cos^2 Z_1 + \cos^2 Z_2 + \cdots$$
$$B = \cos Z_1 \sin Z_1 + \cos Z_2 \sin Z_2 + \cdots$$
$$C = \sin^2 Z_1 + \sin^2 Z_2 + \cdots$$
$$D = p_1 \cos Z_1 + p_2 \cos Z_2 + \cdots$$
$$E = p_1 \sin Z_1 + p_2 \sin Z_2 + \cdots$$

where the number of terms in each summation is equal to the number of observations.

With $G = AC - B^2$, an improved estimate of the position at the time of fix (L_I, B_I) is given by

$$L_I = L_F + (AE - BD)/(G\cos B_F), \qquad B_I = B_F + (CD - BE)/G$$

Calculate the distance d between the initial estimated position (L_F, B_F) at the time of fix and the improved estimated position (L_I, B_I) in nautical miles from

$$d = 60\sqrt{((L_I - L_F)^2 \cos^2 B_F + (B_I - B_F)^2)}$$

If d exceeds about 20 nautical miles set $L_F = L_I$, $B_F = B_I$ and repeat the calculation until d, the distance between the position at the previous estimate and the improved estimate, is less than about 20 nautical miles.

12. ***Example of direct computation.*** Using the method described above, calculate the position of a ship on 1992 June 30 at $21^h\ 00^m\ 00^s$ UT from the marine sextant observations of the three stars *Regulus* (No. 26) at $20^h\ 39^m\ 23^s$ UT, *Antares* (No. 42) at $20^h\ 45^m\ 47^s$ UT and *Kochab* (No. 40) at $21^h\ 10^m\ 34^s$ UT, where the observed altitudes of the three stars corrected for the effects of refraction, dip and instrumental error, are 29°9309, 24°6445 and 47°4555 respectively. The ship was travelling at a constant speed of 20 knots on a course of 325° during the period of observation, and the position of the ship at the time of fix $21^h\ 00^m\ 00^s$ UT is only known to the nearest whole degree W 15°, N 32°.

Intermediate values for the first iteration are shown in the table. *GHA* Aries was interpolated from the nearest tabular values on page 130. For the first iteration set $L_F = -15°0000$, $B_F = +32°0000$ at the time of fix at $21^h\ 00^m\ 00^s$ UT.

First Iteration

Body No.	*Regulus* 26	*Antares* 42	*Kochab* 40
time of observation	$20^h\ 39^m\ 23^s$	$20^h\ 45^m\ 47^s$	$21^h\ 10^m\ 34^s$
H_O	29·9309	24·6445	47·4555
interpolation factor	0·6564	0·7631	0·1761
GHA Aries	229·0065	230·6109	236·8240
SHA (page 130)	208·0050	112·7533	137·3083
GHA	77·0115	343·3643	14·1323
Dec (page 130)	+12·0033	−26·4167	+74·1900
t	−0·3436	−0·2369	+0·1761
Long	−14·9225	−14·9466	−15·0397
Lat	+31·9062	+31·9353	+32·0481
Z	265·6699	149·0166	0·3684
H_C	29·9078	24·3387	47·8556
p	+0·0231	+0·3058	−0·4001

$A = 1{\cdot}7407$ $B = -0{\cdot}3596$ $C = 1{\cdot}2593$ $D = -0{\cdot}6640$ $E = 0{\cdot}1318$ $G = 2{\cdot}0628$

$(AE - BD)/(G\cos B_F) = -0{\cdot}0053$, $(CD - BE)/G = -0{\cdot}3824$

An improved estimate of the position at the time of fix is

$$L_I = L_F - 0{\cdot}0053 = -15{\cdot}0053 \quad \text{and} \quad B_I = B_F - 0{\cdot}3824 = +31{\cdot}6176$$

Since the distance between the previous estimated position and the improved estimate $d = 22{\cdot}9$ nautical miles set $L_F = -15{\cdot}0053$, and $B_F = +31{\cdot}6176$ and repeat the calculation. The table shows the intermediate values of the calculation for the second iteration. In each iteration the quantities H_O, *GHA*, *Dec* and t do not change.

Second Iteration

Body No.	*Regulus* 26	*Antares* 42	*Kochab* 40
Long	−14·9282	−14·9521	−15·0449
Lat	+31·5238	+31·5529	+31·6657
Z	265·8862	148·9220	0·3678
H_C	29·9408	24·6640	47·4732
p	−0·0099	−0·0194	−0·0177

$A = 1{\cdot}7386$ $B = -0{\cdot}3641$ $C = 1{\cdot}2614$ $D = -0{\cdot}0003$ $E = -0{\cdot}0003$ $G = 2{\cdot}0605$

$(AE - BD)/(G\cos B_F) = -0{\cdot}0004$, $(CD - BE)/G = -0{\cdot}0003$

An improved estimate of the position at the time of fix is

$$L_I = L_F - 0{\cdot}0004 = -15{\cdot}0057 \quad \text{and} \quad B_I = B_F - 0{\cdot}0003 = +31{\cdot}6173$$

The distance between the previous estimated position and the improved estimated position $d = 0{\cdot}02$ nautical miles is so small that a third iteration would produce a negligible improvement to the estimate of the position.

USE OF CONCISE SIGHT REDUCTION TABLES

1. *Introduction.* The concise sight reduction tables given on pages 286 to 317 are intended for use when neither more extensive tables nor electronic computing aids are available. These "NAO sight reduction tables" provide for the reduction of the local hour angle and declination of a celestial object to azimuth and altitude, referred to an assumed position on the Earth, for use in the intercept method of celestial navigation which is now standard practice.

2. *Form of tables.* Entries in the reduction table are at a fixed interval of one degree for all latitudes and hour angles. A compact arrangement results from division of the navigational triangle into two right spherical triangles, so that the table has to be entered twice. Assumed latitude and local hour angle are the arguments for the first entry. The reduction table responds with the intermediate arguments A, B, and Z_1, where A is used as one of the arguments for the second entry to the table, B has to be incremented by the declination to produce the quantity F, and Z_1 is a component of the azimuth angle. The reduction table is then reentered with A and F and yields H, P, and Z_2 where H is the altitude, P is the complement of the parallactic angle, and Z_2 is the second component of the azimuth angle. It is usually necessary to adjust the tabular altitude for the fractional parts of the intermediate entering arguments to derive computed altitude, and an auxiliary table is provided for the purpose. Rules governing signs of the quantities which must be added or subtracted are given in the instructions and summarized on each tabular page. Azimuth angle is the sum of two components and is converted to true azimuth by familiar rules, repeated at the bottom of the tabular pages.

Tabular altitude and intermediate quantities are given to the nearest minute of arc, although errors of 2′ in computed altitude may accrue during adjustment for the minutes parts of entering arguments. Components of azimuth angle are stated to 0°1; for derived true azimuth, only whole degrees are warranted. Since objects near the zenith are difficult to observe with a marine sextant, they should be avoided; altitudes greater than about 80° are not suited to reduction by this method.

In many circumstances the accuracy provided by these tables is sufficient. However, to maintain the full accuracy (0′1) of the ephemeral data in the almanac throughout their reduction to altitude and azimuth, more extensive tables or a calculator should be used.

3. *Use of Tables.*

Step 1. Determine the Greenwich hour angle (*GHA*) and Declination (*Dec*) of the body from the almanac. Select an assumed latitude (*Lat*) of integral degrees nearest to the estimated latitude. Choose an assumed longitude nearest to the estimated longitude such that the local hour angle

$$LHA = GHA \begin{matrix} - \text{ west} \\ + \text{ east} \end{matrix} \text{ longitude}$$

has integral degrees.

Step 2. Enter the reduction table with *Lat* and *LHA* as arguments. Record the quantities A, B and Z_1. Apply the rules for the sign of B and Z_1: B is minus if $90° < LHA < 270°$: Z_1 has the same sign as B. Set $A°$ = nearest whole degree of A and A' = minutes part of A. This step may be repeated for all reductions before leaving the latitude opening of the table.

Step 3. Record the declination *Dec*. Apply the rules for the sign of *Dec*: *Dec* is minus if the name of *Dec* (*i.e.* N or S) is contrary to latitude. Add B and *Dec* algebraically to produce F. If F is negative, the object is below the horizon (in sight reduction, this can occur when the objects are close to the horizon). Regard F as positive until step 7. Set $F°$ = nearest whole degree of F and F' = minutes part of F.

Step 4. Enter the reduction table a second time with $A°$ and $F°$ as arguments and record H, P, and Z_2. Set $P°$ = nearest whole degree of P and $Z_2°$ = nearest whole degree of Z_2.

Step 5. Enter the auxiliary table with F' and $P°$ as arguments to obtain $corr_1$ to H for F'. Apply the rule for the sign of $corr_1$: $corr_1$ is minus if $F < 90°$ and $F' > 29'$ or if $F > 90°$ and $F' < 30'$, otherwise $corr_1$ is plus.

Step 6. Enter the auxiliary table with A' and $Z_2°$ as arguments to obtain $corr_2$ to H for A'. Apply the rule for the sign of $corr_2$: $corr_2$ is minus if $A' < 30'$, otherwise $corr_2$ is plus.

Step 7. Calculate the computed altitude H_C as the sum of H, $corr_1$ and $corr_2$. Apply the rule for the sign of H_C: H_C is minus if F is negative.

Step 8. Apply the rule for the sign of Z_2: Z_2 is minus if $F > 90°$. If F is negative, replace Z_2 by $180° - Z_2$. Set the azimuth angle Z equal to the algebraic sum of Z_1 and Z_2 and ignore the resulting sign. Obtain the true azimuth Z_n from the rules

For N latitude, if	$LHA > 180°$	$Z_n = Z$
	if $LHA < 180°$	$Z_n = 360° - Z$
For S latitude, if	$LHA > 180°$	$Z_n = 180° - Z$
	if $LHA < 180°$	$Z_n = 180° + Z$

Observed altitude H_O is compared with H_C to obtain the altitude difference, which, with Z_n, is used to plot the position line.

4. *Example.* (a) Required the altitude and azimuth of *Schedar* on 1992 February 5 at UT $6^h\ 28^m$ from the estimated position 5° east, 53° north.

1. Assumed latitude	$Lat =$ 53° N		
From the almanac	$GHA =$ 221° 40′		
Assumed longitude	5° 20′ E		
Local hour angle	$LHA = 227$		
2. Reduction table, 1st entry $(Lat, LHA) = (53, 227)$	$A =$ 26 07	$A° = 26$, $A' = 7$	
	$B =$ −27 12	$Z_1 = -49{\cdot}4$,	$90° < LHA < 270°$
3. From the almanac	$Dec =$ +56 30		*Lat* and *Dec* same
Sum $= B + Dec$	$F =$ +29 18	$F° = 29$, $F' = 18$	
4. Reduction table, 2nd entry $(A°, F°) = (26, 29)$	$H =$ 25 50	$P° = 61$ $Z_2 = 76{\cdot}3$	
5. Auxiliary table, 1st entry $(F', P°) = (18, 61)$	$corr_1 =$ +16		$F < 90°, F' < 29'$
Sum	26 06		
6. Auxiliary table, 2nd entry $(A', Z_2°) = (7, 76)$	$corr_2 =$ −2		$A' < 30'$
7. Sum = computed altitude	$H_C =$ +26° 04′		$F > 0°$
8. Azimuth, first component	$Z_1 = -49{\cdot}4$		same sign as B
second component	$Z_2 =$ +76·3		$F < 90°, F > 0°$
Sum = azimuth angle	$Z =$ 26·9		
True azimuth	$Z_n =$ 27°		N *Lat*, $LHA > 180°$

continued on page 318

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A	0°			1°			2°			3°			4°			5°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
0 180	0 00	90 00	90.0	0 00	89 00	90.0	0 00	88 00	90.0	0 00	87 00	90.0	0 00	86 00	90.0	0 00	85 00	90.0	180 360
1 179	1 00	90 00	90.0	1 00	89 00	90.0	1 00	88 00	90.0	1 00	87 00	89.9	1 00	86 00	89.9	1 00	85 00	89.9	181 359
2 178	2 00	90 00	90.0	2 00	89 00	90.0	2 00	88 00	89.9	2 00	87 00	89.9	2 00	86 00	89.9	2 00	85 00	89.8	182 358
3 177	3 00	90 00	90.0	3 00	89 00	89.9	3 00	88 00	89.9	3 00	87 00	89.8	3 00	86 00	89.8	2 59	85 00	89.7	183 357
4 176	4 00	90 00	90.0	4 00	89 00	89.9	4 00	88 00	89.9	4 00	87 00	89.8	3 59	85 59	89.7	3 59	84 59	89.7	184 356
5 175	5 00	90 00	90.0	5 00	89 00	89.9	5 00	88 00	89.8	5 00	86 59	89.7	4 59	85 59	89.7	4 59	84 59	89.6	185 355
6 174	6 00	90 00	90.0	6 00	89 00	89.9	6 00	87 59	89.8	6 00	86 59	89.7	5 59	85 59	89.6	5 59	84 58	89.5	186 354
7 173	7 00	90 00	90.0	7 00	89 00	89.9	7 00	87 59	89.8	6 59	86 59	89.6	6 59	85 58	89.5	6 58	84 58	89.4	187 353
8 172	8 00	90 00	90.0	8 00	88 59	89.9	8 00	87 59	89.7	7 59	86 58	89.6	7 59	85 58	89.4	7 58	84 57	89.3	188 352
9 171	9 00	90 00	90.0	9 00	88 59	89.8	9 00	87 59	89.7	8 59	86 58	89.5	8 59	85 57	89.4	8 58	84 56	89.2	189 351
10 170	10 00	90 00	90.0	10 00	88 59	89.8	10 00	87 58	89.6	9 59	86 57	89.5	9 59	85 56	89.3	9 58	84 55	89.1	190 350
11 169	11 00	90 00	90.0	11 00	88 59	89.8	11 00	87 58	89.6	10 59	86 57	89.4	10 58	85 56	89.2	10 57	84 54	89.0	191 349
12 168	12 00	90 00	90.0	12 00	88 59	89.8	12 00	87 57	89.6	11 59	86 56	89.4	11 58	85 55	89.2	11 57	84 53	88.9	192 348
13 167	13 00	90 00	90.0	13 00	88 58	89.8	13 00	87 57	89.5	12 59	86 55	89.3	12 58	85 54	89.1	12 57	84 52	88.8	193 347
14 166	14 00	90 00	90.0	14 00	88 58	89.8	13 59	87 56	89.5	13 59	86 54	89.3	13 58	85 53	89.0	13 57	84 51	88.8	194 346
15 165	15 00	90 00	90.0	15 00	88 58	89.7	14 59	87 56	89.5	14 59	86 54	89.2	14 58	85 52	88.9	14 56	84 49	88.7	195 345
16 164	16 00	90 00	90.0	16 00	88 58	89.7	15 59	87 55	89.4	15 59	86 53	89.1	15 58	85 50	88.9	15 56	84 48	88.6	196 344
17 163	17 00	90 00	90.0	17 00	88 57	89.7	16 59	87 55	89.4	16 59	86 52	89.1	16 57	85 49	88.8	16 56	84 46	88.5	197 343
18 162	18 00	90 00	90.0	18 00	88 57	89.7	17 59	87 54	89.4	17 58	86 51	89.0	17 57	85 48	88.7	17 56	84 45	88.4	198 342
19 161	19 00	90 00	90.0	19 00	88 57	89.7	18 59	87 53	89.3	18 58	86 50	89.0	18 57	85 46	88.6	18 55	84 43	88.3	199 341
20 160	20 00	90 00	90.0	20 00	88 56	89.6	19 59	87 52	89.3	19 58	86 48	88.9	19 57	85 45	88.5	19 55	84 41	88.2	200 340
21 159	21 00	90 00	90.0	21 00	88 56	89.6	20 59	87 51	89.2	20 58	86 47	88.8	20 57	85 43	88.5	20 55	84 39	88.1	201 339
22 158	22 00	90 00	90.0	22 00	88 55	89.6	21 59	87 51	89.2	21 58	86 46	88.8	21 57	85 41	88.4	21 55	84 37	88.0	202 338
23 157	23 00	90 00	90.0	23 00	88 55	89.6	22 59	87 50	89.2	22 58	86 44	88.7	22 56	85 39	88.3	22 54	84 34	87.9	203 337
24 156	24 00	90 00	90.0	24 00	88 54	89.6	23 59	87 49	89.1	23 58	86 43	88.7	23 56	85 37	88.2	23 54	84 32	87.8	204 336
25 155	25 00	90 00	90.0	25 00	88 54	89.5	24 59	87 48	89.1	24 58	86 41	88.6	24 56	85 35	88.1	24 54	84 29	87.7	205 335
26 154	26 00	90 00	90.0	26 00	88 53	89.5	25 59	87 46	89.0	25 58	86 40	88.5	25 56	85 33	88.1	25 54	84 26	87.6	206 334
27 153	27 00	90 00	90.0	27 00	88 53	89.5	26 59	87 45	89.0	26 58	86 38	88.5	26 56	85 31	88.0	26 53	84 24	87.5	207 333
28 152	28 00	90 00	90.0	28 00	88 52	89.5	27 59	87 44	88.9	27 57	86 36	88.4	27 56	85 28	87.9	27 53	84 20	87.3	208 332
29 151	29 00	90 00	90.0	29 00	88 51	89.4	28 59	87 43	88.9	28 57	86 34	88.3	28 55	85 26	87.8	28 53	84 17	87.2	209 331
30 150	30 00	90 00	90.0	30 00	88 51	89.4	29 59	87 41	88.8	29 57	86 32	88.3	29 55	85 23	87.7	29 52	84 14	87.1	210 330
31 149	31 00	90 00	90.0	31 00	88 50	89.4	30 59	87 40	88.8	30 57	86 30	88.2	30 55	85 20	87.6	30 52	84 10	87.0	211 329
32 148	32 00	90 00	90.0	32 00	88 49	89.4	31 59	87 39	88.8	31 57	86 28	88.1	31 55	85 17	87.5	31 52	84 07	86.9	212 328
33 147	33 00	90 00	90.0	33 00	88 48	89.4	32 59	87 37	88.7	32 57	86 25	88.1	32 55	85 14	87.4	32 52	84 03	86.8	213 327
34 146	34 00	90 00	90.0	34 00	88 48	89.3	33 59	87 35	88.7	33 57	86 23	88.0	33 54	85 11	87.3	33 51	83 59	86.6	214 326
35 145	35 00	90 00	90.0	35 00	88 47	89.3	34 59	87 34	88.6	34 57	86 20	87.9	34 54	85 07	87.2	34 51	83 54	86.5	215 325
36 144	36 00	90 00	90.0	36 00	88 46	89.3	35 58	87 32	88.5	35 57	86 18	87.8	35 54	85 04	87.1	35 51	83 50	86.4	216 324
37 143	37 00	90 00	90.0	37 00	88 45	89.2	36 58	87 30	88.5	36 56	86 15	87.7	36 54	85 00	87.0	36 50	83 45	86.2	217 323
38 142	38 00	90 00	90.0	38 00	88 44	89.2	37 58	87 28	88.4	37 56	86 12	87.7	37 53	84 56	86.9	37 50	83 40	86.1	218 322
39 141	39 00	90 00	90.0	39 00	88 43	89.2	38 58	87 26	88.4	38 56	86 09	87.6	38 53	84 52	86.8	38 49	83 35	86.0	219 321
40 140	40 00	90 00	90.0	40 00	88 42	89.2	39 58	87 23	88.3	39 56	86 05	87.5	39 53	84 47	86.7	39 49	83 29	85.8	220 320
41 139	41 00	90 00	90.0	41 00	88 40	89.1	40 58	87 21	88.3	40 56	86 02	87.4	40 53	84 42	86.5	40 49	83 23	85.7	221 319
42 138	42 00	90 00	90.0	42 00	88 39	89.1	41 58	87 19	88.2	41 56	85 58	87.3	41 52	84 37	86.4	41 48	83 17	85.5	222 318
43 137	43 00	90 00	90.0	43 00	88 38	89.1	42 58	87 16	88.1	42 56	85 54	87.2	42 52	84 32	86.3	42 48	83 11	85.4	223 317
44 136	44 00	90 00	90.0	43 59	88 37	89.0	43 58	87 13	88.1	43 55	85 50	87.1	43 52	84 27	86.1	43 47	83 04	85.2	224 316
45 135	45 00	90 00	90.0	44 59	88 35	89.0	44 58	87 10	88.0	44 55	85 46	87.0	44 52	84 21	86.0	44 47	82 57	85.0	225 315

Lat. / A	0°			1°			2°			3°			4°			5°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
45 135	45 00	90 00	90.0	44 59	88 35	89.0	44 58	87 10	88.0	44 55	85 46	87.0	44 52	84 21	86.0	44 47	82 57	85.0	225 315
46 134	46 00	90 00	90.0	45 59	88 34	89.0	45 58	87 07	87.9	45 55	85 41	86.9	45 51	84 15	85.9	45 46	82 49	84.8	226 314
47 133	47 00	90 00	90.0	46 59	88 32	88.9	46 58	87 04	87.9	46 55	85 36	86.8	46 51	84 09	85.7	46 46	82 41	84.7	227 313
48 132	48 00	90 00	90.0	47 59	88 30	88.9	47 58	87 01	87.8	47 55	85 31	86.7	47 51	84 02	85.6	47 46	82 33	84.5	228 312
49 131	49 00	90 00	90.0	48 59	88 29	88.8	48 58	86 57	87.7	48 55	85 26	86.6	48 50	83 55	85.4	48 45	82 24	84.3	229 311
50 130	50 00	90 00	90.0	49 59	88 27	88.8	49 58	86 53	87.6	49 54	85 20	86.4	49 50	83 47	85.2	49 44	82 15	84.1	230 310
51 129	51 00	90 00	90.0	50 59	88 25	88.8	50 57	86 49	87.5	50 54	85 14	86.3	50 50	83 40	85.1	50 44	82 05	83.9	231 309
52 128	52 00	90 00	90.0	51 59	88 23	88.7	51 57	86 45	87.4	51 54	85 08	86.2	51 49	83 31	84.9	51 43	81 55	83.6	232 308
53 127	53 00	90 00	90.0	52 59	88 20	88.7	52 57	86 41	87.3	52 54	85 01	86.0	52 49	83 22	84.7	52 43	81 44	83.4	233 307
54 126	54 00	90 00	90.0	53 59	88 18	88.6	53 57	86 36	87.2	53 54	84 54	85.9	53 49	83 13	84.5	53 42	81 32	83.2	234 306
55 125	55 00	90 00	90.0	54 59	88 15	88.6	54 57	86 31	87.1	54 53	84 47	85.7	54 48	83 03	84.3	54 41	81 20	82.9	235 305
56 124	56 00	90 00	90.0	55 59	88 13	88.5	55 57	86 26	87.0	55 53	84 39	85.6	55 48	82 52	84.1	55 41	81 06	82.6	236 304
57 123	57 00	90 00	90.0	56 59	88 10	88.5	56 57	86 20	86.9	56 53	84 30	85.4	56 47	82 41	83.9	56 40	80 52	82.4	237 303
58 122	58 00	90 00	90.0	57 59	88 07	88.4	57 57	86 14	86.8	57 52	84 21	85.2	57 47	82 29	83.6	57 39	80 38	82.1	238 302
59 121	59 00	90 00	90.0	58 59	88 04	88.3	58 57	86 07	86.7	58 52	84 11	85.0	58 46	82 16	83.4	58 38	80 22	81.7	239 301
60 120	60 00	90 00	90.0	59 59	88 00	88.3	59 56	86 00	86.5	59 52	84 01	84.8	59 46	82 02	83.1	59 37	80 04	81.4	240 300
61 119	61 00	90 00	90.0	60 59	87 56	88.2	60 56	85 53	86.4	60 52	83 50	84.6	60 45	81 48	82.8	60 37	79 46	81.1	241 299
62 118	62 00	90 00	90.0	61 59	87 52	88.1	61 56	85 45	86.2	61 51	83 38	84.4	61 44	81 32	82.5	61 36	79 27	80.7	242 298
63 117	63 00	90 00	90.0	62 59	87 48	88.0	62 56	85 36	86.1	62 51	83 25	84.1	62 44	81 15	82.2	62 35	79 06	80.3	243 297
64 116	64 00	90 00	90.0	63 59	87 43	88.0	63 56	85 27	85.9	63 50	83 11	83.9	63 43	80 56	81.9	63 33	78 43	79.9	244 296
65 115	65 00	90 00	90.0	64 59	87 38	87.9	64 56	85 17	85.7	64 50	82 56	83.6	64 42	80 36	81.5	64 32	78 18	79.4	245 295
66 114	66 00	90 00	90.0	65 59	87 33	87.8	65 55	85 06	85.5	65 49	82 39	83.3	65 41	80 15	81.1	65 31	77 52	78.9	246 294
67 113	67 00	90 00	90.0	66 59	87 26	87.6	66 55	84 54	85.3	66 49	82 22	83.0	66 40	79 51	80.7	66 29	77 23	78.4	247 293
68 112	68 00	90 00	90.0	67 59	87 20	87.5	67 55	84 40	85.1	67 48	82 02	82.6	67 39	79 26	80.2	67 28	76 51	77.8	248 292
69 111	69 00	90 00	90.0	68 59	87 13	87.4	68 55	84 26	84.8	68 48	81 41	82.2	68 38	78 57	79.7	68 26	76 17	77.2	249 291
70 110	70 00	90 00	90.0	69 59	87 05	87.3	69 54	84 10	84.5	69 47	81 17	81.8	69 37	78 27	79.2	69 25	75 39	76.5	250 290
71 109	71 00	90 00	90.0	70 58	86 56	87.1	70 54	83 53	84.2	70 46	80 51	81.4	70 36	77 53	78.5	70 23	74 57	75.8	251 289
72 108	72 00	90 00	90.0	71 58	86 46	86.9	71 54	83 33	83.9	71 46	80 22	80.8	71 35	77 15	77.9	71 20	74 12	75.0	252 288
73 107	73 00	90 00	90.0	72 58	86 35	86.7	72 53	83 11	83.5	72 45	79 50	80.3	72 33	76 33	77.1	72 18	73 20	74.1	253 287
74 106	74 00	90 00	90.0	73 58	86 22	86.5	73 53	82 47	83.1	73 44	79 14	79.7	73 31	75 46	76.3	73 15	72 23	73.1	254 286
75 105	75 00	90 00	90.0	74 58	86 08	86.3	74 52	82 19	82.6	74 43	78 33	78.9	74 29	74 53	75.4	74 12	71 19	72.0	255 285
76 104	76 00	90 00	90.0	75 58	85 52	86.0	75 52	81 47	82.0	75 41	77 47	78.1	75 27	73 53	74.4	75 09	70 07	70.7	256 284
77 103	77 00	90 00	90.0	76 58	85 34	85.7	76 51	81 11	81.4	76 40	76 53	77.2	76 25	72 44	73.2	76 05	68 45	69.3	257 283
78 102	78 00	90 00	90.0	77 58	85 12	85.3	77 50	80 28	80.7	77 38	75 51	76.2	77 22	71 25	71.8	77 01	67 11	67.7	258 282
79 101	79 00	90 00	90.0	78 57	84 46	84.9	78 49	79 38	79.8	78 36	74 38	74.9	78 18	69 52	70.3	77 56	65 22	65.8	259 281
80 100	80 00	90 00	90.0	79 57	84 16	84.3	79 48	78 38	78.8	79 34	73 12	73.5	79 14	68 04	68.4	78 50	63 16	63.7	260 280
81 99	81 00	90 00	90.0	80 57	83 38	83.7	80 47	77 25	77.6	80 31	71 29	71.7	80 09	65 55	66.2	79 43	60 47	61.2	261 279
82 98	82 00	90 00	90.0	81 56	82 51	82.9	81 45	75 55	76.1	81 28	69 22	69.6	81 04	63 19	63.6	80 34	57 51	58.2	262 278
83 97	83 00	90 00	90.0	82 56	81 51	81.9	82 43	74 01	74.1	82 23	66 44	66.9	81 57	60 09	60.4	81 24	54 20	54.6	263 277
84 96	84 00	90 00	90.0	83 55	80 31	80.6	83 41	71 32	71.6	83 18	63 22	63.5	82 48	56 13	56.4	82 12	50 04	50.3	264 276
85 95	85 00	90 00	90.0	84 54	78 40	78.7	84 37	68 10	68.3	84 10	58 59	59.1	83 36	51 16	51.4	82 56	44 53	45.1	265 275
86 94	86 00	90 00	90.0	85 53	75 57	76.0	85 32	63 24	63.5	85 00	53 05	53.2	84 21	44 56	45.1	83 36	38 34	38.7	266 274
87 93	87 00	90 00	90.0	86 50	71 33	71.6	86 24	56 17	56.3	85 45	44 58	45.0	85 00	36 49	36.9	84 10	30 53	31.0	267 273
88 92	88 00	90 00	90.0	87 46	63 26	63.4	87 10	44 59	45.0	86 24	33 40	33.7	85 32	26 31	26.6	84 37	21 45	21.8	268 272
89 91	89 00	90 00	90.0	88 35	45 00	45.0	87 46	26 33	26.6	86 50	18 25	18.4	85 53	14 01	14.0	84 54	11 17	11.3	269 271
90 90	90 00	0 00	0.0	89 00	0 00	0.0	88 00	0 00	0.0	87 00	0 00	0.0	86 00	0 00	0.0	85 00	0 00	0.0	270 270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A	6°			7°			8°			9°			10°			11°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
0 180	0 00	84 00	90.0	0 00	83 00	90.0	0 00	82 00	90.0	0 00	81 00	90.0	0 00	80 00	90.0	0 00	79 00	90.0	180 360
1 179	1 00	84 00	89.9	1 00	83 00	89.9	0 59	82 00	89.9	0 59	81 00	89.8	0 59	80 00	89.8	0 59	79 00	89.8	181 359
2 178	1 59	84 00	89.8	1 59	83 00	89.8	1 59	82 00	89.7	1 59	81 00	89.7	1 58	80 00	89.7	1 58	79 00	89.6	182 358
3 177	2 59	84 00	89.7	2 59	82 59	89.6	2 58	81 59	89.6	2 58	80 59	89.5	2 57	79 59	89.5	2 57	78 59	89.4	183 357
4 176	3 59	83 59	89.6	3 58	82 59	89.5	3 58	81 59	89.4	3 57	80 59	89.4	3 56	79 59	89.3	3 56	78 58	89.2	184 356
5 175	4 58	83 59	89.5	4 58	82 58	89.4	4 57	81 58	89.3	4 56	80 58	89.2	4 55	79 58	89.1	4 54	78 58	89.0	185 355
6 174	5 58	83 58	89.4	5 57	82 58	89.3	5 56	81 57	89.2	5 56	80 57	89.1	5 55	79 57	89.0	5 53	78 56	88.9	186 354
7 173	6 58	83 57	89.3	6 57	82 57	89.1	6 56	81 56	89.0	6 55	80 56	88.9	6 54	79 56	88.8	6 52	78 55	88.7	187 353
8 172	7 57	83 56	89.2	7 56	82 56	89.0	7 55	81 55	88.9	7 54	80 55	88.7	7 53	79 54	88.6	7 51	78 54	88.5	188 352
9 171	8 57	83 56	89.1	8 56	82 55	88.9	8 55	81 54	88.7	8 53	80 53	88.6	8 52	79 53	88.4	8 50	78 52	88.3	189 351
10 170	9 57	83 54	88.9	9 55	82 54	88.8	9 54	81 53	88.6	9 53	80 52	88.4	9 51	79 51	88.2	9 49	78 50	88.1	190 350
11 169	10 56	83 53	88.8	10 55	82 52	88.6	10 53	81 51	88.5	10 52	80 50	88.3	10 50	79 49	88.1	10 48	78 48	87.9	191 349
12 168	11 56	83 52	88.7	11 55	82 51	88.5	11 53	81 49	88.3	11 51	80 48	88.1	11 49	79 47	87.9	11 47	78 46	87.7	192 348
13 167	12 56	83 51	88.6	12 54	82 49	88.4	12 52	81 48	88.2	12 50	80 46	87.9	12 48	79 45	87.7	12 45	78 43	87.5	193 347
14 166	13 55	83 49	88.5	13 54	82 47	88.3	13 52	81 46	88.0	13 49	80 44	87.8	13 47	79 42	87.5	13 44	78 40	87.3	194 346
15 165	14 55	83 47	88.4	14 53	82 45	88.1	14 51	81 43	87.9	14 49	80 41	87.6	14 46	79 39	87.3	14 43	78 37	87.1	195 345
16 164	15 55	83 46	88.3	15 53	82 43	88.0	15 50	81 41	87.7	15 48	80 39	87.4	15 45	79 36	87.1	15 42	78 34	86.9	196 344
17 163	16 54	83 44	88.2	16 52	82 41	87.9	16 50	81 38	87.6	16 47	80 36	87.3	16 44	79 33	87.0	16 41	78 31	86.7	197 343
18 162	17 54	83 42	88.1	17 52	82 39	87.7	17 49	81 36	87.4	17 46	80 33	87.1	17 43	79 30	86.8	17 39	78 27	86.5	198 342
19 161	18 54	83 39	87.9	18 51	82 36	87.6	18 48	81 33	87.3	18 45	80 29	86.9	18 42	79 26	86.6	18 38	78 23	86.2	199 341
20 160	19 53	83 37	87.8	19 51	82 33	87.5	19 48	81 30	87.1	19 45	80 26	86.7	19 41	79 22	86.4	19 37	78 19	86.0	200 340
21 159	20 53	83 35	87.7	20 50	82 30	87.3	20 47	81 26	86.9	20 44	80 22	86.6	20 40	79 18	86.2	20 36	78 14	85.8	201 339
22 158	21 52	83 32	87.6	21 50	82 27	87.2	21 46	81 23	86.8	21 43	80 18	86.4	21 39	79 14	86.0	21 35	78 10	85.6	202 338
23 157	22 52	83 29	87.5	22 49	82 24	87.0	22 46	81 19	86.6	22 42	80 14	86.2	22 38	79 09	85.8	22 33	78 05	85.4	203 337
24 156	23 52	83 26	87.3	23 49	82 21	86.9	23 45	81 15	86.5	23 41	80 10	86.0	23 37	79 05	85.6	23 32	77 59	85.1	204 336
25 155	24 51	83 23	87.2	24 48	82 17	86.7	24 44	81 11	86.3	24 40	80 05	85.8	24 36	78 59	85.4	24 31	77 54	84.9	205 335
26 154	25 51	83 20	87.1	25 48	82 13	86.6	25 44	81 07	86.1	25 39	80 00	85.6	25 35	78 54	85.2	25 29	77 48	84.7	206 334
27 153	26 50	83 16	87.0	26 47	82 09	86.4	26 43	81 02	85.9	26 38	79 55	85.4	26 33	78 48	84.9	26 28	77 42	84.4	207 333
28 152	27 50	83 13	86.8	27 46	82 05	86.3	27 42	80 57	85.8	27 38	79 50	85.2	27 32	78 42	84.7	27 27	77 35	84.2	208 332
29 151	28 50	83 09	86.7	28 46	82 01	86.1	28 41	80 52	85.6	28 37	79 44	85.0	28 31	78 36	84.5	28 25	77 28	84.0	209 331
30 150	29 49	83 05	86.5	29 45	81 56	86.0	29 41	80 47	85.4	29 36	79 38	84.8	29 30	78 29	84.3	29 24	77 21	83.7	210 330
31 149	30 49	83 01	86.4	30 45	81 51	85.8	30 40	80 41	85.2	30 35	79 32	84.6	30 29	78 23	84.0	30 22	77 13	83.5	211 329
32 148	31 48	82 56	86.3	31 44	81 46	85.6	31 39	80 35	85.0	31 34	79 25	84.4	31 27	78 15	83.8	31 21	77 05	83.2	212 328
33 147	32 48	82 51	86.1	32 43	81 40	85.5	32 38	80 29	84.8	32 33	79 18	84.2	32 26	78 08	83.6	32 19	76 57	82.9	213 327
34 146	33 47	82 46	86.0	33 43	81 35	85.3	33 37	80 23	84.6	33 32	79 11	84.0	33 25	78 00	83.3	33 18	76 48	82.7	214 326
35 145	34 47	82 41	85.8	34 42	81 29	85.1	34 37	80 16	84.4	34 30	79 03	83.7	34 24	77 51	83.1	34 16	76 39	82.4	215 325
36 144	35 46	82 36	85.7	35 41	81 22	84.9	35 36	80 09	84.2	35 29	78 55	83.5	35 22	77 42	82.8	35 14	76 29	82.1	216 324
37 143	36 46	82 30	85.5	36 41	81 16	84.8	36 35	80 01	84.0	36 28	78 47	83.3	36 21	77 33	82.5	36 13	76 19	81.8	217 323
38 142	37 45	82 24	85.3	37 40	81 09	84.6	37 34	79 53	83.8	37 27	78 38	83.0	37 19	77 23	82.3	37 11	76 09	81.5	218 322
39 141	38 45	82 18	85.2	38 39	81 01	84.4	38 33	79 45	83.6	38 26	78 29	82.8	38 18	77 13	82.0	38 09	75 57	81.2	219 321
40 140	39 44	82 11	85.0	39 39	80 54	84.2	39 32	79 36	83.3	39 25	78 19	82.5	39 16	77 02	81.7	39 07	75 46	80.9	220 320
41 139	40 44	82 04	84.8	40 38	80 46	84.0	40 31	79 27	83.1	40 23	78 09	82.3	40 15	76 51	81.4	40 05	75 33	80.6	221 319
42 138	41 43	81 57	84.6	41 37	80 37	83.7	41 30	79 17	82.9	41 22	77 58	82.0	41 13	76 39	81.1	41 04	75 21	80.3	222 318
43 137	42 42	81 49	84.4	42 36	80 28	83.5	42 29	79 07	82.6	42 21	77 47	81.7	42 12	76 27	80.8	42 02	75 07	79.9	223 317
44 136	43 42	81 41	84.2	43 35	80 19	83.3	43 28	78 57	82.3	43 19	77 35	81.4	43 10	76 14	80.5	43 00	74 53	79.6	224 316
45 135	44 41	81 33	84.0	44 34	80 09	83.1	44 27	78 46	82.1	44 18	77 22	81.1	44 08	76 00	80.1	43 57	74 38	79.2	225 315

Lat. / A	6°			7°			8°			9°			10°			11°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
45 135	44 41	81 33	84.0	44 34	80 09	83.1	44 27	78 46	82.1	44 18	77 22	81.1	44 08	76 00	80.1	43 57	74 38	79.2	225 315
46 134	45 41	81 24	83.8	45 34	79 59	82.8	45 26	78 34	81.8	45 16	77 09	80.8	45 06	75 45	79.8	44 55	74 22	78.8	226 314
47 133	46 40	81 14	83.6	46 33	79 48	82.6	46 24	78 21	81.5	46 15	76 56	80.5	46 04	75 30	79.5	45 53	74 05	78.4	227 313
48 132	47 39	81 04	83.4	47 32	79 36	82.3	47 23	78 08	81.2	47 13	76 41	80.1	47 03	75 14	79.1	46 51	73 48	78.0	228 312
49 131	48 38	80 54	83.1	48 31	79 24	82.0	48 22	77 55	80.9	48 12	76 26	79.8	48 01	74 57	78.7	47 48	73 30	77.6	229 311
50 130	49 38	80 43	82.9	49 30	79 11	81.7	49 20	77 40	80.6	49 10	76 09	79.4	48 58	74 40	78.3	48 46	73 10	77.2	230 310
51 129	50 37	80 31	82.6	50 29	78 58	81.4	50 19	77 25	80.2	50 08	75 52	79.1	49 56	74 21	77.9	49 43	72 50	76.7	231 309
52 128	51 36	80 19	82.4	51 27	78 43	81.1	51 18	77 08	79.9	51 06	75 34	78.7	50 54	74 01	77.5	50 40	72 29	76.3	232 308
53 127	52 35	80 06	82.1	52 26	78 28	80.8	52 16	76 51	79.5	52 04	75 15	78.3	51 52	73 40	77.0	51 37	72 06	75.8	233 307
54 126	53 34	79 52	81.8	53 25	78 12	80.5	53 14	76 33	79.2	53 02	74 55	77.8	52 49	73 18	76.6	52 35	71 42	75.3	234 306
55 125	54 33	79 37	81.5	54 24	77 55	80.1	54 13	76 14	78.8	54 00	74 34	77.4	53 47	72 55	76.1	53 31	71 17	74.8	235 305
56 124	55 32	79 21	81.2	55 22	77 37	79.8	55 11	75 54	78.3	54 58	74 11	76.9	54 44	72 30	75.6	54 28	70 50	74.2	236 304
57 123	56 31	79 05	80.9	56 21	77 18	79.4	56 09	75 32	77.9	55 56	73 47	76.5	55 41	72 04	75.0	55 25	70 22	73.6	237 303
58 122	57 30	78 47	80.5	57 19	76 57	79.0	57 07	75 09	77.4	56 53	73 22	75.9	56 38	71 36	74.5	56 21	69 51	73.0	238 302
59 121	58 29	78 28	80.1	58 18	76 35	78.5	58 05	74 44	77.0	57 51	72 54	75.4	57 35	71 06	73.9	57 17	69 19	72.4	239 301
60 120	59 28	78 08	79.7	59 16	76 12	78.1	59 03	74 18	76.4	58 48	72 25	74.8	58 32	70 34	73.3	58 13	68 45	71.7	240 300
61 119	60 26	77 46	79.3	60 14	75 47	77.6	60 01	73 50	75.9	59 45	71 54	74.2	59 28	70 01	72.6	59 09	68 09	71.0	241 299
62 118	61 25	77 23	78.9	61 12	75 21	77.1	60 58	73 20	75.3	60 42	71 21	73.6	60 24	69 25	71.9	60 05	67 30	70.3	242 298
63 117	62 23	76 58	78.4	62 10	74 52	76.5	61 56	72 48	74.7	61 39	70 46	72.9	61 20	68 46	71.2	61 00	66 49	69.5	243 297
64 116	63 22	76 31	77.9	63 08	74 21	76.0	62 53	72 13	74.1	62 35	70 08	72.2	62 16	68 05	70.4	61 55	66 05	68.6	244 296
65 115	64 20	76 02	77.4	64 06	73 48	75.4	63 50	71 36	73.4	63 32	69 27	71.5	63 12	67 21	69.6	62 50	65 18	67.7	245 295
66 114	65 18	75 31	76.8	65 03	73 12	74.7	64 47	70 56	72.6	64 28	68 43	70.6	64 07	66 34	68.7	63 44	64 27	66.8	246 294
67 113	66 16	74 57	76.2	66 01	72 33	74.0	65 43	70 13	71.8	65 23	67 56	69.8	65 02	65 43	67.8	64 38	63 33	65.8	247 293
68 112	67 14	74 20	75.5	66 58	71 51	73.2	66 40	69 26	71.0	66 19	67 05	68.8	65 56	64 48	66.7	65 32	62 35	64.7	248 292
69 111	68 12	73 39	74.8	67 55	71 05	72.4	67 36	68 35	70.1	67 14	66 09	67.8	66 50	63 48	65.7	66 25	61 31	63.6	249 291
70 110	69 09	72 55	74.0	68 51	70 15	71.5	68 31	67 40	69.1	68 09	65 09	66.7	67 44	62 44	64.5	67 17	60 23	62.3	250 290
71 109	70 07	72 06	73.1	69 48	69 20	70.5	69 27	66 39	68.0	69 03	64 03	65.6	68 37	61 34	63.2	68 09	59 10	61.0	251 289
72 108	71 03	71 13	72.2	70 44	68 20	69.4	70 21	65 33	66.8	69 57	62 52	64.3	69 29	60 17	61.9	69 00	57 50	59.6	252 288
73 107	72 00	70 14	71.1	71 39	67 13	68.3	71 16	64 20	65.5	70 50	61 33	62.9	70 21	58 54	60.4	69 50	56 23	58.0	253 287
74 106	72 56	69 08	70.0	72 34	65 59	67.0	72 09	62 59	64.1	71 42	60 07	61.4	71 12	57 24	58.8	70 40	54 48	56.4	254 286
75 105	73 52	67 54	68.7	73 29	64 37	65.5	73 03	61 30	62.6	72 34	58 32	59.7	72 02	55 44	57.1	71 28	53 06	54.5	255 285
76 104	74 48	66 31	67.3	74 23	63 05	64.0	73 55	59 51	60.8	73 24	56 47	57.9	72 51	53 55	55.1	72 16	51 13	52.6	256 284
77 103	75 42	64 57	65.6	75 16	61 22	62.2	74 46	58 00	58.9	74 14	54 51	55.9	73 39	51 55	53.1	73 02	49 10	50.4	257 283
78 102	76 36	63 11	63.8	76 08	59 26	60.2	75 37	55 57	56.8	75 02	52 42	53.6	74 26	49 42	50.8	73 47	46 56	48.1	258 282
79 101	77 29	61 09	61.7	76 59	57 14	57.9	76 26	53 38	54.4	75 49	50 18	51.2	75 11	47 16	48.2	74 30	44 28	45.5	259 281
80 100	78 21	58 49	59.3	77 49	54 44	55.3	77 13	51 01	51.7	76 35	47 38	48.4	75 54	44 34	45.4	75 11	41 47	42.7	260 280
81 99	79 12	56 06	56.6	78 37	51 52	52.4	77 59	48 04	48.7	77 18	44 39	45.4	76 35	41 35	42.4	75 49	38 50	39.7	261 279
82 98	80 01	52 56	53.4	79 23	48 35	49.1	78 42	44 43	45.3	77 59	41 18	41.9	77 13	38 17	39.0	76 26	35 36	36.4	262 278
83 97	80 47	49 13	49.6	80 07	44 47	45.2	79 23	40 56	41.4	78 37	37 35	38.1	77 49	34 39	35.3	76 59	32 05	32.8	263 277
84 96	81 31	44 51	45.2	80 47	40 24	40.8	80 01	36 38	37.1	79 12	33 25	33.9	78 21	30 40	31.2	77 29	28 16	28.8	264 276
85 95	82 12	39 40	39.9	81 24	35 22	35.7	80 34	31 48	32.2	79 43	28 49	29.2	78 50	26 18	26.7	77 56	24 09	24.6	265 275
86 94	82 48	33 34	33.8	81 57	29 36	29.8	81 04	26 24	26.7	80 09	23 46	24.1	79 14	21 35	21.9	78 18	19 44	20.1	266 274
87 93	83 18	26 28	26.6	82 23	23 05	23.3	81 28	20 25	20.6	80 31	18 17	18.5	79 34	16 32	16.8	78 36	15 04	15.4	267 273
88 92	83 41	18 22	18.5	82 43	15 52	16.0	81 45	13 57	14.1	80 47	12 26	12.6	79 48	11 12	11.4	78 49	10 11	10.4	268 272
89 91	83 55	9 28	9.5	82 56	8 05	8.2	81 56	7 05	7.1	80 57	6 17	6.4	79 57	5 39	5.7	78 57	5 08	5.2	269 271
90 90	84 00	0 00	0.0	83 00	0 00	0.0	82 00	0 00	0.0	81 00	0 00	0.0	80 00	0 00	0.0	79 00	0 00	0.0	270 270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		12°			13°			14°			15°			16°			17°			Lat. / A	
LHA	F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	78 00	90.0	0 00	77 00	90.0	0 00	76 00	90.0	0 00	75 00	90.0	0 00	74 00	90.0	0 00	73 00	90.0	180	360
1	179	0 59	78 00	89.8	0 58	77 00	89.8	0 58	76 00	89.8	0 58	75 00	89.7	0 58	74 00	89.7	0 57	73 00	89.7	181	359
2	178	1 57	78 00	89.6	1 57	77 00	89.5	1 56	76 00	89.5	1 56	74 59	89.5	1 55	73 59	89.4	1 55	72 59	89.4	182	358
3	177	2 56	77 59	89.4	2 55	76 59	89.3	2 55	75 59	89.3	2 54	74 59	89.2	2 53	73 59	89.2	2 52	72 59	89.1	183	357
4	176	3 55	77 58	89.2	3 54	76 58	89.1	3 53	75 58	89.0	3 52	74 58	89.0	3 51	73 58	88.9	3 49	72 58	88.8	184	356
5	175	4 53	77 57	89.0	4 52	76 57	88.9	4 51	75 57	88.8	4 50	74 57	88.7	4 48	73 57	88.6	4 47	72 56	88.5	185	355
6	174	5 52	77 56	88.7	5 51	76 56	88.6	5 49	75 56	88.5	5 48	74 55	88.4	5 46	73 55	88.3	5 44	72 55	88.2	186	354
7	173	6 51	77 55	88.5	6 49	76 54	88.4	6 47	75 54	88.3	6 46	74 54	88.2	6 44	73 53	88.1	6 42	72 53	87.9	187	353
8	172	7 49	77 53	88.3	7 48	76 53	88.2	7 46	75 52	88.1	7 44	74 52	87.9	7 41	73 51	87.8	7 39	72 51	87.6	188	352
9	171	8 48	77 51	88.1	8 46	76 51	88.0	8 44	75 50	87.8	8 41	74 49	87.7	8 39	73 49	87.5	8 36	72 48	87.3	189	351
10	170	9 47	77 49	87.9	9 44	76 48	87.7	9 42	75 48	87.6	9 39	74 47	87.4	9 37	73 46	87.2	9 34	72 45	87.0	190	350
11	169	10 45	77 47	87.7	10 43	76 46	87.5	10 40	75 45	87.3	10 37	74 44	87.1	10 34	73 43	86.9	10 31	72 42	86.7	191	349
12	168	11 44	77 44	87.5	11 41	76 43	87.3	11 38	75 42	87.1	11 35	74 41	86.9	11 32	73 40	86.6	11 28	72 39	86.4	192	348
13	167	12 43	77 42	87.3	12 40	76 40	87.0	12 36	75 39	86.8	12 33	74 37	86.6	12 29	73 36	86.4	12 25	72 35	86.1	193	347
14	166	13 41	77 39	87.0	13 38	76 37	86.8	13 35	75 35	86.5	13 31	74 34	86.3	13 27	73 32	86.1	13 23	72 31	85.8	194	346
15	165	14 40	77 35	86.8	14 36	76 33	86.6	14 33	75 32	86.3	14 29	74 30	86.0	14 24	73 28	85.8	14 20	72 26	85.5	195	345
16	164	15 38	77 32	86.6	15 35	76 30	86.3	15 31	75 28	86.0	15 26	74 25	85.8	15 22	73 23	85.5	15 17	72 21	85.2	196	344
17	163	16 37	77 28	86.4	16 33	76 26	86.1	16 29	75 23	85.8	16 24	74 21	85.5	16 19	73 19	85.2	16 14	72 16	84.9	197	343
18	162	17 36	77 24	86.1	17 31	76 21	85.8	17 27	75 19	85.5	17 22	74 16	85.2	17 17	73 13	84.9	17 11	72 11	84.6	198	342
19	161	18 34	77 20	85.9	18 30	76 17	85.6	18 25	75 14	85.2	18 20	74 11	84.9	18 14	73 08	84.6	18 08	72 05	84.3	199	341
20	160	19 33	77 15	85.7	19 28	76 12	85.3	19 23	75 08	85.0	19 17	74 05	84.6	19 12	73 02	84.3	19 05	71 59	83.9	200	340
21	159	20 31	77 10	85.4	20 26	76 07	85.1	20 21	75 03	84.7	20 15	73 59	84.3	20 09	72 56	84.0	20 03	71 52	83.6	201	339
22	158	21 30	77 05	85.2	21 24	76 01	84.8	21 19	74 57	84.4	21 13	73 53	84.0	21 06	72 49	83.6	21 00	71 45	83.3	202	338
23	157	22 28	77 00	85.0	22 23	75 55	84.5	22 17	74 51	84.1	22 10	73 46	83.7	22 04	72 42	83.3	21 56	71 38	82.9	203	337
24	156	23 27	76 54	84.7	23 21	75 49	84.3	23 15	74 44	83.9	23 08	73 39	83.4	23 01	72 34	83.0	22 53	71 30	82.6	204	336
25	155	24 25	76 48	84.5	24 19	75 43	84.0	24 13	74 37	83.6	24 06	73 32	83.1	23 58	72 27	82.7	23 50	71 22	82.2	205	335
26	154	25 23	76 42	84.2	25 17	75 36	83.7	25 10	74 30	83.3	25 03	73 24	82.8	24 55	72 18	82.3	24 47	71 13	81.9	206	334
27	153	26 22	76 35	84.0	26 15	75 28	83.5	26 08	74 22	83.0	26 01	73 16	82.5	25 52	72 10	82.0	25 44	71 04	81.5	207	333
28	152	27 20	76 28	83.7	27 13	75 21	83.2	27 06	74 14	82.7	26 58	73 07	82.2	26 50	72 00	81.7	26 41	70 54	81.2	208	332
29	151	28 18	76 20	83.4	28 11	75 13	82.9	28 04	74 05	82.4	27 55	72 58	81.8	27 47	71 51	81.3	27 37	70 44	80.8	209	331
30	150	29 17	76 13	83.2	29 09	75 04	82 6	29 01	73 56	82.0	28 53	72 48	81.5	28 44	71 41	81.0	28 34	70 33	80.4	210	330
31	149	30 15	76 04	82.9	30 07	74 56	82.3	29 59	73 47	81.7	29 50	72 38	81.2	29 41	71 30	80.6	29 30	70 22	80.0	211	329
32	148	31 13	75 56	82.6	31 05	74 46	82.0	30 57	73 37	81.4	30 47	72 28	80.8	30 37	71 19	80.2	30 27	70 11	79.6	212	328
33	147	32 11	75 47	82.3	32 03	74 37	81.7	31 54	73 27	81.1	31 44	72 17	80.5	31 34	71 07	79.9	31 23	69 58	79.2	213	327
34	146	33 10	75 37	82.0	33 01	74 26	81.4	32 52	73 16	80.7	32 42	72 05	80.1	32 31	70 55	79.5	32 20	69 45	78.8	214	326
35	145	34 08	75 27	81.7	33 59	74 16	81.0	33 49	73 04	80.4	33 39	71 53	79.7	33 28	70 42	79.1	33 16	69 32	78.4	215	325
36	144	35 06	75 17	81.4	34 56	74 04	80.7	34 46	72 52	80.0	34 36	71 40	79.4	34 24	70 29	78.7	34 12	69 18	78.0	216	324
37	143	36 04	75 06	81.1	35 54	73 53	80.4	35 44	72 40	79.7	35 33	71 27	79.0	35 21	70 15	78.3	35 08	69 03	77.6	217	323
38	142	37 02	74 54	80.8	36 52	73 40	80.0	36 41	72 27	79.3	36 29	71 13	78.6	36 17	70 00	77.8	36 04	68 48	77.1	218	322
39	141	38 00	74 42	80.4	37 49	73 27	79.7	37 38	72 13	78.9	37 26	70 59	78.2	37 13	69 45	77.4	37 00	68 32	76.7	219	321
40	140	38 57	74 30	80.1	38 47	73 14	79.3	38 35	71 58	78.5	38 23	70 43	77.7	38 10	69 29	77.0	37 56	68 15	76.2	220	320
41	139	39 55	74 16	79.8	39 44	72 59	78.9	39 32	71 43	78.1	39 19	70 27	77.3	39 06	69 12	76.5	38 51	67 57	75.7	221	319
42	138	40 53	74 02	79.4	40 41	72 45	78.5	40 29	71 27	77.7	40 16	70 10	76.9	40 02	69 54	76.1	39 47	67 38	75.3	222	318
43	137	41 51	73 48	79.0	41 39	72 29	78.2	41 26	71 11	77.3	41 12	69 53	76.4	40 58	68 35	75.6	40 42	67 19	74.7	223	317
44	136	42 48	73 32	78.6	42 36	72 12	77.7	42 23	70 53	76.9	42 09	69 34	76.0	41 54	68 16	75.1	41 38	66 58	74.2	224	316
45	135	43 46	73 16	78.3	43 33	71 55	77.3	43 19	70 35	76.4	43 05	69 15	75.5	42 49	67 56	74.6	42 33	66 37	73.7	225	315

Lat. / A		12°			13°			14°			15°			16°			17°			Lat. / A	
LHA	F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
45	135	43 46	73 16	78.3	43 33	71 55	77.3	43 19	70 35	76.4	43 05	69 15	75.5	42 49	67 56	74.6	42 33	66 37	73.7	225	315
46	134	44 43	72 59	77.8	44 30	71 37	76.9	44 16	70 15	75.9	44 01	68 54	75.0	43 45	67 34	74.1	43 28	66 15	73.2	226	314
47	133	45 40	72 41	77.4	45 27	71 18	76.4	45 12	69 55	75.5	44 57	68 33	74.5	44 40	67 12	73.5	44 23	65 51	72.6	227	313
48	132	46 38	72 23	77.0	46 24	70 58	76.0	46 09	69 34	75.0	45 53	68 11	74.0	45 35	66 48	73.0	45 17	65 27	72.0	228	312
49	131	47 35	72 03	76.5	47 20	70 37	75.5	47 05	69 11	74.4	46 48	67 47	73.4	46 30	66 23	72.4	46 12	65 01	71.4	229	311
50	130	48 32	71 42	76.1	48 17	70 15	75.0	48 01	68 48	73.9	47 44	67 22	72.9	47 25	65 58	71.8	47 06	64 34	70.8	230	310
51	129	49 29	71 20	75.6	49 13	69 51	74.5	48 57	68 23	73.4	48 39	66 56	72.3	48 20	65 30	71.2	48 00	64 05	70.1	231	309
52	128	50 25	70 57	75.1	50 09	69 27	73.9	49 52	67 57	72.8	49 34	66 29	71.7	49 15	65 02	70.6	48 54	63 35	69.5	232	308
53	127	51 22	70 33	74.6	51 06	69 01	73.4	50 48	67 30	72.2	50 29	66 00	71.0	50 09	64 31	69.9	49 48	63 04	68.8	233	307
54	126	52 19	70 07	74.0	52 02	68 33	72.8	51 43	67 01	71.6	51 24	65 30	70.4	51 03	64 00	69.2	50 41	62 31	68.1	234	306
55	125	53 15	69 40	73.5	52 57	68 04	72.2	52 38	66 30	70.9	52 18	64 58	69.7	51 57	63 26	68.5	51 34	61 56	67.3	235	305
56	124	54 11	69 11	72.9	53 53	67 34	71.6	53 33	65 58	70.3	53 12	64 24	69.0	52 50	62 51	67.8	52 27	61 20	66.6	236	304
57	123	55 07	68 41	72.2	54 48	67 02	70.9	54 28	65 24	69.6	54 06	63 48	68.3	53 43	62 14	67.0	53 19	60 42	65.8	237	303
58	122	56 03	68 09	71.6	55 43	66 28	70.2	55 22	64 48	68.8	55 00	63 11	67.5	54 36	61 35	66.2	54 12	60 01	64.9	238	302
59	121	56 59	67 34	70.9	56 38	65 51	69.5	56 16	64 10	68.1	55 53	62 31	66.7	55 29	60 54	65.4	55 03	59 18	64.1	239	301
60	120	57 54	66 58	70.2	57 33	65 13	68.7	57 10	63 30	67.3	56 46	61 49	65.9	56 21	60 10	64.5	55 55	58 33	63.1	240	300
61	119	58 49	66 20	69.4	58 27	64 32	67.9	58 04	62 47	66.4	57 39	61 04	65.0	57 13	59 24	63.6	56 46	57 46	62.2	241	299
62	118	59 44	65 38	68.6	59 21	63 49	67.1	58 57	62 02	65.5	58 31	60 17	64.0	58 05	58 35	62.6	57 36	56 56	61.2	242	298
63	117	60 38	64 55	67.8	60 15	63 03	66.2	59 50	61 13	64.6	59 23	59 27	63.1	58 55	57 43	61.6	58 26	56 03	60.2	243	297
64	116	61 32	64 08	66.9	61 08	62 14	65.2	60 42	60 22	63.6	60 15	58 34	62.0	59 46	56 49	60.5	59 16	55 06	59.1	244	296
65	115	62 26	63 18	66.0	62 01	61 21	64.2	61 34	59 28	62.6	61 06	57 37	61.0	60 36	55 51	59.4	60 05	54 07	57.9	245	295
66	114	63 20	62 25	65.0	62 53	60 25	63.2	62 26	58 30	61.5	61 56	56 37	59.8	61 25	54 49	58.2	60 53	53 04	56.7	246	294
67	113	64 13	61 27	63.9	63 45	59 25	62.1	63 16	57 27	60.3	62 46	55 34	58.6	62 14	53 44	57.0	61 41	51 57	55.4	247	293
68	112	65 05	60 26	62.8	64 37	58 21	60.9	64 07	56 21	59.1	63 35	54 25	57.4	63 02	52 34	55.7	62 27	50 47	54.1	248	292
69	111	65 57	59 20	61.6	65 27	57 13	59.6	64 56	55 10	57.8	64 23	53 13	56.0	63 49	51 20	54.3	63 14	49 32	52.7	249	291
70	110	66 48	58 08	60.3	66 18	55 59	58.3	65 45	53 55	56.4	65 11	51 55	54.6	64 36	50 01	52.9	63 59	48 12	51.2	250	290
71	109	67 39	56 52	58.9	67 07	54 40	56.8	66 33	52 33	54.9	65 58	50 33	53.1	65 21	48 38	51.3	64 43	46 48	49.7	251	289
72	108	68 29	55 29	57.4	67 55	53 14	55.3	67 20	51 06	53.3	66 44	49 04	51.5	66 06	47 08	49.7	65 26	45 18	48.0	252	288
73	107	69 18	53 59	55.8	68 43	51 42	53.7	68 07	49 33	51.6	67 29	47 30	49.8	66 49	45 33	48.0	66 08	43 43	46.3	253	287
74	106	70 06	52 22	54.1	69 30	50 03	51.9	68 52	47 52	49.8	68 12	45 49	47.9	67 31	43 52	46.1	66 49	42 02	44.4	254	286
75	105	70 53	50 36	52.2	70 15	48 16	50.0	69 36	46 04	47.9	68 55	44 00	46.0	68 12	42 04	44.2	67 29	40 15	42.5	255	285
76	104	71 38	48 42	50.2	70 59	46 20	47.9	70 18	44 08	45.9	69 36	42 05	43.9	68 52	40 09	42.1	68 07	38 21	40.5	256	284
77	103	72 23	46 37	48.0	71 42	44 15	45.7	70 59	42 03	43.7	70 15	40 01	41.7	69 30	38 07	39.9	68 43	36 21	38.3	257	283
78	102	73 06	44 22	45.6	72 23	42 00	43.4	71 38	39 49	41.3	70 53	37 49	39.4	70 06	35 57	37.6	69 18	34 13	36.0	258	282
79	101	73 47	41 55	43.1	73 02	39 34	40.8	72 16	37 26	38.8	71 28	35 27	36.9	70 40	33 38	35.2	69 50	31 58	33.6	259	281
80	100	74 26	39 15	40.3	73 39	36 57	38.1	72 51	34 51	36.1	72 02	32 57	34.3	71 12	31 12	32.6	70 21	29 36	31.1	260	280
81	99	75 02	36 21	37.3	74 14	34 07	35.1	73 24	32 06	33.2	72 34	30 17	31.5	71 42	28 37	29.9	70 50	27 06	28.4	261	279
82	98	75 37	33 13	34.1	74 46	31 05	32.0	73 55	29 10	30.2	73 03	27 27	28.5	72 09	25 53	27.0	71 16	24 29	25.7	262	278
83	97	76 08	29 50	30.6	75 16	27 50	28.6	74 23	26 03	26.9	73 29	24 27	25.4	72 34	23 02	24.0	71 39	21 44	22.8	263	277
84	96	76 36	26 11	26.8	75 42	24 22	25.0	74 48	22 45	23.5	73 52	21 19	22.1	72 56	20 02	20.9	72 00	18 53	19.8	264	276
85	95	77 01	22 18	22.8	76 05	20 41	21.3	75 09	19 16	19.9	74 12	18 01	18.7	73 15	16 54	17.6	72 18	15 55	16.7	265	275
86	94	77 22	18 10	18.6	76 25	16 49	17.3	75 27	15 38	16.1	74 29	14 36	15.1	73 31	13 40	14.2	72 33	12 51	13.5	266	274
87	93	77 38	13 50	14.1	76 40	12 46	13.1	75 41	11 51	12.2	74 43	11 03	11.4	73 44	10 21	10.8	72 45	9 43	10.2	267	273
88	92	77 50	9 19	9.5	76 51	8 36	8.8	75 52	7 58	8.2	74 52	7 25	7.7	73 53	6 56	7.2	72 53	6 31	6.8	268	272
89	91	77 58	4 42	4.8	76 58	4 19	4.4	75 58	4 00	4.1	74 58	3 44	3.9	73 58	3 29	3.6	72 58	3 16	3.4	269	271
90	90	78 00	0 00	0.0	77 00	0 00	0.0	76 00	0 00	0.0	75 00	0 00	0.0	74 00	0 00	0.0	73 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		18°			19°			20°			21°			22°			23°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	72 00	90.0	0 00	71 00	90.0	0 00	70 00	90.0	0 00	69 00	90.0	0 00	68 00	90.0	0 00	67 00	90.0	180	360
1	179	0 57	72 00	89.7	0 57	71 00	89.7	0 56	70 00	89.7	0 56	69 00	89.6	0 56	68 00	89.6	0 55	67 00	89.6	181	359
2	178	1 54	71 59	89.4	1 53	70 59	89.3	1 53	69 59	89.3	1 52	68 59	89.3	1 51	67 59	89.3	1 50	66 59	89.2	182	358
3	177	2 51	71 59	89.1	2 50	70 59	89.0	2 49	69 58	89.0	2 48	68 58	88.9	2 47	67 58	88.9	2 46	66 58	88.8	183	357
4	176	3 48	71 58	88.8	3 47	70 57	88.7	3 46	69 57	88.6	3 44	68 57	88.6	3 42	67 57	88.5	3 41	66 57	88.4	184	356
5	175	4 45	71 56	88.5	4 44	70 56	88.4	4 42	69 56	88.3	4 40	68 56	88.2	4 38	67 55	88.1	4 36	66 55	88.0	185	355
6	174	5 42	71 54	88.1	5 40	70 54	88.0	5 38	69 54	87.9	5 36	68 54	87.8	5 34	67 53	87.7	5 31	66 53	87.6	186	354
7	173	6 39	71 52	87.8	6 37	70 52	87.7	6 35	69 52	87.6	6 32	68 51	87.5	6 29	67 51	87.4	6 26	66 51	87.3	187	353
8	172	7 36	71 50	87.5	7 34	70 50	87.4	7 31	69 49	87.2	7 28	68 49	87.1	7 25	67 48	87.0	7 22	66 48	86.9	188	352
9	171	8 33	71 47	87.2	8 30	70 47	87.0	8 27	69 46	86.9	8 24	68 46	86.8	8 20	67 45	86.6	8 17	66 45	86.5	189	351
10	170	9 30	71 44	86.9	9 27	70 44	86.7	9 23	69 43	86.5	9 20	68 42	86.4	9 16	67 42	86.2	9 12	66 41	86.1	190	350
11	169	10 27	71 41	86.6	10 24	70 40	86.4	10 20	69 39	86.2	10 16	68 39	86.0	10 11	67 38	85.8	10 07	66 37	85.7	191	349
12	168	11 24	71 37	86.2	11 20	70 36	86.0	11 16	69 35	85.8	11 12	68 34	85.6	11 07	67 33	85.4	11 02	66 32	85.3	192	348
13	167	12 21	71 33	85.9	12 17	70 32	85.7	12 12	69 31	85.5	12 07	68 30	85.3	12 02	67 29	85.1	11 57	66 28	84.8	193	347
14	166	13 18	71 29	85.6	13 13	70 28	85.4	13 08	69 26	85.1	13 03	68 25	84.9	12 58	67 24	84.7	12 52	66 22	84.4	194	346
15	165	14 15	71 24	85.3	14 10	70 23	85.0	14 05	69 21	84.8	13 59	68 20	84.5	13 53	67 18	84.3	13 47	66 17	84.0	195	345
16	164	15 12	71 19	84.9	15 06	70 18	84.7	15 01	69 16	84.4	14 55	68 14	84.1	14 48	67 12	83.9	14 42	66 10	83.6	196	344
17	163	16 09	71 14	84.6	16 03	70 12	84.3	15 57	69 10	84.0	15 50	68 08	83.7	15 44	67 06	83.5	15 37	66 04	83.2	197	343
18	162	17 05	71 08	84.3	16 59	70 06	84.0	16 53	69 03	83.7	16 46	68 01	83.4	16 39	66 59	83.1	16 32	65 57	82.8	198	342
19	161	18 02	71 02	83.9	17 56	69 59	83.6	17 49	68 57	83.3	17 42	67 54	83.0	17 34	66 52	82.7	17 26	65 49	82.3	199	341
20	160	18 59	70 56	83.6	18 52	69 53	83.2	18 45	68 50	82.9	18 37	67 47	82.6	18 29	66 44	82.2	18 21	65 41	81.9	200	340
21	159	19 56	70 49	83.2	19 48	69 45	82.9	19 41	68 42	82.5	19 33	67 39	82.2	19 24	66 36	81.8	19 16	65 33	81.5	201	339
22	158	20 52	70 41	82.9	20 45	69 38	82.5	20 37	68 34	82.1	20 28	67 31	81.8	20 19	66 27	81.4	20 10	65 24	81.0	202	338
23	157	21 49	70 33	82.5	21 41	69 29	82.1	21 32	68 26	81.7	21 24	67 22	81.4	21 14	66 18	81.0	21 05	65 15	80.6	203	337
24	156	22 45	70 25	82.2	22 37	69 21	81.8	22 28	68 17	81.3	22 19	67 12	80.9	22 09	66 09	80.5	21 59	65 05	80.1	204	336
25	155	23 42	70 17	81.8	23 33	69 12	81.4	23 24	68 07	80.9	23 14	67 03	80.5	23 04	65 58	80.1	22 54	64 54	79.7	205	335
26	154	24 38	70 07	81.4	24 29	69 02	81.0	24 20	67 57	80.5	24 09	66 52	80.1	23 59	65 48	79.6	23 48	64 43	79.2	206	334
27	153	25 35	69 58	81.1	25 25	68 52	80.6	25 15	67 47	80.1	25 05	66 42	79.7	24 54	65 36	79.2	24 42	64 32	78.7	207	333
28	152	26 31	69 48	80.7	26 21	68 42	80.2	26 11	67 36	79.7	26 00	66 30	79.2	25 48	65 25	78.7	25 36	64 19	78.3	208	332
29	151	27 27	69 37	80.3	27 17	68 31	79.8	27 06	67 24	79.3	26 55	66 18	78.8	26 43	65 12	78.3	26 30	64 07	77.8	209	331
30	150	28 24	69 26	79.9	28 13	68 19	79.4	28 01	67 12	78.8	27 50	66 06	78.3	27 37	64 59	77.8	27 24	63 53	77.3	210	330
31	149	29 20	69 14	79.5	29 09	68 07	78.9	28 57	67 00	78.4	28 44	65 53	77.8	28 31	64 46	77.3	28 18	63 39	76.8	211	329
32	148	30 16	69 02	79.1	30 04	67 54	78.5	29 52	66 46	77.9	29 39	65 39	77.4	29 26	64 32	76.8	29 12	63 25	76.3	212	328
33	147	31 12	68 49	78.7	31 00	67 41	78.1	30 47	66 32	77.5	30 34	65 24	76.9	30 20	64 17	76.3	30 05	63 09	75.8	213	327
34	146	32 08	68 36	78.2	31 55	67 27	77.6	31 42	66 18	77.0	31 28	65 09	76.4	31 14	64 01	75.8	30 59	62 53	75.2	214	326
35	145	33 04	68 22	77.8	32 51	67 12	77.2	32 37	66 03	76.5	32 23	64 54	75.9	32 08	63 45	75.3	31 52	62 36	74.7	215	325
36	144	33 59	68 07	77.3	33 46	66 57	76.7	33 32	65 47	76.0	33 17	64 37	75.4	33 01	63 28	74.8	32 45	62 19	74.2	216	324
37	143	34 55	67 52	76.9	34 41	66 41	76.2	34 26	65 30	75.5	34 11	64 20	74.9	33 55	63 10	74.2	33 38	62 01	73.6	217	323
38	142	35 50	67 36	76.4	35 36	66 24	75.7	35 21	65 13	75.0	35 05	64 02	74.4	34 48	62 51	73.7	34 31	61 41	73.0	218	322
39	141	36 46	67 19	76.0	36 31	66 06	75.2	36 15	64 54	74.5	35 59	63 43	73.8	35 42	62 32	73.1	35 24	61 21	72.4	219	321
40	140	37 41	67 01	75.5	37 26	65 48	74.7	37 10	64 35	74.0	36 53	63 23	73.3	36 35	62 12	72.6	36 17	61 01	71.8	220	320
41	139	38 36	66 42	75.0	38 20	65 29	74.2	38 04	64 15	73.4	37 46	63 02	72.7	37 28	61 50	72.0	37 09	60 39	71.2	221	319
42	138	39 31	66 23	74.5	39 15	65 08	73.7	38 58	63 54	72.9	38 40	62 41	72.1	38 21	61 28	71.4	38 01	60 16	70.6	222	318
43	137	40 26	66 03	73.9	40 09	64 47	73.1	39 51	63 33	72.3	39 33	62 18	71.5	39 13	61 05	70.7	38 53	59 52	70.0	223	317
44	136	41 21	65 42	73.4	41 03	64 25	72.5	40 45	63 10	71.7	40 26	61 55	70.9	40 06	60 41	70.1	39 45	59 27	69.3	224	316
45	135	42 16	65 19	72.8	41 57	64 02	72.0	41 38	62 46	71.1	41 19	61 30	70.3	40 58	60 15	69.5	40 37	59 01	68.7	225	315

Lat. / A		18°			19°			20°			21°			22°			23°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
45	135	42 16	65 19	72.8	41 57	64 02	72.0	41 38	62 46	71.1	41 19	61 30	70.3	40 58	60 15	69.5	40 37	59 01	68.7	225	315
46	134	43 10	64 56	72.3	42 51	63 38	71.4	42 32	62 21	70.5	42 11	61 05	69.6	41 50	59 49	68.8	41 28	58 34	68.0	226	314
47	133	44 04	64 32	71.7	43 45	63 13	70.8	43 25	61 55	69.9	43 04	60 38	69.0	42 42	59 21	68.1	42 19	58 06	67.3	227	313
48	132	44 58	64 06	71.1	44 38	62 46	70.1	44 18	61 27	69.2	43 56	60 09	68.3	43 33	58 53	67.4	43 10	57 37	66.5	228	312
49	131	45 52	63 39	70.4	45 32	62 18	69.5	45 10	60 59	68.5	44 48	59 40	67.6	44 24	58 22	66.7	44 00	57 06	65.8	229	311
50	130	46 46	63 11	69.8	46 25	61 49	68.8	46 03	60 29	67.8	45 39	59 09	66.9	45 15	57 51	65.9	44 50	56 34	65.0	230	310
51	129	47 39	62 42	69.1	47 17	61 19	68.1	46 55	59 57	67.1	46 31	58 37	66.1	46 06	57 18	65.2	45 40	56 00	64.2	231	309
52	128	48 33	62 11	68.4	48 10	60 47	67.4	47 46	59 25	66.4	47 22	58 03	65.4	46 56	56 44	64.4	46 30	55 25	63.4	232	308
53	127	49 25	61 38	67.7	49 02	60 13	66.6	48 38	58 50	65.6	48 13	57 28	64.6	47 46	56 07	63.6	47 19	54 48	62.6	233	307
54	126	50 18	61 04	67.0	49 54	59 38	65.9	49 29	58 14	64.8	49 03	56 51	63.7	48 36	55 30	62.7	48 08	54 10	61.7	234	306
55	125	51 10	60 28	66.2	50 46	59 01	65.1	50 20	57 36	64.0	49 53	56 12	62.9	49 25	54 50	61.9	48 56	53 30	60.8	235	305
56	124	52 03	59 50	65.4	51 37	58 23	64.2	51 10	56 56	63.1	50 43	55 32	62.0	50 14	54 09	61.0	49 44	52 48	59.9	236	304
57	123	52 54	59 11	64.6	52 28	57 42	63.4	52 00	56 15	62.2	51 32	54 49	61.1	51 02	53 26	60.0	50 32	52 04	59.0	237	303
58	122	53 46	58 29	63.7	53 18	56 59	62.5	52 50	55 31	61.3	52 21	54 05	60.2	51 50	52 41	59.1	51 19	51 18	58.0	238	302
59	121	54 37	57 45	62.8	54 08	56 14	61.5	53 39	54 45	60.4	53 09	53 18	59.2	52 38	51 53	58.1	52 06	50 30	57.0	239	301
60	120	55 27	56 59	61.8	54 58	55 27	60.6	54 28	53 57	59.4	53 57	52 29	58.2	53 25	51 04	57.0	52 52	49 40	55.9	240	300
61	119	56 17	56 10	60.9	55 47	54 37	59.6	55 16	53 06	58.3	54 44	51 38	57.1	54 11	50 12	55.9	53 37	48 48	54.8	241	299
62	118	57 07	55 19	59.8	56 36	53 45	58.5	56 04	52 13	57.2	55 31	50 44	56.0	54 57	49 17	54.8	54 22	47 53	53.7	242	298
63	117	57 56	54 25	58.8	57 24	52 49	57.4	56 51	51 17	56.1	56 17	49 47	54.9	55 42	48 20	53.7	55 06	46 55	52.5	243	297
64	116	58 44	53 27	57.6	58 12	51 51	56.3	57 38	50 18	55.0	57 03	48 48	53.7	56 27	47 20	52.5	55 50	45 55	51.3	244	296
65	115	59 32	52 27	56.5	58 58	50 50	55.1	58 23	49 16	53.7	57 47	47 45	52.5	57 10	46 17	51.2	56 32	44 52	50.0	245	295
66	114	60 19	51 23	55.2	59 45	49 45	53.8	59 09	48 11	52.5	58 32	46 39	51.2	57 53	45 11	49.9	57 14	43 47	48.7	246	294
67	113	61 06	50 15	53.9	60 30	48 37	52.5	59 53	47 02	51.1	59 15	45 30	49.8	58 36	44 02	48.6	57 55	42 38	47.4	247	293
68	112	61 52	49 04	52.6	61 15	47 25	51.1	60 36	45 50	49.8	59 57	44 18	48.4	59 17	42 50	47.2	58 36	41 26	46.0	248	292
69	111	62 37	47 48	51.2	61 58	46 09	49.7	61 19	44 33	48.3	60 39	43 02	47.0	59 57	41 34	45.7	59 15	40 10	44.5	249	291
70	110	63 21	46 28	49.7	62 41	44 48	48.2	62 01	43 13	46.8	61 19	41 42	45.4	60 36	40 15	44.2	59 53	38 52	43.0	250	290
71	109	64 04	45 03	48.1	63 23	43 24	46.6	62 41	41 49	45.2	61 58	40 18	43.9	61 15	38 52	42.6	60 30	37 29	41.4	251	289
72	108	64 45	43 34	46.4	64 04	41 54	44.9	63 21	40 20	43.5	62 37	38 50	42.2	61 52	37 25	40.9	61 06	36 03	39.7	252	288
73	107	65 26	41 59	44.7	64 43	40 20	43.2	63 59	38 46	41.8	63 14	37 18	40.5	62 27	35 53	39.2	61 41	34 34	38.0	253	287
74	106	66 06	40 19	42.9	65 21	38 41	41.4	64 36	37 08	40.0	63 49	35 41	38.7	63 02	34 18	37.4	62 14	33 00	36.3	254	286
75	105	66 44	38 32	40.9	65 58	36 56	39.5	65 11	35 25	38.1	64 23	33 59	36.8	63 35	32 39	35.6	62 46	31 22	34.4	255	285
76	104	67 20	36 40	38.9	66 33	35 05	37.4	65 45	33 37	36.1	64 56	32 13	34.8	64 07	30 55	33.6	63 16	29 41	32.5	256	284
77	103	67 55	34 42	36.8	67 07	33 09	35.3	66 18	31 43	34.0	65 27	30 22	32.8	64 37	29 06	31.6	63 45	27 55	30.6	257	283
78	102	68 29	32 37	34.5	67 39	31 07	33.1	66 48	29 44	31.9	65 57	28 26	30.7	65 05	27 14	29.6	64 13	26 06	28.5	258	282
79	101	69 00	30 25	32.2	68 09	29 00	30.8	67 17	27 40	29.6	66 25	26 26	28.5	65 32	25 17	27.4	64 38	24 12	26.4	259	281
80	100	69 29	28 07	29.7	68 37	26 46	28.4	67 44	25 30	27.3	66 50	24 20	26.2	65 56	23 15	25.2	65 02	22 15	24.3	260	280
81	99	69 57	25 43	27.1	69 03	24 26	25.9	68 09	23 15	24.8	67 14	22 10	23.8	66 19	21 10	22.9	65 23	20 14	22.1	261	279
82	98	70 21	23 11	24.5	69 27	22 00	23.3	68 31	20 56	22.3	67 36	19 56	21.4	66 40	19 00	20.6	65 43	18 09	19.8	262	278
83	97	70 44	20 34	21.7	69 48	19 29	20.7	68 51	18 31	19.7	67 55	17 37	18.9	66 58	16 47	18.1	66 01	16 01	17.4	263	277
84	96	71 03	17 50	18.8	70 07	16 53	17.9	69 09	16 01	17.1	68 12	15 14	16.3	67 14	14 30	15.7	66 16	13 50	15.1	264	276
85	95	71 20	15 01	15.8	70 23	14 12	15.0	69 25	13 28	14.3	68 26	12 48	13.7	67 28	12 10	13.1	66 29	11 36	12.6	265	275
86	94	71 35	12 07	12.8	70 36	11 27	12.1	69 37	10 51	11.6	68 38	10 18	11.0	67 39	9 48	10.6	66 40	9 20	10.1	266	274
87	93	71 46	9 09	9.6	70 46	8 39	9.1	69 47	8 11	8.7	68 48	7 46	8.3	67 48	7 23	8.0	66 49	7 02	7.6	267	273
88	92	71 54	6 08	6.4	70 54	5 47	6.1	69 54	5 29	5.8	68 55	5 12	5.6	67 55	4 56	5.3	66 55	4 42	5.1	268	272
89	91	71 58	3 04	3.2	70 58	2 54	3.1	69 59	2 45	2.9	68 59	2 36	2.8	67 59	2 28	2.7	66 59	2 21	2.6	269	271
90	90	72 00	0 00	0.0	71 00	0 00	0.0	70 00	0 00	0.0	69 00	0 00	0.0	68 00	0 00	0.0	67 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$.
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

SIGHT REDUCTION TABLE

B: (–) for 90°< LHA < 270°
Dec: (–) for Lat. contrary name

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A	24°			25°			26°			27°			28°			29°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
0 180	0 00	66 00	90.0	0 00	65 00	90.0	0 00	64 00	90.0	0 00	63 00	90.0	0 00	62 00	90.0	0 00	61 00	90.0	180 360
1 179	0 55	66 00	89.6	0 54	65 00	89.6	0 54	64 00	89.6	0 53	63 00	89.5	0 53	62 00	89.5	0 52	61 00	89.5	181 359
2 178	1 50	65 59	89.2	1 49	64 59	89.2	1 48	63 59	89.1	1 47	62 59	89.1	1 46	61 59	89.1	1 45	60 59	89.0	182 358
3 177	2 44	65 58	88.8	2 43	64 58	88.7	2 42	63 58	88.7	2 40	62 58	88.6	2 39	61 58	88.6	2 37	60 58	88.5	183 357
4 176	3 39	65 57	88.4	3 37	64 57	88.3	3 36	63 57	88.2	3 34	62 57	88.2	3 32	61 57	88.1	3 30	60 56	88.1	184 356
5 175	4 34	65 55	88.0	4 32	64 55	87.9	4 30	63 55	87.8	4 27	62 55	87.7	4 25	61 55	87.6	4 22	60 54	87.6	185 355
6 174	5 29	65 53	87.6	5 26	64 53	87.5	5 23	63 53	87.4	5 21	62 52	87.3	5 18	61 52	87.2	5 15	60 52	87.1	186 354
7 173	6 24	65 50	87.1	6 20	64 50	87.0	6 17	63 50	86.9	6 14	62 50	86.8	6 11	61 49	86.7	6 07	60 49	86.6	187 353
8 172	7 18	65 47	86.7	7 15	64 47	86.6	7 11	63 47	86.5	7 07	62 46	86.3	7 04	61 46	86.2	6 59	60 46	86.1	188 352
9 171	8 13	65 44	86.3	8 09	64 44	86.2	8 05	63 43	86.0	8 01	62 43	85.9	7 56	61 42	85.7	7 52	60 42	85.6	189 351
10 170	9 08	65 40	85.9	9 03	64 40	85.7	8 59	63 39	85.6	8 54	62 39	85.4	8 49	61 38	85.3	8 44	60 38	85.1	190 350
11 169	10 02	65 36	85.5	9 57	64 35	85.3	9 52	63 35	85.1	9 47	62 34	85.0	9 42	61 33	84.8	9 36	60 33	84.6	191 349
12 168	10 57	65 32	85.1	10 52	64 31	84.9	10 46	63 30	84.7	10 41	62 29	84.5	10 35	61 28	84.3	10 29	60 28	84.1	192 348
13 167	11 52	65 27	84.6	11 46	64 26	84.4	11 40	63 25	84.2	11 34	62 24	84.0	11 27	61 23	83.8	11 21	60 22	83.6	193 347
14 166	12 46	65 21	84.2	12 40	64 20	84.0	12 34	63 19	83.8	12 27	62 18	83.5	12 20	61 17	83.3	12 13	60 16	83.1	194 346
15 165	13 41	65 15	83.8	13 34	64 14	83.5	13 27	63 13	83.3	13 20	62 11	83.1	13 13	61 10	82.8	13 05	60 09	82.6	195 345
16 164	14 35	65 09	83.3	14 28	64 07	83.1	14 21	63 06	82.8	14 13	62 04	82.6	14 05	61 03	82.3	13 57	60 02	82.1	196 344
17 163	15 29	65 02	82.9	15 22	64 00	82.6	15 14	62 59	82.4	15 06	61 57	82.1	14 58	60 56	81.8	14 49	59 54	81.6	197 343
18 162	16 24	64 55	82.5	16 16	63 53	82.2	16 08	62 51	81.9	15 59	61 49	81.6	15 50	60 47	81.3	15 41	59 46	81.0	198 342
19 161	17 18	64 47	82.0	17 10	63 45	81.7	17 01	62 43	81.4	16 52	61 41	81.1	16 42	60 39	80.8	16 33	59 37	80.5	199 341
20 160	18 12	64 39	81.6	18 03	63 36	81.3	17 54	62 34	80.9	17 45	61 32	80.6	17 35	60 30	80.3	17 24	59 28	80.0	200 340
21 159	19 07	64 30	81.1	18 57	63 28	80.8	18 47	62 25	80.4	18 37	61 23	80.1	18 27	60 20	79.8	18 16	59 18	79.5	201 339
22 158	20 01	64 21	80.7	19 51	63 18	80.3	19 41	62 15	80.0	19 30	61 13	79.6	19 19	60 10	79.3	19 08	59 08	78.9	202 338
23 157	20 55	64 11	80.2	20 44	63 08	79.8	20 34	62 05	79.5	20 22	61 02	79.1	20 11	59 59	78.7	19 59	58 57	78.4	203 337
24 156	21 49	64 01	79.7	21 38	62 58	79.3	21 27	61 54	79.0	21 15	60 51	78.6	21 03	59 48	78.2	20 50	58 45	77.8	204 336
25 155	22 43	63 50	79.3	22 31	62 46	78.9	22 19	61 43	78.4	22 07	60 39	78.0	21 55	59 36	77.7	21 42	58 33	77.3	205 335
26 154	23 36	63 39	78.8	23 25	62 35	78.4	23 12	61 31	77.9	22 59	60 27	77.5	22 46	59 24	77.1	22 33	58 20	76.7	206 334
27 153	24 30	63 27	78.3	24 18	62 22	77.8	24 05	61 18	77.4	23 52	60 14	77.0	23 38	59 10	76.5	23 24	58 07	76.1	207 333
28 152	25 24	63 14	77.8	25 11	62 10	77.3	24 57	61 05	76.9	24 44	60 01	76.4	24 29	58 57	76.0	24 15	57 53	75.5	208 332
29 151	26 17	63 01	77.3	26 04	61 56	76.8	25 50	60 51	76.3	25 36	59 47	75.9	25 21	58 42	75.4	25 05	57 38	75.0	209 331
30 150	27 11	62 48	76.8	26 57	61 42	76.3	26 42	60 37	75.8	26 27	59 32	75.3	26 12	58 27	74.8	25 56	57 23	74.4	210 330
31 149	28 04	62 33	76.3	27 50	61 27	75.8	27 35	60 22	75.2	27 19	59 16	74.7	27 03	58 11	74.2	26 46	57 07	73.8	211 329
32 148	28 57	62 18	75.7	28 42	61 12	75.2	28 27	60 06	74.7	28 10	59 00	74.2	27 54	57 55	73.7	27 37	56 50	73.1	212 328
33 147	29 50	62 02	75.2	29 35	60 56	74.7	29 19	59 49	74.1	29 02	58 43	73.6	28 45	57 38	73.0	28 27	56 32	72.5	213 327
34 146	30 43	61 46	74.7	30 27	60 39	74.1	30 10	59 32	73.5	29 53	58 26	73.0	29 35	57 20	72.4	29 17	56 14	71.9	214 326
35 145	31 36	61 28	74.1	31 19	60 21	73.5	31 02	59 14	72.9	30 44	58 07	72.4	30 26	57 01	71.8	30 07	55 55	71.2	215 325
36 144	32 29	61 10	73.5	32 11	60 02	72.9	31 53	58 55	72.3	31 35	57 48	71.7	31 16	56 41	71.2	30 56	55 35	70.6	216 324
37 143	33 21	60 52	73.0	33 03	59 43	72.3	32 45	58 35	71.7	32 26	57 28	71.1	32 06	56 21	70.5	31 46	55 14	69.9	217 323
38 142	34 13	60 32	72.4	33 55	59 23	71.7	33 36	58 15	71.1	33 16	57 07	70.5	32 56	55 59	69.9	32 35	54 53	69.3	218 322
39 141	35 06	60 11	71.8	34 47	59 02	71.1	34 27	57 53	70.5	34 06	56 45	69.8	33 45	55 37	69.2	33 24	54 30	68.6	219 321
40 140	35 58	59 50	71.2	35 38	58 40	70.5	35 17	57 31	69.8	34 56	56 22	69.1	34 35	55 14	68.5	34 12	54 07	67.9	220 320
41 139	36 49	59 28	70.5	36 29	58 17	69.8	36 08	57 08	69.1	35 46	55 59	68.5	35 24	54 50	67.8	35 01	53 42	67.1	221 319
42 138	37 41	59 04	69.9	37 20	57 54	69.2	36 58	56 43	68.5	36 36	55 34	67.8	36 13	54 25	67.1	35 49	53 17	66.4	222 318
43 137	38 32	58 40	69.2	38 11	57 29	68.5	37 48	56 18	67.8	37 25	55 08	67.1	37 02	53 59	66.4	36 37	52 50	65.7	223 317
44 136	39 23	58 15	68.6	39 01	57 03	67.8	38 38	55 52	67.1	38 14	54 41	66.3	37 50	53 32	65.6	37 25	52 23	64.9	224 316
45 135	40 14	57 48	67.9	39 51	56 36	67.1	39 28	55 24	66.3	39 03	54 13	65.6	38 38	53 04	64.9	38 12	51 54	64.1	225 315

Lat. / A	24°			25°			26°			27°			28°			29°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
45 135	40 14	57 48	67.9	39 51	56 36	67.1	39 28	55 24	66.3	39 03	54 13	65.6	38 38	53 04	64.9	38 12	51 54	64.1	225 315
46 134	41 05	57 21	67.2	40 41	56 08	66.4	40 17	54 56	65.6	39 52	53 44	64.8	39 26	52 34	64.1	38 59	51 25	63 3	226 314
47 133	41 55	56 52	66.4	41 31	55 38	65.6	41 06	54 26	64.8	40 40	53 14	64.0	40 13	52 04	63.3	39 46	50 54	62.5	227 313
48 132	42 45	56 22	65.7	42 20	55 08	64.9	41 54	53 55	64.0	41 28	52 43	63.2	41 00	51 32	62.5	40 32	50 22	61.7	228 312
49 131	43 35	55 50	64.9	43 09	54 36	64.1	42 43	53 22	63.2	42 15	52 10	62.4	41 47	50 59	61.6	41 18	49 48	60.9	229 311
50 130	44 25	55 17	64.1	43 58	54 02	63.3	43 31	52 49	62.4	43 03	51 36	61.6	42 34	50 24	60.8	42 04	49 14	60.0	230 310
51 129	45 14	54 43	63.3	44 47	53 28	62.4	44 18	52 13	61.6	43 49	51 00	60.7	43 20	49 48	59.9	42 49	48 38	59.1	231 309
52 128	46 03	54 08	62.5	45 35	52 52	61.6	45 06	51 37	60.7	44 36	50 23	59.8	44 05	49 11	59.0	43 34	48 00	58.2	232 308
53 127	46 51	53 30	61.6	46 22	52 14	60.7	45 52	50 59	59.8	45 22	49 45	58.9	44 51	48 32	58.1	44 18	47 21	57.2	233 307
54 126	47 39	52 51	60.8	47 09	51 34	59.8	46 39	50 19	58.9	46 07	49 05	58.0	45 35	47 52	57.1	45 02	46 41	56.3	234 306
55 125	48 27	52 11	59.8	47 56	50 53	58.9	47 25	49 37	58.0	46 53	48 23	57.0	46 19	47 10	56.2	45 46	45 59	55.3	235 305
56 124	49 14	51 28	58.9	48 43	50 11	57.9	48 10	48 54	57.0	47 37	47 40	56.1	47 03	46 27	55.2	46 29	45 15	54.3	236 304
57 123	50 01	50 44	57.9	49 28	49 26	56.9	48 55	48 09	56.0	48 21	46 54	55.0	47 46	45 41	54.1	47 11	44 30	53.3	237 303
58 122	50 47	49 58	56.9	50 14	48 39	55.9	49 40	47 22	54.9	49 05	46 07	54.0	48 29	44 54	53.1	47 53	43 43	52.2	238 302
59 121	51 33	49 09	55.9	50 58	47 51	54.9	50 23	46 34	53.9	49 48	45 18	52.9	49 11	44 05	52.0	48 34	42 54	51.1	239 301
60 120	52 18	48 19	54.8	51 43	47 00	53.8	51 07	45 43	52.8	50 30	44 28	51.8	49 53	43 14	50.9	49 14	42 03	50 0	240 300
61 119	53 02	47 26	53.7	52 26	46 07	52.7	51 49	44 50	51.7	51 12	43 35	50.7	50 33	42 22	49.7	49 54	41 10	48.8	241 299
62 118	53 46	46 31	52.6	53 09	45 12	51.5	52 31	43 54	50.5	51 53	42 39	49.5	51 13	41 27	48.6	50 33	40 16	47.6	242 298
63 117	54 29	45 33	51.4	53 51	44 14	50.3	53 13	42 57	49.3	52 33	41 42	48.3	51 53	40 30	47.3	51 12	39 19	46.4	243 297
64 116	55 12	44 33	50.2	54 33	43 14	49.1	53 53	41 57	48.1	53 13	40 42	47.1	52 31	39 30	46.1	51 49	38 20	45.2	244 296
65 115	55 53	43 30	48.9	55 13	42 11	47.8	54 33	40 55	46.8	53 51	39 40	45.8	53 09	38 29	44.8	52 26	37 19	43.9	245 295
66 114	56 34	42 25	47.6	55 53	41 06	46.5	55 12	39 50	45.4	54 29	38 36	44.4	53 46	37 25	43.5	53 02	36 16	42.6	246 294
67 113	57 14	41 16	46.2	56 32	39 58	45.1	55 50	38 42	44.1	55 06	37 29	43.1	54 22	36 19	42.1	53 37	35 11	41.2	247 293
68 112	57 53	40 05	44.8	57 10	38 47	43.7	56 27	37 32	42.7	55 42	36 19	41.7	54 57	35 10	40.7	54 11	34 03	39.8	248 292
69 111	58 32	38 50	43.3	57 47	37 33	42.2	57 03	36 18	41.2	56 17	35 07	40.2	55 31	33 59	39.3	54 44	32 53	38.4	249 291
70 110	59 09	37 32	41.8	58 23	36 16	40.7	57 38	35 02	39.7	56 51	33 52	38.7	56 04	32 45	37.8	55 16	31 41	36.9	250 290
71 109	59 45	36 11	40.2	58 58	34 55	39.2	58 12	33 43	38.1	57 24	32 35	37.2	56 36	31 29	36.3	55 47	30 26	35.4	251 289
72 108	60 19	34 46	38.6	59 32	33 32	37.6	58 44	32 21	36.5	57 56	31 14	35.6	57 07	30 10	34.7	56 17	29 08	33.8	252 288
73 107	60 53	33 18	36.9	60 05	32 05	35.9	59 16	30 56	34.9	58 26	29 51	34.0	57 36	28 48	33.1	56 46	27 49	32.2	253 287
74 106	61 25	31 46	35.2	60 36	30 35	34.2	59 46	29 28	33.2	58 55	28 25	32.3	58 05	27 24	31.4	57 13	26 26	30.6	254 286
75 105	61 56	30 10	33.4	61 06	29 02	32.4	60 15	27 57	31.4	59 23	26 56	30.5	58 31	25 57	29.7	57 39	25 02	28.9	255 285
76 104	62 26	28 31	31.5	61 34	27 25	30.5	60 42	26 23	29.6	59 50	25 24	28.8	58 57	24 28	28.0	58 04	23 35	27.2	256 284
77 103	62 53	26 48	29.6	62 01	25 45	28.6	61 08	24 46	27.8	60 15	23 49	27.0	59 21	22 56	26.2	58 27	22 05	25.5	257 283
78 102	63 20	25 02	27.6	62 26	24 02	26.7	61 32	23 05	25.9	60 38	22 12	25.1	59 44	21 21	24.4	58 49	20 34	23.7	258 282
79 101	63 44	23 12	25.5	62 50	22 15	24.7	61 55	21 22	23.9	61 00	20 32	23.2	60 05	19 44	22.5	59 09	19 00	21.8	259 281
80 100	64 07	21 18	23.4	63 12	20 25	22.6	62 16	19 36	21.9	61 20	18 49	21.2	60 24	18 05	20.6	59 28	17 24	20.0	260 280
81 99	64 28	19 22	21.3	63 32	18 33	20.5	62 35	17 47	19.9	61 39	17 04	19.2	60 42	16 24	18.6	59 45	15 46	18.1	261 279
82 98	64 47	17 22	19.1	63 50	16 37	18.4	62 53	15 56	17.8	61 56	15 17	17.2	60 58	14 40	16.7	60 01	14 06	16.2	262 278
83 97	65 03	15 18	16.8	64 06	14 39	16.2	63 08	14 02	15.6	62 10	13 27	15.1	61 12	12 55	14.7	60 14	12 24	14.2	263 277
84 96	65 18	13 13	14.5	64 20	12 38	14.0	63 22	12 06	13.5	62 23	11 36	13.0	61 25	11 07	12.6	60 26	10 41	12.2	264 276
85 95	65 31	11 05	12.1	64 32	10 35	11.7	63 33	10 08	11.3	62 35	9 42	10.9	61 36	9 19	10.6	60 37	8 56	10.2	265 275
86 94	65 41	8 54	9.8	64 42	8 30	9.4	63 43	8 08	9.1	62 44	7 48	8.8	61 44	7 28	8.5	60 45	7 10	8.2	266 274
87 93	65 49	6 42	7.3	64 50	6 24	7.1	63 50	6 07	6.8	62 51	5 52	6.6	61 51	5 37	6.4	60 52	5 24	6.2	267 273
88 92	65 55	4 29	4.9	64 56	4 17	4.7	63 56	4 06	4.6	62 56	3 55	4.4	61 56	3 45	4.3	60 56	3 36	4.1	268 272
89 91	65 59	2 15	2.5	64 59	2 09	2.4	63 59	2 03	2.3	62 59	1 58	2.2	61 59	1 53	2.1	60 59	1 48	2.1	269 271
90 90	66 00	0 00	0.0	65 00	0 00	0.0	64 00	0 00	0.0	63 00	0 00	0.0	62 00	0 00	0.0	61 00	0 00	0.0	270 270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90°< LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		30°			31°			32°			33°			34°			35°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	60 00	90.0	0 00	59 00	90.0	0 00	58 00	90.0	0 00	57 00	90.0	0 00	56 00	90.0	0 00	55 00	90.0	180	360
1	179	0 52	60 00	89.5	0 51	59 00	89.5	0 51	58 00	89.5	0 50	57 00	89.5	0 50	56 00	89.4	0 49	55 00	89.4	181	359
2	178	1 44	59 59	89.0	1 43	58 59	89.0	1 42	57 59	88.9	1 41	56 59	88.9	1 39	55 59	88.9	1 38	54 59	88.9	182	358
3	177	2 36	59 58	88.5	2 34	58 58	88.5	2 33	57 58	88.4	2 31	56 58	88.4	2 29	55 58	88.3	2 27	54 58	88.3	183	357
4	176	3 28	59 56	88.0	3 26	58 56	87.9	3 23	57 56	87.9	3 21	56 56	87.8	3 19	55 56	87.8	3 17	54 56	87.7	184	356
5	175	4 20	59 54	87.5	4 17	58 54	87.4	4 14	57 54	87.3	4 12	56 54	87.3	4 09	55 54	87.2	4 06	54 54	87.1	185	355
6	174	5 12	59 52	87.0	5 08	58 52	86.9	5 05	57 52	86.8	5 02	56 51	86.7	4 58	55 51	86.6	4 55	54 51	86.6	186	354
7	173	6 04	59 49	86.5	6 00	58 49	86.4	5 56	57 48	86.3	5 52	56 48	86.2	5 48	55 48	86.1	5 44	54 48	86.0	187	353
8	172	6 55	59 45	86.0	6 51	58 45	85.9	6 47	57 45	85.7	6 42	56 45	85.6	6 38	55 44	85.5	6 33	54 44	85.4	188	352
9	171	7 47	59 42	85.5	7 42	58 41	85.3	7 37	57 41	85.2	7 32	56 40	85.1	7 27	55 40	84.9	7 22	54 40	84.8	189	351
10	170	8 39	59 37	85.0	8 34	58 37	84.8	8 28	57 36	84.7	8 22	56 36	84.5	8 17	55 36	84.4	8 11	54 35	84.2	190	350
11	169	9 31	59 32	84.4	9 25	58 32	84.3	9 19	57 31	84.1	9 13	56 31	84.0	9 06	55 30	83.8	9 00	54 30	83.6	191	349
12	168	10 22	59 27	83.9	10 18	58 26	83.8	10 09	57 26	83.6	10 03	56 25	83.4	9 56	55 25	83.2	9 48	54 24	83.0	192	348
13	167	11 14	59 21	83.4	11 07	58 20	83.2	11 00	57 20	83.0	10 52	56 19	82.8	10 45	55 18	82.6	10 37	54 18	82.5	193	347
14	166	12 06	59 15	82.9	11 58	58 14	82.7	11 50	57 13	82.5	11 42	56 12	82.3	11 34	55 12	82.1	11 26	54 11	81.9	194	346
15	165	12 57	59 08	82.4	12 49	58 07	82.1	12 41	57 06	81.9	12 32	56 05	81.7	12 23	55 04	81.5	12 14	54 04	81.3	195	345
16	164	13 49	59 01	81.8	13 40	57 59	81.6	13 31	56 58	81.4	13 22	55 57	81.1	13 13	54 57	80.9	13 03	53 56	80.7	196	344
17	163	14 40	58 53	81.3	14 31	57 51	81.1	14 21	56 50	80.8	14 12	55 49	80.5	14 02	54 48	80.3	13 51	53 47	80.1	197	343
18	162	15 31	58 44	80.8	15 22	57 43	80.5	15 12	56 42	80.2	15 01	55 40	80.0	14 51	54 39	79.7	14 40	53 38	79.4	198	342
19	161	16 23	58 35	80.2	16 12	57 34	79.9	16 02	56 32	79.7	15 51	55 31	79.4	15 40	54 30	79.1	15 28	53 29	78.8	199	341
20	160	17 14	58 26	79.7	17 03	57 24	79.4	16 52	56 23	79.1	16 40	55 21	78.8	16 28	54 20	78.5	16 16	53 19	78.2	200	340
21	159	18 05	58 16	79.1	17 53	57 14	78.8	17 42	56 12	78.5	17 29	55 11	78.2	17 17	54 09	77.9	17 04	53 08	77.6	201	339
22	158	18 56	58 05	78.6	18 44	57 03	78.2	18 31	56 01	77.9	18 19	55 00	77.6	18 06	53 58	77.3	17 52	52 56	77.0	202	338
23	157	19 47	57 54	78.0	19 34	56 52	77.7	19 21	55 50	77.3	19 08	54 48	77.0	18 54	53 46	76.6	18 40	52 44	76.3	203	337
24	156	20 37	57 42	77.4	20 24	56 40	77.1	20 11	55 38	76.7	19 57	54 36	76.4	19 42	53 34	76.0	19 28	52 32	75.7	204	336
25	155	21 28	57 30	76.9	21 14	56 27	76.5	21 00	55 25	76.1	20 46	54 23	75.7	20 31	53 21	75.4	20 15	52 19	75.0	205	335
26	154	22 19	57 17	76.3	22 04	56 14	75.9	21 49	55 12	75.5	21 34	54 09	75.1	21 19	53 07	74.7	21 03	52 05	74.4	206	334
27	153	23 09	57 03	75.7	22 54	56 00	75.3	22 39	54 57	74.9	22 23	53 55	74.5	22 07	52 52	74.1	21 50	51 50	73.7	207	333
28	152	23 59	56 49	75.1	23 44	55 46	74.7	23 28	54 43	74.3	23 11	53 40	73.8	22 54	52 37	73.4	22 37	51 35	73.0	208	332
29	151	24 50	56 34	74.5	24 33	55 31	74.1	24 17	54 27	73.6	23 59	53 24	73.2	23 42	52 22	72.8	23 24	51 19	72.4	209	331
30	150	25 40	56 19	73.9	25 23	55 15	73.4	25 05	54 11	73.0	24 48	53 08	72.5	24 29	52 05	72.1	24 11	51 03	71.7	210	330
31	149	26 29	56 02	73.3	26 12	54 58	72.8	25 54	53 54	72.3	25 35	52 51	71.9	25 17	51 48	71.4	24 57	50 45	71.0	211	329
32	148	27 19	55 45	72.6	27 01	54 41	72.2	26 42	53 37	71.7	26 23	52 33	71.2	26 04	51 30	70.7	25 44	50 27	70.3	212	328
33	147	28 09	55 27	72.0	27 50	54 23	71.5	27 31	53 19	71.0	27 11	52 15	70.5	26 50	51 12	70.0	26 30	50 08	69.6	213	327
34	146	28 58	55 09	71.4	28 38	54 04	70.8	28 19	53 00	70.3	27 58	51 56	69.8	27 37	50 52	69.3	27 16	49 49	68.8	214	326
35	145	29 47	54 49	70.7	29 27	53 44	70.2	29 06	52 40	69.6	28 45	51 36	69.1	28 24	50 32	68.6	28 01	49 29	68.1	215	325
36	144	30 36	54 29	70.0	30 15	53 24	69.5	29 54	52 19	68.9	29 32	51 15	68.4	29 10	50 11	67.9	28 47	49 07	67.4	216	324
37	143	31 25	54 08	69.4	31 03	53 03	68.8	30 41	51 58	68.2	30 19	50 53	67.7	29 56	49 49	67.2	29 32	48 45	66.6	217	323
38	142	32 13	53 46	68.7	31 51	52 40	68.1	31 28	51 35	67.5	31 05	50 30	66.9	30 41	49 26	66.4	30 17	48 23	65.9	218	322
39	141	33 02	53 23	68.0	32 39	52 17	67.4	32 15	51 12	66.8	31 51	50 07	66.2	31 27	49 03	65.6	31 02	47 59	65.1	219	321
40	140	33 50	53 00	67.2	33 26	51 53	66.6	33 02	50 48	66.0	32 37	49 43	65.4	32 12	48 38	64.9	31 46	47 34	64.3	220	320
41	139	34 37	52 35	66.5	34 13	51 29	65.9	33 48	50 23	65.3	33 23	49 17	64.7	32 57	48 13	64.1	32 30	47 09	63.5	221	319
42	138	35 25	52 09	65.8	35 00	51 03	65.1	34 34	49 56	64.5	34 08	48 51	63.9	33 42	47 46	63.3	33 14	46 42	62.7	222	318
43	137	36 12	51 43	65.0	35 46	50 36	64.3	35 20	49 29	63.7	34 53	48 24	63.1	34 26	47 19	62.5	33 58	46 15	61.9	223	317
44	136	36 59	51 15	64.2	36 33	50 08	63.6	36 06	49 01	62.9	35 38	47 55	62.3	35 10	46 51	61.6	34 41	45 46	61.0	224	316
45	135	37 46	50 46	63.4	37 19	49 39	62.7	36 51	48 32	62.1	36 22	47 26	61.4	35 53	46 21	60.8	35 24	45 17	60.2	225	315

Lat. / A		30°			31°			32°			33°			34°			35°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
45	135	37 46	50 46	63.4	37 19	49 39	62.7	36 51	48 32	62.1	36 22	47 26	61.4	35 53	46 21	60.8	35 24	45 17	60.2	225	315
46	134	38 32	50 16	62.6	38 04	49 08	61.9	37 36	48 02	61.2	37 06	46 56	60.6	36 37	45 51	59.9	36 06	44 46	59.3	226	314
47	133	39 18	49 45	61.8	38 49	48 37	61.1	38 20	47 30	60.4	37 50	46 24	59.7	37 19	45 19	59.1	36 48	44 15	58.4	227	313
48	132	40 04	49 13	61.0	39 34	48 05	60.2	39 04	46 58	59.5	38 33	45 51	58.8	38 02	44 46	58.2	37 30	43 42	57.5	228	312
49	131	40 49	48 39	60.1	40 19	47 31	59.4	39 48	46 24	58.6	39 16	45 18	57.9	38 44	44 12	57.2	38 11	43 08	56.6	229	311
50	130	41 34	48 04	59.2	41 03	46 56	58.5	40 31	45 49	57.7	39 59	44 42	57.0	39 26	43 37	56.3	38 52	42 33	55.6	230	310
51	129	42 18	47 28	58.3	41 46	46 20	57.5	41 14	45 12	56.8	40 41	44 06	56.1	40 07	43 01	55.4	39 32	41 57	54.7	231	309
52	128	43 02	46 50	57.4	42 29	45 42	56.6	41 56	44 34	55.9	41 22	43 28	55.1	40 47	42 23	54.4	40 12	41 19	53.7	232	308
53	127	43 46	46 11	56.4	43 12	45 03	55.6	42 38	43 55	54.9	42 03	42 49	54.1	41 28	41 44	53.4	40 52	40 41	52.7	233	307
54	126	44 29	45 31	55.5	43 54	44 22	54.7	43 19	43 15	53.9	42 44	42 09	53.1	42 07	41 04	52.4	41 30	40 01	51.7	234	306
55	125	45 11	44 49	54.5	44 36	43 40	53.7	44 00	42 33	52.9	43 24	41 27	52.1	42 46	40 23	51.4	42 09	39 19	50.7	235	305
56	124	45 53	44 05	53.5	45 17	42 57	52.6	44 40	41 50	51.8	44 03	40 44	51.1	43 25	39 40	50.3	42 46	38 37	49.6	236	304
57	123	46 35	43 20	52.4	45 58	42 11	51.6	45 20	41 05	50.8	44 42	39 59	50.0	44 03	38 55	49.3	43 24	37 53	48.5	237	303
58	122	47 16	42 33	51.3	46 38	41 25	50.5	45 59	40 18	49.7	45 20	39 13	48.9	44 40	38 09	48.2	44 00	37 07	47.5	238	302
59	121	47 56	41 44	50.2	47 17	40 36	49.4	46 38	39 30	48.6	45 58	38 25	47.8	45 17	37 22	47.1	44 36	36 20	46.3	239	301
60	120	48 35	40 54	49.1	47 56	39 46	48.3	47 16	38 40	47.5	46 35	37 36	46.7	45 53	36 33	45.9	45 11	35 32	45.2	240	300
61	119	49 14	40 01	47.9	48 34	38 54	47.1	47 53	37 48	46.3	47 11	36 45	45.5	46 29	35 42	44.7	45 46	34 42	44.0	241	299
62	118	49 53	39 07	46.8	49 11	38 00	45.9	48 29	36 55	45.1	47 46	35 52	44.3	47 03	34 50	43.6	46 19	33 50	42.8	242	298
63	117	50 30	38 11	45.5	49 48	37 04	44.7	49 05	36 00	43.9	48 21	34 57	43.1	47 37	33 57	42.3	46 53	32 57	41.6	243	297
64	116	51 07	37 13	44.3	50 23	36 07	43.4	49 40	35 03	42.6	48 55	34 01	41.8	48 10	33 01	41.1	47 25	32 03	40.4	244	296
65	115	51 43	36 12	43.0	50 58	35 07	42.2	50 14	34 04	41.3	49 28	33 03	40.6	48 43	32 04	39.8	47 56	31 07	39.1	245	295
66	114	52 18	35 10	41.7	51 33	34 06	40.8	50 47	33 04	40.0	50 01	32 04	39.3	49 14	31 05	38.5	48 27	30 09	37.8	246	294
67	113	52 52	34 05	40.3	52 06	33 02	39.5	51 19	32 01	38.7	50 32	31 02	37.9	49 44	30 05	37.2	48 56	29 10	36.5	247	293
68	112	53 25	32 59	38.9	52 38	31 56	38.1	51 50	30 57	37.3	51 02	29 59	36.6	50 14	29 03	35.8	49 25	28 09	35.2	248	292
69	111	53 57	31 50	37.5	53 09	30 49	36.7	52 21	29 50	35.9	51 32	28 53	35.2	50 43	27 59	34.5	49 53	27 06	33.8	249	291
70	110	54 28	30 39	36.1	53 39	29 39	35.2	52 50	28 42	34.5	52 00	27 46	33.8	51 10	26 53	33.1	50 20	26 02	32.4	250	290
71	109	54 58	29 25	34.6	54 08	28 27	33.8	53 18	27 31	33.0	52 28	26 38	32.3	51 37	25 46	31.6	50 46	24 56	31.0	251	289
72	108	55 27	28 09	33.0	54 37	27 13	32.2	53 46	26 19	31.5	52 54	25 27	30.8	52 03	24 37	30.2	51 10	23 49	29.5	252	288
73	107	55 55	26 51	31.4	55 03	25 57	30.7	54 12	25 04	30.0	53 19	24 14	29.3	52 27	23 26	28.7	51 34	22 40	28.1	253	287
74	106	56 21	25 31	29.8	55 29	24 39	29.1	54 36	23 48	28.4	53 43	23 00	27.8	52 50	22 14	27.1	51 57	©21 29	26.6	254	286
75	105	56 46	24 09	28.2	55 53	23 18	27.5	55 00	22 30	26.8	54 06	21 44	26.2	53 12	21 00	25.6	52 18	20 17	25.0	255	285
76	104	57 10	22 44	26.5	56 16	21 56	25.8	55 22	21 10	25.2	54 28	20 26	24.6	53 33	19 44	24.0	52 38	19 04	23.5	256	284
77	103	57 33	21 17	24.8	56 38	20 31	24.1	55 43	19 48	23.5	54 48	19 06	23.0	53 53	18 27	22.4	52 57	17 49	21.9	257	283
78	102	57 54	19 48	23.0	56 59	19 05	22.4	56 03	18 24	21.9	55 07	17 45	21.3	54 11	17 08	20.8	53 15	16 32	20.3	258	282
79	101	58 13	18 17	21.2	57 17	17 37	20.7	56 21	16 59	20.1	55 25	16 22	19.6	54 28	15 48	19.2	53 31	15 15	18.7	259	281
80	100	58 32	16 44	19.4	57 35	16 07	18.9	56 38	15 32	18.4	55 41	14 58	17.9	54 44	14 26	17.5	53 47	13 56	17.1	260	280
81	99	58 48	15 10	17.6	57 51	14 36	17.1	56 53	14 03	16.6	55 56	13 33	16.2	54 58	13 03	15.8	54 00	12 36	15.4	261	279
82	98	59 03	13 33	15.7	58 05	13 02	15.3	57 07	12 33	14.9	56 09	12 06	14.5	55 11	11 40	14.1	54 13	11 14	13.8	262	278
83	97	59 16	11 55	13.8	58 18	11 28	13.4	57 19	11 02	13.0	56 21	10 38	12.7	55 22	10 14	12.4	54 24	9 52	12.1	263	277
84	96	59 28	10 16	11.9	58 29	9 52	11.5	57 30	9 30	11.2	56 31	9 09	10.9	55 32	8 49	10.6	54 33	8 29	10.4	264	276
85	95	59 37	8 35	9.9	58 38	8 15	9.6	57 39	7 56	9.4	56 40	7 39	9.1	55 41	7 22	8.9	54 41	7 06	8.7	265	275
86	94	59 46	6 53	8.0	58 46	6 37	7.7	57 47	6 22	7.5	56 47	6 08	7.3	55 48	5 54	7.1	54 48	5 41	7.0	266	274
87	93	59 52	5 11	6.0	58 52	4 59	5.8	57 52	4 47	5.6	56 53	4 36	5.5	55 53	4 26	5.4	54 53	4 16	5.2	267	273
88	92	59 56	3 28	4.0	58 57	3 19	3.9	57 57	3 12	3.8	56 57	3 05	3.7	55 57	2 58	3.6	54 57	2 51	3.5	268	272
89	91	59 59	1 44	2.0	58 59	1 40	1.9	57 59	1 36	1.9	56 59	1 32	1.8	55 59	1 29	1.8	54 59	1 26	1.7	269	271
90	90	60 00	0 00	0.0	59 00	0 00	0.0	58 00	0 00	0.0	57 00	0 00	0.0	56 00	0 00	0.0	55 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		36°			37°			38°			39°			40°			41°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	54 00	90.0	0 00	53 00	90.0	0 00	52 00	90.0	0 00	51 00	90.0	0 00	50 00	90.0	0 00	49 00	90.0	180	360
1	179	0 49	54 00	89.4	0 48	53 00	89.4	0 47	52 00	89.4	0 47	51 00	89.4	0 46	50 00	89.4	0 45	49 00	89.3	181	359
2	178	1 37	53 59	88.8	1 36	52 59	88.8	1 35	51 59	88.8	1 33	50 59	88.7	1 32	49 59	88.7	1 31	48 59	88.7	182	358
3	177	2 26	53 58	88.2	2 24	52 58	88.2	2 22	51 58	88.2	2 20	50 58	88.1	2 18	49 58	88.1	2 16	48 58	88.0	183	357
4	176	3 14	53 56	87.6	3 12	52 56	87.6	3 09	51 56	87.5	3 06	50 56	87.5	3 04	49 56	87.4	3 01	48 56	87.4	184	356
5	175	4 03	53 54	87.1	3 59	52 54	87.0	3 56	51 54	86.9	3 53	50 54	86.8	3 50	49 54	86.8	3 46	48 54	86.7	185	355
6	174	4 51	53 51	86.5	4 47	52 51	86.4	4 43	51 51	86.3	4 40	50 51	86.2	4 36	49 51	86.1	4 31	48 51	86.1	186	354
7	173	5 39	53 48	85.9	5 35	52 48	85.8	5 31	51 48	85.7	5 26	50 47	85.6	5 21	49 47	85.5	5 17	48 47	85.4	187	353
8	172	6 28	53 44	85.3	6 23	52 44	85.2	6 18	51 44	85.1	6 13	50 44	84.9	6 07	49 43	84.8	6 02	48 43	84.7	188	352
9	171	7 16	53 40	84.7	7 11	52 39	84.6	7 05	51 39	84.4	6 59	50 39	84.3	6 53	49 39	84.2	6 47	48 39	84.1	189	351
10	170	8 05	53 35	84.1	7 58	52 35	83.9	7 52	51 34	83.8	7 45	50 34	83.7	7 39	49 34	83.5	7 32	48 34	83.4	190	350
11	169	8 53	53 30	83.5	8 46	52 29	83.3	8 39	51 29	83.2	8 32	50 29	83.0	8 24	49 29	82.9	8 17	48 28	82.7	191	349
12	168	9 41	53 24	82.9	9 33	52 23	82.7	9 26	51 23	82.5	9 18	50 23	82.4	9 10	49 23	82.2	9 02	48 22	82.1	192	348
13	167	10 29	53 17	82.3	10 21	52 17	82.1	10 13	51 17	81.9	10 04	50 16	81.7	9 55	49 16	81.6	9 46	48 16	81.4	193	347
14	166	11 17	53 10	81.7	11 08	52 10	81.5	10 59	51 10	81.3	10 50	50 09	81.1	10 41	49 09	80.9	10 31	48 09	80.7	194	346
15	165	12 05	53 03	81.0	11 56	52 02	80.8	11 46	51 02	80.6	11 36	50 02	80.4	11 26	49 01	80.2	11 16	48 01	80.0	195	345
16	164	12 53	52 55	80.4	12 43	51 54	80.2	12 33	50 54	80.0	12 22	49 53	79.8	12 11	48 53	79.6	12 00	47 53	79.3	196	344
17	163	13 41	52 46	79.8	13 30	51 46	79.6	13 19	50 45	79.3	13 08	49 45	79.1	12 57	48 44	78.9	12 45	47 44	78.7	197	343
18	162	14 29	52 37	79.2	14 17	51 37	78.9	14 06	50 36	78.7	13 54	49 35	78.4	13 42	48 35	78.2	13 29	47 34	78.0	198	342
19	161	15 16	52 28	78.6	15 04	51 27	78.3	14 52	50 26	78.0	14 39	49 25	77.8	14 27	48 25	77.5	14 13	47 24	77.3	199	341
20	160	16 04	52 17	77.9	15 51	51 16	77.6	15 38	50 16	77.4	15 25	49 15	77.1	15 11	48 14	76.8	14 58	47 14	76.6	200	340
21	159	16 51	52 07	77.3	16 38	51 05	77.0	16 24	50 05	76.7	16 10	49 04	76.4	15 56	48 03	76.1	15 42	47 03	75.9	201	339
22	158	17 39	51 55	76.6	17 24	50 54	76.3	17 10	49 53	76.0	16 56	48 52	75.7	16 41	47 51	75.4	16 25	46 51	75.2	202	338
23	157	18 26	51 43	76.0	18 11	50 42	75.7	17 56	49 41	75.4	17 41	48 40	75.0	17 25	47 39	74.7	17 09	46 38	74.4	203	337
24	156	19 13	51 30	75.3	18 57	50 29	75.0	18 42	49 28	74.7	18 26	48 27	74.3	18 09	47 26	74.0	17 53	46 25	73.7	204	336
25	155	20 00	51 17	74.7	19 44	50 15	74.3	19 27	49 14	74.0	19 10	48 13	73.6	18 53	47 12	73.3	18 36	46 12	73.0	205	335
26	154	20 46	51 03	74.0	20 30	50 01	73.6	20 13	49 00	73.3	19 55	47 59	72.9	19 37	46 58	72.6	19 19	45 57	72.3	206	334
27	153	21 33	50 48	73.3	21 15	49 47	73.0	20 58	48 45	72.6	20 40	47 44	72.2	20 21	46 43	71.9	20 02	45 42	71.5	207	333
28	152	22 19	50 33	72.6	22 01	49 31	72.3	21 43	48 30	71.9	21 24	47 28	71.5	21 05	46 28	71.1	20 45	45 27	70.8	208	332
29	151	23 06	50 17	72.0	22 47	49 15	71.6	22 28	48 14	71.2	22 08	47 12	70.8	21 48	46 11	70.4	21 28	45 11	70.0	209	331
30	150	23 52	50 00	71.3	23 32	48 58	70.8	23 12	47 57	70.4	22 52	46 55	70.0	22 31	45 54	69.6	22 10	44 54	69.3	210	330
31	149	24 37	49 43	70.5	24 17	48 41	70.1	23 57	47 39	69.7	23 36	46 38	69.3	23 14	45 37	68.9	22 52	44 36	68.5	211	329
32	148	25 23	49 25	69.8	25 02	48 23	69.4	24 41	47 21	69.0	24 19	46 19	68.5	23 57	45 18	68.1	23 34	44 17	67.7	212	328
33	147	26 09	49 06	69.1	25 47	48 04	68.7	25 25	47 02	68.2	25 02	46 00	67.8	24 40	44 59	67.3	24 16	43 58	66.9	213	327
34	146	26 54	48 46	68.4	26 32	47 44	67.9	26 09	46 42	67.4	25 45	45 40	67.0	25 22	44 39	66.6	24 58	43 39	66.1	214	326
35	145	27 39	48 26	67.6	27 16	47 23	67.1	26 52	46 21	66.7	26 28	45 20	66.2	26 04	44 19	65.8	25 39	43 18	65.3	215	325
36	144	28 24	48 04	66.9	28 00	47 02	66.4	27 36	46 00	65.9	27 11	44 58	65.4	26 46	43 57	65.0	26 20	42 57	64.5	216	324
37	143	29 08	47 42	66.1	28 44	46 40	65.6	28 19	45 38	65.1	27 53	44 36	64.6	27 27	43 35	64.2	27 01	42 34	63.7	217	323
38	142	29 52	47 19	65.3	29 27	46 17	64.8	29 01	45 15	64.3	28 35	44 13	63.8	28 08	43 12	63.3	27 41	42 12	62.9	218	322
39	141	30 36	46 56	64.5	30 10	45 53	64.0	29 44	44 51	63.5	29 17	43 49	63.0	28 49	42 48	62.5	28 21	41 48	62.0	219	321
40	140	31 20	46 31	63.7	30 53	45 28	63.2	30 26	44 26	62.7	29 58	43 25	62.2	29 30	42 24	61.7	29 01	41 23	61.2	220	320
41	139	32 03	46 05	62.9	31 36	45 03	62.4	31 08	44 01	61.8	30 39	42 59	61.3	30 10	41 58	60.8	29 41	40 58	60.3	221	319
42	138	32 46	45 39	62.1	32 18	44 36	61.5	31 49	43 34	61.0	31 20	42 33	60.5	30 50	41 32	59.9	30 20	40 32	59.4	222	318
43	137	33 29	45 11	61.3	33 00	44 09	60.7	32 30	43 07	60.1	32 00	42 05	59.6	31 30	41 05	59.1	30 59	40 04	58.5	223	317
44	136	34 12	44 43	60.4	33 42	43 40	59.8	33 11	42 38	59.3	32 40	41 37	58.7	32 09	40 36	58.2	31 37	39 36	57.6	224	316
45	135	34 54	44 13	59.6	34 23	43 11	59.0	33 52	42 09	58.4	33 20	41 08	57.8	32 48	40 07	57.3	32 15	39 08	56.7	225	315
46	134	35 35	43 43	58.7	35 04	42 40	58.1	34 32	41 38	57.5	33 59	40 37	56.9	33 26	39 37	56.4	32 53	38 38	55.8	226	314
47	133	36 17	43 11	57.8	35 44	42 09	57.2	35 12	41 07	56.6	34 38	40 06	56.0	34 04	39 06	55.4	33 30	38 07	54.9	227	313
48	132	36 57	42 39	56.9	36 24	41 36	56.2	35 51	40 35	55.6	35 17	39 34	55.0	34 42	38 34	54.5	34 07	37 35	53.9	228	312
49	131	37 38	42 05	55.9	37 04	41 03	55.3	36 30	40 01	54.7	35 55	39 01	54.1	35 19	38 01	53.5	34 43	37 03	53.0	229	311
50	130	38 18	41 30	55.0	37 43	40 28	54.4	37 08	39 27	53.7	36 32	38 27	53.1	35 56	37 27	52.5	35 19	36 29	52.0	230	310
51	129	38 57	40 54	54.0	38 22	39 52	53.4	37 46	38 51	52.8	37 09	37 51	52.1	36 32	36 52	51.6	35 55	35 54	51.0	231	309
52	128	39 36	40 17	53.0	39 00	39 15	52.4	38 23	38 14	51.8	37 46	37 15	51.1	37 08	36 16	50.6	36 30	35 18	50.0	232	308
53	127	40 15	39 38	52.0	39 38	38 37	51.4	39 00	37 36	50.8	38 22	36 37	50.1	37 43	35 39	49.5	37 04	34 42	49.0	233	307
54	126	40 53	38 58	51.0	40 15	37 57	50.4	39 36	36 57	49.7	38 57	35 58	49.1	38 18	35 01	48.5	37 38	34 04	47.9	234	306
55	125	41 30	38 17	50.0	40 52	37 17	49.3	40 12	36 17	48.7	39 32	35 19	48.1	38 52	34 21	47.4	38 11	33 25	46.9	235	305
56	124	42 07	37 35	48.9	41 28	36 35	48.3	40 47	35 36	47.6	40 07	34 38	47.0	39 26	33 41	46.4	38 44	32 45	45.8	236	304
57	123	42 44	36 51	47.9	42 03	35 51	47.2	41 22	34 53	46.5	40 41	33 55	45.9	39 59	32 59	45.3	39 16	32 04	44.7	237	303
58	122	43 19	36 06	46.8	42 38	35 07	46.1	41 56	34 09	45.4	41 14	33 12	44.8	40 31	32 16	44.2	39 48	31 22	43.6	238	302
59	121	43 54	35 20	45.6	43 12	34 21	45.0	42 29	33 24	44.3	41 46	32 27	43.7	41 03	31 32	43.1	40 19	30 39	42.5	239	301
60	120	44 29	34 32	44.5	43 46	33 34	43.8	43 02	32 37	43.2	42 18	31 42	42.5	41 34	30 47	41.9	40 49	29 54	41.3	240	300
61	119	45 02	33 43	43.3	44 18	32 45	42.6	43 34	31 49	42.0	42 49	30 55	41.4	42 04	30 01	40.8	41 18	29 09	40.2	241	299
62	118	45 35	32 52	42.1	44 51	31 55	41.5	44 05	31 00	40.8	43 20	30 06	40.2	42 34	29 14	39.6	41 47	28 22	39.0	242	298
63	117	46 07	32 00	40.9	45 22	31 04	40.3	44 36	30 10	39.6	43 49	29 17	39.0	43 03	28 25	38.4	42 15	27 35	37.8	243	297
64	116	46 39	31 06	39.7	45 52	30 11	39.0	45 06	29 18	38.4	44 18	28 26	37.8	43 31	27 35	37.2	42 43	26 46	36.6	244	296
65	115	47 09	30 11	38.4	46 22	29 17	37.8	45 35	28 25	37.1	44 47	27 34	36.5	43 58	26 44	36.0	43 09	25 56	35.4	245	295
66	114	47 39	29 14	37.1	46 51	28 21	36.5	46 03	27 30	35.9	45 14	26 40	35.3	44 25	25 52	34.7	43 35	25 04	34.2	246	294
67	113	48 08	28 16	35.8	47 19	27 24	35.2	46 30	26 34	34.6	45 40	25 45	34.0	44 50	24 58	33.4	44 00	24 12	32.9	247	293
68	112	48 36	27 17	34.5	47 46	26 26	33.9	46 56	25 37	33.3	46 06	24 50	32.7	45 15	24 03	32.2	44 24	23 19	31.6	248	292
69	111	49 03	26 15	33.1	48 13	25 26	32.5	47 22	24 38	31.9	46 31	23 52	31.4	45 39	23 08	30.8	44 48	22 24	30.3	249	291
70	110	49 29	25 13	31.8	48 38	24 25	31.2	47 46	23 39	30.6	46 55	22 54	30.0	46 03	22 11	29.5	45 10	21 29	29.0	250	290
71	109	49 54	24 08	30.4	49 02	23 22	29.8	48 10	22 37	29.2	47 17	21 54	28.7	46 25	21 12	28.2	45 32	20 32	27.7	251	289
72	108	50 18	23 02	28.9	49 25	22 18	28.4	48 33	21 35	27.8	47 39	20 53	27.3	46 46	20 13	26.8	45 52	19 34	26.3	252	288
73	107	50 41	21 55	27.5	49 48	21 12	26.9	48 54	20 31	26.4	48 00	19 51	25.9	47 06	19 13	25.4	46 12	18 35	25.0	253	287
74	106	51 03	20 47	26.0	50 09	20 06	25.5	49 15	19 26	25.0	48 20	18 48	24.5	47 25	18 11	24.0	46 30	17 36	23.6	254	286
75	105	51 24	19 36	24.5	50 29	18 57	24.0	49 34	18 20	23.5	48 39	17 43	23.1	47 44	17 09	22.6	46 48	16 35	22.2	255	285
76	104	51 43	18 25	23.0	50 48	17 48	22.5	49 52	17 12	22.0	48 57	16 38	21.6	48 01	16 05	21.2	47 05	15 33	20.8	256	284
77	103	52 02	17 12	21.4	51 06	16 37	21.0	50 09	16 04	20.6	49 13	15 31	20.1	48 17	15 00	19.8	47 20	14 31	19.4	257	283
78	102	52 19	15 58	19.9	51 22	15 25	19.5	50 25	14 54	19.0	49 29	14 24	18.7	48 32	13 55	18.3	47 35	13 27	18.0	258	282
79	101	52 35	14 43	18.3	51 37	14 13	17.9	50 40	13 49	17.5	49 43	13 16	17.2	48 46	12 49	16.8	47 48	12 23	16.5	259	281
80	100	52 49	13 27	16.7	51 52	12 59	16.3	50 54	12 32	16.0	49 56	12 06	15.7	48 58	11 42	15.3	48 01	11 18	15.0	260	280
81	99	53 02	12 09	15.1	52 04	11 44	14.7	51 06	11 19	14.4	50 08	10 56	14.1	49 10	10 34	13.8	48 12	10 12	13.6	261	279
82	98	53 14	10 51	13.4	52 16	10 28	13.1	51 18	10 06	12.9	50 19	9 45	12.6	49 20	9 25	12.3	48 22	9 06	12.1	262	278
83	97	53 25	9 31	11.8	52 26	9 11	11.5	51 27	8 52	11.3	50 29	8 34	11.0	49 30	8 16	10.8	48 31	7 59	10.6	263	277
84	96	53 34	8 11	10.1	52 35	7 54	9.9	51 36	7 37	9.7	50 37	7 21	9.5	49 38	7 06	9.3	48 38	6 51	9.1	264	276
85	95	53 42	6 50	8.5	52 43	6 36	8.3	51 43	6 22	8.1	50 44	6 09	7.9	49 44	5 56	7.8	48 45	5 44	7.6	265	275
86	94	53 49	5 29	6.8	52 49	5 17	6.6	51 49	5 06	6.5	50 50	4 55	6.3	49 50	4 45	6.2	48 50	4 35	6.1	266	274
87	93	53 54	4 07	5.1	52 54	3 58	5.0	51 54	3 50	4.9	50 54	3 42	4.8	49 54	3 34	4.7	48 55	3 27	4.6	267	273
88	92	53 57	2 45	3.4	52 57	2 39	3.3	51 57	2 33	3.2	50 57	2 28	3.2	49 58	2 23	3.1	48 58	2 18	3.0	268	272
89	91	53 59	1 23	1.7	52 59	1 20	1.7	51 59	1 17	1.6	50 59	1 14	1.6	49 59	1 11	1.6	48 59	1 09	1.5	269	271
90	90	54 00	0 00	0.0	53 00	0 00	0.0	52 00	0 00	0.0	51 00	0 00	0.0	50 00	0 00	0.0	49 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for $Z_1 > 90°$

Lat. / A	42°			43°			44°			45°			46°			47°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
0 180	0 00	48 00	90.0	0 00	47 00	90.0	0 00	46 00	90.0	0 00	45 00	90.0	0 00	44 00	90.0	0 00	43 00	90.0	180 360
1 179	0 45	48 00	89.3	0 44	47 00	89.3	0 43	46 00	89.3	0 42	45 00	89.3	0 42	44 00	89.3	0 41	43 00	89.3	181 359
2 178	1 29	47 59	88.7	1 28	46 59	88.6	1 26	45 59	88.6	1 25	44 59	88.6	1 23	43 59	88.6	1 22	42 59	88.5	182 358
3 177	2 14	47 58	88.0	2 12	46 58	88.0	2 09	45 58	87.9	2 07	44 58	87.9	2 05	43 58	87.8	2 03	42 58	87.8	183 357
4 176	2 58	47 56	87.3	2 55	46 56	87.3	2 53	45 56	87.2	2 50	44 56	87.2	2 47	43 56	87.1	2 44	42 56	87.1	184 356
5 175	3 43	47 53	86.6	3 39	46 53	86.6	3 36	45 53	86.5	3 32	44 53	86.5	3 28	43 53	86.4	3 24	42 53	86.3	185 355
6 174	4 27	47 51	86.0	4 23	46 51	85.9	4 19	45 51	85.8	4 14	44 51	85.7	4 10	43 51	85.7	4 05	42 51	85.6	186 354
7 173	5 12	47 47	85.3	5 07	46 47	85.2	5 02	45 47	85.1	4 57	44 47	85.0	4 51	43 47	85.0	4 46	42 47	84.9	187 353
8 172	5 56	47 43	84.6	5 51	46 43	84.5	5 45	45 43	84.4	5 39	44 43	84.3	5 33	43 43	84.2	5 27	42 43	84.1	188 352
9 171	6 41	47 39	84.0	6 34	46 39	83.8	6 28	45 39	83.7	6 21	44 39	83.6	6 14	43 39	83.5	6 07	42 39	83.4	189 351
10 170	7 25	47 34	83.3	7 18	46 34	83.1	7 11	45 34	83.0	7 03	44 34	82.9	6 56	43 34	82.8	6 48	42 34	82.7	190 350
11 169	8 09	47 28	82.6	8 01	46 28	82.4	7 53	45 28	82.3	7 45	44 28	82.2	7 37	43 28	82.0	7 29	42 28	81.9	191 349
12 168	8 53	47 22	81.9	8 45	46 22	81.8	8 36	45 22	81.6	8 27	44 22	81.5	8 18	43 22	81.3	8 09	42 22	81.2	192 348
13 167	9 37	47 16	81.2	9 28	46 15	81.1	9 19	45 15	80.9	9 09	44 15	80.7	8 59	43 15	80.6	8 49	42 16	80.4	193 347
14 166	10 21	47 08	80.5	10 11	46 08	80.3	10 01	45 08	80.2	9 51	44 08	80.0	9 40	43 08	79.8	9 30	42 08	79.7	194 346
15 165	11 05	47 01	79.8	10 55	46 00	79.6	10 44	45 00	79.5	10 33	44 00	79.3	10 21	43 00	79.1	10 10	42 01	78.9	195 345
16 164	11 49	46 52	79.1	11 38	45 52	78.9	11 26	44 52	78.7	11 14	43 52	78.5	11 02	42 52	78.3	10 50	41 52	78.2	196 344
17 163	12 33	46 43	78.4	12 21	45 43	78.2	12 08	44 43	78.0	11 56	43 43	77.8	11 43	42 43	77.6	11 30	41 44	77.4	197 343
18 162	13 17	46 34	77.7	13 04	45 34	77.5	12 51	44 34	77.3	12 37	43 34	77.1	12 24	42 34	76.8	12 10	41 34	76.6	198 342
19 161	14 00	46 24	77.0	13 46	45 24	76.8	13 33	44 24	76.5	13 19	43 24	76.3	13 04	42 24	76.1	12 50	41 24	75.9	199 341
20 160	14 43	46 13	76.3	14 29	45 13	76.1	14 15	44 13	75.8	14 00	43 13	75.6	13 45	42 13	75.3	13 29	41 14	75.1	200 340
21 159	15 27	46 02	75.6	15 12	45 02	75.3	14 56	44 02	75.1	14 41	43 02	74.8	14 25	42 02	74.6	14 09	41 03	74.3	201 339
22 158	16 10	45 50	74.9	15 54	44 50	74.6	15 38	43 50	74.3	15 22	42 50	74.1	15 05	41 50	73.8	14 48	40 51	73.5	202 338
23 157	16 53	45 38	74.1	16 36	44 38	73.9	16 19	43 38	73.6	16 02	42 38	73.3	15 45	41 38	73.0	15 27	40 39	72.8	203 337
24 156	17 36	45 25	73.4	17 18	44 25	73.1	17 01	43 25	72.8	16 43	42 25	72.5	16 25	41 25	72.2	16 06	40 26	72.0	204 336
25 155	18 18	45 11	72.7	18 00	44 11	72.4	17 42	43 11	72.1	17 23	42 11	71.8	17 04	41 12	71.5	16 45	40 12	71.2	205 335
26 154	19 01	44 57	71.9	18 42	43 57	71.6	18 23	42 57	71.3	18 03	41 57	71.0	17 44	40 57	70.7	17 24	39 58	70.4	206 334
27 153	19 43	44 42	71.2	19 24	43 42	70.8	19 04	42 42	70.5	18 43	41 42	70.2	18 23	40 43	69.9	18 02	39 43	69.6	207 333
28 152	20 25	44 26	70.4	20 05	43 26	70.1	19 44	42 26	69.7	19 23	41 27	69.4	19 02	40 27	69.1	18 40	39 28	68.8	208 332
29 151	21 07	44 10	69.6	20 46	43 10	69.3	20 25	42 10	68.9	20 03	41 10	68.6	19 41	40 11	68.3	19 18	39 12	67.9	209 331
30 150	21 49	43 53	68.9	21 27	42 53	68.5	21 05	41 53	68.1	20 42	40 54	67.8	20 19	39 54	67.4	19 56	38 55	67.1	210 330
31 149	22 30	43 35	68.1	22 08	42 35	67.7	21 45	41 36	67.3	21 21	40 36	67.0	20 58	39 37	66.6	20 34	38 38	66.3	211 329
32 148	23 11	43 17	67.3	22 48	42 17	66.9	22 24	41 17	66.5	22 00	40 18	66.2	21 36	39 19	65.8	21 11	38 20	65.4	212 328
33 147	23 53	42 58	66.5	23 28	41 58	66.1	23 04	40 58	65.7	22 39	39 59	65.3	22 14	39 00	65.0	21 48	38 02	64.6	213 327
34 146	24 33	42 38	65.7	24 08	41 38	65.3	23 43	40 39	64.9	23 17	39 40	64.5	22 51	38 41	64.1	22 25	37 42	63.7	214 326
35 145	25 14	42 18	64.9	24 48	41 18	64.5	24 22	40 18	64.1	23 56	39 19	63.7	23 29	38 21	63.3	23 02	37 23	62.9	215 325
36 144	25 54	41 56	64.1	25 28	40 57	63.6	25 01	39 57	63.2	24 34	38 58	62.8	24 06	38 00	62.4	23 38	37 02	62.0	216 324
37 143	26 34	41 34	63.2	26 07	40 35	62.8	25 39	39 35	62.4	25 11	38 37	61.9	24 43	37 38	61.5	24 14	36 41	61.1	217 323
38 142	27 14	41 11	62.4	26 46	40 12	61.9	26 17	39 13	61.5	25 48	38 14	61.1	25 19	37 16	60.7	24 50	36 19	60.3	218 322
39 141	27 53	40 48	61.5	27 24	39 48	61.1	26 55	38 50	60.6	26 25	37 51	60.2	25 55	36 53	59.8	25 25	35 56	59.4	219 321
40 140	28 32	40 23	60.7	28 02	39 24	60.2	27 32	38 25	59.8	27 02	37 27	59.3	26 31	36 30	58.9	26 00	35 32	58.5	220 320
41 139	29 11	39 58	59.8	28 40	38 59	59.3	28 10	38 01	58.9	27 38	37 03	58.4	27 07	36 05	58.0	26 35	35 08	57.6	221 319
42 138	29 49	39 32	58.9	29 18	38 33	58.4	28 46	37 35	58.0	28 14	36 37	57.5	27 42	35 40	57.1	27 09	34 43	56.6	222 318
43 137	30 27	39 05	58.0	29 55	38 06	57.5	29 23	37 08	57.1	28 50	36 11	56.6	28 17	35 14	56.1	27 43	34 18	55.7	223 317
44 136	31 05	38 37	57.1	30 32	37 39	56.6	29 59	36 41	56.1	29 25	35 44	55.7	28 51	34 47	55.2	28 17	33 51	54.8	224 316
45 135	31 42	38 09	56.2	31 08	37 10	55.7	30 34	36 13	55.2	30 00	35 16	54.7	29 25	34 20	54.3	28 50	33 24	53.8	225 315

Lat. / A	42°			43°			44°			45°			46°			47°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
45 135	31 42	38 09	56.2	31 08	37 10	55.7	30 34	36 13	55.2	30 00	35 16	54.7	29 25	34 20	54.3	28 50	33 24	53.8	225 315
46 134	32 19	37 39	55.3	31 45	36 41	54.8	31 10	35 44	54.3	30 34	34 47	53.8	29 59	33 51	53.3	29 23	32 56	52.9	226 314
47 133	32 55	37 08	54.3	32 20	36 11	53.8	31 45	35 14	53.3	31 08	34 18	52.8	30 32	33 22	52.4	29 55	32 27	51.9	227 313
48 132	33 31	36 37	53.4	32 55	35 40	52.9	32 19	34 43	52.3	31 42	33 47	51.9	31 05	32 52	51.4	30 27	31 58	50.9	228 312
49 131	34 07	36 05	52.4	33 30	35 08	51.9	32 53	34 11	51.4	32 15	33 16	50.9	31 37	32 21	50.4	30 59	31 27	49.9	229 311
50 130	34 42	35 31	51.4	34 04	34 35	50.9	33 26	33 39	50.4	32 48	32 44	49.9	32 09	31 50	49.4	31 30	30 56	48.9	230 310
51 129	35 17	34 57	50.4	34 38	34 01	49.9	33 59	33 05	49.4	33 20	32 11	48.9	32 40	31 17	48.4	32 00	30 24	47.9	231 309
52 128	35 51	34 22	49.4	35 12	33 26	48.9	34 32	32 31	48.4	33 52	31 37	47.9	33 11	30 44	47.4	32 30	29 52	46.9	232 308
53 127	36 24	33 45	48.4	35 44	32 50	47.9	35 04	31 56	47.3	34 23	31 02	46.8	33 42	30 10	46.3	33 00	29 18	45.9	233 307
54 126	36 57	33 08	47.4	36 17	32 13	46.8	35 35	31 20	46.3	34 54	30 27	45.8	34 12	29 35	45.3	33 29	28 44	44.8	234 306
55 125	37 30	32 30	46.3	36 48	31 36	45.8	36 06	30 43	45.2	35 24	29 50	44.7	34 41	28 59	44.2	33 58	28 08	43.8	235 305
56 124	38 02	31 51	45.2	37 19	30 57	44.7	36 37	30 04	44.2	35 53	29 13	43.6	35 10	28 22	43.2	34 26	27 32	42.7	236 304
57 123	38 33	31 10	44.1	37 50	30 17	43.6	37 06	29 25	43.1	36 22	28 34	42.6	35 38	27 45	42.1	34 53	26 56	41.6	237 303
58 122	39 04	30 29	43.0	38 20	29 36	42.5	37 36	28 45	42.0	36 51	27 55	41.5	36 06	27 06	41.0	35 20	26 18	40.5	238 302
59 121	39 34	29 46	41.9	38 49	28 55	41.4	38 04	28 04	40.9	37 19	27 15	40.4	36 33	26 27	39.9	35 46	25 39	39.4	239 301
60 120	40 04	29 03	40.8	39 18	28 12	40.2	38 32	27 22	39.7	37 46	26 34	39.2	36 59	25 46	38.8	36 12	25 00	38.3	240 300
61 119	40 32	28 18	39.6	39 46	27 28	39.1	38 59	26 39	38.6	38 12	25 52	38.1	37 25	25 05	37.6	36 37	24 20	37.2	241 299
62 118	41 00	27 32	38.5	40 13	26 43	37.9	39 26	25 56	37.4	38 38	25 09	36.9	37 50	24 23	36.5	37 02	23 39	36.0	242 298
63 117	41 28	26 45	37.3	40 40	25 58	36.8	39 52	25 11	36.3	39 03	24 25	35.8	38 14	23 40	35.3	37 25	22 57	34.9	243 297
64 116	41 54	25 58	36.1	41 06	25 11	35.6	40 17	24 25	35.1	39 28	23 40	34.6	38 38	22 57	34.1	37 48	22 14	33.7	244 296
65 115	42 20	25 09	34.9	41 31	24 23	34.4	40 41	23 38	33.9	39 51	22 55	33.4	39 01	22 12	33.0	38 11	21 31	32.5	245 295
66 114	42 45	24 19	33.6	41 55	23 34	33.1	41 05	22 50	32.7	40 14	22 08	32.2	39 23	21 27	31.8	38 32	20 46	31.3	246 294
67 113	43 10	23 28	32.4	42 19	22 44	31.9	41 28	22 02	31.4	40 37	21 21	31.0	39 45	20 40	30.5	38 53	20 01	30.1	247 293
68 112	43 33	22 35	31.1	42 42	21 53	30.6	41 50	21 12	30.2	40 58	20 32	29.7	40 06	19 53	29.3	39 13	19 15	28.9	248 292
69 111	43 56	21 42	29.8	43 04	21 01	29.4	42 11	20 22	28.9	41 19	19 43	28.5	40 26	19 05	28.1	39 33	18 29	27.7	249 291
70 110	44 18	20 48	28.5	43 25	20 08	28.1	42 32	19 30	27.7	41 38	18 53	27.2	40 45	18 17	26.8	39 51	17 41	26.5	250 290
71 109	44 38	19 53	27.2	43 45	19 15	26.8	42 51	18 38	26.4	41 57	18 02	26.0	41 03	17 27	25.6	40 09	16 53	25.2	251 289
72 108	44 58	18 57	25.9	44 04	18 20	25.5	43 10	17 45	25.1	42 16	17 10	24.7	41 21	16 37	24.3	40 26	16 05	24.0	252 288
73 107	45 17	17 59	24.6	44 23	17 24	24.1	43 28	16 51	23.8	42 33	16 18	23.4	41 38	15 46	23.0	40 42	15 15	22.7	253 287
74 106	45 35	17 01	23.2	44 40	16 28	22.8	43 45	15 56	22.4	42 49	15 25	22.1	41 54	14 54	21.7	40 58	14 25	21.4	254 286
75 105	45 53	16 02	21.8	44 57	15 31	21.4	44 01	15 00	21.1	43 05	14 31	20.8	42 09	14 02	20.4	41 12	13 34	20.1	255 285
76 104	46 09	15 02	20.4	45 12	14 33	20.1	44 16	14 04	19.7	43 19	13 36	19.4	42 23	13 09	19.1	41 26	12 43	18.8	256 284
77 103	46 24	14 02	19.0	45 27	13 34	18.7	44 30	13 07	18.4	43 33	12 41	18.1	42 36	12 15	17.8	41 39	11 51	17.5	257 283
78 102	46 38	13 00	17.6	45 40	12 34	17.3	44 43	12 09	17.0	43 46	11 45	16.7	42 48	11 21	16.5	41 51	10 58	16.2	258 282
79 101	46 51	11 58	16.2	45 53	11 34	15.9	44 55	11 11	15.6	43 57	10 48	15.4	43 00	10 26	15.1	42 02	10 05	14.9	259 281
80 100	47 03	10 55	14.8	46 04	10 33	14.5	45 06	10 12	14.2	44 08	9 51	14.0	43 10	9 31	13.8	42 12	9 12	13.6	260 280
81 99	47 13	9 51	13.3	46 15	9 31	13.1	45 16	9 12	12.8	44 18	8 53	12.6	43 19	8 35	12.4	42 21	8 18	12.2	261 279
82 98	47 23	8 47	11.9	46 24	8 29	11.6	45 26	8 12	11.4	44 27	7 55	11.2	43 28	7 39	11.1	42 29	7 24	10.9	262 278
83 97	47 32	7 42	10.4	46 33	7 27	10.2	45 34	7 12	10.0	44 34	6 57	9.9	43 35	6 43	9.7	42 36	6 29	9.5	263 277
84 96	47 39	6 37	8.9	46 40	6 24	8.8	45 41	6 11	8.6	44 41	5 58	8.5	43 42	5 46	8.3	42 42	5 34	8.2	264 276
85 95	47 46	5 32	7.4	46 46	5 20	7.3	45 46	5 09	7.2	44 47	4 59	7.1	43 47	4 49	6.9	42 48	4 39	6.8	265 275
86 94	47 51	4 26	6.0	46 51	4 17	5.9	45 51	4 08	5.7	44 52	3 59	5.6	43 52	3 51	5.6	42 52	3 43	5.5	266 274
87 93	47 55	3 20	4.5	46 55	3 13	4.4	45 55	3 06	4.3	44 55	3 00	4.2	43 55	2 54	4.2	42 56	2 48	4.1	267 273
88 92	47 58	2 13	3.0	46 58	2 09	2.9	45 58	2 04	2.9	44 58	2 00	2.8	43 58	1 56	2.8	42 58	1 52	2.7	268 272
89 91	47 59	1 07	1.5	46 59	1 04	1.5	45 59	1 02	1.4	44 59	1 00	1.4	43 59	0 58	1.4	43 00	0 56	1.4	269 271
90 90	48 00	0 00	0.0	47 00	0 00	0.0	46 00	0 00	0.0	45 00	0 00	0.0	44 00	0 00	0.0	43 00	0 00	0.0	270 270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90°< LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		48°			49°			50°			51°			52°			53°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	42 00	90.0	0 00	41 00	90.0	0 00	40 00	90.0	0 00	39 00	90.0	0 00	38 00	90.0	0 00	37 00	90.0	180	360
1	179	0 40	42 00	89.3	0 39	41 00	89.2	0 39	40 00	89.2	0 38	39 00	89.2	0 37	38 00	89.2	0 36	37 00	89.2	181	359
2	178	1 20	41 59	88.5	1 19	40 59	88.5	1 17	39 59	88.5	1 16	38 59	88.4	1 14	37 59	88.4	1 12	36 59	88.4	182	358
3	177	2 00	41 58	87.8	1 58	40 58	87.7	1 56	39 58	87.7	1 53	38 58	87.7	1 51	37 58	87.6	1 48	36 58	87.6	183	357
4	176	2 41	41 56	87.0	2 37	40 56	87.0	2 34	39 56	86.9	2 31	38 56	86.9	2 28	37 56	86.8	2 24	36 56	86.8	184	356
5	175	3 21	41 53	86.3	3 17	40 54	86.2	3 13	39 54	86.2	3 09	38 54	86.1	3 05	37 54	86.1	3 00	36 54	86.0	185	355
6	174	4 01	41 51	85.5	3 56	40 51	85.5	3 51	39 51	85.4	3 46	38 51	85.3	3 41	37 51	85.3	3 36	36 51	85.2	186	354
7	173	4 41	41 47	84.8	4 35	40 47	84.7	4 30	39 47	84.6	4 24	38 47	84.5	4 18	37 48	84.5	4 12	36 48	84.4	187	353
8	172	5 21	41 43	84.0	5 14	40 43	83.9	5 08	39 43	83.9	5 01	38 44	83.8	4 55	37 44	83.7	4 48	36 44	83.6	188	352
9	171	6 01	41 39	83.3	5 53	40 39	83.2	5 46	39 39	83.1	5 39	38 39	83.0	5 32	37 39	82.9	5 24	36 40	82.8	189	351
10	170	6 40	41 34	82.5	6 32	40 34	82.4	6 25	39 34	82.3	6 16	38 34	82.2	6 08	37 35	82.1	6 00	36 35	82.0	190	350
11	169	7 20	41 28	81.8	7 11	40 28	81.7	7 03	39 29	81.5	6 54	38 29	81.4	6 45	37 29	81.3	6 36	36 29	81.2	191	349
12	168	8 00	41 22	81.0	7 50	40 22	80.9	7 41	39 23	80.8	7 31	38 23	80.6	7 21	37 23	80.5	7 11	36 24	80.4	192	348
13	167	8 39	41 16	80.3	8 29	40 16	80.1	8 19	39 16	80.0	8 08	38 16	79.8	7 58	37 17	79.7	7 47	36 17	79.6	193	347
14	166	9 19	41 09	79.5	9 08	40 09	79.3	8 57	39 09	79.2	8 45	38 09	79.0	8 34	37 10	78.9	8 22	36 10	78.7	194	346
15	165	9 58	41 01	78.7	9 47	40 01	78.6	9 35	39 02	78.4	9 22	38 02	78.2	9 10	37 02	78.1	8 58	36 03	77.9	195	345
16	164	10 38	40 53	78.0	10 25	39 53	77.8	10 12	38 53	77.6	9 59	37 54	77.4	9 46	36 54	77.3	9 33	35 55	77.1	196	344
17	163	11 17	40 44	77.2	11 04	39 44	77.0	10 50	38 45	76.8	10 36	37 45	76.6	10 22	36 46	76.5	10 08	35 47	76.3	197	343
18	162	11 56	40 34	76.4	11 42	39 35	76.2	11 27	38 35	76.0	11 13	37 36	75.8	10 58	36 37	75.6	10 43	35 38	75.5	198	342
19	161	12 35	40 25	75.6	12 20	39 25	75.4	12 05	38 26	75.2	11 49	37 26	75.0	11 34	36 27	74.8	11 18	35 28	74.6	199	341
20	160	13 14	40 14	74.9	12 58	39 15	74.6	12 42	38 15	74.4	12 26	37 16	74.2	12 09	36 17	74.0	11 53	35 18	73.8	200	340
21	159	13 52	40 03	74.1	13 36	39 04	73.8	13 19	38 04	73.6	13 02	37 05	73.4	12 45	36 06	73.2	12 27	35 08	73.0	201	339
22	158	14 31	39 51	73.3	14 14	38 52	73.0	13 56	37 53	72.8	13 38	36 54	72.6	13 20	35 55	72.3	13 02	34 56	72.1	202	338
23	157	15 09	39 39	72.5	14 51	38 40	72.2	14 33	37 41	72.0	14 14	36 42	71.7	13 55	35 43	71.5	13 36	34 45	71.3	203	337
24	156	15 48	39 26	71.7	15 29	38 27	71.4	15 09	37 28	71.2	14 50	36 30	70.9	14 30	35 31	70.7	14 10	34 33	70.4	204	336
25	155	16 26	39 13	70.9	16 06	38 14	70.6	15 46	37 15	70.3	15 25	36 17	70.1	15 05	35 18	69.8	14 44	34 20	69.6	205	335
26	154	17 03	38 59	70.1	16 43	38 00	69.8	16 22	37 01	69.5	16 01	36 03	69.2	15 39	35 05	69.0	15 18	34 07	68.7	206	334
27	153	17 41	38 44	69.3	17 20	37 46	69.0	16 58	36 47	68.7	16 36	35 49	68.4	16 14	34 51	68.1	15 51	33 53	67.9	207	333
28	152	18 19	38 29	68.4	17 56	37 30	68.1	17 34	36 32	67.8	17 11	35 34	67.5	16 48	34 36	67.3	16 25	33 38	67.0	208	332
29	151	18 56	38 13	67.6	18 33	37 15	67.3	18 09	36 16	67.0	17 46	35 18	66.7	17 22	34 21	66.4	16 58	33 23	66.1	209	331
30	150	19 33	37 57	66.8	19 09	36 58	66.5	18 45	36 00	66.1	18 20	35 03	65.8	17 56	34 05	65.5	17 31	33 08	65.2	210	330
31	149	20 10	37 40	65.9	19 45	36 41	65.6	19 20	35 44	65.3	18 55	34 46	65.0	18 29	33 49	64.7	18 03	32 52	64.4	211	329
32	148	20 46	37 22	65.1	20 21	36 24	64.8	19 55	35 26	64.4	19 29	34 29	64.1	19 02	33 32	63.8	18 36	32 35	63.5	212	328
33	147	21 22	37 03	64.2	20 56	36 06	63.9	20 30	35 08	63.6	20 03	34 11	63.2	19 35	33 14	62.9	19 08	32 18	62.6	213	327
34	146	21 58	36 44	63.4	21 31	35 47	63.0	21 04	34 49	62.7	20 36	33 53	62.3	20 08	32 56	62.0	19 40	32 00	61.7	214	326
35	145	22 34	36 25	62.5	22 06	35 27	62.1	21 38	34 30	61.8	21 10	33 33	61.4	20 41	32 37	61.1	20 12	31 41	60.8	215	325
36	144	23 10	36 04	61.6	22 41	35 07	61.3	22 12	34 10	60.9	21 43	33 14	60.5	21 13	32 18	60.2	20 43	31 22	59.9	216	324
37	143	23 45	35 43	60.8	23 15	34 46	60.4	22 45	33 50	60.0	22 15	32 54	59.6	21 45	31 58	59.3	21 14	31 02	59.0	217	323
38	142	24 20	35 21	59.9	23 49	34 25	59.5	23 19	33 28	59.1	22 48	32 33	58.7	22 16	31 37	58.4	21 45	30 42	58.0	218	322
39	141	24 54	34 59	59.0	24 23	34 02	58.6	23 52	33 07	58.2	23 20	32 11	57.8	22 48	31 16	57.5	22 15	30 21	57.1	219	321
40	140	25 28	34 36	58.1	24 57	33 40	57.7	24 24	32 44	57.3	23 52	31 49	56.9	23 19	30 54	56.5	22 45	30 00	56.2	220	320
41	139	26 02	34 12	57.1	25 30	33 16	56.7	24 57	32 21	56.3	24 23	31 26	56.0	23 49	30 32	55.6	23 15	29 38	55.2	221	319
42	138	26 36	33 47	56.2	26 02	32 52	55.8	25 28	31 57	55.4	24 54	31 02	55.0	24 20	30 08	54.6	23 45	29 15	54.3	222	318
43	137	27 09	33 22	55.3	26 35	32 27	54.9	26 00	31 32	54.5	25 25	30 38	54.1	24 50	29 45	53.7	24 14	28 52	53.3	223	317
44	136	27 42	32 56	54.3	27 07	32 01	53.9	26 31	31 07	53.5	25 55	30 13	53.1	25 19	29 20	52.7	24 43	28 28	52.4	224	316
45	135	28 14	32 29	53.4	27 38	31 35	53.0	27 02	30 41	52.5	26 25	29 48	52.1	25 48	28 55	51.8	25 11	28 03	51.4	225	315
46	134	28 46	32 01	52.4	28 10	31 08	52.0	27 32	30 14	51.6	26 55	29 22	51.2	26 17	28 29	50.8	25 39	27 38	50.4	226	314
47	133	29 18	31 33	51.4	28 40	30 40	51.0	28 02	29 47	50.6	27 24	28 55	50.2	26 46	28 03	49.8	26 07	27 12	49.4	227	313
48	132	29 49	31 04	50.5	29 11	30 11	50.0	28 32	29 19	49.6	27 53	28 27	49.2	27 14	27 38	48.8	26 34	26 46	48.4	228	312
49	131	30 20	30 34	49.5	29 41	29 42	49.0	29 01	28 50	48.6	28 21	27 59	48.2	27 41	27 08	47.8	27 01	26 18	47.4	229	311
50	130	30 50	30 04	48.5	30 10	29 12	48.0	29 30	28 20	47.6	28 49	27 30	47.2	28 08	26 40	46.8	27 27	25 51	46.4	230	310
51	129	31 20	29 32	47.5	30 39	28 41	47.0	29 58	27 50	46.6	29 17	27 00	46.2	28 35	26 11	45.8	27 53	25 22	45.4	231	309
52	128	31 49	29 00	46.4	31 08	28 09	46.0	30 26	27 19	45.6	29 44	26 30	45.2	29 01	25 41	44.8	28 19	24 53	44.4	232	308
53	127	32 18	28 27	45.4	31 36	27 37	45.0	30 53	26 48	44.5	30 10	25 59	44.1	29 27	25 11	43.7	28 44	24 24	43.3	233	307
54	126	32 46	27 53	44.4	32 03	27 04	43.9	31 20	26 15	43.5	30 36	25 27	43.1	29 52	24 40	42.7	29 08	23 53	42.3	234	306
55	125	33 14	27 19	43.3	32 30	26 30	42.9	31 46	25 42	42.4	31 02	24 55	42.0	30 17	24 08	41.6	29 32	23 23	41.2	235	305
56	124	33 42	26 44	42.2	32 57	25 55	41.8	32 12	25 08	41.4	31 27	24 22	41.0	30 41	23 36	40.6	29 56	22 51	40.2	236	304
57	123	34 08	26 07	41.1	33 23	25 20	40.7	32 37	24 34	40.3	31 51	23 48	39.9	31 05	23 03	39.5	30 19	22 19	39.1	237	303
58	122	34 34	25 30	40.1	33 48	24 44	39.6	33 02	23 58	39.2	32 15	23 14	38.8	31 28	22 29	38.4	30 41	21 46	38.0	238	302
59	121	35 00	24 53	39.0	34 13	24 07	38.5	33 26	23 22	38.1	32 39	22 38	37.7	31 51	21 55	37.3	31 03	21 13	37.0	239	301
60	120	35 25	24 14	37.8	34 37	23 30	37.4	33 50	22 46	37.0	33 02	22 03	36.6	32 13	21 20	36.2	31 25	20 39	35.9	240	300
61	119	35 49	23 35	36.7	35 01	22 51	36.3	34 12	22 08	35.9	33 24	21 26	35.5	32 35	20 45	35.1	31 46	20 04	34.8	241	299
62	118	36 13	22 55	35.6	35 24	22 12	35.2	34 35	21 30	34.8	33 45	20 49	34.4	32 56	20 09	34.0	32 06	19 29	33.7	242	298
63	117	36 36	22 14	34.4	35 46	21 32	34.0	34 56	20 51	33.6	34 06	20 11	33.3	33 16	19 32	32.9	32 26	18 53	32.5	243	297
64	116	36 58	21 32	33.3	36 08	20 52	32.9	35 17	20 12	32.5	34 27	19 33	32.1	33 36	18 54	31.8	32 45	18 17	31.4	244	296
65	115	37 20	20 50	32.1	36 29	20 10	31.7	35 38	19 32	31.3	34 47	18 54	31.0	33 55	18 16	30.6	33 03	17 40	30.3	245	295
66	114	37 41	20 07	30.9	36 49	19 28	30.5	35 58	18 51	30.2	35 06	18 14	29.8	34 13	17 38	29.5	33 21	17 02	29.1	246	294
67	113	38 01	19 23	29.7	37 09	18 46	29.4	36 17	18 09	29.0	35 24	17 33	28.6	34 31	16 59	28.3	33 38	16 24	28.0	247	293
68	112	38 21	18 38	28.5	37 28	18 02	28.2	36 35	17 27	27.8	35 42	16 53	27.5	34 48	16 19	27.1	33 55	15 46	26.8	248	292
69	111	38 40	17 58	27.3	37 46	17 18	27.0	36 53	16 44	26.6	35 59	16 11	26.3	35 05	15 38	26.0	34 11	15 07	25.7	249	291
70	110	38 58	17 07	26.1	38 04	16 33	25.7	37 10	16 01	25.4	36 15	15 29	25.1	35 21	14 58	24.8	34 26	14 27	24.5	250	290
71	109	39 15	16 20	24.9	38 20	15 48	24.5	37 26	15 17	24.2	36 31	14 46	23.9	35 36	14 16	23.6	34 41	13 47	23.3	251	289
72	108	39 31	15 33	23.6	38 36	15 02	23.3	37 41	14 32	23.0	36 46	14 03	22.7	35 50	13 34	22.4	34 55	13 07	22.1	252	288
73	107	39 47	14 45	22.4	38 51	14 16	22.1	37 56	13 47	21.8	37 00	13 19	21.5	36 04	12 52	21.2	35 08	12 25	20.9	253	287
74	106	40 02	13 56	21.1	39 06	13 28	20.8	38 10	13 01	20.5	37 13	12 35	20.3	36 17	12 09	20.0	35 21*	11 44	19.8	254	286
75	105	40 16	13 07	19.8	39 19	12 41	19.5	38 23	12 15	19.3	37 26	11 50	19.0	36 29	11 26	18.8	35 33	11 02	18.5	255	285
76	104	40 29	12 17	18.5	39 32	11 53	18.3	38 35	11 28	18.0	37 38	11 05	17.8	36 41	10 42	17.6	35 44	10 20	17.3	256	284
77	103	40 41	11 27	17.3	39 44	11 04	17.0	38 47	10 41	16.8	37 49	10 19	16.5	36 52	9 58	16.3	35 54	9 37	16.1	257	283
78	102	40 53	10 36	16.0	39 55	10 15	15.7	38 57	9 54	15.5	38 00	9 33	15.3	37 02	9 14	15.1	36 04	8 54	14.9	258	282
79	101	41 04	9 45	14.7	40 05	9 25	14.4	39 07	9 06	14.2	38 09	8 47	14.0	37 11	8 29	13.9	36 13	8 11	13.7	259	281
80	100	41 13	8 53	13.3	40 15	8 35	13.2	39 16	8 17	13.0	38 18	8 00	12.8	37 19	7 44	12.6	36 21	7 27	12.5	260	280
81	99	41 22	8 01	12.0	40 23	7 45	11.9	39 25	7 29	11.7	38 26	7 13	11.5	37 27	6 58	11.4	36 28	6 43	11.2	261	279
82	98	41 30	7 09	10.7	40 31	6 54	10.5	39 32	6 40	10.4	38 33	6 26	10.3	37 34	6 12	10.1	36 35	5 59	10.0	262	278
83	97	41 37	6 16	9.4	40 38	6 03	9.2	39 39	5 50	9.1	38 39	5 38	9.0	37 40	5 26	8.9	36 41	5 15	8.7	263	277
84	96	41 43	5 23	8.1	40 44	5 12	7.9	39 44	5 01	7.8	38 45	4 50	7.7	37 45	4 40	7.6	36 46	4 30	7.5	264	276
85	95	41 48	4 29	6.7	40 49	4 20	6.6	39 49	4 11	6.5	38 49	4 02	6.4	37 50	3 54	6.3	36 50	3 45	6.3	265	275
86	94	41 52	3 36	5.4	40 53	3 28	5.3	39 53	3 21	5.2	38 53	3 14	5.1	37 53	3 07	5.1	36 54	3 01	5.0	266	274
87	93	41 56	2 42	4.0	40 56	2 36	4.0	39 56	2 31	3.9	38 56	2 26	3.9	37 56	2 20	3.8	36 56	2 16	3.8	267	273
88	92	41 58	1 48	2.7	40 58	1 44	2.6	39 58	1 41	2.6	38 58	1 37	2.6	37 58	1 34	2.5	36 58	1 30	2.5	268	272
89	91	42 00	0 54	1.3	41 00	0 52	1.3	40 00	0 50	1.3	39 00	0 49	1.3	38 00	0 47	1.3	37 00	0 45	1.3	269	271
90	90	42 00	0 00	0.0	41 00	0 00	0.0	40 00	0 00	0.0	39 00	0 00	0.0	38 00	0 00	0.0	37 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

SIGHT REDUCTION TABLE

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		54°			55°			56°			57°			58°			59°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	36 00	90.0	0 00	35 00	90.0	0 00	34 00	90.0	0 00	33 00	90.0	0 00	32 00	90.0	0 00	31 00	90.0	180	360
1	179	0 35	36 00	89.2	0 34	35 00	89.2	0 34	34 00	89.2	0 33	33 00	89.2	0 32	32 00	89.2	0 31	31 00	89.1	181	359
2	178	1 11	35 59	88.4	1 09	34 59	88.4	1 07	33 59	88.3	1 05	32 59	88.3	1 04	31 59	88.3	1 02	30 59	88.3	182	358
3	177	1 46	35 58	87.6	1 43	34 58	87.5	1 41	33 58	87.5	1 38	32 58	87.5	1 35	31 58	87.5	1 33	30 58	87.4	183	357
4	176	2 21	35 56	86.8	2 18	34 56	86.7	2 14	33 56	86.7	2 11	32 56	86.6	2 07	31 56	86.6	2 04	30 56	86.6	184	356
5	175	2 56	35 54	86.0	2 52	34 54	85.9	2 48	33 54	85.9	2 43	32 54	85.8	2 39	31 54	85.8	2 34	30 54	85.7	185	355
6	174	3 31	35 51	85.1	3 26	34 51	85.1	3 21	33 51	85.0	3 16	32 51	85.0	3 11	31 52	84.9	3 05	30 52	84.9	186	354
7	173	4 06	35 48	84.3	4 00	34 48	84.3	3 54	33 48	84.2	3 48	32 48	84.1	3 42	31 48	84.1	3 36	30 49	84.0	187	353
8	172	4 42	35 44	83.5	4 35	34 44	83.4	4 28	33 44	83.4	4 21	32 45	83.3	4 14	31 45	83.2	4 07	30 45	83.1	188	352
9	171	5 17	35 40	82.7	5 09	34 40	82.6	5 01	33 40	82.5	4 53	32 41	82.4	4 45	31 41	82.3	4 37	30 41	82.3	189	351
10	170	5 51	35 35	81.9	5 43	34 35	81.8	5 34	33 36	81.7	5 26	32 36	81.6	5 17	31 36	81.5	5 08	30 37	81.4	190	350
11	169	6 26	35 30	81.1	6 17	34 30	81.0	6 08	33 31	80.8	5 58	32 31	80.7	5 48	31 31	80.6	5 38	30 32	80.5	191	349
12	168	7 01	35 24	80.2	6 51	34 24	80.1	6 41	33 25	80.0	6 30	32 25	79.9	6 20	31 26	79.8	6 09	30 27	79.7	192	348
13	167	7 36	35 18	79.4	7 25	34 18	79.3	7 14	33 19	79.2	7 02	32 19	79.0	6 51	31 20	78.9	6 39	30 21	78.8	193	347
14	166	8 11	35 11	78.6	7 59	34 12	78.5	7 46	33 12	78.3	7 34	32 13	78.2	7 22	31 14	78.1	7 09	30 15	77.9	194	346
15	165	8 45	35 04	77.8	8 32	34 04	77.6	8 19	33 05	77.5	8 06	32 06	77.3	7 53	31 07	77.2	7 40	30 08	77.1	195	345
16	164	9 19	34 56	76.9	9 06	33 57	76.8	8 52	32 58	76.6	8 38	31 58	76.5	8 24	31 00	76.3	8 10	30 01	76.2	196	344
17	163	9 54	34 47	76.1	9 39	33 48	75.9	9 25	32 49	75.8	9 10	31 50	75.6	8 55	30 52	75.5	8 40	29 53	75.3	197	343
18	162	10 28	34 39	75.3	10 13	33 40	75.1	9 57	32 41	74.9	9 41	31 42	74.8	9 25	30 43	74.6	9 09	29 45	74.4	198	342
19	161	11 02	34 29	74.4	10 46	33 30	74.2	10 29	32 32	74.1	10 13	31 33	73.9	9 56	30 35	73.7	9 39	29 36	73.6	199	341
20	160	11 36	34 19	73.6	11 19	33 21	73.4	11 02	32 22	73.2	10 44	31 24	73.0	10 27	30 25	72.8	10 09	29 27	72.7	200	340
21	159	12 10	34 09	72.7	11 52	33 10	72.5	11 34	32 12	72.3	11 15	31 14	72.2	10 57	30 15	72.0	10 38	29 17	71.8	201	339
22	158	12 43	33 58	71.9	12 24	33 00	71.7	12 06	32 01	71.5	11 46	31 03	71.3	11 27	30 05	71.1	11 07	29 07	70.9	202	338
23	157	13 17	33 46	71.0	12 57	32 48	70.8	12 37	31 50	70.6	12 17	30 52	70.4	11 57	29 54	70.2	11 37	28 57	70.0	203	337
24	156	13 50	33 34	70.2	13 29	32 36	70.0	13 09	31 38	69.7	12 48	30 41	69.5	12 27	29 43	69.3	12 06	28 46	69.1	204	336
25	155	14 23	33 22	69.3	14 02	32 24	69.1	13 40	31 26	68.9	13 18	30 29	68.6	12 56	29 31	68.4	12 34	28 34	68.2	205	335
26	154	14 56	33 09	68.5	14 34	32 11	68.2	14 11	31 14	68.0	13 49	30 16	67.8	13 26	29 19	67.5	13 03	28 22	67.3	206	334
27	153	15 29	32 55	67.6	15 06	31 58	67.3	14 42	31 00	67.1	14 19	30 03	66.9	13 55	29 06	66.6	13 31	28 10	66.4	207	333
28	152	16 01	32 41	66.7	15 37	31 44	66.5	15 13	30 47	66.2	14 49	29 50	66.0	14 24	28 53	65.7	14 00	27 57	65.5	208	332
29	151	16 33	32 26	65.8	16 09	31 29	65.6	15 44	30 32	65.3	15 19	29 36	65.1	14 53	28 39	64.8	14 28	27 43	64.6	209	331
30	150	17 05	32 11	65.0	16 40	31 14	64.7	16 14	30 17	64.4	15 48	29 21	64.2	15 22	28 25	63.9	14 55	27 29	63.7	210	330
31	149	17 37	31 55	64.1	17 11	30 58	63.8	16 44	30 02	63.5	16 17	29 06	63.3	15 50	28 10	63.0	15 23	27 15	62.7	211	329
32	148	18 09	31 38	63.2	17 42	30 42	62.9	17 14	29 46	62.6	16 47	28 51	62.3	16 19	27 55	62.1	15 50	27 00	61.8	212	328
33	147	18 40	31 21	62.3	18 12	30 25	62.0	17 44	29 30	61.7	17 15	28 34	61.4	16 47	27 39	61.2	16 17	26 45	60.9	213	327
34	146	19 11	31 04	61.4	18 42	30 08	61.1	18 13	29 13	60.8	17 44	28 18	60.5	17 14	27 23	60.2	16 44	26 29	60.0	214	326
35	145	19 42	30 46	60.5	19 12	29 50	60.2	18 42	28 55	59.9	18 12	28 01	59.6	17 42	27 06	59.3	17 11	26 12	59.0	215	325
36	144	20 13	30 27	59.6	19 42	29 32	59.2	19 11	28 37	58.9	18 40	27 43	58.6	18 09	26 49	58.4	17 37	25 55	58.1	216	324
37	143	20 43	30 07	58.6	20 12	29 13	58.3	19 40	28 19	58.0	19 08	27 25	57.7	18 36	26 31	57.4	18 03	25 38	57.1	217	323
38	142	21 13	29 48	57.7	20 41	28 53	57.4	20 08	27 59	57.1	19 35	27 06	56.8	19 02	26 13	56.5	18 29	25 20	56.2	218	322
39	141	21 43	29 27	56.8	21 10	28 33	56.4	20 36	27 40	56.1	20 03	26 47	55.8	19 29	25 54	55.5	18 55	25 02	55.2	219	321
40	140	22 12	29 06	55.8	21 38	28 13	55.5	21 04	27 20	55.2	20 30	26 27	54.9	19 55	25 35	54.6	19 20	24 43	54.3	220	320
41	139	22 41	28 44	54.9	22 06	27 51	54.5	21 31	26 59	54.2	20 56	26 07	53.9	20 21	25 15	53.6	19 45	24 24	53.3	221	319
42	138	23 10	28 22	53.9	22 34	27 29	53.6	21 58	26 37	53.3	21 22	25 46	52.9	20 46	24 55	52.6	20 10	24 04	52.3	222	318
43	137	23 38	27 59	53.0	23 02	27 07	52.6	22 25	26 15	52.3	21 48	25 24	52.0	21 11	24 34	51.7	20 34	23 43	51.4	223	317
44	136	24 06	27 36	52.0	23 29	26 44	51.7	22 51	25 53	51.3	22 14	25 02	51.0	21 36	24 12	50.7	20 58	23 23	50.4	224	316
45	135	24 34	27 11	51.0	23 56	26 20	50.7	23 17	25 30	50.3	22 39	24 40	50.0	22 00	23 50	49.7	21 21	23 01	49.4	225	315
46	134	25 01	26 47	50.0	24 22	25 56	49.7	23 43	25 06	49.4	23 04	24 17	49.0	22 24	23 28	48.7	21 45	22 39	48.4	226	314
47	133	25 28	26 22	49.1	24 48	25 32	48.7	24 08	24 42	48.4	23 28	23 53	48.0	22 48	23 05	47.7	22 08	22 17	47.4	227	313
48	132	25 54	25 56	48.1	25 14	25 06	47.7	24 33	24 17	47.4	23 53	23 29	47.0	23 11	22 41	46.7	22 30	21 54	46.4	228	312
49	131	26 20	25 29	47.1	25 39	24 40	46.7	24 58	23 52	46.4	24 16	23 05	46.0	23 34	22 17	45.7	22 52	21 31	45.4	229	311
50	130	26 46	25 02	46.0	26 04	24 14	45.7	25 22	23 26	45.3	24 40	22 39	45.0	23 57	21 53	44.7	23 14	21 07	44.4	230	310
51	129	27 11	24 34	45.0	26 28	23 47	44.7	25 45	23 00	44.3	25 02	22 14	44.0	24 19	21 28	43.7	23 36	20 43	43.4	231	309
52	128	27 36	24 06	44.0	26 52	23 19	43.6	26 09	22 33	43.3	25 25	21 48	43.0	24 41	21 03	42.7	23 57	20 18	42.3	232	308
53	127	28 00	23 37	43.0	27 16	22 51	42.6	26 32	22 06	42.3	25 47	21 21	41.9	25 02	20 37	41.6	24 17	19 53	41.3	233	307
54	126	28 24	23 07	41.9	27 39	22 22	41.6	26 54	21 38	41.2	26 09	20 54	40.9	25 23	20 10	40.6	24 37	19 27	40.3	234	306
55	125	28 47	22 37	40.9	28 01	21 53	40.5	27 16	21 09	40.2	26 30	20 26	39.9	25 44	19 43	39.5	24 57	19 01	39.2	235	305
56	124	29 10	22 07	39.8	28 24	21 23	39.5	27 37	20 40	39.1	26 50	19 57	38.8	26 04	19 16	38.5	25 17	18 34	38.2	236	304
57	123	29 32	21 35	38.8	28 45	20 52	38.4	27 58	20 10	38.1	27 11	19 29	37.8	26 23	18 48	37.4	25 35	18 07	37.1	237	303
58	122	29 54	21 03	37.7	29 06	20 21	37.3	28 19	19 40	37.0	27 31	18 59	36.7	26 42	18 19	36.4	25 54	17 40	36.1	238	302
59	121	30 15	20 31	36.6	29 27	19 50	36.3	28 38	19 09	35.9	27 50	18 30	35.6	27 01	17 50	35.3	26 12	17 12	35.0	239	301
60	120	30 36	19 58	35.5	29 47	19 18	35.2	28 58	18 38	34.9	28 09	17 59	34.5	27 19	17 21	34.2	26 29	16 43	34.0	240	300
61	119	30 56	19 24	34.4	30 07	18 45	34.1	29 17	18 06	33.8	28 27	17 29	33.5	27 37	16 51	33.2	26 46	16 14	32.9	241	299
62	118	31 16	18 50	33.3	30 26	18 12	33.0	29 35	17 34	32.7	28 45	16 57	32.4	27 54	16 21	32.1	27 03	15 45	31.8	242	298
63	117	31 35	18 15	32.2	30 44	17 38	31.9	29 53	17 02	31.6	29 02	16 26	31.3	28 10	15 50	31.0	27 19	15 15	30.7	243	297
64	116	31 53	17 40	31.1	31 02	17 04	30.8	30 10	16 28	30.5	29 19	15 53	30.2	28 27	15 19	29.9	27 35	14 45	29.6	244	296
65	115	32 11	17 04	30.0	31 19	16 29	29.7	30 27	15 55	29.4	29 35	15 21	29.1	28 42	14 48	28.8	27 50	14 15	28.5	245	295
66	114	32 29	16 28	28.8	31 36	15 54	28.5	30 43	15 20	28.2	29 50	14 48	28.0	28 57	14 16	27.7	28 04	13 44	27.4	246	294
67	113	32 45	15 51	27.7	31 52	15 18	27.4	30 59	14 46	27.1	30 05	14 14	26.8	29 12	13 43	26.6	28 18	13 13	26.3	247	293
68	112	33 01	15 14	26.5	32 08	14 42	26.3	31 14	14 11	26.0	30 20	13 40	25.7	29 26	13 10	25.5	28 31	12 41	25.2	248	292
69	111	33 17	14 36	25.4	32 23	14 05	25.1	31 28	13 35	24.8	30 34	13 06	24.6	29 39	12 37	24.4	28 44	12 09	24.1	249	291
70	110	33 32	13 57	24.2	32 37	13 28	24.0	31 42	12 59	23.7	30 47	12 31	23.5	29 52	12 04	23.2	28 57	11 37	23.0	250	290
71	109	33 46	13 18	23.1	32 51	12 51	22.8	31 55	12 23	22.6	31 00	11 56	22.3	30 04	11 30	22.1	29 09	11 04	21.9	251	289
72	108	33 59	12 39	21.9	33 04	12 13	21.6	32 08	11 46	21.4	31 12	11 21	21.2	30 16	10 56	21.0	29 20	10 31	20.8	252	288
73	107	34 12	12 00	20.7	33 16	11 34	20.5	32 20	11 09	20.2	31 23	10 45	20.0	30 27	10 21	19.8	29 30	9 58	19.6	253	287
74	106	34 24	11 19	19.5	33 28	10 55	19.3	32 31	10 32	19.1	31 34	10 09	18.9	30 37	9 46	18.7	29 41	9 24	18.5	254	286
75	105	34 36	10 39	18.3	33 39	10 16	18.1	32 42	9 54	17.9	31 44	9 32	17.7	30 47	9 11	17.5	29 50	* 8 50	17.4	255	285
76	104	34 46	9 58	17.1	33 49	9 37	16.9	32 52	9 16	16.7	31 54	8 56	16.6	30 57	8 36	16.4	29 59	8 16	16.2	256	284
77	103	34 56	9 17	15.9	33 59	8 57	15.7	33 01	8 38	15.6	32 03	8 19	15.4	31 05	8 00	15.2	30 07	7 42	15.1	257	283
78	102	35 06	8 35	14.7	34 08	8 17	14.5	33 10	7 59	14.4	32 11	7 41	14.2	31 13	7 24	14.1	30 15	7 07	13.9	258	282
79	101	35 14	7 54	13.5	34 16	7 37	13.3	33 18	7 20	13.2	32 19	7 04	13.0	31 21	6 48	12.9	30 22	6 32	12.8	259	281
80	100	35 22	7 11	12.3	34 24	6 56	12.1	33 25	6 41	12.0	32 26	6 26	11.9	31 27	6 12	11.7	30 29	5 57	11.6	260	280
81	99	35 29	6 29	11.1	34 30	6 15	10.9	33 32	6 01	10.8	32 33	5 48	10.7	31 34	5 35	10.6	30 35	5 22	10.5	261	279
82	98	35 36	5 46	9.9	34 37	5 34	9.7	33 37	5 22	9.6	32 38	5 10	9.5	31 39	4 58	9.4	30 40	4 47	9.3	262	278
83	97	35 41	5 04	8.6	34 42	4 53	8.5	33 43	4 42	8.4	32 43	4 32	8.3	31 44	4 21	8.2	30 45	4 11	8.2	263	277
84	96	35 46	4 21	7.4	34 47	4 11	7.3	33 47	4 02	7.2	32 48	3 53	7.1	31 48	3 44	7.1	30 49	3 36	7.0	264	276
85	95	35 51	3 37	6.2	34 51	3 30	6.1	33 51	3 22	6.0	32 52	3 14	6.0	31 52	3 07	5.9	30 52	3 00	5.8	265	275
86	94	35 54	2 54	4.9	34 54	2 48	4.9	33 54	2 42	4.8	32 55	2 36	4.8	31 55	2 30	4.7	30 55	2 24	4.7	266	274
87	93	35 57	2 11	3.7	34 57	2 06	3.7	33 57	2 01	3.6	32 57	1 57	3.6	31 57	1 52	3.5	30 57	1 48	3.5	267	273
88	92	35 58	1 27	2.5	34 59	1 24	2.4	33 59	1 21	2.4	32 59	1 18	2.4	31 59	1 15	2.4	30 59	1 12	2.3	268	272
89	91	36 00	0 44	1.2	35 00	0 42	1.2	34 00	0 40	1.2	33 00	0 39	1.2	32 00	0 37	1.2	31 00	0 36	1.2	269	271
90	90	36 00	0 00	0.0	35 00	0 00	0.0	34 00	0 00	0.0	33 00	0 00	0.0	32 00	0 00	0.0	31 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		60°			61°			62°			63°			64°			65°			Lat. / A	
LHA	/ F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	30 00	90.0	0 00	29 00	90.0	0 00	28 00	90.0	0 00	27 00	90.0	0 00	26 00	90.0	0 00	25 00	90.0	180	360
1	179	0 30	30 00	89.1	0 29	29 00	89.1	0 28	28 00	89.1	0 27	27 00	89.1	0 26	26 00	89.1	0 25	25 00	89.1	181	359
2	178	1 00	29 59	88.3	0 58	28 59	88.3	0 56	27 59	88.2	0 54	26 59	88.2	0 53	25 59	88.2	0 51	24 59	88.2	182	358
3	177	1 30	29 58	87.4	1 27	28 58	87.4	1 24	27 58	87.4	1 22	26 58	87.3	1 19	25 58	87.3	1 16	24 58	87.3	183	357
4	176	2 00	29 56	86.5	1 56	28 56	86.5	1 53	27 57	86.5	1 49	26 57	86.4	1 45	25 57	86.4	1 41	24 57	86.4	184	356
5	175	2 30	29 54	85.7	2 25	28 54	85.6	2 21	27 55	85.6	2 16	26 55	85.5	2 11	25 55	85.5	2 07	24 55	85.5	185	355
6	174	3 00	29 52	84.8	2 54	28 52	84.7	2 49	27 52	84.7	2 43	26 52	84.6	2 38	25 53	84.6	2 32	24 53	84.6	186	354
7	173	3 30	29 49	83.9	3 23	28 49	83.9	3 17	27 49	83.8	3 10	26 50	83.8	3 04	25 50	83.7	2 57	24 50	83.7	187	353
8	172	3 59	29 45	83.1	3 52	28 46	83.0	3 45	27 46	82.9	3 37	26 46	82.9	3 30	25 47	82.8	3 22	24 47	82.7	188	352
9	171	4 29	29 42	82.2	4 21	28 42	82.1	4 13	27 42	82.0	4 04	26 43	82.0	3 56	25 43	81.9	3 47	24 44	81.8	189	351
10	170	4 59	29 37	81.3	4 50	28 38	81.2	4 41	27 38	81.2	4 31	26 39	81.1	4 22	25 39	81.0	4 13	24 40	80.9	190	350
11	169	5 28	29 33	80.4	5 18	28 33	80.4	5 08	27 34	80.3	4 58	26 34	80.2	4 48	25 35	80.1	4 38	24 36	80.0	191	349
12	168	5 58	29 27	79.6	5 47	28 28	79.5	5 36	27 29	79.4	5 25	26 29	79.3	5 14	25 30	79.2	5 02	24 31	79.1	192	348
13	167	6 27	29 22	78.7	6 16	28 22	78.6	6 04	27 23	78.5	5 52	26 24	78.4	5 40	25 25	78.3	5 27	24 26	78.2	193	347
14	166	6 57	29 15	77.8	6 44	28 16	77.7	6 31	27 17	77.6	6 18	26 18	77.5	6 05	25 20	77.4	5 52	24 21	77.3	194	346
15	165	7 26	29 09	76.9	7 13	28 10	76.8	6 59	27 11	76.7	6 45	26 12	76.6	6 31	25 14	76.5	6 17	24 15	76.4	195	345
16	164	7 55	29 02	76.1	7 41	28 03	75.9	7 26	27 04	75.8	7 11	26 06	75.7	6 56	25 07	75.5	6 41	24 09	75.4	196	344
17	163	8 24	28 54	75.2	8 09	27 56	75.0	7 53	26 57	74.9	7 38	25 59	74.8	7 22	25 00	74.6	7 06	24 02	74.5	197	343
18	162	8 53	28 46	74.3	8 37	27 48	74.1	8 20	26 50	74.0	8 04	25 51	73.9	7 47	24 53	73.7	7 30	23 55	73.6	198	342
19	161	9 22	28 38	73.4	9 05	27 40	73.2	8 48	26 41	73.1	8 30	25 43	72.9	8 12	24 45	72.8	7 55	23 48	72.7	199	341
20	160	9 51	28 29	72.5	9 33	27 31	72.3	9 14	26 33	72.2	8 56	25 35	72.0	8 37	24 37	71.9	8 19	23 40	71.7	200	340
21	159	10 19	28 19	71.6	10 00	27 22	71.4	9 41	26 24	71.3	9 22	25 26	71.1	9 02	24 29	71.0	8 43	23 32	70.8	201	339
22	158	10 48	28 10	70.7	10 28	27 12	70.5	10 08	26 15	70.4	9 48	25 17	70.2	9 27	24 20	70.0	9 07	23 23	69.9	202	338
23	157	11 16	27 59	69.8	10 55	27 02	69.6	10 34	26 05	69.5	10 13	25 08	69.3	9 52	24 11	69.1	9 30	23 14	69.0	203	337
24	156	11 44	27 49	68.9	11 22	26 51	68.7	11 00	25 54	68.5	10 38	24 58	68.4	10 16	24 01	68.2	9 54	23 04	68.0	204	336
25	155	12 12	27 37	68.0	11 49	26 40	67.8	11 27	25 44	67.6	11 04	24 47	67.4	10 41	23 51	67.3	10 17	22 55	67.1	205	335
26	154	12 40	27 26	67.1	12 16	26 29	66.9	11 53	25 33	66.7	11 29	24 36	66.5	11 05	23 40	66.3	10 41	22 44	66.2	206	334
27	153	13 07	27 13	66.2	12 43	26 17	66.0	12 18	25 21	65.8	11 54	24 25	65.6	11 29	23 29	65.4	11 04	22 34	65.2	207	333
28	152	13 35	27 01	65.3	13 09	26 05	65.1	12 44	25 09	64.9	12 18	24 13	64.7	11 53	23 18	64.5	11 27	22 23	64.3	208	332
29	151	14 02	26 48	64.4	13 36	25 52	64.1	13 09	24 56	63.9	12 43	24 01	63.7	12 16	23 06	63.5	11 49	22 11	63.3	209	331
30	150	14 29	26 34	63.4	14 02	25 39	63.2	13 35	24 43	63.0	13 07	23 49	62.8	12 40	22 54	62.6	12 12	21 59	62.4	210	330
31	149	14 55	26 20	62.5	14 28	25 25	62.3	14 00	24 30	62.1	13 31	23 36	61.8	13 03	22 41	61.6	12 34	21 47	61.4	211	329
32	148	15 22	26 05	61.6	14 53	25 11	61.3	14 24	24 16	61.1	13 55	23 22	60.9	13 26	22 28	60.7	12 56	21 35	60.5	212	328
33	147	15 48	25 50	60.6	15 19	24 56	60.4	14 49	24 02	60.2	14 19	23 08	59.9	13 49	22 15	59.7	13 18	21 22	59.5	213	327
34	146	16 14	25 35	59.7	15 44	24 41	59.5	15 13	23 47	59.2	14 42	22 54	59.0	14 11	22 01	58.8	13 40	21 08	58.6	214	326
35	145	16 40	25 19	58.8	16 09	24 25	58.5	15 37	23 32	58.3	15 06	22 39	58.0	14 34	21 47	57.8	14 02	20 54	57.6	215	325
36	144	17 05	25 02	57.8	16 33	24 09	57.6	16 01	23 17	57.3	15 29	22 24	57.1	14 56	21 32	56.9	14 23	20 40	56.6	216	324
37	143	17 31	24 45	56.9	16 58	23 53	56.6	16 25	23 00	56.4	15 51	22 09	56.1	15 18	21 17	55.9	14 44	20 26	55.7	217	323
38	142	17 56	24 28	55.9	17 22	23 36	55.7	16 48	22 44	55.4	16 14	21 53	55.2	15 39	21 01	54.9	15 05	20 11	54.7	218	322
39	141	18 20	24 10	55.0	17 46	23 18	54.7	17 11	22 27	54.4	16 36	21 36	54.2	16 01	20 46	54.0	15 25	19 55	53.7	219	321
40	140	18 45	23 52	54.0	18 09	23 00	53.7	17 34	22 10	53.5	16 58	21 19	53.2	16 22	20 29	53.0	15 46	19 39	52.7	220	320
41	139	19 09	23 33	53.0	18 33	22 42	52.8	17 56	21 52	52.5	17 20	21 02	52.2	16 43	20 13	52.0	16 06	19 23	51.8	221	319
42	138	19 33	23 13	52.1	18 56	22 23	51.8	18 19	21 34	51.5	17 41	20 44	51.3	17 03	19 55	51.0	16 26	19 07	50.8	222	318
43	137	19 56	22 54	51.1	19 18	22 04	50.8	18 40	21 15	50.5	18 02	20 26	50.3	17 24	19 38	50.0	16 45	18 50	49.8	223	317
44	136	20 19	22 33	50.1	19 41	21 44	49.8	19 02	20 56	49.5	18 23	20 08	49.3	17 44	19 20	49.0	17 04	18 33	48.8	224	316

Lat. / A		60°			61°			62°			63°			64°			65°			Lat. / A	
LHA	/ F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
45	135	20 42	22 12	49.1	20 03	21 24	48.8	19 23	20 36	48.6	18 43	19 49	48.3	18 03	19 02	48.1	17 23	18 15	47.8	225	315
46	134	21 05	21 51	48.1	20 25	21 04	47.8	19 44	20 16	47.6	19 04	19 29	47.3	18 23	18 43	47.1	17 42	17 57	46.8	226	314
47	133	21 27	21 30	47.1	20 46	20 43	46.8	20 05	19 56	46.6	19 24	19 10	46.3	18 42	18 24	46.1	18 00	17 39	45.8	227	313
48	132	21 49	21 07	46.1	21 07	20 21	45.8	20 25	19 35	45.6	19 43	18 50	45.3	19 01	18 04	45.1	18 18	17 20	44.8	228	312
49	131	22 10	20 45	45.1	21 28	19 59	44.8	20 45	19 14	44.6	20 02	18 29	44.3	19 19	17 45	44.0	18 36	17 01	43.8	229	311
50	130	22 31	20 22	44.1	21 48	19 37	43.8	21 05	18 52	43.5	20 21	18 08	43.3	19 37	17 24	43.0	18 53	16 41	42.8	230	310
51	129	22 52	19 58	43.1	22 08	19 14	42.8	21 24	18 30	42.5	20 40	17 47	42.3	19 55	17 04	42.0	19 10	16 21	41.8	231	309
52	128	23 12	19 34	42.1	22 28	18 51	41.8	21 43	18 08	41.5	20 58	17 25	41.2	20 13	16 43	41.0	19 27	16 01	40.8	232	308
53	127	23 32	19 10	41.0	22 47	18 27	40.7	22 01	17 45	40.5	21 15	17 03	40.2	20 30	16 21	40.0	19 44	15 41	39.7	233	307
54	126	23 52	18 45	40.0	23 06	18 03	39.7	22 19	17 21	39.4	21 33	16 40	39.2	20 46	16 00	39.0	20 00	15 20	38.7	234	306
55	125	24 11	18 19	39.0	23 24	17 38	38.7	22 37	16 58	38.4	21 50	16 17	38.2	21 03	15 38	37.9	20 15	14 58	37.7	235	305
56	124	24 29	17 54	37.9	23 42	17 13	37.6	22 54	16 34	37.4	22 07	15 54	37.1	21 19	15 15	36.9	20 31	14 37	36.7	236	304
57	123	24 48	17 27	36.9	23 59	16 48	36.6	23 11	16 09	36.3	22 23	15 31	36.1	21 34	14 53	35.8	20 46	14 15	35.6	237	303
58	122	25 05	17 01	35.8	24 17	16 22	35.5	23 28	15 44	35.3	22 39	15 07	35.0	21 49	14 29	34.8	21 00	13 53	34.6	238	302
59	121	25 23	16 34	34.8	24 33	15 56	34.5	23 44	15 19	34.2	22 54	14 42	34.0	22 04	14 06	33.8	21 14	13 30	33.5	239	301
60	120	25 40	16 06	33.7	24 50	15 29	33.4	23 59	14 53	33.2	23 09	14 18	32.9	22 19	13 42	32.7	21 28	13 07	32.5	240	300
61	119	25 56	15 38	32.6	25 05	15 03	32.4	24 15	14 27	32.1	23 24	13 53	31.9	22 33	13 18	31.7	21 42	12 44	31.5	241	299
62	118	26 12	15 10	31.5	25 21	14 35	31.3	24 29	14 01	31.1	23 38	13 27	30.8	22 46	12 54	30.6	21 55	12 21	30.4	242	298
63	117	26 27	14 41	30.5	25 36	14 08	30.2	24 44	13 34	30.0	23 52	13 01	29.8	22 59	12 29	29.5	22 07	11 57	29.3	243	297
64	116	26 42	14 12	29.4	25 50	13 39	29.1	24 57	13 07	28.9	24 05	12 35	28.7	23 12	12 04	28.5	22 19	11 33	28.3	244	296
65	115	26 57	13 43	28.3	26 04	13 11	28.1	25 11	12 40	27.8	24 18	12 09	27.6	23 25	11 39	27.4	22 31	11 09	27.2	245	295
66	114	27 11	13 13	27.2	26 17	12 42	27.0	25 24	12 12	26.8	24 30	11 43	26.6	23 36	11 13	26.4	22 43	10 44	26.2	246	294
67	113	27 24	12 43	26.1	26 30	12 13	25.9	25 36	11 44	25.7	24 42	11 16	25.5	23 48	10 47	25.3	22 54	10 20	25.1	247	293
68	112	27 37	12 12	25.0	26 43	11 44	24.8	25 48	11 16	24.6	24 54	10 48	24.4	23 59	10 21	24.2	23 04	9 55	24.0	248	292
69	111	27 50	11 41	23.9	26 55	11 14	23.7	26 00	10 47	23.5	25 05	10 21	23.3	24 09	9 55	23.1	23 14	9 29	23.0	249	291
70	110	28 01	11 10	22.8	27 06	10 44	22.6	26 11	10 18	22.4	25 15	9 53	22.2	24 20	9 28	22.0	23 24	9 04	21.9	250	290
71	109	28 13	10 39	21.7	27 17	10 14	21.5	26 21	9 49	21.3	25 25	9 25	21.1	24 29	9 01	21.0	23 33	8 38	20.8	251	289
72	108	28 24	10 07	20.6	27 27	9 43	20.4	26 31	9 20	20.2	25 35	8 57	20.0	24 38	8 34	19.9	23 42	8 12	19.7	252	288
73	107	28 34	9 35	19.4	27 37	9 12	19.3	26 41	8 50	19.1	25 44	8 28	18.9	24 47	8 07	18.8	23 50	7 46	18.6	253	287
74	106	28 44	9 03	18.3	27 47	8 41	18.2	26 50	8 20	18.0	25 52	8 00	17.8	24 55	7 39	17.7	23 58	7 19	17.6	254	286
75	105	28 53	8 30	17.2	27 55	8 10	17.0	26 58	7 59	16.9	26 01	7 31	16.7	25 03	7 12	16.6	24 06	6 53	16.5	255	285
76	104	29 01	7 57	16.1	28 04	7 38	15.9	27 06	7 20	15.8	26 08	7 02	15.6	25 10	6 44	15.5	24 13	6 26	15.4	256	284
77	103	29 09	7 24	14.9	28 11	7 06	14.8	27 13	6 49	14.7	26 15	6 32	14.5	25 17	6 16	14.4	24 19	5 59	14.3	257	283
78	102	29 17	6 51	13.8	28 18	6 34	13.7	27 20	6 19	13.5	26 22	6 03	13.4	25 23	5 47	13.3	24 25	5 32	13.2	258	282
79	101	29 24	6 17	12.7	28 25	6 02	12.5	27 27	5 48	12.4	26 28	5 33	12.3	25 29	5 19	12.2	24 31	5 05	12.1	259	281
80	100	29 30	5 44	11.5	28 31	5 30	11.4	27 32	5 17	11.3	26 33	5 03	11.2	25 35	4 50	11.1	24 36	4 38	11.0	260	280
81	99	29 36	5 10	10.4	28 37	4 57	10.3	27 38	4 45	10.2	26 38	4 33	10.1	25 39	4 22	10.0	24 40	4 10	9.9	261	279
82	98	29 41	4 36	9.2	28 41	4 25	9.1	27 42	4 14	9.0	26 43	4 03	9.0	25 44	3 53	8.9	24 44	3 43	8.8	262	278
83	97	29 45	4 01	8.1	28 46	3 52	8.0	27 46	3 42	7.9	26 47	3 33	7.8	25 48	3 24	7.8	24 48	3 15	7.7	263	277
84	96	29 49	3 27	6.9	28 50	3 19	6.9	27 50	3 11	6.8	26 50	3 03	6.7	25 51	2 55	6.7	24 51	2 47	6.6	264	276
85	95	29 52	2 53	5.8	28 53	2 46	5.7	27 53	2 39	5.7	26 53	2 33	5.6	25 54	2 26	5.6	24 54	2 20	5.5	265	275
86	94	29 55	2 18	4.6	28 55	2 13	4.6	27 56	2 07	4.5	26 56	2 02	4.5	25 56	1 57	4.4	24 56	1 52	4.4	266	274
87	93	29 57	1 44	3.5	28 57	1 40	3.4	27 57	1 36	3.4	26 58	1 32	3.4	25 58	1 28	3.3	24 58	1 24	3.3	267	273
88	92	29 59	1 09	2.3	28 59	1 06	2.3	27 59	1 04	2.3	26 59	1 01	2.2	25 59	0 59	2.2	24 59	0 56	2.2	268	272
89	91	30 00	0 35	1.2	29 00	0 33	1.1	28 00	0 32	1.1	27 00	0 31	1.1	26 00	0 29	1.1	25 00	0 28	1.1	269	271
90	90	30 00	0 00	0.0	29 00	0 00	0.0	28 00	0 00	0.0	27 00	0 00	0.0	26 00	0 00	0.0	25 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

SIGHT REDUCTION TABLE

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A	66°			67°			68°			69°			70°			71°			Lat. / A
LHA / F	A / H	B / P	Z_1/Z_2	A / H	B / P	Z_1/Z_2	A / H	B / P	Z_1/Z_2	A / H	B / P	Z_1/Z_2	A / H	B / P	Z_1/Z_2	A / H	B / P	Z_1/Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
0 180	0 00	24 00	90.0	0 00	23 00	90.0	0 00	22 00	90.0	0 00	21 00	90.0	0 00	20 00	90.0	0 00	19 00	90.0	180 360
1 179	0 24	24 00	89.1	0 23	23 00	89.1	0 22	22 00	89.1	0 22	21 00	89.1	0 21	20 00	89.1	0 20	19 00	89.1	181 359
2 178	0 49	23 59	88.2	0 47	22 59	88.2	0 45	21 59	88.1	0 43	20 59	88.1	0 41	19 59	88.1	0 39	18 59	88.1	182 358
3 177	1 13	23 58	87.3	1 10	22 58	87.2	1 07	21 58	87.2	1 04	20 58	87.2	1 02	19 58	87.2	0 59	18 59	87.2	183 357
4 176	1 38	23 57	86.3	1 34	22 57	86.3	1 30	21 57	86.3	1 26	20 57	86.3	1 22	19 57	86.2	1 18	18 57	86.2	184 356
5 175	2 02	23 55	85.4	1 57	22 55	85.4	1 52	21 55	85.4	1 47	20 56	85.3	1 42	19 56	85.3	1 38	18 56	85.3	185 355
6 174	2 26	23 53	84.5	2 20	22 53	84.5	2 15	21 53	84.4	2 09	20 54	84.4	2 03	19 54	84.4	1 57	18 54	84.3	186 354
7 173	2 50	23 50	83.6	2 44	22 51	83.6	2 37	21 51	83.5	2 30	20 51	83.5	2 23	19 52	83.4	2 16	18 52	83.4	187 353
8 172	3 15	23 48	82.7	3 07	22 48	82.6	2 59	21 48	82.6	2 52	20 49	82.5	2 44	19 49	82.5	2 36	18 50	82.4	188 352
9 171	3 39	23 44	81.8	3 30	22 45	81.7	3 22	21 45	81.6	3 13	20 46	81.6	3 04	19 46	81.5	2 55	18 47	81.5	189 351
10 170	4 03	23 41	80.8	3 53	22 41	80.8	3 44	21 42	80.7	3 34	20 42	80.7	3 24	19 43	80.6	3 14	18 44	80.5	190 350
11 169	4 27	23 36	79.9	4 17	22 37	79.9	4 06	21 38	79.8	3 55	20 39	79.7	3 45	19 40	79.6	3 34	18 41	79.6	191 349
12 168	4 51	23 32	79.0	4 40	22 33	78.9	4 28	21 34	78.9	4 16	20 35	78.8	4 05	19 36	78.7	3 53	18 37	78.6	192 348
13 167	5 15	23 27	78.1	5 03	22 28	78.0	4 50	21 29	77.9	4 37	20 30	77.8	4 25	19 32	77.8	4 12	18 33	77.7	193 347
14 166	5 39	23 22	77.2	5 25	22 23	77.1	5 12	21 24	77.0	4 58	20 26	76.9	4 45	19 27	76.8	4 31	18 28	76.7	194 346
15 165	6 03	23 16	76.2	5 48	22 18	76.1	5 34	21 19	76.0	5 19	20 21	76.0	5 05	19 22	75.9	4 50	18 24	75.8	195 345
16 164	6 26	23 10	75.3	6 11	22 12	75.2	5 56	21 13	75.1	5 40	20 15	75.0	5 25	19 17	74.9	5 09	18 19	74.8	196 344
17 163	6 50	23 04	74.4	6 34	22 06	74.3	6 17	21 08	74.2	6 01	20 09	74.1	5 44	19 11	74.0	5 28	18 14	73.9	197 343
18 162	7 13	22 57	73.5	6 56	21 59	73.3	6 39	21 01	73.2	6 21	20 03	73.1	6 04	19 06	73.0	5 46	18 08	72.9	198 342
19 161	7 37	22 50	72.5	7 19	21 52	72.4	7 00	20 54	72.3	6 42	19 57	72.2	6 24	18 59	72.1	6 05	18 02	72.0	199 341
20 160	8 00	22 42	71.6	7 41	21 45	71.5	7 22	20 47	71.4	7 02	19 50	71.2	6 43	18 53	71.1	6 24	17 56	71.0	200 340
21 159	8 23	22 34	70.7	8 03	21 37	70.5	7 43	20 40	70.4	7 23	19 43	70.3	7 02	18 46	70.2	6 42	17 49	70.1	201 339
22 158	8 46	22 26	69.7	8 25	21 29	69.6	8 04	20 32	69.5	7 43	19 35	69.3	7 22	18 39	69.2	7 00	17 42	69.1	202 338
23 157	9 09	22 17	68.8	8 47	21 21	68.7	8 25	20 24	68.5	8 03	19 28	68.4	7 41	18 31	68.3	7 19	17 35	68.1	203 337
24 156	9 31	22 08	67.9	9 09	21 12	67.7	8 46	20 16	67.6	8 23	19 19	67.4	8 00	18 24	67.3	7 37	17 28	67.2	204 336
25 155	9 54	21 58	66.9	9 30	21 03	66.8	9 07	20 07	66.6	8 43	19 11	66.5	8 19	18 15	66.3	7 55	17 20	66.2	205 335
26 154	10 16	21 49	66.0	9 52	20 53	65.8	9 27	19 57	65.7	9 02	19 02	65.5	8 37	18 07	65.4	8 12	17 12	65.2	206 334
27 153	10 38	21 38	65.0	10 13	20 43	64.9	9 48	19 48	64.7	9 22	18 53	64.6	8 56	17 58	64.4	8 30	17 03	64.3	207 333
28 152	11 00	21 28	64.1	10 34	20 33	63.9	10 08	19 38	63.8	9 41	18 43	63.6	9 14	17 49	63.5	8 48	16 55	63.3	208 332
29 151	11 22	21 17	63.1	10 55	20 22	63.0	10 28	19 28	62.8	10 00	18 34	62.6	9 33	17 39	62.5	9 05	16 46	62.3	209 331
30 150	11 44	21 05	62.2	11 16	20 11	62.0	10 48	19 17	61.8	10 19	18 23	61.7	9 51	17 30	61.5	9 22	16 36	61.4	210 330
31 149	12 06	20 53	61.2	11 37	20 00	61.1	11 07	19 06	60.9	10 38	18 13	60.7	10 09	17 20	60.5	9 39	16 27	60.4	211 329
32 148	12 27	20 41	60.3	11 57	19 48	60.1	11 27	18 55	59.9	10 57	18 02	59.7	10 27	17 09	59.6	9 56	16 17	59.4	212 328
33 147	12 48	20 29	59.3	12 17	19 36	59.1	11 46	18 43	58.9	11 15	17 51	58.8	10 44	16 58	58.6	10 13	16 06	58.4	213 327
34 146	13 09	20 16	58.4	12 37	19 23	58.2	12 06	18 31	58.0	11 34	17 39	57.8	11 02	16 47	57.6	10 29	15 56	57.5	214 326
35 145	13 29	20 02	57.4	12 57	19 10	57.2	12 24	18 19	57.0	11 52	17 27	56.8	11 19	16 36	56.7	10 46	15 45	56.5	215 325
36 144	13 50	19 49	56.4	13 17	18 57	56.2	12 43	18 06	56.0	12 10	17 15	55.9	11 36	16 24	55.7	11 02	15 34	55.5	216 324
37 143	14 10	19 34	55.5	13 36	18 44	55.3	13 02	17 53	55.1	12 27	17 03	54.9	11 53	16 12	54.7	11 18	15 23	54.5	217 323
38 142	14 30	19 20	54.5	13 55	18 30	54.3	13 20	17 40	54.1	12 45	16 50	53.9	12 09	16 00	53.7	11 34	15 11	53.5	218 322
39 141	14 50	19 05	53.5	14 14	18 15	53.3	13 38	17 26	53.1	13 02	16 37	52.9	12 26	15 48	52.7	11 49	14 59	52.6	219 321
40 140	15 09	18 50	52.5	14 33	18 01	52.3	13 56	17 12	52.1	13 19	16 23	51.9	12 42	15 35	51.7	12 05	14 47	51.6	220 320
41 139	15 29	18 34	51.5	14 51	17 46	51.3	14 14	16 57	51.1	13 36	16 09	50.9	12 58	15 22	50.8	12 20	14 34	50.6	221 319
42 138	15 48	18 18	50.6	15 09	17 30	50.3	14 31	16 43	50.1	13 52	15 55	49.9	13 14	15 08	49.8	12 35	14 21	49.6	222 318
43 137	16 06	18 02	49.6	15 27	17 15	49.4	14 48	16 28	49.2	14 09	15 41	49.0	13 29	14 54	48.8	12 50	14 08	48.6	223 317
44 136	16 25	17 46	48.6	15 45	16 59	48.4	15 05	16 12	48.2	14 25	15 26	48.0	13 45	14 40	47.8	13 04	13 55	47.6	224 316
45 135	16 43	17 29	47.6	16 02	16 42	47.4	15 22	15 57	47.2	14 41	15 11	47.0	14 00	14 26	46.8	13 19	13 41	46.6	225 315
46 134	17 01	17 11	46.6	16 19	16 26	46.4	15 38	15 41	46.2	14 56	14 56	46.0	14 15	14 11	45.8	13 33	13 27	45.6	226 314
47 133	17 18	16 53	45.6	16 36	16 09	45.4	15 54	15 24	45.2	15 12	14 40	45.0	14 29	13 56	44.8	13 46	13 13	44.6	227 313
48 132	17 36	16 35	44.6	16 53	15 51	44.4	16 10	15 08	44.2	15 27	14 24	44.0	14 43	13 41	43.8	14 00	12 58	43.6	228 312
49 131	17 53	16 17	43.6	17 09	15 34	43.4	16 25	14 51	43.2	15 42	14 08	43.0	14 58	13 26	42.8	14 13	12 44	42.6	229 311
50 130	18 09	15 58	42.6	17 25	15 16	42.4	16 41	14 33	42.1	15 56	13 52	41.9	15 11	13 10	41.8	14 27	12 29	41.6	230 310
51 129	18 26	15 39	41.6	17 41	14 57	41.3	16 56	14 16	41.1	16 10	13 35	40.9	15 25	12 54	40.8	14 39	12 14	40.6	231 309
52 128	18 42	15 20	40.5	17 56	14 39	40.3	17 10	13 58	40.1	16 24	13 18	39.9	15 38	12 38	39.7	14 52	11 58	39.6	232 308
53 127	18 57	15 00	39.5	18 11	14 20	39.3	17 24	13 40	39.1	16 38	13 00	38.9	15 51	12 21	38.7	15 04	11 42	38.6	233 307
54 126	19 13	14 40	38.5	18 26	14 01	38.3	17 39	13 22	38.1	16 51	12 43	37.9	16 04	12 05	37.7	15 16	11 26	37.5	234 306
55 125	19 28	14 20	37.5	18 40	13 41	37.3	17 52	13 03	37.1	17 04	12 25	36.9	16 16	11 48	36.7	15 28	11 10	36.5	235 305
56 124	19 42	13 59	36.4	18 54	13 21	36.2	18 06	12 44	36.0	17 17	12 07	35.8	16 28	11 30	35.7	15 40	10 54	35.5	236 304
57 123	19 57	13 38	35.4	19 08	13 01	35.2	18 19	12 25	35.0	17 29	11 49	34.8	16 40	11 13	34.6	15 51	10 37	34.5	237 303
58 122	20 11	13 17	34.4	19 21	12 41	34.2	18 31	12 05	34.0	17 42	11 30	33.8	16 52	10 55	33.6	16 02	10 20	33.5	238 302
59 121	20 24	12 55	33.3	19 34	12 20	33.1	18 44	11 45	32.9	17 53	11 11	32.8	17 03	10 37	32.6	16 12	10 03	32.4	239 301
60 120	20 37	12 33	32.3	19 47	11 59	32.1	18 56	11 25	31.9	18 05	10 52	31.7	17 14	10 19	31.6	16 23	9 46	31.4	240 300
61 119	20 50	12 11	31.2	19 59	11 38	31.1	19 08	11 05	30.9	18 16	10 33	30.7	17 24	10 00	30.5	16 33	9 29	30.4	241 299
62 118	21 03	11 48	30.2	20 11	11 16	30.0	19 19	10 44	29.8	18 27	10 13	29.7	17 35	9 42	29.5	16 42	9 11	29.4	242 298
63 117	21 15	11 26	29.2	20 22	10 54	29.0	19 30	10 24	28.8	18 37	9 53	28.6	17 45	9 23	28.5	16 52	8 53	28.3	243 297
64 116	21 27	11 03	28.1	20 34	10 32	27.9	19 41	10 03	27.7	18 47	9 33	27.6	17 54	9 04	27.4	17 01	8 35	27.3	244 296
65 115	21 38	10 39	27.0	20 44	10 10	26.9	19 51	9 41	26.7	18 57	9 13	26.5	18 03	8 45	26.4	17 10	8 17	26.3	245 295
66 114	21 49	10 16	26.0	20 55	9 48	25.8	20 01	9 20	25.7	19 07	8 52	25.5	18 12	8 25	25.4	17 18	7 58	25.2	246 294
67 113	21 59	9 52	24.9	21 05	9 25	24.8	20 10	8 58	24.6	19 16	8 32	24.5	18 21	8 06	24.3	17 26	7 40	24.2	247 293
68 112	22 09	9 28	23.9	21 14	9 02	23.7	20 19	8 36	23.5	19 24	8 11	23.4	18 29	7 46	23.3	17 34	7 21	23.1	248 292
69 111	22 19	9 04	22.8	21 24	8 39	22.6	20 28	8 14	22.5	19 33	7 50	22.4	18 37	7 26	22.2	17 42	7 02	22.1	249 291
70 110	22 28	8 40	21.7	21 32	8 16	21.6	20 37	7 52	21.4	19 41	7 29	21.3	18 45	7 06	21.2	17 49	6 43	21.1	250 290
71 109	22 37	8 15	20.7	21 41	7 52	20.5	20 45	7 30	20.4	19 48	7 07	20.2	18 52	6 45	20.1	17 56	6 24	20.0	251 289
72 108	22 45	7 50	19.6	21 49	7 28	19.4	20 52	7 07	19.3	19 56	6 46	19.2	18 59	6 25	19.1	18 02	6 04	19.0	252 288
73 107	22 53	7 25	18.5	21 56	7 04	18.4	21 00	6 44	18.2	20 03	6 24	18.1	19 05	6 04	18.0	18 08	5 45	17.9	253 287
74 106	23 01	7 00	17.4	22 04	6 40	17.3	21 06	6 21	17.2	20 09	6 02	17.1	19 12	5 44	17.0	18 14	5 25	16.9	254 286
75 105	23 08	6 34	16.3	22 10	6 16	16.2	21 13	5 58	16.1	20 15	5 40	16.0	19 17	5 23	15.9	18 20	5 06	15.8	255 285
76 104	23 15	6 09	15.3	22 17	5 52	15.2	21 19	5 35	15.1	20 21	5 18	15.0	19 23	5 02	14.9	18 25	4 46	14.8	256 284
77 103	23 21	5 43	14.2	22 23	5 27	14.1	21 24	5 12	14.0	20 26	4 56	13.9	19 28	4 41	13.8	18 30	4 26	13.7	257 283
78 102	23 27	5 17	13.1	22 28	5 03	13.0	21 30	4 48	12.9	20 31	4 34	12.8	19 33	4 20	12.7	18 34	4 06	12.7	258 282
79 101	23 32	4 51	12.0	22 33	4 38	11.9	21 35	4 24	11.8	20 36	4 11	11.8	19 37	3 58	11.7	18 38	3 46	11.6	259 281
80 100	23 37	4 25	10.9	22 38	4 13	10.8	21 39	4 01	10.8	20 40	3 49	10.7	19 41	3 37	10.6	18 42	3 25	10.6	260 280
81 99	23 41	3 59	9.8	22 42	3 48	9.8	21 43	3 37	9.7	20 44	3 26	9.6	19 45	3 16	9.6	18 45	3 05	9.5	261 279
82 98	23 45	3 33	8.7	22 46	3 23	8.7	21 46	3 13	8.6	20 47	3 03	8.6	19 48	2 54	8.5	18 48	2 45	8.5	262 278
83 97	23 49	3 06	7.7	22 49	2 58	7.6	21 50	2 49	7.5	20 50	2 41	7.5	19 51	2 32	7.4	18 51	2 24	7.4	263 277
84 96	23 52	2 40	6.6	22 52	2 32	6.5	21 52	2 25	6.5	20 53	2 18	6.4	19 53	2 11	6.4	18 54	2 04	6.3	264 276
85 95	23 54	2 13	5.5	22 54	2 07	5.4	21 55	2 01	5.4	20 55	1 55	5.4	19 55	1 49	5.3	18 55	1 43	5.3	265 275
86 94	23 56	1 47	4.4	22 56	1 42	4.3	21 57	1 37	4.3	20 57	1 32	4.3	19 57	1 27	4.3	18 57	1 23	4.2	266 274
87 93	23 58	1 20	3.3	22 58	1 16	3.3	21 58	1 13	3.2	20 58	1 09	3.2	19 58	1 05	3.2	18 58	1 02	3.2	267 273
88 92	23 59	0 53	2.2	22 59	0 51	2.2	21 59	0 48	2.2	20 59	0 46	2.1	19 59	0 44	2.1	18 59	0 41	2.1	268 272
89 91	24 00	0 27	1.1	23 00	0 25	1.1	22 00	0 24	1.1	21 00	0 23	1.1	20 00	0 22	1.1	19 00	0 21	1.1	269 271
90 90	24 00	0 00	0.0	23 00	0 00	0.0	22 00	0 00	0.0	21 00	0 00	0.0	20 00	0 00	0.0	19 00	0 00	0.0	270 270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

SIGHT REDUCTION TABLE

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

Z_1: same sign as B
Z_2: (–) for P > 90°

Lat. / A		72°			73°			74°			75°			76°			77°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	18 00	90.0	0 00	17 00	90.0	0 00	16 00	90.0	0 00	15 00	90.0	0 00	14 00	90.0	0 00	13 00	90.0	180	360
1	179	0 19	18 00	89.0	0 18	17 00	89.0	0 17	16 00	89.0	0 16	15 00	89.0	0 15	14 00	89.0	0 13	13 00	89.0	181	359
2	178	0 37	17 59	88.1	0 35	16 59	88.1	0 33	15 59	88.1	0 31	14 59	88.1	0 29	14 00	88.1	0 27	13 00	88.1	182	358
3	177	0 56	17 59	87.1	0 53	16 59	87.1	0 50	15 59	87.1	0 47	14 59	87.1	0 44	13 59	87.1	0 40	12 59	87.1	183	357
4	176	1 14	17 58	86.2	1 10	16 58	86.2	1 06	15 58	86.2	1 02	14 58	86.1	0 58	13 58	86.1	0 54	12 58	86.1	184	356
5	175	1 33	17 56	85.2	1 28	16 56	85.2	1 23	15 57	85.2	1 18	14 57	85.2	1 12	13 57	85.1	1 07	12 57	85.1	185	355
6	174	1 51	17 54	84.3	1 45	16 55	84.3	1 39	15 55	84.2	1 33	14 55	84.2	1 27	13 56	84.2	1 21	12 56	84.2	186	354
7	173	2 09	17 52	83.3	2 03	16 53	83.3	1 56	15 53	83.3	1 48	14 54	83.2	1 41	13 54	83.2	1 34	12 54	83.2	187	353
8	172	2 28	17 50	82.4	2 20	16 51	82.3	2 12	15 51	82.3	2 04	14 52	82.3	1 56	13 52	82.2	1 48	12 53	82.2	188	352
9	171	2 46	17 48	81.4	2 37	16 48	81.4	2 28	15 49	81.3	2 19	14 49	81.3	2 10	13 50	81.3	2 01	12 51	81.2	189	351
10	170	3 05	17 45	80.5	2 55	16 45	80.4	2 45	15 46	80.4	2 35	14 47	80.3	2 24	13 48	80.3	2 14	12 49	80.3	190	350
11	169	3 23	17 41	79.5	3 12	16 42	79.5	3 01	15 43	79.4	2 50	14 44	79.4	2 39	13 45	79.3	2 28	12 46	79.3	191	349
12	168	3 41	17 38	78.6	3 29	16 39	78.5	3 17	15 40	78.5	3 05	14 41	78.4	2 53	13 42	78.3	2 41	12 44	78.3	192	348
13	167	3 59	17 34	77.6	3 46	16 35	77.5	3 33	15 37	77.5	3 20	14 38	77.4	3 07	13 39	77.4	2 54	12 41	77.3	193	347
14	166	4 17	17 30	76.7	4 03	16 31	76.6	3 49	15 33	76.5	3 35	14 34	76.5	3 21	13 36	76.4	3 07	12 38	76.3	194	346
15	165	4 35	17 25	75.7	4 20	16 27	75.6	4 05	15 29	75.6	3 50	14 31	75.5	3 35	13 32	75.4	3 20	12 34	75.4	195	345
16	164	4 53	17 21	74.7	4 37	16 23	74.7	4 21	15 25	74.6	4 05	14 27	74.5	3 49	13 29	74.5	3 33	12 31	74.4	196	344
17	163	5 11	17 16	73.8	4 54	16 18	73.7	4 37	15 20	73.6	4 20	14 22	73.5	4 03	13 25	73.5	3 46	12 27	73.4	197	343
18	162	5 29	17 10	72.8	5 11	16 13	72.7	4 53	15 15	72.7	4 35	14 18	72.6	4 17	13 20	72.5	3 59	12 23	72.4	198	342
19	161	5 46	17 05	71.9	5 28	16 07	71.8	5 09	15 10	71.7	4 50	14 13	71.6	4 31	13 16	71.5	4 12	12 19	71.5	199	341
20	160	6 04	16 59	70.9	5 44	16 02	70.8	5 25	15 05	70.7	5 05	14 08	70.6	4 45	13 11	70.5	4 25	12 14	70.5	200	340
21	159	6 21	16 52	69.9	6 01	15 56	69.8	5 40	14 59	69.7	5 19	14 03	69.7	4 58	13 06	69.6	4 37	12 10	69.5	201	339
22	158	6 39	16 46	69.0	6 17	15 50	68.9	5 56	14 53	68.8	5 34	13 57	68.7	5 12	13 01	68.6	4 50	12 05	68.5	202	338
23	157	6 56	16 39	68.0	6 34	15 43	67.9	6 11	14 47	67.8	5 48	13 51	67.7	5 25	12 56	67.6	5 03	12 00	67.5	203	337
24	156	7 13	16 32	67.1	6 50	15 36	66.9	6 26	14 41	66.8	6 03	13 45	66.7	5 39	12 50	66.6	5 15	11 55	66.5	204	336
25	155	7 30	16 25	66.1	7 06	15 29	66.0	6 41	14 34	65.9	6 17	13 39	65.8	5 52	12 44	65.7	5 27	11 49	65.6	205	335
26	154	7 47	16 17	65.1	7 22	15 22	65.0	6 56	14 27	64.9	6 31	13 32	64.8	6 05	12 38	64.7	5 40	11 43	64.6	206	334
27	153	8 04	16 09	64.1	7 38	15 14	64.0	7 11	14 20	63.9	6 45	13 26	63.8	6 18	12 32	63.7	5 52	11 37	63.6	207	333
28	152	8 20	16 00	63.2	7 53	15 06	63.0	7 26	14 12	62.9	6 59	13 19	62.8	6 31	12 25	62.7	6 04	11 31	62.6	208	332
29	151	8 37	15 52	62.2	8 09	14 58	62.1	7 41	14 05	61.9	7 13	13 11	61.8	6 44	12 18	61.7	6 16	11 25	61.6	209	331
30	150	8 53	15 43	61.2	8 24	14 50	61.1	7 55	13 57	61.0	7 26	13 04	60.9	6 57	12 11	60.7	6 27	11 18	60.6	210	330
31	149	9 09	15 34	60.3	8 40	14 41	60.1	8 10	13 49	60.0	7 40	12 56	59.9	7 09	12 04	59.8	6 39	11 12	59.7	211	329
32	148	9 25	15 24	59.3	8 55	14 32	59.1	8 24	13 40	59.0	7 53	12 48	58.9	7 22	11 56	58.8	6 51	11 05	58.7	212	328
33	147	9 41	15 15	58.3	9 10	14 23	58.2	8 38	13 31	58.0	8 06	12 40	57.9	7 34	11 49	57.8	7 02	10 57	57.7	213	327
34	146	9 57	15 05	57.3	9 25	14 13	57.2	8 52	13 22	57.0	8 19	12 31	56.9	7 46	11 41	56.8	7 14	10 50	56.7	214	326
35	145	10 13	14 54	56.3	9 39	14 04	56.2	9 06	13 13	56.1	8 32	12 23	55.9	7 59	11 33	55.8	7 25	10 43	55.7	215	325
36	144	10 28	14 44	55.4	9 54	13 54	55.2	9 19	13 04	55.1	8 45	12 14	54.9	8 11	11 24	54.8	7 36	10 35	54.7	216	324
37	143	10 43	14 33	54.4	10 08	13 43	54.2	9 33	12 54	54.1	8 58	12 05	53.9	8 22	11 16	53.8	7 47	10 27	53.7	217	323
38	142	10 58	14 22	53.4	10 22	13 33	53.2	9 46	12 44	53.1	9 10	11 55	53.0	8 34	11 07	52.8	7 58	10 19	52.7	218	322
39	141	11 13	14 10	52.4	10 36	13 22	52.2	9 59	12 34	52.1	9 22	11 46	52.0	8 45	10 58	51.8	8 08	10 10	51.7	219	321
40	140	11 27	13 59	51.4	10 50	13 11	51.3	10 12	12 23	51.1	9 35	11 36	51.0	8 57	10 49	50.8	8 19	10 02	50.7	220	320
41	139	11 42	13 47	50.4	11 04	13 00	50.3	10 25	12 13	50.1	9 47	11 26	50.0	9 08	10 39	49.9	8 29	9 53	49.7	221	319
42	138	11 56	13 34	49.4	11 17	12 48	49.3	10 38	12 02	49.1	9 58	11 16	49.0	9 19	10 30	48.9	8 39	9 44	48.7	222	318
43	137	12 10	13 22	48.4	11 30	12 36	48.3	10 50	11 51	48.1	10 10	11 05	48.0	9 30	10 20	47.9	8 49	9 35	47.7	223	317
44	136	12 24	13 09	47.4	11 43	12 24	47.3	11 02	11 39	47.1	10 21	10 55	47.0	9 40	10 10	46.9	8 59	9 26	46.7	224	316
45	135	12 37	12 56	46.4	11 56	12 12	46.3	11 14	11 28	46.1	10 33	10 44	46.0	9 51	10 00	45.9	9 09	9 16	45.7	225	315

Lat. / A		72°			73°			74°			75°			76°			77°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
45	135	12 37	12 56	46.4	11 56	12 12	46.3	11 14	11 28	46.1	10 33	10 44	46.0	9 51	10 00	45.9	9 09	9 16	45.7	225	315
46	134	12 51	12 43	45.4	12 08	11 59	45.3	11 26	11 16	45.1	10 44	10 33	45.0	10 01	9 50	44.9	9 19	9 07	44.7	226	314
47	133	13 04	12 30	44.4	12 21	11 47	44.3	11 38	11 04	44.1	10 55	10 21	44.0	10 11	9 39	43.9	9 28	8 57	43.7	227	313
48	132	13 17	12 16	43.4	12 33	11 34	43.3	11 49	10 52	43.1	11 05	10 10	43.0	10 21	9 28	42.9	9 37	8 47	42.7	228	312
49	131	13 29	12 02	42.4	12 45	11 21	42.3	12 00	10 39	42.1	11 16	9 58	42.0	10 31	9 17	41.9	9 46	8 37	41.7	229	311
50	130	13 42	11 48	41.4	12 57	11 07	41.3	12 11	10 27	41.1	11 26	9 46	41.0	10 41	9 06	40.9	9 55	8 26	40.7	230	310
51	129	13 54	11 33	40.4	13 08	10 53	40.3	12 22	10 14	40.1	11 36	9 34	40.0	10 50	8 55	39.8	10 04	8 16	39.7	231	309
52	128	14 06	11 19	39.4	13 19	10 40	39.2	12 33	10 01	39.1	11 46	9 22	39.0	10 59	8 44	38.8	10 13	8 05	38.7	232	308
53	127	14 17	11 04	38.4	13 30	10 26	38.2	12 43	9 47	38.1	11 56	9 10	38.0	11 08	8 32	37.8	10 21	7 55	37.7	233	307
54	126	14 29	10 49	37.4	13 41	10 11	37.2	12 53	9 34	37.1	12 05	8 57	36.9	11 17	8 20	36.8	10 29	7 44	36.7	234	306
55	125	14 40	10 33	36.4	13 51	9 57	36.2	13 03	9 20	36.1	12 14	8 44	35.9	11 26	8 08	35.8	10 37	7 33	35.7	235	305
56	124	14 51	10 18	35.3	14 02	9 42	35.2	13 13	9 07	35.1	12 23	8 31	34.9	11 34	7 56	34.8	10 45	7 21	34.7	236	304
57	123	15 01	10 02	34.3	14 12	9 27	34.2	13 22	8 53	34.0	12 32	8 18	33.9	11 42	7 44	33.8	10 52	7 10	33.7	237	303
58	122	15 12	9 46	33.3	14 21	9 12	33.2	13 31	8 38	33.0	12 41	8 05	32.9	11 50	7 32	32.8	11 00	6 59	32.7	238	302
59	121	15 22	9 30	32.3	14 31	8 57	32.1	13 40	8 24	32.0	12 49	7 51	31.9	11 58	7 19	31.8	11 07	6 47	31.7	239	301
60	120	15 31	9 14	31.3	14 40	8 41	31.1	13 49	8 10	31.0	12 57	7 38	30.9	12 06	7 06	30.8	11 14	6 35	30.6	240	300
61	119	15 41	8 57	30.2	14 49	8 26	30.1	13 57	7 55	30.0	13 05	7 24	29.8	12 13	6 54	29.7	11 21	6 23	29.6	241	299
62	118	15 50	8 40	29.2	14 58	8 10	29.1	14 05	7 40	28.9	13 13	7 10	28.8	12 20	6 41	28.7	11 27	6 11	28.6	242	298
63	117	15 59	8 23	28.2	15 06	7 54	28.0	14 13	7 25	27.9	13 20	6 56	27.8	12 27	6 27	27.7	11 34	5 59	27.6	243	297
64	116	16 08	8 06	27.2	15 14	7 38	27.0	14 21	7 10	26.9	13 27	6 42	26.8	12 34	6 14	26.7	11 40	5 47	26.6	244	296
65	115	16 16	7 49	26.1	15 22	7 22	26.0	14 28	6 55	25.9	13 34	6 28	25.8	12 40	6 01	25.7	11 46	5 34	25.6	245	295
66	114	16 24	7 32	25.1	15 29	7 05	25.0	14 35	6 39	24.9	13 41	6 13	24.7	12 46	5 47	24.6	11 52	5 22	24.6	246	294
67	113	16 32	7 14	24.1	15 37	6 49	23.9	14 42	6 24	23.8	13 47	5 59	23.7	12 52	5 34	23.6	11 57	5 09	23.5	247	293
68	112	16 39	6 56	23.0	15 44	6 32	22.9	14 48	6 08	22.8	13 53	5 44	22.7	12 58	5 20	22.6	12 02	4 57	22.5	248	292
69	111	16 46	6 39	22.0	15 50	6 15	21.9	14 55	5 52	21.8	13 59	5 29	21.7	13 03	5 06	21.6	12 07	4 44	21.5	249	291
70	110	16 53	6 20	20.9	15 57	5 58	20.8	15 01	5 36	20.7	14 05	5 14	20.6	13 08	4 52	20.6	12 12	4 31	20.5	250	290
71	109	16 59	6 02	19.9	16 03	5 41	19.8	15 06	5 20	19.7	14 10	4 59	19.6	13 13	4 38	19.5	12 17	4 18	19.5	251	289
72	108	17 05	5 44	18.9	16 09	5 24	18.8	15 12	5 04	18.7	14 15	4 44	18.6	13 18	4 24	18.5	12 21	4 05	18.4	252	288
73	107	17 11	5 26	17.8	16 14	5 06	17.7	15 17	4 48	17.6	14 20	4 29	17.6	13 23	4 10	17.5	12 25	3 52	17.4	253	287
74	106	17 17	5 07	16.8	16 19	4 49	16.7	15 22	4 31	16.6	14 24	4 13	16.5	13 27	3 56	16.5	12 29	3 38	16.4	254	286
75	105	17 22	4 48	15.7	16 24	4 31	15.7	15 26	4 15	15.6	14 29	3 58	15.5	13 31	3 42	15.4	12 33	3 25	15.4	255	285
76	104	17 27	4 30	14.7	16 29	4 14	14.6	15 31	3 58	14.5	14 33	3 43	14.5	13 35	3 27	14.4	12 36	3 12	14.4	256	284
77	103	17 31	4 11	13.6	16 33	3 56	13.6	15 35	3 41	13.5	14 36	3 27	13.4	13 38	3 13	13.4	12 40	2 58	13.3	257	283
78	102	17 36	3 52	12.6	16 37	3 38	12.5	15 38	3 25	12.5	14 40	3 11	12.4	13 41	2 58	12.4	12 43	2 45	12.3	258	282
79	101	17 39	3 33	11.6	16 41	3 20	11.5	15 42	3 08	11.4	14 43	2 56	11.4	13 44	2 43	11.3	12 45	2 31	11.3	259	281
80	100	17 43	3 14	10.5	16 44	3 02	10.4	15 45	2 51	10.4	14 46	2 40	10.3	13 47	2 29	10.3	12 48	2 18	10.3	260	280
81	99	17 46	2 55	9.5	16 47	2 44	9.4	15 48	2 34	9.4	14 49	2 24	9.3	13 49	2 14	9.3	12 50	2 04	9.2	261	279
82	98	17 49	2 35	8.4	16 50	2 26	8.4	15 50	2 17	8.3	14 51	2 08	8.3	13 52	1 59	8.2	12 52	1 50	8.2	262	278
83	97	17 52	2 16	7.4	16 52	2 08	7.3	15 53	2 00	7.3	14 53	1 52	7.2	13 54	1 44	7.2	12 54	1 37	7.2	263	277
84	96	17 54	1 57	6.3	16 54	1 50	6.3	15 55	1 43	6.2	14 55	1 36	6.2	13 55	1 30	6.2	12 56	1 23	6.2	264	276
85	95	17 56	1 37	5.3	16 56	1 32	5.2	15 56	1 26	5.2	14 56	1 20	5.2	13 57	1 15	5.2	12 57	1 09	5.1	265	275
86	94	17 57	1 18	4.2	16 57	1 13	4.2	15 58	1 09	4.2	14 58	1 04	4.1	13 58	1 00	4.1	12 58	0 55	4.1	266	274
87	93	17 58	0 58	3.2	16 59	0 55	3.1	15 59	0 52	3.1	14 59	0 48	3.1	13 59	0 45	3.1	12 59	0 42	3.1	267	273
88	92	17 59	0 39	2.1	16 59	0 37	2.1	15 59	0 34	2.1	14 59	0 32	2.1	13 59	0 30	2.1	13 00	0 28	2.1	268	272
89	91	18 00	0 19	1.1	17 00	0 18	1.0	16 00	0 17	1.0	15 00	0 16	1.0	14 00	0 15	1.0	13 00	0 14	1.0	269	271
90	90	18 00	0 00	0.0	17 00	0 00	0.0	16 00	0 00	0.0	15 00	0 00	0.0	14 00	0 00	0.0	13 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

SIGHT REDUCTION TABLE

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

Z_1: same sign as B
Z_2: (–) for F > 90°

Lat. / A		78°			79°			80°			81°			82°			83°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
0	180	0 00	12 00	90.0	0 00	11 00	90.0	0 00	10 00	90.0	0 00	9 00	90.0	0 00	8 00	90.0	0 00	7 00	90.0	180	360
1	179	0 12	12 00	89.0	0 11	11 00	89.0	0 10	10 00	89.0	0 09	9 00	89.0	0 08	8 00	89.0	0 07	7 00	89.0	181	359
2	178	0 25	12 00	88.0	0 23	11 00	88.0	0 21	10 00	88.0	0 19	9 00	88.0	0 17	8 00	88.0	0 15	7 00	88.0	182	358
3	177	0 37	11 59	87.1	0 34	10 59	87.1	0 31	9 59	87.0	0 28	8 59	87.0	0 25	7 59	87.0	0 22	6 59	87.0	183	357
4	176	0 50	11 58	86.1	0 46	10 58	86.1	0 42	9 59	86.1	0 38	8 59	86.0	0 33	7 59	86.0	0 29	6 59	86.0	184	356
5	175	1 02	11 57	85.1	0 57	10 58	85.1	0 52	9 58	85.1	0 47	8 58	85.1	0 42	7 58	85.0	0 37	6 58	85.0	185	355
6	174	1 15	11 56	84.1	1 09	10 56	84.1	1 02	9 57	84.1	0 56	8 57	84.1	0 50	7 57	84.1	0 44	6 58	84.0	186	354
7	173	1 27	11 55	83.2	1 20	10 55	83.1	1 13	9 56	83.1	1 06	8 56	83.1	0 58	7 56	83.1	0 51	6 57	83.1	187	353
8	172	1 39	11 53	82.2	1 31	10 54	82.1	1 23	9 54	82.1	1 15	8 55	82.1	1 07	7 55	82.1	0 58	6 56	82.1	188	352
9	171	1 52	11 51	81.2	1 43	10 52	81.2	1 33	9 53	81.1	1 24	8 53	81.1	1 15	7 54	81.1	1 06	6 55	81.1	189	351
10	170	2 04	11 49	80.2	1 54	10 50	80.2	1 44	9 51	80.1	1 33	8 52	80.1	1 23	7 53	80.1	1 13	6 54	80.1	190	350
11	169	2 16	11 47	79.2	2 05	10 48	79.2	1 54	9 49	79.2	1 43	8 50	79.1	1 31	7 51	79.1	1 20	6 52	79.1	191	349
12	168	2 29	11 45	78.3	2 16	10 46	78.2	2 04	9 47	78.2	1 52	8 48	78.1	1 39	7 50	78.1	1 27	6 51	78.1	192	348
13	167	2 41	11 42	77.3	2 28	10 43	77.2	2 14	9 45	77.2	2 01	8 46	77.2	1 48	7 48	77.1	1 34	6 49	77.1	193	347
14	166	2 53	11 39	76.3	2 39	10 41	76.2	2 24	9 43	76.2	2 10	8 44	76.2	1 56	7 46	76.1	1 41	6 48	76.1	194	346
15	165	3 05	11 36	75.3	2 50	10 38	75.3	2 35	9 40	75.2	2 19	8 42	75.2	2 04	7 44	75.1	1 48	6 46	75.1	195	345
16	164	3 17	11 33	74.3	3 01	10 35	74.3	2 45	9 37	74.2	2 28	8 39	74.2	2 12	7 42	74.1	1 56	6 44	74.1	196	344
17	163	3 29	11 29	73.4	3 12	10 32	73.3	2 55	9 34	73.2	2 37	8 37	73.2	2 20	7 39	73.2	2 03	6 42	73.1	197	343
18	162	3 41	11 26	72.4	3 23	10 28	72.3	3 05	9 31	72.3	2 46	8 34	72.2	2 28	7 37	72.2	2 09	6 40	72.1	198	342
19	161	3 53	11 22	71.4	3 34	10 25	71.3	3 14	9 28	71.3	2 55	8 31	71.2	2 36	7 34	71.2	2 16	6 37	71.1	199	341
20	160	4 05	11 18	70.4	3 45	10 21	70.3	3 24	9 24	70.3	3 04	8 28	70.2	2 44	7 31	70.2	2 23	6 35	70.1	200	340
21	159	4 16	11 13	69.4	3 55	10 17	69.4	3 34	9 21	69.3	3 13	8 25	69.2	2 52	7 28	69.2	2 30	6 32	69.1	201	339
22	158	4 28	11 09	68.4	4 06	10 13	68.4	3 44	9 17	68.3	3 22	8 21	68.2	2 59	7 25	68.2	2 37	6 30	68.1	202	338
23	157	4 40	11 04	67.5	4 17	10 09	67.4	3 53	9 13	67.3	3 30	8 18	67.3	3 07	7 22	67.2	2 44	6 27	67.2	203	337
24	156	4 51	10 59	66.5	4 27	10 04	66.4	4 03	9 09	66.3	3 39	8 14	66.3	3 15	7 19	66.2	2 50	6 24	66.2	204	336
25	155	5 02	10 54	65.5	4 38	9 59	65.4	4 13	9 05	65.3	3 47	8 10	65.3	3 22	7 16	65.2	2 57	6 21	65.2	205	335
26	154	5 14	10 49	64.5	4 48	9 55	64.4	4 22	9 00	64.3	3 56	8 06	64.3	3 30	7 12	64.2	3 04	6 18	64.2	206	334
27	153	5 25	10 43	63.5	4 58	9 50	63.4	4 31	8 56	63.4	4 04	8 02	63.3	3 37	7 08	63.2	3 10	6 15	63.2	207	333
28	152	5 36	10 38	62.5	5 08	9 44	62.4	4 41	8 51	62.4	4 13	7 58	62.3	3 45	7 04	62.2	3 17	6 11	62.2	208	332
29	151	5 47	10 32	61.5	5 18	9 39	61.4	4 50	8 46	61.4	4 21	7 53	61.3	3 52	7 00	61.2	3 23	6 08	61.2	209	331
30	150	5 58	10 26	60.5	5 28	9 33	60.5	4 59	8 41	60.4	4 29	7 49	60.3	3 59	6 56	60.2	3 30	6 04	60.2	210	330
31	149	6 09	10 20	59.6	5 38	9 28	59.5	5 08	8 36	59.4	4 37	7 44	59.3	4 07	6 52	59.2	3 36	6 00	59.2	211	329
32	148	6 20	10 13	58.6	5 48	9 22	58.5	5 17	8 30	58.4	4 45	7 39	58.3	4 14	6 48	58.3	3 42	5 57	58.2	212	328
33	147	6 30	10 06	57.6	5 58	9 16	57.5	5 26	8 25	57.4	4 53	7 34	57.3	4 21	6 43	57.3	3 48	5 53	57.2	213	327
34	146	6 41	10 00	56.6	6 08	9 09	56.5	5 34	8 19	56.4	5 01	7 29	56.3	4 28	6 39	56.3	3 54	5 49	56.2	214	326
35	145	6 51	9 53	55.6	6 17	9 03	55.5	5 43	8 13	55.4	5 09	7 24	55.3	4 35	6 34	55.3	4 00	5 45	55.2	215	325
36	144	7 01	9 45	54.6	6 26	8 56	54.5	5 51	8 07	54.4	5 17	7 18	54.3	4 42	6 29	54.3	4 06	5 40	54.2	216	324
37	143	7 11	9 38	53.6	6 36	8 49	53.5	6 00	8 01	53.4	5 24	7 13	53.3	4 48	6 24	53.3	4 12	5 36	53.2	217	323
38	142	7 21	9 31	52.6	6 45	8 43	52.5	6 08	7 55	52.4	5 32	7 07	52.3	4 55	6 19	52.3	4 18	5 32	52.2	218	322
39	141	7 31	9 23	51.6	6 54	8 35	51.5	6 16	7 48	51.4	5 39	7 01	51.3	5 01	6 14	51.3	4 24	5 27	51.2	219	321
40	140	7 41	9 15	50.6	7 03	8 28	50.5	6 25	7 42	50.4	5 46	6 55	50.3	5 08	6 09	50.3	4 30	5 22	50.2	220	320
41	139	7 50	9 07	49.6	7 11	8 21	49.5	6 32	7 35	49.4	5 53	6 49	49.4	5 14	6 03	49.3	4 35	5 18	49.2	221	319
42	138	8 00	8 59	48.6	7 20	8 13	48.5	6 40	7 28	48.4	6 01	6 43	48.4	5 21	5 58	48.3	4 41	5 13	48.2	222	318
43	137	8 09	8 50	47.6	7 29	8 05	47.5	6 48	7 21	47.4	6 07	6 36	47.4	5 27	5 52	47.3	4 46	5 08	47.2	223	317
44	136	8 18	8 42	46.6	7 37	7 58	46.5	6 56	7 14	46.4	6 14	6 30	46.4	5 33	5 46	46.3	4 51	5 03	46.2	224	316

Lat. / A		78°			79°			80°			81°			82°			83°			Lat. / A	
LHA / F		A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA	
°	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	°	°
45	135	8 27	8 33	45.6	7 45	7 50	45.5	7 03	7 06	45.4	6 21	6 23	45.4	5 39	5 41	45.3	4 57	4 58	45.2	225	315
46	134	8 36	8 24	44.6	7 53	7 41	44.5	7 11	6 59	44.4	6 28	6 17	44.4	5 45	5 35	44.3	5 02	4 53	44.2	226	314
47	133	8 45	8 15	43.6	8 01	7 33	43.5	7 18	6 51	43.4	6 34	6 10	43.4	5 51	5 29	43.3	5 07	4 47	43.2	227	313
48	132	8 53	8 06	42.6	8 09	7 25	42.5	7 25	6 44	42.4	6 41	6 03	42.4	5 56	5 22	42.3	5 12	4 42	42.2	228	312
49	131	9 02	7 56	41.6	8 17	7 16	41.5	7 32	6 36	41.4	6 47	5 56	41.4	6 02	5 16	41.3	5 17	4 36	41.2	229	311
50	130	9 10	7 47	40.6	8 24	7 07	40.5	7 39	6 28	40.4	6 53	5 49	40.3	6 07	5 10	40.3	5 21	4 31	40.2	230	310
51	129	9 18	7 37	39.6	8 32	6 58	39.5	7 45	6 20	39.4	6 59	5 42	39.3	6 13	5 03	39.3	5 26	4 25	39.2	231	309
52	128	9 26	7 27	38.6	8 39	6 49	38.5	7 52	6 12	38.4	7 05	5 34	38.3	6 18	4 57	38.3	5 31	4 19	38.2	232	308
53	127	9 33	7 17	37.6	8 46	6 40	37.5	7 58	6 03	37.4	7 11	5 27	37.3	6 23	4 50	37.3	5 35	4 14	37.2	233	307
54	126	9 41	7 07	36.6	8 53	6 31	36.5	8 05	5 55	36.4	7 16	5 19	36.3	6 28	4 43	36.3	5 39	4 08	36.2	234	306
55	125	9 48	6 57	35.6	9 00	6 22	35.5	8 11	5 47	35.4	7 22	5 11	35.3	6 33	4 37	35.3	5 44	4 02	35.2	235	305
56	124	9 56	6 47	34.6	9 06	6 12	34.5	8 17	5 38	34.4	7 27	5 04	34.3	6 38	4 30	34.3	5 48	3 56	34.2	236	304
57	123	10 03	6 36	33.6	9 13	6 03	33.5	8 22	5 29	33.4	7 32	4 56	33.3	6 42	4 23	33.3	5 52	3 50	33.2	237	303
58	122	10 09	6 26	32.6	9 19	5 53	32.5	8 28	5 20	32.4	7 37	4 48	32.3	6 47	4 16	32.3	5 56	3 43	32.2	238	302
59	121	10 16	6 15	31.6	9 25	5 43	31.5	8 34	5 11	31.4	7 42	4 40	31.3	6 51	4 08	31.2	6 00	3 37	31.2	239	301
60	120	10 22	6 04	30.6	9 31	5 33	30.5	8 39	5 02	30.4	7 47	4 32	30.3	6 55	4 01	30.2	6 04	3 31	30.2	240	300
61	119	10 29	5 53	29.5	9 36	5 23	29.5	8 44	4 53	29.4	7 52	4 23	29.3	6 59	3 54	29.2	6 07	3 24	29.2	241	299
62	118	10 35	5 42	28.5	9 42	5 13	28.4	8 49	4 44	28.4	7 56	4 15	28.3	7 04	3 46	28.2	6 11	3 18	28.2	242	298
63	117	10 41	5 31	27.5	9 47	5 03	27.4	8 54	4 35	27.4	8 01	4 07	27.3	7 07	3 39	27.2	6 14	3 11	27.2	243	297
64	116	10 46	5 19	26.5	9 52	4 52	26.4	8 59	4 25	26.3	8 05	3 58	26.3	7 11	3 32	26.2	6 17	3 05	26.2	244	296
65	115	10 52	5 08	25.5	9 57	4 42	25.4	9 03	4 16	25.3	8 09	3 50	25.3	7 15	3 24	25.2	6 20	2 58	25.2	245	295
66	114	10 57	4 56	24.5	10 02	4 31	24.4	9 08	4 06	24.3	8 13	3 41	24.3	7 18	3 16	24.2	6 24	2 52	24.2	246	294
67	113	11 02	4 45	23.5	10 07	4 21	23.4	9 12	3 56	23.3	8 17	3 32	23.3	7 22	3 09	23.2	6 26	2 45	23.2	247	293
68	112	11 07	4 33	22.4	10 11	4 10	22.4	9 16	3 47	22.3	8 20	3 24	22.2	7 25	3 01	22.2	6 29	2 38	22.1	248	292
69	111	11 12	4 21	21.4	10 16	3 59	21.4	9 20	3 37	21.3	8 24	3 15	21.2	7 28	2 53	21.2	6 32	2 31	21.1	249	291
70	110	11 16	4 09	20.4	10 20	3 48	20.3	9 23	3 27	20.3	8 27	3 06	20.2	7 31	2 45	20.2	6 35	2 24	20.1	250	290
71	109	11 20	3 58	19.4	10 24	3 37	19.3	9 27	3 17	19.3	8 30	2 57	19.2	7 34	2 37	19.2	6 37	2 17	19.1	251	289
72	108	11 24	3 45	18.4	10 27	3 26	18.3	9 30	3 07	18.3	8 33	2 48	18.2	7 36	2 29	18.2	6 39	2 10	18.1	252	288
73	107	11 28	3 33	17.4	10 31	3 15	17.3	9 34	2 57	17.2	8 36	2 39	17.2	7 39	2 21	17.2	6 42	2 03	17.1	253	287
74	106	11 32	3 21	16.3	10 34	3 04	16.3	9 37	2 47	16.2	8 39	2 30	16.2	7 41	2 13	16.1	6 44	1 56	16.1	254	286
75	105	11 35	3 09	15.3	10 37	2 53	15.3	9 39	2 37	15.2	8 41	2 21	15.2	7 44	2 05	15.1	6 46	1 49	15.1	255	285
76	104	11 38	2 57	14.3	10 40	2 42	14.3	9 42	2 27	14.2	8 44	2 12	14.2	7 46	1 57	14.1	6 47	1 42	14.1	256	284
77	103	11 41	2 44	13.3	10 43	2 30	13.2	9 44	2 16	13.2	8 46	2 02	13.2	7 48	1 49	13.1	6 49	1 35	13.1	257	283
78	102	11 44	2 32	12.3	10 45	2 19	12.2	9 47	2 06	12.2	8 48	1 53	12.1	7 49	1 40	12.1	6 51	1 28	12.1	258	282
79	101	11 47	2 19	11.2	10 48	2 07	11.2	9 49	1 56	11.2	8 50	1 44	11.1	7 51	1 32	11.1	6 52	1 21	11.1	259	281
80	100	11 49	2 07	10.2	10 50	1 56	10.2	9 51	1 45	10.2	8 52	1 35	10.1	7 53	1 24	10.1	6 54	1 13	10.1	260	280
81	99	11 51	1 54	9.2	10 52	1 45	9.2	9 53	1 35	9.1	8 53	1 25	9.1	7 54	1 16	9.1	6 55	1 06	9.1	261	279
82	98	11 53	1 42	8.2	10 53	1 33	8.1	9 54	1 24	8.1	8 55	1 16	8.1	7 55	1 07	8.1	6 56	0 59	8.1	262	278
83	97	11 55	1 29	7.2	10 55	1 21	7.1	9 55	1 14	7.1	8 56	1 06	7.1	7 56	0 59	7.1	6 57	0 51	7.1	263	277
84	96	11 56	1 16	6.1	10 56	1 10	6.1	9 57	1 03	6.1	8 57	0 57	6.1	7 57	0 50	6.1	6 58	0 44	6.0	264	276
85	95	11 57	1 04	5.1	10 57	0 58	5.1	9 58	0 53	5.1	8 58	0 47	5.1	7 58	0 42	5.0	6 58	0 37	5.0	265	275
86	94	11 58	0 51	4.1	10 58	0 47	4.1	9 59	0 42	4.1	8 59	0 38	4.0	7 59	0 34	4.0	6 59	0 29	4.0	266	274
87	93	11 59	0 38	3.1	10 59	0 35	3.1	9 59	0 32	3.0	8 59	0 28	3.0	7 59	0 25	3.0	6 59	0 22	3.0	267	273
88	92	12 00	0 26	2.0	11 00	0 23	2.0	10 00	0 21	2.0	9 00	0 19	2.0	8 00	0 17	2.0	7 00	0 15	2.0	268	272
89	91	12 00	0 13	1.0	11 00	0 12	1.0	10 00	0 11	1.0	9 00	0 10	1.0	8 00	0 08	1.0	7 00	0 07	1.0	269	271
90	90	12 00	0 00	0.0	11 00	0 00	0.0	10 00	0 00	0.0	9 00	0 00	0.0	8 00	0 00	0.0	7 00	0 00	0.0	270	270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

B: (–) for 90° < LHA < 270°
Dec: (–) for Lat. contrary name

SIGHT REDUCTION TABLE

Z_1: same sign as B
Z_2: (–) for P > 90°

Lat. / A	84°			85°			86°			87°			88°			89°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
0 180	0 00	6 00	90.0	0 00	5 00	90.0	0 00	4 00	90.0	0 00	3 00	90.0	0 00	2 00	90.0	0 00	1 00	90.0	180 360
1 179	0 06	6 00	89.0	0 05	5 00	89.0	0 04	4 00	89.0	0 03	3 00	89.0	0 02	2 00	89.0	0 01	1 00	89.0	181 359
2 178	0 13	6 00	88.0	0 10	5 00	88.0	0 08	4 00	88.0	0 06	3 00	88.0	0 04	2 00	88.0	0 02	1 00	88.0	182 358
3 177	0 19	6 00	87.0	0 16	5 00	87.0	0 13	4 00	87.0	0 09	3 00	87.0	0 06	2 00	87.0	0 03	1 00	87.0	183 357
4 176	0 25	5 59	86.0	0 21	4 59	86.0	0 17	3 59	86.0	0 13	3 00	86.0	0 08	2 00	86.0	0 04	1 00	86.0	184 356
5 175	0 31	5 59	85.0	0 26	4 59	85.0	0 21	3 59	85.0	0 16	2 59	85.0	0 10	2 00	85.0	0 05	1 00	85.0	185 355
6 174	0 38	5 58	84.0	0 31	4 58	84.0	0 25	3 59	84.0	0 19	2 59	84.0	0 13	1 59	84.0	0 06	1 00	84.0	186 354
7 173	0 44	5 57	83.0	0 37	4 58	83.0	0 29	3 58	83.0	0 22	2 59	83.0	0 15	1 59	83.0	0 07	1 00	83.0	187 353
8 172	0 50	5 57	82.0	0 42	4 57	82.0	0 33	3 58	82.0	0 25	2 58	82.0	0 17	1 59	82.0	0 08	0 59	82.0	188 352
9 171	0 56	5 56	81.0	0 47	4 56	81.0	0 38	3 57	81.0	0 28	2 58	81.0	0 19	1 59	81.0	0 09	0 59	81.0	189 351
10 170	1 02	5 55	80.1	0 52	4 55	80.0	0 42	3 56	80.0	0 31	2 57	80.0	0 21	1 58	80.0	0 10	0 59	80.0	190 350
11 169	1 09	5 53	79.1	0 57	4 55	79.0	0 46	3 56	79.0	0 34	2 57	79.0	0 23	1 58	79.0	0 11	0 59	79.0	191 349
12 168	1 15	5 52	78.1	1 02	4 53	78.0	0 50	3 55	78.0	0 37	2 56	78.0	0 25	1 57	78.0	0 12	0 59	78.0	192 348
13 167	1 21	5 51	77.1	1 07	4 52	77.0	0 54	3 54	77.0	0 40	2 55	77.0	0 27	1 57	77.0	0 13	0 58	77.0	193 347
14 166	1 27	5 49	76.1	1 12	4 51	76.1	0 58	3 53	76.0	0 44	2 55	76.0	0 29	1 56	76.0	0 15	0 58	76.0	194 346
15 165	1 33	5 48	75.1	1 18	4 50	75.1	1 02	3 52	75.0	0 47	2 54	75.0	0 31	1 56	75.0	0 16	0 58	75.0	195 345
16 164	1 39	5 46	74.1	1 23	4 48	74.1	1 06	3 51	74.0	0 50	2 53	74.0	0 33	1 55	74.0	0 17	0 58	74.0	196 344
17 163	1 45	5 44	73.1	1 28	4 47	73.1	1 10	3 50	73.0	0 53	2 52	73.0	0 35	1 55	73.0	0 18	0 57	73.0	197 343
18 162	1 51	5 43	72.1	1 33	4 45	72.1	1 14	3 48	72.0	0 56	2 51	72.0	0 37	1 54	72.0	0 19	0 57	72.0	198 342
19 161	1 57	5 41	71.1	1 38	4 44	71.1	1 18	3 47	71.0	0 59	2 50	71.0	0 39	1 53	71.0	0 20	0 57	71.0	199 341
20 160	2 03	5 38	70.1	1 42	4 42	70.1	1 22	3 46	70.0	1 02	2 49	70.0	0 41	1 53	70.0	0 21	0 56	70.0	200 340
21 159	2 09	5 36	69.1	1 47	4 40	69.1	1 26	3 44	69.0	1 04	2 48	69.0	0 43	1 52	69.0	0 22	0 56	69.0	201 339
22 158	2 15	5 34	68.1	1 52	4 38	68.1	1 30	3 43	68.0	1 07	2 47	68.0	0 45	1 51	68.0	0 22	0 56	68.0	202 338
23 157	2 20	5 32	67.1	1 57	4 36	67.1	1 34	3 41	67.1	1 10	2 46	67.0	0 47	1 50	67.0	0 23	0 55	67.0	203 337
24 156	2 26	5 29	66.1	2 02	4 34	66.1	1 38	3 39	66.1	1 13	2 44	66.0	0 49	1 50	66.0	0 24	0 55	66.0	204 336
25 155	2 32	5 26	65.1	2 07	4 32	65.1	1 41	3 38	65.1	1 16	2 43	65.0	0 51	1 49	65.0	0 25	0 54	65.0	205 335
26 154	2 38	5 24	64.1	2 11	4 30	64.1	1 45	3 36	64.1	1 19	2 42	64.0	0 53	1 48	64.0	0 26	0 54	64.0	206 334
27 153	2 43	5 21	63.1	2 16	4 27	63.1	1 49	3 34	63.1	1 22	2 40	63.0	0 54	1 47	63.0	0 27	0 53	63.0	207 333
28 152	2 49	5 18	62.1	2 21	4 25	62.1	1 53	3 32	62.1	1 24	2 39	62.0	0 56	1 46	62.0	0 28	0 53	62.0	208 332
29 151	2 54	5 15	61.1	2 25	4 23	61.1	1 56	3 30	61.1	1 27	2 37	61.0	0 58	1 45	61.0	0 29	0 52	61.0	209 331
30 150	3 00	5 12	60.1	2 30	4 20	60.1	2 00	3 28	60.1	1 30	2 36	60.0	1 00	1 44	60.0	0 30	0 52	60.0	210 330
31 149	3 05	5 09	59.1	2 34	4 17	59.1	2 04	3 26	59.1	1 33	2 34	59.0	1 02	1 43	59.0	0 31	0 51	59.0	211 329
32 148	3 11	5 06	58.1	2 39	4 15	58.1	2 07	3 24	58.1	1 35	2 33	58.0	1 04	1 42	58.0	0 32	0 51	58.0	212 328
33 147	3 16	5 02	57.1	2 43	4 12	57.1	2 11	3 21	57.1	1 38	2 31	57.0	1 05	1 41	57.0	0 33	0 50	57.0	213 327
34 146	3 21	4 59	56.1	2 48	4 09	56.1	2 14	3 19	56.1	1 41	2 29	56.0	1 07	1 39	56.0	0 34	0 50	56.0	214 326
35 145	3 26	4 55	55.1	2 52	4 06	55.1	2 18	3 17	55.1	1 43	2 27	55.0	1 09	1 38	55.0	0 34	0 49	55.0	215 325
36 144	3 31	4 52	54.1	2 56	4 03	54.1	2 21	3 14	54.1	1 46	2 26	54.0	1 11	1 37	54.0	0 35	0 49	54.0	216 324
37 143	3 36	4 48	53.2	3 00	4 00	53.1	2 24	3 12	53.1	1 48	2 24	53.0	1 12	1 36	53.0	0 36	0 48	53.0	217 323
38 142	3 41	4 44	52.2	3 05	3 57	52.1	2 28	3 09	52.1	1 51	2 22	52.0	1 14	1 35	52.0	0 37	0 47	52.0	218 322
39 141	3 46	4 40	51.2	3 09	3 53	51.1	2 31	3 07	51.1	1 53	2 20	51.0	1 16	1 33	51.0	0 38	0 47	51.0	219 321
40 140	3 51	4 36	50.2	3 13	3 50	50.1	2 34	3 04	50.1	1 56	2 18	50.0	1 17	1 32	50.0	0 39	0 46	50.0	220 320
41 139	3 56	4 32	49.2	3 17	3 47	49.1	2 37	3 01	49.1	1 58	2 16	49.0	1 19	1 31	49.0	0 39	0 45	49.0	221 319
42 138	4 01	4 28	48.2	3 21	3 43	48.1	2 41	2 58	48.1	2 00	2 14	48.0	1 20	1 29	48.0	0 40	0 45	48.0	222 318
43 137	4 05	4 24	47.2	3 24	3 40	47.1	2 44	2 56	47.1	2 03	2 12	47.0	1 22	1 28	47.0	0 41	0 44	47.0	223 317
44 136	4 10	4 19	46.2	3 28	3 36	46.1	2 47	2 53	46.1	2 05	2 10	46.0	1 23	1 26	46.0	0 42	0 43	46.0	224 316
45 135	4 14	4 15	45.2	3 32	3 32	45.1	2 50	2 50	45.1	2 07	2 07	45.0	1 25	1 25	45.0	0 42	0 42	45.0	225 315

Lat. / A	84°			85°			86°			87°			88°			89°			Lat. / A
LHA / F	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	A / H	B / P	Z_1 / Z_2	LHA
° °	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° ′	° ′	°	° °
45 135	4 14	4 15	45.2	3 32	3 32	45.1	2 50	2 50	45.1	2 07	2 07	45.0	1 25	1 25	45.0	0 42	0 42	45.0	225 315
46 134	4 19	4 11	44.2	3 36	3 29	44.1	2 53	2 47	44.1	2 09	2 05	44.0	1 26	1 23	44.0	0 43	0 42	44.0	226 314
47 133	4 23	4 06	43.2	3 39	3 25	43.1	2 55	2 44	43.1	2 12	2 03	43.0	1 28	1 22	43.0	0 44	0 41	43.0	227 313
48 132	4 27	4 01	42.2	3 43	3 21	42.1	2 58	2 41	42.1	2 14	2 01	42.0	1 29	1 20	42.0	0 45	0 40	42.0	228 312
49 131	4 31	3 57	41.2	3 46	3 17	41.1	3 01	2 38	41.1	2 16	1 58	41.0	1 31	1 19	41.0	0 45	0 39	41.0	229 311
50 130	4 36	3 52	40.2	3 50	3 13	40.1	3 04	2 34	40.1	2 18	1 56	40.0	1 32	1 17	40.0	0 46	0 39	40.0	230 310
51 129	4 40	3 47	39.2	3 53	3 09	39.1	3 06	2 31	39.1	2 20	1 53	39.0	1 33	1 16	39.0	0 47	0 38	39.0	231 309
52 128	4 43	3 42	38.2	3 56	3 05	38.1	3 09	2 28	38.1	2 22	1 51	38.0	1 35	1 14	38.0	0 47	0 37	38.0	232 308
53 127	4 47	3 37	37.2	3 59	3 01	37.1	3 12	2 25	37.1	2 24	1 48	37.0	1 36	1 12	37.0	0 48	0 36	37.0	233 307
54 126	4 51	3 32	36.1	4 03	2 57	36.1	3 14	2 21	36.1	2 26	1 46	36.0	1 37	1 11	36.0	0 49	0 35	36.0	234 306
55 125	4 55	3 27	35.1	4 06	2 52	35.1	3 17	2 18	35.1	2 27	1 43	35.0	1 38	1 09	35.0	0 49	0 34	35.0	235 305
56 124	4 58	3 22	34.1	4 09	2 48	34.1	3 19	2 14	34.1	2 29	1 41	34.0	1 39	1 07	34.0	0 50	0 34	34.0	236 304
57 123	5 02	3 17	33.1	4 12	2 44	33.1	3 21	2 11	33.1	2 31	1 38	33.0	1 41	1 05	33.0	0 50	0 33	33.0	237 303
58 122	5 05	3 11	32.1	4 14	2 39	32.1	3 23	2 07	32.1	2 33	1 35	32.0	1 42	1 04	32.0	0 51	0 32	32.0	238 302
59 121	5 08	3 06	31.1	4 17	2 35	31.1	3 26	2 04	31.1	2 34	1 33	31.0	1 43	1 02	31.0	0 51	0 31	31.0	239 301
60 120	5 12	3 00	30.1	4 20	2 30	30.1	3 28	2 00	30.1	2 36	1 30	30.0	1 44	1 00	30.0	0 52	0 30	30.0	240 300
61 119	5 15	2 55	29.1	4 22	2 26	29.1	3 30	1 56	29.1	2 37	1 27	29.0	1 45	0 58	29.0	0 52	0 29	29.0	241 299
62 118	5 18	2 49	28.1	4 25	2 21	28.1	3 32	1 53	28.1	2 39	1 25	28.0	1 46	0 56	28.0	0 53	0 28	28.0	242 298
63 117	5 21	2 44	27.1	4 27	2 16	27.1	3 34	1 49	27.1	2 40	1 22	27.0	1 47	0 54	27.0	0 53	0 27	27.0	243 297
64 116	5 23	2 38	26.1	4 30	2 12	26.1	3 36	1 45	26.1	2 42	1 19	26.0	1 48	0 53	26.0	0 54	0 26	26.0	244 296
65 115	5 26	2 33	25.1	4 32	2 07	25.1	3 37	1 42	25.1	2 43	1 16	25.0	1 49	0 51	25.0	0 54	0 25	25.0	245 295
66 114	5 29	2 27	24.1	4 34	2 02	24.1	3 39	1 38	24.1	2 44	1 13	24.0	1 50	0 49	24.0	0 55	0 24	24.0	246 294
67 113	5 31	2 21	23.1	4 36	1 57	23.1	3 41	1 34	23.1	2 46	1 10	23.0	1 50	0 47	23.0	0 55	0 23	23.0	247 293
68 112	5 34	2 15	22.1	4 38	1 53	22.1	3 42	1 30	22.0	2 47	1 07	22.0	1 51	0 45	22.0	0 56	0 22	22.0	248 292
69 111	5 36	2 09	21.1	4 40	1 48	21.1	3 44	1 26	21.0	2 48	1 05	21.0	1 52	0 43	21.0	0 56	0 22	21.0	249 291
70 110	5 38	2 04	20.1	4 42	1 43	20.1	3 46	1 22	20.0	2 49	1 02	20.0	1 53	0 41	20.0	0 56	0 21	20.0	250 290
71 109	5 40	1 58	19.1	4 44	1 38	19.1	3 47	1 18	19.0	2 50	0 59	19.0	1 53	0 39	19.0	0 57	0 20	19.0	251 289
72 108	5 42	1 52	18.1	4 45	1 33	18.1	3 48	1 14	18.0	2 51	0 56	18.0	1 54	0 37	18.0	0 57	0 19	18.0	252 288
73 107	5 44	1 46	17.1	4 47	1 28	17.1	3 49	1 10	17.0	2 52	0 53	17.0	1 55	0 35	17.0	0 57	0 18	17.0	253 287
74 106	5 46	1 40	16.1	4 48	1 23	16.1	3 51	1 06	16.0	2 53	0 50	16.0	1 55	0 33	16.0	0 58	0 17	16.0	254 286
75 105	5 48	1 33	15.1	4 50	1 18	15.1	3 52	1 02	15.0	2 54	0 47	15.0	1 56	0 31	15.0	0 58	0 16	15.0	255 285
76 104	5 49	1 27	14.1	4 51	1 13	14.1	3 53	0 58	14.0	2 55	0 44	14.0	1 56	0 29	14.0	0 58	0 15	14.0	256 284
77 103	5 51	1 21	13.1	4 52	1 08	13.0	3 54	0 54	13.0	2 55	0 41	13.0	1 57	0 27	13.0	0 58	0 13	13.0	257 283
78 102	5 52	1 15	12.1	4 53	1 03	12.0	3 55	0 50	12.0	2 56	0 37	12.0	1 57	0 25	12.0	0 59	0 12	12.0	258 282
79 101	5 53	1 09	11.1	4 54	0 57	11.0	3 56	0 46	11.0	2 57	0 34	11.0	1 58	0 23	11.0	0 59	0 11	11.0	259 281
80 100	5 55	1 03	10.1	4 55	0 52	10.0	3 56	0 42	10.0	2 57	0 31	10.0	1 58	0 21	10.0	0 59	0 10	10.0	260 280
81 99	5 56	0 57	9.0	4 56	0 47	9.0	3 57	0 38	9.0	2 58	0 28	9.0	1 59	0 19	9.0	0 59	0 09	9.0	261 279
82 98	5 56	0 50	8.0	4 57	0 42	8.0	3 58	0 33	8.0	2 58	0 25	8.0	1 59	0 17	8.0	0 59	0 08	8.0	262 278
83 97	5 57	0 44	7.0	4 58	0 37	7.0	3 58	0 29	7.0	2 59	0 22	7.0	1 59	0 15	7.0	1 00	0 07	7.0	263 277
84 96	5 58	0 38	6.0	4 58	0 31	6.0	3 59	0 25	6.0	2 59	0 19	6.0	1 59	0 13	6.0	1 00	0 06	6.0	264 276
85 95	5 59	0 31	5.0	4 59	0 26	5.0	3 59	0 21	5.0	2 59	0 16	5.0	2 00	0 10	5.0	1 00	0 05	5.0	265 275
86 94	5 59	0 25	4.0	4 59	0 21	4.0	3 59	0 17	4.0	3 00	0 13	4.0	2 00	0 08	4.0	1 00	0 04	4.0	266 274
87 93	6 00	0 19	3.0	5 00	0 16	3.0	4 00	0 13	3.0	3 00	0 09	3.0	2 00	0 06	3.0	1 00	0 03	3.0	267 273
88 92	6 00	0 13	2.0	5 00	0 10	2.0	4 00	0 08	2.0	3 00	0 06	2.0	2 00	0 04	2.0	1 00	0 02	2.0	268 272
89 91	6 00	0 06	1.0	5 00	0 05	1.0	4 00	0 04	1.0	3 00	0 03	1.0	2 00	0 02	1.0	1 00	0 01	1.0	269 271
90 90	6 00	0 00	0.0	5 00	0 00	0.0	4 00	0 00	0.0	3 00	0 00	0.0	2 00	0 00	0.0	1 00	0 00	0.0	270 270

N. Lat.: for LHA > 180°... $Z_n = Z$
for LHA < 180°... $Z_n = 360° - Z$

S. Lat.: for LHA > 180°... $Z_n = 180° - Z$
for LHA < 180°... $Z_n = 180° + Z$

F < 90° and F' > 29' : (−) corr.
F > 90° and F' < 30' : (−) corr.

AUXILIARY TABLE

A' < 30' : (−) corr.

F' / A'	1' 59	2' 58	3' 57	4' 56	5' 55	6' 54	7' 53	8' 52	9' 51	10' 50	11' 49	12' 48	13' 47	14' 46	15' 45	16' 44	17' 43	18' 42	19' 41	20' 40	21' 39	22' 38	23' 37	24' 36	25' 35	26' 34	27' 33	28' 32	29' 31	30' 30	F' / A'
P °	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	Z_2 °
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	89
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	88
3	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	87
4	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	86
5	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	85
6	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	84
7	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	83
8	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	82
9	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5	81
10	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	80
11	0	0	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	79
12	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	78
13	0	0	1	1	1	1	2	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	6	6	7	7	77
14	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	76
15	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	8	8	75
16	0	1	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	7	7	8	8	8	74
17	0	1	1	1	1	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	7	8	8	8	8	9	73
18	0	1	1	1	2	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	9	9	9	72
19	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	9	9	9	10	71
20	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	10	70
21	0	1	1	1	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	10	11	69
22	0	1	1	1	2	2	3	3	3	4	4	4	5	5	6	6	6	7	7	7	8	8	9	9	9	10	10	10	11	11	68
23	0	1	1	2	2	2	3	3	4	4	4	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	11	12	67
24	0	1	1	2	2	2	3	3	4	4	4	5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	11	12	12	66
25	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7	7	8	8	8	9	9	10	10	11	11	11	12	12	13	65
26	0	1	1	2	2	3	3	4	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11	11	11	12	12	13	13	64
27	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8	9	9	10	10	10	11	11	12	12	13	13	14	63
28	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	8	9	9	10	10	11	11	12	12	13	13	14	14	62
29	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	61
30	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	60
31	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	59
32	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	10	10	11	11	12	12	13	13	14	14	15	15	16	58
33	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10	11	11	12	13	13	14	14	15	15	16	16	57
34	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	10	10	11	11	12	12	13	13	14	15	15	16	16	17	56
35	1	1	2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	10	11	11	12	13	13	14	14	15	15	16	17	17	55
36	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	11	11	12	12	13	14	14	15	15	16	16	17	18	54
37	1	1	2	2	3	4	4	5	5	6	7	7	8	8	9	10	10	11	11	12	13	13	14	14	15	16	16	17	17	18	53
38	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	15	16	17	17	18	18	52
39	1	1	2	3	3	4	4	5	6	6	7	8	8	9	9	10	11	11	12	13	13	14	14	15	16	16	17	18	18	19	51
40	1	1	2	3	3	4	4	5	6	6	7	8	8	9	10	10	11	12	12	13	13	14	15	15	16	17	17	18	19	19	50

F' / A'	1' 59	2' 58	3' 57	4' 56	5' 55	6' 54	7' 53	8' 52	9' 51	10' 50	11' 49	12' 48	13' 47	14' 46	15' 45	16' 44	17' 43	18' 42	19' 41	20' 40	21' 39	22' 38	23' 37	24' 36	25' 35	26' 34	27' 33	28' 32	29' 31	30' 30	F' / A'
P °	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	Z_2 °
41	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	16	16	17	18	18	19	20	49
42	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13	13	14	15	15	16	17	17	18	19	19	20	48
43	1	1	2	3	3	4	5	5	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16	17	18	18	19	20	20	47
44	1	1	2	3	3	4	5	6	6	7	8	8	9	10	10	11	12	13	13	14	15	15	16	17	17	18	19	19	20	21	46
45	1	1	2	3	4	4	5	6	6	7	8	8	9	10	11	11	12	13	13	14	15	16	16	17	18	18	19	20	21	21	45
46	1	1	2	3	4	4	5	6	6	7	8	9	9	10	11	12	12	13	14	14	15	16	17	17	18	19	19	20	21	22	44
47	1	1	2	3	4	4	5	6	7	7	8	9	10	10	11	12	12	13	14	15	15	16	17	18	18	19	20	20	21	22	43
48	1	1	2	3	4	4	5	6	7	7	8	9	10	10	11	12	13	13	14	15	16	16	17	18	19	19	20	21	22	22	42
49	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14	15	16	17	17	18	19	20	20	21	22	23	41
50	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	15	15	16	17	18	18	19	20	21	21	22	23	40
51	1	2	2	3	4	5	5	6	7	8	9	9	10	11	12	12	13	14	15	16	16	17	18	19	19	20	21	22	23	23	39
52	1	2	2	3	4	5	6	6	7	8	9	9	10	11	12	13	13	14	15	16	17	17	18	19	20	20	21	22	23	24	38
53	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13	14	14	15	16	17	18	18	19	20	21	22	22	23	24	37
54	1	2	2	3	4	5	6	6	7	8	9	10	11	11	12	13	14	15	15	16	17	18	19	19	20	21	22	23	23	24	36
55	1	2	2	3	4	5	6	7	7	8	9	10	11	11	12	13	14	15	16	16	17	18	19	20	20	21	22	23	24	25	35
56	1	2	2	3	4	5	6	7	7	8	9	10	11	12	12	13	14	15	16	17	17	18	19	20	21	22	22	23	24	25	34
57	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	13	14	15	16	17	18	18	19	20	21	22	23	23	24	25	33
58	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	14	15	16	17	18	19	20	20	21	22	23	24	25	25	32
59	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14	15	15	16	17	18	19	20	21	21	22	23	24	25	26	31
60	1	2	3	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	23	24	25	26	30
61	1	2	3	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	17	18	19	20	21	22	23	24	24	25	26	29
62	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	26	28
63	1	2	3	4	4	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	20	21	22	23	24	25	26	27	27
64	1	2	3	4	4	5	6	7	8	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	22	23	24	25	26	27	26
65	1	2	3	4	5	5	6	7	8	9	10	11	12	13	14	15	15	16	17	18	19	20	21	22	23	24	24	25	26	27	25
66	1	2	3	4	5	5	6	7	8	9	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	24	25	26	26	27	24
67	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	28	23
68	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	22
69	1	2	3	4	5	6	7	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	21
70	1	2	3	4	5	6	7	8	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23	24	25	26	27	28	20
71	1	2	3	4	5	6	7	8	9	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	26	27	28	19
72	1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	18
73	1	2	3	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	17
74	1	2	3	4	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	16
75	1	2	3	4	5	6	7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	15
76	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	24	25	26	27	28	29	14
77	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	13
78	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	22	23	24	25	26	27	28	29	12
79	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	27	28	29	11
80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	10

For P > 80°, use 80°.

For Z_2 < 10°, use 10°.

USE OF CONCISE SIGHT REDUCTION TABLES (continued)

4. *Example.* (b) Required the altitude and azimuth of *Vega* on 1992 July 29 at UT $4^h\ 49^m$ from the estimated position 152° west, 15° south.

1. Assumed latitude	$Lat = 15°$ S		
From the almanac	$GHA = 100°\ 10'$		
Assumed longitude	$152°\ 10'$ W		
Local hour angle	$LHA = 308$		
2. Reduction table, 1st entry $(Lat, LHA) = (15, 308)$	$A = 49\ 34$	$A° = 50$, $A' = 34$	
	$B = +66\ 29$	$Z_1 = +71{\cdot}7$,	$LHA > 270°$
3. From the almanac	$Dec = -38\ 47$		*Lat* and *Dec* contrary
Sum $= B + Dec$	$F = +27\ 42$	$F° = 28$, $F' = 42$	
4. Reduction table, 2nd entry $(A°, F°) = (50, 28)$	$H = 17\ 34$	$P° = 37$	
		$Z_2 = 67{\cdot}8$	
5. Auxiliary table, 1st entry $(F', P°) = (42, 37)$	$corr_1 = -11$		$F < 90°$, $F' > 29'$
Sum	$17\ 23$		
6. Auxiliary table, 2nd entry $(A', Z_2°) = (34, 68)$	$corr_2 = +10$		$A' > 30'$
7. Sum = computed altitude	$H_C = +17°\ 33'$		$F > 0°$
8. Azimuth, first component	$Z_1 = +71{\cdot}7$		same sign as B
second component,	$Z_2 = +67{\cdot}8$		$F < 90°$, $F > 0°$
Sum = azimuth angle	$Z = 139{\cdot}5$		
True azimuth	$Z_n = 40°$		S *Lat*, $LHA > 180°$

0°–59°		60°–119°		120°–179°		180°–239°		240°–299°		300°–359°			0′·00	0′·25	0′·50	0′·75
°	h m	°	h m	°	h m	°	h m	°	h m	°	h m	′	m s	m s	m s	m s
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00	0	0 00	0 01	0 02	0 03
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04	1	0 04	0 05	0 06	0 07
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08	2	0 08	0 09	0 10	0 11
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12	3	0 12	0 13	0 14	0 15
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16	4	0 16	0 17	0 18	0 19
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20	5	0 20	0 21	0 22	0 23
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24	6	0 24	0 25	0 26	0 27
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28	7	0 28	0 29	0 30	0 31
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32	8	0 32	0 33	0 34	0 35
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36	9	0 36	0 37	0 38	0 39
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40	10	0 40	0 41	0 42	0 43
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44	11	0 44	0 45	0 46	0 47
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48	12	0 48	0 49	0 50	0 51
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52	13	0 52	0 53	0 54	0 55
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56	14	0 56	0 57	0 58	0 59
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00	15	1 00	1 01	1 02	1 03
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04	16	1 04	1 05	1 06	1 07
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08	17	1 08	1 09	1 10	1 11
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12	18	1 12	1 13	1 14	1 15
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16	19	1 16	1 17	1 18	1 19
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20	20	1 20	1 21	1 22	1 23
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24	21	1 24	1 25	1 26	1 27
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28	22	1 28	1 29	1 30	1 31
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32	23	1 32	1 33	1 34	1 35
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36	24	1 36	1 37	1 38	1 39
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40	25	1 40	1 41	1 42	1 43
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44	26	1 44	1 45	1 46	1 47
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48	27	1 48	1 49	1 50	1 51
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52	28	1 52	1 53	1 54	1 55
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56	29	1 56	1 57	1 58	1 59
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00	30	2 00	2 01	2 02	2 03
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04	31	2 04	2 05	2 06	2 07
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08	32	2 08	2 09	2 10	2 11
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12	33	2 12	2 13	2 14	2 15
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16	34	2 16	2 17	2 18	2 19
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20	35	2 20	2 21	2 22	2 23
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24	36	2 24	2 25	2 26	2 27
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28	37	2 28	2 29	2 30	2 31
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32	38	2 32	2 33	2 34	2 35
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36	39	2 36	2 37	2 38	2 39
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40	40	2 40	2 41	2 42	2 43
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44	41	2 44	2 45	2 46	2 47
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48	42	2 48	2 49	2 50	2 51
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52	43	2 52	2 53	2 54	2 55
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56	44	2 56	2 57	2 58	2 59
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00	45	3 00	3 01	3 02	3 03
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04	46	3 04	3 05	3 06	3 07
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08	47	3 08	3 09	3 10	3 11
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12	48	3 12	3 13	3 14	3 15
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16	49	3 16	3 17	3 18	3 19
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20	50	3 20	3 21	3 22	3 23
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24	51	3 24	3 25	3 26	3 27
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28	52	3 28	3 29	3 30	3 31
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32	53	3 32	3 33	3 34	3 35
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36	54	3 36	3 37	3 38	3 39
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40	55	3 40	3 41	3 42	3 43
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44	56	3 44	3 45	3 46	3 47
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48	57	3 48	3 49	3 50	3 51
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52	58	3 52	3 53	3 54	3 55
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56	59	3 56	3 57	3 58	3 59

The above table is for converting expressions in arc to their equivalent in time; its main use in this Almanac is for the conversion of longitude for application to L.M.T. (*added* if *west*, *subtracted* if *east*) to give UT or vice versa, particularly in the case of sunrise, sunset, etc.

0	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	0 00·0	0 00·0	0 00·0	0·0 0·0	6·0 0·1	12·0 0·1
01	0 00·3	0 00·3	0 00·2	0·1 0·0	6·1 0·1	12·1 0·1
02	0 00·5	0 00·5	0 00·5	0·2 0·0	6·2 0·1	12·2 0·1
03	0 00·8	0 00·8	0 00·7	0·3 0·0	6·3 0·1	12·3 0·1
04	0 01·0	0 01·0	0 01·0	0·4 0·0	6·4 0·1	12·4 0·1
05	0 01·3	0 01·3	0 01·2	0·5 0·0	6·5 0·1	12·5 0·1
06	0 01·5	0 01·5	0 01·4	0·6 0·0	6·6 0·1	12·6 0·1
07	0 01·8	0 01·8	0 01·7	0·7 0·0	6·7 0·1	12·7 0·1
08	0 02·0	0 02·0	0 01·9	0·8 0·0	6·8 0·1	12·8 0·1
09	0 02·3	0 02·3	0 02·1	0·9 0·0	6·9 0·1	12·9 0·1
10	0 02·5	0 02·5	0 02·4	1·0 0·0	7·0 0·1	13·0 0·1
11	0 02·8	0 02·8	0 02·6	1·1 0·0	7·1 0·1	13·1 0·1
12	0 03·0	0 03·0	0 02·9	1·2 0·0	7·2 0·1	13·2 0·1
13	0 03·3	0 03·3	0 03·1	1·3 0·0	7·3 0·1	13·3 0·1
14	0 03·5	0 03·5	0 03·3	1·4 0·0	7·4 0·1	13·4 0·1
15	0 03·8	0 03·8	0 03·6	1·5 0·0	7·5 0·1	13·5 0·1
16	0 04·0	0 04·0	0 03·8	1·6 0·0	7·6 0·1	13·6 0·1
17	0 04·3	0 04·3	0 04·1	1·7 0·0	7·7 0·1	13·7 0·1
18	0 04·5	0 04·5	0 04·3	1·8 0·0	7·8 0·1	13·8 0·1
19	0 04·8	0 04·8	0 04·5	1·9 0·0	7·9 0·1	13·9 0·1
20	0 05·0	0 05·0	0 04·8	2·0 0·0	8·0 0·1	14·0 0·1
21	0 05·3	0 05·3	0 05·0	2·1 0·0	8·1 0·1	14·1 0·1
22	0 05·5	0 05·5	0 05·2	2·2 0·0	8·2 0·1	14·2 0·1
23	0 05·8	0 05·8	0 05·5	2·3 0·0	8·3 0·1	14·3 0·1
24	0 06·0	0 06·0	0 05·7	2·4 0·0	8·4 0·1	14·4 0·1
25	0 06·3	0 06·3	0 06·0	2·5 0·0	8·5 0·1	14·5 0·1
26	0 06·5	0 06·5	0 06·2	2·6 0·0	8·6 0·1	14·6 0·1
27	0 06·8	0 06·8	0 06·4	2·7 0·0	8·7 0·1	14·7 0·1
28	0 07·0	0 07·0	0 06·7	2·8 0·0	8·8 0·1	14·8 0·1
29	0 07·3	0 07·3	0 06·9	2·9 0·0	8·9 0·1	14·9 0·1
30	0 07·5	0 07·5	0 07·2	3·0 0·0	9·0 0·1	15·0 0·1
31	0 07·8	0 07·8	0 07·4	3·1 0·0	9·1 0·1	15·1 0·1
32	0 08·0	0 08·0	0 07·6	3·2 0·0	9·2 0·1	15·2 0·1
33	0 08·3	0 08·3	0 07·9	3·3 0·0	9·3 0·1	15·3 0·1
34	0 08·5	0 08·5	0 08·1	3·4 0·0	9·4 0·1	15·4 0·1
35	0 08·8	0 08·8	0 08·4	3·5 0·0	9·5 0·1	15·5 0·1
36	0 09·0	0 09·0	0 08·6	3·6 0·0	9·6 0·1	15·6 0·1
37	0 09·3	0 09·3	0 08·8	3·7 0·0	9·7 0·1	15·7 0·1
38	0 09·5	0 09·5	0 09·1	3·8 0·0	9·8 0·1	15·8 0·1
39	0 09·8	0 09·8	0 09·3	3·9 0·0	9·9 0·1	15·9 0·1
40	0 10·0	0 10·0	0 09·5	4·0 0·0	10·0 0·1	16·0 0·1
41	0 10·3	0 10·3	0 09·8	4·1 0·0	10·1 0·1	16·1 0·1
42	0 10·5	0 10·5	0 10·0	4·2 0·0	10·2 0·1	16·2 0·1
43	0 10·8	0 10·8	0 10·3	4·3 0·0	10·3 0·1	16·3 0·1
44	0 11·0	0 11·0	0 10·5	4·4 0·0	10·4 0·1	16·4 0·1
45	0 11·3	0 11·3	0 10·7	4·5 0·0	10·5 0·1	16·5 0·1
46	0 11·5	0 11·5	0 11·0	4·6 0·0	10·6 0·1	16·6 0·1
47	0 11·8	0 11·8	0 11·2	4·7 0·0	10·7 0·1	16·7 0·1
48	0 12·0	0 12·0	0 11·5	4·8 0·0	10·8 0·1	16·8 0·1
49	0 12·3	0 12·3	0 11·7	4·9 0·0	10·9 0·1	16·9 0·1
50	0 12·5	0 12·5	0 11·9	5·0 0·0	11·0 0·1	17·0 0·1
51	0 12·8	0 12·8	0 12·2	5·1 0·0	11·1 0·1	17·1 0·1
52	0 13·0	0 13·0	0 12·4	5·2 0·0	11·2 0·1	17·2 0·1
53	0 13·3	0 13·3	0 12·6	5·3 0·0	11·3 0·1	17·3 0·1
54	0 13·5	0 13·5	0 12·9	5·4 0·0	11·4 0·1	17·4 0·1
55	0 13·8	0 13·8	0 13·1	5·5 0·0	11·5 0·1	17·5 0·1
56	0 14·0	0 14·0	0 13·4	5·6 0·0	11·6 0·1	17·6 0·1
57	0 14·3	0 14·3	0 13·6	5·7 0·0	11·7 0·1	17·7 0·1
58	0 14·5	0 14·5	0 13·8	5·8 0·0	11·8 0·1	17·8 0·1
59	0 14·8	0 14·8	0 14·1	5·9 0·0	11·9 0·1	17·9 0·1
60	0 15·0	0 15·0	0 14·3	6·0 0·1	12·0 0·1	18·0 0·2

1	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	0 15·0	0 15·0	0 14·3	0·0 0·0	6·0 0·2	12·0 0·3
01	0 15·3	0 15·3	0 14·6	0·1 0·0	6·1 0·2	12·1 0·3
02	0 15·5	0 15·5	0 14·8	0·2 0·0	6·2 0·2	12·2 0·3
03	0 15·8	0 15·8	0 15·0	0·3 0·0	6·3 0·2	12·3 0·3
04	0 16·0	0 16·0	0 15·3	0·4 0·0	6·4 0·2	12·4 0·3
05	0 16·3	0 16·3	0 15·5	0·5 0·0	6·5 0·2	12·5 0·3
06	0 16·5	0 16·5	0 15·7	0·6 0·0	6·6 0·2	12·6 0·3
07	0 16·8	0 16·8	0 16·0	0·7 0·0	6·7 0·2	12·7 0·3
08	0 17·0	0 17·0	0 16·2	0·8 0·0	6·8 0·2	12·8 0·3
09	0 17·3	0 17·3	0 16·5	0·9 0·0	6·9 0·2	12·9 0·3
10	0 17·5	0 17·5	0 16·7	1·0 0·0	7·0 0·2	13·0 0·3
11	0 17·8	0 17·8	0 16·9	1·1 0·0	7·1 0·2	13·1 0·3
12	0 18·0	0 18·0	0 17·2	1·2 0·0	7·2 0·2	13·2 0·3
13	0 18·3	0 18·3	0 17·4	1·3 0·0	7·3 0·2	13·3 0·3
14	0 18·5	0 18·6	0 17·7	1·4 0·0	7·4 0·2	13·4 0·3
15	0 18·8	0 18·8	0 17·9	1·5 0·0	7·5 0·2	13·5 0·3
16	0 19·0	0 19·1	0 18·1	1·6 0·0	7·6 0·2	13·6 0·3
17	0 19·3	0 19·3	0 18·4	1·7 0·0	7·7 0·2	13·7 0·3
18	0 19·5	0 19·6	0 18·6	1·8 0·0	7·8 0·2	13·8 0·3
19	0 19·8	0 19·8	0 18·9	1·9 0·0	7·9 0·2	13·9 0·3
20	0 20·0	0 20·1	0 19·1	2·0 0·1	8·0 0·2	14·0 0·4
21	0 20·3	0 20·3	0 19·3	2·1 0·1	8·1 0·2	14·1 0·4
22	0 20·5	0 20·6	0 19·6	2·2 0·1	8·2 0·2	14·2 0·4
23	0 20·8	0 20·8	0 19·8	2·3 0·1	8·3 0·2	14·3 0·4
24	0 21·0	0 21·1	0 20·0	2·4 0·1	8·4 0·2	14·4 0·4
25	0 21·3	0 21·3	0 20·3	2·5 0·1	8·5 0·2	14·5 0·4
26	0 21·5	0 21·6	0 20·5	2·6 0·1	8·6 0·2	14·6 0·4
27	0 21·8	0 21·8	0 20·8	2·7 0·1	8·7 0·2	14·7 0·4
28	0 22·0	0 22·1	0 21·0	2·8 0·1	8·8 0·2	14·8 0·4
29	0 22·3	0 22·3	0 21·2	2·9 0·1	8·9 0·2	14·9 0·4
30	0 22·5	0 22·6	0 21·5	3·0 0·1	9·0 0·2	15·0 0·4
31	0 22·8	0 22·8	0 21·7	3·1 0·1	9·1 0·2	15·1 0·4
32	0 23·0	0 23·1	0 22·0	3·2 0·1	9·2 0·2	15·2 0·4
33	0 23·3	0 23·3	0 22·2	3·3 0·1	9·3 0·2	15·3 0·4
34	0 23·5	0 23·6	0 22·4	3·4 0·1	9·4 0·2	15·4 0·4
35	0 23·8	0 23·8	0 22·7	3·5 0·1	9·5 0·2	15·5 0·4
36	0 24·0	0 24·1	0 22·9	3·6 0·1	9·6 0·2	15·6 0·4
37	0 24·3	0 24·3	0 23·1	3·7 0·1	9·7 0·2	15·7 0·4
38	0 24·5	0 24·6	0 23·4	3·8 0·1	9·8 0·2	15·8 0·4
39	0 24·8	0 24·8	0 23·6	3·9 0·1	9·9 0·2	15·9 0·4
40	0 25·0	0 25·1	0 23·9	4·0 0·1	10·0 0·3	16·0 0·4
41	0 25·3	0 25·3	0 24·1	4·1 0·1	10·1 0·3	16·1 0·4
42	0 25·5	0 25·6	0 24·3	4·2 0·1	10·2 0·3	16·2 0·4
43	0 25·8	0 25·8	0 24·6	4·3 0·1	10·3 0·3	16·3 0·4
44	0 26·0	0 26·1	0 24·8	4·4 0·1	10·4 0·3	16·4 0·4
45	0 26·3	0 26·3	0 25·1	4·5 0·1	10·5 0·3	16·5 0·4
46	0 26·5	0 26·6	0 25·3	4·6 0·1	10·6 0·3	16·6 0·4
47	0 26·8	0 26·8	0 25·5	4·7 0·1	10·7 0·3	16·7 0·4
48	0 27·0	0 27·1	0 25·8	4·8 0·1	10·8 0·3	16·8 0·4
49	0 27·3	0 27·3	0 26·0	4·9 0·1	10·9 0·3	16·9 0·4
50	0 27·5	0 27·6	0 26·2	5·0 0·1	11·0 0·3	17·0 0·4
51	0 27·8	0 27·8	0 26·5	5·1 0·1	11·1 0·3	17·1 0·4
52	0 28·0	0 28·1	0 26·7	5·2 0·1	11·2 0·3	17·2 0·4
53	0 28·3	0 28·3	0 27·0	5·3 0·1	11·3 0·3	17·3 0·4
54	0 28·5	0 28·6	0 27·2	5·4 0·1	11·4 0·3	17·4 0·4
55	0 28·8	0 28·8	0 27·4	5·5 0·1	11·5 0·3	17·5 0·4
56	0 29·0	0 29·1	0 27·7	5·6 0·1	11·6 0·3	17·6 0·4
57	0 29·3	0 29·3	0 27·9	5·7 0·1	11·7 0·3	17·7 0·4
58	0 29·5	0 29·6	0 28·2	5·8 0·1	11·8 0·3	17·8 0·4
59	0 29·8	0 29·8	0 28·4	5·9 0·1	11·9 0·3	17·9 0·4
60	0 30·0	0 30·1	0 28·6	6·0 0·2	12·0 0·3	18·0 0·5

2	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	0 30·0	0 30·1	0 28·6	0·0 0·0	6·0 0·3	12·0 0·5
01	0 30·3	0 30·3	0 28·9	0·1 0·0	6·1 0·3	12·1 0·5
02	0 30·5	0 30·6	0 29·1	0·2 0·0	6·2 0·3	12·2 0·5
03	0 30·8	0 30·8	0 29·3	0·3 0·0	6·3 0·3	12·3 0·5
04	0 31·0	0 31·1	0 29·6	0·4 0·0	6·4 0·3	12·4 0·5
05	0 31·3	0 31·3	0 29·8	0·5 0·0	6·5 0·3	12·5 0·5
06	0 31·5	0 31·6	0 30·1	0·6 0·0	6·6 0·3	12·6 0·5
07	0 31·8	0 31·8	0 30·3	0·7 0·0	6·7 0·3	12·7 0·5
08	0 32·0	0 32·1	0 30·5	0·8 0·0	6·8 0·3	12·8 0·5
09	0 32·3	0 32·3	0 30·8	0·9 0·0	6·9 0·3	12·9 0·5
10	0 32·5	0 32·6	0 31·0	1·0 0·0	7·0 0·3	13·0 0·5
11	0 32·8	0 32·8	0 31·3	1·1 0·0	7·1 0·3	13·1 0·5
12	0 33·0	0 33·1	0 31·5	1·2 0·1	7·2 0·3	13·2 0·6
13	0 33·3	0 33·3	0 31·7	1·3 0·1	7·3 0·3	13·3 0·6
14	0 33·5	0 33·6	0 32·0	1·4 0·1	7·4 0·3	13·4 0·6
15	0 33·8	0 33·8	0 32·2	1·5 0·1	7·5 0·3	13·5 0·6
16	0 34·0	0 34·1	0 32·5	1·6 0·1	7·6 0·3	13·6 0·6
17	0 34·3	0 34·3	0 32·7	1·7 0·1	7·7 0·3	13·7 0·6
18	0 34·5	0 34·6	0 32·9	1·8 0·1	7·8 0·3	13·8 0·6
19	0 34·8	0 34·8	0 33·2	1·9 0·1	7·9 0·3	13·9 0·6
20	0 35·0	0 35·1	0 33·4	2·0 0·1	8·0 0·3	14·0 0·6
21	0 35·3	0 35·3	0 33·6	2·1 0·1	8·1 0·3	14·1 0·6
22	0 35·5	0 35·6	0 33·9	2·2 0·1	8·2 0·3	14·2 0·6
23	0 35·8	0 35·8	0 34·1	2·3 0·1	8·3 0·3	14·3 0·6
24	0 36·0	0 36·1	0 34·4	2·4 0·1	8·4 0·4	14·4 0·6
25	0 36·3	0 36·3	0 34·6	2·5 0·1	8·5 0·4	14·5 0·6
26	0 36·5	0 36·6	0 34·8	2·6 0·1	8·6 0·4	14·6 0·6
27	0 36·8	0 36·9	0 35·1	2·7 0·1	8·7 0·4	14·7 0·6
28	0 37·0	0 37·1	0 35·3	2·8 0·1	8·8 0·4	14·8 0·6
29	0 37·3	0 37·4	0 35·6	2·9 0·1	8·9 0·4	14·9 0·6
30	0 37·5	0 37·6	0 35·8	3·0 0·1	9·0 0·4	15·0 0·6
31	0 37·8	0 37·9	0 36·0	3·1 0·1	9·1 0·4	15·1 0·6
32	0 38·0	0 38·1	0 36·3	3·2 0·1	9·2 0·4	15·2 0·6
33	0 38·3	0 38·4	0 36·5	3·3 0·1	9·3 0·4	15·3 0·6
34	0 38·5	0 38·6	0 36·7	3·4 0·1	9·4 0·4	15·4 0·6
35	0 38·8	0 38·9	0 37·0	3·5 0·1	9·5 0·4	15·5 0·6
36	0 39·0	0 39·1	0 37·2	3·6 0·2	9·6 0·4	15·6 0·7
37	0 39·3	0 39·4	0 37·5	3·7 0·2	9·7 0·4	15·7 0·7
38	0 39·5	0 39·6	0 37·7	3·8 0·2	9·8 0·4	15·8 0·7
39	0 39·8	0 39·9	0 37·9	3·9 0·2	9·9 0·4	15·9 0·7
40	0 40·0	0 40·1	0 38·2	4·0 0·2	10·0 0·4	16·0 0·7
41	0 40·3	0 40·4	0 38·4	4·1 0·2	10·1 0·4	16·1 0·7
42	0 40·5	0 40·6	0 38·7	4·2 0·2	10·2 0·4	16·2 0·7
43	0 40·8	0 40·9	0 38·9	4·3 0·2	10·3 0·4	16·3 0·7
44	0 41·0	0 41·1	0 39·1	4·4 0·2	10·4 0·4	16·4 0·7
45	0 41·3	0 41·4	0 39·4	4·5 0·2	10·5 0·4	16·5 0·7
46	0 41·5	0 41·6	0 39·6	4·6 0·2	10·6 0·4	16·6 0·7
47	0 41·8	0 41·9	0 39·8	4·7 0·2	10·7 0·4	16·7 0·7
48	0 42·0	0 42·1	0 40·1	4·8 0·2	10·8 0·5	16·8 0·7
49	0 42·3	0 42·4	0 40·3	4·9 0·2	10·9 0·5	16·9 0·7
50	0 42·5	0 42·6	0 40·6	5·0 0·2	11·0 0·5	17·0 0·7
51	0 42·8	0 42·9	0 40·8	5·1 0·2	11·1 0·5	17·1 0·7
52	0 43·0	0 43·1	0 41·0	5·2 0·2	11·2 0·5	17·2 0·7
53	0 43·3	0 43·4	0 41·3	5·3 0·2	11·3 0·5	17·3 0·7
54	0 43·5	0 43·6	0 41·5	5·4 0·2	11·4 0·5	17·4 0·7
55	0 43·8	0 43·9	0 41·8	5·5 0·2	11·5 0·5	17·5 0·7
56	0 44·0	0 44·1	0 42·0	5·6 0·2	11·6 0·5	17·6 0·7
57	0 44·3	0 44·4	0 42·2	5·7 0·2	11·7 0·5	17·7 0·7
58	0 44·5	0 44·6	0 42·5	5·8 0·2	11·8 0·5	17·8 0·7
59	0 44·8	0 44·9	0 42·7	5·9 0·2	11·9 0·5	17·9 0·7
60	0 45·0	0 45·1	0 43·0	6·0 0·3	12·0 0·5	18·0 0·8

3	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	0 45·0	0 45·1	0 43·0	0·0 0·0	6·0 0·4	12·0 0·7
01	0 45·3	0 45·4	0 43·2	0·1 0·0	6·1 0·4	12·1 0·7
02	0 45·5	0 45·6	0 43·4	0·2 0·0	6·2 0·4	12·2 0·7
03	0 45·8	0 45·9	0 43·7	0·3 0·0	6·3 0·4	12·3 0·7
04	0 46·0	0 46·1	0 43·9	0·4 0·0	6·4 0·4	12·4 0·7
05	0 46·3	0 46·4	0 44·1	0·5 0·0	6·5 0·4	12·5 0·7
06	0 46·5	0 46·6	0 44·4	0·6 0·0	6·6 0·4	12·6 0·7
07	0 46·8	0 46·9	0 44·6	0·7 0·0	6·7 0·4	12·7 0·7
08	0 47·0	0 47·1	0 44·9	0·8 0·0	6·8 0·4	12·8 0·7
09	0 47·3	0 47·4	0 45·1	0·9 0·1	6·9 0·4	12·9 0·8
10	0 47·5	0 47·6	0 45·3	1·0 0·1	7·0 0·4	13·0 0·8
11	0 47·8	0 47·9	0 45·6	1·1 0·1	7·1 0·4	13·1 0·8
12	0 48·0	0 48·1	0 45·8	1·2 0·1	7·2 0·4	13·2 0·8
13	0 48·3	0 48·4	0 46·1	1·3 0·1	7·3 0·4	13·3 0·8
14	0 48·5	0 48·6	0 46·3	1·4 0·1	7·4 0·4	13·4 0·8
15	0 48·8	0 48·9	0 46·5	1·5 0·1	7·5 0·4	13·5 0·8
16	0 49·0	0 49·1	0 46·8	1·6 0·1	7·6 0·4	13·6 0·8
17	0 49·3	0 49·4	0 47·0	1·7 0·1	7·7 0·4	13·7 0·8
18	0 49·5	0 49·6	0 47·2	1·8 0·1	7·8 0·5	13·8 0·8
19	0 49·8	0 49·9	0 47·5	1·9 0·1	7·9 0·5	13·9 0·8
20	0 50·0	0 50·1	0 47·7	2·0 0·1	8·0 0·5	14·0 0·8
21	0 50·3	0 50·4	0 48·0	2·1 0·1	8·1 0·5	14·1 0·8
22	0 50·5	0 50·6	0 48·2	2·2 0·1	8·2 0·5	14·2 0·8
23	0 50·8	0 50·9	0 48·4	2·3 0·1	8·3 0·5	14·3 0·8
24	0 51·0	0 51·1	0 48·7	2·4 0·1	8·4 0·5	14·4 0·8
25	0 51·3	0 51·4	0 48·9	2·5 0·1	8·5 0·5	14·5 0·8
26	0 51·5	0 51·6	0 49·2	2·6 0·2	8·6 0·5	14·6 0·9
27	0 51·8	0 51·9	0 49·4	2·7 0·2	8·7 0·5	14·7 0·9
28	0 52·0	0 52·1	0 49·6	2·8 0·2	8·8 0·5	14·8 0·9
29	0 52·3	0 52·4	0 49·9	2·9 0·2	8·9 0·5	14·9 0·9
30	0 52·5	0 52·6	0 50·1	3·0 0·2	9·0 0·5	15·0 0·9
31	0 52·8	0 52·9	0 50·3	3·1 0·2	9·1 0·5	15·1 0·9
32	0 53·0	0 53·1	0 50·6	3·2 0·2	9·2 0·5	15·2 0·9
33	0 53·3	0 53·4	0 50·8	3·3 0·2	9·3 0·5	15·3 0·9
34	0 53·5	0 53·6	0 51·1	3·4 0·2	9·4 0·5	15·4 0·9
35	0 53·8	0 53·9	0 51·3	3·5 0·2	9·5 0·6	15·5 0·9
36	0 54·0	0 54·1	0 51·5	3·6 0·2	9·6 0·6	15·6 0·9
37	0 54·3	0 54·4	0 51·8	3·7 0·2	9·7 0·6	15·7 0·9
38	0 54·5	0 54·6	0 52·0	3·8 0·2	9·8 0·6	15·8 0·9
39	0 54·8	0 54·9	0 52·3	3·9 0·2	9·9 0·6	15·9 0·9
40	0 55·0	0 55·2	0 52·5	4·0 0·2	10·0 0·6	16·0 0·9
41	0 55·3	0 55·4	0 52·7	4·1 0·2	10·1 0·6	16·1 0·9
42	0 55·5	0 55·7	0 53·0	4·2 0·2	10·2 0·6	16·2 0·9
43	0 55·8	0 55·9	0 53·2	4·3 0·3	10·3 0·6	16·3 1·0
44	0 56·0	0 56·2	0 53·4	4·4 0·3	10·4 0·6	16·4 1·0
45	0 56·3	0 56·4	0 53·7	4·5 0·3	10·5 0·6	16·5 1·0
46	0 56·5	0 56·7	0 53·9	4·6 0·3	10·6 0·6	16·6 1·0
47	0 56·8	0 56·9	0 54·2	4·7 0·3	10·7 0·6	16·7 1·0
48	0 57·0	0 57·2	0 54·4	4·8 0·3	10·8 0·6	16·8 1·0
49	0 57·3	0 57·4	0 54·6	4·9 0·3	10·9 0·6	16·9 1·0
50	0 57·5	0 57·7	0 54·9	5·0 0·3	11·0 0·6	17·0 1·0
51	0 57·8	0 57·9	0 55·1	5·1 0·3	11·1 0·6	17·1 1·0
52	0 58·0	0 58·2	0 55·4	5·2 0·3	11·2 0·7	17·2 1·0
53	0 58·3	0 58·4	0 55·6	5·3 0·3	11·3 0·7	17·3 1·0
54	0 58·5	0 58·7	0 55·8	5·4 0·3	11·4 0·7	17·4 1·0
55	0 58·8	0 58·9	0 56·1	5·5 0·3	11·5 0·7	17·5 1·0
56	0 59·0	0 59·2	0 56·3	5·6 0·3	11·6 0·7	17·6 1·0
57	0 59·3	0 59·4	0 56·6	5·7 0·3	11·7 0·7	17·7 1·0
58	0 59·5	0 59·7	0 56·8	5·8 0·3	11·8 0·7	17·8 1·0
59	0 59·8	0 59·9	0 57·0	5·9 0·3	11·9 0·7	17·9 1·0
60	1 00·0	1 00·2	0 57·3	6·0 0·4	12·0 0·7	18·0 1·1

4	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 00·0	1 00·2	0 57·3	0·0	0·0	6·0	0·5	12·0	0·9
01	1 00·3	1 00·4	0 57·5	0·1	0·0	6·1	0·5	12·1	0·9
02	1 00·5	1 00·7	0 57·7	0·2	0·0	6·2	0·5	12·2	0·9
03	1 00·8	1 00·9	0 58·0	0·3	0·0	6·3	0·5	12·3	0·9
04	1 01·0	1 01·2	0 58·2	0·4	0·0	6·4	0·5	12·4	0·9
05	1 01·3	1 01·4	0 58·5	0·5	0·0	6·5	0·5	12·5	0·9
06	1 01·5	1 01·7	0 58·7	0·6	0·0	6·6	0·5	12·6	0·9
07	1 01·8	1 01·9	0 58·9	0·7	0·1	6·7	0·5	12·7	1·0
08	1 02·0	1 02·2	0 59·2	0·8	0·1	6·8	0·5	12·8	1·0
09	1 02·3	1 02·4	0 59·4	0·9	0·1	6·9	0·5	12·9	1·0
10	1 02·5	1 02·7	0 59·7	1·0	0·1	7·0	0·5	13·0	1·0
11	1 02·8	1 02·9	0 59·9	1·1	0·1	7·1	0·5	13·1	1·0
12	1 03·0	1 03·2	1 00·1	1·2	0·1	7·2	0·5	13·2	1·0
13	1 03·3	1 03·4	1 00·4	1·3	0·1	7·3	0·5	13·3	1·0
14	1 03·5	1 03·7	1 00·6	1·4	0·1	7·4	0·6	13·4	1·0
15	1 03·8	1 03·9	1 00·8	1·5	0·1	7·5	0·6	13·5	1·0
16	1 04·0	1 04·2	1 01·1	1·6	0·1	7·6	0·6	13·6	1·0
17	1 04·3	1 04·4	1 01·3	1·7	0·1	7·7	0·6	13·7	1·0
18	1 04·5	1 04·7	1 01·6	1·8	0·1	7·8	0·6	13·8	1·0
19	1 04·8	1 04·9	1 01·8	1·9	0·1	7·9	0·6	13·9	1·0
20	1 05·0	1 05·2	1 02·0	2·0	0·2	8·0	0·6	14·0	1·1
21	1 05·3	1 05·4	1 02·3	2·1	0·2	8·1	0·6	14·1	1·1
22	1 05·5	1 05·7	1 02·5	2·2	0·2	8·2	0·6	14·2	1·1
23	1 05·8	1 05·9	1 02·8	2·3	0·2	8·3	0·6	14·3	1·1
24	1 06·0	1 06·2	1 03·0	2·4	0·2	8·4	0·6	14·4	1·1
25	1 06·3	1 06·4	1 03·2	2·5	0·2	8·5	0·6	14·5	1·1
26	1 06·5	1 06·7	1 03·5	2·6	0·2	8·6	0·6	14·6	1·1
27	1 06·8	1 06·9	1 03·7	2·7	0·2	8·7	0·7	14·7	1·1
28	1 07·0	1 07·2	1 03·9	2·8	0·2	8·8	0·7	14·8	1·1
29	1 07·3	1 07·4	1 04·2	2·9	0·2	8·9	0·7	14·9	1·1
30	1 07·5	1 07·7	1 04·4	3·0	0·2	9·0	0·7	15·0	1·1
31	1 07·8	1 07·9	1 04·7	3·1	0·2	9·1	0·7	15·1	1·1
32	1 08·0	1 08·2	1 04·9	3·2	0·2	9·2	0·7	15·2	1·1
33	1 08·3	1 08·4	1 05·1	3·3	0·2	9·3	0·7	15·3	1·1
34	1 08·5	1 08·7	1 05·4	3·4	0·3	9·4	0·7	15·4	1·2
35	1 08·8	1 08·9	1 05·6	3·5	0·3	9·5	0·7	15·5	1·2
36	1 09·0	1 09·2	1 05·9	3·6	0·3	9·6	0·7	15·6	1·2
37	1 09·3	1 09·4	1 06·1	3·7	0·3	9·7	0·7	15·7	1·2
38	1 09·5	1 09·7	1 06·3	3·8	0·3	9·8	0·7	15·8	1·2
39	1 09·8	1 09·9	1 06·6	3·9	0·3	9·9	0·7	15·9	1·2
40	1 10·0	1 10·2	1 06·8	4·0	0·3	10·0	0·8	16·0	1·2
41	1 10·3	1 10·4	1 07·0	4·1	0·3	10·1	0·8	16·1	1·2
42	1 10·5	1 10·7	1 07·3	4·2	0·3	10·2	0·8	16·2	1·2
43	1 10·8	1 10·9	1 07·5	4·3	0·3	10·3	0·8	16·3	1·2
44	1 11·0	1 11·2	1 07·8	4·4	0·3	10·4	0·8	16·4	1·2
45	1 11·3	1 11·4	1 08·0	4·5	0·3	10·5	0·8	16·5	1·2
46	1 11·5	1 11·7	1 08·2	4·6	0·3	10·6	0·8	16·6	1·2
47	1 11·8	1 11·9	1 08·5	4·7	0·4	10·7	0·8	16·7	1·3
48	1 12·0	1 12·2	1 08·7	4·8	0·4	10·8	0·8	16·8	1·3
49	1 12·3	1 12·4	1 09·0	4·9	0·4	10·9	0·8	16·9	1·3
50	1 12·5	1 12·7	1 09·2	5·0	0·4	11·0	0·8	17·0	1·3
51	1 12·8	1 12·9	1 09·4	5·1	0·4	11·1	0·8	17·1	1·3
52	1 13·0	1 13·2	1 09·7	5·2	0·4	11·2	0·8	17·2	1·3
53	1 13·3	1 13·5	1 09·9	5·3	0·4	11·3	0·8	17·3	1·3
54	1 13·5	1 13·7	1 10·2	5·4	0·4	11·4	0·9	17·4	1·3
55	1 13·8	1 14·0	1 10·4	5·5	0·4	11·5	0·9	17·5	1·3
56	1 14·0	1 14·2	1 10·6	5·6	0·4	11·6	0·9	17·6	1·3
57	1 14·3	1 14·5	1 10·9	5·7	0·4	11·7	0·9	17·7	1·3
58	1 14·5	1 14·7	1 11·1	5·8	0·4	11·8	0·9	17·8	1·3
59	1 14·8	1 15·0	1 11·3	5·9	0·4	11·9	0·9	17·9	1·3
60	1 15·0	1 15·2	1 11·6	6·0	0·5	12·0	0·9	18·0	1·4

5	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 15·0	1 15·2	1 11·6	0·0	0·0	6·0	0·6	12·0	1·1
01	1 15·3	1 15·5	1 11·8	0·1	0·0	6·1	0·6	12·1	1·1
02	1 15·5	1 15·7	1 12·1	0·2	0·0	6·2	0·6	12·2	1·1
03	1 15·8	1 16·0	1 12·3	0·3	0·0	6·3	0·6	12·3	1·1
04	1 16·0	1 16·2	1 12·5	0·4	0·0	6·4	0·6	12·4	1·1
05	1 16·3	1 16·5	1 12·8	0·5	0·0	6·5	0·6	12·5	1·1
06	1 16·5	1 16·7	1 13·0	0·6	0·1	6·6	0·6	12·6	1·2
07	1 16·8	1 17·0	1 13·3	0·7	0·1	6·7	0·6	12·7	1·2
08	1 17·0	1 17·2	1 13·5	0·8	0·1	6·8	0·6	12·8	1·2
09	1 17·3	1 17·5	1 13·7	0·9	0·1	6·9	0·6	12·9	1·2
10	1 17·5	1 17·7	1 14·0	1·0	0·1	7·0	0·6	13·0	1·2
11	1 17·8	1 18·0	1 14·2	1·1	0·1	7·1	0·7	13·1	1·2
12	1 18·0	1 18·2	1 14·4	1·2	0·1	7·2	0·7	13·2	1·2
13	1 18·3	1 18·5	1 14·7	1·3	0·1	7·3	0·7	13·3	1·2
14	1 18·5	1 18·7	1 14·9	1·4	0·1	7·4	0·7	13·4	1·2
15	1 18·8	1 19·0	1 15·2	1·5	0·1	7·5	0·7	13·5	1·2
16	1 19·0	1 19·2	1 15·4	1·6	0·1	7·6	0·7	13·6	1·2
17	1 19·3	1 19·5	1 15·6	1·7	0·2	7·7	0·7	13·7	1·3
18	1 19·5	1 19·7	1 15·9	1·8	0·2	7·8	0·7	13·8	1·3
19	1 19·8	1 20·0	1 16·1	1·9	0·2	7·9	0·7	13·9	1·3
20	1 20·0	1 20·2	1 16·4	2·0	0·2	8·0	0·7	14·0	1·3
21	1 20·3	1 20·5	1 16·6	2·1	0·2	8·1	0·7	14·1	1·3
22	1 20·5	1 20·7	1 16·8	2·2	0·2	8·2	0·8	14·2	1·3
23	1 20·8	1 21·0	1 17·1	2·3	0·2	8·3	0·8	14·3	1·3
24	1 21·0	1 21·2	1 17·3	2·4	0·2	8·4	0·8	14·4	1·3
25	1 21·3	1 21·5	1 17·5	2·5	0·2	8·5	0·8	14·5	1·3
26	1 21·5	1 21·7	1 17·8	2·6	0·2	8·6	0·8	14·6	1·3
27	1 21·8	1 22·0	1 18·0	2·7	0·2	8·7	0·8	14·7	1·3
28	1 22·0	1 22·2	1 18·3	2·8	0·3	8·8	0·8	14·8	1·4
29	1 22·3	1 22·5	1 18·5	2·9	0·3	8·9	0·8	14·9	1·4
30	1 22·5	1 22·7	1 18·7	3·0	0·3	9·0	0·8	15·0	1·4
31	1 22·8	1 23·0	1 19·0	3·1	0·3	9·1	0·8	15·1	1·4
32	1 23·0	1 23·2	1 19·2	3·2	0·3	9·2	0·8	15·2	1·4
33	1 23·3	1 23·5	1 19·5	3·3	0·3	9·3	0·9	15·3	1·4
34	1 23·5	1 23·7	1 19·7	3·4	0·3	9·4	0·9	15·4	1·4
35	1 23·8	1 24·0	1 19·9	3·5	0·3	9·5	0·9	15·5	1·4
36	1 24·0	1 24·2	1 20·2	3·6	0·3	9·6	0·9	15·6	1·4
37	1 24·3	1 24·5	1 20·4	3·7	0·3	9·7	0·9	15·7	1·4
38	1 24·5	1 24·7	1 20·7	3·8	0·3	9·8	0·9	15·8	1·4
39	1 24·8	1 25·0	1 20·9	3·9	0·4	9·9	0·9	15·9	1·5
40	1 25·0	1 25·2	1 21·1	4·0	0·4	10·0	0·9	16·0	1·5
41	1 25·3	1 25·5	1 21·4	4·1	0·4	10·1	0·9	16·1	1·5
42	1 25·5	1 25·7	1 21·6	4·2	0·4	10·2	0·9	16·2	1·5
43	1 25·8	1 26·0	1 21·8	4·3	0·4	10·3	0·9	16·3	1·5
44	1 26·0	1 26·2	1 22·1	4·4	0·4	10·4	1·0	16·4	1·5
45	1 26·3	1 26·5	1 22·3	4·5	0·4	10·5	1·0	16·5	1·5
46	1 26·5	1 26·7	1 22·6	4·6	0·4	10·6	1·0	16·6	1·5
47	1 26·8	1 27·0	1 22·8	4·7	0·4	10·7	1·0	16·7	1·5
48	1 27·0	1 27·2	1 23·0	4·8	0·4	10·8	1·0	16·8	1·5
49	1 27·3	1 27·5	1 23·3	4·9	0·4	10·9	1·0	16·9	1·5
50	1 27·5	1 27·7	1 23·5	5·0	0·5	11·0	1·0	17·0	1·6
51	1 27·8	1 28·0	1 23·8	5·1	0·5	11·1	1·0	17·1	1·6
52	1 28·0	1 28·2	1 24·0	5·2	0·5	11·2	1·0	17·2	1·6
53	1 28·3	1 28·5	1 24·2	5·3	0·5	11·3	1·0	17·3	1·6
54	1 28·5	1 28·7	1 24·5	5·4	0·5	11·4	1·0	17·4	1·6
55	1 28·8	1 29·0	1 24·7	5·5	0·5	11·5	1·1	17·5	1·6
56	1 29·0	1 29·2	1 24·9	5·6	0·5	11·6	1·1	17·6	1·6
57	1 29·3	1 29·5	1 25·2	5·7	0·5	11·7	1·1	17·7	1·6
58	1 29·5	1 29·7	1 25·4	5·8	0·5	11·8	1·1	17·8	1·6
59	1 29·8	1 30·0	1 25·7	5·9	0·5	11·9	1·1	17·9	1·6
60	1 30·0	1 30·2	1 25·9	6·0	0·6	12·0	1·1	18·0	1·7

6	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 30·0	1 30·2	1 25·9	0·0	0·0	6·0	0·7	12·0	1·3
01	1 30·3	1 30·5	1 26·1	0·1	0·0	6·1	0·7	12·1	1·3
02	1 30·5	1 30·7	1 26·4	0·2	0·0	6·2	0·7	12·2	1·3
03	1 30·8	1 31·0	1 26·6	0·3	0·0	6·3	0·7	12·3	1·3
04	1 31·0	1 31·2	1 26·9	0·4	0·0	6·4	0·7	12·4	1·3
05	1 31·3	1 31·5	1 27·1	0·5	0·1	6·5	0·7	12·5	1·4
06	1 31·5	1 31·8	1 27·3	0·6	0·1	6·6	0·7	12·6	1·4
07	1 31·8	1 32·0	1 27·6	0·7	0·1	6·7	0·7	12·7	1·4
08	1 32·0	1 32·3	1 27·8	0·8	0·1	6·8	0·7	12·8	1·4
09	1 32·3	1 32·5	1 28·0	0·9	0·1	6·9	0·7	12·9	1·4
10	1 32·5	1 32·8	1 28·3	1·0	0·1	7·0	0·8	13·0	1·4
11	1 32·8	1 33·0	1 28·5	1·1	0·1	7·1	0·8	13·1	1·4
12	1 33·0	1 33·3	1 28·8	1·2	0·1	7·2	0·8	13·2	1·4
13	1 33·3	1 33·5	1 29·0	1·3	0·1	7·3	0·8	13·3	1·4
14	1 33·5	1 33·8	1 29·2	1·4	0·2	7·4	0·8	13·4	1·5
15	1 33·8	1 34·0	1 29·5	1·5	0·2	7·5	0·8	13·5	1·5
16	1 34·0	1 34·3	1 29·7	1·6	0·2	7·6	0·8	13·6	1·5
17	1 34·3	1 34·5	1 30·0	1·7	0·2	7·7	0·8	13·7	1·5
18	1 34·5	1 34·8	1 30·2	1·8	0·2	7·8	0·8	13·8	1·5
19	1 34·8	1 35·0	1 30·4	1·9	0·2	7·9	0·9	13·9	1·5
20	1 35·0	1 35·3	1 30·7	2·0	0·2	8·0	0·9	14·0	1·5
21	1 35·3	1 35·5	1 30·9	2·1	0·2	8·1	0·9	14·1	1·5
22	1 35·5	1 35·8	1 31·1	2·2	0·2	8·2	0·9	14·2	1·5
23	1 35·8	1 36·0	1 31·4	2·3	0·2	8·3	0·9	14·3	1·5
24	1 36·0	1 36·3	1 31·6	2·4	0·3	8·4	0·9	14·4	1·6
25	1 36·3	1 36·5	1 31·9	2·5	0·3	8·5	0·9	14·5	1·6
26	1 36·5	1 36·8	1 32·1	2·6	0·3	8·6	0·9	14·6	1·6
27	1 36·8	1 37·0	1 32·3	2·7	0·3	8·7	0·9	14·7	1·6
28	1 37·0	1 37·3	1 32·6	2·8	0·3	8·8	1·0	14·8	1·6
29	1 37·3	1 37·5	1 32·8	2·9	0·3	8·9	1·0	14·9	1·6
30	1 37·5	1 37·8	1 33·1	3·0	0·3	9·0	1·0	15·0	1·6
31	1 37·8	1 38·0	1 33·3	3·1	0·3	9·1	1·0	15·1	1·6
32	1 38·0	1 38·3	1 33·5	3·2	0·3	9·2	1·0	15·2	1·6
33	1 38·3	1 38·5	1 33·8	3·3	0·4	9·3	1·0	15·3	1·7
34	1 38·5	1 38·8	1 34·0	3·4	0·4	9·4	1·0	15·4	1·7
35	1 38·8	1 39·0	1 34·3	3·5	0·4	9·5	1·0	15·5	1·7
36	1 39·0	1 39·3	1 34·5	3·6	0·4	9·6	1·0	15·6	1·7
37	1 39·3	1 39·5	1 34·7	3·7	0·4	9·7	1·1	15·7	1·7
38	1 39·5	1 39·8	1 35·0	3·8	0·4	9·8	1·1	15·8	1·7
39	1 39·8	1 40·0	1 35·2	3·9	0·4	9·9	1·1	15·9	1·7
40	1 40·0	1 40·3	1 35·4	4·0	0·4	10·0	1·1	16·0	1·7
41	1 40·3	1 40·5	1 35·7	4·1	0·4	10·1	1·1	16·1	1·7
42	1 40·5	1 40·8	1 35·9	4·2	0·5	10·2	1·1	16·2	1·8
43	1 40·8	1 41·0	1 36·2	4·3	0·5	10·3	1·1	16·3	1·8
44	1 41·0	1 41·3	1 36·4	4·4	0·5	10·4	1·1	16·4	1·8
45	1 41·3	1 41·5	1 36·6	4·5	0·5	10·5	1·1	16·5	1·8
46	1 41·5	1 41·8	1 36·9	4·6	0·5	10·6	1·1	16·6	1·8
47	1 41·8	1 42·0	1 37·1	4·7	0·5	10·7	1·2	16·7	1·8
48	1 42·0	1 42·3	1 37·4	4·8	0·5	10·8	1·2	16·8	1·8
49	1 42·3	1 42·5	1 37·6	4·9	0·5	10·9	1·2	16·9	1·8
50	1 42·5	1 42·8	1 37·8	5·0	0·5	11·0	1·2	17·0	1·8
51	1 42·8	1 43·0	1 38·1	5·1	0·6	11·1	1·2	17·1	1·9
52	1 43·0	1 43·3	1 38·3	5·2	0·6	11·2	1·2	17·2	1·9
53	1 43·3	1 43·5	1 38·5	5·3	0·6	11·3	1·2	17·3	1·9
54	1 43·5	1 43·8	1 38·8	5·4	0·6	11·4	1·2	17·4	1·9
55	1 43·8	1 44·0	1 39·0	5·5	0·6	11·5	1·2	17·5	1·9
56	1 44·0	1 44·3	1 39·3	5·6	0·6	11·6	1·3	17·6	1·9
57	1 44·3	1 44·5	1 39·5	5·7	0·6	11·7	1·3	17·7	1·9
58	1 44·5	1 44·8	1 39·7	5·8	0·6	11·8	1·3	17·8	1·9
59	1 44·8	1 45·0	1 40·0	5·9	0·6	11·9	1·3	17·9	1·9
60	1 45·0	1 45·3	1 40·2	6·0	0·7	12·0	1·3	18·0	2·0

7	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 45·0	1 45·3	1 40·2	0·0	0·0	6·0	0·8	12·0	1·5
01	1 45·3	1 45·5	1 40·5	0·1	0·0	6·1	0·8	12·1	1·5
02	1 45·5	1 45·8	1 40·7	0·2	0·0	6·2	0·8	12·2	1·5
03	1 45·8	1 46·0	1 40·9	0·3	0·0	6·3	0·8	12·3	1·5
04	1 46·0	1 46·3	1 41·2	0·4	0·1	6·4	0·8	12·4	1·6
05	1 46·3	1 46·5	1 41·4	0·5	0·1	6·5	0·8	12·5	1·6
06	1 46·5	1 46·8	1 41·6	0·6	0·1	6·6	0·8	12·6	1·6
07	1 46·8	1 47·0	1 41·9	0·7	0·1	6·7	0·8	12·7	1·6
08	1 47·0	1 47·3	1 42·1	0·8	0·1	6·8	0·9	12·8	1·6
09	1 47·3	1 47·5	1 42·4	0·9	0·1	6·9	0·9	12·9	1·6
10	1 47·5	1 47·8	1 42·6	1·0	0·1	7·0	0·9	13·0	1·6
11	1 47·8	1 48·0	1 42·8	1·1	0·1	7·1	0·9	13·1	1·6
12	1 48·0	1 48·3	1 43·1	1·2	0·2	7·2	0·9	13·2	1·7
13	1 48·3	1 48·5	1 43·3	1·3	0·2	7·3	0·9	13·3	1·7
14	1 48·5	1 48·8	1 43·6	1·4	0·2	7·4	0·9	13·4	1·7
15	1 48·8	1 49·0	1 43·8	1·5	0·2	7·5	0·9	13·5	1·7
16	1 49·0	1 49·3	1 44·0	1·6	0·2	7·6	1·0	13·6	1·7
17	1 49·3	1 49·5	1 44·3	1·7	0·2	7·7	1·0	13·7	1·7
18	1 49·5	1 49·8	1 44·5	1·8	0·2	7·8	1·0	13·8	1·7
19	1 49·8	1 50·1	1 44·8	1·9	0·2	7·9	1·0	13·9	1·7
20	1 50·0	1 50·3	1 45·0	2·0	0·3	8·0	1·0	14·0	1·8
21	1 50·3	1 50·6	1 45·2	2·1	0·3	8·1	1·0	14·1	1·8
22	1 50·5	1 50·8	1 45·5	2·2	0·3	8·2	1·0	14·2	1·8
23	1 50·8	1 51·1	1 45·7	2·3	0·3	8·3	1·0	14·3	1·8
24	1 51·0	1 51·3	1 45·9	2·4	0·3	8·4	1·1	14·4	1·8
25	1 51·3	1 51·6	1 46·2	2·5	0·3	8·5	1·1	14·5	1·8
26	1 51·5	1 51·8	1 46·4	2·6	0·3	8·6	1·1	14·6	1·8
27	1 51·8	1 52·1	1 46·7	2·7	0·3	8·7	1·1	14·7	1·8
28	1 52·0	1 52·3	1 46·9	2·8	0·4	8·8	1·1	14·8	1·9
29	1 52·3	1 52·6	1 47·1	2·9	0·4	8·9	1·1	14·9	1·9
30	1 52·5	1 52·8	1 47·4	3·0	0·4	9·0	1·1	15·0	1·9
31	1 52·8	1 53·1	1 47·6	3·1	0·4	9·1	1·1	15·1	1·9
32	1 53·0	1 53·3	1 47·9	3·2	0·4	9·2	1·2	15·2	1·9
33	1 53·3	1 53·6	1 48·1	3·3	0·4	9·3	1·2	15·3	1·9
34	1 53·5	1 53·8	1 48·3	3·4	0·4	9·4	1·2	15·4	1·9
35	1 53·8	1 54·1	1 48·6	3·5	0·4	9·5	1·2	15·5	1·9
36	1 54·0	1 54·3	1 48·8	3·6	0·5	9·6	1·2	15·6	2·0
37	1 54·3	1 54·6	1 49·0	3·7	0·5	9·7	1·2	15·7	2·0
38	1 54·5	1 54·8	1 49·3	3·8	0·5	9·8	1·2	15·8	2·0
39	1 54·8	1 55·1	1 49·5	3·9	0·5	9·9	1·2	15·9	2·0
40	1 55·0	1 55·3	1 49·8	4·0	0·5	10·0	1·3	16·0	2·0
41	1 55·3	1 55·6	1 50·0	4·1	0·5	10·1	1·3	16·1	2·0
42	1 55·5	1 55·8	1 50·2	4·2	0·5	10·2	1·3	16·2	2·0
43	1 55·8	1 56·1	1 50·5	4·3	0·5	10·3	1·3	16·3	2·0
44	1 56·0	1 56·3	1 50·7	4·4	0·6	10·4	1·3	16·4	2·1
45	1 56·3	1 56·6	1 51·0	4·5	0·6	10·5	1·3	16·5	2·1
46	1 56·5	1 56·8	1 51·2	4·6	0·6	10·6	1·3	16·6	2·1
47	1 56·8	1 57·1	1 51·4	4·7	0·6	10·7	1·3	16·7	2·1
48	1 57·0	1 57·3	1 51·7	4·8	0·6	10·8	1·4	16·8	2·1
49	1 57·3	1 57·6	1 51·9	4·9	0·6	10·9	1·4	16·9	2·1
50

8	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	2 00·0	2 00·3	1 54·5	0·0 0·0	6·0 0·9	12·0 1·7
01	2 00·3	2 00·6	1 54·8	0·1 0·0	6·1 0·9	12·1 1·7
02	2 00·5	2 00·8	1 55·0	0·2 0·0	6·2 0·9	12·2 1·7
03	2 00·8	2 01·1	1 55·2	0·3 0·0	6·3 0·9	12·3 1·7
04	2 01·0	2 01·3	1 55·5	0·4 0·1	6·4 0·9	12·4 1·8
05	2 01·3	2 01·6	1 55·7	0·5 0·1	6·5 0·9	12·5 1·8
06	2 01·5	2 01·8	1 56·0	0·6 0·1	6·6 0·9	12·6 1·8
07	2 01·8	2 02·1	1 56·2	0·7 0·1	6·7 0·9	12·7 1·8
08	2 02·0	2 02·3	1 56·4	0·8 0·1	6·8 1·0	12·8 1·8
09	2 02·3	2 02·6	1 56·7	0·9 0·1	6·9 1·0	12·9 1·8
10	2 02·5	2 02·8	1 56·9	1·0 0·1	7·0 1·0	13·0 1·8
11	2 02·8	2 03·1	1 57·2	1·1 0·2	7·1 1·0	13·1 1·9
12	2 03·0	2 03·3	1 57·4	1·2 0·2	7·2 1·0	13·2 1·9
13	2 03·3	2 03·6	1 57·6	1·3 0·2	7·3 1·0	13·3 1·9
14	2 03·5	2 03·8	1 57·9	1·4 0·2	7·4 1·0	13·4 1·9
15	2 03·8	2 04·1	1 58·1	1·5 0·2	7·5 1·1	13·5 1·9
16	2 04·0	2 04·3	1 58·4	1·6 0·2	7·6 1·1	13·6 1·9
17	2 04·3	2 04·6	1 58·6	1·7 0·2	7·7 1·1	13·7 1·9
18	2 04·5	2 04·8	1 58·8	1·8 0·3	7·8 1·1	13·8 2·0
19	2 04·8	2 05·1	1 59·1	1·9 0·3	7·9 1·1	13·9 2·0
20	2 05·0	2 05·3	1 59·3	2·0 0·3	8·0 1·1	14·0 2·0
21	2 05·3	2 05·6	1 59·5	2·1 0·3	8·1 1·1	14·1 2·0
22	2 05·5	2 05·8	1 59·8	2·2 0·3	8·2 1·2	14·2 2·0
23	2 05·8	2 06·1	2 00·0	2·3 0·3	8·3 1·2	14·3 2·0
24	2 06·0	2 06·3	2 00·3	2·4 0·3	8·4 1·2	14·4 2·0
25	2 06·3	2 06·6	2 00·5	2·5 0·4	8·5 1·2	14·5 2·1
26	2 06·5	2 06·8	2 00·7	2·6 0·4	8·6 1·2	14·6 2·1
27	2 06·8	2 07·1	2 01·0	2·7 0·4	8·7 1·2	14·7 2·1
28	2 07·0	2 07·3	2 01·2	2·8 0·4	8·8 1·2	14·8 2·1
29	2 07·3	2 07·6	2 01·5	2·9 0·4	8·9 1·3	14·9 2·1
30	2 07·5	2 07·8	2 01·7	3·0 0·4	9·0 1·3	15·0 2·1
31	2 07·8	2 08·1	2 01·9	3·1 0·4	9·1 1·3	15·1 2·1
32	2 08·0	2 08·4	2 02·2	3·2 0·5	9·2 1·3	15·2 2·2
33	2 08·3	2 08·6	2 02·4	3·3 0·5	9·3 1·3	15·3 2·2
34	2 08·5	2 08·9	2 02·6	3·4 0·5	9·4 1·3	15·4 2·2
35	2 08·8	2 09·1	2 02·9	3·5 0·5	9·5 1·3	15·5 2·2
36	2 09·0	2 09·4	2 03·1	3·6 0·5	9·6 1·4	15·6 2·2
37	2 09·3	2 09·6	2 03·4	3·7 0·5	9·7 1·4	15·7 2·2
38	2 09·5	2 09·9	2 03·6	3·8 0·5	9·8 1·4	15·8 2·2
39	2 09·8	2 10·1	2 03·8	3·9 0·6	9·9 1·4	15·9 2·3
40	2 10·0	2 10·4	2 04·1	4·0 0·6	10·0 1·4	16·0 2·3
41	2 10·3	2 10·6	2 04·3	4·1 0·6	10·1 1·4	16·1 2·3
42	2 10·5	2 10·9	2 04·6	4·2 0·6	10·2 1·4	16·2 2·3
43	2 10·8	2 11·1	2 04·8	4·3 0·6	10·3 1·5	16·3 2·3
44	2 11·0	2 11·4	2 05·0	4·4 0·6	10·4 1·5	16·4 2·3
45	2 11·3	2 11·6	2 05·3	4·5 0·6	10·5 1·5	16·5 2·3
46	2 11·5	2 11·9	2 05·5	4·6 0·7	10·6 1·5	16·6 2·4
47	2 11·8	2 12·1	2 05·7	4·7 0·7	10·7 1·5	16·7 2·4
48	2 12·0	2 12·4	2 06·0	4·8 0·7	10·8 1·5	16·8 2·4
49	2 12·3	2 12·6	2 06·2	4·9 0·7	10·9 1·5	16·9 2·4
50	2 12·5	2 12·9	2 06·5	5·0 0·7	11·0 1·6	17·0 2·4
51	2 12·8	2 13·1	2 06·7	5·1 0·7	11·1 1·6	17·1 2·4
52	2 13·0	2 13·4	2 06·9	5·2 0·7	11·2 1·6	17·2 2·4
53	2 13·3	2 13·6	2 07·2	5·3 0·8	11·3 1·6	17·3 2·5
54	2 13·5	2 13·9	2 07·4	5·4 0·8	11·4 1·6	17·4 2·5
55	2 13·8	2 14·1	2 07·7	5·5 0·8	11·5 1·6	17·5 2·5
56	2 14·0	2 14·4	2 07·9	5·6 0·8	11·6 1·6	17·6 2·5
57	2 14·3	2 14·6	2 08·1	5·7 0·8	11·7 1·7	17·7 2·5
58	2 14·5	2 14·9	2 08·4	5·8 0·8	11·8 1·7	17·8 2·5
59	2 14·8	2 15·1	2 08·6	5·9 0·8	11·9 1·7	17·9 2·5
60	2 15·0	2 15·4	2 08·9	6·0 0·9	12·0 1·7	18·0 2·6

9	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	2 15·0	2 15·4	2 08·9	0·0 0·0	6·0 1·0	12·0 1·9
01	2 15·3	2 15·6	2 09·1	0·1 0·0	6·1 1·0	12·1 1·9
02	2 15·5	2 15·9	2 09·3	0·2 0·0	6·2 1·0	12·2 1·9
03	2 15·8	2 16·1	2 09·6	0·3 0·0	6·3 1·0	12·3 1·9
04	2 16·0	2 16·4	2 09·8	0·4 0·1	6·4 1·0	12·4 2·0
05	2 16·3	2 16·6	2 10·0	0·5 0·1	6·5 1·0	12·5 2·0
06	2 16·5	2 16·9	2 10·3	0·6 0·1	6·6 1·0	12·6 2·0
07	2 16·8	2 17·1	2 10·5	0·7 0·1	6·7 1·1	12·7 2·0
08	2 17·0	2 17·4	2 10·8	0·8 0·1	6·8 1·1	12·8 2·0
09	2 17·3	2 17·6	2 11·0	0·9 0·1	6·9 1·1	12·9 2·0
10	2 17·5	2 17·9	2 11·2	1·0 0·2	7·0 1·1	13·0 2·1
11	2 17·8	2 18·1	2 11·5	1·1 0·2	7·1 1·1	13·1 2·1
12	2 18·0	2 18·4	2 11·7	1·2 0·2	7·2 1·1	13·2 2·1
13	2 18·3	2 18·6	2 12·0	1·3 0·2	7·3 1·2	13·3 2·1
14	2 18·5	2 18·9	2 12·2	1·4 0·2	7·4 1·2	13·4 2·1
15	2 18·8	2 19·1	2 12·4	1·5 0·2	7·5 1·2	13·5 2·1
16	2 19·0	2 19·4	2 12·7	1·6 0·3	7·6 1·2	13·6 2·2
17	2 19·3	2 19·6	2 12·9	1·7 0·3	7·7 1·2	13·7 2·2
18	2 19·5	2 19·9	2 13·1	1·8 0·3	7·8 1·2	13·8 2·2
19	2 19·8	2 20·1	2 13·4	1·9 0·3	7·9 1·3	13·9 2·2
20	2 20·0	2 20·4	2 13·6	2·0 0·3	8·0 1·3	14·0 2·2
21	2 20·3	2 20·6	2 13·9	2·1 0·3	8·1 1·3	14·1 2·2
22	2 20·5	2 20·9	2 14·1	2·2 0·3	8·2 1·3	14·2 2·2
23	2 20·8	2 21·1	2 14·3	2·3 0·4	8·3 1·3	14·3 2·3
24	2 21·0	2 21·4	2 14·6	2·4 0·4	8·4 1·3	14·4 2·3
25	2 21·3	2 21·6	2 14·8	2·5 0·4	8·5 1·3	14·5 2·3
26	2 21·5	2 21·9	2 15·1	2·6 0·4	8·6 1·4	14·6 2·3
27	2 21·8	2 22·1	2 15·3	2·7 0·4	8·7 1·4	14·7 2·3
28	2 22·0	2 22·4	2 15·5	2·8 0·4	8·8 1·4	14·8 2·3
29	2 22·3	2 22·6	2 15·8	2·9 0·5	8·9 1·4	14·9 2·4
30	2 22·5	2 22·9	2 16·0	3·0 0·5	9·0 1·4	15·0 2·4
31	2 22·8	2 23·1	2 16·2	3·1 0·5	9·1 1·4	15·1 2·4
32	2 23·0	2 23·4	2 16·5	3·2 0·5	9·2 1·5	15·2 2·4
33	2 23·3	2 23·6	2 16·7	3·3 0·5	9·3 1·5	15·3 2·4
34	2 23·5	2 23·9	2 17·0	3·4 0·5	9·4 1·5	15·4 2·4
35	2 23·8	2 24·1	2 17·2	3·5 0·6	9·5 1·5	15·5 2·5
36	2 24·0	2 24·4	2 17·4	3·6 0·6	9·6 1·5	15·6 2·5
37	2 24·3	2 24·6	2 17·7	3·7 0·6	9·7 1·5	15·7 2·5
38	2 24·5	2 24·9	2 17·9	3·8 0·6	9·8 1·6	15·8 2·5
39	2 24·8	2 25·1	2 18·2	3·9 0·6	9·9 1·6	15·9 2·5
40	2 25·0	2 25·4	2 18·4	4·0 0·6	10·0 1·6	16·0 2·5
41	2 25·3	2 25·6	2 18·6	4·1 0·6	10·1 1·6	16·1 2·5
42	2 25·5	2 25·9	2 18·9	4·2 0·7	10·2 1·6	16·2 2·6
43	2 25·8	2 26·1	2 19·1	4·3 0·7	10·3 1·6	16·3 2·6
44	2 26·0	2 26·4	2 19·3	4·4 0·7	10·4 1·6	16·4 2·6
45	2 26·3	2 26·7	2 19·6	4·5 0·7	10·5 1·7	16·5 2·6
46	2 26·5	2 26·9	2 19·8	4·6 0·7	10·6 1·7	16·6 2·6
47	2 26·8	2 27·2	2 20·1	4·7 0·7	10·7 1·7	16·7 2·6
48	2 27·0	2 27·4	2 20·3	4·8 0·8	10·8 1·7	16·8 2·7
49	2 27·3	2 27·7	2 20·5	4·9 0·8	10·9 1·7	16·9 2·7
50	2 27·5	2 27·9	2 20·8	5·0 0·8	11·0 1·7	17·0 2·7
51	2 27·8	2 28·2	2 21·0	5·1 0·8	11·1 1·8	17·1 2·7
52	2 28·0	2 28·4	2 21·3	5·2 0·8	11·2 1·8	17·2 2·7
53	2 28·3	2 28·7	2 21·5	5·3 0·8	11·3 1·8	17·3 2·7
54	2 28·5	2 28·9	2 21·7	5·4 0·9	11·4 1·8	17·4 2·8
55	2 28·8	2 29·2	2 22·0	5·5 0·9	11·5 1·8	17·5 2·8
56	2 29·0	2 29·4	2 22·2	5·6 0·9	11·6 1·8	17·6 2·8
57	2 29·3	2 29·7	2 22·5	5·7 0·9	11·7 1·9	17·7 2·8
58	2 29·5	2 29·9	2 22·7	5·8 0·9	11·8 1·9	17·8 2·8
59	2 29·8	2 30·2	2 22·9	5·9 0·9	11·9 1·9	17·9 2·8
60	2 30·0	2 30·4	2 23·2	6·0 1·0	12·0 1·9	18·0 2·9

10	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	2 30·0	2 30·4	2 23·2	0·0 0·0	6·0 1·1	12·0 2·1
01	2 30·3	2 30·7	2 23·4	0·1 0·0	6·1 1·1	12·1 2·1
02	2 30·5	2 30·9	2 23·6	0·2 0·0	6·2 1·1	12·2 2·1
03	2 30·8	2 31·2	2 23·9	0·3 0·1	6·3 1·1	12·3 2·2
04	2 31·0	2 31·4	2 24·1	0·4 0·1	6·4 1·1	12·4 2·2
05	2 31·3	2 31·7	2 24·4	0·5 0·1	6·5 1·1	12·5 2·2
06	2 31·5	2 31·9	2 24·6	0·6 0·1	6·6 1·2	12·6 2·2
07	2 31·8	2 32·2	2 24·8	0·7 0·1	6·7 1·2	12·7 2·2
08	2 32·0	2 32·4	2 25·1	0·8 0·1	6·8 1·2	12·8 2·2
09	2 32·3	2 32·7	2 25·3	0·9 0·2	6·9 1·2	12·9 2·3
10	2 32·5	2 32·9	2 25·6	1·0 0·2	7·0 1·2	13·0 2·3
11	2 32·8	2 33·2	2 25·8	1·1 0·2	7·1 1·2	13·1 2·3
12	2 33·0	2 33·4	2 26·0	1·2 0·2	7·2 1·3	13·2 2·3
13	2 33·3	2 33·7	2 26·3	1·3 0·2	7·3 1·3	13·3 2·3
14	2 33·5	2 33·9	2 26·5	1·4 0·2	7·4 1·3	13·4 2·3
15	2 33·8	2 34·2	2 26·7	1·5 0·3	7·5 1·3	13·5 2·4
16	2 34·0	2 34·4	2 27·0	1·6 0·3	7·6 1·3	13·6 2·4
17	2 34·3	2 34·7	2 27·2	1·7 0·3	7·7 1·3	13·7 2·4
18	2 34·5	2 34·9	2 27·5	1·8 0·3	7·8 1·4	13·8 2·4
19	2 34·8	2 35·2	2 27·7	1·9 0·3	7·9 1·4	13·9 2·4
20	2 35·0	2 35·4	2 27·9	2·0 0·4	8·0 1·4	14·0 2·5
21	2 35·3	2 35·7	2 28·2	2·1 0·4	8·1 1·4	14·1 2·5
22	2 35·5	2 35·9	2 28·4	2·2 0·4	8·2 1·4	14·2 2·5
23	2 35·8	2 36·2	2 28·7	2·3 0·4	8·3 1·5	14·3 2·5
24	2 36·0	2 36·4	2 28·9	2·4 0·4	8·4 1·5	14·4 2·5
25	2 36·3	2 36·7	2 29·1	2·5 0·4	8·5 1·5	14·5 2·5
26	2 36·5	2 36·9	2 29·4	2·6 0·5	8·6 1·5	14·6 2·6
27	2 36·8	2 37·2	2 29·6	2·7 0·5	8·7 1·5	14·7 2·6
28	2 37·0	2 37·4	2 29·8	2·8 0·5	8·8 1·5	14·8 2·6
29	2 37·3	2 37·7	2 30·1	2·9 0·5	8·9 1·6	14·9 2·6
30	2 37·5	2 37·9	2 30·3	3·0 0·5	9·0 1·6	15·0 2·6
31	2 37·8	2 38·2	2 30·6	3·1 0·5	9·1 1·6	15·1 2·6
32	2 38·0	2 38·4	2 30·8	3·2 0·6	9·2 1·6	15·2 2·7
33	2 38·3	2 38·7	2 31·0	3·3 0·6	9·3 1·6	15·3 2·7
34	2 38·5	2 38·9	2 31·3	3·4 0·6	9·4 1·6	15·4 2·7
35	2 38·8	2 39·2	2 31·5	3·5 0·6	9·5 1·7	15·5 2·7
36	2 39·0	2 39·4	2 31·8	3·6 0·6	9·6 1·7	15·6 2·7
37	2 39·3	2 39·7	2 32·0	3·7 0·6	9·7 1·7	15·7 2·7
38	2 39·5	2 39·9	2 32·2	3·8 0·7	9·8 1·7	15·8 2·8
39	2 39·8	2 40·2	2 32·5	3·9 0·7	9·9 1·7	15·9 2·8
40	2 40·0	2 40·4	2 32·7	4·0 0·7	10·0 1·8	16·0 2·8
41	2 40·3	2 40·7	2 32·9	4·1 0·7	10·1 1·8	16·1 2·8
42	2 40·5	2 40·9	2 33·2	4·2 0·7	10·2 1·8	16·2 2·8
43	2 40·8	2 41·2	2 33·4	4·3 0·8	10·3 1·8	16·3 2·9
44	2 41·0	2 41·4	2 33·7	4·4 0·8	10·4 1·8	16·4 2·9
45	2 41·3	2 41·7	2 33·9	4·5 0·8	10·5 1·8	16·5 2·9
46	2 41·5	2 41·9	2 34·1	4·6 0·8	10·6 1·9	16·6 2·9
47	2 41·8	2 42·2	2 34·4	4·7 0·8	10·7 1·9	16·7 2·9
48	2 42·0	2 42·4	2 34·6	4·8 0·8	10·8 1·9	16·8 2·9
49	2 42·3	2 42·7	2 34·9	4·9 0·9	10·9 1·9	16·9 3·0
50	2 42·5	2 42·9	2 35·1	5·0 0·9	11·0 1·9	17·0 3·0
51	2 42·8	2 43·2	2 35·3	5·1 0·9	11·1 1·9	17·1 3·0
52	2 43·0	2 43·4	2 35·6	5·2 0·9	11·2 2·0	17·2 3·0
53	2 43·3	2 43·7	2 35·8	5·3 0·9	11·3 2·0	17·3 3·0
54	2 43·5	2 43·9	2 36·1	5·4 0·9	11·4 2·0	17·4 3·0
55	2 43·8	2 44·2	2 36·3	5·5 1·0	11·5 2·0	17·5 3·1
56	2 44·0	2 44·4	2 36·5	5·6 1·0	11·6 2·0	17·6 3·1
57	2 44·3	2 44·7	2 36·8	5·7 1·0	11·7 2·0	17·7 3·1
58	2 44·5	2 45·0	2 37·0	5·8 1·0	11·8 2·1	17·8 3·1
59	2 44·8	2 45·2	2 37·2	5·9 1·0	11·9 2·1	17·9 3·1
60	2 45·0	2 45·5	2 37·5	6·0 1·1	12·0 2·1	18·0 3·2

11	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	2 45·0	2 45·5	2 37·5	0·0 0·0	6·0 1·2	12·0 2·3
01	2 45·3	2 45·7	2 37·7	0·1 0·0	6·1 1·2	12·1 2·3
02	2 45·5	2 46·0	2 38·0	0·2 0·0	6·2 1·2	12·2 2·3
03	2 45·8	2 46·2	2 38·2	0·3 0·1	6·3 1·2	12·3 2·4
04	2 46·0	2 46·5	2 38·4	0·4 0·1	6·4 1·2	12·4 2·4
05	2 46·3	2 46·7	2 38·7	0·5 0·1	6·5 1·2	12·5 2·4
06	2 46·5	2 47·0	2 38·9	0·6 0·1	6·6 1·3	12·6 2·4
07	2 46·8	2 47·2	2 39·2	0·7 0·1	6·7 1·3	12·7 2·4
08	2 47·0	2 47·5	2 39·4	0·8 0·2	6·8 1·3	12·8 2·5
09	2 47·3	2 47·7	2 39·6	0·9 0·2	6·9 1·3	12·9 2·5
10	2 47·5	2 48·0	2 39·9	1·0 0·2	7·0 1·3	13·0 2·5
11	2 47·8	2 48·2	2 40·1	1·1 0·2	7·1 1·4	13·1 2·5
12	2 48·0	2 48·5	2 40·3	1·2 0·2	7·2 1·4	13·2 2·6
13	2 48·3	2 48·7	2 40·6	1·3 0·2	7·3 1·4	13·3 2·6
14	2 48·5	2 49·0	2 40·8	1·4 0·3	7·4 1·4	13·4 2·6
15	2 48·8	2 49·2	2 41·1	1·5 0·3	7·5 1·4	13·5 2·6
16	2 49·0	2 49·5	2 41·3	1·6 0·3	7·6 1·5	13·6 2·6
17	2 49·3	2 49·7	2 41·5	1·7 0·3	7·7 1·5	13·7 2·6
18	2 49·5	2 50·0	2 41·8	1·8 0·3	7·8 1·5	13·8 2·6
19	2 49·8	2 50·2	2 42·0	1·9 0·4	7·9 1·5	13·9 2·7
20	2 50·0	2 50·5	2 42·3	2·0 0·4	8·0 1·5	14·0 2·7
21	2 50·3	2 50·7	2 42·5	2·1 0·4	8·1 1·6	14·1 2·7
22	2 50·5	2 51·0	2 42·7	2·2 0·4	8·2 1·6	14·2 2·7
23	2 50·8	2 51·2	2 43·0	2·3 0·4	8·3 1·6	14·3 2·7
24	2 51·0	2 51·5	2 43·2	2·4 0·5	8·4 1·6	14·4 2·8
25	2 51·3	2 51·7	2 43·4	2·5 0·5	8·5 1·6	14·5 2·8
26	2 51·5	2 52·0	2 43·7	2·6 0·5	8·6 1·6	14·6 2·8
27	2 51·8	2 52·2	2 43·9	2·7 0·5	8·7 1·7	14·7 2·8
28	2 52·0	2 52·5	2 44·2	2·8 0·5	8·8 1·7	14·8 2·8
29	2 52·3	2 52·7	2 44·4	2·9 0·6	8·9 1·7	14·9 2·9
30	2 52·5	2 53·0	2 44·6	3·0 0·6	9·0 1·7	15·0 2·9
31	2 52·8	2 53·2	2 44·9	3·1 0·6	9·1 1·7	15·1 2·9
32	2 53·0	2 53·5	2 45·1	3·2 0·6	9·2 1·8	15·2 2·9
33	2 53·3	2 53·7	2 45·4	3·3 0·6	9·3 1·8	15·3 2·9
34	2 53·5	2 54·0	2 45·6	3·4 0·7	9·4 1·8	15·4 3·0
35	2 53·8	2 54·2	2 45·8	3·5 0·7	9·5 1·8	15·5 3·0
36	2 54·0	2 54·5	2 46·1	3·6 0·7	9·6 1·8	15·6 3·0
37	2 54·3	2 54·7	2 46·3	3·7 0·7	9·7 1·9	15·7 3·0
38	2 54·5	2 55·0	2 46·6	3·8 0·7	9·8 1·9	15·8 3·0
39	2 54·8	2 55·2	2 46·8	3·9 0·7	9·9 1·9	15·9 3·0
40	2 55·0	2 55·5	2 47·0	4·0 0·8	10·0 1·9	16·0 3·1
41	2 55·3	2 55·7	2 47·3	4·1 0·8	10·1 1·9	16·1 3·1
42	2 55·5	2 56·0	2 47·5	4·2 0·8	10·2 2·0	16·2 3·1
43	2 55·8	2 56·2	2 47·7	4·3 0·8	10·3 2·0	16·3 3·1
44	2 56·0	2 56·5	2 48·0	4·4 0·8	10·4 2·0	16·4 3·1
45	2 56·3	2 56·7	2 48·2	4·5 0·9	10·5 2·0	16·5 3·2
46	2 56·5	2 57·0	2 48·5	4·6 0·9	10·6 2·0	16·6 3·2
47	2 56·8	2 57·2	2 48·7	4·7 0·9	10·7 2·1	16·7 3·2
48	2 57·0	2 57·5	2 48·9	4·8 0·9	10·8 2·1	16·8 3·2
49	2 57·3	2 57·7	2 49·2	4·9 0·9	10·9 2·1	16·9 3·2
50	2 57·5	2 58·0	2 49·4	5·0 1·0	11·0 2·1	17·0 3·3
51	2 57·8	2 58·2	2 49·7	5·1 1·0	11·1 2·1	17·1 3·3
52	2 58·0	2 58·5	2 49·9	5·2 1·0	11·2 2·1	17·2 3·3
53	2 58·3	2 58·7	2 50·1	5·3 1·0	11·3 2·2	17·3 3·3
54	2 58·5	2 59·0	2 50·4	5·4 1·0	11·4 2·2	17·4 3·3
55	2 58·8	2 59·2	2 50·6	5·5 1·1	11·5 2·2	17·5 3·4
56	2 59·0	2 59·5	2 50·8	5·6 1·1	11·6 2·2	17·6 3·4
57	2 59·3	2 59·7	2 51·1	5·7 1·1	11·7 2·2	17·7 3·4
58	2 59·5	3 00·0	2 51·3	5·8 1·1	11·8 2·3	17·8 3·4
59	2 59·8	3 00·2	2 51·6	5·9 1·1	11·9 2·3	17·9 3·4
60	3 00·0	3 00·5	2 51·8	6·0 1·2	12·0 2·3	18·0 3·5

12m	SUN PLANETS	ARIES	MOON	v or Corr n d	v or Corr n d	v or Corr n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	3 00·0	3 00·5	2 51·8	0·0 0·0	6·0 1·3	12·0 2·5
01	3 00·3	3 00·7	2 52·0	0·1 0·0	6·1 1·3	12·1 2·5
02	3 00·5	3 01·0	2 52·3	0·2 0·0	6·2 1·3	12·2 2·5
03	3 00·8	3 01·2	2 52·5	0·3 0·1	6·3 1·3	12·3 2·6
04	3 01·0	3 01·5	2 52·8	0·4 0·1	6·4 1·3	12·4 2·6
05	3 01·3	3 01·7	2 53·0	0·5 0·1	6·5 1·4	12·5 2·6
06	3 01·5	3 02·0	2 53·2	0·6 0·1	6·6 1·4	12·6 2·6
07	3 01·8	3 02·2	2 53·5	0·7 0·1	6·7 1·4	12·7 2·6
08	3 02·0	3 02·5	2 53·7	0·8 0·2	6·8 1·4	12·8 2·7
09	3 02·3	3 02·7	2 53·9	0·9 0·2	6·9 1·4	12·9 2·7
10	3 02·5	3 03·0	2 54·2	1·0 0·2	7·0 1·5	13·0 2·7
11	3 02·8	3 03·3	2 54·4	1·1 0·2	7·1 1·5	13·1 2·7
12	3 03·0	3 03·5	2 54·7	1·2 0·3	7·2 1·5	13·2 2·8
13	3 03·3	3 03·8	2 54·9	1·3 0·3	7·3 1·5	13·3 2·8
14	3 03·5	3 04·0	2 55·1	1·4 0·3	7·4 1·5	13·4 2·8
15	3 03·8	3 04·3	2 55·4	1·5 0·3	7·5 1·6	13·5 2·8
16	3 04·0	3 04·5	2 55·6	1·6 0·3	7·6 1·6	13·6 2·8
17	3 04·3	3 04·8	2 55·9	1·7 0·4	7·7 1·6	13·7 2·9
18	3 04·5	3 05·0	2 56·1	1·8 0·4	7·8 1·6	13·8 2·9
19	3 04·8	3 05·3	2 56·3	1·9 0·4	7·9 1·6	13·9 2·9
20	3 05·0	3 05·5	2 56·6	2·0 0·4	8·0 1·7	14·0 2·9
21	3 05·3	3 05·8	2 56·8	2·1 0·4	8·1 1·7	14·1 2·9
22	3 05·5	3 06·0	2 57·0	2·2 0·5	8·2 1·7	14·2 3·0
23	3 05·8	3 06·3	2 57·3	2·3 0·5	8·3 1·7	14·3 3·0
24	3 06·0	3 06·5	2 57·5	2·4 0·5	8·4 1·8	14·4 3·0
25	3 06·3	3 06·8	2 57·8	2·5 0·5	8·5 1·8	14·5 3·0
26	3 06·5	3 07·0	2 58·0	2·6 0·5	8·6 1·8	14·6 3·0
27	3 06·8	3 07·3	2 58·2	2·7 0·6	8·7 1·8	14·7 3·1
28	3 07·0	3 07·5	2 58·5	2·8 0·6	8·8 1·8	14·8 3·1
29	3 07·3	3 07·8	2 58·7	2·9 0·6	8·9 1·9	14·9 3·1
30	3 07·5	3 08·0	2 59·0	3·0 0·6	9·0 1·9	15·0 3·1
31	3 07·8	3 08·3	2 59·2	3·1 0·6	9·1 1·9	15·1 3·1
32	3 08·0	3 08·5	2 59·4	3·2 0·7	9·2 1·9	15·2 3·2
33	3 08·3	3 08·8	2 59·7	3·3 0·7	9·3 1·9	15·3 3·2
34	3 08·5	3 09·0	2 59·9	3·4 0·7	9·4 2·0	15·4 3·2
35	3 08·8	3 09·3	3 00·2	3·5 0·7	9·5 2·0	15·5 3·2
36	3 09·0	3 09·5	3 00·4	3·6 0·8	9·6 2·0	15·6 3·3
37	3 09·3	3 09·8	3 00·6	3·7 0·8	9·7 2·0	15·7 3·3
38	3 09·5	3 10·0	3 00·9	3·8 0·8	9·8 2·0	15·8 3·3
39	3 09·8	3 10·3	3 01·1	3·9 0·8	9·9 2·1	15·9 3·3
40	3 10·0	3 10·5	3 01·3	4·0 0·8	10·0 2·1	16·0 3·3
41	3 10·3	3 10·8	3 01·6	4·1 0·9	10·1 2·1	16·1 3·4
42	3 10·5	3 11·0	3 01·8	4·2 0·9	10·2 2·1	16·2 3·4
43	3 10·8	3 11·3	3 02·1	4·3 0·9	10·3 2·1	16·3 3·4
44	3 11·0	3 11·5	3 02·3	4·4 0·9	10·4 2·2	16·4 3·4
45	3 11·3	3 11·8	3 02·5	4·5 0·9	10·5 2·2	16·5 3·4
46	3 11·5	3 12·0	3 02·8	4·6 1·0	10·6 2·2	16·6 3·5
47	3 11·8	3 12·3	3 03·0	4·7 1·0	10·7 2·2	16·7 3·5
48	3 12·0	3 12·5	3 03·3	4·8 1·0	10·8 2·3	16·8 3·5
49	3 12·3	3 12·8	3 03·5	4·9 1·0	10·9 2·3	16·9 3·5
50	3 12·5	3 13·0	3 03·7	5·0 1·0	11·0 2·3	17·0 3·5
51	3 12·8	3 13·3	3 04·0	5·1 1·1	11·1 2·3	17·1 3·6
52	3 13·0	3 13·5	3 04·2	5·2 1·1	11·2 2·3	17·2 3·6
53	3 13·3	3 13·8	3 04·4	5·3 1·1	11·3 2·4	17·3 3·6
54	3 13·5	3 14·0	3 04·7	5·4 1·1	11·4 2·4	17·4 3·6
55	3 13·8	3 14·3	3 04·9	5·5 1·1	11·5 2·4	17·5 3·6
56	3 14·0	3 14·5	3 05·2	5·6 1·2	11·6 2·4	17·6 3·7
57	3 14·3	3 14·8	3 05·4	5·7 1·2	11·7 2·4	17·7 3·7
58	3 14·5	3 15·0	3 05·6	5·8 1·2	11·8 2·5	17·8 3·7
59	3 14·8	3 15·3	3 05·9	5·9 1·2	11·9 2·5	17·9 3·7
60	3 15·0	3 15·5	3 06·1	6·0 1·3	12·0 2·5	18·0 3·8

13m	SUN PLANETS	ARIES	MOON	v or Corr n d	v or Corr n d	v or Corr n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	3 15·0	3 15·5	3 06·1	0·0 0·0	6·0 1·4	12·0 2·7
01	3 15·3	3 15·8	3 06·4	0·1 0·0	6·1 1·4	12·1 2·7
02	3 15·5	3 16·0	3 06·6	0·2 0·0	6·2 1·4	12·2 2·7
03	3 15·8	3 16·3	3 06·8	0·3 0·1	6·3 1·4	12·3 2·8
04	3 16·0	3 16·5	3 07·1	0·4 0·1	6·4 1·4	12·4 2·8
05	3 16·3	3 16·8	3 07·3	0·5 0·1	6·5 1·5	12·5 2·8
06	3 16·5	3 17·0	3 07·5	0·6 0·1	6·6 1·5	12·6 2·8
07	3 16·8	3 17·3	3 07·8	0·7 0·2	6·7 1·5	12·7 2·9
08	3 17·0	3 17·5	3 08·0	0·8 0·2	6·8 1·5	12·8 2·9
09	3 17·3	3 17·8	3 08·3	0·9 0·2	6·9 1·6	12·9 2·9
10	3 17·5	3 18·0	3 08·5	1·0 0·2	7·0 1·6	13·0 2·9
11	3 17·8	3 18·3	3 08·7	1·1 0·2	7·1 1·6	13·1 2·9
12	3 18·0	3 18·5	3 09·0	1·2 0·3	7·2 1·6	13·2 3·0
13	3 18·3	3 18·8	3 09·2	1·3 0·3	7·3 1·6	13·3 3·0
14	3 18·5	3 19·0	3 09·5	1·4 0·3	7·4 1·7	13·4 3·0
15	3 18·8	3 19·3	3 09·7	1·5 0·3	7·5 1·7	13·5 3·0
16	3 19·0	3 19·5	3 09·9	1·6 0·4	7·6 1·7	13·6 3·1
17	3 19·3	3 19·8	3 10·2	1·7 0·4	7·7 1·7	13·7 3·1
18	3 19·5	3 20·0	3 10·4	1·8 0·4	7·8 1·8	13·8 3·1
19	3 19·8	3 20·3	3 10·7	1·9 0·4	7·9 1·8	13·9 3·1
20	3 20·0	3 20·5	3 10·9	2·0 0·5	8·0 1·8	14·0 3·2
21	3 20·3	3 20·8	3 11·1	2·1 0·5	8·1 1·8	14·1 3·2
22	3 20·5	3 21·0	3 11·4	2·2 0·5	8·2 1·8	14·2 3·2
23	3 20·8	3 21·3	3 11·6	2·3 0·5	8·3 1·9	14·3 3·2
24	3 21·0	3 21·6	3 11·8	2·4 0·5	8·4 1·9	14·4 3·2
25	3 21·3	3 21·8	3 12·1	2·5 0·6	8·5 1·9	14·5 3·3
26	3 21·5	3 22·1	3 12·3	2·6 0·6	8·6 1·9	14·6 3·3
27	3 21·8	3 22·3	3 12·6	2·7 0·6	8·7 2·0	14·7 3·3
28	3 22·0	3 22·6	3 12·8	2·8 0·6	8·8 2·0	14·8 3·3
29	3 22·3	3 22·8	3 13·0	2·9 0·7	8·9 2·0	14·9 3·4
30	3 22·5	3 23·1	3 13·3	3·0 0·7	9·0 2·0	15·0 3·4
31	3 22·8	3 23·3	3 13·5	3·1 0·7	9·1 2·0	15·1 3·4
32	3 23·0	3 23·6	3 13·8	3·2 0·7	9·2 2·1	15·2 3·4
33	3 23·3	3 23·8	3 14·0	3·3 0·7	9·3 2·1	15·3 3·4
34	3 23·5	3 24·1	3 14·2	3·4 0·8	9·4 2·1	15·4 3·5
35	3 23·8	3 24·3	3 14·5	3·5 0·8	9·5 2·1	15·5 3·5
36	3 24·0	3 24·6	3 14·7	3·6 0·8	9·6 2·2	15·6 3·5
37	3 24·3	3 24·8	3 14·9	3·7 0·8	9·7 2·2	15·7 3·5
38	3 24·5	3 25·1	3 15·2	3·8 0·9	9·8 2·2	15·8 3·6
39	3 24·8	3 25·3	3 15·4	3·9 0·9	9·9 2·2	15·9 3·6
40	3 25·0	3 25·6	3 15·7	4·0 0·9	10·0 2·3	16·0 3·6
41	3 25·3	3 25·8	3 15·9	4·1 0·9	10·1 2·3	16·1 3·6
42	3 25·5	3 26·1	3 16·1	4·2 0·9	10·2 2·3	16·2 3·6
43	3 25·8	3 26·3	3 16·4	4·3 1·0	10·3 2·3	16·3 3·7
44	3 26·0	3 26·6	3 16·6	4·4 1·0	10·4 2·3	16·4 3·7
45	3 26·3	3 26·8	3 16·9	4·5 1·0	10·5 2·4	16·5 3·7
46	3 26·5	3 27·1	3 17·1	4·6 1·0	10·6 2·4	16·6 3·7
47	3 26·8	3 27·3	3 17·3	4·7 1·1	10·7 2·4	16·7 3·8
48	3 27·0	3 27·6	3 17·6	4·8 1·1	10·8 2·4	16·8 3·8
49	3 27·3	3 27·8	3 17·8	4·9 1·1	10·9 2·5	16·9 3·8
50	3 27·5	3 28·1	3 18·0	5·0 1·1	11·0 2·5	17·0 3·8
51	3 27·8	3 28·3	3 18·3	5·1 1·1	11·1 2·5	17·1 3·8
52	3 28·0	3 28·6	3 18·5	5·2 1·2	11·2 2·5	17·2 3·9
53	3 28·3	3 28·8	3 18·8	5·3 1·2	11·3 2·5	17·3 3·9
54	3 28·5	3 29·1	3 19·0	5·4 1·2	11·4 2·6	17·4 3·9
55	3 28·8	3 29·3	3 19·2	5·5 1·2	11·5 2·6	17·5 3·9
56	3 29·0	3 29·6	3 19·5	5·6 1·3	11·6 2·6	17·6 4·0
57	3 29·3	3 29·8	3 19·7	5·7 1·3	11·7 2·6	17·7 4·0
58	3 29·5	3 30·1	3 20·0	5·8 1·3	11·8 2·7	17·8 4·0
59	3 29·8	3 30·3	3 20·2	5·9 1·3	11·9 2·7	17·9 4·0
60	3 30·0	3 30·6	3 20·4	6·0 1·4	12·0 2·7	18·0 4·1

14m	SUN PLANETS	ARIES	MOON	v or Corr n d	v or Corr n d	v or Corr n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	3 30·0	3 30·6	3 20·4	0·0 0·0	6·0 1·5	12·0 2·9
01	3 30·3	3 30·8	3 20·7	0·1 0·0	6·1 1·5	12·1 2·9
02	3 30·5	3 31·1	3 20·9	0·2 0·0	6·2 1·5	12·2 2·9
03	3 30·8	3 31·3	3 21·1	0·3 0·1	6·3 1·5	12·3 3·0
04	3 31·0	3 31·6	3 21·4	0·4 0·1	6·4 1·5	12·4 3·0
05	3 31·3	3 31·8	3 21·6	0·5 0·1	6·5 1·6	12·5 3·0
06	3 31·5	3 32·1	3 21·9	0·6 0·1	6·6 1·6	12·6 3·0
07	3 31·8	3 32·3	3 22·1	0·7 0·2	6·7 1·6	12·7 3·1
08	3 32·0	3 32·6	3 22·3	0·8 0·2	6·8 1·6	12·8 3·1
09	3 32·3	3 32·8	3 22·6	0·9 0·2	6·9 1·7	12·9 3·1
10	3 32·5	3 33·1	3 22·8	1·0 0·2	7·0 1·7	13·0 3·1
11	3 32·8	3 33·3	3 23·1	1·1 0·3	7·1 1·7	13·1 3·2
12	3 33·0	3 33·6	3 23·3	1·2 0·3	7·2 1·7	13·2 3·2
13	3 33·3	3 33·8	3 23·5	1·3 0·3	7·3 1·8	13·3 3·2
14	3 33·5	3 34·1	3 23·8	1·4 0·3	7·4 1·8	13·4 3·2
15	3 33·8	3 34·3	3 24·0	1·5 0·4	7·5 1·8	13·5 3·3
16	3 34·0	3 34·6	3 24·3	1·6 0·4	7·6 1·8	13·6 3·3
17	3 34·3	3 34·8	3 24·5	1·7 0·4	7·7 1·9	13·7 3·3
18	3 34·5	3 35·1	3 24·7	1·8 0·4	7·8 1·9	13·8 3·3
19	3 34·8	3 35·3	3 25·0	1·9 0·5	7·9 1·9	13·9 3·4
20	3 35·0	3 35·6	3 25·2	2·0 0·5	8·0 1·9	14·0 3·4
21	3 35·3	3 35·8	3 25·4	2·1 0·5	8·1 2·0	14·1 3·4
22	3 35·5	3 36·1	3 25·7	2·2 0·5	8·2 2·0	14·2 3·4
23	3 35·8	3 36·3	3 25·9	2·3 0·6	8·3 2·0	14·3 3·5
24	3 36·0	3 36·6	3 26·2	2·4 0·6	8·4 2·0	14·4 3·5
25	3 36·3	3 36·8	3 26·4	2·5 0·6	8·5 2·1	14·5 3·5
26	3 36·5	3 37·1	3 26·6	2·6 0·6	8·6 2·1	14·6 3·5
27	3 36·8	3 37·3	3 26·9	2·7 0·7	8·7 2·1	14·7 3·6
28	3 37·0	3 37·6	3 27·1	2·8 0·7	8·8 2·1	14·8 3·6
29	3 37·3	3 37·8	3 27·4	2·9 0·7	8·9 2·2	14·9 3·6
30	3 37·5	3 38·1	3 27·6	3·0 0·7	9·0 2·2	15·0 3·6
31	3 37·8	3 38·3	3 27·8	3·1 0·7	9·1 2·2	15·1 3·6
32	3 38·0	3 38·6	3 28·1	3·2 0·8	9·2 2·2	15·2 3·7
33	3 38·3	3 38·8	3 28·3	3·3 0·8	9·3 2·2	15·3 3·7
34	3 38·5	3 39·1	3 28·5	3·4 0·8	9·4 2·3	15·4 3·7
35	3 38·8	3 39·3	3 28·8	3·5 0·8	9·5 2·3	15·5 3·7
36	3 39·0	3 39·6	3 29·0	3·6 0·9	9·6 2·3	15·6 3·8
37	3 39·3	3 39·9	3 29·3	3·7 0·9	9·7 2·3	15·7 3·8
38	3 39·5	3 40·1	3 29·5	3·8 0·9	9·8 2·4	15·8 3·8
39	3 39·8	3 40·4	3 29·7	3·9 0·9	9·9 2·4	15·9 3·8
40	3 40·0	3 40·6	3 30·0	4·0 1·0	10·0 2·4	16·0 3·9
41	3 40·3	3 40·9	3 30·2	4·1 1·0	10·1 2·4	16·1 3·9
42	3 40·5	3 41·1	3 30·5	4·2 1·0	10·2 2·5	16·2 3·9
43	3 40·8	3 41·4	3 30·7	4·3 1·0	10·3 2·5	16·3 3·9
44	3 41·0	3 41·6	3 30·9	4·4 1·1	10·4 2·5	16·4 4·0
45	3 41·3	3 41·9	3 31·2	4·5 1·1	10·5 2·5	16·5 4·0
46	3 41·5	3 42·1	3 31·4	4·6 1·1	10·6 2·6	16·6 4·0
47	3 41·8	3 42·4	3 31·6	4·7 1·1	10·7 2·6	16·7 4·0
48	3 42·0	3 42·6	3 31·9	4·8 1·2	10·8 2·6	16·8 4·1
49	3 42·3	3 42·9	3 32·1	4·9 1·2	10·9 2·6	16·9 4·1
50	3 42·5	3 43·1	3 32·4	5·0 1·2	11·0 2·7	17·0 4·1
51	3 42·8	3 43·4	3 32·6	5·1 1·2	11·1 2·7	17·1 4·1
52	3 43·0	3 43·6	3 32·8	5·2 1·3	11·2 2·7	17·2 4·2
53	3 43·3	3 43·9	3 33·1	5·3 1·3	11·3 2·7	17·3 4·2
54	3 43·5	3 44·1	3 33·3	5·4 1·3	11·4 2·8	17·4 4·2
55	3 43·8	3 44·4	3 33·6	5·5 1·3	11·5 2·8	17·5 4·2
56	3 44·0	3 44·6	3 33·8	5·6 1·4	11·6 2·8	17·6 4·3
57	3 44·3	3 44·9	3 34·0	5·7 1·4	11·7 2·8	17·7 4·3
58	3 44·5	3 45·1	3 34·3	5·8 1·4	11·8 2·9	17·8 4·3
59	3 44·8	3 45·4	3 34·5	5·9 1·4	11·9 2·9	17·9 4·3
60	3 45·0	3 45·6	3 34·8	6·0 1·5	12·0 2·9	18·0 4·4

15m	SUN PLANETS	ARIES	MOON	v or Corr n d	v or Corr n d	v or Corr n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	3 45·0	3 45·6	3 34·8	0·0 0·0	6·0 1·6	12·0 3·1
01	3 45·3	3 45·9	3 35·0	0·1 0·0	6·1 1·6	12·1 3·1
02	3 45·5	3 46·1	3 35·2	0·2 0·1	6·2 1·6	12·2 3·2
03	3 45·8	3 46·4	3 35·5	0·3 0·1	6·3 1·6	12·3 3·2
04	3 46·0	3 46·6	3 35·7	0·4 0·1	6·4 1·7	12·4 3·2
05	3 46·3	3 46·9	3 35·9	0·5 0·1	6·5 1·7	12·5 3·2
06	3 46·5	3 47·1	3 36·2	0·6 0·2	6·6 1·7	12·6 3·3
07	3 46·8	3 47·4	3 36·4	0·7 0·2	6·7 1·7	12·7 3·3
08	3 47·0	3 47·6	3 36·7	0·8 0·2	6·8 1·8	12·8 3·3
09	3 47·3	3 47·9	3 36·9	0·9 0·2	6·9 1·8	12·9 3·3
10	3 47·5	3 48·1	3 37·1	1·0 0·3	7·0 1·8	13·0 3·4
11	3 47·8	3 48·4	3 37·4	1·1 0·3	7·1 1·8	13·1 3·4
12	3 48·0	3 48·6	3 37·6	1·2 0·3	7·2 1·9	13·2 3·4
13	3 48·3	3 48·9	3 37·9	1·3 0·3	7·3 1·9	13·3 3·4
14	3 48·5	3 49·1	3 38·1	1·4 0·4	7·4 1·9	13·4 3·5
15	3 48·8	3 49·4	3 38·3	1·5 0·4	7·5 1·9	13·5 3·5
16	3 49·0	3 49·6	3 38·6	1·6 0·4	7·6 2·0	13·6 3·5
17	3 49·3	3 49·9	3 38·8	1·7 0·4	7·7 2·0	13·7 3·5
18	3 49·5	3 50·1	3 39·0	1·8 0·5	7·8 2·0	13·8 3·6
19	3 49·8	3 50·4	3 39·3	1·9 0·5	7·9 2·0	13·9 3·6
20	3 50·0	3 50·6	3 39·5	2·0 0·5	8·0 2·1	14·0 3·6
21	3 50·3	3 50·9	3 39·8	2·1 0·5	8·1 2·1	14·1 3·6
22	3 50·5	3 51·1	3 40·0	2·2 0·6	8·2 2·1	14·2 3·7
23	3 50·8	3 51·4	3 40·2	2·3 0·6	8·3 2·1	14·3 3·7
24	3 51·0	3 51·6	3 40·5	2·4 0·6	8·4 2·2	14·4 3·7
25	3 51·3	3 51·9	3 40·7	2·5 0·6	8·5 2·2	14·5 3·7
26	3 51·5	3 52·1	3 41·0	2·6 0·7	8·6 2·2	14·6 3·8
27	3 51·8	3 52·4	3 41·2	2·7 0·7	8·7 2·2	14·7 3·8
28	3 52·0	3 52·6	3 41·4	2·8 0·7	8·8 2·3	14·8 3·8
29	3 52·3	3 52·9	3 41·7	2·9 0·7	8·9 2·3	14·9 3·8
30	3 52·5	3 53·1	3 41·9	3·0 0·8	9·0 2·3	15·0 3·9
31	3 52·8	3 53·4	3 42·1	3·1 0·8	9·1 2·4	15·1 3·9
32	3 53·0	3 53·6	3 42·4	3·2 0·8	9·2 2·4	15·2 3·9
33	3 53·3	3 53·9	3 42·6	3·3 0·9	9·3 2·4	15·3 4·0
34	3 53·5	3 54·1	3 42·9	3·4 0·9	9·4 2·4	15·4 4·0
35	3 53·8	3 54·4	3 43·1	3·5 0·9	9·5 2·5	15·5 4·0
36	3 54·0	3 54·6	3 43·3	3·6 0·9	9·6 2·5	15·6 4·0
37	3 54·3	3 54·9	3 43·6	3·7 1·0	9·7 2·5	15·7 4·1
38	3 54·5	3 55·1	3 43·8	3·8 1·0	9·8 2·5	15·8 4·1
39	3 54·8	3 55·4	3 44·1	3·9 1·0	9·9 2·6	15·9 4·1
40	3 55·0	3 55·6	3 44·3	4·0 1·0	10·0 2·6	16·0 4·1
41	3 55·3	3 55·9	3 44·5	4·1 1·1	10·1 2·6	16·1 4·2
42	3 55·5	3 56·1	3 44·8	4·2 1·1	10·2 2·6	16·2 4·2
43	3 55·8	3 56·4	3 45·0	4·3 1·1	10·3 2·7	16·3 4·2
44	3 56·0	3 56·6	3 45·2	4·4 1·1	10·4 2·7	16·4 4·2
45	3 56·3	3 56·9	3 45·5	4·5 1·2	10·5 2·7	16·5 4·3
46	3 56·5	3 57·1	3 45·7	4·6 1·2	10·6 2·7	16·6 4·3
47	3 56·8	3 57·4	3 46·0	4·7 1·2	10·7 2·8	16·7 4·3
48	3 57·0	3 57·6	3 46·2	4·8 1·2	10·8 2·8	16·8 4·3
49	3 57·3	3 57·9	3 46·4	4·9 1·3	10·9 2·8	16·9 4·4
50	3 57·5	3 58·2	3 46·7	5·0 1·3	11·0 2·8	17·0 4·4
51	3 57·8	3 58·4	3 46·9	5·1 1·3	11·1 2·9	17·1 4·4
52	3 58·0	3 58·7	3 47·2	5·2 1·3	11·2 2·9	17·2 4·4
53	3 58·3	3 58·9	3 47·4	5·3 1·4	11·3 2·9	17·3 4·5
54	3 58·5	3 59·2	3 47·6	5·4 1·4	11·4 2·9	17·4 4·5
55	3 58·8	3 59·4	3 47·9	5·5 1·4	11·5 3·0	17·5 4·5
56	3 59·0	3 59·7	3 48·1	5·6 1·4	11·6 3·0	17·6 4·5
57	3 59·3	3 59·9	3 48·4	5·7 1·5	11·7 3·0	17·7 4·6
58	3 59·5	4 00·2	3 48·6	5·8 1·5	11·8 3·0	17·8 4·6
59	3 59·8	4 00·4	3 48·8	5·9 1·5	11·9 3·1	17·9 4·6
60	4 00·0	4 00·7	3 49·1	6·0 1·6	12·0 3·1	18·0 4·7

16m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	4 00·0	4 00·7	3 49·1	0·0 0·0	6·0 1·7	12·0 3·3
01	4 00·3	4 00·9	3 49·3	0·1 0·0	6·1 1·7	12·1 3·3
02	4 00·5	4 01·2	3 49·5	0·2 0·1	6·2 1·7	12·2 3·4
03	4 00·8	4 01·4	3 49·8	0·3 0·1	6·3 1·7	12·3 3·4
04	4 01·0	4 01·7	3 50·0	0·4 0·1	6·4 1·8	12·4 3·4
05	4 01·3	4 01·9	3 50·3	0·5 0·1	6·5 1·8	12·5 3·4
06	4 01·5	4 02·2	3 50·5	0·6 0·2	6·6 1·8	12·6 3·5
07	4 01·8	4 02·4	3 50·7	0·7 0·2	6·7 1·8	12·7 3·5
08	4 02·0	4 02·7	3 51·0	0·8 0·2	6·8 1·9	12·8 3·5
09	4 02·3	4 02·9	3 51·2	0·9 0·2	6·9 1·9	12·9 3·5
10	4 02·5	4 03·2	3 51·5	1·0 0·3	7·0 1·9	13·0 3·6
11	4 02·8	4 03·4	3 51·7	1·1 0·3	7·1 2·0	13·1 3·6
12	4 03·0	4 03·7	3 51·9	1·2 0·3	7·2 2·0	13·2 3·6
13	4 03·3	4 03·9	3 52·2	1·3 0·4	7·3 2·0	13·3 3·7
14	4 03·5	4 04·2	3 52·4	1·4 0·4	7·4 2·0	13·4 3·7
15	4 03·8	4 04·4	3 52·6	1·5 0·4	7·5 2·1	13·5 3·7
16	4 04·0	4 04·7	3 52·9	1·6 0·4	7·6 2·1	13·6 3·7
17	4 04·3	4 04·9	3 53·1	1·7 0·5	7·7 2·1	13·7 3·8
18	4 04·5	4 05·2	3 53·4	1·8 0·5	7·8 2·1	13·8 3·8
19	4 04·8	4 05·4	3 53·6	1·9 0·5	7·9 2·2	13·9 3·8
20	4 05·0	4 05·7	3 53·8	2·0 0·6	8·0 2·2	14·0 3·9
21	4 05·3	4 05·9	3 54·1	2·1 0·6	8·1 2·2	14·1 3·9
22	4 05·5	4 06·2	3 54·3	2·2 0·6	8·2 2·3	14·2 3·9
23	4 05·8	4 06·4	3 54·6	2·3 0·6	8·3 2·3	14·3 3·9
24	4 06·0	4 06·7	3 54·8	2·4 0·7	8·4 2·3	14·4 4·0
25	4 06·3	4 06·9	3 55·0	2·5 0·7	8·5 2·3	14·5 4·0
26	4 06·5	4 07·2	3 55·3	2·6 0·7	8·6 2·4	14·6 4·0
27	4 06·8	4 07·4	3 55·5	2·7 0·7	8·7 2·4	14·7 4·0
28	4 07·0	4 07·7	3 55·7	2·8 0·8	8·8 2·4	14·8 4·1
29	4 07·3	4 07·9	3 56·0	2·9 0·8	8·9 2·4	14·9 4·1
30	4 07·5	4 08·2	3 56·2	3·0 0·8	9·0 2·5	15·0 4·1
31	4 07·8	4 08·4	3 56·5	3·1 0·9	9·1 2·5	15·1 4·2
32	4 08·0	4 08·7	3 56·7	3·2 0·9	9·2 2·5	15·2 4·2
33	4 08·3	4 08·9	3 56·9	3·3 0·9	9·3 2·6	15·3 4·2
34	4 08·5	4 09·2	3 57·2	3·4 0·9	9·4 2·6	15·4 4·2
35	4 08·8	4 09·4	3 57·4	3·5 1·0	9·5 2·6	15·5 4·3
36	4 09·0	4 09·7	3 57·7	3·6 1·0	9·6 2·6	15·6 4·3
37	4 09·3	4 09·9	3 57·9	3·7 1·0	9·7 2·7	15·7 4·3
38	4 09·5	4 10·2	3 58·1	3·8 1·0	9·8 2·7	15·8 4·3
39	4 09·8	4 10·4	3 58·4	3·9 1·1	9·9 2·7	15·9 4·4
40	4 10·0	4 10·7	3 58·6	4·0 1·1	10·0 2·8	16·0 4·4
41	4 10·3	4 10·9	3 58·8	4·1 1·1	10·1 2·8	16·1 4·4
42	4 10·5	4 11·2	3 59·1	4·2 1·2	10·2 2·8	16·2 4·5
43	4 10·8	4 11·4	3 59·3	4·3 1·2	10·3 2·8	16·3 4·5
44	4 11·0	4 11·7	3 59·6	4·4 1·2	10·4 2·9	16·4 4·5
45	4 11·3	4 11·9	3 59·8	4·5 1·2	10·5 2·9	16·5 4·5
46	4 11·5	4 12·2	4 00·0	4·6 1·3	10·6 2·9	16·6 4·6
47	4 11·8	4 12·4	4 00·3	4·7 1·3	10·7 2·9	16·7 4·6
48	4 12·0	4 12·7	4 00·5	4·8 1·3	10·8 3·0	16·8 4·6
49	4 12·3	4 12·9	4 00·8	4·9 1·3	10·9 3·0	16·9 4·6
50	4 12·5	4 13·2	4 01·0	5·0 1·4	11·0 3·0	17·0 4·7
51	4 12·8	4 13·4	4 01·2	5·1 1·4	11·1 3·1	17·1 4·7
52	4 13·0	4 13·7	4 01·5	5·2 1·4	11·2 3·1	17·2 4·7
53	4 13·3	4 13·9	4 01·7	5·3 1·5	11·3 3·1	17·3 4·8
54	4 13·5	4 14·2	4 02·0	5·4 1·5	11·4 3·1	17·4 4·8
55	4 13·8	4 14·4	4 02·2	5·5 1·5	11·5 3·2	17·5 4·8
56	4 14·0	4 14·7	4 02·4	5·6 1·5	11·6 3·2	17·6 4·8
57	4 14·3	4 14·9	4 02·7	5·7 1·6	11·7 3·2	17·7 4·9
58	4 14·5	4 15·2	4 02·9	5·8 1·6	11·8 3·2	17·8 4·9
59	4 14·8	4 15·4	4 03·1	5·9 1·6	11·9 3·3	17·9 4·9
60	4 15·0	4 15·7	4 03·4	6·0 1·7	12·0 3·3	18·0 5·0

17m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	4 15·0	4 15·7	4 03·4	0·0 0·0	6·0 1·8	12·0 3·5
01	4 15·3	4 15·9	4 03·6	0·1 0·0	6·1 1·8	12·1 3·5
02	4 15·5	4 16·2	4 03·9	0·2 0·1	6·2 1·8	12·2 3·6
03	4 15·8	4 16·5	4 04·1	0·3 0·1	6·3 1·8	12·3 3·6
04	4 16·0	4 16·7	4 04·3	0·4 0·1	6·4 1·9	12·4 3·6
05	4 16·3	4 17·0	4 04·6	0·5 0·1	6·5 1·9	12·5 3·6
06	4 16·5	4 17·2	4 04·8	0·6 0·2	6·6 1·9	12·6 3·7
07	4 16·8	4 17·5	4 05·1	0·7 0·2	6·7 2·0	12·7 3·7
08	4 17·0	4 17·7	4 05·3	0·8 0·2	6·8 2·0	12·8 3·7
09	4 17·3	4 18·0	4 05·5	0·9 0·3	6·9 2·0	12·9 3·8
10	4 17·5	4 18·2	4 05·8	1·0 0·3	7·0 2·0	13·0 3·8
11	4 17·8	4 18·5	4 06·0	1·1 0·3	7·1 2·1	13·1 3·8
12	4 18·0	4 18·7	4 06·2	1·2 0·4	7·2 2·1	13·2 3·9
13	4 18·3	4 19·0	4 06·5	1·3 0·4	7·3 2·1	13·3 3·9
14	4 18·5	4 19·2	4 06·7	1·4 0·4	7·4 2·2	13·4 3·9
15	4 18·8	4 19·5	4 07·0	1·5 0·4	7·5 2·2	13·5 3·9
16	4 19·0	4 19·7	4 07·2	1·6 0·5	7·6 2·2	13·6 4·0
17	4 19·3	4 20·0	4 07·4	1·7 0·5	7·7 2·2	13·7 4·0
18	4 19·5	4 20·2	4 07·7	1·8 0·5	7·8 2·3	13·8 4·0
19	4 19·8	4 20·5	4 07·9	1·9 0·6	7·9 2·3	13·9 4·1
20	4 20·0	4 20·7	4 08·2	2·0 0·6	8·0 2·3	14·0 4·1
21	4 20·3	4 21·0	4 08·4	2·1 0·6	8·1 2·4	14·1 4·1
22	4 20·5	4 21·2	4 08·6	2·2 0·6	8·2 2·4	14·2 4·1
23	4 20·8	4 21·5	4 08·9	2·3 0·7	8·3 2·4	14·3 4·2
24	4 21·0	4 21·7	4 09·1	2·4 0·7	8·4 2·5	14·4 4·2
25	4 21·3	4 22·0	4 09·3	2·5 0·7	8·5 2·5	14·5 4·2
26	4 21·5	4 22·2	4 09·6	2·6 0·8	8·6 2·5	14·6 4·3
27	4 21·8	4 22·5	4 09·8	2·7 0·8	8·7 2·5	14·7 4·3
28	4 22·0	4 22·7	4 10·1	2·8 0·8	8·8 2·6	14·8 4·3
29	4 22·3	4 23·0	4 10·3	2·9 0·8	8·9 2·6	14·9 4·3
30	4 22·5	4 23·2	4 10·5	3·0 0·9	9·0 2·6	15·0 4·4
31	4 22·8	4 23·5	4 10·8	3·1 0·9	9·1 2·7	15·1 4·4
32	4 23·0	4 23·7	4 11·0	3·2 0·9	9·2 2·7	15·2 4·4
33	4 23·3	4 24·0	4 11·3	3·3 1·0	9·3 2·7	15·3 4·5
34	4 23·5	4 24·2	4 11·5	3·4 1·0	9·4 2·7	15·4 4·5
35	4 23·8	4 24·5	4 11·7	3·5 1·0	9·5 2·8	15·5 4·5
36	4 24·0	4 24·7	4 12·0	3·6 1·1	9·6 2·8	15·6 4·6
37	4 24·3	4 25·0	4 12·2	3·7 1·1	9·7 2·8	15·7 4·6
38	4 24·5	4 25·2	4 12·5	3·8 1·1	9·8 2·9	15·8 4·6
39	4 24·8	4 25·5	4 12·7	3·9 1·1	9·9 2·9	15·9 4·6
40	4 25·0	4 25·7	4 12·9	4·0 1·2	10·0 2·9	16·0 4·7
41	4 25·3	4 26·0	4 13·2	4·1 1·2	10·1 2·9	16·1 4·7
42	4 25·5	4 26·2	4 13·4	4·2 1·2	10·2 3·0	16·2 4·7
43	4 25·8	4 26·5	4 13·6	4·3 1·3	10·3 3·0	16·3 4·8
44	4 26·0	4 26·7	4 13·9	4·4 1·3	10·4 3·0	16·4 4·8
45	4 26·3	4 27·0	4 14·1	4·5 1·3	10·5 3·1	16·5 4·8
46	4 26·5	4 27·2	4 14·4	4·6 1·3	10·6 3·1	16·6 4·8
47	4 26·8	4 27·5	4 14·6	4·7 1·4	10·7 3·1	16·7 4·9
48	4 27·0	4 27·7	4 14·8	4·8 1·4	10·8 3·2	16·8 4·9
49	4 27·3	4 28·0	4 15·1	4·9 1·4	10·9 3·2	16·9 4·9
50	4 27·5	4 28·2	4 15·3	5·0 1·5	11·0 3·2	17·0 5·0
51	4 27·8	4 28·5	4 15·6	5·1 1·5	11·1 3·2	17·1 5·0
52	4 28·0	4 28·7	4 15·8	5·2 1·5	11·2 3·3	17·2 5·0
53	4 28·3	4 29·0	4 16·0	5·3 1·5	11·3 3·3	17·3 5·0
54	4 28·5	4 29·2	4 16·3	5·4 1·6	11·4 3·3	17·4 5·1
55	4 28·8	4 29·5	4 16·5	5·5 1·6	11·5 3·4	17·5 5·1
56	4 29·0	4 29·7	4 16·7	5·6 1·6	11·6 3·4	17·6 5·1
57	4 29·3	4 30·0	4 17·0	5·7 1·7	11·7 3·4	17·7 5·2
58	4 29·5	4 30·2	4 17·2	5·8 1·7	11·8 3·4	17·8 5·2
59	4 29·8	4 30·5	4 17·5	5·9 1·7	11·9 3·5	17·9 5·2
60	4 30·0	4 30·7	4 17·7	6·0 1·8	12·0 3·5	18·0 5·3

18m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	4 30·0	4 30·7	4 17·7	0·0 0·0	6·0 1·9	12·0 3·7
01	4 30·3	4 31·0	4 17·9	0·1 0·0	6·1 1·9	12·1 3·7
02	4 30·5	4 31·2	4 18·2	0·2 0·1	6·2 1·9	12·2 3·8
03	4 30·8	4 31·5	4 18·4	0·3 0·1	6·3 1·9	12·3 3·8
04	4 31·0	4 31·7	4 18·7	0·4 0·1	6·4 2·0	12·4 3·8
05	4 31·3	4 32·0	4 18·9	0·5 0·2	6·5 2·0	12·5 3·9
06	4 31·5	4 32·2	4 19·1	0·6 0·2	6·6 2·0	12·6 3·9
07	4 31·8	4 32·5	4 19·4	0·7 0·2	6·7 2·1	12·7 3·9
08	4 32·0	4 32·7	4 19·6	0·8 0·2	6·8 2·1	12·8 3·9
09	4 32·3	4 33·0	4 19·8	0·9 0·3	6·9 2·1	12·9 4·0
10	4 32·5	4 33·2	4 20·1	1·0 0·3	7·0 2·2	13·0 4·0
11	4 32·8	4 33·5	4 20·3	1·1 0·3	7·1 2·2	13·1 4·0
12	4 33·0	4 33·7	4 20·6	1·2 0·4	7·2 2·2	13·2 4·1
13	4 33·3	4 34·0	4 20·8	1·3 0·4	7·3 2·3	13·3 4·1
14	4 33·5	4 34·2	4 21·0	1·4 0·4	7·4 2·3	13·4 4·1
15	4 33·8	4 34·5	4 21·3	1·5 0·5	7·5 2·3	13·5 4·2
16	4 34·0	4 34·8	4 21·5	1·6 0·5	7·6 2·3	13·6 4·2
17	4 34·3	4 35·0	4 21·8	1·7 0·5	7·7 2·4	13·7 4·2
18	4 34·5	4 35·3	4 22·0	1·8 0·6	7·8 2·4	13·8 4·3
19	4 34·8	4 35·5	4 22·2	1·9 0·6	7·9 2·4	13·9 4·3
20	4 35·0	4 35·8	4 22·5	2·0 0·6	8·0 2·5	14·0 4·3
21	4 35·3	4 36·0	4 22·7	2·1 0·6	8·1 2·5	14·1 4·3
22	4 35·5	4 36·3	4 22·9	2·2 0·7	8·2 2·5	14·2 4·4
23	4 35·8	4 36·5	4 23·2	2·3 0·7	8·3 2·6	14·3 4·4
24	4 36·0	4 36·8	4 23·4	2·4 0·7	8·4 2·6	14·4 4·4
25	4 36·3	4 37·0	4 23·7	2·5 0·8	8·5 2·6	14·5 4·5
26	4 36·5	4 37·3	4 23·9	2·6 0·8	8·6 2·7	14·6 4·5
27	4 36·8	4 37·5	4 24·1	2·7 0·8	8·7 2·7	14·7 4·5
28	4 37·0	4 37·8	4 24·4	2·8 0·9	8·8 2·7	14·8 4·6
29	4 37·3	4 38·0	4 24·6	2·9 0·9	8·9 2·7	14·9 4·6
30	4 37·5	4 38·3	4 24·9	3·0 0·9	9·0 2·8	15·0 4·6
31	4 37·8	4 38·5	4 25·1	3·1 1·0	9·1 2·8	15·1 4·7
32	4 38·0	4 38·8	4 25·3	3·2 1·0	9·2 2·8	15·2 4·7
33	4 38·3	4 39·0	4 25·6	3·3 1·0	9·3 2·9	15·3 4·7
34	4 38·5	4 39·3	4 25·8	3·4 1·0	9·4 2·9	15·4 4·7
35	4 38·8	4 39·5	4 26·1	3·5 1·1	9·5 2·9	15·5 4·8
36	4 39·0	4 39·8	4 26·3	3·6 1·1	9·6 3·0	15·6 4·8
37	4 39·3	4 40·0	4 26·5	3·7 1·1	9·7 3·0	15·7 4·8
38	4 39·5	4 40·3	4 26·8	3·8 1·2	9·8 3·0	15·8 4·9
39	4 39·8	4 40·5	4 27·0	3·9 1·2	9·9 3·1	15·9 4·9
40	4 40·0	4 40·8	4 27·2	4·0 1·2	10·0 3·1	16·0 4·9
41	4 40·3	4 41·0	4 27·5	4·1 1·3	10·1 3·1	16·1 5·0
42	4 40·5	4 41·3	4 27·7	4·2 1·3	10·2 3·1	16·2 5·0
43	4 40·8	4 41·5	4 28·0	4·3 1·3	10·3 3·2	16·3 5·0
44	4 41·0	4 41·8	4 28·2	4·4 1·4	10·4 3·2	16·4 5·1
45	4 41·3	4 42·0	4 28·4	4·5 1·4	10·5 3·2	16·5 5·1
46	4 41·5	4 42·3	4 28·7	4·6 1·4	10·6 3·3	16·6 5·1
47	4 41·8	4 42·5	4 28·9	4·7 1·4	10·7 3·3	16·7 5·1
48	4 42·0	4 42·8	4 29·2	4·8 1·5	10·8 3·3	16·8 5·2
49	4 42·3	4 43·0	4 29·4	4·9 1·5	10·9 3·4	16·9 5·2
50	4 42·5	4 43·3	4 29·6	5·0 1·5	11·0 3·4	17·0 5·2
51	4 42·8	4 43·5	4 29·9	5·1 1·6	11·1 3·4	17·1 5·3
52	4 43·0	4 43·8	4 30·1	5·2 1·6	11·2 3·5	17·2 5·3
53	4 43·3	4 44·0	4 30·3	5·3 1·6	11·3 3·5	17·3 5·3
54	4 43·5	4 44·3	4 30·6	5·4 1·7	11·4 3·5	17·4 5·4
55	4 43·8	4 44·5	4 30·8	5·5 1·7	11·5 3·5	17·5 5·4
56	4 44·0	4 44·8	4 31·1	5·6 1·7	11·6 3·6	17·6 5·4
57	4 44·3	4 45·0	4 31·3	5·7 1·8	11·7 3·6	17·7 5·5
58	4 44·5	4 45·3	4 31·5	5·8 1·8	11·8 3·6	17·8 5·5
59	4 44·8	4 45·5	4 31·8	5·9 1·8	11·9 3·7	17·9 5·5
60	4 45·0	4 45·8	4 32·0	6·0 1·9	12·0 3·7	18·0 5·6

19m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	4 45·0	4 45·8	4 32·0	0·0 0·0	6·0 2·0	12·0 3·9
01	4 45·3	4 46·0	4 32·3	0·1 0·0	6·1 2·0	12·1 3·9
02	4 45·5	4 46·3	4 32·5	0·2 0·1	6·2 2·0	12·2 4·0
03	4 45·8	4 46·5	4 32·7	0·3 0·1	6·3 2·0	12·3 4·0
04	4 46·0	4 46·8	4 33·0	0·4 0·1	6·4 2·1	12·4 4·0
05	4 46·3	4 47·0	4 33·2	0·5 0·2	6·5 2·1	12·5 4·1
06	4 46·5	4 47·3	4 33·4	0·6 0·2	6·6 2·1	12·6 4·1
07	4 46·8	4 47·5	4 33·7	0·7 0·2	6·7 2·2	12·7 4·1
08	4 47·0	4 47·8	4 33·9	0·8 0·3	6·8 2·2	12·8 4·2
09	4 47·3	4 48·0	4 34·2	0·9 0·3	6·9 2·2	12·9 4·2
10	4 47·5	4 48·3	4 34·4	1·0 0·3	7·0 2·3	13·0 4·2
11	4 47·8	4 48·5	4 34·6	1·1 0·4	7·1 2·3	13·1 4·3
12	4 48·0	4 48·8	4 34·9	1·2 0·4	7·2 2·3	13·2 4·3
13	4 48·3	4 49·0	4 35·1	1·3 0·4	7·3 2·4	13·3 4·3
14	4 48·5	4 49·3	4 35·4	1·4 0·5	7·4 2·4	13·4 4·4
15	4 48·8	4 49·5	4 35·6	1·5 0·5	7·5 2·4	13·5 4·4
16	4 49·0	4 49·8	4 35·8	1·6 0·5	7·6 2·5	13·6 4·4
17	4 49·3	4 50·0	4 36·1	1·7 0·6	7·7 2·5	13·7 4·5
18	4 49·5	4 50·3	4 36·3	1·8 0·6	7·8 2·5	13·8 4·5
19	4 49·8	4 50·5	4 36·6	1·9 0·6	7·9 2·6	13·9 4·5
20	4 50·0	4 50·8	4 36·8	2·0 0·7	8·0 2·6	14·0 4·6
21	4 50·3	4 51·0	4 37·0	2·1 0·7	8·1 2·6	14·1 4·6
22	4 50·5	4 51·3	4 37·3	2·2 0·7	8·2 2·7	14·2 4·6
23	4 50·8	4 51·5	4 37·5	2·3 0·7	8·3 2·7	14·3 4·6
24	4 51·0	4 51·8	4 37·7	2·4 0·8	8·4 2·7	14·4 4·7
25	4 51·3	4 52·0	4 38·0	2·5 0·8	8·5 2·8	14·5 4·7
26	4 51·5	4 52·3	4 38·2	2·6 0·8	8·6 2·8	14·6 4·7
27	4 51·8	4 52·5	4 38·5	2·7 0·9	8·7 2·8	14·7 4·8
28	4 52·0	4 52·8	4 38·7	2·8 0·9	8·8 2·9	14·8 4·8
29	4 52·3	4 53·1	4 38·9	2·9 0·9	8·9 2·9	14·9 4·8
30	4 52·5	4 53·3	4 39·2	3·0 1·0	9·0 2·9	15·0 4·9
31	4 52·8	4 53·6	4 39·4	3·1 1·0	9·1 3·0	15·1 4·9
32	4 53·0	4 53·8	4 39·7	3·2 1·0	9·2 3·0	15·2 4·9
33	4 53·3	4 54·1	4 39·9	3·3 1·1	9·3 3·0	15·3 5·0
34	4 53·5	4 54·3	4 40·1	3·4 1·1	9·4 3·1	15·4 5·0
35	4 53·8	4 54·6	4 40·4	3·5 1·1	9·5 3·1	15·5 5·0
36	4 54·0	4 54·8	4 40·6	3·6 1·2	9·6 3·1	15·6 5·1
37	4 54·3	4 55·1	4 40·8	3·7 1·2	9·7 3·2	15·7 5·1
38	4 54·5	4 55·3	4 41·1	3·8 1·2	9·8 3·2	15·8 5·1
39	4 54·8	4 55·6	4 41·3	3·9 1·3	9·9 3·2	15·9 5·2
40	4 55·0	4 55·8	4 41·6	4·0 1·3	10·0 3·3	16·0 5·2
41	4 55·3	4 56·1	4 41·8	4·1 1·3	10·1 3·3	16·1 5·2
42	4 55·5	4 56·3	4 42·0	4·2 1·4	10·2 3·3	16·2 5·3
43	4 55·8	4 56·6	4 42·3	4·3 1·4	10·3 3·3	16·3 5·3
44	4 56·0	4 56·8	4 42·5	4·4 1·4	10·4 3·4	16·4 5·3
45	4 56·3	4 57·1	4 42·8	4·5 1·5	10·5 3·4	16·5 5·4
46	4 56·5	4 57·3	4 43·0	4·6 1·5	10·6 3·4	16·6 5·4
47	4 56·8	4 57·6	4 43·2	4·7 1·5	10·7 3·5	16·7 5·4
48	4 57·0	4 57·8	4 43·5	4·8 1·6	10·8 3·5	16·8 5·5
49	4 57·3	4 58·1	4 43·7	4·9 1·6	10·9 3·5	16·9 5·5
50	4 57·5	4 58·3	4 43·9	5·0 1·6	11·0 3·6	17·0 5·5
51	4 57·8	4 58·6	4 44·2	5·1 1·7	11·1 3·6	17·1 5·6
52	4 58·0	4 58·8	4 44·4	5·2 1·7	11·2 3·6	17·2 5·6
53	4 58·3	4 59·1	4 44·7	5·3 1·7	11·3 3·7	17·3 5·6
54	4 58·5	4 59·3	4 44·9	5·4 1·8	11·4 3·7	17·4 5·7
55	4 58·8	4 59·6	4 45·1	5·5 1·8	11·5 3·7	17·5 5·7
56	4 59·0	4 59·8	4 45·4	5·6 1·8	11·6 3·8	17·6 5·7
57	4 59·3	5 00·1	4 45·6	5·7 1·9	11·7 3·8	17·7 5·8
58	4 59·5	5 00·3	4 45·9	5·8 1·9	11·8 3·8	17·8 5·8
59	4 59·8	5 00·6	4 46·1	5·9 1·9	11·9 3·9	17·9 5·8
60	5 00·0	5 00·8	4 46·3	6·0 2·0	12·0 3·9	18·0 5·9

20s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	5 00·0	5 00·8	4 46·3	0·0	0·0	6·0	2·1	12·0	4·1
01	5 00·3	5 01·1	4 46·6	0·1	0·0	6·1	2·1	12·1	4·1
02	5 00·5	5 01·3	4 46·8	0·2	0·1	6·2	2·1	12·2	4·2
03	5 00·8	5 01·6	4 47·0	0·3	0·1	6·3	2·2	12·3	4·2
04	5 01·0	5 01·8	4 47·3	0·4	0·1	6·4	2·2	12·4	4·2
05	5 01·3	5 02·1	4 47·5	0·5	0·2	6·5	2·2	12·5	4·3
06	5 01·5	5 02·3	4 47·8	0·6	0·2	6·6	2·3	12·6	4·3
07	5 01·8	5 02·6	4 48·0	0·7	0·2	6·7	2·3	12·7	4·3
08	5 02·0	5 02·8	4 48·2	0·8	0·3	6·8	2·3	12·8	4·4
09	5 02·3	5 03·1	4 48·5	0·9	0·3	6·9	2·4	12·9	4·4
10	5 02·5	5 03·3	4 48·7	1·0	0·3	7·0	2·4	13·0	4·4
11	5 02·8	5 03·6	4 49·0	1·1	0·4	7·1	2·4	13·1	4·5
12	5 03·0	5 03·8	4 49·2	1·2	0·4	7·2	2·5	13·2	4·5
13	5 03·3	5 04·1	4 49·4	1·3	0·4	7·3	2·5	13·3	4·5
14	5 03·5	5 04·3	4 49·7	1·4	0·5	7·4	2·5	13·4	4·6
15	5 03·8	5 04·6	4 49·9	1·5	0·5	7·5	2·6	13·5	4·6
16	5 04·0	5 04·8	4 50·2	1·6	0·5	7·6	2·6	13·6	4·6
17	5 04·3	5 05·1	4 50·4	1·7	0·6	7·7	2·6	13·7	4·7
18	5 04·5	5 05·3	4 50·6	1·8	0·6	7·8	2·7	13·8	4·7
19	5 04·8	5 05·6	4 50·9	1·9	0·6	7·9	2·7	13·9	4·7
20	5 05·0	5 05·8	4 51·1	2·0	0·7	8·0	2·7	14·0	4·8
21	5 05·3	5 06·1	4 51·3	2·1	0·7	8·1	2·8	14·1	4·8
22	5 05·5	5 06·3	4 51·6	2·2	0·8	8·2	2·8	14·2	4·9
23	5 05·8	5 06·6	4 51·8	2·3	0·8	8·3	2·8	14·3	4·9
24	5 06·0	5 06·8	4 52·1	2·4	0·8	8·4	2·9	14·4	4·9
25	5 06·3	5 07·1	4 52·3	2·5	0·9	8·5	2·9	14·5	5·0
26	5 06·5	5 07·3	4 52·5	2·6	0·9	8·6	2·9	14·6	5·0
27	5 06·8	5 07·6	4 52·8	2·7	0·9	8·7	3·0	14·7	5·0
28	5 07·0	5 07·8	4 53·0	2·8	1·0	8·8	3·0	14·8	5·1
29	5 07·3	5 08·1	4 53·3	2·9	1·0	8·9	3·0	14·9	5·1
30	5 07·5	5 08·3	4 53·5	3·0	1·0	9·0	3·1	15·0	5·1
31	5 07·8	5 08·6	4 53·7	3·1	1·1	9·1	3·1	15·1	5·2
32	5 08·0	5 08·8	4 54·0	3·2	1·1	9·2	3·1	15·2	5·2
33	5 08·3	5 09·1	4 54·2	3·3	1·1	9·3	3·2	15·3	5·2
34	5 08·5	5 09·3	4 54·4	3·4	1·2	9·4	3·2	15·4	5·3
35	5 08·8	5 09·6	4 54·7	3·5	1·2	9·5	3·2	15·5	5·3
36	5 09·0	5 09·8	4 54·9	3·6	1·2	9·6	3·3	15·6	5·3
37	5 09·3	5 10·1	4 55·2	3·7	1·3	9·7	3·3	15·7	5·4
38	5 09·5	5 10·3	4 55·4	3·8	1·3	9·8	3·3	15·8	5·4
39	5 09·8	5 10·6	4 55·6	3·9	1·3	9·9	3·4	15·9	5·4
40	5 10·0	5 10·8	4 55·9	4·0	1·4	10·0	3·4	16·0	5·5
41	5 10·3	5 11·1	4 56·1	4·1	1·4	10·1	3·5	16·1	5·5
42	5 10·5	5 11·4	4 56·4	4·2	1·4	10·2	3·5	16·2	5·5
43	5 10·8	5 11·6	4 56·6	4·3	1·5	10·3	3·5	16·3	5·6
44	5 11·0	5 11·9	4 56·8	4·4	1·5	10·4	3·6	16·4	5·6
45	5 11·3	5 12·1	4 57·1	4·5	1·5	10·5	3·6	16·5	5·6
46	5 11·5	5 12·4	4 57·3	4·6	1·6	10·6	3·6	16·6	5·7
47	5 11·8	5 12·6	4 57·5	4·7	1·6	10·7	3·7	16·7	5·7
48	5 12·0	5 12·9	4 57·8	4·8	1·6	10·8	3·7	16·8	5·7
49	5 12·3	5 13·1	4 58·0	4·9	1·7	10·9	3·7	16·9	5·8
50	5 12·5	5 13·4	4 58·3	5·0	1·7	11·0	3·8	17·0	5·8
51	5 12·8	5 13·6	4 58·5	5·1	1·7	11·1	3·8	17·1	5·8
52	5 13·0	5 13·9	4 58·7	5·2	1·8	11·2	3·8	17·2	5·9
53	5 13·3	5 14·1	4 59·0	5·3	1·8	11·3	3·9	17·3	5·9
54	5 13·5	5 14·4	4 59·2	5·4	1·8	11·4	3·9	17·4	5·9
55	5 13·8	5 14·6	4 59·5	5·5	1·9	11·5	3·9	17·5	6·0
56	5 14·0	5 14·9	4 59·7	5·6	1·9	11·6	4·0	17·6	6·0
57	5 14·3	5 15·1	4 59·9	5·7	1·9	11·7	4·0	17·7	6·0
58	5 14·5	5 15·4	5 00·2	5·8	2·0	11·8	4·0	17·8	6·1
59	5 14·8	5 15·6	5 00·4	5·9	2·0	11·9	4·1	17·9	6·1
60	5 15·0	5 15·9	5 00·7	6·0	2·1	12·0	4·1	18·0	6·2

21s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	5 15·0	5 15·9	5 00·7	0·0	0·0	6·0	2·2	12·0	4·3
01	5 15·3	5 16·1	5 00·9	0·1	0·0	6·1	2·2	12·1	4·3
02	5 15·5	5 16·4	5 01·1	0·2	0·1	6·2	2·2	12·2	4·4
03	5 15·8	5 16·6	5 01·4	0·3	0·1	6·3	2·3	12·3	4·4
04	5 16·0	5 16·9	5 01·6	0·4	0·1	6·4	2·3	12·4	4·4
05	5 16·3	5 17·1	5 01·8	0·5	0·2	6·5	2·3	12·5	4·5
06	5 16·5	5 17·4	5 02·1	0·6	0·2	6·6	2·4	12·6	4·5
07	5 16·8	5 17·6	5 02·3	0·7	0·3	6·7	2·4	12·7	4·6
08	5 17·0	5 17·9	5 02·6	0·8	0·3	6·8	2·4	12·8	4·6
09	5 17·3	5 18·1	5 02·8	0·9	0·3	6·9	2·5	12·9	4·6
10	5 17·5	5 18·4	5 03·0	1·0	0·4	7·0	2·5	13·0	4·7
11	5 17·8	5 18·6	5 03·3	1·1	0·4	7·1	2·5	13·1	4·7
12	5 18·0	5 18·9	5 03·5	1·2	0·4	7·2	2·6	13·2	4·7
13	5 18·3	5 19·1	5 03·8	1·3	0·5	7·3	2·6	13·3	4·8
14	5 18·5	5 19·4	5 04·0	1·4	0·5	7·4	2·7	13·4	4·8
15	5 18·8	5 19·6	5 04·2	1·5	0·5	7·5	2·7	13·5	4·8
16	5 19·0	5 19·9	5 04·5	1·6	0·6	7·6	2·7	13·6	4·9
17	5 19·3	5 20·1	5 04·7	1·7	0·6	7·7	2·8	13·7	4·9
18	5 19·5	5 20·4	5 04·9	1·8	0·6	7·8	2·8	13·8	4·9
19	5 19·8	5 20·6	5 05·2	1·9	0·7	7·9	2·8	13·9	5·0
20	5 20·0	5 20·9	5 05·4	2·0	0·7	8·0	2·9	14·0	5·0
21	5 20·3	5 21·1	5 05·7	2·1	0·8	8·1	2·9	14·1	5·1
22	5 20·5	5 21·4	5 05·9	2·2	0·8	8·2	2·9	14·2	5·1
23	5 20·8	5 21·6	5 06·1	2·3	0·8	8·3	3·0	14·3	5·1
24	5 21·0	5 21·9	5 06·4	2·4	0·9	8·4	3·0	14·4	5·2
25	5 21·3	5 22·1	5 06·6	2·5	0·9	8·5	3·0	14·5	5·2
26	5 21·5	5 22·4	5 06·9	2·6	0·9	8·6	3·1	14·6	5·2
27	5 21·8	5 22·6	5 07·1	2·7	1·0	8·7	3·1	14·7	5·3
28	5 22·0	5 22·9	5 07·3	2·8	1·0	8·8	3·2	14·8	5·3
29	5 22·3	5 23·1	5 07·6	2·9	1·0	8·9	3·2	14·9	5·3
30	5 22·5	5 23·4	5 07·8	3·0	1·1	9·0	3·2	15·0	5·4
31	5 22·8	5 23·6	5 08·0	3·1	1·1	9·1	3·3	15·1	5·4
32	5 23·0	5 23·9	5 08·3	3·2	1·1	9·2	3·3	15·2	5·4
33	5 23·3	5 24·1	5 08·5	3·3	1·2	9·3	3·3	15·3	5·5
34	5 23·5	5 24·4	5 08·8	3·4	1·2	9·4	3·4	15·4	5·5
35	5 23·8	5 24·6	5 09·0	3·5	1·3	9·5	3·4	15·5	5·6
36	5 24·0	5 24·9	5 09·2	3·6	1·3	9·6	3·4	15·6	5·6
37	5 24·3	5 25·1	5 09·5	3·7	1·3	9·7	3·5	15·7	5·6
38	5 24·5	5 25·4	5 09·7	3·8	1·4	9·8	3·5	15·8	5·7
39	5 24·8	5 25·6	5 10·0	3·9	1·4	9·9	3·5	15·9	5·7
40	5 25·0	5 25·9	5 10·2	4·0	1·4	10·0	3·6	16·0	5·7
41	5 25·3	5 26·1	5 10·4	4·1	1·5	10·1	3·6	16·1	5·8
42	5 25·5	5 26·4	5 10·7	4·2	1·5	10·2	3·7	16·2	5·8
43	5 25·8	5 26·6	5 10·9	4·3	1·5	10·3	3·7	16·3	5·8
44	5 26·0	5 26·9	5 11·1	4·4	1·6	10·4	3·7	16·4	5·9
45	5 26·3	5 27·1	5 11·4	4·5	1·6	10·5	3·8	16·5	5·9
46	5 26·5	5 27·4	5 11·6	4·6	1·6	10·6	3·8	16·6	5·9
47	5 26·8	5 27·6	5 11·9	4·7	1·7	10·7	3·8	16·7	6·0
48	5 27·0	5 27·9	5 12·1	4·8	1·7	10·8	3·9	16·8	6·0
49	5 27·3	5 28·1	5 12·3	4·9	1·8	10·9	3·9	16·9	6·1
50	5 27·5	5 28·4	5 12·6	5·0	1·8	11·0	3·9	17·0	6·1
51	5 27·8	5 28·6	5 12·8	5·1	1·8	11·1	4·0	17·1	6·1
52	5 28·0	5 28·9	5 13·1	5·2	1·9	11·2	4·0	17·2	6·2
53	5 28·3	5 29·1	5 13·3	5·3	1·9	11·3	4·0	17·3	6·2
54	5 28·5	5 29·4	5 13·5	5·4	1·9	11·4	4·1	17·4	6·2
55	5 28·8	5 29·7	5 13·8	5·5	2·0	11·5	4·1	17·5	6·3
56	5 29·0	5 29·9	5 14·0	5·6	2·0	11·6	4·2	17·6	6·3
57	5 29·3	5 30·2	5 14·3	5·7	2·0	11·7	4·2	17·7	6·3
58	5 29·5	5 30·4	5 14·5	5·8	2·1	11·8	4·2	17·8	6·4
59	5 29·8	5 30·7	5 14·7	5·9	2·1	11·9	4·3	17·9	6·4
60	5 30·0	5 30·9	5 15·0	6·0	2·2	12·0	4·3	18·0	6·5

22s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	5 30·0	5 30·9	5 15·0	0·0	0·0	6·0	2·3	12·0	4·5
01	5 30·3	5 31·2	5 15·2	0·1	0·0	6·1	2·3	12·1	4·5
02	5 30·5	5 31·4	5 15·4	0·2	0·1	6·2	2·3	12·2	4·6
03	5 30·8	5 31·7	5 15·7	0·3	0·1	6·3	2·4	12·3	4·6
04	5 31·0	5 31·9	5 15·9	0·4	0·2	6·4	2·4	12·4	4·7
05	5 31·3	5 32·2	5 16·2	0·5	0·2	6·5	2·4	12·5	4·7
06	5 31·5	5 32·4	5 16·4	0·6	0·2	6·6	2·5	12·6	4·7
07	5 31·8	5 32·7	5 16·6	0·7	0·3	6·7	2·5	12·7	4·8
08	5 32·0	5 32·9	5 16·9	0·8	0·3	6·8	2·6	12·8	4·8
09	5 32·3	5 33·2	5 17·1	0·9	0·3	6·9	2·6	12·9	4·8
10	5 32·5	5 33·4	5 17·4	1·0	0·4	7·0	2·6	13·0	4·9
11	5 32·8	5 33·7	5 17·6	1·1	0·4	7·1	2·7	13·1	4·9
12	5 33·0	5 33·9	5 17·8	1·2	0·5	7·2	2·7	13·2	5·0
13	5 33·3	5 34·2	5 18·1	1·3	0·5	7·3	2·7	13·3	5·0
14	5 33·5	5 34·4	5 18·3	1·4	0·5	7·4	2·8	13·4	5·0
15	5 33·8	5 34·7	5 18·5	1·5	0·6	7·5	2·8	13·5	5·1
16	5 34·0	5 34·9	5 18·8	1·6	0·6	7·6	2·9	13·6	5·1
17	5 34·3	5 35·2	5 19·0	1·7	0·6	7·7	2·9	13·7	5·1
18	5 34·5	5 35·4	5 19·3	1·8	0·7	7·8	2·9	13·8	5·2
19	5 34·8	5 35·7	5 19·5	1·9	0·7	7·9	3·0	13·9	5·2
20	5 35·0	5 35·9	5 19·7	2·0	0·8	8·0	3·0	14·0	5·3
21	5 35·3	5 36·2	5 20·0	2·1	0·8	8·1	3·0	14·1	5·3
22	5 35·5	5 36·4	5 20·2	2·2	0·8	8·2	3·1	14·2	5·3
23	5 35·8	5 36·7	5 20·5	2·3	0·9	8·3	3·1	14·3	5·4
24	5 36·0	5 36·9	5 20·7	2·4	0·9	8·4	3·2	14·4	5·4
25	5 36·3	5 37·2	5 20·9	2·5	0·9	8·5	3·2	14·5	5·4
26	5 36·5	5 37·4	5 21·2	2·6	1·0	8·6	3·2	14·6	5·5
27	5 36·8	5 37·7	5 21·4	2·7	1·0	8·7	3·3	14·7	5·5
28	5 37·0	5 37·9	5 21·6	2·8	1·1	8·8	3·3	14·8	5·6
29	5 37·3	5 38·2	5 21·9	2·9	1·1	8·9	3·3	14·9	5·6
30	5 37·5	5 38·4	5 22·1	3·0	1·1	9·0	3·4	15·0	5·6
31	5 37·8	5 38·7	5 22·4	3·1	1·2	9·1	3·4	15·1	5·7
32	5 38·0	5 38·9	5 22·6	3·2	1·2	9·2	3·5	15·2	5·7
33	5 38·3	5 39·2	5 22·8	3·3	1·2	9·3	3·5	15·3	5·7
34	5 38·5	5 39·4	5 23·1	3·4	1·3	9·4	3·5	15·4	5·8
35	5 38·8	5 39·7	5 23·3	3·5	1·3	9·5	3·6	15·5	5·8
36	5 39·0	5 39·9	5 23·6	3·6	1·4	9·6	3·6	15·6	5·9
37	5 39·3	5 40·2	5 23·8	3·7	1·4	9·7	3·6	15·7	5·9
38	5 39·5	5 40·4	5 24·0	3·8	1·4	9·8	3·7	15·8	5·9
39	5 39·8	5 40·7	5 24·3	3·9	1·5	9·9	3·7	15·9	6·0
40	5 40·0	5 40·9	5 24·5	4·0	1·5	10·0	3·8	16·0	6·0
41	5 40·3	5 41·2	5 24·7	4·1	1·5	10·1	3·8	16·1	6·0
42	5 40·5	5 41·4	5 25·0	4·2	1·6	10·2	3·8	16·2	6·1
43	5 40·8	5 41·7	5 25·2	4·3	1·6	10·3	3·9	16·3	6·1
44	5 41·0	5 41·9	5 25·5	4·4	1·7	10·4	3·9	16·4	6·2
45	5 41·3	5 42·2	5 25·7	4·5	1·7	10·5	3·9	16·5	6·2
46	5 41·5	5 42·4	5 25·9	4·6	1·7	10·6	4·0	16·6	6·2
47	5 41·8	5 42·7	5 26·2	4·7	1·8	10·7	4·0	16·7	6·3
48	5 42·0	5 42·9	5 26·4	4·8	1·8	10·8	4·1	16·8	6·3
49	5 42·3	5 43·2	5 26·7	4·9	1·8	10·9	4·1	16·9	6·3
50	5 42·5	5 43·4	5 26·9	5·0	1·9	11·0	4·1	17·0	6·4
51	5 42·8	5 43·7	5 27·1	5·1	1·9	11·1	4·2	17·1	6·4
52	5 43·0	5 43·9	5 27·4	5·2	2·0	11·2	4·2	17·2	6·5
53	5 43·3	5 44·2	5 27·6	5·3	2·0	11·3	4·2	17·3	6·5
54	5 43·5	5 44·4	5 27·9	5·4	2·0	11·4	4·3	17·4	6·5
55	5 43·8	5 44·7	5 28·1	5·5	2·1	11·5	4·3	17·5	6·6
56	5 44·0	5 44·9	5 28·3	5·6	2·1	11·6	4·4	17·6	6·6
57	5 44·3	5 45·2	5 28·6	5·7	2·1	11·7	4·4	17·7	6·6
58	5 44·5	5 45·4	5 28·8	5·8	2·2	11·8	4·4	17·8	6·7
59	5 44·8	5 45·7	5 29·0	5·9	2·2	11·9	4·5	17·9	6·7
60	5 45·0	5 45·9	5 29·3	6·0	2·3	12·0	4·5	18·0	6·8

23s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	5 45·0	5 45·9	5 29·3	0·0	0·0	6·0	2·4	12·0	4·7
01	5 45·3	5 46·2	5 29·5	0·1	0·0	6·1	2·4	12·1	4·7
02	5 45·5	5 46·4	5 29·8	0·2	0·1	6·2	2·4	12·2	4·8
03	5 45·8	5 46·7	5 30·0	0·3	0·1	6·3	2·5	12·3	4·8
04	5 46·0	5 46·9	5 30·2	0·4	0·2	6·4	2·5	12·4	4·9
05	5 46·3	5 47·2	5 30·5	0·5	0·2	6·5	2·5	12·5	4·9
06	5 46·5	5 47·4	5 30·7	0·6	0·2	6·6	2·6	12·6	4·9
07	5 46·8	5 47·7	5 31·0	0·7	0·3	6·7	2·6	12·7	5·0
08	5 47·0	5 48·0	5 31·2	0·8	0·3	6·8	2·7	12·8	5·0
09	5 47·3	5 48·2	5 31·4	0·9	0·4	6·9	2·7	12·9	5·1
10	5 47·5	5 48·5	5 31·7	1·0	0·4	7·0	2·7	13·0	5·1
11	5 47·8	5 48·7	5 31·9	1·1	0·4	7·1	2·8	13·1	5·1
12	5 48·0	5 49·0	5 32·1	1·2	0·5	7·2	2·8	13·2	5·2
13	5 48·3	5 49·2	5 32·4	1·3	0·5	7·3	2·9	13·3	5·2
14	5 48·5	5 49·5	5 32·6	1·4	0·5	7·4	2·9	13·4	5·2
15	5 48·8	5 49·7	5 32·9	1·5	0·6	7·5	2·9	13·5	5·3
16	5 49·0	5 50·0	5 33·1	1·6	0·6	7·6	3·0	13·6	5·3
17	5 49·3	5 50·2	5 33·3	1·7	0·7	7·7	3·0	13·7	5·4
18	5 49·5	5 50·5	5 33·6	1·8	0·7	7·8	3·1	13·8	5·4
19	5 49·8	5 50·7	5 33·8	1·9	0·7	7·9	3·1	13·9	5·4
20	5 50·0	5 51·0	5 34·1	2·0	0·8	8·0	3·1	14·0	5·5
21	5 50·3	5 51·2	5 34·3	2·1	0·8	8·1	3·2	14·1	5·5
22	5 50·5	5 51·5	5 34·5	2·2	0·9	8·2	3·2	14·2	5·6
23	5 50·8	5 51·7	5 34·8	2·3	0·9	8·3	3·3	14·3	5·6
24	5 51·0	5 52·0	5 35·0	2·4	0·9	8·4	3·3	14·4	5·6
25	5 51·3	5 52·2	5 35·2	2·5	1·0	8·5	3·3	14·5	5·7
26	5 51·5	5 52·5	5 35·5	2·6	1·0	8·6	3·4	14·6	5·7
27	5 51·8	5 52·7	5 35·7	2·7	1·1	8·7	3·4	14·7	5·8
28	5 52·0	5 53·0	5 36·0	2·8	1·1	8·8	3·4	14·8	5·8
29	5 52·3	5 53·2	5 36·2	2·9	1·1	8·9	3·5	14·9	5·8
30	5 52·5	5 53·5	5 36·4	3·0	1·2	9·0	3·5	15·0	5·9
31	5 52·8	5 53·7	5 36·7	3·1	1·2	9·1	3·6	15·1	5·9
32	5 53·0	5 54·0	5 36·9	3·2	1·3	9·2	3·6	15·2	6·0
33	5 53·3	5 54·2	5 37·2	3·3	1·3	9·3	3·6	15·3	6·0
34	5 53·5	5 54·5	5 37·4	3·4	1·3	9·4	3·7	15·4	6·0
35	5 53·8	5 54·7	5 37·6	3·5	1·4	9·5	3·7	15·5	6·1
36	5 54·0	5 55·0	5 37·9	3·6	1·4	9·6	3·8	15·6	6·1
37	5 54·3	5 55·2	5 38·1	3·7	1·4	9·7	3·8	15·7	6·1
38	5 54·5	5 55·5	5 38·4	3·8	1·5	9·8	3·8	15·8	6·2
39	5 54·8	5 55·7	5 38·6	3·9	1·5	9·9	3·9	15·9	6·2
40	5 55·0	5 56·0	5 38·8	4·0	1·6	10·0	3·9	16·0	6·3
41	5 55·3	5 56·2	5 39·1	4·1	1·6	10·1	4·0	16·1	6·3
42	5 55·5	5 56·5	5 39·3	4·2	1·6	10·2	4·0	16·2	6·3
43	5 55·8	5 56·7	5 39·5	4·3	1·7	10·3	4·0	16·3	6·4
44	5 56·0	5 57·0	5 39·8	4·4	1·7	10·4	4·1	16·4	6·4
45	5 56·3	5 57·2	5 40·0	4·5	1·8	10·5	4·1	16·5	6·5
46	5 56·5	5 57·5	5 40·3	4·6	1·8	10·6	4·2	16·6	6·5
47	5 56·8	5 57·7	5 40·5	4·7	1·8	10·7	4·2	16·7	6·5
48	5 57·0	5 58·0	5 40·7	4·8	1·9	10·8	4·2	16·8	6·6
49	5 57·3	5 58·2	5 41·0	4·9	1·9	10·9	4·3	16·9	6·6
50	5

24	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′	′	′
00	6 00·0	6 01·0	5 43·6	0·0 0·0	6·0 2·5	12·0 4·9
01	6 00·3	6 01·2	5 43·8	0·1 0·0	6·1 2·5	12·1 4·9
02	6 00·5	6 01·5	5 44·1	0·2 0·1	6·2 2·5	12·2 5·0
03	6 00·8	6 01·7	5 44·3	0·3 0·1	6·3 2·6	12·3 5·0
04	6 01·0	6 02·0	5 44·6	0·4 0·2	6·4 2·6	12·4 5·1
05	6 01·3	6 02·2	5 44·8	0·5 0·2	6·5 2·7	12·5 5·1
06	6 01·5	6 02·5	5 45·0	0·6 0·2	6·6 2·7	12·6 5·1
07	6 01·8	6 02·7	5 45·3	0·7 0·3	6·7 2·7	12·7 5·2
08	6 02·0	6 03·0	5 45·5	0·8 0·3	6·8 2·8	12·8 5·2
09	6 02·3	6 03·2	5 45·7	0·9 0·4	6·9 2·8	12·9 5·3
10	6 02·5	6 03·5	5 46·0	1·0 0·4	7·0 2·9	13·0 5·3
11	6 02·8	6 03·7	5 46·2	1·1 0·4	7·1 2·9	13·1 5·3
12	6 03·0	6 04·0	5 46·5	1·2 0·5	7·2 2·9	13·2 5·4
13	6 03·3	6 04·2	5 46·7	1·3 0·5	7·3 3·0	13·3 5·4
14	6 03·5	6 04·5	5 46·9	1·4 0·6	7·4 3·0	13·4 5·5
15	6 03·8	6 04·7	5 47·2	1·5 0·6	7·5 3·1	13·5 5·5
16	6 04·0	6 05·0	5 47·4	1·6 0·7	7·6 3·1	13·6 5·6
17	6 04·3	6 05·2	5 47·7	1·7 0·7	7·7 3·1	13·7 5·6
18	6 04·5	6 05·5	5 47·9	1·8 0·7	7·8 3·2	13·8 5·6
19	6 04·8	6 05·7	5 48·1	1·9 0·8	7·9 3·2	13·9 5·7
20	6 05·0	6 06·0	5 48·4	2·0 0·8	8·0 3·3	14·0 5·7
21	6 05·3	6 06·3	5 48·6	2·1 0·9	8·1 3·3	14·1 5·8
22	6 05·5	6 06·5	5 48·8	2·2 0·9	8·2 3·3	14·2 5·8
23	6 05·8	6 06·8	5 49·1	2·3 0·9	8·3 3·4	14·3 5·8
24	6 06·0	6 07·0	5 49·3	2·4 1·0	8·4 3·4	14·4 5·9
25	6 06·3	6 07·3	5 49·6	2·5 1·0	8·5 3·5	14·5 5·9
26	6 06·5	6 07·5	5 49·8	2·6 1·1	8·6 3·5	14·6 6·0
27	6 06·8	6 07·8	5 50·0	2·7 1·1	8·7 3·6	14·7 6·0
28	6 07·0	6 08·0	5 50·3	2·8 1·1	8·8 3·6	14·8 6·0
29	6 07·3	6 08·3	5 50·5	2·9 1·2	8·9 3·6	14·9 6·1
30	6 07·5	6 08·5	5 50·8	3·0 1·2	9·0 3·7	15·0 6·1
31	6 07·8	6 08·8	5 51·0	3·1 1·3	9·1 3·7	15·1 6·2
32	6 08·0	6 09·0	5 51·2	3·2 1·3	9·2 3·8	15·2 6·2
33	6 08·3	6 09·3	5 51·5	3·3 1·3	9·3 3·8	15·3 6·2
34	6 08·5	6 09·5	5 51·7	3·4 1·4	9·4 3·8	15·4 6·3
35	6 08·8	6 09·8	5 52·0	3·5 1·4	9·5 3·9	15·5 6·3
36	6 09·0	6 10·0	5 52·2	3·6 1·5	9·6 3·9	15·6 6·4
37	6 09·3	6 10·3	5 52·4	3·7 1·5	9·7 4·0	15·7 6·4
38	6 09·5	6 10·5	5 52·7	3·8 1·6	9·8 4·0	15·8 6·5
39	6 09·8	6 10·8	5 52·9	3·9 1·6	9·9 4·0	15·9 6·5
40	6 10·0	6 11·0	5 53·1	4·0 1·6	10·0 4·1	16·0 6·5
41	6 10·3	6 11·3	5 53·4	4·1 1·7	10·1 4·1	16·1 6·6
42	6 10·5	6 11·5	5 53·6	4·2 1·7	10·2 4·2	16·2 6·6
43	6 10·8	6 11·8	5 53·9	4·3 1·8	10·3 4·2	16·3 6·7
44	6 11·0	6 12·0	5 54·1	4·4 1·8	10·4 4·2	16·4 6·7
45	6 11·3	6 12·3	5 54·3	4·5 1·8	10·5 4·3	16·5 6·7
46	6 11·5	6 12·5	5 54·6	4·6 1·9	10·6 4·3	16·6 6·8
47	6 11·8	6 12·8	5 54·8	4·7 1·9	10·7 4·4	16·7 6·8
48	6 12·0	6 13·0	5 55·1	4·8 2·0	10·8 4·4	16·8 6·9
49	6 12·3	6 13·3	5 55·3	4·9 2·0	10·9 4·5	16·9 6·9
50	6 12·5	6 13·5	5 55·5	5·0 2·0	11·0 4·5	17·0 6·9
51	6 12·8	6 13·8	5 55·8	5·1 2·1	11·1 4·5	17·1 7·0
52	6 13·0	6 14·0	5 56·0	5·2 2·1	11·2 4·6	17·2 7·0
53	6 13·3	6 14·3	5 56·2	5·3 2·2	11·3 4·6	17·3 7·1
54	6 13·5	6 14·5	5 56·5	5·4 2·2	11·4 4·7	17·4 7·1
55	6 13·8	6 14·8	5 56·7	5·5 2·2	11·5 4·7	17·5 7·1
56	6 14·0	6 15·0	5 57·0	5·6 2·3	11·6 4·7	17·6 7·2
57	6 14·3	6 15·3	5 57·2	5·7 2·3	11·7 4·8	17·7 7·2
58	6 14·5	6 15·5	5 57·4	5·8 2·4	11·8 4·8	17·8 7·3
59	6 14·8	6 15·8	5 57·7	5·9 2·4	11·9 4·9	17·9 7·3
60	6 15·0	6 16·0	5 57·9	6·0 2·5	12·0 4·9	18·0 7·4

25	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′	′	′
00	6 15·0	6 16·0	5 57·9	0·0 0·0	6·0 2·6	12·0 5·1
01	6 15·3	6 16·3	5 58·2	0·1 0·0	6·1 2·6	12·1 5·1
02	6 15·5	6 16·5	5 58·4	0·2 0·1	6·2 2·6	12·2 5·2
03	6 15·8	6 16·8	5 58·6	0·3 0·1	6·3 2·7	12·3 5·2
04	6 16·0	6 17·0	5 58·9	0·4 0·2	6·4 2·7	12·4 5·3
05	6 16·3	6 17·3	5 59·1	0·5 0·2	6·5 2·8	12·5 5·3
06	6 16·5	6 17·5	5 59·3	0·6 0·3	6·6 2·8	12·6 5·4
07	6 16·8	6 17·8	5 59·6	0·7 0·3	6·7 2·8	12·7 5·4
08	6 17·0	6 18·0	5 59·8	0·8 0·3	6·8 2·9	12·8 5·4
09	6 17·3	6 18·3	6 00·1	0·9 0·4	6·9 2·9	12·9 5·5
10	6 17·5	6 18·5	6 00·3	1·0 0·4	7·0 3·0	13·0 5·5
11	6 17·8	6 18·8	6 00·5	1·1 0·5	7·1 3·0	13·1 5·6
12	6 18·0	6 19·0	6 00·8	1·2 0·5	7·2 3·1	13·2 5·6
13	6 18·3	6 19·3	6 01·0	1·3 0·6	7·3 3·1	13·3 5·7
14	6 18·5	6 19·5	6 01·3	1·4 0·6	7·4 3·1	13·4 5·7
15	6 18·8	6 19·8	6 01·5	1·5 0·6	7·5 3·2	13·5 5·7
16	6 19·0	6 20·0	6 01·7	1·6 0·7	7·6 3·2	13·6 5·8
17	6 19·3	6 20·3	6 02·0	1·7 0·7	7·7 3·3	13·7 5·8
18	6 19·5	6 20·5	6 02·2	1·8 0·8	7·8 3·3	13·8 5·9
19	6 19·8	6 20·8	6 02·5	1·9 0·8	7·9 3·4	13·9 5·9
20	6 20·0	6 21·0	6 02·7	2·0 0·9	8·0 3·4	14·0 6·0
21	6 20·3	6 21·3	6 02·9	2·1 0·9	8·1 3·4	14·1 6·0
22	6 20·5	6 21·5	6 03·2	2·2 0·9	8·2 3·5	14·2 6·0
23	6 20·8	6 21·8	6 03·4	2·3 1·0	8·3 3·5	14·3 6·1
24	6 21·0	6 22·0	6 03·6	2·4 1·0	8·4 3·6	14·4 6·1
25	6 21·3	6 22·3	6 03·9	2·5 1·1	8·5 3·6	14·5 6·2
26	6 21·5	6 22·5	6 04·1	2·6 1·1	8·6 3·7	14·6 6·2
27	6 21·8	6 22·8	6 04·4	2·7 1·1	8·7 3·7	14·7 6·2
28	6 22·0	6 23·0	6 04·6	2·8 1·2	8·8 3·7	14·8 6·3
29	6 22·3	6 23·3	6 04·8	2·9 1·2	8·9 3·8	14·9 6·3
30	6 22·5	6 23·5	6 05·1	3·0 1·3	9·0 3·8	15·0 6·4
31	6 22·8	6 23·8	6 05·3	3·1 1·3	9·1 3·9	15·1 6·4
32	6 23·0	6 24·0	6 05·6	3·2 1·4	9·2 3·9	15·2 6·5
33	6 23·3	6 24·3	6 05·8	3·3 1·4	9·3 4·0	15·3 6·5
34	6 23·5	6 24·5	6 06·0	3·4 1·4	9·4 4·0	15·4 6·5
35	6 23·8	6 24·8	6 06·3	3·5 1·5	9·5 4·0	15·5 6·6
36	6 24·0	6 25·1	6 06·5	3·6 1·5	9·6 4·1	15·6 6·6
37	6 24·3	6 25·3	6 06·7	3·7 1·6	9·7 4·1	15·7 6·7
38	6 24·5	6 25·6	6 07·0	3·8 1·6	9·8 4·2	15·8 6·7
39	6 24·8	6 25·8	6 07·2	3·9 1·7	9·9 4·2	15·9 6·8
40	6 25·0	6 26·1	6 07·5	4·0 1·7	10·0 4·3	16·0 6·8
41	6 25·3	6 26·3	6 07·7	4·1 1·7	10·1 4·3	16·1 6·8
42	6 25·5	6 26·6	6 07·9	4·2 1·8	10·2 4·3	16·2 6·9
43	6 25·8	6 26·8	6 08·2	4·3 1·8	10·3 4·4	16·3 6·9
44	6 26·0	6 27·1	6 08·4	4·4 1·9	10·4 4·4	16·4 7·0
45	6 26·3	6 27·3	6 08·7	4·5 1·9	10·5 4·5	16·5 7·0
46	6 26·5	6 27·6	6 08·9	4·6 2·0	10·6 4·5	16·6 7·1
47	6 26·8	6 27·8	6 09·1	4·7 2·0	10·7 4·5	16·7 7·1
48	6 27·0	6 28·1	6 09·4	4·8 2·0	10·8 4·6	16·8 7·1
49	6 27·3	6 28·3	6 09·6	4·9 2·1	10·9 4·6	16·9 7·2
50	6 27·5	6 28·6	6 09·8	5·0 2·1	11·0 4·7	17·0 7·2
51	6 27·8	6 28·8	6 10·1	5·1 2·2	11·1 4·7	17·1 7·3
52	6 28·0	6 29·1	6 10·3	5·2 2·2	11·2 4·8	17·2 7·3
53	6 28·3	6 29·3	6 10·6	5·3 2·3	11·3 4·8	17·3 7·4
54	6 28·5	6 29·6	6 10·8	5·4 2·3	11·4 4·8	17·4 7·4
55	6 28·8	6 29·8	6 11·0	5·5 2·3	11·5 4·9	17·5 7·4
56	6 29·0	6 30·1	6 11·3	5·6 2·4	11·6 4·9	17·6 7·5
57	6 29·3	6 30·3	6 11·5	5·7 2·4	11·7 5·0	17·7 7·5
58	6 29·5	6 30·6	6 11·8	5·8 2·5	11·8 5·0	17·8 7·6
59	6 29·8	6 30·8	6 12·0	5·9 2·5	11·9 5·1	17·9 7·6
60	6 30·0	6 31·1	6 12·2	6·0 2·6	12·0 5·1	18·0 7·7

26	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′	′	′
00	6 30·0	6 31·1	6 12·2	0·0 0·0	6·0 2·7	12·0 5·3
01	6 30·3	6 31·3	6 12·5	0·1 0·0	6·1 2·7	12·1 5·3
02	6 30·5	6 31·6	6 12·7	0·2 0·1	6·2 2·7	12·2 5·4
03	6 30·8	6 31·8	6 12·9	0·3 0·1	6·3 2·8	12·3 5·4
04	6 31·0	6 32·1	6 13·2	0·4 0·2	6·4 2·8	12·4 5·5
05	6 31·3	6 32·3	6 13·4	0·5 0·2	6·5 2·9	12·5 5·5
06	6 31·5	6 32·6	6 13·7	0·6 0·3	6·6 2·9	12·6 5·6
07	6 31·8	6 32·8	6 13·9	0·7 0·3	6·7 3·0	12·7 5·6
08	6 32·0	6 33·1	6 14·1	0·8 0·4	6·8 3·0	12·8 5·7
09	6 32·3	6 33·3	6 14·4	0·9 0·4	6·9 3·0	12·9 5·7
10	6 32·5	6 33·6	6 14·6	1·0 0·4	7·0 3·1	13·0 5·7
11	6 32·8	6 33·8	6 14·9	1·1 0·5	7·1 3·1	13·1 5·8
12	6 33·0	6 34·1	6 15·1	1·2 0·5	7·2 3·2	13·2 5·8
13	6 33·3	6 34·3	6 15·3	1·3 0·6	7·3 3·2	13·3 5·9
14	6 33·5	6 34·6	6 15·6	1·4 0·6	7·4 3·3	13·4 5·9
15	6 33·8	6 34·8	6 15·8	1·5 0·7	7·5 3·3	13·5 6·0
16	6 34·0	6 35·1	6 16·1	1·6 0·7	7·6 3·4	13·6 6·0
17	6 34·3	6 35·3	6 16·3	1·7 0·8	7·7 3·4	13·7 6·1
18	6 34·5	6 35·6	6 16·5	1·8 0·8	7·8 3·4	13·8 6·1
19	6 34·8	6 35·8	6 16·8	1·9 0·8	7·9 3·5	13·9 6·1
20	6 35·0	6 36·1	6 17·0	2·0 0·9	8·0 3·5	14·0 6·2
21	6 35·3	6 36·3	6 17·2	2·1 0·9	8·1 3·6	14·1 6·2
22	6 35·5	6 36·6	6 17·5	2·2 1·0	8·2 3·6	14·2 6·3
23	6 35·8	6 36·8	6 17·7	2·3 1·0	8·3 3·7	14·3 6·3
24	6 36·0	6 37·1	6 18·0	2·4 1·1	8·4 3·7	14·4 6·4
25	6 36·3	6 37·3	6 18·2	2·5 1·1	8·5 3·8	14·5 6·4
26	6 36·5	6 37·6	6 18·4	2·6 1·1	8·6 3·8	14·6 6·4
27	6 36·8	6 37·8	6 18·7	2·7 1·2	8·7 3·8	14·7 6·5
28	6 37·0	6 38·1	6 18·9	2·8 1·2	8·8 3·9	14·8 6·5
29	6 37·3	6 38·3	6 19·2	2·9 1·3	8·9 3·9	14·9 6·6
30	6 37·5	6 38·6	6 19·4	3·0 1·3	9·0 4·0	15·0 6·6
31	6 37·8	6 38·8	6 19·6	3·1 1·4	9·1 4·0	15·1 6·7
32	6 38·0	6 39·1	6 19·9	3·2 1·4	9·2 4·1	15·2 6·7
33	6 38·3	6 39·3	6 20·1	3·3 1·5	9·3 4·1	15·3 6·8
34	6 38·5	6 39·6	6 20·3	3·4 1·5	9·4 4·2	15·4 6·8
35	6 38·8	6 39·8	6 20·6	3·5 1·5	9·5 4·2	15·5 6·8
36	6 39·0	6 40·1	6 20·8	3·6 1·6	9·6 4·2	15·6 6·9
37	6 39·3	6 40·3	6 21·1	3·7 1·6	9·7 4·3	15·7 6·9
38	6 39·5	6 40·6	6 21·3	3·8 1·7	9·8 4·3	15·8 7·0
39	6 39·8	6 40·8	6 21·5	3·9 1·7	9·9 4·4	15·9 7·0
40	6 40·0	6 41·1	6 21·8	4·0 1·8	10·0 4·4	16·0 7·1
41	6 40·3	6 41·3	6 22·0	4·1 1·8	10·1 4·5	16·1 7·1
42	6 40·5	6 41·6	6 22·3	4·2 1·9	10·2 4·5	16·2 7·2
43	6 40·8	6 41·8	6 22·5	4·3 1·9	10·3 4·5	16·3 7·2
44	6 41·0	6 42·1	6 22·7	4·4 1·9	10·4 4·6	16·4 7·2
45	6 41·3	6 42·3	6 23·0	4·5 2·0	10·5 4·6	16·5 7·3
46	6 41·5	6 42·6	6 23·2	4·6 2·0	10·6 4·7	16·6 7·3
47	6 41·8	6 42·8	6 23·4	4·7 2·1	10·7 4·7	16·7 7·4
48	6 42·0	6 43·1	6 23·7	4·8 2·1	10·8 4·8	16·8 7·4
49	6 42·3	6 43·4	6 23·9	4·9 2·2	10·9 4·8	16·9 7·5
50	6 42·5	6 43·6	6 24·2	5·0 2·2	11·0 4·9	17·0 7·5
51	6 42·8	6 43·9	6 24·4	5·1 2·3	11·1 4·9	17·1 7·6
52	6 43·0	6 44·1	6 24·6	5·2 2·3	11·2 4·9	17·2 7·6
53	6 43·3	6 44·4	6 24·9	5·3 2·3	11·3 5·0	17·3 7·6
54	6 43·5	6 44·6	6 25·1	5·4 2·4	11·4 5·0	17·4 7·7
55	6 43·8	6 44·9	6 25·4	5·5 2·4	11·5 5·1	17·5 7·7
56	6 44·0	6 45·1	6 25·6	5·6 2·5	11·6 5·1	17·6 7·8
57	6 44·3	6 45·4	6 25·8	5·7 2·5	11·7 5·2	17·7 7·8
58	6 44·5	6 45·6	6 26·1	5·8 2·6	11·8 5·2	17·8 7·9
59	6 44·8	6 45·9	6 26·3	5·9 2·6	11·9 5·3	17·9 7·9
60	6 45·0	6 46·1	6 26·6	6·0 2·7	12·0 5·3	18·0 8·0

27	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′	′	′
00	6 45·0	6 46·1	6 26·6	0·0 0·0	6·0 2·8	12·0 5·5
01	6 45·3	6 46·4	6 26·8	0·1 0·0	6·1 2·8	12·1 5·5
02	6 45·5	6 46·6	6 27·0	0·2 0·1	6·2 2·8	12·2 5·6
03	6 45·8	6 46·9	6 27·3	0·3 0·1	6·3 2·9	12·3 5·6
04	6 46·0	6 47·1	6 27·5	0·4 0·2	6·4 2·9	12·4 5·7
05	6 46·3	6 47·4	6 27·7	0·5 0·2	6·5 3·0	12·5 5·7
06	6 46·5	6 47·6	6 28·0	0·6 0·3	6·6 3·0	12·6 5·8
07	6 46·8	6 47·9	6 28·2	0·7 0·3	6·7 3·1	12·7 5·8
08	6 47·0	6 48·1	6 28·5	0·8 0·4	6·8 3·1	12·8 5·9
09	6 47·3	6 48·4	6 28·7	0·9 0·4	6·9 3·2	12·9 5·9
10	6 47·5	6 48·6	6 28·9	1·0 0·5	7·0 3·2	13·0 6·0
11	6 47·8	6 48·9	6 29·2	1·1 0·5	7·1 3·3	13·1 6·0
12	6 48·0	6 49·1	6 29·4	1·2 0·6	7·2 3·3	13·2 6·1
13	6 48·3	6 49·4	6 29·7	1·3 0·6	7·3 3·3	13·3 6·1
14	6 48·5	6 49·6	6 29·9	1·4 0·6	7·4 3·4	13·4 6·1
15	6 48·8	6 49·9	6 30·1	1·5 0·7	7·5 3·4	13·5 6·2
16	6 49·0	6 50·1	6 30·4	1·6 0·7	7·6 3·5	13·6 6·2
17	6 49·3	6 50·4	6 30·6	1·7 0·8	7·7 3·5	13·7 6·3
18	6 49·5	6 50·6	6 30·8	1·8 0·8	7·8 3·6	13·8 6·3
19	6 49·8	6 50·9	6 31·1	1·9 0·9	7·9 3·6	13·9 6·4
20	6 50·0	6 51·1	6 31·3	2·0 0·9	8·0 3·7	14·0 6·4
21	6 50·3	6 51·4	6 31·6	2·1 1·0	8·1 3·7	14·1 6·5
22	6 50·5	6 51·6	6 31·8	2·2 1·0	8·2 3·8	14·2 6·5
23	6 50·8	6 51·9	6 32·0	2·3 1·1	8·3 3·8	14·3 6·6
24	6 51·0	6 52·1	6 32·3	2·4 1·1	8·4 3·9	14·4 6·6
25	6 51·3	6 52·4	6 32·5	2·5 1·1	8·5 3·9	14·5 6·6
26	6 51·5	6 52·6	6 32·8	2·6 1·2	8·6 3·9	14·6 6·7
27	6 51·8	6 52·9	6 33·0	2·7 1·2	8·7 4·0	14·7 6·7
28	6 52·0	6 53·1	6 33·2	2·8 1·3	8·8 4·0	14·8 6·8
29	6 52·3	6 53·4	6 33·5	2·9 1·3	8·9 4·1	14·9 6·8
30	6 52·5	6 53·6	6 33·7	3·0 1·4	9·0 4·1	15·0 6·9
31	6 52·8	6 53·9	6 33·9	3·1 1·4	9·1 4·2	15·1 6·9
32	6 53·0	6 54·1	6 34·2	3·2 1·5	9·2 4·2	15·2 7·0
33	6 53·3	6 54·4	6 34·4	3·3 1·5	9·3 4·3	15·3 7·0
34	6 53·5	6 54·6	6 34·7	3·4 1·6	9·4 4·3	15·4 7·1
35	6 53·8	6 54·9	6 34·9	3·5 1·6	9·5 4·4	15·5 7·1
36	6 54·0	6 55·1	6 35·1	3·6 1·7	9·6 4·4	15·6 7·2
37	6 54·3	6 55·4	6 35·4	3·7 1·7	9·7 4·4	15·7 7·2
38	6 54·5	6 55·6	6 35·6	3·8 1·7	9·8 4·5	15·8 7·2
39	6 54·8	6 55·9	6 35·9	3·9 1·8	9·9 4·5	15·9 7·3
40	6 55·0	6 56·1	6 36·1	4·0 1·8	10·0 4·6	16·0 7·3
41	6 55·3	6 56·4	6 36·3	4·1 1·9	10·1 4·6	16·1 7·4
42	6 55·5	6 56·6	6 36·6	4·2 1·9	10·2 4·7	16·2 7·4
43	6 55·8	6 56·9	6 36·8	4·3 2·0	10·3 4·7	16·3 7·5
44	6 56·0	6 57·1	6 37·0	4·4 2·0	10·4 4·8	16·4 7·5
45	6 56·3	6 57·4	6 37·3	4·5 2·1	10·5 4·8	16·5 7·6
46	6 56·5	6 57·6	6 37·5	4·6 2·1	10·6 4·9	16·6 7·6
47	6 56·8	6 57·9	6 37·8	4·7 2·2	10·7 4·9	16·7 7·7
48	6 57·0	6 58·1	6 38·0	4·8 2·2	10·8 5·0	16·8 7·7
49	6 57·3	6 58·4	6 38·2	4·9 2·2	10·9 5·0	16·9 7·7
50	6 57·5	6 58·6	6 38·5	5·0 2·3	11·0 5·0	17·0 7·8
51	6 57·8	6 58·9	6 38·7	5·1 2·3	11·1 5·1	17·1 7·8
52	6 58·0	6 59·1	6 39·0	5·2 2·4	11·2 5·1	17·2 7·9
53	6 58·3	6 59·4	6 39·2	5·3 2·4	11·3 5·2	17·3 7·9
54	6 58·5	6 59·6	6 39·4	5·4 2·5	11·4 5·2	17·4 8·0
55	6 58·8	6 59·9	6 39·7	5·5 2·5	11·5 5·3	17·5 8·0
56	6 59·0	7 00·1	6 39·9	5·6 2·6	11·6 5·3	17·6 8·1
57	6 59·3	7 00·4	6 40·2	5·7 2·6	11·7 5·4	17·7 8·1
58	6 59·5	7 00·6	6 40·4	5·8 2·7	11·8 5·4	17·8 8·2
59	6 59·8	7 00·9	6 40·6	5·9 2·7	11·9 5·5	17·9 8·2
60	7 00·0	7 01·1	6 40·9	6·0 2·8	12·0 5·5	18·0 8·3

28	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 00·0	7 01·1	6 40·9	0·0	0·0	6·0	2·9	12·0	5·7
01	7 00·3	7 01·4	6 41·1	0·1	0·0	6·1	2·9	12·1	5·7
02	7 00·5	7 01·7	6 41·3	0·2	0·1	6·2	2·9	12·2	5·8
03	7 00·8	7 01·9	6 41·6	0·3	0·1	6·3	3·0	12·3	5·8
04	7 01·0	7 02·2	6 41·8	0·4	0·2	6·4	3·0	12·4	5·9
05	7 01·3	7 02·4	6 42·1	0·5	0·2	6·5	3·1	12·5	5·9
06	7 01·5	7 02·7	6 42·3	0·6	0·3	6·6	3·1	12·6	6·0
07	7 01·8	7 02·9	6 42·5	0·7	0·3	6·7	3·2	12·7	6·0
08	7 02·0	7 03·2	6 42·8	0·8	0·4	6·8	3·2	12·8	6·1
09	7 02·3	7 03·4	6 43·0	0·9	0·4	6·9	3·3	12·9	6·1
10	7 02·5	7 03·7	6 43·3	1·0	0·5	7·0	3·3	13·0	6·2
11	7 02·8	7 03·9	6 43·5	1·1	0·5	7·1	3·4	13·1	6·2
12	7 03·0	7 04·2	6 43·7	1·2	0·6	7·2	3·4	13·2	6·3
13	7 03·3	7 04·4	6 44·0	1·3	0·6	7·3	3·5	13·3	6·3
14	7 03·5	7 04·7	6 44·2	1·4	0·7	7·4	3·5	13·4	6·4
15	7 03·8	7 04·9	6 44·4	1·5	0·7	7·5	3·6	13·5	6·4
16	7 04·0	7 05·2	6 44·7	1·6	0·8	7·6	3·6	13·6	6·5
17	7 04·3	7 05·4	6 44·9	1·7	0·8	7·7	3·7	13·7	6·5
18	7 04·5	7 05·7	6 45·2	1·8	0·9	7·8	3·7	13·8	6·6
19	7 04·8	7 05·9	6 45·4	1·9	0·9	7·9	3·8	13·9	6·6
20	7 05·0	7 06·2	6 45·6	2·0	1·0	8·0	3·8	14·0	6·7
21	7 05·3	7 06·4	6 45·9	2·1	1·0	8·1	3·8	14·1	6·7
22	7 05·5	7 06·7	6 46·1	2·2	1·0	8·2	3·9	14·2	6·7
23	7 05·8	7 06·9	6 46·4	2·3	1·1	8·3	3·9	14·3	6·8
24	7 06·0	7 07·2	6 46·6	2·4	1·1	8·4	4·0	14·4	6·8
25	7 06·3	7 07·4	6 46·8	2·5	1·2	8·5	4·0	14·5	6·9
26	7 06·5	7 07·7	6 47·1	2·6	1·2	8·6	4·1	14·6	6·9
27	7 06·8	7 07·9	6 47·3	2·7	1·3	8·7	4·1	14·7	7·0
28	7 07·0	7 08·2	6 47·5	2·8	1·3	8·8	4·2	14·8	7·0
29	7 07·3	7 08·4	6 47·8	2·9	1·4	8·9	4·2	14·9	7·1
30	7 07·5	7 08·7	6 48·0	3·0	1·4	9·0	4·3	15·0	7·1
31	7 07·8	7 08·9	6 48·3	3·1	1·5	9·1	4·3	15·1	7·2
32	7 08·0	7 09·2	6 48·5	3·2	1·5	9·2	4·4	15·2	7·2
33	7 08·3	7 09·4	6 48·7	3·3	1·6	9·3	4·4	15·3	7·3
34	7 08·5	7 09·7	6 49·0	3·4	1·6	9·4	4·5	15·4	7·3
35	7 08·8	7 09·9	6 49·2	3·5	1·7	9·5	4·5	15·5	7·4
36	7 09·0	7 10·2	6 49·5	3·6	1·7	9·6	4·6	15·6	7·4
37	7 09·3	7 10·4	6 49·7	3·7	1·8	9·7	4·6	15·7	7·5
38	7 09·5	7 10·7	6 49·9	3·8	1·8	9·8	4·7	15·8	7·5
39	7 09·8	7 10·9	6 50·2	3·9	1·9	9·9	4·7	15·9	7·6
40	7 10·0	7 11·2	6 50·4	4·0	1·9	10·0	4·8	16·0	7·6
41	7 10·3	7 11·4	6 50·6	4·1	1·9	10·1	4·8	16·1	7·6
42	7 10·5	7 11·7	6 50·9	4·2	2·0	10·2	4·8	16·2	7·7
43	7 10·8	7 11·9	6 51·1	4·3	2·0	10·3	4·9	16·3	7·7
44	7 11·0	7 12·2	6 51·4	4·4	2·1	10·4	4·9	16·4	7·8
45	7 11·3	7 12·4	6 51·6	4·5	2·1	10·5	5·0	16·5	7·8
46	7 11·5	7 12·7	6 51·8	4·6	2·2	10·6	5·0	16·6	7·9
47	7 11·8	7 12·9	6 52·1	4·7	2·2	10·7	5·1	16·7	7·9
48	7 12·0	7 13·2	6 52·3	4·8	2·3	10·8	5·1	16·8	8·0
49	7 12·3	7 13·4	6 52·6	4·9	2·3	10·9	5·2	16·9	8·0
50	7 12·5	7 13·7	6 52·8	5·0	2·4	11·0	5·2	17·0	8·1
51	7 12·8	7 13·9	6 53·0	5·1	2·4	11·1	5·3	17·1	8·1
52	7 13·0	7 14·2	6 53·3	5·2	2·5	11·2	5·3	17·2	8·2
53	7 13·3	7 14·4	6 53·5	5·3	2·5	11·3	5·4	17·3	8·2
54	7 13·5	7 14·7	6 53·8	5·4	2·6	11·4	5·4	17·4	8·3
55	7 13·8	7 14·9	6 54·0	5·5	2·6	11·5	5·5	17·5	8·3
56	7 14·0	7 15·2	6 54·2	5·6	2·7	11·6	5·5	17·6	8·4
57	7 14·3	7 15·4	6 54·5	5·7	2·7	11·7	5·6	17·7	8·4
58	7 14·5	7 15·7	6 54·7	5·8	2·8	11·8	5·6	17·8	8·5
59	7 14·8	7 15·9	6 54·9	5·9	2·8	11·9	5·7	17·9	8·5
60	7 15·0	7 16·2	6 55·2	6·0	2·9	12·0	5·7	18·0	8·6

29	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 15·0	7 16·2	6 55·2	0·0	0·0	6·0	3·0	12·0	5·9
01	7 15·3	7 16·4	6 55·4	0·1	0·0	6·1	3·0	12·1	5·9
02	7 15·5	7 16·7	6 55·7	0·2	0·1	6·2	3·0	12·2	6·0
03	7 15·8	7 16·9	6 55·9	0·3	0·1	6·3	3·1	12·3	6·0
04	7 16·0	7 17·2	6 56·1	0·4	0·2	6·4	3·1	12·4	6·1
05	7 16·3	7 17·4	6 56·4	0·5	0·2	6·5	3·2	12·5	6·1
06	7 16·5	7 17·7	6 56·6	0·6	0·3	6·6	3·2	12·6	6·2
07	7 16·8	7 17·9	6 56·9	0·7	0·3	6·7	3·3	12·7	6·2
08	7 17·0	7 18·2	6 57·1	0·8	0·4	6·8	3·3	12·8	6·3
09	7 17·3	7 18·4	6 57·3	0·9	0·4	6·9	3·4	12·9	6·3
10	7 17·5	7 18·7	6 57·6	1·0	0·5	7·0	3·4	13·0	6·4
11	7 17·8	7 18·9	6 57·8	1·1	0·5	7·1	3·5	13·1	6·4
12	7 18·0	7 19·2	6 58·0	1·2	0·6	7·2	3·5	13·2	6·5
13	7 18·3	7 19·4	6 58·3	1·3	0·6	7·3	3·6	13·3	6·5
14	7 18·5	7 19·7	6 58·5	1·4	0·7	7·4	3·6	13·4	6·6
15	7 18·8	7 20·0	6 58·8	1·5	0·7	7·5	3·7	13·5	6·6
16	7 19·0	7 20·2	6 59·0	1·6	0·8	7·6	3·7	13·6	6·7
17	7 19·3	7 20·5	6 59·2	1·7	0·8	7·7	3·8	13·7	6·7
18	7 19·5	7 20·7	6 59·5	1·8	0·9	7·8	3·8	13·8	6·8
19	7 19·8	7 21·0	6 59·7	1·9	0·9	7·9	3·9	13·9	6·8
20	7 20·0	7 21·2	7 00·0	2·0	1·0	8·0	3·9	14·0	6·9
21	7 20·3	7 21·5	7 00·2	2·1	1·0	8·1	4·0	14·1	6·9
22	7 20·5	7 21·7	7 00·4	2·2	1·1	8·2	4·0	14·2	7·0
23	7 20·8	7 22·0	7 00·7	2·3	1·1	8·3	4·1	14·3	7·0
24	7 21·0	7 22·2	7 00·9	2·4	1·2	8·4	4·1	14·4	7·1
25	7 21·3	7 22·5	7 01·1	2·5	1·2	8·5	4·2	14·5	7·1
26	7 21·5	7 22·7	7 01·4	2·6	1·3	8·6	4·2	14·6	7·2
27	7 21·8	7 23·0	7 01·6	2·7	1·3	8·7	4·3	14·7	7·2
28	7 22·0	7 23·2	7 01·9	2·8	1·4	8·8	4·3	14·8	7·3
29	7 22·3	7 23·5	7 02·1	2·9	1·4	8·9	4·4	14·9	7·3
30	7 22·5	7 23·7	7 02·3	3·0	1·5	9·0	4·4	15·0	7·4
31	7 22·8	7 24·0	7 02·6	3·1	1·5	9·1	4·5	15·1	7·4
32	7 23·0	7 24·2	7 02·8	3·2	1·6	9·2	4·5	15·2	7·5
33	7 23·3	7 24·5	7 03·1	3·3	1·6	9·3	4·6	15·3	7·5
34	7 23·5	7 24·7	7 03·3	3·4	1·7	9·4	4·6	15·4	7·6
35	7 23·8	7 25·0	7 03·5	3·5	1·7	9·5	4·7	15·5	7·6
36	7 24·0	7 25·2	7 03·8	3·6	1·8	9·6	4·7	15·6	7·7
37	7 24·3	7 25·5	7 04·0	3·7	1·8	9·7	4·8	15·7	7·7
38	7 24·5	7 25·7	7 04·3	3·8	1·9	9·8	4·8	15·8	7·8
39	7 24·8	7 26·0	7 04·5	3·9	1·9	9·9	4·9	15·9	7·8
40	7 25·0	7 26·2	7 04·7	4·0	2·0	10·0	4·9	16·0	7·9
41	7 25·3	7 26·5	7 05·0	4·1	2·0	10·1	5·0	16·1	7·9
42	7 25·5	7 26·7	7 05·2	4·2	2·1	10·2	5·0	16·2	8·0
43	7 25·8	7 27·0	7 05·4	4·3	2·1	10·3	5·1	16·3	8·0
44	7 26·0	7 27·2	7 05·7	4·4	2·2	10·4	5·1	16·4	8·1
45	7 26·3	7 27·5	7 05·9	4·5	2·2	10·5	5·2	16·5	8·1
46	7 26·5	7 27·7	7 06·2	4·6	2·3	10·6	5·2	16·6	8·2
47	7 26·8	7 28·0	7 06·4	4·7	2·3	10·7	5·3	16·7	8·2
48	7 27·0	7 28·2	7 06·6	4·8	2·4	10·8	5·3	16·8	8·3
49	7 27·3	7 28·5	7 06·9	4·9	2·4	10·9	5·4	16·9	8·3
50	7 27·5	7 28·7	7 07·1	5·0	2·5	11·0	5·4	17·0	8·4
51	7 27·8	7 29·0	7 07·4	5·1	2·5	11·1	5·5	17·1	8·4
52	7 28·0	7 29·2	7 07·6	5·2	2·6	11·2	5·5	17·2	8·5
53	7 28·3	7 29·5	7 07·8	5·3	2·6	11·3	5·6	17·3	8·5
54	7 28·5	7 29·7	7 08·1	5·4	2·7	11·4	5·6	17·4	8·6
55	7 28·8	7 30·0	7 08·3	5·5	2·7	11·5	5·7	17·5	8·6
56	7 29·0	7 30·2	7 08·5	5·6	2·8	11·6	5·7	17·6	8·7
57	7 29·3	7 30·5	7 08·8	5·7	2·8	11·7	5·8	17·7	8·7
58	7 29·5	7 30·7	7 09·0	5·8	2·9	11·8	5·8	17·8	8·8
59	7 29·8	7 31·0	7 09·3	5·9	2·9	11·9	5·9	17·9	8·8
60	7 30·0	7 31·2	7 09·5	6·0	3·0	12·0	5·9	18·0	8·9

30	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 30·0	7 31·2	7 09·5	0·0	0·0	6·0	3·1	12·0	6·1
01	7 30·3	7 31·5	7 09·7	0·1	0·1	6·1	3·1	12·1	6·2
02	7 30·5	7 31·7	7 10·0	0·2	0·1	6·2	3·2	12·2	6·2
03	7 30·8	7 32·0	7 10·2	0·3	0·2	6·3	3·2	12·3	6·3
04	7 31·0	7 32·2	7 10·5	0·4	0·2	6·4	3·3	12·4	6·3
05	7 31·3	7 32·5	7 10·7	0·5	0·3	6·5	3·3	12·5	6·4
06	7 31·5	7 32·7	7 10·9	0·6	0·3	6·6	3·4	12·6	6·4
07	7 31·8	7 33·0	7 11·2	0·7	0·4	6·7	3·4	12·7	6·5
08	7 32·0	7 33·2	7 11·4	0·8	0·4	6·8	3·5	12·8	6·5
09	7 32·3	7 33·5	7 11·6	0·9	0·5	6·9	3·5	12·9	6·6
10	7 32·5	7 33·7	7 11·9	1·0	0·5	7·0	3·6	13·0	6·6
11	7 32·8	7 34·0	7 12·1	1·1	0·6	7·1	3·6	13·1	6·7
12	7 33·0	7 34·2	7 12·4	1·2	0·6	7·2	3·7	13·2	6·7
13	7 33·3	7 34·5	7 12·6	1·3	0·7	7·3	3·7	13·3	6·8
14	7 33·5	7 34·7	7 12·8	1·4	0·7	7·4	3·8	13·4	6·8
15	7 33·8	7 35·0	7 13·1	1·5	0·8	7·5	3·8	13·5	6·9
16	7 34·0	7 35·2	7 13·3	1·6	0·8	7·6	3·9	13·6	6·9
17	7 34·3	7 35·5	7 13·6	1·7	0·9	7·7	3·9	13·7	7·0
18	7 34·5	7 35·7	7 13·8	1·8	0·9	7·8	4·0	13·8	7·0
19	7 34·8	7 36·0	7 14·0	1·9	1·0	7·9	4·0	13·9	7·1
20	7 35·0	7 36·2	7 14·3	2·0	1·0	8·0	4·1	14·0	7·1
21	7 35·3	7 36·5	7 14·5	2·1	1·1	8·1	4·1	14·1	7·2
22	7 35·5	7 36·7	7 14·7	2·2	1·1	8·2	4·2	14·2	7·2
23	7 35·8	7 37·0	7 15·0	2·3	1·2	8·3	4·2	14·3	7·3
24	7 36·0	7 37·2	7 15·2	2·4	1·2	8·4	4·3	14·4	7·3
25	7 36·3	7 37·5	7 15·5	2·5	1·3	8·5	4·3	14·5	7·4
26	7 36·5	7 37·7	7 15·7	2·6	1·3	8·6	4·4	14·6	7·4
27	7 36·8	7 38·0	7 15·9	2·7	1·4	8·7	4·4	14·7	7·5
28	7 37·0	7 38·3	7 16·2	2·8	1·4	8·8	4·5	14·8	7·5
29	7 37·3	7 38·5	7 16·4	2·9	1·5	8·9	4·5	14·9	7·6
30	7 37·5	7 38·8	7 16·7	3·0	1·5	9·0	4·6	15·0	7·6
31	7 37·8	7 39·0	7 16·9	3·1	1·6	9·1	4·6	15·1	7·7
32	7 38·0	7 39·3	7 17·1	3·2	1·6	9·2	4·7	15·2	7·7
33	7 38·3	7 39·5	7 17·4	3·3	1·7	9·3	4·7	15·3	7·8
34	7 38·5	7 39·8	7 17·6	3·4	1·7	9·4	4·8	15·4	7·8
35	7 38·8	7 40·0	7 17·9	3·5	1·8	9·5	4·8	15·5	7·9
36	7 39·0	7 40·3	7 18·1	3·6	1·8	9·6	4·9	15·6	7·9
37	7 39·3	7 40·5	7 18·3	3·7	1·9	9·7	4·9	15·7	8·0
38	7 39·5	7 40·8	7 18·6	3·8	1·9	9·8	5·0	15·8	8·0
39	7 39·8	7 41·0	7 18·8	3·9	2·0	9·9	5·0	15·9	8·1
40	7 40·0	7 41·3	7 19·0	4·0	2·0	10·0	5·1	16·0	8·1
41	7 40·3	7 41·5	7 19·3	4·1	2·1	10·1	5·1	16·1	8·2
42	7 40·5	7 41·8	7 19·5	4·2	2·1	10·2	5·2	16·2	8·2
43	7 40·8	7 42·0	7 19·8	4·3	2·2	10·3	5·2	16·3	8·3
44	7 41·0	7 42·3	7 20·0	4·4	2·2	10·4	5·3	16·4	8·3
45	7 41·3	7 42·5	7 20·2	4·5	2·3	10·5	5·3	16·5	8·4
46	7 41·5	7 42·8	7 20·5	4·6	2·3	10·6	5·4	16·6	8·4
47	7 41·8	7 43·0	7 20·7	4·7	2·4	10·7	5·4	16·7	8·5
48	7 42·0	7 43·3	7 21·0	4·8	2·4	10·8	5·5	16·8	8·5
49	7 42·3	7 43·5	7 21·2	4·9	2·5	10·9	5·5	16·9	8·6
50	7 42·5	7 43·8	7 21·4	5·0	2·5	11·0	5·6	17·0	8·6
51	7 42·8	7 44·0	7 21·7	5·1	2·6	11·1	5·6	17·1	8·7
52	7 43·0	7 44·3	7 21·9	5·2	2·6	11·2	5·7	17·2	8·7
53	7 43·3	7 44·5	7 22·1	5·3	2·7	11·3	5·7	17·3	8·8
54	7 43·5	7 44·8	7 22·4	5·4	2·7	11·4	5·8	17·4	8·8
55	7 43·8	7 45·0	7 22·6	5·5	2·8	11·5	5·8	17·5	8·9
56	7 44·0	7 45·3	7 22·9	5·6	2·8	11·6	5·9	17·6	8·9
57	7 44·3	7 45·5	7 23·1	5·7	2·9	11·7	5·9	17·7	9·0
58	7 44·5	7 45·8	7 23·3	5·8	2·9	11·8	6·0	17·8	9·0
59	7 44·8	7 46·0	7 23·6	5·9	3·0	11·9	6·0	17·9	9·1
60	7 45·0	7 46·3	7 23·8	6·0	3·1	12·0	6·1	18·0	9·2

31	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 45·0	7 46·3	7 23·8	0·0	0·0	6·0	3·2	12·0	6·3
01	7 45·3	7 46·5	7 24·1	0·1	0·1	6·1	3·2	12·1	6·4
02	7 45·5	7 46·8	7 24·3	0·2	0·1	6·2	3·3	12·2	6·4
03	7 45·8	7 47·0	7 24·5	0·3	0·2	6·3	3·3	12·3	6·5
04	7 46·0	7 47·3	7 24·8	0·4	0·2	6·4	3·4	12·4	6·5
05	7 46·3	7 47·5	7 25·0	0·5	0·3	6·5	3·4	12·5	6·6
06	7 46·5	7 47·8	7 25·2	0·6	0·3	6·6	3·5	12·6	6·6
07	7 46·8	7 48·0	7 25·5	0·7	0·4	6·7	3·5	12·7	6·7
08	7 47·0	7 48·3	7 25·7	0·8	0·4	6·8	3·6	12·8	6·7
09	7 47·3	7 48·5	7 26·0	0·9	0·5	6·9	3·6	12·9	6·8
10	7 47·5	7 48·8	7 26·2	1·0	0·5	7·0	3·7	13·0	6·8
11	7 47·8	7 49·0	7 26·4	1·1	0·6	7·1	3·7	13·1	6·9
12	7 48·0	7 49·3	7 26·7	1·2	0·6	7·2	3·8	13·2	6·9
13	7 48·3	7 49·5	7 26·9	1·3	0·7	7·3	3·8	13·3	7·0
14	7 48·5	7 49·8	7 27·2	1·4	0·7	7·4	3·9	13·4	7·0
15	7 48·8	7 50·0	7 27·4	1·5	0·8	7·5	3·9	13·5	7·1
16	7 49·0	7 50·3	7 27·6	1·6	0·8	7·6	4·0	13·6	7·1
17	7 49·3	7 50·5	7 27·9	1·7	0·9	7·7	4·0	13·7	7·2
18	7 49·5	7 50·8	7 28·1	1·8	0·9	7·8	4·1	13·8	7·2
19	7 49·8	7 51·0	7 28·4	1·9	1·0	7·9	4·1	13·9	7·3
20	7 50·0	7 51·3	7 28·6	2·0	1·1	8·0	4·2	14·0	7·4
21	7 50·3	7 51·5	7 28·8	2·1	1·1	8·1	4·3	14·1	7·4
22	7 50·5	7 51·8	7 29·1	2·2	1·2	8·2	4·3	14·2	7·5
23	7 50·8	7 52·0	7 29·3	2·3	1·2	8·3	4·4	14·3	7·5
24	7 51·0	7 52·3	7 29·5	2·4	1·3	8·4	4·4	14·4	7·6
25	7 51·3	7 52·5	7 29·8	2·5	1·3	8·5	4·5	14·5	7·6
26	7 51·5	7 52·8	7 30·0	2·6	1·4	8·6	4·5	14·6	7·7
27	7 51·8	7 53·0	7 30·3	2·7	1·4	8·7	4·6	14·7	7·7
28	7 52·0	7 53·3	7 30·5	2·8	1·5	8·8	4·6	14·8	7·8
29	7 52·3	7 53·5	7 30·7	2·9	1·5	8·9	4·7	14·9	7·8
30	7 52·5	7 53·8	7 31·0	3·0	1·6	9·0	4·7	15·0	7·9
31	7 52·8	7 54·0	7 31·2	3·1	1·6	9·1	4·8	15·1	7·9
32	7 53·0	7 54·3	7 31·5	3·2	1·7	9·2	4·8	15·2	8·0
33	7 53·3	7 54·5	7 31·7	3·3	1·7	9·3	4·9	15·3	8·0
34	7 53·5	7 54·8	7 31·9	3·4	1·8	9·4	4·9	15·4	8·1
35	7 53·8	7 55·0	7 32·2	3·5	1·8	9·5	5·0	15·5	8·1
36	7 54·0	7 55·3	7 32·4	3·6	1·9	9·6	5·0	15·6	8·2
37	7 54·3	7 55·5	7 32·6	3·7	1·9	9·7	5·1	15·7	8·2
38	7 54·5	7 55·8	7 32·9	3·8	2·0	9·8	5·1	15·8	8·3
39	7 54·8	7 56·0	7 33·1	3·9	2·0	9·9	5·2	15·9	8·3
40	7 55·0	7 56·3	7 33·4	4·0	2·1	10·0	5·3	16·0	8·4
41	7 55·3	7 56·6	7 33·6	4·1	2·2	10·1	5·3	16·1	8·5
42	7 55·5	7 56·8	7 33·8	4·2	2·2	10·2	5·4	16·2	8·5
43	7 55·8	7 57·1	7 34·1	4·3	2·3	10·3	5·4	16·3	8·6
44	7 56·0	7 57·3	7 34·3	4·4	2·3	10·4	5·5	16·4	8·6
45	7 56·3	7 57·6	7 34·6	4·5	2·4	10·5	5·5	16·5	8·7
46	7 56·5	7 57·8	7 34·8	4·6	2·4	10·6	5·6	16·6	8·7
47	7 56·8	7 58·1	7 35·0	4·7	2·5	10·7	5·6	16·7	8·8
48	7 57·0	7 58·3	7 35·3	4·8	2·5	10·8	5·7	16·8	8·8
49	7 57·3	7 58·6	7 35·5	4·9	2·6	10·9	5·7	16·9	8·9

32m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′	′	′	′
00	8 00·0	8 01·3	7 38·1	0·0	0·0	6·0	3·3	12·0	6·5
01	8 00·3	8 01·6	7 38·4	0·1	0·1	6·1	3·3	12·1	6·6
02	8 00·5	8 01·8	7 38·6	0·2	0·1	6·2	3·4	12·2	6·6
03	8 00·8	8 02·1	7 38·8	0·3	0·2	6·3	3·4	12·3	6·7
04	8 01·0	8 02·3	7 39·1	0·4	0·2	6·4	3·5	12·4	6·7
05	8 01·3	8 02·6	7 39·3	0·5	0·3	6·5	3·5	12·5	6·8
06	8 01·5	8 02·8	7 39·6	0·6	0·3	6·6	3·6	12·6	6·8
07	8 01·8	8 03·1	7 39·8	0·7	0·4	6·7	3·6	12·7	6·9
08	8 02·0	8 03·3	7 40·0	0·8	0·4	6·8	3·7	12·8	6·9
09	8 02·3	8 03·6	7 40·3	0·9	0·5	6·9	3·7	12·9	7·0
10	8 02·5	8 03·8	7 40·5	1·0	0·5	7·0	3·8	13·0	7·0
11	8 02·8	8 04·1	7 40·8	1·1	0·6	7·1	3·8	13·1	7·1
12	8 03·0	8 04·3	7 41·0	1·2	0·7	7·2	3·9	13·2	7·2
13	8 03·3	8 04·6	7 41·2	1·3	0·7	7·3	4·0	13·3	7·2
14	8 03·5	8 04·8	7 41·5	1·4	0·8	7·4	4·0	13·4	7·3
15	8 03·8	8 05·1	7 41·7	1·5	0·8	7·5	4·1	13·5	7·3
16	8 04·0	8 05·3	7 42·0	1·6	0·9	7·6	4·1	13·6	7·4
17	8 04·3	8 05·6	7 42·2	1·7	0·9	7·7	4·2	13·7	7·4
18	8 04·5	8 05·8	7 42·4	1·8	1·0	7·8	4·2	13·8	7·5
19	8 04·8	8 06·1	7 42·7	1·9	1·0	7·9	4·3	13·9	7·5
20	8 05·0	8 06·3	7 42·9	2·0	1·1	8·0	4·3	14·0	7·6
21	8 05·3	8 06·6	7 43·1	2·1	1·1	8·1	4·4	14·1	7·6
22	8 05·5	8 06·8	7 43·4	2·2	1·2	8·2	4·4	14·2	7·7
23	8 05·8	8 07·1	7 43·6	2·3	1·2	8·3	4·5	14·3	7·7
24	8 06·0	8 07·3	7 43·9	2·4	1·3	8·4	4·6	14·4	7·8
25	8 06·3	8 07·6	7 44·1	2·5	1·4	8·5	4·6	14·5	7·9
26	8 06·5	8 07·8	7 44·3	2·6	1·4	8·6	4·7	14·6	7·9
27	8 06·8	8 08·1	7 44·6	2·7	1·5	8·7	4·7	14·7	8·0
28	8 07·0	8 08·3	7 44·8	2·8	1·5	8·8	4·8	14·8	8·0
29	8 07·3	8 08·6	7 45·1	2·9	1·6	8·9	4·8	14·9	8·1
30	8 07·5	8 08·8	7 45·3	3·0	1·6	9·0	4·9	15·0	8·1
31	8 07·8	8 09·1	7 45·5	3·1	1·7	9·1	4·9	15·1	8·2
32	8 08·0	8 09·3	7 45·8	3·2	1·7	9·2	5·0	15·2	8·2
33	8 08·3	8 09·6	7 46·0	3·3	1·8	9·3	5·0	15·3	8·3
34	8 08·5	8 09·8	7 46·2	3·4	1·8	9·4	5·1	15·4	8·3
35	8 08·8	8 10·1	7 46·5	3·5	1·9	9·5	5·1	15·5	8·4
36	8 09·0	8 10·3	7 46·7	3·6	2·0	9·6	5·2	15·6	8·5
37	8 09·3	8 10·6	7 47·0	3·7	2·0	9·7	5·3	15·7	8·5
38	8 09·5	8 10·8	7 47·2	3·8	2·1	9·8	5·3	15·8	8·6
39	8 09·8	8 11·1	7 47·4	3·9	2·1	9·9	5·4	15·9	8·6
40	8 10·0	8 11·3	7 47·7	4·0	2·2	10·0	5·4	16·0	8·7
41	8 10·3	8 11·6	7 47·9	4·1	2·2	10·1	5·5	16·1	8·7
42	8 10·5	8 11·8	7 48·2	4·2	2·3	10·2	5·5	16·2	8·8
43	8 10·8	8 12·1	7 48·4	4·3	2·3	10·3	5·6	16·3	8·8
44	8 11·0	8 12·3	7 48·6	4·4	2·4	10·4	5·6	16·4	8·9
45	8 11·3	8 12·6	7 48·9	4·5	2·4	10·5	5·7	16·5	8·9
46	8 11·5	8 12·8	7 49·1	4·6	2·5	10·6	5·7	16·6	9·0
47	8 11·8	8 13·1	7 49·3	4·7	2·5	10·7	5·8	16·7	9·0
48	8 12·0	8 13·3	7 49·6	4·8	2·6	10·8	5·9	16·8	9·1
49	8 12·3	8 13·6	7 49·8	4·9	2·7	10·9	5·9	16·9	9·2
50	8 12·5	8 13·8	7 50·1	5·0	2·7	11·0	6·0	17·0	9·2
51	8 12·8	8 14·1	7 50·3	5·1	2·8	11·1	6·0	17·1	9·3
52	8 13·0	8 14·3	7 50·5	5·2	2·8	11·2	6·1	17·2	9·3
53	8 13·3	8 14·6	7 50·8	5·3	2·9	11·3	6·1	17·3	9·4
54	8 13·5	8 14·9	7 51·0	5·4	2·9	11·4	6·2	17·4	9·4
55	8 13·8	8 15·1	7 51·3	5·5	3·0	11·5	6·2	17·5	9·5
56	8 14·0	8 15·4	7 51·5	5·6	3·0	11·6	6·3	17·6	9·5
57	8 14·3	8 15·6	7 51·7	5·7	3·1	11·7	6·3	17·7	9·6
58	8 14·5	8 15·9	7 52·0	5·8	3·1	11·8	6·4	17·8	9·6
59	8 14·8	8 16·1	7 52·2	5·9	3·2	11·9	6·4	17·9	9·7
60	8 15·0	8 16·4	7 52·5	6·0	3·3	12·0	6·5	18·0	9·8

33m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′	′	′	′
00	8 15·0	8 16·4	7 52·5	0·0	0·0	6·0	3·4	12·0	6·7
01	8 15·3	8 16·6	7 52·7	0·1	0·1	6·1	3·4	12·1	6·8
02	8 15·5	8 16·9	7 52·9	0·2	0·1	6·2	3·5	12·2	6·8
03	8 15·8	8 17·1	7 53·2	0·3	0·2	6·3	3·5	12·3	6·9
04	8 16·0	8 17·4	7 53·4	0·4	0·2	6·4	3·6	12·4	6·9
05	8 16·3	8 17·6	7 53·6	0·5	0·3	6·5	3·6	12·5	7·0
06	8 16·5	8 17·9	7 53·9	0·6	0·3	6·6	3·7	12·6	7·0
07	8 16·8	8 18·1	7 54·1	0·7	0·4	6·7	3·7	12·7	7·1
08	8 17·0	8 18·4	7 54·4	0·8	0·4	6·8	3·8	12·8	7·1
09	8 17·3	8 18·6	7 54·6	0·9	0·5	6·9	3·9	12·9	7·2
10	8 17·5	8 18·9	7 54·8	1·0	0·6	7·0	3·9	13·0	7·3
11	8 17·8	8 19·1	7 55·1	1·1	0·6	7·1	4·0	13·1	7·3
12	8 18·0	8 19·4	7 55·3	1·2	0·7	7·2	4·0	13·2	7·4
13	8 18·3	8 19·6	7 55·6	1·3	0·7	7·3	4·1	13·3	7·4
14	8 18·5	8 19·9	7 55·8	1·4	0·8	7·4	4·1	13·4	7·5
15	8 18·8	8 20·1	7 56·0	1·5	0·8	7·5	4·2	13·5	7·5
16	8 19·0	8 20·4	7 56·3	1·6	0·9	7·6	4·2	13·6	7·6
17	8 19·3	8 20·6	7 56·5	1·7	0·9	7·7	4·3	13·7	7·6
18	8 19·5	8 20·9	7 56·7	1·8	1·0	7·8	4·4	13·8	7·7
19	8 19·8	8 21·1	7 57·0	1·9	1·1	7·9	4·4	13·9	7·8
20	8 20·0	8 21·4	7 57·2	2·0	1·1	8·0	4·5	14·0	7·8
21	8 20·3	8 21·6	7 57·5	2·1	1·2	8·1	4·5	14·1	7·9
22	8 20·5	8 21·9	7 57·7	2·2	1·2	8·2	4·6	14·2	7·9
23	8 20·8	8 22·1	7 57·9	2·3	1·3	8·3	4·6	14·3	8·0
24	8 21·0	8 22·4	7 58·2	2·4	1·3	8·4	4·7	14·4	8·0
25	8 21·3	8 22·6	7 58·4	2·5	1·4	8·5	4·7	14·5	8·1
26	8 21·5	8 22·9	7 58·7	2·6	1·5	8·6	4·8	14·6	8·2
27	8 21·8	8 23·1	7 58·9	2·7	1·5	8·7	4·9	14·7	8·2
28	8 22·0	8 23·4	7 59·1	2·8	1·6	8·8	4·9	14·8	8·3
29	8 22·3	8 23·6	7 59·4	2·9	1·6	8·9	5·0	14·9	8·3
30	8 22·5	8 23·9	7 59·6	3·0	1·7	9·0	5·0	15·0	8·4
31	8 22·8	8 24·1	7 59·8	3·1	1·7	9·1	5·1	15·1	8·4
32	8 23·0	8 24·4	8 00·1	3·2	1·8	9·2	5·1	15·2	8·5
33	8 23·3	8 24·6	8 00·3	3·3	1·8	9·3	5·2	15·3	8·5
34	8 23·5	8 24·9	8 00·6	3·4	1·9	9·4	5·2	15·4	8·6
35	8 23·8	8 25·1	8 00·8	3·5	2·0	9·5	5·3	15·5	8·7
36	8 24·0	8 25·4	8 01·0	3·6	2·0	9·6	5·4	15·6	8·7
37	8 24·3	8 25·6	8 01·3	3·7	2·1	9·7	5·4	15·7	8·8
38	8 24·5	8 25·9	8 01·5	3·8	2·1	9·8	5·5	15·8	8·8
39	8 24·8	8 26·1	8 01·8	3·9	2·2	9·9	5·5	15·9	8·9
40	8 25·0	8 26·4	8 02·0	4·0	2·2	10·0	5·6	16·0	8·9
41	8 25·3	8 26·6	8 02·2	4·1	2·3	10·1	5·6	16·1	9·0
42	8 25·5	8 26·9	8 02·5	4·2	2·3	10·2	5·7	16·2	9·0
43	8 25·8	8 27·1	8 02·7	4·3	2·4	10·3	5·8	16·3	9·1
44	8 26·0	8 27·4	8 02·9	4·4	2·5	10·4	5·8	16·4	9·2
45	8 26·3	8 27·6	8 03·2	4·5	2·5	10·5	5·9	16·5	9·2
46	8 26·5	8 27·9	8 03·4	4·6	2·6	10·6	5·9	16·6	9·3
47	8 26·8	8 28·1	8 03·7	4·7	2·6	10·7	6·0	16·7	9·3
48	8 27·0	8 28·4	8 03·9	4·8	2·7	10·8	6·0	16·8	9·4
49	8 27·3	8 28·6	8 04·1	4·9	2·7	10·9	6·1	16·9	9·4
50	8 27·5	8 28·9	8 04·4	5·0	2·8	11·0	6·1	17·0	9·5
51	8 27·8	8 29·1	8 04·6	5·1	2·8	11·1	6·2	17·1	9·5
52	8 28·0	8 29·4	8 04·9	5·2	2·9	11·2	6·3	17·2	9·6
53	8 28·3	8 29·6	8 05·1	5·3	3·0	11·3	6·3	17·3	9·7
54	8 28·5	8 29·9	8 05·3	5·4	3·0	11·4	6·4	17·4	9·7
55	8 28·8	8 30·1	8 05·6	5·5	3·1	11·5	6·4	17·5	9·8
56	8 29·0	8 30·4	8 05·8	5·6	3·1	11·6	6·5	17·6	9·8
57	8 29·3	8 30·6	8 06·1	5·7	3·2	11·7	6·5	17·7	9·9
58	8 29·5	8 30·9	8 06·3	5·8	3·2	11·8	6·6	17·8	9·9
59	8 29·8	8 31·1	8 06·5	5·9	3·3	11·9	6·6	17·9	10·0
60	8 30·0	8 31·4	8 06·8	6·0	3·4	12·0	6·7	18·0	10·1

34m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′	′	′	′
00	8 30·0	8 31·4	8 06·8	0·0	0·0	6·0	3·5	12·0	6·9
01	8 30·3	8 31·6	8 07·0	0·1	0·1	6·1	3·5	12·1	7·0
02	8 30·5	8 31·9	8 07·2	0·2	0·1	6·2	3·6	12·2	7·0
03	8 30·8	8 32·1	8 07·5	0·3	0·2	6·3	3·6	12·3	7·1
04	8 31·0	8 32·4	8 07·7	0·4	0·2	6·4	3·7	12·4	7·1
05	8 31·3	8 32·6	8 08·0	0·5	0·3	6·5	3·7	12·5	7·2
06	8 31·5	8 32·9	8 08·2	0·6	0·3	6·6	3·8	12·6	7·2
07	8 31·8	8 33·2	8 08·4	0·7	0·4	6·7	3·9	12·7	7·3
08	8 32·0	8 33·4	8 08·7	0·8	0·5	6·8	3·9	12·8	7·4
09	8 32·3	8 33·7	8 08·9	0·9	0·5	6·9	4·0	12·9	7·4
10	8 32·5	8 33·9	8 09·2	1·0	0·6	7·0	4·0	13·0	7·5
11	8 32·8	8 34·2	8 09·4	1·1	0·6	7·1	4·1	13·1	7·5
12	8 33·0	8 34·4	8 09·6	1·2	0·7	7·2	4·1	13·2	7·6
13	8 33·3	8 34·7	8 09·9	1·3	0·7	7·3	4·2	13·3	7·6
14	8 33·5	8 34·9	8 10·1	1·4	0·8	7·4	4·3	13·4	7·7
15	8 33·8	8 35·2	8 10·3	1·5	0·9	7·5	4·3	13·5	7·8
16	8 34·0	8 35·4	8 10·6	1·6	0·9	7·6	4·4	13·6	7·8
17	8 34·3	8 35·7	8 10·8	1·7	1·0	7·7	4·4	13·7	7·9
18	8 34·5	8 35·9	8 11·1	1·8	1·0	7·8	4·5	13·8	7·9
19	8 34·8	8 36·2	8 11·3	1·9	1·1	7·9	4·5	13·9	8·0
20	8 35·0	8 36·4	8 11·5	2·0	1·2	8·0	4·6	14·0	8·1
21	8 35·3	8 36·7	8 11·8	2·1	1·2	8·1	4·7	14·1	8·1
22	8 35·5	8 36·9	8 12·0	2·2	1·3	8·2	4·7	14·2	8·2
23	8 35·8	8 37·2	8 12·3	2·3	1·3	8·3	4·8	14·3	8·2
24	8 36·0	8 37·4	8 12·5	2·4	1·4	8·4	4·8	14·4	8·3
25	8 36·3	8 37·7	8 12·7	2·5	1·4	8·5	4·9	14·5	8·3
26	8 36·5	8 37·9	8 13·0	2·6	1·5	8·6	4·9	14·6	8·4
27	8 36·8	8 38·2	8 13·2	2·7	1·6	8·7	5·0	14·7	8·5
28	8 37·0	8 38·4	8 13·4	2·8	1·6	8·8	5·1	14·8	8·5
29	8 37·3	8 38·7	8 13·7	2·9	1·7	8·9	5·1	14·9	8·6
30	8 37·5	8 38·9	8 13·9	3·0	1·7	9·0	5·2	15·0	8·6
31	8 37·8	8 39·2	8 14·2	3·1	1·8	9·1	5·2	15·1	8·7
32	8 38·0	8 39·4	8 14·4	3·2	1·8	9·2	5·3	15·2	8·7
33	8 38·3	8 39·7	8 14·6	3·3	1·9	9·3	5·3	15·3	8·8
34	8 38·5	8 39·9	8 14·9	3·4	2·0	9·4	5·4	15·4	8·9
35	8 38·8	8 40·2	8 15·1	3·5	2·0	9·5	5·5	15·5	8·9
36	8 39·0	8 40·4	8 15·4	3·6	2·1	9·6	5·5	15·6	9·0
37	8 39·3	8 40·7	8 15·6	3·7	2·1	9·7	5·6	15·7	9·0
38	8 39·5	8 40·9	8 15·8	3·8	2·2	9·8	5·6	15·8	9·1
39	8 39·8	8 41·2	8 16·1	3·9	2·2	9·9	5·7	15·9	9·1
40	8 40·0	8 41·4	8 16·3	4·0	2·3	10·0	5·8	16·0	9·2
41	8 40·3	8 41·7	8 16·5	4·1	2·4	10·1	5·8	16·1	9·3
42	8 40·5	8 41·9	8 16·8	4·2	2·4	10·2	5·9	16·2	9·3
43	8 40·8	8 42·2	8 17·0	4·3	2·5	10·3	5·9	16·3	9·4
44	8 41·0	8 42·4	8 17·3	4·4	2·5	10·4	6·0	16·4	9·4
45	8 41·3	8 42·7	8 17·5	4·5	2·6	10·5	6·0	16·5	9·5
46	8 41·5	8 42·9	8 17·7	4·6	2·6	10·6	6·1	16·6	9·5
47	8 41·8	8 43·2	8 18·0	4·7	2·7	10·7	6·2	16·7	9·6
48	8 42·0	8 43·4	8 18·2	4·8	2·8	10·8	6·2	16·8	9·7
49	8 42·3	8 43·7	8 18·5	4·9	2·8	10·9	6·3	16·9	9·7
50	8 42·5	8 43·9	8 18·7	5·0	2·9	11·0	6·3	17·0	9·8
51	8 42·8	8 44·2	8 18·9	5·1	2·9	11·1	6·4	17·1	9·8
52	8 43·0	8 44·4	8 19·2	5·2	3·0	11·2	6·4	17·2	9·9
53	8 43·3	8 44·7	8 19·4	5·3	3·0	11·3	6·5	17·3	9·9
54	8 43·5	8 44·9	8 19·7	5·4	3·1	11·4	6·6	17·4	10·0
55	8 43·8	8 45·2	8 19·9	5·5	3·2	11·5	6·6	17·5	10·1
56	8 44·0	8 45·4	8 20·1	5·6	3·2	11·6	6·7	17·6	10·1
57	8 44·3	8 45·7	8 20·4	5·7	3·3	11·7	6·7	17·7	10·2
58	8 44·5	8 45·9	8 20·6	5·8	3·3	11·8	6·8	17·8	10·2
59	8 44·8	8 46·2	8 20·8	5·9	3·4	11·9	6·8	17·9	10·3
60	8 45·0	8 46·4	8 21·1	6·0	3·5	12·0	6·9	18·0	10·4

35m	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′	′	′	′
00	8 45·0	8 46·4	8 21·1	0·0	0·0	6·0	3·6	12·0	7·1
01	8 45·3	8 46·7	8 21·3	0·1	0·1	6·1	3·6	12·1	7·2
02	8 45·5	8 46·9	8 21·6	0·2	0·1	6·2	3·7	12·2	7·2
03	8 45·8	8 47·2	8 21·8	0·3	0·2	6·3	3·7	12·3	7·3
04	8 46·0	8 47·4	8 22·0	0·4	0·2	6·4	3·8	12·4	7·3
05	8 46·3	8 47·7	8 22·3	0·5	0·3	6·5	3·8	12·5	7·4
06	8 46·5	8 47·9	8 22·5	0·6	0·4	6·6	3·9	12·6	7·5
07	8 46·8	8 48·2	8 22·8	0·7	0·4	6·7	4·0	12·7	7·5
08	8 47·0	8 48·4	8 23·0	0·8	0·5	6·8	4·0	12·8	7·6
09	8 47·3	8 48·7	8 23·2	0·9	0·5	6·9	4·1	12·9	7·6
10	8 47·5	8 48·9	8 23·5	1·0	0·6	7·0	4·1	13·0	7·7
11	8 47·8	8 49·2	8 23·7	1·1	0·7	7·1	4·2	13·1	7·8
12	8 48·0	8 49·4	8 23·9	1·2	0·7	7·2	4·3	13·2	7·8
13	8 48·3	8 49·7	8 24·2	1·3	0·8	7·3	4·3	13·3	7·9
14	8 48·5	8 49·9	8 24·4	1·4	0·8	7·4	4·4	13·4	7·9
15	8 48·8	8 50·2	8 24·7	1·5	0·9	7·5	4·4	13·5	8·0
16	8 49·0	8 50·4	8 24·9	1·6	0·9	7·6	4·5	13·6	8·0
17	8 49·3	8 50·7	8 25·1	1·7	1·0	7·7	4·6	13·7	8·1
18	8 49·5	8 50·9	8 25·4	1·8	1·1	7·8	4·6	13·8	8·2
19	8 49·8	8 51·2	8 25·6	1·9	1·1	7·9	4·7	13·9	8·2
20	8 50·0	8 51·5	8 25·9	2·0	1·2	8·0	4·7	14·0	8·3
21	8 50·3	8 51·7	8 26·1	2·1	1·2	8·1	4·8	14·1	8·3
22	8 50·5	8 52·0	8 26·3	2·2	1·3	8·2	4·9	14·2	8·4
23	8 50·8	8 52·2	8 26·6	2·3	1·4	8·3	4·9	14·3	8·5
24	8 51·0	8 52·5	8 26·8	2·4	1·4	8·4	5·0	14·4	8·5
25	8 51·3	8 52·7	8 27·0	2·5	1·5	8·5	5·0	14·5	8·6
26	8 51·5	8 53·0	8 27·3	2·6	1·5	8·6	5·1	14·6	8·6
27	8 51·8	8 53·2	8 27·5	2·7	1·6	8·7	5·1	14·7	8·7
28	8 52·0	8 53·5	8 27·8	2·8	1·7	8·8	5·2	14·8	8·8
29	8 52·3	8 53·7	8 28·0	2·9	1·7	8·9	5·3	14·9	8·8
30	8 52·5	8 54·0	8 28·2	3·0	1·8	9·0	5·3	15·0	8·9
31	8 52·8	8 54·2	8 28·5	3·1	1·8	9·1	5·4	15·1	8·9
32	8 53·0	8 54·5	8 28·7	3·2	1·9	9·2	5·4	15·2	9·0
33	8 53·3	8 54·7	8 29·0	3·3	2·0	9·3	5·5	15·3	9·1
34	8 53·5	8 55·0	8 29·2	3·4	2·0	9·4	5·6	15·4	9·1
35	8 53·8	8 55·2	8 29·4	3·5	2·1	9·5	5·6	15·5	9·2
36	8 54·0	8 55·5	8 29·7	3·6	2·1	9·6	5·7	15·6	9·2
37	8 54·3	8 55·7	8 29·9	3·7	2·2	9·7	5·7	15·7	9·3
38	8 54·5	8 56·0	8 30·2	3·8	2·2	9·8	5·8	15·8	9·3
39	8 54·8	8 56·2	8 30·4	3·9	2·3	9·9	5·9	15·9	9·4
40	8 55·0	8 56·5	8 30·6	4·0	2·4	10·0	5·9	16·0	9·5
41	8 55·3	8 56·7	8 30·9	4·1	2·4	10·1	6·0	16·1	9·5
42	8 55·5	8 57·0	8 31·1	4·2	2·5	10·2	6·0	16·2	9·6
43	8 55·8	8 57·2	8 31·3	4·3	2·5	10·3	6·1	16·3	9·6
44	8 56·0	8 57·5	8 31·6	4·4	2·6	10·4	6·2	16·4	9·7
45	8 56·3	8 57·7	8 31·8	4·5	2·7	10·5	6·2	16·5	9·8
46	8 56·5	8 58·0	8 32·1	4·6	2·7	10·6	6·3	16·6	9·8
47	8 56·8	8 58·2	8 32·3	4·7	2·8	10·7	6·3	16·7	9·9
48	8 57·0	8 58·5	8 32·5	4·8	2·8	10·8	6·4	16·8	9·9
49	8 57·3	8 58·7	8 32·8	4·9	2·9	10·

36m	SUN PLANETS	ARIES	MOON	v or d	Corr	v or d	Corr	v or d	Corr
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 00·0	9 01·5	8 35·4	0·0	0·0	6·0	3·7	12·0	7·3
01	9 00·3	9 01·7	8 35·6	0·1	0·1	6·1	3·7	12·1	7·4
02	9 00·5	9 02·0	8 35·9	0·2	0·1	6·2	3·8	12·2	7·4
03	9 00·8	9 02·2	8 36·1	0·3	0·2	6·3	3·8	12·3	7·5
04	9 01·0	9 02·5	8 36·4	0·4	0·2	6·4	3·9	12·4	7·5
05	9 01·3	9 02·7	8 36·6	0·5	0·3	6·5	4·0	12·5	7·6
06	9 01·5	9 03·0	8 36·8	0·6	0·4	6·6	4·0	12·6	7·7
07	9 01·8	9 03·2	8 37·1	0·7	0·4	6·7	4·1	12·7	7·7
08	9 02·0	9 03·5	8 37·3	0·8	0·5	6·8	4·1	12·8	7·8
09	9 02·3	9 03·7	8 37·5	0·9	0·5	6·9	4·2	12·9	7·8
10	9 02·5	9 04·0	8 37·8	1·0	0·6	7·0	4·3	13·0	7·9
11	9 02·8	9 04·2	8 38·0	1·1	0·7	7·1	4·3	13·1	8·0
12	9 03·0	9 04·5	8 38·3	1·2	0·7	7·2	4·4	13·2	8·0
13	9 03·3	9 04·7	8 38·5	1·3	0·8	7·3	4·4	13·3	8·1
14	9 03·5	9 05·0	8 38·7	1·4	0·9	7·4	4·5	13·4	8·2
15	9 03·8	9 05·2	8 39·0	1·5	0·9	7·5	4·6	13·5	8·2
16	9 04·0	9 05·5	8 39·2	1·6	1·0	7·6	4·6	13·6	8·3
17	9 04·3	9 05·7	8 39·5	1·7	1·0	7·7	4·7	13·7	8·3
18	9 04·5	9 06·0	8 39·7	1·8	1·1	7·8	4·7	13·8	8·4
19	9 04·8	9 06·2	8 39·9	1·9	1·2	7·9	4·8	13·9	8·5
20	9 05·0	9 06·5	8 40·2	2·0	1·2	8·0	4·9	14·0	8·5
21	9 05·3	9 06·7	8 40·4	2·1	1·3	8·1	4·9	14·1	8·6
22	9 05·5	9 07·0	8 40·6	2·2	1·3	8·2	5·0	14·2	8·6
23	9 05·8	9 07·2	8 40·9	2·3	1·4	8·3	5·0	14·3	8·7
24	9 06·0	9 07·5	8 41·1	2·4	1·5	8·4	5·1	14·4	8·8
25	9 06·3	9 07·7	8 41·4	2·5	1·5	8·5	5·2	14·5	8·8
26	9 06·5	9 08·0	8 41·6	2·6	1·6	8·6	5·2	14·6	8·9
27	9 06·8	9 08·2	8 41·8	2·7	1·6	8·7	5·3	14·7	8·9
28	9 07·0	9 08·5	8 42·1	2·8	1·7	8·8	5·4	14·8	9·0
29	9 07·3	9 08·7	8 42·3	2·9	1·8	8·9	5·4	14·9	9·1
30	9 07·5	9 09·0	8 42·6	3·0	1·8	9·0	5·5	15·0	9·1
31	9 07·8	9 09·2	8 42·8	3·1	1·9	9·1	5·5	15·1	9·2
32	9 08·0	9 09·5	8 43·0	3·2	1·9	9·2	5·6	15·2	9·2
33	9 08·3	9 09·8	8 43·3	3·3	2·0	9·3	5·7	15·3	9·3
34	9 08·5	9 10·0	8 43·5	3·4	2·1	9·4	5·7	15·4	9·4
35	9 08·8	9 10·3	8 43·8	3·5	2·1	9·5	5·8	15·5	9·4
36	9 09·0	9 10·5	8 44·0	3·6	2·2	9·6	5·8	15·6	9·5
37	9 09·3	9 10·8	8 44·2	3·7	2·3	9·7	5·9	15·7	9·6
38	9 09·5	9 11·0	8 44·5	3·8	2·3	9·8	6·0	15·8	9·6
39	9 09·8	9 11·3	8 44·7	3·9	2·4	9·9	6·0	15·9	9·7
40	9 10·0	9 11·5	8 44·9	4·0	2·4	10·0	6·1	16·0	9·7
41	9 10·3	9 11·8	8 45·2	4·1	2·5	10·1	6·1	16·1	9·8
42	9 10·5	9 12·0	8 45·4	4·2	2·6	10·2	6·2	16·2	9·9
43	9 10·8	9 12·3	8 45·7	4·3	2·6	10·3	6·3	16·3	9·9
44	9 11·0	9 12·5	8 45·9	4·4	2·7	10·4	6·3	16·4	10·0
45	9 11·3	9 12·8	8 46·1	4·5	2·7	10·5	6·4	16·5	10·0
46	9 11·5	9 13·0	8 46·4	4·6	2·8	10·6	6·4	16·6	10·1
47	9 11·8	9 13·3	8 46·6	4·7	2·9	10·7	6·5	16·7	10·2
48	9 12·0	9 13·5	8 46·9	4·8	2·9	10·8	6·6	16·8	10·2
49	9 12·3	9 13·8	8 47·1	4·9	3·0	10·9	6·6	16·9	10·3
50	9 12·5	9 14·0	8 47·3	5·0	3·0	11·0	6·7	17·0	10·3
51	9 12·8	9 14·3	8 47·6	5·1	3·1	11·1	6·8	17·1	10·4
52	9 13·0	9 14·5	8 47·8	5·2	3·2	11·2	6·8	17·2	10·5
53	9 13·3	9 14·8	8 48·0	5·3	3·2	11·3	6·9	17·3	10·5
54	9 13·5	9 15·0	8 48·3	5·4	3·3	11·4	6·9	17·4	10·6
55	9 13·8	9 15·3	8 48·5	5·5	3·3	11·5	7·0	17·5	10·6
56	9 14·0	9 15·5	8 48·8	5·6	3·4	11·6	7·1	17·6	10·7
57	9 14·3	9 15·8	8 49·0	5·7	3·5	11·7	7·1	17·7	10·8
58	9 14·5	9 16·0	8 49·2	5·8	3·5	11·8	7·2	17·8	10·8
59	9 14·8	9 16·3	8 49·5	5·9	3·6	11·9	7·2	17·9	10·9
60	9 15·0	9 16·5	8 49·7	6·0	3·7	12·0	7·3	18·0	11·0

37m	SUN PLANETS	ARIES	MOON	v or d	Corr	v or d	Corr	v or d	Corr
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 15·0	9 16·5	8 49·7	0·0	0·0	6·0	3·8	12·0	7·5
01	9 15·3	9 16·8	8 50·0	0·1	0·1	6·1	3·8	12·1	7·6
02	9 15·5	9 17·0	8 50·2	0·2	0·1	6·2	3·9	12·2	7·6
03	9 15·8	9 17·3	8 50·4	0·3	0·2	6·3	3·9	12·3	7·7
04	9 16·0	9 17·5	8 50·7	0·4	0·3	6·4	4·0	12·4	7·8
05	9 16·3	9 17·8	8 50·9	0·5	0·3	6·5	4·1	12·5	7·8
06	9 16·5	9 18·0	8 51·1	0·6	0·4	6·6	4·1	12·6	7·9
07	9 16·8	9 18·3	8 51·4	0·7	0·4	6·7	4·2	12·7	7·9
08	9 17·0	9 18·5	8 51·6	0·8	0·5	6·8	4·3	12·8	8·0
09	9 17·3	9 18·8	8 51·9	0·9	0·6	6·9	4·3	12·9	8·1
10	9 17·5	9 19·0	8 52·1	1·0	0·6	7·0	4·4	13·0	8·1
11	9 17·8	9 19·3	8 52·3	1·1	0·7	7·1	4·4	13·1	8·2
12	9 18·0	9 19·5	8 52·6	1·2	0·8	7·2	4·5	13·2	8·3
13	9 18·3	9 19·8	8 52·8	1·3	0·8	7·3	4·6	13·3	8·3
14	9 18·5	9 20·0	8 53·1	1·4	0·9	7·4	4·6	13·4	8·4
15	9 18·8	9 20·3	8 53·3	1·5	0·9	7·5	4·7	13·5	8·4
16	9 19·0	9 20·5	8 53·5	1·6	1·0	7·6	4·8	13·6	8·5
17	9 19·3	9 20·8	8 53·8	1·7	1·1	7·7	4·8	13·7	8·6
18	9 19·5	9 21·0	8 54·0	1·8	1·1	7·8	4·9	13·8	8·6
19	9 19·8	9 21·3	8 54·3	1·9	1·2	7·9	4·9	13·9	8·7
20	9 20·0	9 21·5	8 54·5	2·0	1·3	8·0	5·0	14·0	8·8
21	9 20·3	9 21·8	8 54·7	2·1	1·3	8·1	5·1	14·1	8·8
22	9 20·5	9 22·0	8 55·0	2·2	1·4	8·2	5·1	14·2	8·9
23	9 20·8	9 22·3	8 55·2	2·3	1·4	8·3	5·2	14·3	8·9
24	9 21·0	9 22·5	8 55·4	2·4	1·5	8·4	5·3	14·4	9·0
25	9 21·3	9 22·8	8 55·7	2·5	1·6	8·5	5·3	14·5	9·1
26	9 21·5	9 23·0	8 55·9	2·6	1·6	8·6	5·4	14·6	9·1
27	9 21·8	9 23·3	8 56·2	2·7	1·7	8·7	5·4	14·7	9·2
28	9 22·0	9 23·5	8 56·4	2·8	1·8	8·8	5·5	14·8	9·3
29	9 22·3	9 23·8	8 56·6	2·9	1·8	8·9	5·6	14·9	9·3
30	9 22·5	9 24·0	8 56·9	3·0	1·9	9·0	5·6	15·0	9·4
31	9 22·8	9 24·3	8 57·1	3·1	1·9	9·1	5·7	15·1	9·4
32	9 23·0	9 24·5	8 57·4	3·2	2·0	9·2	5·8	15·2	9·5
33	9 23·3	9 24·8	8 57·6	3·3	2·1	9·3	5·8	15·3	9·6
34	9 23·5	9 25·0	8 57·8	3·4	2·1	9·4	5·9	15·4	9·6
35	9 23·8	9 25·3	8 58·1	3·5	2·2	9·5	5·9	15·5	9·7
36	9 24·0	9 25·5	8 58·3	3·6	2·3	9·6	6·0	15·6	9·8
37	9 24·3	9 25·8	8 58·5	3·7	2·3	9·7	6·1	15·7	9·8
38	9 24·5	9 26·0	8 58·8	3·8	2·4	9·8	6·1	15·8	9·9
39	9 24·8	9 26·3	8 59·0	3·9	2·4	9·9	6·2	15·9	9·9
40	9 25·0	9 26·5	8 59·3	4·0	2·5	10·0	6·3	16·0	10·0
41	9 25·3	9 26·8	8 59·5	4·1	2·6	10·1	6·3	16·1	10·1
42	9 25·5	9 27·0	8 59·7	4·2	2·6	10·2	6·4	16·2	10·1
43	9 25·8	9 27·3	9 00·0	4·3	2·7	10·3	6·4	16·3	10·2
44	9 26·0	9 27·5	9 00·2	4·4	2·8	10·4	6·5	16·4	10·3
45	9 26·3	9 27·8	9 00·5	4·5	2·8	10·5	6·6	16·5	10·3
46	9 26·5	9 28·1	9 00·7	4·6	2·9	10·6	6·6	16·6	10·4
47	9 26·8	9 28·3	9 00·9	4·7	2·9	10·7	6·7	16·7	10·4
48	9 27·0	9 28·6	9 01·2	4·8	3·0	10·8	6·8	16·8	10·5
49	9 27·3	9 28·8	9 01·4	4·9	3·1	10·9	6·8	16·9	10·6
50	9 27·5	9 29·1	9 01·6	5·0	3·1	11·0	6·9	17·0	10·6
51	9 27·8	9 29·3	9 01·9	5·1	3·2	11·1	6·9	17·1	10·7
52	9 28·0	9 29·6	9 02·1	5·2	3·3	11·2	7·0	17·2	10·8
53	9 28·3	9 29·8	9 02·4	5·3	3·3	11·3	7·1	17·3	10·8
54	9 28·5	9 30·1	9 02·6	5·4	3·4	11·4	7·1	17·4	10·9
55	9 28·8	9 30·3	9 02·8	5·5	3·4	11·5	7·2	17·5	10·9
56	9 29·0	9 30·6	9 03·1	5·6	3·5	11·6	7·3	17·6	11·0
57	9 29·3	9 30·8	9 03·3	5·7	3·6	11·7	7·3	17·7	11·1
58	9 29·5	9 31·1	9 03·6	5·8	3·6	11·8	7·4	17·8	11·1
59	9 29·8	9 31·3	9 03·8	5·9	3·7	11·9	7·4	17·9	11·2
60	9 30·0	9 31·6	9 04·0	6·0	3·8	12·0	7·5	18·0	11·3

38m	SUN PLANETS	ARIES	MOON	v or d	Corr	v or d	Corr	v or d	Corr
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 30·0	9 31·6	9 04·0	0·0	0·0	6·0	3·9	12·0	7·7
01	9 30·3	9 31·8	9 04·3	0·1	0·1	6·1	3·9	12·1	7·8
02	9 30·5	9 32·1	9 04·5	0·2	0·1	6·2	4·0	12·2	7·8
03	9 30·8	9 32·3	9 04·7	0·3	0·2	6·3	4·0	12·3	7·9
04	9 31·0	9 32·6	9 05·0	0·4	0·3	6·4	4·1	12·4	8·0
05	9 31·3	9 32·8	9 05·2	0·5	0·3	6·5	4·2	12·5	8·0
06	9 31·5	9 33·1	9 05·5	0·6	0·4	6·6	4·2	12·6	8·1
07	9 31·8	9 33·3	9 05·7	0·7	0·4	6·7	4·3	12·7	8·1
08	9 32·0	9 33·6	9 05·9	0·8	0·5	6·8	4·4	12·8	8·2
09	9 32·3	9 33·8	9 06·2	0·9	0·6	6·9	4·4	12·9	8·3
10	9 32·5	9 34·1	9 06·4	1·0	0·6	7·0	4·5	13·0	8·3
11	9 32·8	9 34·3	9 06·7	1·1	0·7	7·1	4·6	13·1	8·4
12	9 33·0	9 34·6	9 06·9	1·2	0·8	7·2	4·6	13·2	8·5
13	9 33·3	9 34·8	9 07·1	1·3	0·8	7·3	4·7	13·3	8·5
14	9 33·5	9 35·1	9 07·4	1·4	0·9	7·4	4·7	13·4	8·6
15	9 33·8	9 35·3	9 07·6	1·5	1·0	7·5	4·8	13·5	8·7
16	9 34·0	9 35·6	9 07·9	1·6	1·0	7·6	4·9	13·6	8·7
17	9 34·3	9 35·8	9 08·1	1·7	1·1	7·7	4·9	13·7	8·8
18	9 34·5	9 36·1	9 08·3	1·8	1·2	7·8	5·0	13·8	8·9
19	9 34·8	9 36·3	9 08·6	1·9	1·2	7·9	5·1	13·9	8·9
20	9 35·0	9 36·6	9 08·8	2·0	1·3	8·0	5·1	14·0	9·0
21	9 35·3	9 36·8	9 09·0	2·1	1·3	8·1	5·2	14·1	9·0
22	9 35·5	9 37·1	9 09·3	2·2	1·4	8·2	5·3	14·2	9·1
23	9 35·8	9 37·3	9 09·5	2·3	1·5	8·3	5·3	14·3	9·2
24	9 36·0	9 37·6	9 09·8	2·4	1·5	8·4	5·4	14·4	9·2
25	9 36·3	9 37·8	9 10·0	2·5	1·6	8·5	5·5	14·5	9·3
26	9 36·5	9 38·1	9 10·2	2·6	1·7	8·6	5·5	14·6	9·4
27	9 36·8	9 38·3	9 10·5	2·7	1·7	8·7	5·6	14·7	9·4
28	9 37·0	9 38·6	9 10·7	2·8	1·8	8·8	5·6	14·8	9·5
29	9 37·3	9 38·8	9 11·0	2·9	1·9	8·9	5·7	14·9	9·6
30	9 37·5	9 39·1	9 11·2	3·0	1·9	9·0	5·8	15·0	9·6
31	9 37·8	9 39·3	9 11·4	3·1	2·0	9·1	5·8	15·1	9·7
32	9 38·0	9 39·6	9 11·7	3·2	2·1	9·2	5·9	15·2	9·8
33	9 38·3	9 39·8	9 11·9	3·3	2·1	9·3	6·0	15·3	9·8
34	9 38·5	9 40·1	9 12·1	3·4	2·2	9·4	6·0	15·4	9·9
35	9 38·8	9 40·3	9 12·4	3·5	2·2	9·5	6·1	15·5	9·9
36	9 39·0	9 40·6	9 12·6	3·6	2·3	9·6	6·2	15·6	10·0
37	9 39·3	9 40·8	9 12·9	3·7	2·4	9·7	6·2	15·7	10·1
38	9 39·5	9 41·1	9 13·1	3·8	2·4	9·8	6·3	15·8	10·1
39	9 39·8	9 41·3	9 13·3	3·9	2·5	9·9	6·4	15·9	10·2
40	9 40·0	9 41·6	9 13·6	4·0	2·6	10·0	6·4	16·0	10·3
41	9 40·3	9 41·8	9 13·8	4·1	2·6	10·1	6·5	16·1	10·3
42	9 40·5	9 42·1	9 14·1	4·2	2·7	10·2	6·5	16·2	10·4
43	9 40·8	9 42·3	9 14·3	4·3	2·8	10·3	6·6	16·3	10·5
44	9 41·0	9 42·6	9 14·5	4·4	2·8	10·4	6·7	16·4	10·5
45	9 41·3	9 42·8	9 14·8	4·5	2·9	10·5	6·7	16·5	10·6
46	9 41·5	9 43·1	9 15·0	4·6	3·0	10·6	6·8	16·6	10·7
47	9 41·8	9 43·3	9 15·2	4·7	3·0	10·7	6·9	16·7	10·7
48	9 42·0	9 43·6	9 15·5	4·8	3·1	10·8	6·9	16·8	10·8
49	9 42·3	9 43·8	9 15·7	4·9	3·1	10·9	7·0	16·9	10·8
50	9 42·5	9 44·1	9 16·0	5·0	3·2	11·0	7·1	17·0	10·9
51	9 42·8	9 44·3	9 16·2	5·1	3·3	11·1	7·1	17·1	11·0
52	9 43·0	9 44·6	9 16·4	5·2	3·3	11·2	7·2	17·2	11·0
53	9 43·3	9 44·8	9 16·7	5·3	3·4	11·3	7·3	17·3	11·1
54	9 43·5	9 45·1	9 16·9	5·4	3·5	11·4	7·3	17·4	11·2
55	9 43·8	9 45·3	9 17·2	5·5	3·5	11·5	7·4	17·5	11·2
56	9 44·0	9 45·6	9 17·4	5·6	3·6	11·6	7·4	17·6	11·3
57	9 44·3	9 45·8	9 17·6	5·7	3·7	11·7	7·5	17·7	11·4
58	9 44·5	9 46·1	9 17·9	5·8	3·7	11·8	7·6	17·8	11·4
59	9 44·8	9 46·4	9 18·1	5·9	3·8	11·9	7·6	17·9	11·5
60	9 45·0	9 46·6	9 18·4	6·0	3·9	12·0	7·7	18·0	11·6

39m	SUN PLANETS	ARIES	MOON	v or d	Corr	v or d	Corr	v or d	Corr
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 45·0	9 46·6	9 18·4	0·0	0·0	6·0	4·0	12·0	7·9
01	9 45·3	9 46·9	9 18·6	0·1	0·1	6·1	4·0	12·1	8·0
02	9 45·5	9 47·1	9 18·8	0·2	0·1	6·2	4·1	12·2	8·0
03	9 45·8	9 47·4	9 19·1	0·3	0·2	6·3	4·1	12·3	8·1
04	9 46·0	9 47·6	9 19·3	0·4	0·3	6·4	4·2	12·4	8·2
05	9 46·3	9 47·9	9 19·5	0·5	0·3	6·5	4·3	12·5	8·2
06	9 46·5	9 48·1	9 19·8	0·6	0·4	6·6	4·3	12·6	8·3
07	9 46·8	9 48·4	9 20·0	0·7	0·5	6·7	4·4	12·7	8·4
08	9 47·0	9 48·6	9 20·3	0·8	0·5	6·8	4·5	12·8	8·4
09	9 47·3	9 48·9	9 20·5	0·9	0·6	6·9	4·5	12·9	8·5
10	9 47·5	9 49·1	9 20·7	1·0	0·7	7·0	4·6	13·0	8·6
11	9 47·8	9 49·4	9 21·0	1·1	0·7	7·1	4·7	13·1	8·6
12	9 48·0	9 49·6	9 21·2	1·2	0·8	7·2	4·7	13·2	8·7
13	9 48·3	9 49·9	9 21·5	1·3	0·9	7·3	4·8	13·3	8·8
14	9 48·5	9 50·1	9 21·7	1·4	0·9	7·4	4·9	13·4	8·8
15	9 48·8	9 50·4	9 21·9	1·5	1·0	7·5	4·9	13·5	8·9
16	9 49·0	9 50·6	9 22·2	1·6	1·1	7·6	5·0	13·6	9·0
17	9 49·3	9 50·9	9 22·4	1·7	1·1	7·7	5·1	13·7	9·0
18	9 49·5	9 51·1	9 22·6	1·8	1·2	7·8	5·1	13·8	9·1
19	9 49·8	9 51·4	9 22·9	1·9	1·3	7·9	5·2	13·9	9·2
20	9 50·0	9 51·6	9 23·1	2·0	1·3	8·0	5·3	14·0	9·2
21	9 50·3	9 51·9	9 23·4	2·1	1·4	8·1	5·3	14·1	9·3
22	9 50·5	9 52·1	9 23·6	2·2	1·4	8·2	5·4	14·2	9·3
23	9 50·8	9 52·4	9 23·8	2·3	1·5	8·3	5·5	14·3	9·4
24	9 51·0	9 52·6	9 24·1	2·4	1·6	8·4	5·5	14·4	9·5
25	9 51·3	9 52·9	9 24·3	2·5	1·6	8·5	5·6	14·5	9·5
26	9 51·5	9 53·1	9 24·6	2·6	1·7	8·6	5·7	14·6	9·6
27	9 51·8	9 53·4	9 24·8	2·7	1·8	8·7	5·7	14·7	9·7
28	9 52·0	9 53·6	9 25·0	2·8	1·8	8·8	5·8	14·8	9·7
29	9 52·3	9 53·9	9 25·3	2·9	1·9	8·9	5·9	14·9	9·8
30	9 52·5	9 54·1	9 25·5	3·0	2·0	9·0	5·9	15·0	9·9
31	9 52·8	9 54·4	9 25·7	3·1	2·0	9·1	6·0	15·1	9·9
32	9 53·0	9 54·6	9 26·0	3·2	2·1	9·2	6·1	15·2	10·0
33	9 53·3	9 54·9	9 26·2	3·3	2·2	9·3	6·1	15·3	10·1
34	9 53·5	9 55·1	9 26·5	3·4	2·2	9·4	6·2	15·4	10·1
35	9 53·8	9 55·4	9 26·7	3·5	2·3	9·5	6·3	15·5	10·2
36	9 54·0	9 55·6	9 26·9	3·6	2·4	9·6	6·3	15·6	10·3
37	9 54·3	9 55·9	9 27·2	3·7	2·4	9·7	6·4	15·7	10·3
38	9 54·5	9 56·1	9 27·4	3·8	2·5	9·8	6·5	15·8	10·4
39	9 54·8	9 56·4	9 27·7	3·9	2·6	9·9	6·5	15·9	10·5
40	9 55·0	9 56·6	9 27·9	4·0	2·6	10·0	6·6	16·0	10·5
41	9 55·3	9 56·9	9 28·1	4·1	2·7	10·1	6·6	16·1	10·6
42	9 55·5	9 57·1	9 28·4	4·2	2·8	10·2	6·7	16·2	10·7
43	9 55·8	9 57·4	9 28·6	4·3	2·8	10·3	6·8	16·3	10·7
44	9 56·0	9 57·6	9 28·8	4·4	2·9	10·4	6·8	16·4	10·8
45	9 56·3	9 57·9	9 29·1	4·5	3·0	10·5	6·9	16·5	10·9
46	9 56·5	9 58·1	9 29·3	4·6	3·0	10·6	7·0	16·6	10·9
47	9 56·8	9 58·4	9 29·6	4·7	3·1	10·7	7·0	16·7	11·0
48	9 57·0	9 58·6	9 29·8	4·8	3·2	10·8	7·1	16·8	11·1
49	9 57·3	9 58·9	9 30·0	4·9	3·2	10·9	7·2	16·9	11·1
50	9 57·5	9 59·1	9 30·3

40m	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	10 00·0	10 01·6	9 32·7	0·0 0·0	6·0 4·1	12·0 8·1
01	10 00·3	10 01·9	9 32·9	0·1 0·1	6·1 4·1	12·1 8·2
02	10 00·5	10 02·1	9 33·1	0·2 0·1	6·2 4·2	12·2 8·2
03	10 00·8	10 02·4	9 33·4	0·3 0·2	6·3 4·3	12·3 8·3
04	10 01·0	10 02·6	9 33·6	0·4 0·3	6·4 4·3	12·4 8·4
05	10 01·3	10 02·9	9 33·9	0·5 0·3	6·5 4·4	12·5 8·4
06	10 01·5	10 03·1	9 34·1	0·6 0·4	6·6 4·5	12·6 8·5
07	10 01·8	10 03·4	9 34·3	0·7 0·5	6·7 4·5	12·7 8·6
08	10 02·0	10 03·6	9 34·6	0·8 0·5	6·8 4·6	12·8 8·6
09	10 02·3	10 03·9	9 34·8	0·9 0·6	6·9 4·7	12·9 8·7
10	10 02·5	10 04·1	9 35·1	1·0 0·7	7·0 4·7	13·0 8·8
11	10 02·8	10 04·4	9 35·3	1·1 0·7	7·1 4·8	13·1 8·8
12	10 03·0	10 04·7	9 35·5	1·2 0·8	7·2 4·9	13·2 8·9
13	10 03·3	10 04·9	9 35·8	1·3 0·9	7·3 4·9	13·3 9·0
14	10 03·5	10 05·2	9 36·0	1·4 0·9	7·4 5·0	13·4 9·0
15	10 03·8	10 05·4	9 36·2	1·5 1·0	7·5 5·1	13·5 9·1
16	10 04·0	10 05·7	9 36·5	1·6 1·1	7·6 5·1	13·6 9·2
17	10 04·3	10 05·9	9 36·7	1·7 1·1	7·7 5·2	13·7 9·2
18	10 04·5	10 06·2	9 37·0	1·8 1·2	7·8 5·3	13·8 9·3
19	10 04·8	10 06·4	9 37·2	1·9 1·3	7·9 5·3	13·9 9·4
20	10 05·0	10 06·7	9 37·4	2·0 1·4	8·0 5·4	14·0 9·5
21	10 05·3	10 06·9	9 37·7	2·1 1·4	8·1 5·5	14·1 9·5
22	10 05·5	10 07·2	9 37·9	2·2 1·5	8·2 5·5	14·2 9·6
23	10 05·8	10 07·4	9 38·2	2·3 1·6	8·3 5·6	14·3 9·7
24	10 06·0	10 07·7	9 38·4	2·4 1·6	8·4 5·7	14·4 9·7
25	10 06·3	10 07·9	9 38·6	2·5 1·7	8·5 5·7	14·5 9·8
26	10 06·5	10 08·2	9 38·9	2·6 1·8	8·6 5·8	14·6 9·9
27	10 06·8	10 08·4	9 39·1	2·7 1·8	8·7 5·9	14·7 9·9
28	10 07·0	10 08·7	9 39·3	2·8 1·9	8·8 5·9	14·8 10·0
29	10 07·3	10 08·9	9 39·6	2·9 2·0	8·9 6·0	14·9 10·1
30	10 07·5	10 09·2	9 39·8	3·0 2·0	9·0 6·1	15·0 10·1
31	10 07·8	10 09·4	9 40·1	3·1 2·1	9·1 6·1	15·1 10·2
32	10 08·0	10 09·7	9 40·3	3·2 2·2	9·2 6·2	15·2 10·3
33	10 08·3	10 09·9	9 40·5	3·3 2·2	9·3 6·3	15·3 10·3
34	10 08·5	10 10·2	9 40·8	3·4 2·3	9·4 6·3	15·4 10·4
35	10 08·8	10 10·4	9 41·0	3·5 2·4	9·5 6·4	15·5 10·5
36	10 09·0	10 10·7	9 41·3	3·6 2·4	9·6 6·5	15·6 10·5
37	10 09·3	10 10·9	9 41·5	3·7 2·5	9·7 6·5	15·7 10·6
38	10 09·5	10 11·2	9 41·7	3·8 2·6	9·8 6·6	15·8 10·7
39	10 09·8	10 11·4	9 42·0	3·9 2·6	9·9 6·7	15·9 10·7
40	10 10·0	10 11·7	9 42·2	4·0 2·7	10·0 6·8	16·0 10·8
41	10 10·3	10 11·9	9 42·4	4·1 2·8	10·1 6·8	16·1 10·9
42	10 10·5	10 12·2	9 42·7	4·2 2·8	10·2 6·9	16·2 10·9
43	10 10·8	10 12·4	9 42·9	4·3 2·9	10·3 7·0	16·3 11·0
44	10 11·0	10 12·7	9 43·2	4·4 3·0	10·4 7·0	16·4 11·1
45	10 11·3	10 12·9	9 43·4	4·5 3·0	10·5 7·1	16·5 11·1
46	10 11·5	10 13·2	9 43·6	4·6 3·1	10·6 7·2	16·6 11·2
47	10 11·8	10 13·4	9 43·9	4·7 3·2	10·7 7·2	16·7 11·3
48	10 12·0	10 13·7	9 44·1	4·8 3·2	10·8 7·3	16·8 11·3
49	10 12·3	10 13·9	9 44·4	4·9 3·3	10·9 7·4	16·9 11·4
50	10 12·5	10 14·2	9 44·6	5·0 3·4	11·0 7·4	17·0 11·5
51	10 12·8	10 14·4	9 44·8	5·1 3·4	11·1 7·5	17·1 11·5
52	10 13·0	10 14·7	9 45·1	5·2 3·5	11·2 7·6	17·2 11·6
53	10 13·3	10 14·9	9 45·3	5·3 3·6	11·3 7·6	17·3 11·7
54	10 13·5	10 15·2	9 45·6	5·4 3·6	11·4 7·7	17·4 11·7
55	10 13·8	10 15·4	9 45·8	5·5 3·7	11·5 7·8	17·5 11·8
56	10 14·0	10 15·7	9 46·0	5·6 3·8	11·6 7·8	17·6 11·9
57	10 14·3	10 15·9	9 46·3	5·7 3·8	11·7 7·9	17·7 11·9
58	10 14·5	10 16·2	9 46·5	5·8 3·9	11·8 8·0	17·8 12·0
59	10 14·8	10 16·4	9 46·7	5·9 4·0	11·9 8·0	17·9 12·1
60	10 15·0	10 16·7	9 47·0	6·0 4·1	12·0 8·1	18·0 12·2

41m	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	10 15·0	10 16·7	9 47·0	0·0 0·0	6·0 4·2	12·0 8·3
01	10 15·3	10 16·9	9 47·2	0·1 0·1	6·1 4·2	12·1 8·4
02	10 15·5	10 17·2	9 47·5	0·2 0·1	6·2 4·3	12·2 8·4
03	10 15·8	10 17·4	9 47·7	0·3 0·2	6·3 4·4	12·3 8·5
04	10 16·0	10 17·7	9 47·9	0·4 0·3	6·4 4·4	12·4 8·6
05	10 16·3	10 17·9	9 48·2	0·5 0·3	6·5 4·5	12·5 8·6
06	10 16·5	10 18·2	9 48·4	0·6 0·4	6·6 4·6	12·6 8·7
07	10 16·8	10 18·4	9 48·7	0·7 0·5	6·7 4·6	12·7 8·8
08	10 17·0	10 18·7	9 48·9	0·8 0·6	6·8 4·7	12·8 8·9
09	10 17·3	10 18·9	9 49·1	0·9 0·6	6·9 4·8	12·9 8·9
10	10 17·5	10 19·2	9 49·4	1·0 0·7	7·0 4·8	13·0 9·0
11	10 17·8	10 19·4	9 49·6	1·1 0·8	7·1 4·9	13·1 9·1
12	10 18·0	10 19·7	9 49·8	1·2 0·8	7·2 5·0	13·2 9·1
13	10 18·3	10 19·9	9 50·1	1·3 0·9	7·3 5·0	13·3 9·2
14	10 18·5	10 20·2	9 50·3	1·4 1·0	7·4 5·1	13·4 9·3
15	10 18·8	10 20·4	9 50·6	1·5 1·0	7·5 5·2	13·5 9·3
16	10 19·0	10 20·7	9 50·8	1·6 1·1	7·6 5·3	13·6 9·4
17	10 19·3	10 20·9	9 51·0	1·7 1·2	7·7 5·3	13·7 9·5
18	10 19·5	10 21·2	9 51·3	1·8 1·2	7·8 5·4	13·8 9·5
19	10 19·8	10 21·4	9 51·5	1·9 1·3	7·9 5·5	13·9 9·6
20	10 20·0	10 21·7	9 51·8	2·0 1·4	8·0 5·5	14·0 9·7
21	10 20·3	10 21·9	9 52·0	2·1 1·5	8·1 5·6	14·1 9·8
22	10 20·5	10 22·2	9 52·2	2·2 1·5	8·2 5·7	14·2 9·8
23	10 20·8	10 22·4	9 52·5	2·3 1·6	8·3 5·7	14·3 9·9
24	10 21·0	10 22·7	9 52·7	2·4 1·7	8·4 5·8	14·4 10·0
25	10 21·3	10 23·0	9 52·9	2·5 1·7	8·5 5·9	14·5 10·0
26	10 21·5	10 23·2	9 53·2	2·6 1·8	8·6 5·9	14·6 10·1
27	10 21·8	10 23·5	9 53·4	2·7 1·9	8·7 6·0	14·7 10·2
28	10 22·0	10 23·7	9 53·7	2·8 1·9	8·8 6·1	14·8 10·2
29	10 22·3	10 24·0	9 53·9	2·9 2·0	8·9 6·2	14·9 10·3
30	10 22·5	10 24·2	9 54·1	3·0 2·1	9·0 6·2	15·0 10·4
31	10 22·8	10 24·5	9 54·4	3·1 2·1	9·1 6·3	15·1 10·4
32	10 23·0	10 24·7	9 54·6	3·2 2·2	9·2 6·4	15·2 10·5
33	10 23·3	10 25·0	9 54·9	3·3 2·3	9·3 6·4	15·3 10·6
34	10 23·5	10 25·2	9 55·1	3·4 2·4	9·4 6·5	15·4 10·7
35	10 23·8	10 25·5	9 55·3	3·5 2·4	9·5 6·6	15·5 10·7
36	10 24·0	10 25·7	9 55·6	3·6 2·5	9·6 6·6	15·6 10·8
37	10 24·3	10 26·0	9 55·8	3·7 2·6	9·7 6·7	15·7 10·9
38	10 24·5	10 26·2	9 56·1	3·8 2·6	9·8 6·8	15·8 10·9
39	10 24·8	10 26·5	9 56·3	3·9 2·7	9·9 6·8	15·9 11·0
40	10 25·0	10 26·7	9 56·5	4·0 2·8	10·0 6·9	16·0 11·1
41	10 25·3	10 27·0	9 56·8	4·1 2·8	10·1 7·0	16·1 11·1
42	10 25·5	10 27·2	9 57·0	4·2 2·9	10·2 7·1	16·2 11·2
43	10 25·8	10 27·5	9 57·2	4·3 3·0	10·3 7·1	16·3 11·3
44	10 26·0	10 27·7	9 57·5	4·4 3·0	10·4 7·2	16·4 11·3
45	10 26·3	10 28·0	9 57·7	4·5 3·1	10·5 7·3	16·5 11·4
46	10 26·5	10 28·2	9 58·0	4·6 3·2	10·6 7·3	16·6 11·5
47	10 26·8	10 28·5	9 58·2	4·7 3·3	10·7 7·4	16·7 11·6
48	10 27·0	10 28·7	9 58·4	4·8 3·3	10·8 7·5	16·8 11·6
49	10 27·3	10 29·0	9 58·7	4·9 3·4	10·9 7·5	16·9 11·7
50	10 27·5	10 29·2	9 58·9	5·0 3·5	11·0 7·6	17·0 11·8
51	10 27·8	10 29·5	9 59·2	5·1 3·5	11·1 7·7	17·1 11·8
52	10 28·0	10 29·7	9 59·4	5·2 3·6	11·2 7·7	17·2 11·9
53	10 28·3	10 30·0	9 59·6	5·3 3·7	11·3 7·8	17·3 12·0
54	10 28·5	10 30·2	9 59·9	5·4 3·7	11·4 7·9	17·4 12·0
55	10 28·8	10 30·5	10 00·1	5·5 3·8	11·5 8·0	17·5 12·1
56	10 29·0	10 30·7	10 00·3	5·6 3·9	11·6 8·0	17·6 12·2
57	10 29·3	10 31·0	10 00·6	5·7 3·9	11·7 8·1	17·7 12·2
58	10 29·5	10 31·2	10 00·8	5·8 4·0	11·8 8·2	17·8 12·3
59	10 29·8	10 31·5	10 01·1	5·9 4·1	11·9 8·2	17·9 12·4
60	10 30·0	10 31·7	10 01·3	6·0 4·2	12·0 8·3	18·0 12·5

42m	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	10 30·0	10 31·7	10 01·3	0·0 0·0	6·0 4·3	12·0 8·5
01	10 30·3	10 32·0	10 01·5	0·1 0·1	6·1 4·3	12·1 8·6
02	10 30·5	10 32·2	10 01·8	0·2 0·1	6·2 4·4	12·2 8·6
03	10 30·8	10 32·5	10 02·0	0·3 0·2	6·3 4·5	12·3 8·7
04	10 31·0	10 32·7	10 02·3	0·4 0·3	6·4 4·5	12·4 8·8
05	10 31·3	10 33·0	10 02·5	0·5 0·4	6·5 4·6	12·5 8·9
06	10 31·5	10 33·2	10 02·7	0·6 0·4	6·6 4·7	12·6 8·9
07	10 31·8	10 33·5	10 03·0	0·7 0·5	6·7 4·7	12·7 9·0
08	10 32·0	10 33·7	10 03·2	0·8 0·6	6·8 4·8	12·8 9·1
09	10 32·3	10 34·0	10 03·4	0·9 0·6	6·9 4·9	12·9 9·1
10	10 32·5	10 34·2	10 03·7	1·0 0·7	7·0 5·0	13·0 9·2
11	10 32·8	10 34·5	10 03·9	1·1 0·8	7·1 5·0	13·1 9·3
12	10 33·0	10 34·7	10 04·2	1·2 0·9	7·2 5·1	13·2 9·4
13	10 33·3	10 35·0	10 04·4	1·3 0·9	7·3 5·2	13·3 9·4
14	10 33·5	10 35·2	10 04·6	1·4 1·0	7·4 5·2	13·4 9·5
15	10 33·8	10 35·5	10 04·9	1·5 1·1	7·5 5·3	13·5 9·6
16	10 34·0	10 35·7	10 05·1	1·6 1·1	7·6 5·4	13·6 9·6
17	10 34·3	10 36·0	10 05·4	1·7 1·2	7·7 5·5	13·7 9·7
18	10 34·5	10 36·2	10 05·6	1·8 1·3	7·8 5·5	13·8 9·8
19	10 34·8	10 36·5	10 05·8	1·9 1·3	7·9 5·6	13·9 9·8
20	10 35·0	10 36·7	10 06·1	2·0 1·4	8·0 5·7	14·0 9·9
21	10 35·3	10 37·0	10 06·3	2·1 1·5	8·1 5·7	14·1 10·0
22	10 35·5	10 37·2	10 06·5	2·2 1·6	8·2 5·8	14·2 10·1
23	10 35·8	10 37·5	10 06·8	2·3 1·6	8·3 5·9	14·3 10·1
24	10 36·0	10 37·7	10 07·0	2·4 1·7	8·4 6·0	14·4 10·2
25	10 36·3	10 38·0	10 07·3	2·5 1·8	8·5 6·0	14·5 10·3
26	10 36·5	10 38·2	10 07·5	2·6 1·8	8·6 6·1	14·6 10·3
27	10 36·8	10 38·5	10 07·7	2·7 1·9	8·7 6·2	14·7 10·4
28	10 37·0	10 38·7	10 08·0	2·8 2·0	8·8 6·2	14·8 10·5
29	10 37·3	10 39·0	10 08·2	2·9 2·1	8·9 6·3	14·9 10·6
30	10 37·5	10 39·2	10 08·5	3·0 2·1	9·0 6·4	15·0 10·6
31	10 37·8	10 39·5	10 08·7	3·1 2·2	9·1 6·4	15·1 10·7
32	10 38·0	10 39·7	10 08·9	3·2 2·3	9·2 6·5	15·2 10·8
33	10 38·3	10 40·0	10 09·2	3·3 2·3	9·3 6·6	15·3 10·8
34	10 38·5	10 40·2	10 09·4	3·4 2·4	9·4 6·7	15·4 10·9
35	10 38·8	10 40·5	10 09·7	3·5 2·5	9·5 6·7	15·5 11·0
36	10 39·0	10 40·7	10 09·9	3·6 2·6	9·6 6·8	15·6 11·1
37	10 39·3	10 41·0	10 10·1	3·7 2·6	9·7 6·9	15·7 11·1
38	10 39·5	10 41·3	10 10·4	3·8 2·7	9·8 6·9	15·8 11·2
39	10 39·8	10 41·5	10 10·6	3·9 2·8	9·9 7·0	15·9 11·3
40	10 40·0	10 41·8	10 10·8	4·0 2·8	10·0 7·1	16·0 11·3
41	10 40·3	10 42·0	10 11·1	4·1 2·9	10·1 7·2	16·1 11·4
42	10 40·5	10 42·3	10 11·3	4·2 3·0	10·2 7·2	16·2 11·5
43	10 40·8	10 42·5	10 11·6	4·3 3·0	10·3 7·3	16·3 11·5
44	10 41·0	10 42·8	10 11·8	4·4 3·1	10·4 7·4	16·4 11·6
45	10 41·3	10 43·0	10 12·0	4·5 3·2	10·5 7·4	16·5 11·7
46	10 41·5	10 43·3	10 12·3	4·6 3·3	10·6 7·5	16·6 11·8
47	10 41·8	10 43·5	10 12·5	4·7 3·3	10·7 7·6	16·7 11·8
48	10 42·0	10 43·8	10 12·8	4·8 3·4	10·8 7·7	16·8 11·9
49	10 42·3	10 44·0	10 13·0	4·9 3·5	10·9 7·7	16·9 12·0
50	10 42·5	10 44·3	10 13·2	5·0 3·5	11·0 7·8	17·0 12·0
51	10 42·8	10 44·5	10 13·5	5·1 3·6	11·1 7·9	17·1 12·1
52	10 43·0	10 44·8	10 13·7	5·2 3·7	11·2 7·9	17·2 12·2
53	10 43·3	10 45·0	10 13·9	5·3 3·8	11·3 8·0	17·3 12·3
54	10 43·5	10 45·3	10 14·2	5·4 3·8	11·4 8·1	17·4 12·3
55	10 43·8	10 45·5	10 14·4	5·5 3·9	11·5 8·1	17·5 12·4
56	10 44·0	10 45·8	10 14·7	5·6 4·0	11·6 8·2	17·6 12·5
57	10 44·3	10 46·0	10 14·9	5·7 4·0	11·7 8·3	17·7 12·5
58	10 44·5	10 46·3	10 15·1	5·8 4·1	11·8 8·4	17·8 12·6
59	10 44·8	10 46·5	10 15·4	5·9 4·2	11·9 8·4	17·9 12·7
60	10 45·0	10 46·8	10 15·6	6·0 4·3	12·0 8·5	18·0 12·8

43m	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	10 45·0	10 46·8	10 15·6	0·0 0·0	6·0 4·4	12·0 8·7
01	10 45·3	10 47·0	10 15·9	0·1 0·1	6·1 4·4	12·1 8·8
02	10 45·5	10 47·3	10 16·1	0·2 0·1	6·2 4·5	12·2 8·8
03	10 45·8	10 47·5	10 16·3	0·3 0·2	6·3 4·6	12·3 8·9
04	10 46·0	10 47·8	10 16·6	0·4 0·3	6·4 4·6	12·4 9·0
05	10 46·3	10 48·0	10 16·8	0·5 0·4	6·5 4·7	12·5 9·1
06	10 46·5	10 48·3	10 17·0	0·6 0·4	6·6 4·8	12·6 9·1
07	10 46·8	10 48·5	10 17·3	0·7 0·5	6·7 4·9	12·7 9·2
08	10 47·0	10 48·8	10 17·5	0·8 0·6	6·8 4·9	12·8 9·3
09	10 47·3	10 49·0	10 17·8	0·9 0·7	6·9 5·0	12·9 9·4
10	10 47·5	10 49·3	10 18·0	1·0 0·7	7·0 5·1	13·0 9·4
11	10 47·8	10 49·5	10 18·2	1·1 0·8	7·1 5·1	13·1 9·5
12	10 48·0	10 49·8	10 18·5	1·2 0·9	7·2 5·2	13·2 9·6
13	10 48·3	10 50·0	10 18·7	1·3 0·9	7·3 5·3	13·3 9·6
14	10 48·5	10 50·3	10 19·0	1·4 1·0	7·4 5·4	13·4 9·7
15	10 48·8	10 50·5	10 19·2	1·5 1·1	7·5 5·4	13·5 9·8
16	10 49·0	10 50·8	10 19·4	1·6 1·2	7·6 5·5	13·6 9·9
17	10 49·3	10 51·0	10 19·7	1·7 1·2	7·7 5·6	13·7 9·9
18	10 49·5	10 51·3	10 19·9	1·8 1·3	7·8 5·7	13·8 10·0
19	10 49·8	10 51·5	10 20·2	1·9 1·4	7·9 5·7	13·9 10·1
20	10 50·0	10 51·8	10 20·4	2·0 1·5	8·0 5·8	14·0 10·2
21	10 50·3	10 52·0	10 20·6	2·1 1·5	8·1 5·9	14·1 10·2
22	10 50·5	10 52·3	10 20·9	2·2 1·6	8·2 5·9	14·2 10·3
23	10 50·8	10 52·5	10 21·1	2·3 1·7	8·3 6·0	14·3 10·4
24	10 51·0	10 52·8	10 21·3	2·4 1·7	8·4 6·1	14·4 10·4
25	10 51·3	10 53·0	10 21·6	2·5 1·8	8·5 6·2	14·5 10·5
26	10 51·5	10 53·3	10 21·8	2·6 1·9	8·6 6·2	14·6 10·6
27	10 51·8	10 53·5	10 22·1	2·7 2·0	8·7 6·3	14·7 10·7
28	10 52·0	10 53·8	10 22·3	2·8 2·0	8·8 6·4	14·8 10·7
29	10 52·3	10 54·0	10 22·5	2·9 2·1	8·9 6·5	14·9 10·8
30	10 52·5	10 54·3	10 22·8	3·0 2·2	9·0 6·5	15·0 10·9
31	10 52·8	10 54·5	10 23·0	3·1 2·2	9·1 6·6	15·1 10·9
32	10 53·0	10 54·8	10 23·3	3·2 2·3	9·2 6·7	15·2 11·0
33	10 53·3	10 55·0	10 23·5	3·3 2·4	9·3 6·7	15·3 11·1
34	10 53·5	10 55·3	10 23·7	3·4 2·5	9·4 6·8	15·4 11·2
35	10 53·8	10 55·5	10 24·0	3·5 2·5	9·5 6·9	15·5 11·2
36	10 54·0	10 55·8	10 24·2	3·6 2·6	9·6 7·0	15·6 11·3
37	10 54·3	10 56·0	10 24·4	3·7 2·7	9·7 7·0	15·7 11·4
38	10 54·5	10 56·3	10 24·7	3·8 2·8	9·8 7·1	15·8 11·5
39	10 54·8	10 56·5	10 24·9	3·9 2·8	9·9 7·2	15·9 11·5
40	10 55·0	10 56·8	10 25·2	4·0 2·9	10·0 7·3	16·0 11·6
41	10 55·3	10 57·0	10 25·4	4·1 3·0	10·1 7·3	16·1 11·7
42	10 55·5	10 57·3	10 25·6	4·2 3·0	10·2 7·4	16·2 11·7
43	10 55·8	10 57·5	10 25·9	4·3 3·1	10·3 7·5	16·3 11·8
44	10 56·0	10 57·8	10 26·1	4·4 3·2	10·4 7·5	16·4 11·9
45	10 56·3	10 58·0	10 26·4	4·5 3·3	10·5 7·6	16·5 12·0
46	10 56·5	10 58·3	10 26·6	4·6 3·3	10·6 7·7	16·6 12·0
47	10 56·8	10 58·5	10 26·8	4·7 3·4	10·7 7·8	16·7 12·1
48	10 57·0	10 58·8	10 27·1	4·8 3·5	10·8 7·8	16·8 12·2
49	10 57·3	10 59·0	10 27·3	4·9 3·6	10·9 7·9	16·9 12·3
50	10 57·5	10 59·3	10 27·5	5·0 3·6	11·0 8·0	17·0 12·3
51	10 57·8	10 59·6	10 27·8	5·1 3·7	11·1 8·0	17·1 12·4
52	10 58·0	10 59·8	10 28·0	5·2 3·8	11·2 8·1	17·2 12·5
53	10 58·3	11 00·1	10 28·3	5·3 3·8	11·3 8·2	17·3 12·5
54	10 58·5	11 00·3	10 28·5	5·4 3·9	11·4 8·3	17·4 12·6
55	10 58·8	11 00·6	10 28·7	5·5 4·0	11·5 8·3	17·5 12·7
56	10 59·0	11 00·8	10 29·0	5·6 4·1	11·6 8·4	17·6 12·8
57	10 59·3	11 01·1	10 29·2	5·7 4·1	11·7 8·5	17·7 12·8
58	10 59·5	11 01·3	10 29·5	5·8 4·2	11·8 8·6	17·8 12·9
59	10 59·8	11 01·6	10 29·7	5·9 4·3	11·9 8·6	17·9 13·0
60	11 00·0	11 01·8	10 29·9	6·0 4·4	12·0 8·7	18·0 13·1

44m s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	11 00·0	11 01·8	10 29·9	0·0	0·0	6·0	4·5	12·0	8·9
01	11 00·3	11 02·1	10 30·2	0·1	0·1	6·1	4·5	12·1	9·0
02	11 00·5	11 02·3	10 30·4	0·2	0·1	6·2	4·6	12·2	9·0
03	11 00·8	11 02·6	10 30·6	0·3	0·2	6·3	4·7	12·3	9·1
04	11 01·0	11 02·8	10 30·9	0·4	0·3	6·4	4·7	12·4	9·2
05	11 01·3	11 03·1	10 31·1	0·5	0·4	6·5	4·8	12·5	9·3
06	11 01·5	11 03·3	10 31·4	0·6	0·4	6·6	4·9	12·6	9·3
07	11 01·8	11 03·6	10 31·6	0·7	0·5	6·7	5·0	12·7	9·4
08	11 02·0	11 03·8	10 31·8	0·8	0·6	6·8	5·0	12·8	9·5
09	11 02·3	11 04·1	10 32·1	0·9	0·7	6·9	5·1	12·9	9·6
10	11 02·5	11 04·3	10 32·3	1·0	0·7	7·0	5·2	13·0	9·6
11	11 02·8	11 04·6	10 32·6	1·1	0·8	7·1	5·3	13·1	9·7
12	11 03·0	11 04·8	10 32·8	1·2	0·9	7·2	5·3	13·2	9·8
13	11 03·3	11 05·1	10 33·0	1·3	1·0	7·3	5·4	13·3	9·9
14	11 03·5	11 05·3	10 33·3	1·4	1·0	7·4	5·5	13·4	9·9
15	11 03·8	11 05·6	10 33·5	1·5	1·1	7·5	5·6	13·5	10·0
16	11 04·0	11 05·8	10 33·8	1·6	1·2	7·6	5·6	13·6	10·1
17	11 04·3	11 06·1	10 34·0	1·7	1·3	7·7	5·7	13·7	10·2
18	11 04·5	11 06·3	10 34·2	1·8	1·3	7·8	5·8	13·8	10·2
19	11 04·8	11 06·6	10 34·5	1·9	1·4	7·9	5·9	13·9	10·3
20	11 05·0	11 06·8	10 34·7	2·0	1·5	8·0	5·9	14·0	10·4
21	11 05·3	11 07·1	10 34·9	2·1	1·6	8·1	6·0	14·1	10·5
22	11 05·5	11 07·3	10 35·2	2·2	1·6	8·2	6·1	14·2	10·5
23	11 05·8	11 07·6	10 35·4	2·3	1·7	8·3	6·2	14·3	10·6
24	11 06·0	11 07·8	10 35·7	2·4	1·8	8·4	6·2	14·4	10·7
25	11 06·3	11 08·1	10 35·9	2·5	1·9	8·5	6·3	14·5	10·8
26	11 06·5	11 08·3	10 36·1	2·6	1·9	8·6	6·4	14·6	10·8
27	11 06·8	11 08·6	10 36·4	2·7	2·0	8·7	6·5	14·7	10·9
28	11 07·0	11 08·8	10 36·6	2·8	2·1	8·8	6·5	14·8	11·0
29	11 07·3	11 09·1	10 36·9	2·9	2·2	8·9	6·6	14·9	11·1
30	11 07·5	11 09·3	10 37·1	3·0	2·2	9·0	6·7	15·0	11·1
31	11 07·8	11 09·6	10 37·3	3·1	2·3	9·1	6·7	15·1	11·2
32	11 08·0	11 09·8	10 37·6	3·2	2·4	9·2	6·8	15·2	11·3
33	11 08·3	11 10·1	10 37·8	3·3	2·4	9·3	6·9	15·3	11·3
34	11 08·5	11 10·3	10 38·0	3·4	2·5	9·4	7·0	15·4	11·4
35	11 08·8	11 10·6	10 38·3	3·5	2·6	9·5	7·0	15·5	11·5
36	11 09·0	11 10·8	10 38·5	3·6	2·7	9·6	7·1	15·6	11·6
37	11 09·3	11 11·1	10 38·8	3·7	2·7	9·7	7·2	15·7	11·6
38	11 09·5	11 11·3	10 39·0	3·8	2·8	9·8	7·3	15·8	11·7
39	11 09·8	11 11·6	10 39·2	3·9	2·9	9·9	7·3	15·9	11·8
40	11 10·0	11 11·8	10 39·5	4·0	3·0	10·0	7·4	16·0	11·9
41	11 10·3	11 12·1	10 39·7	4·1	3·0	10·1	7·5	16·1	11·9
42	11 10·5	11 12·3	10 40·0	4·2	3·1	10·2	7·6	16·2	12·0
43	11 10·8	11 12·6	10 40·2	4·3	3·2	10·3	7·6	16·3	12·1
44	11 11·0	11 12·8	10 40·4	4·4	3·3	10·4	7·7	16·4	12·2
45	11 11·3	11 13·1	10 40·7	4·5	3·3	10·5	7·8	16·5	12·2
46	11 11·5	11 13·3	10 40·9	4·6	3·4	10·6	7·9	16·6	12·3
47	11 11·8	11 13·6	10 41·1	4·7	3·5	10·7	7·9	16·7	12·4
48	11 12·0	11 13·8	10 41·4	4·8	3·6	10·8	8·0	16·8	12·5
49	11 12·3	11 14·1	10 41·6	4·9	3·6	10·9	8·1	16·9	12·5
50	11 12·5	11 14·3	10 41·9	5·0	3·7	11·0	8·2	17·0	12·6
51	11 12·8	11 14·6	10 42·1	5·1	3·8	11·1	8·2	17·1	12·7
52	11 13·0	11 14·8	10 42·3	5·2	3·9	11·2	8·3	17·2	12·8
53	11 13·3	11 15·1	10 42·6	5·3	3·9	11·3	8·4	17·3	12·8
54	11 13·5	11 15·3	10 42·8	5·4	4·0	11·4	8·5	17·4	12·9
55	11 13·8	11 15·6	10 43·1	5·5	4·1	11·5	8·5	17·5	13·0
56	11 14·0	11 15·8	10 43·3	5·6	4·2	11·6	8·6	17·6	13·1
57	11 14·3	11 16·1	10 43·5	5·7	4·2	11·7	8·7	17·7	13·1
58	11 14·5	11 16·3	10 43·8	5·8	4·3	11·8	8·8	17·8	13·2
59	11 14·8	11 16·6	10 44·0	5·9	4·4	11·9	8·8	17·9	13·3
60	11 15·0	11 16·8	10 44·3	6·0	4·5	12·0	8·9	18·0	13·4

45m s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	11 15·0	11 16·8	10 44·3	0·0	0·0	6·0	4·6	12·0	9·1
01	11 15·3	11 17·1	10 44·5	0·1	0·1	6·1	4·6	12·1	9·2
02	11 15·5	11 17·3	10 44·7	0·2	0·2	6·2	4·7	12·2	9·3
03	11 15·8	11 17·6	10 45·0	0·3	0·2	6·3	4·8	12·3	9·3
04	11 16·0	11 17·9	10 45·2	0·4	0·3	6·4	4·9	12·4	9·4
05	11 16·3	11 18·1	10 45·4	0·5	0·4	6·5	4·9	12·5	9·5
06	11 16·5	11 18·4	10 45·7	0·6	0·5	6·6	5·0	12·6	9·6
07	11 16·8	11 18·6	10 45·9	0·7	0·5	6·7	5·1	12·7	9·6
08	11 17·0	11 18·9	10 46·2	0·8	0·6	6·8	5·2	12·8	9·7
09	11 17·3	11 19·1	10 46·4	0·9	0·7	6·9	5·2	12·9	9·8
10	11 17·5	11 19·4	10 46·6	1·0	0·8	7·0	5·3	13·0	9·9
11	11 17·8	11 19·6	10 46·9	1·1	0·8	7·1	5·4	13·1	9·9
12	11 18·0	11 19·9	10 47·1	1·2	0·9	7·2	5·5	13·2	10·0
13	11 18·3	11 20·1	10 47·4	1·3	1·0	7·3	5·5	13·3	10·1
14	11 18·5	11 20·4	10 47·6	1·4	1·1	7·4	5·6	13·4	10·2
15	11 18·8	11 20·6	10 47·8	1·5	1·1	7·5	5·7	13·5	10·2
16	11 19·0	11 20·9	10 48·1	1·6	1·2	7·6	5·8	13·6	10·3
17	11 19·3	11 21·1	10 48·3	1·7	1·3	7·7	5·8	13·7	10·4
18	11 19·5	11 21·4	10 48·5	1·8	1·4	7·8	5·9	13·8	10·5
19	11 19·8	11 21·6	10 48·8	1·9	1·4	7·9	6·0	13·9	10·5
20	11 20·0	11 21·9	10 49·0	2·0	1·5	8·0	6·1	14·0	10·6
21	11 20·3	11 22·1	10 49·3	2·1	1·6	8·1	6·1	14·1	10·7
22	11 20·5	11 22·4	10 49·5	2·2	1·7	8·2	6·2	14·2	10·8
23	11 20·8	11 22·6	10 49·7	2·3	1·7	8·3	6·3	14·3	10·8
24	11 21·0	11 22·9	10 50·0	2·4	1·8	8·4	6·4	14·4	10·9
25	11 21·3	11 23·1	10 50·2	2·5	1·9	8·5	6·4	14·5	11·0
26	11 21·5	11 23·4	10 50·5	2·6	2·0	8·6	6·5	14·6	11·1
27	11 21·8	11 23·6	10 50·7	2·7	2·0	8·7	6·6	14·7	11·1
28	11 22·0	11 23·9	10 50·9	2·8	2·1	8·8	6·7	14·8	11·2
29	11 22·3	11 24·1	10 51·2	2·9	2·2	8·9	6·7	14·9	11·3
30	11 22·5	11 24·4	10 51·4	3·0	2·3	9·0	6·8	15·0	11·4
31	11 22·8	11 24·6	10 51·6	3·1	2·4	9·1	6·9	15·1	11·5
32	11 23·0	11 24·9	10 51·9	3·2	2·4	9·2	7·0	15·2	11·5
33	11 23·3	11 25·1	10 52·1	3·3	2·5	9·3	7·1	15·3	11·6
34	11 23·5	11 25·4	10 52·4	3·4	2·6	9·4	7·1	15·4	11·7
35	11 23·8	11 25·6	10 52·6	3·5	2·7	9·5	7·2	15·5	11·8
36	11 24·0	11 25·9	10 52·8	3·6	2·7	9·6	7·3	15·6	11·8
37	11 24·3	11 26·1	10 53·1	3·7	2·8	9·7	7·4	15·7	11·9
38	11 24·5	11 26·4	10 53·3	3·8	2·9	9·8	7·4	15·8	12·0
39	11 24·8	11 26·6	10 53·6	3·9	3·0	9·9	7·5	15·9	12·1
40	11 25·0	11 26·9	10 53·8	4·0	3·0	10·0	7·6	16·0	12·1
41	11 25·3	11 27·1	10 54·0	4·1	3·1	10·1	7·7	16·1	12·2
42	11 25·5	11 27·4	10 54·3	4·2	3·2	10·2	7·7	16·2	12·3
43	11 25·8	11 27·6	10 54·5	4·3	3·3	10·3	7·8	16·3	12·4
44	11 26·0	11 27·9	10 54·7	4·4	3·3	10·4	7·9	16·4	12·4
45	11 26·3	11 28·1	10 55·0	4·5	3·4	10·5	8·0	16·5	12·5
46	11 26·5	11 28·4	10 55·2	4·6	3·5	10·6	8·0	16·6	12·6
47	11 26·8	11 28·6	10 55·5	4·7	3·6	10·7	8·1	16·7	12·7
48	11 27·0	11 28·9	10 55·7	4·8	3·6	10·8	8·2	16·8	12·7
49	11 27·3	11 29·1	10 55·9	4·9	3·7	10·9	8·3	16·9	12·8
50	11 27·5	11 29·4	10 56·2	5·0	3·8	11·0	8·3	17·0	12·9
51	11 27·8	11 29·6	10 56·4	5·1	3·9	11·1	8·4	17·1	13·0
52	11 28·0	11 29·9	10 56·7	5·2	3·9	11·2	8·5	17·2	13·0
53	11 28·3	11 30·1	10 56·9	5·3	4·0	11·3	8·6	17·3	13·1
54	11 28·5	11 30·4	10 57·1	5·4	4·1	11·4	8·6	17·4	13·2
55	11 28·8	11 30·6	10 57·4	5·5	4·2	11·5	8·7	17·5	13·3
56	11 29·0	11 30·9	10 57·6	5·6	4·2	11·6	8·8	17·6	13·3
57	11 29·3	11 31·1	10 57·9	5·7	4·3	11·7	8·9	17·7	13·4
58	11 29·5	11 31·4	10 58·1	5·8	4·4	11·8	8·9	17·8	13·5
59	11 29·8	11 31·6	10 58·3	5·9	4·5	11·9	9·0	17·9	13·6
60	11 30·0	11 31·9	10 58·6	6·0	4·6	12·0	9·1	18·0	13·7

46m s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	11 30·0	11 31·9	10 58·6	0·0	0·0	6·0	4·7	12·0	9·3
01	11 30·3	11 32·1	10 58·8	0·1	0·1	6·1	4·7	12·1	9·4
02	11 30·5	11 32·4	10 59·0	0·2	0·2	6·2	4·8	12·2	9·5
03	11 30·8	11 32·6	10 59·3	0·3	0·2	6·3	4·9	12·3	9·5
04	11 31·0	11 32·9	10 59·5	0·4	0·3	6·4	5·0	12·4	9·6
05	11 31·3	11 33·1	10 59·8	0·5	0·4	6·5	5·0	12·5	9·7
06	11 31·5	11 33·4	11 00·0	0·6	0·5	6·6	5·1	12·6	9·8
07	11 31·8	11 33·6	11 00·2	0·7	0·5	6·7	5·2	12·7	9·8
08	11 32·0	11 33·9	11 00·5	0·8	0·6	6·8	5·3	12·8	9·9
09	11 32·3	11 34·1	11 00·7	0·9	0·7	6·9	5·3	12·9	10·0
10	11 32·5	11 34·4	11 01·0	1·0	0·8	7·0	5·4	13·0	10·1
11	11 32·8	11 34·6	11 01·2	1·1	0·9	7·1	5·5	13·1	10·2
12	11 33·0	11 34·9	11 01·4	1·2	0·9	7·2	5·6	13·2	10·2
13	11 33·3	11 35·1	11 01·7	1·3	1·0	7·3	5·7	13·3	10·3
14	11 33·5	11 35·4	11 01·9	1·4	1·1	7·4	5·7	13·4	10·4
15	11 33·8	11 35·6	11 02·1	1·5	1·2	7·5	5·8	13·5	10·5
16	11 34·0	11 35·9	11 02·4	1·6	1·2	7·6	5·9	13·6	10·5
17	11 34·3	11 36·2	11 02·6	1·7	1·3	7·7	6·0	13·7	10·6
18	11 34·5	11 36·4	11 02·9	1·8	1·4	7·8	6·0	13·8	10·7
19	11 34·8	11 36·7	11 03·1	1·9	1·5	7·9	6·1	13·9	10·8
20	11 35·0	11 36·9	11 03·3	2·0	1·6	8·0	6·2	14·0	10·9
21	11 35·3	11 37·2	11 03·6	2·1	1·6	8·1	6·3	14·1	10·9
22	11 35·5	11 37·4	11 03·8	2·2	1·7	8·2	6·4	14·2	11·0
23	11 35·8	11 37·7	11 04·1	2·3	1·8	8·3	6·4	14·3	11·1
24	11 36·0	11 37·9	11 04·3	2·4	1·9	8·4	6·5	14·4	11·2
25	11 36·3	11 38·2	11 04·5	2·5	1·9	8·5	6·6	14·5	11·2
26	11 36·5	11 38·4	11 04·8	2·6	2·0	8·6	6·7	14·6	11·3
27	11 36·8	11 38·7	11 05·0	2·7	2·1	8·7	6·7	14·7	11·4
28	11 37·0	11 38·9	11 05·2	2·8	2·2	8·8	6·8	14·8	11·5
29	11 37·3	11 39·2	11 05·5	2·9	2·2	8·9	6·9	14·9	11·5
30	11 37·5	11 39·4	11 05·7	3·0	2·3	9·0	7·0	15·0	11·6
31	11 37·8	11 39·7	11 06·0	3·1	2·4	9·1	7·1	15·1	11·7
32	11 38·0	11 39·9	11 06·2	3·2	2·5	9·2	7·1	15·2	11·8
33	11 38·3	11 40·2	11 06·4	3·3	2·6	9·3	7·2	15·3	11·9
34	11 38·5	11 40·4	11 06·7	3·4	2·6	9·4	7·3	15·4	11·9
35	11 38·8	11 40·7	11 06·9	3·5	2·7	9·5	7·4	15·5	12·0
36	11 39·0	11 40·9	11 07·2	3·6	2·8	9·6	7·4	15·6	12·1
37	11 39·3	11 41·2	11 07·4	3·7	2·9	9·7	7·5	15·7	12·2
38	11 39·5	11 41·4	11 07·6	3·8	2·9	9·8	7·6	15·8	12·2
39	11 39·8	11 41·7	11 07·9	3·9	3·0	9·9	7·7	15·9	12·3
40	11 40·0	11 41·9	11 08·1	4·0	3·1	10·0	7·8	16·0	12·4
41	11 40·3	11 42·2	11 08·3	4·1	3·2	10·1	7·8	16·1	12·5
42	11 40·5	11 42·4	11 08·6	4·2	3·3	10·2	7·9	16·2	12·6
43	11 40·8	11 42·7	11 08·8	4·3	3·3	10·3	8·0	16·3	12·6
44	11 41·0	11 42·9	11 09·1	4·4	3·4	10·4	8·1	16·4	12·7
45	11 41·3	11 43·2	11 09·3	4·5	3·5	10·5	8·1	16·5	12·8
46	11 41·5	11 43·4	11 09·5	4·6	3·6	10·6	8·2	16·6	12·9
47	11 41·8	11 43·7	11 09·8	4·7	3·6	10·7	8·3	16·7	12·9
48	11 42·0	11 43·9	11 10·0	4·8	3·7	10·8	8·4	16·8	13·0
49	11 42·3	11 44·2	11 10·3	4·9	3·8	10·9	8·4	16·9	13·1
50	11 42·5	11 44·4	11 10·5	5·0	3·9	11·0	8·5	17·0	13·2
51	11 42·8	11 44·7	11 10·7	5·1	4·0	11·1	8·6	17·1	13·3
52	11 43·0	11 44·9	11 11·0	5·2	4·0	11·2	8·7	17·2	13·3
53	11 43·3	11 45·2	11 11·2	5·3	4·1	11·3	8·8	17·3	13·4
54	11 43·5	11 45·4	11 11·5	5·4	4·2	11·4	8·8	17·4	13·5
55	11 43·8	11 45·7	11 11·7	5·5	4·3	11·5	8·9	17·5	13·6
56	11 44·0	11 45·9	11 11·9	5·6	4·3	11·6	9·0	17·6	13·6
57	11 44·3	11 46·2	11 12·2	5·7	4·4	11·7	9·1	17·7	13·7
58	11 44·5	11 46·4	11 12·4	5·8	4·5	11·8	9·1	17·8	13·8
59	11 44·8	11 46·7	11 12·6	5·9	4·6	11·9	9·2	17·9	13·9
60	11 45·0	11 46·9	11 12·9	6·0	4·7	12·0	9·3	18·0	14·0

47m s	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
	° ′	° ′	° ′	′	′	′	′	′	′
00	11 45·0	11 46·9	11 12·9	0·0	0·0	6·0	4·8	12·0	9·5
01	11 45·3	11 47·2	11 13·1	0·1	0·1	6·1	4·8	12·1	9·6
02	11 45·5	11 47·4	11 13·4	0·2	0·2	6·2	4·9	12·2	9·7
03	11 45·8	11 47·7	11 13·6	0·3	0·2	6·3	5·0	12·3	9·7
04	11 46·0	11 47·9	11 13·8	0·4	0·3	6·4	5·1	12·4	9·8
05	11 46·3	11 48·2	11 14·1	0·5	0·4	6·5	5·1	12·5	9·9
06	11 46·5	11 48·4	11 14·3	0·6	0·5	6·6	5·2	12·6	10·0
07	11 46·8	11 48·7	11 14·6	0·7	0·6	6·7	5·3	12·7	10·1
08	11 47·0	11 48·9	11 14·8	0·8	0·6	6·8	5·4	12·8	10·1
09	11 47·3	11 49·2	11 15·0	0·9	0·7	6·9	5·5	12·9	10·2
10	11 47·5	11 49·4	11 15·3	1·0	0·8	7·0	5·5	13·0	10·3
11	11 47·8	11 49·7	11 15·5	1·1	0·9	7·1	5·6	13·1	10·4
12	11 48·0	11 49·9	11 15·7	1·2	1·0	7·2	5·7	13·2	10·5
13	11 48·3	11 50·2	11 16·0	1·3	1·0	7·3	5·8	13·3	10·5
14	11 48·5	11 50·4	11 16·2	1·4	1·1	7·4	5·9	13·4	10·6
15	11 48·8	11 50·7	11 16·5	1·5	1·2	7·5	5·9	13·5	10·7
16	11 49·0	11 50·9	11 16·7	1·6	1·3	7·6	6·0	13·6	10·8
17	11 49·3	11 51·2	11 16·9	1·7	1·3	7·7	6·1	13·7	10·8
18	11 49·5	11 51·4	11 17·2	1·8	1·4	7·8	6·2	13·8	10·9
19	11 49·8	11 51·7	11 17·4	1·9	1·5	7·9	6·3	13·9	11·0
20	11 50·0	11 51·9	11 17·7	2·0	1·6	8·0	6·3	14·0	11·1
21	11 50·3	11 52·2	11 17·9	2·1	1·7	8·1	6·4	14·1	11·2
22	11 50·5	11 52·4	11 18·1	2·2	1·7	8·2	6·5	14·2	11·2
23	11 50·8	11 52·7	11 18·4	2·3	1·8	8·3	6·6	14·3	11·3
24	11 51·0	11 52·9	11 18·6	2·4	1·9	8·4	6·7	14·4	11·4
25	11 51·3	11 53·2	11 18·8	2·5	2·0	8·5	6·7	14·5	11·5
26	11 51·5	11 53·4	11 19·1	2·6	2·1	8·6	6·8	14·6	11·6
27	11 51·8	11 53·7	11 19·3	2·7	2·1	8·7	6·9	14·7	11·6
28	11 52·0	11 53·9	11 19·6	2·8	2·2	8·8	7·0	14·8	11·7
29	11 52·3	11 54·2	11 19·8	2·9	2·3	8·9	7·0	14·9	11·8
30	11 52·5	11 54·5	11 20·0	3·0	2·4	9·0	7·1	15·0	11·9
31	11 52·8	11 54·7	11 20·3	3·1	2·5	9·1	7·2	15·1	12·0
32	11 53·0	11 55·0	11 20·5	3·2	2·5	9·2	7·3	15·2	12·0
33	11 53·3	11 55·2	11 20·8	3·3	2·6	9·3	7·4	15·3	12·1
34	11 53·5	11 55·5	11 21·0	3·4	2·7	9·4	7·4	15·4	12·2
35	11 53·8	11 55·7	11 21·2	3·5	2·8	9·5	7·5	15·5	12·3
36	11 54·0	11 56·0	11 21·5	3·6	2·9	9·6	7·6	15·6	12·4
37	11 54·3	11 56·2	11 21·7	3·7	2·9	9·7	7·7	15·7	12·4
38	11 54·5	11 56·5	11 22·0	3·8	3·0	9·8	7·8	15·8	12·5
39	11 54·8	11 56·7	11 22·2	3·9	3·1	9·9	7·8	15·9	12·6
40	11 55·0	11 57·0	11 22·4	4·0	3·2	10·0	7·9	16·0	12·7
41	11 55·3	11 57·2	11 22·7	4·1	3·2	10·1	8·0	16·1	12·7
42	11 55·5	11 57·5	11 22·9	4·2	3·3	10·2	8·1	16·2	12·8
43	11 55·8	11 57·7	11 23·1	4·3	3·4	10·3	8·2	16·3	12·9
44	11 56·0	11 58·0	11 23·4	4·4	3·5	10·4	8·2	16·4	13·0
45	11 56·3	11 58·2	11 23·6	4·5	3·6	10·5	8·3	16·5	13·1
46	11 56·5	11 58·5	11 23·9	4·6	3·6	10·6	8·4	16·6	13·1
47	11 56·8	11 58·7	11 24·1	4·7	3·7	10·7	8·5	16·7	13·2
48	11 57·0	11 59·0	11 24·3	4·8	3·8	10·8	8·6	16·8	13·3
49	11 57·3	11 59·2	11 24·6	4·9	3·9	10·9	8·6	16·9	13·4

48	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	12 00·0	12 02·0	11 27·2	0·0 0·0	4·0 4·9	12·0 9·7
01	12 00·3	12 02·2	11 27·4	0·1 0·1	4·1 4·9	12·1 9·8
02	12 00·5	12 02·5	11 27·7	0·2 0·2	4·2 5·0	12·2 9·9
03	12 00·8	12 02·7	11 27·9	0·3 0·2	4·3 5·1	12·3 9·9
04	12 01·0	12 03·0	11 28·2	0·4 0·3	4·4 5·2	12·4 10·0
05	12 01·3	12 03·2	11 28·4	0·5 0·4	4·5 5·3	12·5 10·1
06	12 01·5	12 03·5	11 28·6	0·6 0·5	4·6 5·3	12·6 10·2
07	12 01·8	12 03·7	11 28·9	0·7 0·6	4·7 5·4	12·7 10·3
08	12 02·0	12 04·0	11 29·1	0·8 0·6	4·8 5·5	12·8 10·3
09	12 02·3	12 04·2	11 29·3	0·9 0·7	4·9 5·6	12·9 10·4
10	12 02·5	12 04·5	11 29·6	1·0 0·8	5·0 5·7	13·0 10·5
11	12 02·8	12 04·7	11 29·8	1·1 0·9	5·1 5·7	13·1 10·6
12	12 03·0	12 05·0	11 30·1	1·2 1·0	5·2 5·8	13·2 10·7
13	12 03·3	12 05·2	11 30·3	1·3 1·1	5·3 5·9	13·3 10·8
14	12 03·5	12 05·5	11 30·5	1·4 1·1	5·4 6·0	13·4 10·8
15	12 03·8	12 05·7	11 30·8	1·5 1·2	5·5 6·1	13·5 10·9
16	12 04·0	12 06·0	11 31·0	1·6 1·3	5·6 6·1	13·6 11·0
17	12 04·3	12 06·2	11 31·3	1·7 1·4	5·7 6·2	13·7 11·1
18	12 04·5	12 06·5	11 31·5	1·8 1·5	5·8 6·3	13·8 11·2
19	12 04·8	12 06·7	11 31·7	1·9 1·5	5·9 6·4	13·9 11·2
20	12 05·0	12 07·0	11 32·0	2·0 1·6	6·0 6·5	14·0 11·3
21	12 05·3	12 07·2	11 32·2	2·1 1·7	6·1 6·5	14·1 11·4
22	12 05·5	12 07·5	11 32·4	2·2 1·8	6·2 6·6	14·2 11·5
23	12 05·8	12 07·7	11 32·7	2·3 1·9	6·3 6·7	14·3 11·6
24	12 06·0	12 08·0	11 32·9	2·4 1·9	6·4 6·8	14·4 11·6
25	12 06·3	12 08·2	11 33·2	2·5 2·0	6·5 6·9	14·5 11·7
26	12 06·5	12 08·5	11 33·4	2·6 2·1	6·6 7·0	14·6 11·8
27	12 06·8	12 08·7	11 33·6	2·7 2·2	6·7 7·0	14·7 11·9
28	12 07·0	12 09·0	11 33·9	2·8 2·3	6·8 7·1	14·8 12·0
29	12 07·3	12 09·2	11 34·1	2·9 2·3	6·9 7·2	14·9 12·0
30	12 07·5	12 09·5	11 34·4	3·0 2·4	7·0 7·3	15·0 12·1
31	12 07·8	12 09·7	11 34·6	3·1 2·5	7·1 7·4	15·1 12·2
32	12 08·0	12 10·0	11 34·8	3·2 2·6	7·2 7·4	15·2 12·3
33	12 08·3	12 10·2	11 35·1	3·3 2·7	7·3 7·5	15·3 12·4
34	12 08·5	12 10·5	11 35·3	3·4 2·7	7·4 7·6	15·4 12·4
35	12 08·8	12 10·7	11 35·6	3·5 2·8	7·5 7·7	15·5 12·5
36	12 09·0	12 11·0	11 35·8	3·6 2·9	7·6 7·8	15·6 12·6
37	12 09·3	12 11·2	11 36·0	3·7 3·0	7·7 7·8	15·7 12·7
38	12 09·5	12 11·5	11 36·3	3·8 3·1	7·8 7·9	15·8 12·8
39	12 09·8	12 11·7	11 36·5	3·9 3·2	7·9 8·0	15·9 12·9
40	12 10·0	12 12·0	11 36·7	4·0 3·2	8·0 8·1	16·0 12·9
41	12 10·3	12 12·2	11 37·0	4·1 3·3	8·1 8·2	16·1 13·0
42	12 10·5	12 12·5	11 37·2	4·2 3·4	8·2 8·2	16·2 13·1
43	12 10·8	12 12·8	11 37·5	4·3 3·5	8·3 8·3	16·3 13·2
44	12 11·0	12 13·0	11 37·7	4·4 3·6	8·4 8·4	16·4 13·3
45	12 11·3	12 13·3	11 37·9	4·5 3·6	8·5 8·5	16·5 13·3
46	12 11·5	12 13·5	11 38·2	4·6 3·7	8·6 8·6	16·6 13·4
47	12 11·8	12 13·8	11 38·4	4·7 3·8	8·7 8·6	16·7 13·5
48	12 12·0	12 14·0	11 38·7	4·8 3·9	8·8 8·7	16·8 13·6
49	12 12·3	12 14·3	11 38·9	4·9 4·0	8·9 8·8	16·9 13·7
50	12 12·5	12 14·5	11 39·1	5·0 4·0	9·0 8·9	17·0 13·7
51	12 12·8	12 14·8	11 39·4	5·1 4·1	9·1 9·0	17·1 13·8
52	12 13·0	12 15·0	11 39·6	5·2 4·2	9·2 9·1	17·2 13·9
53	12 13·3	12 15·3	11 39·8	5·3 4·3	9·3 9·1	17·3 14·0
54	12 13·5	12 15·5	11 40·1	5·4 4·4	9·4 9·2	17·4 14·1
55	12 13·8	12 15·8	11 40·3	5·5 4·4	9·5 9·3	17·5 14·1
56	12 14·0	12 16·0	11 40·6	5·6 4·5	9·6 9·4	17·6 14·2
57	12 14·3	12 16·3	11 40·8	5·7 4·6	9·7 9·5	17·7 14·3
58	12 14·5	12 16·5	11 41·0	5·8 4·7	9·8 9·5	17·8 14·4
59	12 14·8	12 16·8	11 41·3	5·9 4·8	9·9 9·6	17·9 14·5
60	12 15·0	12 17·0	11 41·5	6·0 4·9	10·0 9·7	18·0 14·6

49	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	12 15·0	12 17·0	11 41·5	0·0 0·0	5·0 5·0	12·0 9·9
01	12 15·3	12 17·3	11 41·8	0·1 0·1	5·1 5·0	12·1 10·0
02	12 15·5	12 17·5	11 42·0	0·2 0·2	5·2 5·1	12·2 10·1
03	12 15·8	12 17·8	11 42·2	0·3 0·2	5·3 5·2	12·3 10·1
04	12 16·0	12 18·0	11 42·5	0·4 0·3	5·4 5·3	12·4 10·2
05	12 16·3	12 18·3	11 42·7	0·5 0·4	5·5 5·4	12·5 10·3
06	12 16·5	12 18·5	11 42·9	0·6 0·5	5·6 5·4	12·6 10·4
07	12 16·8	12 18·8	11 43·2	0·7 0·6	5·7 5·5	12·7 10·5
08	12 17·0	12 19·0	11 43·4	0·8 0·7	5·8 5·6	12·8 10·6
09	12 17·3	12 19·3	11 43·7	0·9 0·7	5·9 5·7	12·9 10·6
10	12 17·5	12 19·5	11 43·9	1·0 0·8	6·0 5·8	13·0 10·7
11	12 17·8	12 19·8	11 44·1	1·1 0·9	6·1 5·9	13·1 10·8
12	12 18·0	12 20·0	11 44·4	1·2 1·0	6·2 5·9	13·2 10·9
13	12 18·3	12 20·3	11 44·6	1·3 1·1	6·3 6·0	13·3 11·0
14	12 18·5	12 20·5	11 44·9	1·4 1·2	6·4 6·1	13·4 11·1
15	12 18·8	12 20·8	11 45·1	1·5 1·2	6·5 6·2	13·5 11·1
16	12 19·0	12 21·0	11 45·3	1·6 1·3	6·6 6·3	13·6 11·2
17	12 19·3	12 21·3	11 45·6	1·7 1·4	6·7 6·4	13·7 11·3
18	12 19·5	12 21·5	11 45·8	1·8 1·5	6·8 6·4	13·8 11·4
19	12 19·8	12 21·8	11 46·1	1·9 1·6	6·9 6·5	13·9 11·5
20	12 20·0	12 22·0	11 46·3	2·0 1·7	7·0 6·6	14·0 11·6
21	12 20·3	12 22·3	11 46·5	2·1 1·7	7·1 6·7	14·1 11·6
22	12 20·5	12 22·5	11 46·8	2·2 1·8	7·2 6·8	14·2 11·7
23	12 20·8	12 22·8	11 47·0	2·3 1·9	7·3 6·8	14·3 11·8
24	12 21·0	12 23·0	11 47·2	2·4 2·0	7·4 6·9	14·4 11·9
25	12 21·3	12 23·3	11 47·5	2·5 2·1	7·5 7·0	14·5 12·0
26	12 21·5	12 23·5	11 47·7	2·6 2·1	7·6 7·1	14·6 12·0
27	12 21·8	12 23·8	11 48·0	2·7 2·2	7·7 7·2	14·7 12·1
28	12 22·0	12 24·0	11 48·2	2·8 2·3	7·8 7·3	14·8 12·2
29	12 22·3	12 24·3	11 48·4	2·9 2·4	7·9 7·3	14·9 12·3
30	12 22·5	12 24·5	11 48·7	3·0 2·5	8·0 7·4	15·0 12·4
31	12 22·8	12 24·8	11 48·9	3·1 2·6	8·1 7·5	15·1 12·5
32	12 23·0	12 25·0	11 49·2	3·2 2·6	8·2 7·6	15·2 12·5
33	12 23·3	12 25·3	11 49·4	3·3 2·7	8·3 7·7	15·3 12·6
34	12 23·5	12 25·5	11 49·6	3·4 2·8	8·4 7·8	15·4 12·7
35	12 23·8	12 25·8	11 49·9	3·5 2·9	8·5 7·8	15·5 12·8
36	12 24·0	12 26·0	11 50·1	3·6 3·0	8·6 7·9	15·6 12·9
37	12 24·3	12 26·3	11 50·3	3·7 3·1	8·7 8·0	15·7 13·0
38	12 24·5	12 26·5	11 50·6	3·8 3·1	8·8 8·1	15·8 13·0
39	12 24·8	12 26·8	11 50·8	3·9 3·2	8·9 8·2	15·9 13·1
40	12 25·0	12 27·0	11 51·1	4·0 3·3	9·0 8·3	16·0 13·2
41	12 25·3	12 27·3	11 51·3	4·1 3·4	9·1 8·3	16·1 13·3
42	12 25·5	12 27·5	11 51·5	4·2 3·5	9·2 8·4	16·2 13·4
43	12 25·8	12 27·8	11 51·8	4·3 3·5	9·3 8·5	16·3 13·4
44	12 26·0	12 28·0	11 52·0	4·4 3·6	9·4 8·6	16·4 13·5
45	12 26·3	12 28·3	11 52·3	4·5 3·7	9·5 8·7	16·5 13·6
46	12 26·5	12 28·5	11 52·5	4·6 3·8	9·6 8·7	16·6 13·7
47	12 26·8	12 28·8	11 52·7	4·7 3·9	9·7 8·8	16·7 13·8
48	12 27·0	12 29·0	11 53·0	4·8 4·0	9·8 8·9	16·8 13·9
49	12 27·3	12 29·3	11 53·2	4·9 4·0	9·9 9·0	16·9 13·9
50	12 27·5	12 29·5	11 53·4	5·0 4·1	10·0 9·1	17·0 14·0
51	12 27·8	12 29·8	11 53·7	5·1 4·2	10·1 9·2	17·1 14·1
52	12 28·0	12 30·0	11 53·9	5·2 4·3	10·2 9·2	17·2 14·2
53	12 28·3	12 30·3	11 54·2	5·3 4·4	10·3 9·3	17·3 14·3
54	12 28·5	12 30·5	11 54·4	5·4 4·5	10·4 9·4	17·4 14·4
55	12 28·8	12 30·8	11 54·6	5·5 4·5	10·5 9·5	17·5 14·4
56	12 29·0	12 31·1	11 54·9	5·6 4·6	10·6 9·6	17·6 14·5
57	12 29·3	12 31·3	11 55·1	5·7 4·7	10·7 9·7	17·7 14·6
58	12 29·5	12 31·6	11 55·4	5·8 4·8	10·8 9·7	17·8 14·7
59	12 29·8	12 31·8	11 55·6	5·9 4·9	10·9 9·8	17·9 14·8
60	12 30·0	12 32·1	11 55·8	6·0 5·0	11·0 9·9	18·0 14·9

50	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	12 30·0	12 32·1	11 55·8	0·0 0·0	6·0 5·1	12·0 10·1
01	12 30·3	12 32·3	11 56·1	0·1 0·1	6·1 5·1	12·1 10·2
02	12 30·5	12 32·6	11 56·3	0·2 0·2	6·2 5·2	12·2 10·3
03	12 30·8	12 32·8	11 56·5	0·3 0·3	6·3 5·3	12·3 10·4
04	12 31·0	12 33·1	11 56·8	0·4 0·3	6·4 5·4	12·4 10·4
05	12 31·3	12 33·3	11 57·0	0·5 0·4	6·5 5·5	12·5 10·5
06	12 31·5	12 33·6	11 57·3	0·6 0·5	6·6 5·6	12·6 10·6
07	12 31·8	12 33·8	11 57·5	0·7 0·6	6·7 5·6	12·7 10·7
08	12 32·0	12 34·1	11 57·7	0·8 0·7	6·8 5·7	12·8 10·8
09	12 32·3	12 34·3	11 58·0	0·9 0·8	6·9 5·8	12·9 10·9
10	12 32·5	12 34·6	11 58·2	1·0 0·8	7·0 5·9	13·0 10·9
11	12 32·8	12 34·8	11 58·5	1·1 0·9	7·1 6·0	13·1 11·0
12	12 33·0	12 35·1	11 58·7	1·2 1·0	7·2 6·1	13·2 11·1
13	12 33·3	12 35·3	11 58·9	1·3 1·1	7·3 6·1	13·3 11·2
14	12 33·5	12 35·6	11 59·2	1·4 1·2	7·4 6·2	13·4 11·3
15	12 33·8	12 35·8	11 59·4	1·5 1·3	7·5 6·3	13·5 11·4
16	12 34·0	12 36·1	11 59·7	1·6 1·3	7·6 6·4	13·6 11·4
17	12 34·3	12 36·3	11 59·9	1·7 1·4	7·7 6·5	13·7 11·5
18	12 34·5	12 36·6	12 00·1	1·8 1·5	7·8 6·6	13·8 11·6
19	12 34·8	12 36·8	12 00·4	1·9 1·6	7·9 6·6	13·9 11·7
20	12 35·0	12 37·1	12 00·6	2·0 1·7	8·0 6·7	14·0 11·8
21	12 35·3	12 37·3	12 00·8	2·1 1·8	8·1 6·8	14·1 11·9
22	12 35·5	12 37·6	12 01·1	2·2 1·9	8·2 6·9	14·2 12·0
23	12 35·8	12 37·8	12 01·3	2·3 1·9	8·3 7·0	14·3 12·0
24	12 36·0	12 38·1	12 01·6	2·4 2·0	8·4 7·1	14·4 12·1
25	12 36·3	12 38·3	12 01·8	2·5 2·1	8·5 7·2	14·5 12·2
26	12 36·5	12 38·6	12 02·0	2·6 2·2	8·6 7·2	14·6 12·3
27	12 36·8	12 38·8	12 02·3	2·7 2·3	8·7 7·3	14·7 12·4
28	12 37·0	12 39·1	12 02·5	2·8 2·4	8·8 7·4	14·8 12·5
29	12 37·3	12 39·3	12 02·8	2·9 2·4	8·9 7·5	14·9 12·5
30	12 37·5	12 39·6	12 03·0	3·0 2·5	9·0 7·6	15·0 12·6
31	12 37·8	12 39·8	12 03·2	3·1 2·6	9·1 7·7	15·1 12·7
32	12 38·0	12 40·1	12 03·5	3·2 2·7	9·2 7·7	15·2 12·8
33	12 38·3	12 40·3	12 03·7	3·3 2·8	9·3 7·8	15·3 12·9
34	12 38·5	12 40·6	12 03·9	3·4 2·9	9·4 7·9	15·4 13·0
35	12 38·8	12 40·8	12 04·2	3·5 2·9	9·5 8·0	15·5 13·0
36	12 39·0	12 41·1	12 04·4	3·6 3·0	9·6 8·1	15·6 13·1
37	12 39·3	12 41·3	12 04·7	3·7 3·1	9·7 8·2	15·7 13·2
38	12 39·5	12 41·6	12 04·9	3·8 3·2	9·8 8·2	15·8 13·3
39	12 39·8	12 41·8	12 05·1	3·9 3·3	9·9 8·3	15·9 13·4
40	12 40·0	12 42·1	12 05·4	4·0 3·4	10·0 8·4	16·0 13·5
41	12 40·3	12 42·3	12 05·6	4·1 3·5	10·1 8·5	16·1 13·6
42	12 40·5	12 42·6	12 05·9	4·2 3·5	10·2 8·6	16·2 13·6
43	12 40·8	12 42·8	12 06·1	4·3 3·6	10·3 8·7	16·3 13·7
44	12 41·0	12 43·1	12 06·3	4·4 3·7	10·4 8·8	16·4 13·8
45	12 41·3	12 43·3	12 06·6	4·5 3·8	10·5 8·8	16·5 13·9
46	12 41·5	12 43·6	12 06·8	4·6 3·9	10·6 8·9	16·6 14·0
47	12 41·8	12 43·8	12 07·0	4·7 4·0	10·7 9·0	16·7 14·1
48	12 42·0	12 44·1	12 07·3	4·8 4·0	10·8 9·1	16·8 14·1
49	12 42·3	12 44·3	12 07·5	4·9 4·1	10·9 9·2	16·9 14·2
50	12 42·5	12 44·6	12 07·8	5·0 4·2	11·0 9·3	17·0 14·3
51	12 42·8	12 44·8	12 08·0	5·1 4·3	11·1 9·3	17·1 14·4
52	12 43·0	12 45·1	12 08·2	5·2 4·4	11·2 9·4	17·2 14·5
53	12 43·3	12 45·3	12 08·5	5·3 4·5	11·3 9·5	17·3 14·6
54	12 43·5	12 45·6	12 08·7	5·4 4·5	11·4 9·6	17·4 14·6
55	12 43·8	12 45·8	12 09·0	5·5 4·6	11·5 9·7	17·5 14·7
56	12 44·0	12 46·1	12 09·2	5·6 4·7	11·6 9·8	17·6 14·8
57	12 44·3	12 46·3	12 09·4	5·7 4·8	11·7 9·8	17·7 14·9
58	12 44·5	12 46·6	12 09·7	5·8 4·9	11·8 9·9	17·8 15·0
59	12 44·8	12 46·8	12 09·9	5·9 5·0	11·9 10·0	17·9 15·1
60	12 45·0	12 47·1	12 10·2	6·0 5·1	12·0 10·1	18·0 15·2

51	SUN PLANETS	ARIES	MOON	v or Corr^n d	v or Corr^n d	v or Corr^n d
s	° ′	° ′	° ′	′ ′	′ ′	′ ′
00	12 45·0	12 47·1	12 10·2	0·0 0·0	6·0 5·2	12·0 10·3
01	12 45·3	12 47·3	12 10·4	0·1 0·1	6·1 5·2	12·1 10·4
02	12 45·5	12 47·6	12 10·6	0·2 0·2	6·2 5·3	12·2 10·5
03	12 45·8	12 47·8	12 10·9	0·3 0·3	6·3 5·4	12·3 10·6
04	12 46·0	12 48·1	12 11·1	0·4 0·3	6·4 5·5	12·4 10·6
05	12 46·3	12 48·3	12 11·3	0·5 0·4	6·5 5·6	12·5 10·7
06	12 46·5	12 48·6	12 11·6	0·6 0·5	6·6 5·7	12·6 10·8
07	12 46·8	12 48·8	12 11·8	0·7 0·6	6·7 5·8	12·7 10·9
08	12 47·0	12 49·1	12 12·1	0·8 0·7	6·8 5·8	12·8 11·0
09	12 47·3	12 49·4	12 12·3	0·9 0·8	6·9 5·9	12·9 11·1
10	12 47·5	12 49·6	12 12·5	1·0 0·9	7·0 6·0	13·0 11·2
11	12 47·8	12 49·9	12 12·8	1·1 0·9	7·1 6·1	13·1 11·2
12	12 48·0	12 50·1	12 13·0	1·2 1·0	7·2 6·2	13·2 11·3
13	12 48·3	12 50·4	12 13·3	1·3 1·1	7·3 6·3	13·3 11·4
14	12 48·5	12 50·6	12 13·5	1·4 1·2	7·4 6·4	13·4 11·5
15	12 48·8	12 50·9	12 13·7	1·5 1·3	7·5 6·4	13·5 11·6
16	12 49·0	12 51·1	12 14·0	1·6 1·4	7·6 6·5	13·6 11·7
17	12 49·3	12 51·4	12 14·2	1·7 1·5	7·7 6·6	13·7 11·8
18	12 49·5	12 51·6	12 14·4	1·8 1·5	7·8 6·7	13·8 11·8
19	12 49·8	12 51·9	12 14·7	1·9 1·6	7·9 6·8	13·9 11·9
20	12 50·0	12 52·1	12 14·9	2·0 1·7	8·0 6·9	14·0 12·0
21	12 50·3	12 52·4	12 15·2	2·1 1·8	8·1 7·0	14·1 12·1
22	12 50·5	12 52·6	12 15·4	2·2 1·9	8·2 7·0	14·2 12·2
23	12 50·8	12 52·9	12 15·6	2·3 2·0	8·3 7·1	14·3 12·3
24	12 51·0	12 53·1	12 15·9	2·4 2·1	8·4 7·2	14·4 12·4
25	12 51·3	12 53·4	12 16·1	2·5 2·1	8·5 7·3	14·5 12·4
26	12 51·5	12 53·6	12 16·4	2·6 2·2	8·6 7·4	14·6 12·5
27	12 51·8	12 53·9	12 16·6	2·7 2·3	8·7 7·5	14·7 12·6
28	12 52·0	12 54·1	12 16·8	2·8 2·4	8·8 7·6	14·8 12·7
29	12 52·3	12 54·4	12 17·1	2·9 2·5	8·9 7·6	14·9 12·8
30	12 52·5	12 54·6	12 17·3	3·0 2·6	9·0 7·7	15·0 12·9
31	12 52·8	12 54·9	12 17·5	3·1 2·7	9·1 7·8	15·1 13·0
32	12 53·0	12 55·1	12 17·8	3·2 2·7	9·2 7·9	15·2 13·0
33	12 53·3	12 55·4	12 18·0	3·3 2·8	9·3 8·0	15·3 13·1
34	12 53·5	12 55·6	12 18·3	3·4 2·9	9·4 8·1	15·4 13·2
35	12 53·8	12 55·9	12 18·5	3·5 3·0	9·5 8·2	15·5 13·3
36	12 54·0	12 56·1	12 18·7	3·6 3·1	9·6 8·2	15·6 13·4
37	12 54·3	12 56·4	12 19·0	3·7 3·2	9·7 8·3	15·7 13·5
38	12 54·5	12 56·6	12 19·2	3·8 3·3	9·8 8·4	15·8 13·6
39	12 54·8	12 56·9	12 19·5	3·9 3·3	9·9 8·5	15·9 13·6
40	12 55·0	12 57·1	12 19·7	4·0 3·4	10·0 8·6	16·0 13·7
41	12 55·3	12 57·4	12 19·9	4·1 3·5	10·1 8·7	16·1 13·8
42	12 55·5	12 57·6	12 20·2	4·2 3·6	10·2 8·8	16·2 13·9
43	12 55·8	12 57·9	12 20·4	4·3 3·7	10·3 8·8	16·3 14·0
44	12 56·0	12 58·1	12 20·6	4·4 3·8	10·4 8·9	16·4 14·1
45	12 56·3	12 58·4	12 20·9	4·5 3·9	10·5 9·0	16·5 14·2
46	12 56·5	12 58·6	12 21·1	4·6 3·9	10·6 9·1	16·6 14·2
47	12 56·8	12 58·9	12 21·4	4·7 4·0	10·7 9·2	16·7 14·3
48	12 57·0	12 59·1	12 21·6	4·8 4·1	10·8 9·3	16·8 14·4
49	12 57·3	12 59·4	12 21·8	4·9 4·2	10·9 9·4	16·9 14·5
50	12 57·5	12 59·6	12 22·1	5·0 4·3	11·0 9·4	17·0 14·6
51	12 57·8	12 59·9	12 22·3	5·1 4·4	11·1 9·5	17·1 14·7
52	12 58·0	13 00·1	12 22·6	5·2 4·5	11·2 9·6	17·2 14·8
53	12 58·3	13 00·4	12 22·8	5·3 4·5	11·3 9·7	17·3 14·8
54	12 58·5	13 00·6	12 23·0	5·4 4·6	11·4 9·8	17·4 14·9
55	12 58·8	13 00·9	12 23·3	5·5 4·7	11·5 9·9	17·5 15·0
56	12 59·0	13 01·1	12 23·5	5·6 4·8	11·6 10·0	17·6 15·1
57	12 59·3	13 01·4	12 23·8	5·7 4·9	11·7 10·0	17·7 15·2
58	12 59·5	13 01·6	12 24·0	5·8 5·0	11·8 10·1	17·8 15·3
59	12 59·8	13 01·9	12 24·2	5·9 5·1	11·9 10·2	17·9 15·4
60	13 00·0	13 02·1	12 24·5	6·0 5·2	12·0 10·3	18·0 15·5

56m s	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
	° ′	° ′	° ′	′	′	′
00	14 00·0	14 02·3	13 21·7	0·0 0·0	6·0 5·7	12·0 11·3
01	14 00·3	14 02·6	13 22·0	0·1 0·1	6·1 5·7	12·1 11·4
02	14 00·5	14 02·8	13 22·2	0·2 0·2	6·2 5·8	12·2 11·5
03	14 00·8	14 03·1	13 22·4	0·3 0·3	6·3 5·9	12·3 11·6
04	14 01·0	14 03·3	13 22·7	0·4 0·4	6·4 6·0	12·4 11·7
05	14 01·3	14 03·6	13 22·9	0·5 0·5	6·5 6·1	12·5 11·8
06	14 01·5	14 03·8	13 23·2	0·6 0·6	6·6 6·2	12·6 11·9
07	14 01·8	14 04·1	13 23·4	0·7 0·7	6·7 6·3	12·7 12·0
08	14 02·0	14 04·3	13 23·6	0·8 0·8	6·8 6·4	12·8 12·1
09	14 02·3	14 04·6	13 23·9	0·9 0·8	6·9 6·5	12·9 12·1
10	14 02·5	14 04·8	13 24·1	1·0 0·9	7·0 6·6	13·0 12·2
11	14 02·8	14 05·1	13 24·4	1·1 1·0	7·1 6·7	13·1 12·3
12	14 03·0	14 05·3	13 24·6	1·2 1·1	7·2 6·8	13·2 12·4
13	14 03·3	14 05·6	13 24·8	1·3 1·2	7·3 6·9	13·3 12·5
14	14 03·5	14 05·8	13 25·1	1·4 1·3	7·4 7·0	13·4 12·6
15	14 03·8	14 06·1	13 25·3	1·5 1·4	7·5 7·1	13·5 12·7
16	14 04·0	14 06·3	13 25·6	1·6 1·5	7·6 7·2	13·6 12·8
17	14 04·3	14 06·6	13 25·8	1·7 1·6	7·7 7·3	13·7 12·9
18	14 04·5	14 06·8	13 26·0	1·8 1·7	7·8 7·3	13·8 13·0
19	14 04·8	14 07·1	13 26·3	1·9 1·8	7·9 7·4	13·9 13·1
20	14 05·0	14 07·3	13 26·5	2·0 1·9	8·0 7·5	14·0 13·2
21	14 05·3	14 07·6	13 26·7	2·1 2·0	8·1 7·6	14·1 13·3
22	14 05·5	14 07·8	13 27·0	2·2 2·1	8·2 7·7	14·2 13·4
23	14 05·8	14 08·1	13 27·2	2·3 2·2	8·3 7·8	14·3 13·5
24	14 06·0	14 08·3	13 27·5	2·4 2·3	8·4 7·9	14·4 13·6
25	14 06·3	14 08·6	13 27·7	2·5 2·4	8·5 8·0	14·5 13·7
26	14 06·5	14 08·8	13 27·9	2·6 2·4	8·6 8·1	14·6 13·7
27	14 06·8	14 09·1	13 28·2	2·7 2·5	8·7 8·2	14·7 13·8
28	14 07·0	14 09·3	13 28·4	2·8 2·6	8·8 8·3	14·8 13·9
29	14 07·3	14 09·6	13 28·7	2·9 2·7	8·9 8·4	14·9 14·0
30	14 07·5	14 09·8	13 28·9	3·0 2·8	9·0 8·5	15·0 14·1
31	14 07·8	14 10·1	13 29·1	3·1 2·9	9·1 8·6	15·1 14·2
32	14 08·0	14 10·3	13 29·4	3·2 3·0	9·2 8·7	15·2 14·3
33	14 08·3	14 10·6	13 29·6	3·3 3·1	9·3 8·8	15·3 14·4
34	14 08·5	14 10·8	13 29·8	3·4 3·2	9·4 8·9	15·4 14·5
35	14 08·8	14 11·1	13 30·1	3·5 3·3	9·5 8·9	15·5 14·6
36	14 09·0	14 11·3	13 30·3	3·6 3·4	9·6 9·0	15·6 14·7
37	14 09·3	14 11·6	13 30·6	3·7 3·5	9·7 9·1	15·7 14·8
38	14 09·5	14 11·8	13 30·8	3·8 3·6	9·8 9·2	15·8 14·9
39	14 09·8	14 12·1	13 31·0	3·9 3·7	9·9 9·3	15·9 15·0
40	14 10·0	14 12·3	13 31·3	4·0 3·8	10·0 9·4	16·0 15·1
41	14 10·3	14 12·6	13 31·5	4·1 3·9	10·1 9·5	16·1 15·2
42	14 10·5	14 12·8	13 31·8	4·2 4·0	10·2 9·6	16·2 15·3
43	14 10·8	14 13·1	13 32·0	4·3 4·0	10·3 9·7	16·3 15·3
44	14 11·0	14 13·3	13 32·2	4·4 4·1	10·4 9·8	16·4 15·4
45	14 11·3	14 13·6	13 32·5	4·5 4·2	10·5 9·9	16·5 15·5
46	14 11·5	14 13·8	13 32·7	4·6 4·3	10·6 10·0	16·6 15·6
47	14 11·8	14 14·1	13 32·9	4·7 4·4	10·7 10·1	16·7 15·7
48	14 12·0	14 14·3	13 33·2	4·8 4·5	10·8 10·2	16·8 15·8
49	14 12·3	14 14·6	13 33·4	4·9 4·6	10·9 10·3	16·9 15·9
50	14 12·5	14 14·8	13 33·7	5·0 4·7	11·0 10·4	17·0 16·0
51	14 12·8	14 15·1	13 33·9	5·1 4·8	11·1 10·5	17·1 16·1
52	14 13·0	14 15·3	13 34·1	5·2 4·9	11·2 10·5	17·2 16·2
53	14 13·3	14 15·6	13 34·4	5·3 5·0	11·3 10·6	17·3 16·3
54	14 13·5	14 15·8	13 34·6	5·4 5·1	11·4 10·7	17·4 16·4
55	14 13·8	14 16·1	13 34·9	5·5 5·2	11·5 10·8	17·5 16·5
56	14 14·0	14 16·3	13 35·1	5·6 5·3	11·6 10·9	17·6 16·6
57	14 14·3	14 16·6	13 35·3	5·7 5·4	11·7 11·0	17·7 16·7
58	14 14·5	14 16·8	13 35·6	5·8 5·5	11·8 11·1	17·8 16·8
59	14 14·8	14 17·1	13 35·8	5·9 5·6	11·9 11·2	17·9 16·9
60	14 15·0	14 17·3	13 36·1	6·0 5·7	12·0 11·3	18·0 17·0

57m s	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
	° ′	° ′	° ′	′	′	′
00	14 15·0	14 17·3	13 36·1	0·0 0·0	6·0 5·8	12·0 11·5
01	14 15·3	14 17·6	13 36·3	0·1 0·1	6·1 5·8	12·1 11·6
02	14 15·5	14 17·8	13 36·5	0·2 0·2	6·2 5·9	12·2 11·7
03	14 15·8	14 18·1	13 36·8	0·3 0·3	6·3 6·0	12·3 11·8
04	14 16·0	14 18·3	13 37·0	0·4 0·4	6·4 6·1	12·4 11·9
05	14 16·3	14 18·6	13 37·2	0·5 0·5	6·5 6·2	12·5 12·0
06	14 16·5	14 18·8	13 37·5	0·6 0·6	6·6 6·3	12·6 12·1
07	14 16·8	14 19·1	13 37·7	0·7 0·7	6·7 6·4	12·7 12·2
08	14 17·0	14 19·3	13 38·0	0·8 0·8	6·8 6·5	12·8 12·3
09	14 17·3	14 19·6	13 38·2	0·9 0·9	6·9 6·6	12·9 12·4
10	14 17·5	14 19·8	13 38·4	1·0 1·0	7·0 6·7	13·0 12·5
11	14 17·8	14 20·1	13 38·7	1·1 1·1	7·1 6·8	13·1 12·6
12	14 18·0	14 20·3	13 38·9	1·2 1·2	7·2 6·9	13·2 12·7
13	14 18·3	14 20·6	13 39·2	1·3 1·2	7·3 7·0	13·3 12·7
14	14 18·5	14 20·9	13 39·4	1·4 1·3	7·4 7·1	13·4 12·8
15	14 18·8	14 21·1	13 39·6	1·5 1·4	7·5 7·2	13·5 12·9
16	14 19·0	14 21·4	13 39·9	1·6 1·5	7·6 7·3	13·6 13·0
17	14 19·3	14 21·6	13 40·1	1·7 1·6	7·7 7·4	13·7 13·1
18	14 19·5	14 21·9	13 40·3	1·8 1·7	7·8 7·5	13·8 13·2
19	14 19·8	14 22·1	13 40·6	1·9 1·8	7·9 7·6	13·9 13·3
20	14 20·0	14 22·4	13 40·8	2·0 1·9	8·0 7·7	14·0 13·4
21	14 20·3	14 22·6	13 41·1	2·1 2·0	8·1 7·8	14·1 13·5
22	14 20·5	14 22·9	13 41·3	2·2 2·1	8·2 7·9	14·2 13·6
23	14 20·8	14 23·1	13 41·5	2·3 2·2	8·3 8·0	14·3 13·7
24	14 21·0	14 23·4	13 41·8	2·4 2·3	8·4 8·1	14·4 13·8
25	14 21·3	14 23·6	13 42·0	2·5 2·4	8·5 8·1	14·5 13·9
26	14 21·5	14 23·9	13 42·3	2·6 2·5	8·6 8·2	14·6 14·0
27	14 21·8	14 24·1	13 42·5	2·7 2·6	8·7 8·3	14·7 14·1
28	14 22·0	14 24·4	13 42·7	2·8 2·7	8·8 8·4	14·8 14·2
29	14 22·3	14 24·6	13 43·0	2·9 2·8	8·9 8·5	14·9 14·3
30	14 22·5	14 24·9	13 43·2	3·0 2·9	9·0 8·6	15·0 14·4
31	14 22·8	14 25·1	13 43·4	3·1 3·0	9·1 8·7	15·1 14·5
32	14 23·0	14 25·4	13 43·7	3·2 3·1	9·2 8·8	15·2 14·6
33	14 23·3	14 25·6	13 43·9	3·3 3·2	9·3 8·9	15·3 14·7
34	14 23·5	14 25·9	13 44·2	3·4 3·3	9·4 9·0	15·4 14·8
35	14 23·8	14 26·1	13 44·4	3·5 3·4	9·5 9·1	15·5 14·9
36	14 24·0	14 26·4	13 44·6	3·6 3·5	9·6 9·2	15·6 15·0
37	14 24·3	14 26·6	13 44·9	3·7 3·5	9·7 9·3	15·7 15·0
38	14 24·5	14 26·9	13 45·1	3·8 3·6	9·8 9·4	15·8 15·1
39	14 24·8	14 27·1	13 45·4	3·9 3·7	9·9 9·5	15·9 15·2
40	14 25·0	14 27·4	13 45·6	4·0 3·8	10·0 9·6	16·0 15·3
41	14 25·3	14 27·6	13 45·8	4·1 3·9	10·1 9·7	16·1 15·4
42	14 25·5	14 27·9	13 46·1	4·2 4·0	10·2 9·8	16·2 15·5
43	14 25·8	14 28·1	13 46·3	4·3 4·1	10·3 9·9	16·3 15·6
44	14 26·0	14 28·4	13 46·5	4·4 4·2	10·4 10·0	16·4 15·7
45	14 26·3	14 28·6	13 46·8	4·5 4·3	10·5 10·1	16·5 15·8
46	14 26·5	14 28·9	13 47·0	4·6 4·4	10·6 10·2	16·6 15·9
47	14 26·8	14 29·1	13 47·3	4·7 4·5	10·7 10·3	16·7 16·0
48	14 27·0	14 29·4	13 47·5	4·8 4·6	10·8 10·4	16·8 16·1
49	14 27·3	14 29·6	13 47·7	4·9 4·7	10·9 10·4	16·9 16·2
50	14 27·5	14 29·9	13 48·0	5·0 4·8	11·0 10·5	17·0 16·3
51	14 27·8	14 30·1	13 48·2	5·1 4·9	11·1 10·6	17·1 16·4
52	14 28·0	14 30·4	13 48·5	5·2 5·0	11·2 10·7	17·2 16·5
53	14 28·3	14 30·6	13 48·7	5·3 5·1	11·3 10·8	17·3 16·6
54	14 28·5	14 30·9	13 48·9	5·4 5·2	11·4 10·9	17·4 16·7
55	14 28·8	14 31·1	13 49·2	5·5 5·3	11·5 11·0	17·5 16·8
56	14 29·0	14 31·4	13 49·4	5·6 5·4	11·6 11·1	17·6 16·9
57	14 29·3	14 31·6	13 49·7	5·7 5·5	11·7 11·2	17·7 17·0
58	14 29·5	14 31·9	13 49·9	5·8 5·6	11·8 11·3	17·8 17·1
59	14 29·8	14 32·1	13 50·1	5·9 5·7	11·9 11·4	17·9 17·2
60	14 30·0	14 32·4	13 50·4	6·0 5·8	12·0 11·5	18·0 17·3

58m s	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
	° ′	° ′	° ′	′	′	′
00	14 30·0	14 32·4	13 50·4	0·0 0·0	6·0 5·9	12·0 11·7
01	14 30·3	14 32·6	13 50·6	0·1 0·1	6·1 5·9	12·1 11·8
02	14 30·5	14 32·9	13 50·8	0·2 0·2	6·2 6·0	12·2 11·9
03	14 30·8	14 33·1	13 51·1	0·3 0·3	6·3 6·1	12·3 12·0
04	14 31·0	14 33·4	13 51·3	0·4 0·4	6·4 6·2	12·4 12·1
05	14 31·3	14 33·6	13 51·6	0·5 0·5	6·5 6·3	12·5 12·2
06	14 31·5	14 33·9	13 51·8	0·6 0·6	6·6 6·4	12·6 12·3
07	14 31·8	14 34·1	13 52·0	0·7 0·7	6·7 6·5	12·7 12·4
08	14 32·0	14 34·4	13 52·3	0·8 0·8	6·8 6·6	12·8 12·5
09	14 32·3	14 34·6	13 52·5	0·9 0·9	6·9 6·7	12·9 12·6
10	14 32·5	14 34·9	13 52·8	1·0 1·0	7·0 6·8	13·0 12·7
11	14 32·8	14 35·1	13 53·0	1·1 1·1	7·1 6·9	13·1 12·8
12	14 33·0	14 35·4	13 53·2	1·2 1·2	7·2 7·0	13·2 12·9
13	14 33·3	14 35·6	13 53·5	1·3 1·3	7·3 7·1	13·3 13·0
14	14 33·5	14 35·9	13 53·7	1·4 1·4	7·4 7·2	13·4 13·1
15	14 33·8	14 36·1	13 53·9	1·5 1·5	7·5 7·3	13·5 13·2
16	14 34·0	14 36·4	13 54·2	1·6 1·6	7·6 7·4	13·6 13·3
17	14 34·3	14 36·6	13 54·4	1·7 1·7	7·7 7·5	13·7 13·4
18	14 34·5	14 36·9	13 54·7	1·8 1·8	7·8 7·6	13·8 13·5
19	14 34·8	14 37·1	13 54·9	1·9 1·9	7·9 7·7	13·9 13·6
20	14 35·0	14 37·4	13 55·1	2·0 2·0	8·0 7·8	14·0 13·7
21	14 35·3	14 37·6	13 55·4	2·1 2·0	8·1 7·9	14·1 13·7
22	14 35·5	14 37·9	13 55·6	2·2 2·1	8·2 8·0	14·2 13·8
23	14 35·8	14 38·1	13 55·9	2·3 2·2	8·3 8·1	14·3 13·9
24	14 36·0	14 38·4	13 56·1	2·4 2·3	8·4 8·2	14·4 14·0
25	14 36·3	14 38·6	13 56·3	2·5 2·4	8·5 8·3	14·5 14·1
26	14 36·5	14 38·9	13 56·6	2·6 2·5	8·6 8·4	14·6 14·2
27	14 36·8	14 39·2	13 56·8	2·7 2·6	8·7 8·5	14·7 14·3
28	14 37·0	14 39·4	13 57·0	2·8 2·7	8·8 8·6	14·8 14·4
29	14 37·3	14 39·7	13 57·3	2·9 2·8	8·9 8·7	14·9 14·5
30	14 37·5	14 39·9	13 57·5	3·0 2·9	9·0 8·8	15·0 14·6
31	14 37·8	14 40·2	13 57·8	3·1 3·0	9·1 8·9	15·1 14·7
32	14 38·0	14 40·4	13 58·0	3·2 3·1	9·2 9·0	15·2 14·8
33	14 38·3	14 40·7	13 58·2	3·3 3·2	9·3 9·1	15·3 14·9
34	14 38·5	14 40·9	13 58·5	3·4 3·3	9·4 9·2	15·4 15·0
35	14 38·8	14 41·2	13 58·7	3·5 3·4	9·5 9·3	15·5 15·1
36	14 39·0	14 41·4	13 59·0	3·6 3·5	9·6 9·4	15·6 15·2
37	14 39·3	14 41·7	13 59·2	3·7 3·6	9·7 9·5	15·7 15·3
38	14 39·5	14 41·9	13 59·4	3·8 3·7	9·8 9·6	15·8 15·4
39	14 39·8	14 42·2	13 59·7	3·9 3·8	9·9 9·7	15·9 15·5
40	14 40·0	14 42·4	13 59·9	4·0 3·9	10·0 9·8	16·0 15·6
41	14 40·3	14 42·7	14 00·1	4·1 4·0	10·1 9·8	16·1 15·7
42	14 40·5	14 42·9	14 00·4	4·2 4·1	10·2 9·9	16·2 15·8
43	14 40·8	14 43·2	14 00·6	4·3 4·2	10·3 10·0	16·3 15·9
44	14 41·0	14 43·4	14 00·9	4·4 4·3	10·4 10·1	16·4 16·0
45	14 41·3	14 43·7	14 01·1	4·5 4·4	10·5 10·2	16·5 16·1
46	14 41·5	14 43·9	14 01·3	4·6 4·5	10·6 10·3	16·6 16·2
47	14 41·8	14 44·2	14 01·6	4·7 4·6	10·7 10·4	16·7 16·3
48	14 42·0	14 44·4	14 01·8	4·8 4·7	10·8 10·5	16·8 16·4
49	14 42·3	14 44·7	14 02·1	4·9 4·8	10·9 10·6	16·9 16·5
50	14 42·5	14 44·9	14 02·3	5·0 4·9	11·0 10·7	17·0 16·6
51	14 42·8	14 45·2	14 02·5	5·1 5·0	11·1 10·8	17·1 16·7
52	14 43·0	14 45·4	14 02·8	5·2 5·1	11·2 10·9	17·2 16·8
53	14 43·3	14 45·7	14 03·0	5·3 5·2	11·3 11·0	17·3 16·9
54	14 43·5	14 45·9	14 03·3	5·4 5·3	11·4 11·1	17·4 17·0
55	14 43·8	14 46·2	14 03·5	5·5 5·4	11·5 11·2	17·5 17·1
56	14 44·0	14 46·4	14 03·7	5·6 5·5	11·6 11·3	17·6 17·2
57	14 44·3	14 46·7	14 04·0	5·7 5·6	11·7 11·4	17·7 17·3
58	14 44·5	14 46·9	14 04·2	5·8 5·7	11·8 11·5	17·8 17·4
59	14 44·8	14 47·2	14 04·4	5·9 5·8	11·9 11·6	17·9 17·5
60	14 45·0	14 47·4	14 04·7	6·0 5·9	12·0 11·7	18·0 17·6

59m s	SUN PLANETS	ARIES	MOON	v or Corr d	v or Corr d	v or Corr d
	° ′	° ′	° ′	′	′	′
00	14 45·0	14 47·4	14 04·7	0·0 0·0	6·0 6·0	12·0 11·9
01	14 45·3	14 47·7	14 04·9	0·1 0·1	6·1 6·0	12·1 12·0
02	14 45·5	14 47·9	14 05·2	0·2 0·2	6·2 6·1	12·2 12·1
03	14 45·8	14 48·2	14 05·4	0·3 0·3	6·3 6·2	12·3 12·2
04	14 46·0	14 48·4	14 05·6	0·4 0·4	6·4 6·3	12·4 12·3
05	14 46·3	14 48·7	14 05·9	0·5 0·5	6·5 6·4	12·5 12·4
06	14 46·5	14 48·9	14 06·1	0·6 0·6	6·6 6·5	12·6 12·5
07	14 46·8	14 49·2	14 06·4	0·7 0·7	6·7 6·6	12·7 12·6
08	14 47·0	14 49·4	14 06·6	0·8 0·8	6·8 6·7	12·8 12·7
09	14 47·3	14 49·7	14 06·8	0·9 0·9	6·9 6·8	12·9 12·8
10	14 47·5	14 49·9	14 07·1	1·0 1·0	7·0 6·9	13·0 12·9
11	14 47·8	14 50·2	14 07·3	1·1 1·1	7·1 7·0	13·1 13·0
12	14 48·0	14 50·4	14 07·5	1·2 1·2	7·2 7·1	13·2 13·1
13	14 48·3	14 50·7	14 07·8	1·3 1·3	7·3 7·2	13·3 13·2
14	14 48·5	14 50·9	14 08·0	1·4 1·4	7·4 7·3	13·4 13·3
15	14 48·8	14 51·2	14 08·3	1·5 1·5	7·5 7·4	13·5 13·4
16	14 49·0	14 51·4	14 08·5	1·6 1·6	7·6 7·5	13·6 13·5
17	14 49·3	14 51·7	14 08·7	1·7 1·7	7·7 7·6	13·7 13·6
18	14 49·5	14 51·9	14 09·0	1·8 1·8	7·8 7·7	13·8 13·7
19	14 49·8	14 52·2	14 09·2	1·9 1·9	7·9 7·8	13·9 13·8
20	14 50·0	14 52·4	14 09·5	2·0 2·0	8·0 7·9	14·0 13·9
21	14 50·3	14 52·7	14 09·7	2·1 2·1	8·1 8·0	14·1 14·0
22	14 50·5	14 52·9	14 09·9	2·2 2·2	8·2 8·1	14·2 14·1
23	14 50·8	14 53·2	14 10·2	2·3 2·3	8·3 8·2	14·3 14·2
24	14 51·0	14 53·4	14 10·4	2·4 2·4	8·4 8·3	14·4 14·3
25	14 51·3	14 53·7	14 10·6	2·5 2·5	8·5 8·4	14·5 14·4
26	14 51·5	14 53·9	14 10·9	2·6 2·6	8·6 8·5	14·6 14·5
27	14 51·8	14 54·2	14 11·1	2·7 2·7	8·7 8·6	14·7 14·6
28	14 52·0	14 54·4	14 11·4	2·8 2·8	8·8 8·7	14·8 14·7
29	14 52·3	14 54·7	14 11·6	2·9 2·9	8·9 8·8	14·9 14·8
30	14 52·5	14 54·9	14 11·8	3·0 3·0	9·0 8·9	15·0 14·9
31	14 52·8	14 55·2	14 12·1	3·1 3·1	9·1 9·0	15·1 15·0
32	14 53·0	14 55·4	14 12·3	3·2 3·2	9·2 9·1	15·2 15·1
33	14 53·3	14 55·7	14 12·6	3·3 3·3	9·3 9·2	15·3 15·2
34	14 53·5	14 55·9	14 12·8	3·4 3·4	9·4 9·3	15·4 15·3
35	14 53·8	14 56·2	14 13·0	3·5 3·5	9·5 9·4	15·5 15·4
36	14 54·0	14 56·4	14 13·3	3·6 3·6	9·6 9·5	15·6 15·5
37	14 54·3	14 56·7	14 13·5	3·7 3·7	9·7 9·6	15·7 15·6
38	14 54·5	14 56·9	14 13·8	3·8 3·8	9·8 9·7	15·8 15·7
39	14 54·8	14 57·2	14 14·0	3·9 3·9	9·9 9·8	15·9 15·8
40	14 55·0	14 57·5	14 14·2	4·0 4·0	10·0 9·9	16·0 15·9
41	14 55·3	14 57·7	14 14·5	4·1 4·1	10·1 10·0	16·1 16·0
42	14 55·5	14 58·0	14 14·7	4·2 4·2	10·2 10·1	16·2 16·1
43	14 55·8	14 58·2	14 14·9	4·3 4·3	10·3 10·2	16·3 16·2
44	14 56·0	14 58·5	14 15·2	4·4 4·4	10·4 10·3	16·4 16·3
45	14 56·3	14 58·7	14 15·4	4·5 4·5	10·5 10·4	16·5 16·4
46	14 56·5	14 59·0	14 15·7	4·6 4·6	10·6 10·5	16·6 16·5
47	14 56·8	14 59·2	14 15·9	4·7 4·7	10·7 10·6	16·7 16·6
48	14 57·0	14 59·5	14 16·1	4·8 4·8	10·8 10·7	16·8 16·7
49	14 57·3	14 59·7	14 16·4	4·9 4·9	10·9 10·8	16·9 16·8
50	14 57·5	15 00·0	14 16·6	5·0 5·0	11·0 10·9	17·0 16·9
51	14 57·8	15 00·2	14 16·9	5·1 5·1	11·1 11·0	17·1 17·0
52	14 58·0	15 00·5	14 17·1	5·2 5·2	11·2 11·1	17·2 17·1
53	14 58·3	15 00·7	14 17·3	5·3 5·3	11·3 11·2	17·3 17·2
54	14 58·5	15 01·0	14 17·6	5·4 5·4	11·4 11·3	17·4 17·3
55	14 58·8	15 01·2	14 17·8	5·5 5·5	11·5 11·4	17·5 17·4
56	14 59·0	15 01·5	14 18·0	5·6 5·6	11·6 11·5	17·6 17·5
57	14 59·3	15 01·7	14 18·3	5·7 5·7	11·7 11·6	17·7 17·6
58	14 59·5	15 02·0	14 18·5	5·8 5·8	11·8 11·7	17·8 17·7
59	14 59·8	15 02·2	14 18·8	5·9 5·9	11·9 11·8	17·9 17·8
60	15 00·0	15 02·5	14 19·0	6·0 6·0	12·0 11·9	18·0 17·9

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	9·7	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.

ALTITUDE CORRECTION TABLES 35°–90°—MOON

App. Alt.	35°–39°	40°–44°	45°–49°	50°–54°	55°–59°	60°–64°	65°–69°	70°–74°	75°–79°	80°–84°	85°–89°	App. Alt.
	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	Corrⁿ	
00	35 56·5	40 53·7	45 50·5	50 46·9	55 43·1	60 38·9	65 34·6	70 30·1	75 25·3	80 20·5	85 15·6	00
10	56·4	53·6	50·4	46·8	42·9	38·8	34·4	29·9	25·2	20·4	15·5	10
20	56·3	53·5	50·2	46·7	42·8	38·7	34·3	29·7	25·0	20·2	15·3	20
30	56·2	53·4	50·1	46·5	42·7	38·5	34·1	29·6	24·9	20·0	15·1	30
40	56·2	53·3	50·0	46·4	42·5	38·4	34·0	29·4	24·7	19·9	15·0	40
50	56·1	53·2	49·9	46·3	42·4	38·2	33·8	29·3	24·5	19·7	14·8	50
00	36 56·0	41 53·1	46 49·8	51 46·2	56 42·3	61 38·1	66 33·7	71 29·1	76 24·4	81 19·6	86 14·6	00
10	55·9	53·0	49·7	46·0	42·1	37·9	33·5	29·0	24·2	19·4	14·5	10
20	55·8	52·8	49·5	45·9	42·0	37·8	33·4	28·8	24·1	19·2	14·3	20
30	55·7	52·7	49·4	45·8	41·8	37·7	33·2	28·7	23·9	19·1	14·1	30
40	55·6	52·6	49·3	45·7	41·7	37·5	33·1	28·5	23·8	18·9	14·0	40
50	55·5	52·5	49·2	45·5	41·6	37·4	32·9	28·3	23·6	18·7	13·8	50
00	37 55·4	42 52·4	47 49·1	52 45·4	57 41·4	62 37·2	67 32·8	72 28·2	77 23·4	82 18·6	87 13·7	00
10	55·3	52·3	49·0	45·3	41·3	37·1	32·6	28·0	23·3	18·4	13·5	10
20	55·2	52·2	48·8	45·2	41·2	36·9	32·5	27·9	23·1	18·2	13·3	20
30	55·1	52·1	48·7	45·0	41·0	36·8	32·3	27·7	22·9	18·1	13·2	30
40	55·0	52·0	48·6	44·9	40·9	36·6	32·2	27·6	22·8	17·9	13·0	40
50	55·0	51·9	48·5	44·8	40·8	36·5	32·0	27·4	22·6	17·8	12·8	50
00	38 54·9	43 51·8	48 48·4	53 44·6	58 40·6	63 36·4	68 31·9	73 27·2	78 22·5	83 17·6	88 12·7	00
10	54·8	51·7	48·2	44·5	40·5	36·2	31·7	27·1	22·3	17·4	12·5	10
20	54·7	51·6	48·1	44·4	40·3	36·1	31·6	26·9	22·1	17·3	12·3	20
30	54·6	51·5	48·0	44·2	40·2	35·9	31·4	26·8	22·0	17·1	12·2	30
40	54·5	51·4	47·9	44·1	40·1	35·8	31·3	26·6	21·8	16·9	12·0	40
50	54·4	51·2	47·8	44·0	39·9	35·6	31·1	26·5	21·7	16·8	11·8	50
00	39 54·3	44 51·1	49 47·6	54 43·9	59 39·8	64 35·5	69 31·0	74 26·3	79 21·5	84 16·6	89 11·7	00
10	54·2	51·0	47·5	43·7	39·6	35·3	30·8	26·1	21·3	16·5	11·5	10
20	54·1	50·9	47·4	43·6	39·5	35·2	30·7	26·0	21·2	16·3	11·4	20
30	54·0	50·8	47·3	43·5	39·4	35·0	30·5	25·8	21·0	16·1	11·2	30
40	53·9	50·7	47·2	43·3	39·2	34·9	30·4	25·7	20·9	16·0	11·0	40
50	53·8	50·6	47·0	43·2	39·1	34·7	30·2	25·5	20·7	15·8	10·9	50

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

ALTITUDE CORRECTION TABLES 0°–35°—MOON

App. Alt.	0°–4° Corrⁿ	5°–9° Corrⁿ	10°–14° Corrⁿ	15°–19° Corrⁿ	20°–24° Corrⁿ	25°–29° Corrⁿ	30°–34° Corrⁿ	App. Alt.
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
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.

ALTITUDE CORRECTION TABLES 35°–90°—MOON

App. Alt.	35°–39° Corrⁿ	40°–44° Corrⁿ	45°–49° Corrⁿ	50°–54° Corrⁿ	55°–59° Corrⁿ	60°–64° Corrⁿ	65°–69° Corrⁿ	70°–74° Corrⁿ	75°–79° Corrⁿ	80°–84° Corrⁿ	85°–89° Corrⁿ	App. Alt.
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
00	35 56·5	40 53·7	45 50·5	50 46·9	55 43·1	60 38·9	65 34·6	70 30·1	75 25·3	80 20·5	85 15·6	00
10	56·4	53·6	50·4	46·8	42·9	38·8	34·4	29·9	25·2	20·4	15·5	10
20	56·3	53·5	50·2	46·7	42·8	38·7	34·3	29·7	25·0	20·2	15·3	20
30	56·2	53·4	50·1	46·5	42·7	38·5	34·1	29·6	24·9	20·0	15·1	30
40	56·2	53·3	50·0	46·4	42·5	38·4	34·0	29·4	24·7	19·9	15·0	40
50	56·1	53·2	49·9	46·3	42·4	38·2	33·8	29·3	24·5	19·7	14·8	50
00	36 56·0	41 53·1	46 49·8	51 46·2	56 42·3	61 38·1	66 33·7	71 29·1	76 24·4	81 19·6	86 14·6	00
10	55·9	53·0	49·7	46·0	42·1	37·9	33·5	29·0	24·2	19·4	14·5	10
20	55·8	52·8	49·5	45·9	42·0	37·8	33·4	28·8	24·1	19·2	14·3	20
30	55·7	52·7	49·4	45·8	41·8	37·7	33·2	28·7	23·9	19·1	14·1	30
40	55·6	52·6	49·3	45·7	41·7	37·5	33·1	28·5	23·8	18·9	14·0	40
50	55·5	52·5	49·2	45·5	41·6	37·4	32·9	28·3	23·6	18·7	13·8	50
00	37 55·4	42 52·4	47 49·1	52 45·4	57 41·4	62 37·2	67 32·8	72 28·2	77 23·4	82 18·6	87 13·7	00
10	55·3	52·3	49·0	45·3	41·3	37·1	32·6	28·0	23·3	18·4	13·5	10
20	55·2	52·2	48·8	45·2	41·2	36·9	32·5	27·9	23·1	18·2	13·3	20
30	55·1	52·1	48·7	45·0	41·0	36·8	32·3	27·7	22·9	18·1	13·2	30
40	55·0	52·0	48·6	44·9	40·9	36·6	32·2	27·6	22·8	17·9	13·0	40
50	55·0	51·9	48·5	44·8	40·8	36·5	32·0	27·4	22·6	17·8	12·8	50
00	38 54·9	43 51·8	48 48·4	53 44·6	58 40·6	63 36·4	68 31·9	73 27·2	78 22·5	83 17·6	88 12·7	00
10	54·8	51·7	48·2	44·5	40·5	36·2	31·7	27·1	22·3	17·4	12·5	10
20	54·7	51·6	48·1	44·4	40·3	36·1	31·6	26·9	22·1	17·3	12·3	20
30	54·6	51·5	48·0	44·2	40·2	35·9	31·4	26·8	22·0	17·1	12·2	30
40	54·5	51·4	47·9	44·1	40·1	35·8	31·3	26·6	21·8	16·9	12·0	40
50	54·4	51·2	47·8	44·0	39·9	35·6	31·1	26·5	21·7	16·8	11·8	50
00	39 54·3	44 51·1	49 47·6	54 43·9	59 39·8	64 35·5	69 31·0	74 26·3	79 21·5	84 16·6	89 11·7	00
10	54·2	51·0	47·5	43·7	39·6	35·3	30·8	26·1	21·3	16·5	11·5	10
20	54·1	50·9	47·4	43·6	39·5	35·2	30·7	26·0	21·2	16·3	11·4	20
30	54·0	50·8	47·3	43·5	39·4	35·0	30·5	25·8	21·0	16·1	11·2	30
40	53·9	50·7	47·2	43·3	39·2	34·9	30·4	25·7	20·9	16·0	11·0	40
50	53·8	50·6	47·0	43·2	39·1	34·7	30·2	25·5	20·7	15·8	10·9	50
H.P.	L U	L U	L U	L U	L U	L U	L U	L U	L U	L U	L U	H.P.
′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′
54·0	1·1 1·7	1·3 1·9	1·5 2·1	1·7 2·4	2·0 2·6	2·3 2·9	2·6 3·2	2·9 3·5	3·2 3·8	3·5 4·1	3·8 4·5	54·0
54·3	1·4 1·8	1·6 2·0	1·8 2·2	2·0 2·5	2·3 2·7	2·5 3·0	2·8 3·2	3·0 3·5	3·3 3·8	3·6 4·1	3·9 4·4	54·3
54·6	1·7 2·0	1·9 2·2	2·1 2·4	2·3 2·6	2·5 2·8	2·7 3·0	3·0 3·3	3·2 3·5	3·5 3·8	3·7 4·1	4·0 4·3	54·6
54·9	2·0 2·2	2·2 2·3	2·3 2·5	2·5 2·7	2·7 2·9	2·9 3·1	3·2 3·3	3·4 3·5	3·6 3·8	3·9 4·0	4·1 4·3	54·9
55·2	2·3 2·3	2·5 2·4	2·6 2·6	2·8 2·8	3·0 2·9	3·2 3·1	3·4 3·3	3·6 3·5	3·8 3·7	4·0 4·0	4·2 4·2	55·2
55·5	2·7 2·5	2·8 2·6	2·9 2·7	3·1 2·9	3·2 3·0	3·4 3·2	3·6 3·4	3·7 3·5	3·9 3·7	4·1 3·9	4·3 4·1	55·5
55·8	3·0 2·6	3·1 2·7	3·2 2·8	3·3 3·0	3·5 3·1	3·6 3·3	3·8 3·4	3·9 3·6	4·1 3·7	4·2 3·9	4·4 4·0	55·8
56·1	3·3 2·8	3·4 2·9	3·5 3·0	3·6 3·1	3·7 3·2	3·8 3·3	4·0 3·4	4·1 3·6	4·2 3·7	4·4 3·8	4·5 4·0	56·1
56·4	3·6 2·9	3·7 3·0	3·8 3·1	3·9 3·2	3·9 3·3	4·0 3·4	4·1 3·5	4·3 3·6	4·4 3·7	4·5 3·8	4·6 3·9	56·4
56·7	3·9 3·1	4·0 3·1	4·1 3·2	4·1 3·3	4·2 3·3	4·3 3·4	4·3 3·5	4·4 3·6	4·5 3·7	4·6 3·8	4·7 3·8	56·7
57·0	4·3 3·2	4·3 3·3	4·3 3·3	4·4 3·4	4·4 3·4	4·5 3·5	4·5 3·5	4·6 3·6	4·7 3·6	4·7 3·7	4·8 3·8	57·0
57·3	4·6 3·4	4·6 3·4	4·6 3·4	4·6 3·5	4·7 3·5	4·7 3·6	4·8 3·6	4·8 3·6	4·8 3·7	4·9 3·7	57·3	
57·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	5·0 3·6	5·0 3·6	5·0 3·6	57·6
57·9	5·2 3·7	5·2 3·7	5·2 3·7	5·2 3·7	5·2 3·7	5·1 3·6	5·1 3·6	5·1 3·6	5·1 3·6	5·1 3·6	5·1 3·6	57·9
58·2	5·5 3·9	5·5 3·8	5·5 3·8	5·4 3·8	5·4 3·7	5·4 3·7	5·3 3·7	5·3 3·6	5·2 3·6	5·2 3·5	5·2 3·5	58·2
58·5	5·9 4·0	5·8 4·0	5·8 3·9	5·7 3·9	5·6 3·8	5·6 3·8	5·5 3·7	5·5 3·6	5·4 3·6	5·3 3·5	5·3 3·4	58·5
58·8	6·2 4·2	6·1 4·1	6·0 4·1	6·0 4·0	5·9 3·9	5·8 3·8	5·7 3·7	5·6 3·6	5·5 3·5	5·4 3·5	5·3 3·4	58·8
59·1	6·5 4·3	6·4 4·3	6·3 4·2	6·2 4·1	6·1 4·0	6·0 3·9	5·9 3·8	5·8 3·6	5·7 3·5	5·6 3·4	5·4 3·3	59·1
59·4	6·8 4·5	6·7 4·4	6·6 4·3	6·5 4·2	6·4 4·1	6·2 3·9	6·1 3·8	6·0 3·7	5·8 3·5	5·7 3·4	5·5 3·2	59·4
59·7	7·1 4·6	7·0 4·5	6·9 4·4	6·8 4·3	6·6 4·1	6·5 4·0	6·3 3·8	6·2 3·7	6·0 3·5	5·8 3·3	5·6 3·2	59·7
60·0	7·5 4·8	7·3 4·7	7·2 4·5	7·0 4·4	6·9 4·2	6·7 4·0	6·5 3·9	6·3 3·7	6·1 3·5	5·9 3·3	5·7 3·1	60·0
60·3	7·8 5·0	7·6 4·8	7·5 4·7	7·3 4·5	7·1 4·3	6·9 4·1	6·7 3·9	6·5 3·7	6·3 3·5	6·0 3·2	5·8 3·0	60·3
60·6	8·1 5·1	7·9 5·0	7·7 4·8	7·6 4·6	7·3 4·4	7·1 4·2	6·9 3·9	6·7 3·7	6·4 3·4	6·2 3·2	5·9 2·9	60·6
60·9	8·4 5·3	8·2 5·1	8·0 4·9	7·8 4·7	7·6 4·5	7·3 4·2	7·1 4·0	6·8 3·7	6·6 3·4	6·3 3·2	6·0 2·9	60·9
61·2	8·7 5·4	8·5 5·2	8·3 5·0	8·1 4·8	7·8 4·5	7·6 4·3	7·3 4·0	7·0 3·7	6·7 3·4	6·4 3·1	6·1 2·8	61·2
61·5	9·1 5·6	8·8 5·4	8·6 5·1	8·3 4·9	8·1 4·6	7·8 4·3	7·5 4·0	7·2 3·7	6·9 3·4	6·5 3·1	6·2 2·7	61·5