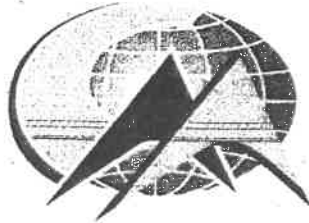


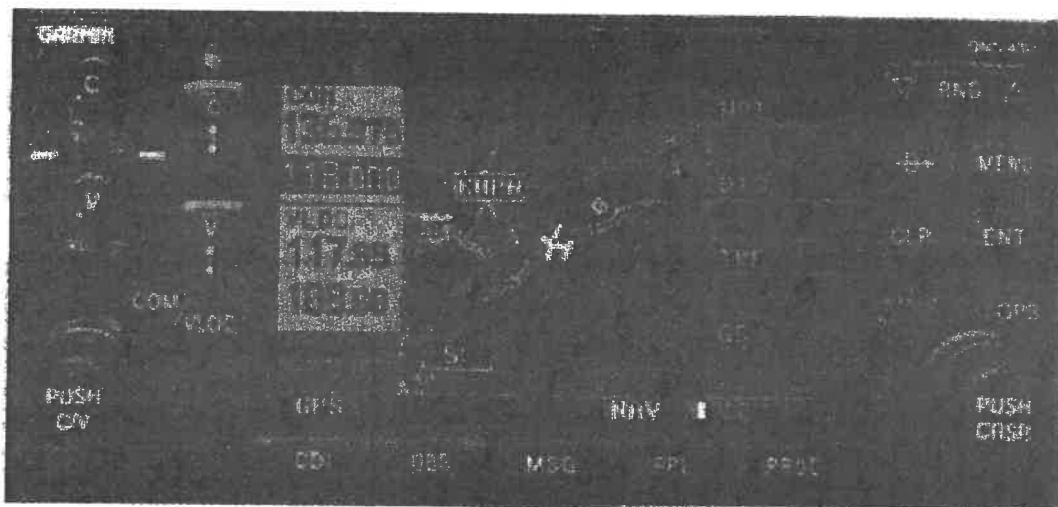
SOUTH AFRICAN



**CIVIL AVIATION
AUTHORITY**

PILOT'S INFORMATION MANUAL

NAVIGATIONAL TABLES



FOR EXAMINATION PURPOSES ONLY

**NB!!! PLEASE DO NOT MARK OR DAMAGE THIS MANUAL IN
ANY WAY**

**FOR THE USE OF COMMERCIAL AND AIRLINE TRANSPORT
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201
CONVERSION OF ARC TO TIME

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

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 G.M.T., or vice versa, particularly in the case of sunrise, sunset, etc.

SUNRISE

A80

Lat.	January											February					
	Dec.																
	30	2	5	8	11	14	17	20	23	26	29	1	4	7	10	13	16
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
N 72	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	10 31	10 26	10 20	10 13	10 05	09 57	09 48	09 38	29	09 19	09 08	08 58	08 47	36	26	15	08 04
64	09 51	09 49	09 45	09 40	09 35	29	22	09 14	09 06	08 58	08 50	41	32	22	13	08 03	07 53
62	24	22	19	09 16	09 12	09 07	09 01	08 55	08 49	42	34	27	19	10	08 02	07 53	44
N 60	09 03	09 02	09 00	08 57	08 54	08 50	08 45	08 40	08 34	08 28	08 22	08 15	08 08	08 00	07 53	07 45	07 37
58	08 46	08 45	08 44	42	39	35	31	27	22	17	11	08 05	07 58	07 52	45	37	30
56	32	31	30	28	26	23	19	15	11	08 06	08 01	07 56	50	44	38	31	24
54	19	19	18	16	14	12	09	08 06	08 02	07 57	07 53	48	42	37	31	25	19
52	08 08	08 08	08 07	08 06	08 04	08 02	08 00	07 57	07 53	49	45	41	36	31	25	20	14
N 50	07 58	07 58	07 58	07 57	07 56	07 54	07 51	07 49	07 46	07 42	07 38	07 34	07 30	07 25	07 20	07 15	07 10
45	38	38	38	38	37	35	34	32	29	27	24	20	17	13	09	07 05	07 00
40	22	22	22	22	21	21	19	18	16	14	12	07 09	07 06	07 03	07 00	06 56	06 52
35	07 08	07 08	07 08	07 08	07 08	07 08	07 07	07 06	07 05	07 03	07 01	06 59	06 57	06 54	06 52	49	46
30	06 55	06 56	06 57	06 57	06 57	06 57	06 56	06 56	06 55	06 54	06 52	51	49	47	45	42	40
N 20	06 34	06 35	06 36	06 37	06 37	06 38	06 38	06 38	06 38	06 37	06 36	06 36	06 35	06 33	06 32	06 31	06 29
N 10	06 16	17	18	19	20	21	22	22	22	23	23	22	22	22	21	20	20
0	05 59	06 00	06 02	06 03	06 04	06 05	06 06	06 07	06 08	06 09	06 10	06 10	06 10	06 11	11	11	11
S 10	41	05 43	05 45	05 46	05 48	05 49	05 51	05 52	05 54	05 55	05 56	05 57	05 59	05 59	06 00	06 01	06 02
20	23	24	26	28	30	32	34	36	38	40	42	44	45	47	05 49	05 50	05 52
S 30	05 01	05 03	05 05	05 07	05 10	05 12	05 15	05 18	05 20	05 23	05 26	05 28	05 31	05 33	05 36	05 38	05 41
35	04 48	04 50	04 52	04 55	04 58	05 01	05 03	05 07	05 10	13	16	19	22	25	28	31	34
40	33	35	38	41	44	04 47	04 50	04 54	04 57	05 01	05 05	05 08	12	16	20	23	27
45	04 15	04 18	04 21	24	27	31	35	39	43	04 47	04 52	05 00	05 05	05 09	14	18	
50	03 53	03 56	03 59	04 03	04 07	11	16	20	25	30	36	41	04 46	04 51	04 57	05 02	07
S 52	03 42	03 45	03 49	03 53	03 57	04 02	04 07	04 12	04 17	04 22	04 28	04 34	04 39	04 45	04 51	04 57	05 02
54	30	33	37	41	46	03 51	03 56	04 02	04 08	14	20	26	32	38	45	51	04 57
56	16	20	24	28	33	39	45	03 51	03 57	04 04	04 10	17	24	30	37	44	51
58	03 00	03 04	03 08	03 13	19	25	31	38	45	03 52	03 59	04 07	14	22	29	37	44
S 60	02 40	02 44	02 49	02 55	03 01	03 08	03 15	03 23	03 31	03 39	03 47	03 55	04 03	04 12	04 20	04 28	04 36

SUNSET

Lat.	January											February					
	Dec.																
	30	2	5	8	11	14	17	20	23	26	29	1	4	7	10	13	16
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
N 72	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	13 34	13 41	13 50	14 00	14 10	14 21	14 32	14 44	14 56	15 07	15 19	30	42	15 53	16 04	15	26
64	14 14	14 19	14 25	33	14 41	14 49	14 59	15 08	15 18	27	37	15 47	15 57	16 07	17	27	36
62	14 41	14 45	14 51	14 57	15 04	15 11	15 19	27	35	44	15 52	16 01	16 10	19	28	36	45
N 60	15 02	15 06	15 11	15 16	15 22	15 29	15 36	15 43	15 50	15 58	16 05	16 13	16 21	16 29	16 37	16 45	16 52
58	19	23	27	32	37	43	15 49	15 56	16 02	16 09	16	23	30	38	45	52	16 59
56	34	37	41	45	15 50	15 55	16 01	16 07	13	19	26	32	39	45	52	16 58	17 05
54	46	15 49	15 53	15 57	16 02	16 06	12	17	22	28	34	40	46	52	16 58	17 04	10
52	15 57	16 00	16 03	16 07	11	16	21	26	31	36	42	47	53	16 58	17 04	09	15
N 50	16 07	16 09	16 13	16 16	16 20	16 25	16 29	16 34	16 38	16 43	16 48	16 53	16 59	17 04	17 09	17 14	17 19
45	27	30	33	36	39	43	16 47	16 50	16 55	16 59	17 03	17 07	17 12	16	20	24	29
40	44	16 46	16 49	16 51	16 54	16 58	17 01	17 04	17 08	17 11	15	19	22	26	29	33	36
35	16 58	17 00	17 02	17 05	17 07	17 10	13	16	19	22	25	28	31	35	37	40	43
30	17 10	12	14	16	19	21	24	27	29	32	34	37	39	42	44	47	17 49
N 20	17 31	17 32	17 34	17 36	17 38	17 40	17 42	17 44	17 46	17 48	17 50	17 52	17 54	17 55	17 57	17 58	18 00
N 10	17 49	17 51	17 52	17 54	17 55	17 57	17 58	18 00	18 01	18 03	18 04	18 05	18 06	18 07	18 07	18 08	09
0	18 06	18 08	18 09	18 10	18 11	18 13	18 14	15	15	16	17	17	18	18	18	18	18
S 10	24	25	26	27	28	29	29	29	30	30	30	30	29	29	28	27	26
20	18 42	18 43	18 44	18 45	18 45	18 46	18 46	18 46	18 45	18 45	18 44	43	42	41	39	38	36
S 30	19 04	19 05	19 05	19 06	19 06	19 05	19 05	19 04	19 03	19 02	19 00	18 59	18 57	18 55	18 52	18 50	18 47
35	17	17	18	18	17	17	16	15	13	12	10	19 08	19 05	19 03	19 00	18 57	18 53
40	32	32	32	32	31	30	29	27	26	23	21	18	15	12	08	19 05	19 01
45	19 50	19 50	19 49	19 49	19 48	19 46	19 44	19 42	40	37	34	30	27	23	18	14	09
50	20 12	20 12	20 11	20 10	20 08	20 06	20 03	20 01	19 57	19 54	50	45	41	36	31	25	20
S 52	20 22	20 22	20 21	20 20	20 18	20 15	20 12	20 09	20 06	20 01	19 57	19 52	19 47	19 42	19 36	19 31	19 25
54	34	34	33	31	29	26	23	19	15	10	20 05	20 00	19 55	49	43	36	30
56	20 48	20 48	20 46	44	41	38	34	30	25	20	15	09	20 03	19 56	50	43	36
58	21 05	21 04	21 02	20 59	20 56	20 52	20 47	43	37	31	25	19	12	20 05	19 58	50	43
S 60	21 25	21 23	21 20	21 17	21 13	21 08	21 03	20 58	20 51	20 45	20 38	20 30	20 23	20 15	20 07	19 59	19 50

MORNING CIVIL TWILIGHT

Lat.	Dec.	January											February					
	30	2	5	8	11	14	17	20	23	26	29	1	4	7	10	13	16	
N 72	10 49	10 40	10 31	10 20	10 09	09 57	09 45	09 32	09 20	09 07	08 54	08 40	08 27	08 13	08 00	07 46	07 32	
70	09 52	09 48	09 43	09 37	09 30	09 22	09 13	09 03	08 54	08 43	33	21	08 10	07 59	07 47	35	23	
68	09 19	09 16	09 12	09 08	09 02	08 56	08 49	08 42	34	25	16	08 07	07 57	47	36	26	15	
66	08 54	08 52	08 50	08 46	08 42	37	31	25	18	08 10	08 03	07 54	46	37	27	18	08	
64	35	33	31	29	25	21	16	08 11	08 05	07 58	07 51	44	36	28	20	11	07 02	
62	19	18	16	14	08 11	08 08	08 03	07 59	07 54	48	42	35	28	21	13	06	06 57	
N 60	08 06	08 05	08 04	08 02	07 59	07 56	07 53	07 49	07 44	07 39	07 33	07 27	07 21	07 15	07 08	07 00	06 53	
58	07 55	07 54	07 53	07 51	49	46	43	40	36	31	26	21	15	09	07 03	06 56	49	
56	44	44	43	42	40	38	35	32	28	24	19	15	09	07 04	06 58	52	45	
54	36	35	35	34	32	30	28	25	21	18	14	09	07 04	06 59	54	48	42	
52	27	28	27	26	25	23	21	18	15	12	08	07 04	06 59	55	50	45	39	
N 50	07 20	07 20	07 20	07 19	07 18	07 17	07 15	07 12	07 10	07 07	07 03	06 59	06 55	06 51	06 46	06 41	06 36	
45	07 04	07 05	07 05	07 04	07 04	07 03	07 01	06 59	06 57	06 55	06 52	49	46	42	38	34	30	
40	06 51	06 52	06 52	06 52	06 51	06 51	06 50	48	47	45	43	40	38	35	32	28	24	
35	39	40	41	41	41	40	40	39	38	36	35	33	30	28	25	23	20	
30	29	30	30	31	31	31	31	30	29	28	27	25	24	22	20	17	15	
N 20	06 10	06 11	06 12	06 13	06 14	06 14	06 14	06 14	06 14	06 14	06 13	06 13	06 12	06 11	06 09	06 08	06 06	
N 10	05 53	05 54	05 55	05 57	05 57	05 58	05 59	06 00	06 00	06 01	06 01	06 01	06 00	06 00	06 00	05 59	05 58	
0	36	38	39	40	42	43	44	05 45	05 46	05 47	05 48	05 48	05 49	05 49	05 49	50	50	
S 10	05 18	20	22	23	25	27	28	30	31	33	34	35	37	38	39	39	40	
20	04 58	05 00	05 02	05 04	05 06	05 08	05 10	05 12	05 14	05 17	19	20	22	24	26	28	29	
S 30	04 33	04 35	04 38	04 40	04 43	04 45	04 48	04 51	04 54	04 57	05 00	05 02	05 05	05 08	05 11	05 13	05 16	
35	18	21	23	26	29	32	35	38	41	45	04 48	04 51	04 55	04 58	05 01	05 05	05 08	
40	04 00	04 03	04 06	04 09	04 12	04 15	19	23	27	30	34	38	42	46	04 50	04 54	04 58	
45	03 58	03 41	03 44	03 47	03 51	03 55	04 00	04 04	04 09	04 13	04 18	23	28	32	37	42	46	
50	03 09	03 12	16	20	24	29	03 34	03 40	03 45	03 51	03 57	04 03	09	15	20	26	32	
S 52	02 54	02 57	03 01	03 06	03 11	03 16	03 22	03 28	03 34	03 40	03 47	03 53	04 00	04 06	04 12	04 19	04 25	
54	36	40	02 45	02 50	02 55	03 01	03 08	03 14	21	28	35	42	03 49	03 56	04 03	10	17	
56	02 14	02 19	02 24	30	36	02 43	02 50	02 58	03 06	03 14	22	29	37	45	03 53	04 01	04 09	
58	01 46	01 51	01 57	02 04	02 12	02 21	29	38	02 47	02 56	03 05	03 15	24	33	41	03 50	03 59	
S 60	00 59	01 08	01 17	01 27	01 39	01 50	02 01	02 13	02 24	02 35	02 46	02 57	03 27	03 18	03 28	03 37	03 47	

EVENING CIVIL TWILIGHT

Lat.	Dec.	January											February					
	30	2	5	8	11	14	17	20	23	26	29	1	4	7	10	13	16	
N 72	13 17	13 27	13 40	13 53	14 07	14 21	14 36	14 50	15 05	15 19	15 34	15 48	16 02	16 16	16 30	16 44	16 58	
70	14 13	14 19	14 27	14 36	14 46	14 57	15 08	15 19	31	15 43	15 55	16 07	19	31	43	16 55	17 07	
68	14 47	14 52	14 58	15 05	15 13	15 22	31	41	15 50	16 01	16 11	21	32	43	16 54	17 04	15	
66	15 11	15 15	15 21	27	34	41	15 49	15 58	16 06	15	24	34	43	16 53	17 02	12	22	
64	30	34	39	44	15 50	15 57	16 04	16 12	19	27	36	44	16 52	17 01	10	18	27	
62	46	15 49	15 54	15 59	16 04	16 10	17	23	30	38	45	16 53	17 01	08	16	24	32	
N 60	15 59	16 02	16 06	16 11	16 16	16 22	16 27	16 34	16 40	16 47	16 53	17 00	17 08	17 15	17 22	17 29	17 36	
58	16 11	14	17	22	26	31	37	42	48	16 54	17 01	07	14	20	27	34	40	
56	21	24	27	31	36	41	45	51	16 56	17 02	07	13	19	25	31	38	44	
54	30	33	36	40	44	48	16 53	16 58	17 03	08	13	19	24	30	36	41	47	
52	38	41	44	47	51	16 55	17 00	17 04	09	14	19	24	29	34	39	45	50	
N 50	16 45	16 48	16 51	16 54	16 58	17 02	17 06	17 10	17 15	17 19	17 24	17 28	17 33	17 38	17 43	17 48	17 53	
45	17 01	17 03	17 06	17 09	17 12	16	19	23	27	31	34	38	42	47	51	17 55	17 59	
40	14	17	19	22	24	27	30	34	37	40	44	47	51	17 54	17 57	18 01	18 04	
35	26	28	30	32	35	38	41	43	46	49	17 52	17 55	17 58	18 01	18 03	06	09	
30	36	38	40	17 42	17 45	17 47	17 50	17 52	17 55	17 57	18 00	18 02	18 04	07	09	11	14	
N 20	17 55	17 56	17 58	18 00	18 02	18 04	18 06	18 08	18 10	18 11	18 13	18 15	18 16	18 18	18 19	18 21	18 22	
N 10	18 12	18 13	18 15	16	18	19	21	22	23	25	26	27	28	28	29	30	30	
0	29	30	32	33	34	35	36	37	37	38	38	39	39	39	39	39	39	
S 10	18 47	18 48	18 49	18 50	18 51	18 51	18 52	18 52	18 52	18 52	18 52	18 52	18 51	18 51	18 50	18 49	48	
20	19 07	19 08	19 09	19 09	19 09	19 10	19 10	19 09	19 09	19 08	19 07	19 06	19 05	19 04	19 02	19 00	18 59	
S 30	19 32	19 32	19 33	19 33	19 33	19 32	19 31	19 30	19 29	19 28	19 26	19 24	19 22	19 20	19 17	19 15	19 12	
35	19 46	19 47	19 47	19 47	19 47	19 46	19 45	43	42	40	38	35	33	30	27	23	20	
40	20 05	20 05	20 05	20 04	20 03	20 02	20 00	19 59	19 56	19 54	19 51	19 48	45	41	37	33	29	
45	27	27	26	25	24	22	20	20 17	20 14	20 11	20 07	20 04	19 59	19 55	19 50	19 46	41	
50	20 56	20 55	20 54	20 53	20 51	20 48	45	41	37	33	28	23	20 18	20 12	20 07	20 01	19 55	
S 52	21 11	21 10	21 08	21 06	21 04	21 00	20 57	20 53	20 48	20 43	20 38	20 33	20 27	20 21	20 15	20 08	20 02	
54	28	27	25	22	19	15	21 11	21 06	21 01	20 56	20 50	43	37	30	23	16	09	
56	21 50	21 48	21 45	21 42	21 38	33	28	22	16	21 10	21 03	20 56	20 49	41	33	26	18	
58	22 18	22 16	22 12	22 07	22 01	21 55	21 49	21 42	34	26	19	21 10	21 02	20 54	45	36	28	
S 60	23 04	22 58	22 51	22 43	22 34	22 25	22 16	22 06	21 57	21 47	21 38	21 28	21 18	21 08	20 58	20 49	20 39	

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SUNRISE

Lat.	February					March										Apr.
	16	19	22	25	28	3	6	9	12	15	18	21	24	27	30	2
N 72	08 51	08 33	08 17	08 01	07 45	07 29	07 13	06 58	06 42	06 27	06 11	05 56	05 41	05 25	05 09	04 53
70	31	17	08 02	07 48	34	20	06	53	39	25	11	57	43	29	15	05 01
68	16	08 03	07 51	38	26	13	07 01	48	36	23	11	58	45	33	20	07
66	08 04	07 53	41	30	19	07	06 56	45	33	22	10	05 59	47	36	24	13
64	07 53	43	33	23	13	07 02	52	42	31	21	10	06 00	49	38	28	17
62	44	35	26	17	08	06 58	48	39	29	20	10	00	50	41	31	21
N 60	07 37	07 28	07 20	07 11	07 03	06 54	06 45	06 36	06 27	06 18	06 09	06 00	05 51	05 42	05 33	05 24
58	30	22	15	07	06 59	51	43	34	26	17	09	01	52	44	35	27
56	24	17	10	07 03	55	48	40	32	25	17	09	01	53	45	37	29
54	19	12	06	06 59	52	45	38	31	24	16	09	01	54	46	39	32
52	14	08	07 02	56	49	43	36	29	22	15	09	02	55	48	41	34
N 50	07 10	07 04	06 58	06 53	06 47	06 40	06 34	06 28	06 21	06 15	06 08	06 02	05 55	05 49	05 42	05 36
45	07 00	06 56	51	46	41	35	30	25	19	14	08	02	57	51	46	40
40	06 52	48	44	40	36	31	27	22	17	12	08	03	58	53	48	43
35	46	42	39	35	31	28	24	20	16	11	07	03	05 59	55	51	46
30	40	37	34	31	28	24	21	18	14	11	07	03	06 00	56	53	49
N 20	06 29	06 27	06 25	06 23	06 21	06 19	06 16	06 14	06 11	06 09	06 06	06 04	06 01	05 58	05 56	05 53
N 10	20	19	17	16	15	13	12	11	09	07	06	04	02	06 01	05 59	05 57
0	11	11	10	10	09	09	08	07	07	06	05	04	03	02	06 01	06 01
S 10	06 02	06 02	06 03	06 03	06 03	06 04	06 04	04	04	04	04	04	04	04	04	04
20	05 52	05 53	05 55	05 56	05 57	05 58	05 59	06 00	06 01	02	03	04	05	06	06	07
S 30	05 41	05 43	05 45	05 48	05 50	05 52	05 54	05 56	05 58	06 00	06 02	06 04	06 05	06 07	06 09	06 11
35	34	37	40	43	46	48	51	53	56	05 59	01	04	06	08	11	13
40	27	30	34	37	41	44	47	51	54	57	06 00	03	06	09	12	16
45	18	22	27	31	35	39	43	47	51	55	05 59	03	07	11	14	18
50	07	13	18	23	28	33	38	43	48	53	58	03	07	12	17	21
S 52	05 02	05 08	05 14	05 19	05 25	05 31	05 36	05 41	05 47	05 52	05 57	06 02	06 08	06 13	06 18	06 23
54	04 57	05 03	09	15	21	27	33	39	45	51	57	02	08	13	19	25
56	51	04 58	05 04	11	18	24	31	37	43	50	56	02	08	14	20	26
58	44	51	04 59	06	13	20	27	34	41	48	55	02	08	15	22	28
S 60	04 36	04 45	04 53	05 01	05 08	05 16	05 24	05 31	05 39	05 46	05 54	06 01	06 09	06 16	06 23	06 30

SUNSET

Lat.	February					March										Apr.
	16	19	22	25	28	3	6	9	12	15	18	21	24	27	30	2
N 72	15 39	15 56	16 12	16 28	16 43	16 57	17 12	17 26	17 40	17 54	18 08	18 22	18 35	18 49	19 03	19 17
70	15 39	16 13	27	40	16 53	17 06	19	31	44	56	08	20	32	45	18 57	09
68	16 14	26	38	50	17 01	13	24	35	46	57	08	19	30	41	52	19 03
66	26	37	47	16 58	08	19	29	39	49	17 59	08	18	28	38	47	18 57
64	36	46	16 56	17 05	14	23	33	42	51	18 00	09	17	26	35	44	53
62	45	16 54	17 02	11	19	28	36	44	52	01	09	17	25	33	41	49
N 60	16 52	17 00	17 08	17 16	17 24	17 31	17 39	17 46	17 54	18 01	18 09	18 16	18 23	18 30	18 38	18 45
58	16 59	06	13	20	27	34	41	48	55	02	09	15	22	29	35	42
56	17 05	12	18	25	31	37	44	50	56	03	09	15	21	27	33	39
54	10	16	22	28	34	40	46	52	57	03	09	14	20	26	31	37
52	15	21	26	32	37	42	48	53	17 58	04	09	14	19	24	30	35
N 50	17 19	17 24	17 29	17 35	17 40	17 45	17 50	17 55	18 00	18 04	18 09	18 14	18 19	18 23	18 28	18 33
45	29	33	37	41	45	49	54	17 58	01	05	09	13	17	21	25	28
40	36	40	43	47	50	53	17 57	18 00	03	06	09	12	16	19	22	25
35	43	46	49	52	54	17 57	18 00	02	05	07	10	12	14	17	19	22
30	17 49	17 52	17 54	17 56	17 58	18 00	02	04	06	08	10	12	14	15	17	19
N 20	18 00	18 01	18 02	18 03	18 05	18 06	18 07	18 08	18 09	18 10	18 10	18 11	18 12	18 13	18 14	18 14
N 10	09	09	10	10	10	11	11	11	11	11	11	11	11	11	11	10
0	18	17	17	17	16	15	15	14	13	12	11	11	10	09	08	07
S 10	26	25	24	23	22	20	19	17	16	14	12	10	09	07	05	03
20	36	34	32	30	28	26	23	21	18	16	13	10	08	05	03	18 00
S 30	18 47	18 44	18 41	18 38	18 35	18 32	18 28	18 25	18 21	18 18	18 14	18 10	18 07	18 03	18 00	17 56
35	18 53	50	47	43	39	35	31	27	23	19	15	11	06	02	17 58	54
40	19 01	18 57	18 53	48	44	39	35	30	25	20	16	11	06	01	56	51
45	09	19 05	19 00	18 55	49	44	39	33	28	22	17	11	05	18 00	54	49
50	20	14	08	19 02	56	50	44	37	31	24	18	11	05	17 58	52	45
S 52	19 25	19 18	19 12	19 06	18 59	18 53	18 46	18 39	18 32	18 25	18 18	18 11	18 04	17 57	17 51	17 44
54	30	23	16	10	19 03	55	48	41	34	26	19	11	04	57	49	42
56	36	29	21	14	06	18 59	51	43	35	27	19	12	04	56	48	40
58	43	35	27	19	11	19 02	54	46	37	29	20	12	03	55	46	38
S 60	19 50	19 42	19 33	19 24	19 15	19 06	18 57	18 48	18 39	18 30	18 21	18 12	18 03	17 54	17 45	17 36

200
MORNING CIVIL TWILIGHT

Lat.	February					March										Apr.
	16	19	22	25	28	3	6	9	12	15	18	21	24	27	30	2
N 72	07 32	07 18	07 04	06 50	06 35	06 20	06 06	05 51	05 35	05 20	05 04	04 48	04 31	04 14	03 57	03 38
70	23	10	06 58	45	32	19	05	52	38	24	10	04 56	41	26	04 11	03 55
68	15	07 04	52	41	29	17	05	53	41	28	15	05 02	49	36	04 08	04 08
66	08	06 58	48	37	27	16	05	54	42	31	19	08	04 56	44	31	19
64	07 02	53	44	34	25	15	05	54	44	33	23	12	05 01	50	39	27
62	06 57	49	41	32	23	14	04	55	45	36	26	16	06	04 56	45	35
N 60	06 53	06 45	06 38	06 29	06 21	06 13	06 04	05 55	05 46	05 37	05 28	05 19	05 10	05 00	04 51	04 41
58	49	42	35	27	19	12	04	55	47	39	30	22	13	04	04 56	47
56	43	39	32	25	18	10	03	55	48	40	32	24	16	08	05 00	51
54	42	36	30	23	17	10	03	55	48	41	33	26	18	11	03	56
52	39	34	28	22	15	09	02	56	49	42	35	28	21	14	07	04 59
N 50	06 36	06 31	06 25	06 20	06 14	06 08	06 02	05 56	05 49	05 43	05 36	05 30	05 23	05 16	05 10	05 03
45	30	25	21	16	11	06	06 01	55	50	44	39	33	27	22	16	10
40	24	21	17	13	08	04	05 59	55	50	46	41	36	31	26	21	16
35	20	16	13	10	06	02	58	54	50	46	42	38	34	29	25	21
30	15	12	10	07	06 04	06 00	57	54	50	47	43	39	36	32	28	25
N 20	06 06	06 05	06 03	06 01	05 59	05 56	05 54	05 52	05 49	05 47	05 44	05 42	05 39	05 37	05 34	05 31
N 10	05 58	05 57	05 56	05 55	54	53	51	50	48	46	45	43	41	40	38	36
0	50	49	49	49	48	48	47	47	46	45	44	43	42	42	41	40
S 10	40	41	41	42	42	42	43	43	43	43	43	43	43	43	43	43
20	29	31	32	34	35	36	37	38	39	40	41	42	43	44	44	45
S 30	05 16	05 18	05 21	05 23	05 26	05 28	05 30	05 32	05 34	05 36	05 38	05 40	05 42	05 44	05 45	05 47
35	05 08	11	14	17	20	23	25	28	31	33	36	38	41	43	45	48
40	04 58	05 02	05 06	09	13	16	20	23	26	30	33	36	39	42	45	48
45	46	04 51	04 56	05 00	05 05	09	13	18	22	26	30	34	38	41	45	49
50	32	38	43	04 49	04 54	05 00	05	10	15	21	25	30	35	40	44	49
S 52	04 25	04 31	04 38	04 44	04 50	04 55	05 01	05 07	05 12	05 18	05 23	05 29	05 34	05 39	05 44	05 49
54	17	24	31	38	44	51	04 57	05 03	09	15	21	27	32	38	44	49
56	04 09	16	24	31	38	45	52	04 59	05	12	18	25	31	37	43	49
58	03 59	04 07	15	23	31	39	47	54	05 01	08	15	22	29	36	42	49
S 60	03 47	03 56	04 06	04 15	04 23	04 32	04 40	04 48	04 57	05 04	05 12	05 20	05 27	05 34	05 42	05 49

EVENING CIVIL TWILIGHT

Lat.	February					March										Apr.
	16	19	22	25	28	3	6	9	12	15	18	21	24	27	30	2
N 72	16 58	17 12	17 26	17 39	17 53	18 06	18 20	18 34	18 48	19 02	19 16	19 30	19 45	20 01	20 17	20 34
70	17 07	20	32	44	56	08	20	32	44	18 57	09	22	35	19 48	20 02	16
68	15	26	37	47	17 58	09	20	31	42	53	04	15	27	38	19 50	20 03
66	22	31	41	51	18 00	10	20	30	40	50	19 00	10	20	30	41	19 52
64	27	36	45	54	02	11	20	29	38	47	18 56	05	14	24	33	43
62	32	40	48	56	04	12	20	28	36	45	53	19 01	09	18	26	35
N 60	17 36	17 44	17 51	17 59	18 06	18 13	18 21	18 28	18 35	18 43	18 50	18 58	19 05	19 13	19 21	19 29
58	40	47	54	18 01	07	14	21	28	34	41	48	55	19 02	09	16	23
56	44	50	56	02	09	15	21	27	33	40	46	52	18 58	05	11	17
54	47	53	17 58	04	10	16	21	27	33	38	44	50	56	19 01	07	13
52	50	55	18 01	06	11	16	22	27	32	37	43	48	53	18 58	04	09
N 50	17 53	17 58	18 02	18 07	18 12	18 17	18 22	18 27	18 31	18 36	18 41	18 46	18 51	18 56	19 01	19 06
45	17 59	18 03	07	11	15	19	23	27	31	35	38	42	46	50	18 54	18 58
40	18 04	08	11	14	17	21	24	27	30	33	36	40	43	46	49	52
35	09	12	15	17	20	22	25	27	30	32	35	37	40	42	45	47
30	14	16	18	20	22	24	26	28	30	32	34	36	37	39	41	43
N 20	18 22	18 23	18 25	18 26	18 27	18 28	18 29	18 30	18 31	18 32	18 32	18 33	18 34	18 35	18 36	18 37
N 10	30	31	31	31	32	32	32	32	32	32	32	32	32	32	32	32
0	39	38	38	37	37	36	36	35	34	33	32	31	30	30	29	28
S 10	48	47	46	44	43	41	40	38	37	35	33	32	30	28	26	25
20	18 59	18 57	18 55	18 52	50	48	45	43	40	38	35	32	30	27	25	22
S 30	19 12	19 09	19 06	19 03	18 59	18 56	18 52	18 49	18 45	18 42	18 38	18 34	18 31	18 27	18 23	18 20
35	20	16	13	09	19 05	19 01	18 57	53	49	44	40	36	32	27	23	19
40	29	25	21	16	12	07	19 02	18 57	52	48	43	38	33	28	23	18
45	41	36	30	25	20	14	08	19 03	18 57	51	46	40	34	29	23	18
50	19 55	49	42	36	30	23	17	10	19 03	57	50	43	37	30	24	17
S 52	20 02	19 55	19 48	19 41	19 34	19 27	19 20	19 13	19 06	18 59	18 52	18 45	18 38	18 31	18 24	18 17
54	09	20 02	19 55	47	40	32	24	17	09	19 02	54	47	39	32	24	17
56	18	10	20 02	19 54	46	38	29	21	13	05	18 57	49	41	33	25	17
58	28	19	10	20 01	19 52	44	35	26	17	08	19 00	51	42	34	26	17
S 60	20 39	20 29	20 19	20 10	20 00	19 50	19 41	19 31	19 22	19 12	19 03	18 54	18 44	18 35	18 26	18 17

SUNRISE

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Lat.	April										May					
	2	5	8	11	14	17	20	23	26	29	2	5	8	11	14	17
N 72	04 53	04 38	04 21	04 05	03 48	03 30	03 12	02 54	02 34	02 12	01 48	01 19	00 36	00 00	00 00	00 00
70	05 01	47	33	18	04 03	03 49	33	03 18	03 02	02 45	02 28	02 10	01 50	01 27	00 59	00 00
68	07	04 55	42	29	16	04 03	03 50	36	23	03 09	02 55	02 41	02 26	02 11	01 55	01 38
66	13	05 01	49	38	26	14	04 03	03 51	39	27	03 16	03 04	02 52	02 40	02 28	02 16
64	17	06	04 56	45	35	24	13	04 03	03 52	42	32	22	03 12	03 02	02 52	02 42
62	21	11	05 01	52	42	32	23	13	04 04	03 54	45	36	27	19	03 11	03 02
N 60	05 24	05 15	05 06	04 57	04 48	04 39	04 30	04 22	04 13	04 05	03 57	03 49	03 41	03 33	03 26	03 19
58	27	18	10	05 02	53	45	37	29	22	14	04 07	03 59	03 52	45	39	33
56	29	22	14	06	04 58	51	43	36	29	22	15	04 08	04 02	03 56	03 50	44
54	32	24	17	10	05 03	04 56	49	42	35	29	23	17	11	04 05	04 00	03 55
52	34	27	20	13	07	05 00	54	47	41	35	29	24	18	13	08	04 04
N 50	05 36	05 29	05 23	05 17	05 10	05 04	04 58	04 52	04 47	04 41	04 36	04 30	04 25	04 21	04 16	04 12
45	40	34	29	23	18	13	05 08	05 03	04 58	04 53	04 49	44	40	36	33	29
40	43	39	34	29	25	20	16	11	05 07	05 03	05 00	04 56	04 52	04 49	46	43
35	46	42	38	34	30	26	22	19	15	12	09	05 06	05 03	05 00	04 58	04 55
30	49	45	42	38	35	32	28	25	22	19	17	14	12	10	05 08	05 06
N 20	05 53	05 51	05 48	05 46	05 43	05 41	05 38	05 36	05 34	05 32	05 30	05 29	05 27	05 26	05 25	05 23
N 10	05 57	05 55	54	52	50	49	47	46	45	44	43	42	41	40	39	39
0	06 01	06 00	05 59	05 58	05 57	05 56	05 56	05 55	05 55	05 54	05 54	05 53	05 53	05 53	05 53	05 53
S 10	04	04	06 04	06 04	06 04	06 04	06 04	06 04	06 04	06 04	06 05	06 05	06 05	06 06	06 06	06 07
20	07	08	09	09	10	11	12	13	14	15	16	17	18	19	20	22
S 30	06 11	06 13	06 14	06 16	06 18	06 20	06 22	06 24	06 25	06 27	06 29	06 31	06 33	06 35	06 37	06 39
35	13	16	18	20	23	25	27	30	32	34	37	39	41	44	46	06 48
40	16	19	22	25	28	30	33	36	39	42	45	48	06 51	06 54	06 57	07 00
45	18	22	26	29	33	37	41	44	48	06 52	06 55	06 59	07 02	07 06	07 09	13
50	21	26	31	35	40	45	49	54	06 58	07 03	07 07	07 12	16	20	25	29
S 52	06 23	06 28	06 33	06 38	06 43	06 48	06 53	06 58	07 03	07 08	07 13	07 18	07 23	07 27	07 32	07 36
54	25	30	36	41	46	52	06 57	07 03	08	14	19	24	29	35	40	44
56	26	32	38	44	50	06 56	07 02	08	14	20	26	32	37	43	48	07 54
58	28	35	41	48	54	07 01	08	14	21	27	33	40	46	07 52	07 58	08 04
S 60	06 30	06 37	06 45	06 52	06 59	07 06	07 13	07 21	07 28	07 35	07 42	07 49	07 56	08 03	08 10	08 16

SUNSET

Lat.	April										May					
	2	5	8	11	14	17	20	23	26	29	2	5	8	11	14	17
N 72	19 17	19 32	19 46	20 01	20 17	20 33	20 50	21 08	21 27	21 49	22 13	22 44	23 52	00 00	00 00	00 00
70	09	22	35	19 48	20 01	14	28	20 43	20 58	21 14	21 31	21 49	22 09	22 33	23 04	22 00
68	19 03	14	25	36	19 48	20 00	20 12	24	36	20 49	21 03	21 16	21 51	21 46	22 02	22 20
66	18 57	07	17	27	38	19 48	19 58	20 09	19	30	20 41	20 53	21 04	21 16	21 28	21 40
64	53	19 02	11	20	29	38	47	19 56	20 06	15	25	34	20 44	20 54	21 03	21 13
62	49	18 57	05	13	21	29	38	46	19 54	20 03	20 11	19	28	36	20 44	20 52
N 60	18 45	18 52	19 00	19 07	19 14	19 22	19 29	19 37	19 44	19 52	19 59	20 07	20 14	20 21	20 28	20 35
58	42	49	18 55	19 02	09	15	22	29	36	42	49	19 56	20 02	20 09	15	21
56	39	45	51	18 58	19 04	10	16	22	28	34	40	46	19 52	19 58	20 04	20 09
54	37	42	48	54	18 59	05	10	16	22	27	33	38	43	49	19 54	19 59
52	35	40	45	50	55	19 00	05	11	16	21	26	31	36	40	45	50
N 50	18 33	18 37	18 42	18 47	18 51	18 56	19 01	19 06	19 10	19 15	19 19	19 24	19 29	19 33	19 37	19 41
45	28	32	36	40	44	47	18 51	18 55	18 59	19 02	19 06	19 10	13	17	21	24
40	25	28	31	34	37	40	43	46	49	18 52	18 55	18 58	19 01	19 04	19 07	19 10
35	22	24	27	29	31	34	36	38	41	43	46	48	18 51	18 53	18 55	18 58
30	19	21	23	24	26	28	30	32	34	36	38	40	42	43	45	47
N 20	18 14	18 15	18 16	18 17	18 18	18 19	18 20	18 21	18 22	18 23	18 24	18 25	18 26	18 27	18 28	18 30
N 10	10	10	10	10	10	11	11	11	11	11	12	12	13	13	14	14
0	07	06	05	18 04	18 04	18 03	18 02	18 02	18 01	18 01	18 00	18 00	18 00	18 00	18 00	18 00
S 10	03	18 02	18 00	17 59	17 57	17 56	17 54	17 53	17 52	17 50	17 49	17 48	17 48	17 47	17 46	17 46
20	18 00	17 58	17 55	53	50	48	46	43	41	40	38	36	35	33	32	31
S 30	17 56	17 53	17 49	17 46	17 42	17 39	17 36	17 33	17 30	17 27	17 24	17 22	17 20	17 18	17 16	17 14
35	54	50	46	42	38	34	30	27	23	20	17	14	11	17 08	17 06	17 04
40	51	47	42	37	33	28	24	20	16	12	17 08	17 05	17 01	16 58	16 56	16 53
45	49	43	38	32	27	22	17	12	17 07	17 02	16 58	16 54	16 50	46	43	40
50	45	39	32	26	20	14	08	17 02	16 57	16 51	46	41	36	32	27	23
S 52	17 44	17 37	17 30	17 23	17 17	17 10	17 04	16 58	16 52	16 46	16 40	16 35	16 30	16 25	16 20	16 16
54	42	35	27	20	13	06	17 00	53	47	40	34	28	23	17	12	16 08
56	40	32	25	17	10	17 02	16 55	48	41	34	27	21	15	09	16 04	15 58
58	38	30	22	13	05	16 57	50	42	34	27	20	13	16 06	16 00	15 54	48
S 60	17 36	17 27	17 18	17 09	17 01	16 52	16 43	16 35	16 27	16 19	16 11	16 03	15 56	15 49	15 42	15 36

MORNING CIVIL TWILIGHT

Lat.	April										May					
	2	5	8	11	14	17	20	23	26	29	2	5	8	11	14	17
N 72	03 38	03 19	02 59	02 36	02 12	01 43	01 04									
70	03 55	39	03 21	03 04	02 45	02 24	02 01	01 35	01 00							
68	04 08	03 54	39	24	03 08	02 51	34	02 15	01 55	01 31	01 01					
66	19	04 06	03 53	40	26	03 12	02 58	02 43	02 27	02 10	01 52	01 32	01 08	00 33		
64	27	16	04 04	03 52	41	28	03 16	03 03	02 50	37	02 23	02 08	01 53	01 37	01 18	00 57
62	35	24	14	04 03	03 52	41	30	19	03 08	02 57	02 45	34	02 22	02 10	01 57	01 45
N 60	04 41	04 32	04 22	04 12	04 02	03 53	03 43	03 33	03 23	03 13	03 03	02 54	02 44	02 34	02 24	02 14
58	47	38	29	20	11	04 02	03 53	44	36	27	18	03 09	03 01	02 53	02 44	02 36
56	51	43	35	27	19	10	04 02	03 54	46	38	30	23	15	03 08	03 01	02 54
54	56	48	40	33	25	18	10	04 03	03 55	48	41	34	28	21	15	03 09
52	04 59	52	45	38	31	24	17	10	04 04	03 57	51	44	38	32	27	21
N 50	05 03	04 56	04 50	04 43	04 36	04 30	04 23	04 17	04 11	04 05	03 59	03 53	03 48	03 42	03 37	03 32
45	10	05 05	04 59	04 53	48	42	37	31	26	21	04 16	04 12	04 07	04 03	03 59	03 55
40	16	11	05 06	05 01	04 57	04 52	47	43	39	34	30	26	23	19	04 16	04 13
35	21	17	12	08	05 04	05 00	45	41	37	34	30	26	23	19	04 16	04 13
30	25	21	18	14	10	07	05 04	05 00	04 57	04 54	04 51	04 49	04 46	04 44	04 42	04 39
N 20	05 31	05 29	05 26	05 23	05 21	05 18	05 16	05 14	05 12	05 09	05 07	05 06	05 04	05 02	05 01	05 00
N 10	36	34	32	31	29	27	26	24	23	22	21	20	19	18	17	16
0	40	39	38	37	36	35	34	34	33	33	32	32	31	31	31	31
S 10	43	43	43	42	42	42	42	42	42	43	43	43	43	44	44	44
20	45	46	47	47	48	49	50	51	05 51	05 52	05 53	05 54	05 55	05 56	05 57	05 58
S 30	05 47	05 49	05 51	05 52	05 54	05 56	05 57	05 59	06 01	06 03	06 04	06 06	06 08	06 10	06 11	06 13
35	48	50	52	55	05 57	05 59	06 01	06 04	06	08	10	13	15	17	19	21
40	48	51	54	05 57	06 00	06 03	06	09	11	14	17	20	23	25	28	30
45	49	52	56	06 00	03	07	11	14	18	21	25	28	31	34	38	41
50	49	54	58	03	07	12	16	20	25	29	33	37	41	45	49	53
S 52	05 49	05 54	05 59	06 04	06 09	06 14	06 18	06 23	06 28	06 32	06 37	06 41	06 46	06 50	06 54	06 58
54	49	55	06 00	05	11	16	21	26	31	36	41	46	51	06 55	07 00	07 04
56	49	55	01	07	12	18	24	29	35	40	46	51	06 56	07 01	06	11
58	49	55	02	08	14	21	27	33	39	45	51	06 56	07 02	08	13	18
S 60	05 49	05 56	06 03	06 10	06 17	06 23	06 30	06 37	06 43	06 50	06 56	07 03	07 09	07 15	07 21	07 26

EVENING CIVIL TWILIGHT

Lat.	April										May					
	2	5	8	11	14	17	20	23	26	29	2	5	8	11	14	17
N 72	20 34	20 52	21 11	21 32	21 57	22 27	23 11									
70	16	31	20 47	21 03	21 21	21 41	22 04	22 31	23 11							
68	20 03	16	29	20 43	20 57	21 12	21 29	21 47	22 07	22 32	23 05					
66	19 52	20 03	14	26	38	20 51	21 04	21 18	21 33	21 50	22 07	22 28	22 54	23 41		
64	43	19 53	20 03	13	23	34	20 45	20 57	21 09	22 21	21 35	21 49	22 04	22 21	22 40	23 05
62	35	44	19 53	20 02	11	20	30	40	20 50	21 01	21 12	23	21 34	21 46	21 59	22 12
N 60	19 29	19 36	19 44	19 52	20 01	20 09	20 18	20 26	20 35	20 44	20 53	21 03	21 12	21 22	21 31	21 41
58	23	30	37	44	19 52	19 59	20 07	15	22	30	38	20 46	20 54	21 02	21 10	18
56	17	24	31	37	44	51	19 57	20 04	11	18	25	32	39	20 47	20 53	21 00
54	13	19	25	31	37	43	49	19 56	20 02	20 08	14	21	27	33	39	20 45
52	09	15	20	25	31	37	42	48	19 53	19 59	20 05	10	16	22	27	32
N 50	19 06	19 10	19 15	19 20	19 26	19 31	19 36	19 41	19 46	19 51	19 56	20 01	20 07	20 12	20 16	20 21
45	18 58	19 02	19 06	10	14	18	22	26	30	35	39	19 43	19 47	19 51	19 55	19 58
40	52	18 56	18 59	19 02	19 05	08	11	15	18	21	25	28	31	34	37	41
35	47	50	52	18 55	18 57	19 00	19 02	19 05	19 08	10	13	16	18	21	23	26
30	43	45	47	49	51	18 53	18 55	18 57	18 59	19 01	19 03	19 05	19 07	19 09	19 11	19 13
N 20	18 37	18 37	18 38	18 39	18 40	18 41	18 42	18 43	18 44	18 46	18 47	18 48	18 49	18 51	18 52	18 53
N 10	32	32	32	32	32	32	32	32	33	33	33	34	35	35	36	37
0	28	27	26	25	25	24	23	23	23	22	22	22	22	22	22	22
S 10	25	23	21	20	18	17	16	14	13	12	11	18 10	18 09	18 09	18 08	18 08
20	22	19	17	15	12	10	08	18 06	18 04	18 02	18 00	17 59	17 57	17 56	17 55	17 54
S 30	18 20	18 16	18 13	18 10	18 06	18 03	18 00	17 57	17 54	17 52	17 49	17 47	17 45	17 43	17 41	17 39
35	19	15	11	07	03	18 00	17 56	53	49	46	43	40	38	35	33	31
40	18	14	09	04	18 00	17 56	52	48	44	40	37	33	30	27	24	22
45	18	12	07	18 02	17 56	52	47	42	37	33	29	25	21	18	15	12
50	17	11	05	17 59	53	47	41	36	30	25	20	16	11	07	17 03	17 00
S 52	18 17	18 11	18 04	17 57	17 51	17 45	17 39	17 33	17 27	17 22	17 16	17 11	17 07	17 02	16 58	16 54
54	17	10	03	56	49	43	36	30	24	18	12	07	17 01	16 57	52	48
56	17	10	02	55	47	40	33	26	20	14	07	17 02	16 56	51	46	41
58	17	09	01	53	45	38	30	23	16	09	17 02	16 56	50	44	39	34
S 60	18 17	18 09	18 00	17 51	17 43	17 35	17 27	17 19	17 11	17 04	16 57	16 50	16 43	16 37	16 31	16 26

SUNRISE

Lat.	May					June											July
	17	20	23	26	29	1	4	7	10	13	16	19	22	25	28	1	
N 72°	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	
70	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	
68	01 38	01 20	00 58	00 25	□	□	□	□	□	□	□	□	□	□	□	□	
66	02 16	02 04	01 52	01 39	01 27	01 14	01 01	00 47	00 31	□	□	□	□	□	□	00 13	
64	02 42	33	02 24	02 15	02 07	01 59	01 52	01 45	01 40	01 36	01 33	01 31	01 31	01 32	01 35	01 40	
62	03 02	02 55	02 47	02 40	34	02 28	02 23	02 18	02 14	02 12	02 10	02 09	02 09	02 10	02 13	02 16	
N 60	03 19	03 12	03 06	03 00	02 55	02 50	02 46	02 42	02 39	02 37	02 36	02 36	02 36	02 37	02 39	02 42	
58	33	27	21	16	03 12	03 08	03 04	03 01	02 59	02 57	02 56	02 56	02 56	02 57	02 59	03 01	
56	44	39	34	30	26	23	20	17	03 15	03 14	03 13	03 13	03 13	03 14	03 16	18	
54	03 55	03 50	46	42	38	35	33	30	29	28	27	27	27	28	30	32	
52	04 04	04 00	03 56	03 52	49	46	44	42	41	40	39	39	40	41	42	44	
N 50	04 12	04 08	04 05	04 02	03 59	03 56	03 54	03 52	03 51	03 50	03 50	03 50	03 51	03 51	03 53	03 54	
45	29	26	23	21	04 19	04 17	04 15	04 14	04 13	04 13	04 13	04 13	04 13	04 14	04 15	04 17	
40	43	41	39	37	35	33	32	31	31	30	30	31	31	32	33	34	
35	04 55	04 53	04 51	04 50	04 48	47	46	46	45	45	45	46	46	04 47	04 48	04 49	
30	05 06	05 04	05 03	05 01	05 00	04 59	04 59	04 58	04 58	04 58	04 58	04 59	04 59	05 00	05 01	05 02	
N 20	05 23	05 22	05 22	05 21	05 20	05 20	05 20	05 20	05 20	05 20	05 20	05 21	05 22	05 22	05 23	05 24	
N 10	39	38	38	38	38	38	38	38	38	39	39	40	40	41	42	05 43	
0	05 53	05 53	05 53	05 53	05 54	05 54	05 55	05 55	05 56	05 56	05 57	05 57	05 58	05 59	05 59	06 00	
S 10	06 07	06 07	06 08	06 09	06 10	06 10	06 11	06 12	06 13	06 13	06 14	06 15	06 16	06 16	06 17	17	
20	22	23	24	25	26	28	29	30	31	32	33	33	34	35	35	35	
S 30	06 39	06 40	06 42	06 44	06 46	06 47	06 49	06 50	06 52	06 53	06 54	06 55	06 55	06 56	06 56	06 56	
35	06 48	06 51	06 53	06 55	06 57	06 59	07 01	07 02	07 04	07 05	07 06	07 07	07 08	07 08	07 09	07 08	
40	07 00	07 02	07 05	07 07	07 10	07 12	14	16	17	19	20	21	22	22	23	23	
45	13	16	19	22	25	27	30	32	34	36	37	38	07 39	07 39	07 39	39	
50	29	33	36	40	43	46	49	07 52	07 54	07 56	07 58	07 59	08 00	08 00	08 00	07 59	
S 52	07 36	07 40	07 45	07 48	07 52	07 55	07 59	08 01	08 04	08 06	08 08	08 09	08 10	08 10	08 10	08 09	
54	44	49	07 54	07 58	08 02	08 06	08 09	12	15	17	19	20	21	21	21	20	
56	07 54	07 59	08 04	08 08	13	17	21	24	27	29	31	33	33	34	33	33	
58	08 04	08 10	16	21	26	30	34	38	41	08 44	08 46	08 47	08 48	08 48	08 48	08 47	
S 60	08 16	08 23	08 29	08 35	08 40	08 46	08 50	08 54	08 58	09 01	09 03	09 05	09 06	09 06	09 05	09 04	

SUNSET

Lat.	May					June											July
	17	20	23	26	29	1	4	7	10	13	16	19	22	25	28	1	
N 72°	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	
70	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	
68	22 20	22 39	23 03	□	□	□	□	□	□	□	□	□	□	□	□	□	
66	21 40	21 52	22 05	22 18	22 31	22 45	22 59	23 15	23 33	□	□	□	□	□	□	23 44	
64	21 13	22	21 32	21 41	21 50	21 58	22 06	22 14	22 20	22 25	22 29	22 32	22 32	22 32	22 29	22 26	
62	20 52	21 00	21 08	21 15	22	29	21 35	21 40	21 45	21 49	21 51	21 53	21 54	21 54	21 53	21 50	
N 60	20 35	20 42	20 49	20 55	21 01	21 07	21 12	21 16	21 20	21 23	21 25	21 27	21 28	21 28	21 27	21 25	
58	21	27	33	39	20 44	20 49	20 53	20 57	21 00	21 03	21 05	21 06	21 07	21 07	21 07	21 05	
56	20 09	15	20	25	29	34	38	41	20 44	20 46	20 48	20 50	20 50	20 51	20 50	20 49	
54	19 59	20 04	20 08	13	17	21	24	27	30	32	34	35	36	36	36	35	
52	50	19 54	19 58	20 02	20 06	10	13	16	18	20	22	23	24	24	24	23	
N 50	19 41	19 45	19 49	19 53	19 57	20 00	20 03	20 05	20 08	20 10	20 11	20 12	20 13	20 13	20 13	20 12	
45	24	27	30	33	36	19 39	19 41	19 44	19 46	19 47	19 49	19 50	19 50	19 51	19 51	19 50	
40	19 10	12	15	18	20	22	24	26	28	29	31	32	32	33	33	33	
35	18 58	19 00	19 02	19 04	19 06	19 08	19 10	19 12	13	15	16	17	17	18	18	18	
30	47	18 49	18 51	18 53	18 55	18 56	18 58	18 59	19 00	19 02	19 03	19 03	19 04	19 05	19 05	19 05	
N 20	18 30	18 31	18 32	18 33	18 34	18 36	18 37	18 38	18 39	18 40	18 41	18 41	18 42	18 43	18 43	18 43	
N 10	14	15	16	16	17	18	19	19	20	21	22	22	23	24	24	25	
0	18 00	18 00	18 00	18 01	18 01	18 01	18 02	18 02	18 03	18 03	18 04	18 05	18 05	18 06	18 07	18 07	
S 10	17 46	17 45	17 45	17 45	17 45	17 45	17 45	17 46	17 46	17 46	17 47	17 47	17 48	17 49	17 49	17 50	
20	31	30	29	28	28	28	28	28	28	28	28	29	30	30	31	32	
S 30	17 14	17 12	17 11	17 10	17 09	17 08	17 07	17 07	17 07	17 07	17 07	17 08	17 08	17 09	17 10	17 11	
35	17 04	17 02	17 00	16 59	16 57	16 56	16 56	16 55	16 55	16 55	16 55	16 55	16 56	16 57	16 58	16 59	
40	16 53	16 50	16 48	46	45	43	42	41	41	41	41	42	42	42	44	45	
45	40	37	34	32	30	28	27	25	25	24	24	24	25	26	27	28	
50	23	20	17	14	11	09	16 07	16 05	16 04	16 04	16 03	16 03	16 04	16 05	16 06	16 08	
S 52	16 16	16 12	16 08	16 05	16 02	16 00	15 57	15 56	15 55	15 54	15 53	15 53	15 54	15 55	15 56	15 58	
54	16 08	16 03	15 59	15 56	15 52	15 49	47	45	44	43	42	42	43	44	45	47	
56	15 58	15 53	49	45	41	38	35	33	31	30	30	30	31	31	33	35	
58	48	42	37	33	29	25	22	19	17	15 16	15 15	15 15	15 16	15 17	18	21	
S 60	15 36	15 29	15 24	15 18	15 14	15 09	15 06	15 03	15 00	14 59	14 58	14 57	14 58	14 59	15 01	15 04	

MORNING CIVIL TWILIGHT

Lat.	May					June												July
	17	20	23	26	29	1	4	7	10	13	16	19	22	25	28	1		
N 72	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	
70																		
68																		
66																		
64	00 57	00 23																
62	01 45	01 31	01 17	01 01	00 42	00 10												
N 60	02 14	02 05	01 55	01 45	01 36	01 27	01 19	01 11	01 03	00 57	00 52	00 49	00 49	00 51	00 55	01 02	01 02	
58	36	29	02 21	02 14	02 07	02 01	01 55	01 50	01 46	01 43	01 41	01 40	01 40	01 42	01 44	01 48	01 48	
56	02 54	02 47	41	35	30	25	02 21	02 17	02 14	02 12	02 11	02 10	02 10	02 12	02 14	02 16	02 16	
54	03 09	03 03	02 58	02 53	02 48	02 44	41	38	36	34	33	32	33	34	36	38	38	
52	21	16	03 12	03 07	03 03	03 00	02 57	02 55	02 53	02 51	02 51	02 50	02 51	02 52	02 53	02 56	02 56	
N 50	03 32	03 28	03 24	03 20	03 17	03 13	03 11	03 09	03 07	03 06	03 06	03 06	03 06	03 06	03 07	03 08	03 10	
45	03 55	03 51	03 48	03 45	03 43	03 41	03 39	37	36	35	35	35	36	37	03 38	03 39	03 39	
40	04 13	04 10	04 07	04 05	04 03	04 01	04 00	03 59	03 58	03 58	03 58	03 58	03 58	03 59	04 00	04 02	04 02	
35	27	25	23	21	19	18	17	04 16	04 16	04 16	04 16	04 16	04 17	04 17	18	20	20	
30	04 39	38	36	35	33	32	32	31	31	31	31	31	31	31	33	34	35	
N 20	05 00	04 59	04 58	04 57	04 56	04 56	04 55	04 55	04 55	04 55	04 56	04 56	04 56	04 57	04 58	04 59	04 59	
N 10	16	05 16	05 15	05 15	05 15	05 15	05 15	05 15	05 15	05 16	05 16	05 17	05 17	05 18	05 19	05 20	05 20	
0	31	31	31	31	31	32	32	33	33	34	34	35	36	36	37	38	38	
S 10	44	45	05 46	05 46	05 47	05 48	05 48	05 49	05 50	05 51	05 51	05 52	05 53	05 53	05 54	05 54	05 54	
20	05 58	05 59	06 01	06 02	06 03	06 04	06 05	06 06	06 07	06 08	06 09	06 09	06 10	06 11	06 11	06 11	06 11	
S 30	06 13	06 15	06 17	06 18	06 20	06 21	06 23	06 24	06 25	06 26	06 27	06 28	06 29	06 30	06 30	06 30	06 30	
35	21	23	25	27	29	31	33	34	36	37	38	39	40	40	40	41	41	
40	30	33	35	38	40	42	44	46	06 47	06 48	06 50	06 51	06 51	06 52	06 52	06 52	06 52	
45	41	44	06 47	06 49	06 52	06 54	06 57	06 59	07 00	07 02	07 03	07 04	07 05	07 05	07 06	07 06	07 06	
50	53	06 56	07 00	07 03	07 06	07 09	07 11	07 14	16	18	19	20	21	21	21	21	21	
S 52	06 58	07 02	07 06	07 09	07 13	07 16	07 19	07 21	07 23	07 25	07 27	07 28	07 29	07 29	07 29	07 29	07 29	
54	07 04	08	13	16	20	23	26	29	31	33	35	36	37	37	37	37	37	
56	11	15	20	24	28	31	35	37	40	42	44	45	46	46	46	46	46	
58	18	23	28	32	37	41	44	47	07 50	07 52	07 54	07 55	07 56	07 57	07 57	07 57	07 57	
S 60	07 26	07 32	07 37	07 42	07 47	07 51	07 55	07 58	08 01	08 04	08 06	08 07	08 08	08 08	08 08	08 07	08 07	

EVENING CIVIL TWILIGHT

Lat.	May					June												July
	17	20	23	26	29	1	4	7	10	13	16	19	22	25	28	1		
N 72	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	
70																		
68																		
66																		
64	23 05																	
62	22 12	22 26	22 41	22 58	23 20													
N 60	21 41	21 51	22 01	22 11	22 21	22 31	22 40	22 49	22 57	23 04	23 10	23 13	23 14	23 13	23 09	23 03	23 03	
58	18	26	21 34	21 42	21 49	21 56	22 02	22 08	22 13	22 17	22 20	22 22	22 23	22 23	22 21	22 19	22 19	
56	21 00	21 07	21 14	20	26	32	21 37	21 41	21 45	21 48	21 51	21 52	21 53	21 53	21 52	21 50	21 50	
54	20 45	20 51	20 57	21 02	21 07	21 12	17	20	24	26	29	30	31	31	30	29	29	
52	20 21	20 38	43	20 47	20 52	20 56	21 00	21 03	21 06	21 09	21 11	21 12	21 13	21 13	21 12	21 11	21 11	
N 50	20 32	20 26	20 30	20 35	20 39	20 43	20 46	20 49	20 52	20 54	20 56	20 57	20 58	20 58	20 57	20 57	20 57	
45	19 58	20 02	20 06	20 09	20 12	20 15	20 18	20 21	23	25	26	27	28	28	28	28	28	
40	41	19 44	19 46	19 49	19 52	19 54	19 57	19 59	20 01	20 02	20 03	20 04	20 05	20 06	20 06	20 05	20 05	
35	26	28	31	33	35	38	39	41	19 43	19 44	19 45	19 46	19 47	19 47	19 48	19 47	19 47	
30	19 13	19 16	19 18	19 20	19 21	23	25	26	28	29	30	31	32	32	32	32	32	
N 20	18 53	18 55	18 56	18 57	18 59	19 00	19 01	19 02	19 03	19 04	19 05	19 06	19 07	19 07	19 08	19 08	19 08	
N 10	37	37	38	39	40	18 41	18 41	18 42	18 43	18 44	18 45	18 45	18 46	18 47	18 47	18 48	18 48	
0	22	22	22	23	23	24	24	25	25	26	27	27	28	29	29	29	30	
S 10	18 08	18 08	18 07	18 07	18 07	18 08	18 08	18 08	18 09	18 09	18 10	18 10	18 11	18 11	18 11	18 12	18 13	
20	17 54	17 53	17 53	17 52	17 52	17 51	17 51	17 51	17 52	17 52	17 52	17 53	17 53	17 54	17 55	17 56	17 56	
S 30	17 39	17 38	17 37	17 35	17 35	17 34	17 33	17 33	17 33	17 33	17 34	17 34	17 35	17 35	17 36	17 37	17 37	
35	31	29	28	26	25	24	24	23	23	23	23	23	24	25	26	27	27	
40	22	20	18	16	15	13	12	17 12	17 11	17 11	17 11	17 12	17 12	17 13	14	15	15	
45	12	17 09	17 06	17 04	17 02	17 01	17 00	16 59	16 58	16 58	16 58	16 58	16 59	16 59	17 01	17 02	17 02	
50	17 00	16 56	16 53	16 51	16 48	16 46	16 45	43	42	42	42	42	43	44	16 45	16 46	16 46	
S 52	16 54	16 50	16 47	16 44	16 42	16 39	16 38	16 36	16 35	16 35	16 34	16 34	16 35	16 36	16 37	16 39	16 39	
54	48	44	40	37	34	32	30	28	27	26	26	26	27	28	29	31	31	
56	41	37	33	30	26	24	21	20	18	17	17	17	18	19	20	22	22	
58	34	29	25	21	17	14	12	16 10	16 08	16 07	16 07	16 07	16 07	16 09	16 10	12	12	
S 60	16 26	16 20	16 16	16 11	16 07	16 04	16 02	15 59	15 57	15 56	15 55	15 55	15 56	15 57	15 58	16 01	16 01	

STANDARD TIMES (Corrected to June 1976)

LIST I—PLACES EAST ON G.M.T. (mainly those EAST OF GREENWICH)

The times given } added to G.M.T. to give Standard Time.
below should be } subtracted from Standard Time to give G.M.T.

	h	m		h	m
Admiralty Islands	10		Egypt (United Arab Republic)	02	
Afghanistan	04	30	Ellice Islands	12	
Albania*	01		Equatorial Guinea, Republic of	01	
Amirante Islands	04		Estonia	03	
Andaman Islands	05	30	Ethiopia	03	
Angola	01		Fernando Póo†	01	
Annobon Island†	01		Fiji	12	
Arabian Emirates, Federation of	04		Finland	02	
Australia			France†*	01	
Australian Capital Territory*	10		French Territory of the Afars and Issas	03	
New South Wales ¹ *	10		Friendly Islands	13	
Northern Territory	09	30	Gabon	01	
Queensland	10		Germany	01	
South Australia*	09	30	Gibraltar†	01	
Tasmania*	10		Gilbert Islands	12	
Victoria*	10		Greece*	02	
Western Australia	08		Guam	10	
Austria	01		Holland (The Netherlands)	01	
Balearic Islands†*	01		Hong Kong*	08	
Bangladesh	06		Hungary	01	
Belgium	01		India	05	30
Benin (Dahomey)	01		Indonesia, Republic of		
Botswana, Republic of	02		Bali, Bangka, Billiton, Java,		
Brunei	08		Lombok, Madura, Sumatra	07	
Bulgaria	02		Borneo, Celebes, Flores, Sumba,		
Burma	06	30	Sumbawa, Timor	08	
Burundi	02		Aru, Kei, Moluccas, Tanimbar,		
Cambodia (Khmer Republic)	07		Irian Jaya	09	
Cameroun Republic	01		Iran	03	30
Caroline Islands, east of long. E. 160°	12		Iraq	03	
west of long. E. 160°	10		Irish Republic†	01	
Truk, Ponape	11		Israel	02	
Central African Republic	01		Italy*	01	
Chad	01		Japan	09	
Chagos Archipelago	05		Jordan*	02	
Chatham Islands†	12	45	Kamchatka Peninsula	12	
China ²	08		Kenya	03	
Christmas Island, Indian Ocean	07		Khmer Republic (Cambodia)	07	
Cocos Keeling Islands	06	30	Korea	09	
Comoro Islands	03		Kuril Islands	11	
Congo Republic	01		Kuwait	03	
Corsica†	01		Laccadive Islands	05	30
Crete	02		Ladron Islands	10	
Cyprus, North*	02		Laos	07	
Cyprus, South	02		Latvia	03	
Czechoslovakia	01				
Denmark	01				

* Summer time may be kept in these countries.

† Winter time is kept in this country.

‡ The legal time may differ from that given here.

¹ Except Broken Hill Area, which keeps 09^h 30^m.

² All the coast, but some areas may keep summer time.

STANDARD TIMES (Corrected to June 1976)

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LIST I—(continued)

	h	m		h	m
Lebanon*	02		Saudi Arabia...	03	
Lesotho	02		Schouten Islands	09	
Libya†	02		Seychelles	04	
Liechtenstein...	01		Sicily*	01	
Lithuania	03		Singapore	07	30
Lord Howe Island	10	30	Socotra	03	
Luxembourg	01		Solomon Islands	11	
Macao*	08		Somali Republic	03	
Malagasy Republic	03		South Africa, Republic of	02	
Malawi	02		Southern Yemen	03	
Malaysia			South West Africa (Namibia)	02	
Malaya	07	30	Spain‡*	01	
Sabah, Sarawak	08		Spitsbergen (Svalbard)	01	
Maldivo Republic	05		Sri Lanka	05	30
Malta*	01		Sudan, Republic of	02	
Manchuria	09		Swaziland	02	
Mariana Islands	10		Sweden	01	
Marshall Islands ¹	12		Switzerland	01	
Mauritius	04		Syria* (Syrian Arab Republic)	02	
Monaco‡	01		Taiwan	08	
Mozambique	02		Tanzania	03	
Muscat and Oman, Sultanate of	04		Thailand	07	
Namibia (South West Africa)	02		Timor...	08	
Nauru...	11	30	Tonga Islands	13	
Netherlands, The	01		Truk	11	
New Caledonia	11		Tunisia	01	
New Hebrides	11		Turkey*	02	
New Zealand*	12		Tuvahu Islands	12	
Nicobar Islands	05	30	Uganda	03	
Niger	01		Union of Soviet Socialist Republics ²		
Nigeria, Republic of	01		west of long. E. 40°	03	
Norfolk Island	11	30	long. E. 40° to E. 52° 30'	04	
Norway	01		long. E. 52° 30' to E. 67° 30'	05	
Novaya Zemlya	05		long. E. 67° 30' to E. 82° 30'	06	
Ocean Island	11	30	long. E. 82° 30' to E. 97° 30'	07	
Okinawa	09		long. E. 97° 30' to E. 112° 30'	08	
Pakistan	05		long. E. 112° 30' to E. 127° 30'...	09	
Papua New Guinea	10		long. E. 127° 30' to E. 142° 30'...	10	
Pescadores Islands	08		long. E. 142° 30' to E. 157° 30'...	11	
Philippine Republic...	08		long. E. 157° 30' to E. 172° 30'...	12	
Poland	01		east of long. E. 172° 30' ...	13	
Portugal	01		Vietnam, Northern	07	
Réunion	04		Southern‡	07	
Rhodesia, Republic of	02		Wrangell Island	13	
Romania	02		Yugoslavia	01	
Rwanda	02		Zaire		
Ryukyu Islands	09		Kinshasa, Mbandaka	01	
Sakhalin	11		Orientale, Kivu, Katanga, Kasai	02	
Santa Cruz Islands	11		Zambia, Republic of	02	
Sardinia	01				

* Summer time may be kept in these countries.

† The legal time may differ from that given here.

¹ Except the islands of Kwajalein and Eniwetok which keep a time 24^h slow on that of the rest of the islands.² The boundaries between the zones are irregular; the longitudes given are approximate only.

STANDARD TIMES (Corrected to June 1976)

LIST II—PLACES NORMALLY KEEPING G.M.T.

Algeria	Ghana	Ivory Coast	Principe	Tangier
Ascension Island	Great Britain ¹	Liberia	Rio de Oro [‡]	Togo Republic
Canary Islands [‡] *	Guinea Republic	Madeira	St. Helena	Tristan da Cunha
Channel Islands ¹	Iceland	Mali	São Tomé	Upper Volta
Faeroes, The	Ifni	Mauritania	Senegal	Western Sahara
Gambia	Ireland, Northern ¹	Morocco*	Sierra Leone	(Moroccan Sector) [‡] *

* Summer time may be kept in these countries.

‡ The legal standard time may differ from that given here.

¹ Summer time, one hour in advance of G.M.T., is kept from March 19^d 02^h to October 29^d 02^h G.M.T.

LIST III—PLACES SLOW ON G.M.T. (WEST OF GREENWICH)

The times given } subtracted from G.M.T. to give Standard Time.
below should be } added to Standard Time to give G.M.T.

	h	m		h	m
Argentina [‡]	03		Cayman Islands	05	
Austral Islands ¹	10		Chile*	04	
Azores	01		Christmas Island, Pacific Ocean	10	
Bahamas*	05		Colombia	05	
Barbados	04		Cook Islands, except Niue	10	30
Belize	06		Costa Rica	06	
Bermuda*	04		Cuba*... ..	05	
Bolivia	04		Curaçao Island	04	
Brazil, eastern ²	03		Dominican Republic [‡]	05	
Territory of Acre	05		Easter Island (I. de Pascua)	07	
western	04		Ecuador	05	
British Antarctic Territory ³	03		Falkland Islands ⁴	04	
Canada			Fanning Island	10	
Alberta*	07		Fernando de Noronha Island	02	
British Columbia*	08		French Guiana [‡]	03	
Labrador*	04		Galápagos Islands	05	
Manitoba*	06		Greenland, Scoresby Sound ⁵	02	
New Brunswick*	04		Angmagssalik and west coast	03	
Newfoundland*	03	30	Thule area	04	
Northwest Territories*			Grenada	04	
east of long. W. 68°	04		Guadeloupe	04	
long. W. 68° to W. 85°	05		Guatemala	06	
long. W. 85° to W. 102°	06		Guiana, French [‡]	03	
west of long. W. 102°	07		Guinea Bissau [‡]	01	
Nova Scotia*	04		Guyana, Republic of [‡]	03	
Ontario*, east of long. W. 90°	05		Haiti	05	
west of long. W. 90°	06		Honduras	06	
Prince Edward Island*	04		Jamaica*	05	
Quebec*, east of long. W. 63°	04		Jan Mayen Island	01	
west of long. W. 63°	05		Johnston Island	10	
Saskatchewan*			Juan Fernandez Islands	04	
east of long. W. 106°	06		Leeward Islands	04	
west of long. W. 106°	07				
Yukon, east of long. W. 138°	08				
west of long. W. 138°	09				
Cape Verde Islands [‡]	01				

* Summer time may be kept in these countries.

‡ Winter time is kept in these countries.

‡ The legal time may differ from that given here.

¹ This is the legal standard time, but local mean time is generally used.

² Including all the coast and Brasilia.

³ Except South Georgia which keeps 02^h.

⁴ Except Port Stanley which keeps 03^h ‡.

⁵ Scoresby Sound may keep 03^h in summer.

LIST III—(continued)

	h	m		h
Low Archipelago	10		United States of America (continued)	
Marquesas Islands ¹	09	30	Hawaii	10
Martinique	04		Idaho ^{3,4}	07
Mexico † ²	06		Illinois ³	06
Midway Islands	11		Indiana ⁴	05
Miquelon	03		Iowa ³	06
Nicaragua †	06		Kansas ^{3,4}	06
Niue Island	11		Kentucky ^{3,4}	05
Panama Canal Zone	05		Louisiana ³	06
Panama, Republic of	05		Maine ³	05
Paraguay*	04		Maryland ³	05
Peru	05		Massachusetts ³	05
Puerto Rico	04		Michigan ^{3,4}	05
Rarotonga	10	30	Minnesota ³	06
St. Pierre and Miquelon	03		Mississippi ³	06
Salvador, El	06		Missouri ³	06
Samoa	11		Montana ³	07
Society Islands ¹	10		Nebraska ^{3,4}	06
South Georgia	02		Nevada ³	08
Surinam	03	30	New Hampshire ³	05
Tobago	04		New Jersey ³	05
Trindade Island, South Atlantic	02		New Mexico ³	07
Trinidad	04		New York ³	05
Tuamotu Archipelago ¹	10		North Carolina ³	05
Tubuai Islands ¹	10		North Dakota ^{3,4}	06
Turks and Caicos Islands	05		Ohio ³	05
United States of America			Oklahoma ³	06
Alabama ³	06		Oregon ^{3,4}	08
Alaska, ³ east of long. W. 137°	08		Pennsylvania ³	05
long. W. 137° to W. 141°	09		Rhode Island ³	05
long. W. 141° to W. 161°	10		South Carolina ³	05
long. W. 161° to W. 172° 30'	11		South Dakota, ³ eastern part	06
Aleutian Islands	11		western part	07
Arizona	07		Tennessee ^{3,4}	06
Arkansas ³	06		Texas ³	06
California ³	08		Utah ^{3,4}	07
Colorado ³	07		Vermont ³	05
Connecticut ³	05		Virginia ³	05
Delaware ³	05		Washington, D.C. ³	05
District of Columbia ³	05		Washington ³	08
Florida ^{3,4}	05		West Virginia ³	05
Georgia ³	05		Wisconsin ³	06
			Wyoming ³	07
			Uruguay	03
			Venezuela	04
			Virgin Islands	04
			Windward Islands	04

* Summer time may be kept in these countries.

† The legal time may differ from that given here.

¹ This is the legal standard time, but local mean time is generally used.

² Except the states of Sonora, Sinaloa, Nayarit, and the Southern District of Lower California which keep 07^h, and the Northern District of Lower California which keeps 08^h *.

³ Summer (daylight-saving) time, one hour fast on the time given, is kept in these states from the last Sunday in April to the last Sunday in October, changing at 02^h 00^m local clock time.

⁴ This applies to the greater portion of the state.

GREENWICH A. M. 1970 JANUARY 1 (THURSDAY)

1

GMT	☉ SUN		♈ ARIES	♂ MARS 1.0		♃ JUPITER - 1.5		♄ SATURN 0.5		☾ MOON		Lat.	Moon-rise	Diff.
	GHA	Dec.	GHA T	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.			
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	N	h m	m
00 00	179 10.9	S23 03.4	100 13.8	116 18 S	7 43	249 40 S11 09	69 28 N	9 49	271 18 S	6 22	72	01 23	67	
10	181 40.9	03.4	102 44.2	118 48		252 11	71 58		273 44	24	70	01 13	61	
20	184 10.8	03.3	105 14.7	121 18		254 41	74 29		276 10	26	68	01 04	56	
30	186 40.8	03.3	107 45.1	123 48		257 11	76 59		278 36	29	66	00 58	52	
40	189 10.7	03.3	110 15.5	126 18		259 42	79 29		281 01	31	64	00 52	49	
50	191 40.7	03.2	112 45.9	128 48		262 12	82 00		283 27	34	62	00 47	47	
01 00	194 10.6	S23 03.2	115 16.3	131 19 S	7 42	264 42 S11 09	84 30 N	9 49	285 53 S	6 36	60	00 43	44	
10	196 40.6	03.2	117 46.7	133 49		267 13	87 01		288 19	39	58	00 39	43	
20	199 10.5	03.1	120 17.1	136 19		269 43	89 31		290 44	41	56	00 35	41	
30	201 40.5	03.1	122 47.5	138 49		272 13	92 01		293 10	44	54	00 32	39	
40	204 10.4	03.1	125 17.9	141 19		274 44	94 32		295 36	46	52	00 30	38	
50	206 40.4	03.0	127 48.4	143 49		277 14	97 02		298 02	48	50	00 27	37	
02 00	209 10.3	S23 03.0	130 18.8	146 19 S	7 41	279 45 S11 09	99 33 N	9 49	300 27 S	6 51	45	00 22	34	
10	211 40.3	03.0	132 49.2	148 49		282 15	102 03		302 53	53	40	00 18	32	
20	214 10.2	03.0	135 19.6	151 20		284 45	104 34		305 19	56	35	00 14	30	
30	216 40.2	02.9	137 50.0	153 50		287 16	107 04		307 44	6 58	30	00 10	29	
40	219 10.1	02.9	140 20.4	156 20		289 46	109 34		310 10	7 01	20	00 05	26	
50	221 40.1	02.9	142 50.8	158 50		292 16	112 05		312 36	03	10	00 00	24	
03 00	224 10.0	S23 02.8	145 21.2	161 20 S	7 41	294 47 S11 09	114 35 N	9 49	315 02 S	7 05	0	24 39	23	
10	226 40.0	02.8	147 51.6	163 50		297 17	117 06		317 27	08	10	24 30	21	
20	229 09.9	02.8	150 22.0	166 20		299 47	119 36		319 53	10	20	24 20	18	
30	231 39.9	02.7	152 52.5	168 50		302 18	122 06		322 19	13	30	24 09	16	
40	234 09.8	02.7	155 22.9	171 21		304 48	124 37		324 44	15	35	24 03	14	
50	236 39.8	02.7	157 53.3	173 51		307 18	127 07		327 10	18	40	23 56	12	
04 00	239 09.7	S23 02.6	160 23.7	176 21 S	7 40	309 49 S11 09	129 38 N	9 49	329 36 S	7 20	45	23 48	10	
10	241 39.7	02.6	162 54.1	178 51		312 19	132 08		332 01	22	50	23 38	08	
20	244 09.6	02.6	165 24.5	181 21		314 49	134 39		334 27	25	52	23 34	06	
30	246 39.6	02.5	167 54.9	183 51		317 20	137 09		336 53	27	54	23 29	05	
40	249 09.5	02.5	170 25.3	186 21		319 50	139 39		339 19	30	56	23 24	04	
50	251 39.5	02.5	172 55.7	188 51		322 21	142 10		341 44	32	58	23 18	02	
05 00	254 09.5	S23 02.4	175 26.2	191 22 S	7 39	324 51 S11 09	144 40 N	9 49	344 10 S	7 35	60	23 11	00	
10	256 39.4	02.4	177 56.6	193 52		327 21	147 11		346 36	37	S			
20	259 09.4	02.4	180 27.0	196 22		329 52	149 41		349 01	39				
30	261 39.3	02.3	182 57.4	198 52		332 22	152 11		351 27	42				
40	264 09.3	02.3	185 27.8	201 22		334 52	154 42		353 53	44				
50	266 39.2	02.3	187 58.2	203 52		337 23	157 12		356 18	47				
06 00	269 09.2	S23 02.2	190 28.6	206 22 S	7 38	339 53 S11 10	159 43 N	9 49	358 44 S	7 49	0	56	55	
10	271 39.1	02.2	192 59.0	208 52		342 23	162 13		1 10	52	8	57	31	
20	274 09.1	02.2	195 29.4	211 23		344 54	164 43		3 35	54	13	58	30	
30	276 39.0	02.1	197 59.9	213 53		347 24	167 14		6 01	56	17	59	28	
40	279 09.0	02.1	200 30.3	216 23		349 54	169 44		8 27	59	20	60	27	
50	281 38.9	02.1	203 00.7	218 53		352 25	172 15		10 52	01	23	61	26	
07 00	284 08.9	S23 02.0	205 31.1	221 23 S	7 38	354 55 S11 10	174 45 N	9 49	13 18 S	8 04	25	62	25	
10	286 38.8	02.0	208 01.5	223 53		357 25	177 16		15 44	06	28	64	24	
20	289 08.8	02.0	210 31.9	226 23		359 56	179 46		18 09	09	30	65	23	
30	291 38.7	01.9	213 02.3	228 53		2 26	182 16		20 35	11	32	66	22	
40	294 08.7	01.9	215 32.7	231 24		4 57	184 47		23 01	13	34	67	21	
50	296 38.6	01.9	218 03.1	233 54		7 27	187 17		25 26	16	35	68	20	
08 00	299 08.6	S23 01.8	220 33.5	236 24 S	7 37	9 57 S11 10	189 48 N	9 49	27 52 S	8 18	37	69	19	
10	301 38.5	01.8	223 04.0	238 54		12 28	192 18		30 18	21	39	70	18	
20	304 08.5	01.8	225 34.4	241 24		14 58	194 48		32 43	23	40	71	17	
30	306 38.4	01.7	228 04.8	243 54		17 28	197 19		35 09	25	42	72	16	
40	309 08.4	01.7	230 35.2	246 24		19 59	199 49		37 35	28	43	73	15	
50	311 38.3	01.7	233 05.6	248 54		22 29	202 20		40 00	30	44	74	14	
09 00	314 08.3	S23 01.6	235 36.0	251 25 S	7 36	24 59 S11 10	204 50 N	9 49	42 26 S	8 33	45	75	13	
10	316 38.2	01.6	238 06.4	253 55		27 30	207 21		44 52	35	46	76	12	
20	319 08.2	01.6	240 36.8	256 25		30 00	209 51		47 17	38	47	77	11	
30	321 38.1	01.5	243 07.2	258 55		32 30	212 21		49 43	40	48	78	10	
40	324 08.1	01.5	245 37.7	261 25		35 01	214 52		52 09	42	49	79	09	
50	326 38.0	01.5	248 08.1	263 55		37 31	217 22		54 34	45	50	80		
10 00	329 08.0	S23 01.4	250 38.5	266 25 S	7 35	40 02 S11 10	219 53 N	9 49	57 00 S	8 47	51			
10	331 37.9	01.4	253 08.9	268 55		42 32	222 23		59 25	50	52			
20	334 07.9	01.4	255 39.3	271 26		45 02	224 53		61 51	52	53			
30	336 37.8	01.3	258 09.7	273 56		47 33	227 24		64 17	54	54			
40	339 07.8	01.3	260 40.1	276 26		50 03	229 54		66 42	57	55			
50	341 37.7	01.3	263 10.5	278 56		52 33	232 25		69 08	59	57			
11 00	344 07.7	S23 01.2	265 40.9	281 26 S	7 35	55 04 S11 10	234 55 N	9 49	71 34 S	9 02				
10	346 37.6	01.2	268 11.4	283 56		57 34	237 25		73 59	04				
20	349 07.6	01.2	270 41.8	286 26		60 04	239 56		76 25	07				
30	351 37.5	01.1	273 12.2	288 56		62 35	242 26		78 50	09				
40	354 07.5	01.1	275 42.6	291 27		65 05	244 57		81 16	11				
50	356 37.4	01.1	278 13.0	293 57		67 35	247 27		83 42	14				

Moon's P. in A.
 Alt. Corr. Alt. Corr.
 0 56 55 31
 8 57 57 30
 13 58 58 29
 17 59 59 28
 20 60 60 27
 23 61 61 26
 25 62 62 25
 28 64 64 24
 30 65 65 23
 32 66 66 22
 34 67 67 21
 35 68 68 20
 37 69 69 19
 39 70 70 18
 40 71 71 17
 42 72 72 16
 43 73 73 15
 45 75 75 14
 46 76 76 13
 48 77 77 12
 49 78 78 11
 50 79 79 10
 52 80
 53 33
 54 32
 55 31

Sun SD 16.3
 Moon SD 15'
 Age 23d

GREENWICH P. M. 1970 JANUARY 1 (THURSDAY)

GMT	☉ SUN		ARIES	MARS 1.0		JUPITER -1.5		SATURN 0.5		☾ MOON		Lat.	Moon-set	Diff.
	GHA	Dec.		GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA			
12 00	359 07.4	S23 01.0	280 43.4	296 27 S 7 34	70 06 S11 10	249 58 N 9 49	86 07 S 9 16	N						
10	1 37.3	01.0	283 13.8	298 57	72 36	252 28	88 33	72	h	m	m			
20	4 07.3	01.0	285 44.2	301 27	75 07	254 58	90 58	21	70	10 30	-16			
30	6 37.2	00.9	288 14.6	303 57	77 37	257 29	93 24	23	68	10 40	-11			
40	9 07.2	00.9	290 45.0	306 27	80 07	259 59	95 50	26	66	10 49	-08			
50	11 37.1	00.8	293 15.5	308 57	82 38	262 30	98 15	28	64	10 57	-05			
13 00	14 07.1	S23 00.8	295 45.9	311 28 S 7 33	85 08 S11 10	265 00 N 9 49	100 41 S 9 31	62	11 03	-03				
10	16 37.0	00.8	298 16.3	313 58	87 38	267 30	103 06	33	60	11 09	-01			
20	19 07.0	00.7	300 46.7	316 28	90 09	270 01	105 32	35	58	11 14	+01			
30	21 36.9	00.7	303 17.1	318 58	92 39	272 31	107 58	38	56	11 19	03			
40	24 06.9	00.7	305 47.5	321 28	95 09	275 02	110 23	40	54	11 23	04			
50	26 36.8	00.6	308 17.9	323 58	97 40	277 32	112 49	43	52	11 26	06			
14 00	29 06.8	S23 00.6	310 48.3	326 28 S 7 32	100 10 S11 10	280 03 N 9 49	115 14 S 9 45	50	11 30	07				
10	31 36.7	00.6	313 18.7	328 58	102 40	282 33	117 40	47	45	11 37	09			
20	34 06.7	00.5	315 49.2	331 29	105 11	285 03	120 06	50	40	11 43	11			
30	36 36.6	00.5	318 19.6	333 59	107 41	287 34	122 31	52	35	11 49	13			
40	39 06.6	00.5	320 50.0	336 29	110 12	290 04	124 57	55	30	11 53	15			
50	41 36.5	00.4	323 20.4	338 59	112 42	292 35	127 22	57	20	12 01	17			
15 00	44 06.5	S23 00.4	325 50.8	341 29 S 7 32	115 12 S11 11	295 05 N 9 49	129 48 S 9 59	10	12 09	20				
10	46 36.4	00.4	328 21.2	343 59	117 43	297 35	132 13	10 02	0	12 16	22			
20	49 06.4	00.3	330 51.6	346 29	120 13	300 06	134 39	04	10	12 22	24			
30	51 36.3	00.3	333 22.0	348 59	122 43	302 36	137 05	07 20	12 30	27				
40	54 06.3	00.3	335 52.4	351 30	125 14	305 07	139 30	09	30	12 38	29			
50	56 36.2	00.2	338 22.8	354 00	127 44	307 37	141 56	11	35	12 43	31			
16 00	59 06.2	S23 00.2	340 53.3	356 30 S 7 31	130 14 S11 11	310 07 N 9 49	144 21 S10 14	40	12 48	33				
10	61 36.1	00.2	343 23.7	359 00	132 45	312 38	146 47	16	45	12 55	35			
20	64 06.1	00.1	345 54.1	1 30	135 15	315 08	149 12	19	50	13 03	38			
30	66 36.0	00.1	348 24.5	4 00	137 45	317 39	151 38	21	52	13 06	39			
40	69 06.0	00.1	350 54.9	6 30	140 16	320 09	154 03	23	54	13 10	40			
50	71 35.9	00.0	353 25.3	9 00	142 46	322 39	156 29	26	56	13 15	42			
17 00	74 05.9	S23 00.0	355 55.7	11 31 S 7 30	145 17 S11 11	325 10 N 9 50	158 55 S10 28	58	13 20	44				
10	76 35.9	23 00.0	358 26.1	14 01	147 47	327 40	161 20	31	60	13 25	46			
20	79 05.8	22 59.9	0 56.5	16 31	150 17	330 11	163 46	33						
30	81 35.8	59.9	3 27.0	19 01	152 48	332 41	166 11	35	S					
40	84 05.7	59.9	5 57.4	21 31	155 18	335 12	168 37	38						
50	86 35.7	59.8	8 27.8	24 01	157 48	337 42	171 02	40						
18 00	89 05.6	S22 59.8	10 58.2	26 31 S 7 29	160 19 S11 11	340 12 N 9 50	173 28 S10 42	45	Moon's P. in A.					
10	91 35.6	59.7	13 28.6	29 01	162 49	342 43	175 53	45	All.	Corr.				
20	94 05.5	59.7	15 59.0	31 32	165 19	345 13	178 19	47	0	+				
30	96 35.5	59.7	18 29.4	34 02	167 50	347 44	180 44	50	0	57	54	32		
40	99 05.4	59.6	20 59.8	36 32	170 20	350 14	183 10	52	2	56	56	31		
50	101 35.4	59.6	23 30.2	39 02	172 50	352 44	185 35	54	11	56	57	30		
19 00	104 05.3	S22 59.6	26 00.7	41 32 S 7 29	175 21 S11 11	355 15 N 9 50	188 01 S10 57	15	55	58	29			
10	106 35.3	59.5	28 31.1	44 02	177 51	357 45	190 26	10 59	18	53	28			
20	109 05.2	59.5	31 01.5	46 32	180 22	0 16	192 52	11 02	21	52	27			
30	111 35.2	59.5	33 31.9	49 02	182 52	2 46	195 17	04	24	51	26			
40	114 05.1	59.4	36 02.3	51 32	185 22	5 17	197 43	06	26	50	25			
50	116 35.1	59.4	38 32.7	54 03	187 53	7 47	200 08	09	28	49	24			
20 00	119 05.0	S22 59.4	41 03.1	56 33 S 7 28	190 23 S11 11	10 17 N 9 50	202 34 S11 11	30	30	48	23			
10	121 35.0	59.3	43 33.5	59 03	192 53	12 48	204 59	13	32	47	22			
20	124 04.9	59.3	46 03.9	61 33	195 24	15 18	207 25	16	34	46	21			
30	126 34.9	59.3	48 34.3	64 03	197 54	17 49	209 50	18	36	45	20			
40	129 04.8	59.2	51 04.8	66 33	200 24	20 19	212 16	21	38	44	19			
50	131 34.8	59.2	53 35.2	69 03	202 55	22 49	214 41	23	39	43	18			
21 00	134 04.7	S22 59.2	56 05.6	71 34 S 7 27	205 25 S11 11	25 20 N 9 50	217 07 S11 25	28	41	42	17			
10	136 34.7	59.1	58 36.0	74 04	207 55	27 50	219 32	28	42	41	16			
20	139 04.6	59.1	61 06.4	76 34	210 26	30 21	221 58	30	44	40	15			
30	141 34.6	59.0	63 36.8	79 04	212 56	32 51	224 23	32	45	39	14			
40	144 04.5	59.0	66 07.2	81 34	215 26	35 21	226 49	35	47	38	13			
50	146 34.5	59.0	68 37.6	84 04	217 57	37 52	229 14	37	48	37	12			
22 00	149 04.4	S22 58.9	71 08.0	86 34 S 7 26	220 27 S11 11	40 22 N 9 50	231 40 S11 39	42	49	36	11			
10	151 34.4	58.9	73 38.5	89 04	222 58	42 53	234 05	44	51	35	10			
20	154 04.3	58.9	76 08.9	91 34	225 28	45 23	236 31	44	52	34				
30	156 34.3	58.8	78 39.3	94 05	227 58	47 54	238 56	47	53	33				
40	159 04.2	58.8	81 09.7	96 35	230 29	50 24	241 22	49	54	32				
50	161 34.2	58.8	83 40.1	99 05	232 59	52 54	243 47	51	56					
23 00	164 04.1	S22 58.7	86 10.5	101 35 S 7 26	235 29 S11 11	55 25 N 9 50	246 13 S11 54	56	Sun SD 16.3					
10	166 34.1	58.7	88 40.9	104 05	238 00	57 55	248 38	56	Moon SD 15'					
20	169 04.0	58.7	91 11.3	106 35	240 30	60 26	251 03	11 58	Age 23d					
30	171 34.0	58.6	93 41.7	109 05	243 00	62 56	253 29	12 01						
40	174 03.9	58.6	96 12.2	111 35	245 31	65 26	255 54	03						
50	176 33.9	58.6	98 42.6	114 06	248 01	67 57	258 20	05						

GREENWICH A. M. 1970 JANUARY 2 (FRIDAY)

GMT	☉ SUN			♈ ARIES		♂ MARS 1.0		♃ JUPITER -1.5		♄ SATURN 0.5		☾ MOON		Lat.	Moon-rise	Diff.	
	GHA	Dec.		GHA	T	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.				
00 00	179 03.8	S22 58.5		101 13.0		116 36 S	7 25	250 32	S11 12	70 27 N	9 50	260 45	S12 08	N			
10	181 33.8	58.5		103 43.4		119 06		253 02		72 58		263 11	10	72	03 47	*	
20	184 03.7	58.4		106 13.8		121 36		255 32		75 28		265 36	12	70	03 21	77	
30	186 33.7	58.4		108 44.2		124 06		258 03		77 59		268 02	15	68	03 01	65	
40	189 03.6	58.4		111 14.6		126 36		260 33		80 29		270 27	17	66	02 46	58	
50	191 33.6	58.3		113 45.0		129 06		263 03		82 59		272 52	20	64	02 33	54	
01 00	194 03.5	S22 58.3		116 15.4		131 37 S	7 24	265 34	S11 12	85 30 N	9 50	275 18	S12 22	62	02 23	50	
10	196 33.5	58.3		118 45.8		134 07		268 04		88 00		277 43	24	60	02 14	47	
20	199 03.4	58.2		121 16.3		136 37		270 34		90 31		280 09	27	58	02 06	45	
30	201 33.4	58.2		123 46.7		139 07		273 05		93 01		282 34	29	56	01 59	43	
40	204 03.3	58.2		126 17.1		141 37		275 35		95 31		284 59	31	54	01 53	42	
50	206 33.3	58.1		128 47.5		144 07		278 05		98 02		287 25	34	52	01 47	40	
02 00	209 03.2	S22 58.1		131 17.9		146 37 S	7 23	280 36	S11 12	100 32 N	9 50	289 50	S12 36	50	01 42	39	
10	211 33.2	58.1		133 48.3		149 07		283 06		103 03		292 16	38	45	01 32	36	
20	214 03.2	58.0		136 18.7		151 37		285 36		105 33		294 41	41	40	01 23	34	
30	216 33.1	58.0		138 49.1		154 08		288 07		108 03		297 07	43	35	01 15	32	
40	219 03.1	57.9		141 19.5		156 38		290 37		110 34		299 32	45	30	01 09	30	
50	221 33.0	57.9		143 50.0		159 08		293 08		113 04		301 57	48	20	00 58	27	
03 00	224 03.0	S22 57.9		146 20.4		161 38 S	7 23	295 38	S11 12	115 35 N	9 50	304 23	S12 50	10	00 48	25	
10	226 32.9	57.8		148 50.8		164 08		298 08		118 05		306 48	52	0	00 39	23	
20	229 02.9	57.8		151 21.2		166 38		300 39		120 36		309 13	55	10	00 30	21	
30	231 32.8	57.8		153 51.6		169 08		303 09		123 06		311 39	57	20	00 20	18	
40	234 02.8	57.7		156 22.0		171 38		305 39		125 36		314 04	12 59	30	00 09	16	
50	236 32.7	57.7		158 52.4		174 09		308 10		128 07		316 30	13 02	35	00 03	14	
04 00	239 02.7	S22 57.7		161 22.8		176 39 S	7 22	310 40	S11 12	130 37 N	9 50	318 55	S13 04	40	24 22	15	
10	241 32.6	57.6		163 53.2		179 09		313 10		133 08		321 20	06	45	24 10	13	
20	244 02.6	57.6		166 23.7		181 39		315 41		135 38		323 46	09	50	23 55	10	
30	246 32.5	57.5		168 54.1		184 09		318 11		138 08		326 11	11	52	23 48	09	
40	249 02.5	57.5		171 24.5		186 39		320 41		140 39		328 37	13	54	23 40	07	
50	251 32.4	57.5		173 54.9		189 09		323 12		143 09		331 02	16	56	23 32	05	
05 00	254 02.4	S22 57.4		176 25.3		191 39 S	7 21	325 42	S11 12	145 40 N	9 50	333 27	S13 18	58	23 22	03	
10	256 32.3	57.4		178 55.7		194 10		328 13		148 10		335 53	20	60	23 11	01	
20	259 02.3	57.4		181 26.1		196 40		330 43		150 40		338 18	23	S			
30	261 32.2	57.3		183 56.5		199 10		333 13		153 11		340 43	25				
40	264 02.2	57.3		186 26.9		201 40		335 44		155 41		343 09	27				
50	266 32.1	57.3		188 57.3		204 10		338 14		158 12		345 34	30	Moon's P. in A.			
06 00	269 02.1	S22 57.2		191 27.8		206 40 S	7 20	340 44	S11 12	160 42 N	9 50	347 59	S13 32				
10	271 32.0	57.2		193 58.2		209 10		343 15		163 13		350 25	34	• All.	• Contr.	• All.	• Contr.
20	274 02.0	57.1		196 28.6		211 40		345 45		165 43		352 50	36	0	+	55	32
30	276 31.9	57.1		198 59.0		214 11		348 15		168 13		355 15	39	7	57	56	31
40	279 01.9	57.1		201 29.4		216 41		350 46		170 44		357 41	41	13	56	57	30
50	281 31.8	57.0		203 59.8		219 11		353 16		173 14		0 06	43	16	55	58	29
07 00	284 01.8	S22 57.0		206 30.2		221 41 S	7 19	355 46	S11 12	175 45 N	9 50	2 31	S13 46	20	53	59	28
10	286 31.7	57.0		209 00.6		224 11		358 17		178 15		4 57	48	22	52	61	27
20	289 01.7	56.9		211 31.0		226 41		0 47		180 45		7 22	50	25	51	62	26
30	291 31.6	56.9		214 01.5		229 11		3 18		183 16		9 47	53	27	50	63	25
40	294 01.6	56.9		216 31.9		231 41		5 48		185 46		12 13	55	29	49	64	24
50	296 31.5	56.8		219 02.3		234 12		8 18		188 17		14 38	13 57	31	48	65	23
08 00	299 01.5	S22 56.8		221 32.7		236 42 S	7 19	10 49	S11 12	190 47 N	9 50	17 03	S14 00	33	47	66	22
10	301 31.4	56.7		224 03.1		239 12		13 19		193 18		19 29	02	35	46	67	21
20	304 01.4	56.7		226 33.5		241 42		15 49		195 48		21 54	04	37	45	68	20
30	306 31.3	56.7		229 03.9		244 12		18 20		198 18		24 19	06	38	44	69	19
40	309 01.3	56.6		231 34.3		246 42		20 50		200 49		26 44	09	40	43	70	18
50	311 31.2	56.6		234 04.7		249 12		23 20		203 19		29 10	11	41	42	71	17
09 00	314 01.2	S22 56.6		236 35.2		251 42 S	7 18	25 51	S11 13	205 50 N	9 50	31 35	S14 13	43	41	72	16
10	316 31.1	56.5		239 05.6		254 13		28 21		208 20		34 00	16	44	41	73	15
20	319 01.1	56.5		241 36.0		256 43		30 51		210 50		36 26	18	45	40	74	14
30	321 31.0	56.5		244 06.4		259 13		33 22		213 21		38 51	20	46	39	75	13
40	324 01.0	56.4		246 36.8		261 43		35 52		215 51		41 16	23	47	38	76	12
50	326 31.0	56.4		249 07.2		264 13		38 23		218 22		43 41	25	48	37	77	11
10 00	329 00.9	S22 56.3		251 37.6		266 43 S	7 17	40 53	S11 13	220 52 N	9 50	46 07	S14 27	50	36	78	10
10	331 30.9	56.3		254 08.0		269 13		43 23		223 22		48 32	29	51	35	79	09
20	334 00.8	56.3		256 38.4		271 43		45 54		225 53		50 57	32	52	34	80	
30	336 30.8	56.2		259 08.8		274 14		48 24		228 23		53 23	34	53	33		
40	339 00.7	56.2		261 39.3		276 44		50 54		230 54		55 48	36	54	32		
50	341 30.7	56.2		264 09.7		279 14		53 25		233 24		58 13	38	56			
11 00	344 00.6	S22 56.1		266 40.1		281 44 S	7 16	55 55	S11 13	235 55 N	9 50	60 38	S14 41	52			
10	346 30.6	56.1		269 10.5		284 14		58 25		238 25		63 04	43	Sun SD 16.3			
20	349 00.5	56.0		271 40.9		286 44		60 56		240 55		65 29	45	Moon SD 16'			
30	351 30.5	56.0		274 11.3		289 14		63 26		243 26		67 54	48	Age 24d			
40	354 00.4	56.0		276 41.7		291 44		65 56		245 56		70 19	50				
50	356 30.4	55.9		279 12.1		294 15		68 27		248 27		72 45	52				

GREENWICH P. M. 1970 JANUARY 2 (FRIDAY)

GMT	☉ SUN		♈ ARIES	♂ MARS 1.0		♃ JUPITER-1.5		♄ SATURN 0.5		☾ MOON		Lot.	Moon-set	Diff.
	GHA	Dec.		GHA T	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA			
12 00	359 00.3	S22 55.9	281 42.5	296 45 S	7 16	70 57 S11 13	250 57 N	9 50	75 10 S14 54	77 35	57	N		
10	1 30.3	55.9	284 13.0	299 15		73 27	253 27		80 00	14 59	72	09 25	*	
20	4 00.2	55.8	286 43.4	301 45		75 58	255 58		82 26	15 01	70	09 54	-29	
30	6 30.2	55.8	289 13.8	304 15		78 28	258 28		84 51	04	68	10 15	-17	
40	9 00.1	55.7	291 44.2	306 45		80 59	260 59		87 16	06	66	10 32	-10	
50	11 30.1	55.7	294 14.6	309 15		83 29	263 29				64	10 46	-06	
13 00	14 00.0	S22 55.7	296 45.0	311 45 S	7 15	85 59 S11 13	265 59 N	9 50	89 41 S15 08	92 06	10	62 10 58	-03	
10	16 30.0	55.6	299 15.4	314 16		88 30	268 30		94 32	13	60	11 08	00	
20	18 59.9	55.6	301 45.8	316 46		91 00	271 00		96 57	15	58	11 17	+02	
30	21 29.9	55.6	304 16.2	319 16		93 30	273 31		99 22	17	56	11 25	04	
40	23 59.8	55.5	306 46.6	321 46		96 01	276 01		101 47	19	54	11 32	06	
50	26 29.8	55.5	309 17.1	324 16		98 31	278 31				52	11 39	07	
14 00	28 59.7	S22 55.4	311 47.5	326 46 S	7 14	101 01 S11 13	281 02 N	9 50	104 13 S15 22	106 38	24	50 11 44	08	
10	31 29.7	55.4	314 17.9	329 16		103 32	283 32		109 03	26	45	11 57	11	
20	33 59.6	55.4	316 48.3	331 46		106 02	286 03		111 28	28	40	12 07	13	
30	36 29.6	55.3	319 18.7	334 17		108 33	288 33		113 53	31	35	12 16	15	
40	38 59.5	55.3	321 49.1	336 47		111 03	291 04		116 19	33	30	12 24	17	
50	41 29.5	55.3	324 19.5	339 17		113 33	293 34				20	12 38	20	
15 00	43 59.4	S22 55.2	326 49.9	341 47 S	7 13	116 04 S11 13	296 04 N	9 50	118 44 S15 35	121 09	37	10 12 50	22	
10	46 29.4	55.2	329 20.3	344 17		118 34	298 35		123 34	40	0	13 01	24	
20	48 59.3	55.1	331 50.8	346 47		121 04	301 05		125 59	42	10	13 12	26	
30	51 29.3	55.1	334 21.2	349 17		123 35	303 36		128 24	44	20	13 24	28	
40	53 59.2	55.1	336 51.6	351 47		126 05	306 06		130 50	46	30	13 38	31	
50	56 29.2	55.0	339 22.0	354 18		128 35	308 36				35	13 46	33	
16 00	58 59.1	S22 55.0	341 52.4	356 48 S	7 13	131 06 S11 13	311 07 N	9 50	133 15 S15 49	135 40	51	40 13 55	35	
10	61 29.1	55.0	344 22.8	359 18		133 36	313 37		138 05	53	45	14 06	37	
20	63 59.1	54.9	346 53.2	1 48		136 06	316 08		140 30	55	50	14 20	40	
30	66 29.0	54.9	349 23.6	4 18		138 37	318 38		142 55	57	52	14 26	41	
40	68 59.0	54.8	351 54.0	6 48		141 07	321 09		145 20	16 00	54	14 33	43	
50	71 28.9	54.8	354 24.5	9 18		143 38	323 39				56	14 40	45	
17 00	73 58.9	S22 54.8	356 54.9	11 48 S	7 12	146 08 S11 13	326 09 N	9 50	147 46 S16 02	150 11	04	58 14 49	47	
10	76 28.8	54.7	359 25.3	14 19		148 38	328 40		152 36	06	60	14 59	49	
20	78 58.8	54.7	1 55.7	16 49		151 09	331 10		155 01	08	S			
30	81 28.7	54.7	4 26.1	19 19		153 39	333 41		157 26	11				
40	83 58.7	54.6	6 56.5	21 49		156 09	336 11		159 51	13				
50	86 28.6	54.6	9 26.9	24 19		158 40	338 41							
18 00	88 58.6	S22 54.5	11 57.3	26 49 S	7 11	161 10 S11 14	341 12 N	9 50	162 16 S16 15	164 42	17	Moon's P. in A.		
10	91 28.5	54.5	14 27.7	29 19		163 40	343 42		164 42	17	10	57	56	32
20	93 58.5	54.5	16 58.1	31 49		166 11	346 13		167 07	20	14	55	57	30
30	96 28.4	54.4	19 28.6	34 20		168 41	348 43		169 32	22	18	54	59	29
40	98 58.4	54.4	21 59.0	36 50		171 11	351 13		171 57	24	21	53	60	28
50	101 28.3	54.4	24 29.4	39 20		173 42	353 44		174 22	26	23	52	61	27
19 00	103 58.3	S22 54.3	26 59.8	41 50 S	7 10	176 12 S11 14	356 14 N	9 50	176 47 S16 28	179 12	31	26	62	26
10	106 28.2	54.3	29 30.2	44 20		178 42	358 45		181 37	33	28	50	63	25
20	108 58.2	54.2	32 00.6	46 50		181 13	1 15		184 02	35	30	49	64	24
30	111 28.1	54.2	34 31.0	49 20		183 43	3 46		188 53	39	32	48	65	23
40	113 58.1	54.2	37 01.4	51 50		186 14	6 16				34	47	66	22
50	116 28.0	54.1	39 31.8	54 21		188 44	8 46		191 18	S16 42	36	46	68	21
20 00	118 58.0	S22 54.1	42 02.3	56 51 S	7 10	191 14 S11 14	11 17 N	9 50	191 18 S16 42	193 43	44	37	69	20
10	121 27.9	54.0	44 32.7	59 21		193 45	13 47		196 08	46	35	46	70	19
20	123 57.9	54.0	47 03.1	61 51		196 15	16 18		198 33	48	39	44	71	18
30	126 27.8	54.0	49 33.5	64 21		198 45	18 48		200 58	50	42	43	72	17
40	128 57.8	53.9	52 03.9	66 51		201 16	21 18		203 23	53	43	42	73	16
50	131 27.7	53.9	54 34.3	69 21		203 46	23 49		205 48	S16 55	40	44	74	15
21 00	133 57.7	S22 53.9	57 04.7	71 51 S	7 09	206 16 S11 14	26 19 N	9 50	205 48 S16 55	208 13	57	42	75	14
10	136 27.6	53.8	59 35.1	74 22		208 47	28 50		210 38	16 59	43	43	76	13
20	138 57.6	53.8	62 05.5	76 52		211 17	31 20		211 03	17 01	45	40	77	12
30	141 27.5	53.7	64 36.0	79 22		213 48	33 50		215 28	03	46	39	78	11
40	143 57.5	53.7	67 06.4	81 52		216 18	36 21		217 53	06	47	38	79	10
50	146 27.4	53.7	69 36.8	84 22		218 48	38 51				49	37	80	
22 00	148 57.4	S22 53.6	72 07.2	86 52 S	7 08	221 19 S11 14	41 22 N	9 50	220 19 S17 08	222 44	10	50	36	
10	151 27.4	53.6	74 37.6	89 22		223 49	43 52		225 09	12	51	35		
20	153 57.3	53.5	77 08.0	91 52		226 19	46 23		227 34	14	53	34		
30	156 27.3	53.5	79 38.4	94 23		228 50	48 53		229 59	16	54	33		
40	158 57.2	53.5	82 08.8	96 53		231 20	51 23		232 24	19	55	32		
50	161 27.2	53.4	84 39.2	99 23		233 50	53 54				56			
23 00	163 57.1	S22 53.4	87 09.6	101 53 S	7 07	236 21 S11 14	56 24 N	9 50	234 49 S17 21	237 14	23	Sun SD 16.3		
10	166 27.1	53.4	89 40.1	104 23		238 51	58 55		239 39	25	Moon SD 16'			
20	168 57.0	53.3	92 10.5	106 53		241 21	61 25		242 04	27	Age 24d			
30	171 27.0	53.3	94 40.9	109 23		243 52	63 55		244 29	29				
40	173 56.9	53.2	97 11.3	111 53		246 22	66 26		246 54	32				
50	176 26.9	53.2	99 41.7	114 23		248 53	68 56							

F4 INTERPOLATION OF MOONRISE, MOONSET

FOR LONGITUDE

Add if longitude west
Subtract if longitude east

Longitude	Diff.*					
	05	10	15	20	25	30
0	00	00	00	00	00	00
20	01	01	02	02	03	03
40	01	02	03	04	06	07
60	02	03	05	07	08	10
80	02	04	07	09	11	13
100	03	06	08	11	14	17
120	03	07	10	13	17	20
140	04	08	12	16	19	23
160	04	09	13	18	22	27
180	05	10	15	20	25	30

Longitude	Diff.*					
	35	40	45	50	55	60
0	00	00	00	00	00	00
15	03	03	04	04	05	05
30	06	07	08	08	09	10
45	09	10	11	12	14	15
60	12	13	15	17	18	20
75	15	17	19	21	23	25
90	18	20	22	25	28	30
105	20	23	26	29	32	35
120	23	27	30	33	37	40
135	26	30	34	38	41	45
150	29	33	38	42	46	50
165	32	37	41	46	50	55
180	35	40	45	50	55	60

Longitude	Diff.*					
	65	70	75	80	85	90
0	00	00	00	00	00	00
10	04	04	04	04	05	05
20	07	08	08	09	09	10
30	11	12	12	13	14	15
40	14	16	17	18	19	20
50	18	19	21	22	24	25
60	22	23	25	27	28	30
70	25	27	29	31	33	35
80	29	31	33	36	38	40
90	32	35	38	40	42	45
100	36	39	42	44	47	50
110	40	43	46	49	52	55
120	43	47	50	53	57	60
130	47	51	54	58	61	65
140	51	54	58	62	66	70
150	54	58	62	67	71	75
160	58	62	67	71	76	80
170	61	66	71	76	80	85
180	65	70	75	80	85	90

*When negative subtract correction if longitude west, and add if east.

STAR INDEX

No.	Name	Mag.	S.H.A.	Dec.
1*	Alpheratz	†	2.2	358 18 N.28 56
2	Ankaa		2.4	353 48 S.42 28
3*	Schedar		2.5	350 18 N.56 23
4*	Diphda	†	2.2	349 29 S.18 09
5*	Achernar		0.6	335 51 S.57 23
6*	Hamal	†	2.2	328 38 N.23 19
7*	Acamar		3.1	315 43 S.40 26
8*	Menkar	†	2.8	314 49 N. 3 58
9*	Mirfak		1.9	309 27 N.49 46
10*	Aldebaran	†	1.1	291 27 N.16 27
11*	Rigel	†	0.3	281 43 S. 8 14
12*	Capella		0.2	281 23 N.45 58
13	Bellatrix	†	1.7	279 07 N. 6 19
14	Elnath	†	1.8	278 54 N.28 35
15	Alnilam	†	1.8	276 19 S. 1 13
16*	Betelgeuse	†	0.1-1.2	271 36 N. 7 24
17*	Canopus		-0.9	264 10 S.52 41
18*	Sirius	†	-1.6	259 02 S.16 40
19	Adhara	†	1.6	255 38 S.28 56
20*	Procyon	†	0.5	245 34 N. 5 18
21*	Pollux	†	1.2	244 07 N.28 06
22	Avior		1.7	234 31 S.59 25
23*	Suhail		2.2	223 16 S.43 19
24*	Miaplacidus		1.8	221 46 S.69 36
25*	Alphard	†	2.2	218 28 S. 8 32
26*	Regulus	†	1.3	208 18 N.12 07
27*	Dubhe		2.0	194 31 N.61 55
28*	Denebola	†	2.2	183 07 N.14 44
29*	Gienah	†	2.8	176 26 S.17 23
30*	Acrux		1.1	173 46 S.62 56
31	Gacrux		1.6	172 37 S.56 57
32*	Alioth		1.7	166 49 N.56 07
33*	Spica	†	1.2	159 05 S.11 01
34*	Alkaid		1.9	153 24 N.49 27
35	Hadar		0.9	149 34 S.60 14
36	Menkent		2.3	148 46 S.36 14
37*	Arcturus	†	0.2	146 25 N.19 20
38*	Rigel Kentaurus		0.1	140 36 S.60 43
39	Zubenelgenubi	†	2.9	137 41 S.15 55
40*	Kochab		2.2	137 18 N.74 16
41*	Alphecca	†	2.3	126 38 N.26 49
42*	Antares	†	1.2	113 06 S.26 22
43	Atria		1.9	108 38 S.68 58
44	Sabik	†	2.6	102 50 S.15 42
45*	Shaula		1.7	97 06 S.37 05
46*	Rasalhague	†	2.1	96 37 N.12 35
47	Eltanin		2.4	91 01 N.51 29
48	Kaus Australis		2.0	84 27 S.34 24
49*	Vega		0.1	81 01 N.38 45
50*	Nunki	†	2.1	76 39 S.26 20
51*	Altair	†	0.9	62 40 N. 8 47
52*	Peacock		2.1	54 11 S.56 50
53*	Deneb		1.3	49 54 N.45 10
54*	Enif	†	2.5	34 19 N. 9 44
55	Al Na'ir		2.2	28 25 S.47 06
56*	Fomalhaut	†	1.3	16 00 S.29 47
57	Markab	†	2.6	14 11 N.15 03

*Stars used in H.O. 249 (A.P. 3270) Vol. 1.
†Stars that may be used with Vols. 2 and 3.

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	M
0	0-00	59-60	119-21	178-86	238-56	298-34	358-22	418-20	478-31	538-58	599-01	0
1	0-99	60-59	120-20	179-85	239-56	299-34	359-21	419-20	479-31	539-58	600-02	1
2	1-99	61-58	121-20	180-85	240-55	300-34	360-21	420-20	480-32	540-59	601-03	2
3	2-98	62-58	122-19	181-84	241-55	301-33	361-21	421-20	481-32	541-59	602-04	3
4	3-97	63-57	123-18	182-84	242-55	302-33	362-21	422-20	482-32	542-60	603-04	4
5	4-97	64-56	124-18	183-83	243-54	303-33	363-21	423-20	483-33	543-60	604-05	5
6	5-96	65-56	125-17	184-82	244-54	304-32	364-21	424-20	484-33	544-61	605-06	6
7	6-95	66-55	126-17	185-82	245-53	305-32	365-21	425-20	485-33	545-62	606-07	7
8	7-95	67-54	127-16	186-81	246-53	306-32	366-21	426-20	486-34	546-62	607-08	8
9	8-94	68-54	128-15	187-81	247-53	307-32	367-20	427-21	487-34	547-63	608-09	9
10	9-93	69-53	129-15	188-80	248-52	308-31	368-20	428-21	488-34	548-64	609-10	10
11	10-92	70-52	130-14	189-80	249-52	309-31	369-20	429-21	489-35	549-64	610-11	11
12	11-92	71-52	131-14	190-79	250-51	310-31	370-20	430-21	490-35	550-65	611-12	12
13	12-91	72-51	132-13	191-79	251-51	311-31	371-20	431-21	491-36	551-65	612-13	13
14	13-90	73-50	133-12	192-78	252-50	312-30	372-20	432-21	492-36	552-66	613-14	14
15	14-90	74-50	134-12	193-78	253-50	313-30	373-20	433-21	493-36	553-67	614-15	15
16	15-89	75-49	135-11	194-77	254-50	314-30	374-20	434-21	494-37	554-67	615-15	16
17	16-88	76-48	136-11	195-77	255-49	315-30	375-20	435-22	495-37	555-68	616-16	17
18	17-88	77-48	137-10	196-76	256-49	316-29	376-20	436-22	496-37	556-69	617-17	18
19	18-87	78-47	138-09	197-76	257-48	317-29	377-20	437-22	497-38	557-69	618-18	19
20	19-86	79-46	139-09	198-75	258-48	318-29	378-20	438-22	498-38	558-70	619-19	20
21	20-86	80-46	140-08	199-75	259-48	319-29	379-20	439-22	499-39	559-71	620-20	21
22	21-85	81-45	141-08	200-74	260-47	320-28	380-19	440-22	500-39	560-71	621-21	22
23	22-84	82-44	142-07	201-74	261-47	321-28	381-19	441-23	501-39	561-72	622-22	23
24	23-84	83-44	143-06	202-73	262-46	322-28	382-19	442-23	502-40	562-73	623-23	24
25	24-83	84-43	144-06	203-73	263-46	323-28	383-19	443-23	503-40	563-73	624-24	25
26	25-82	85-42	145-05	204-72	264-46	324-27	384-19	444-23	504-41	564-74	625-25	26
27	26-82	86-42	146-05	205-72	265-45	325-27	385-19	445-23	505-41	565-75	626-26	27
28	27-81	87-41	147-04	206-71	266-45	326-27	386-19	446-23	506-41	566-75	627-27	28
29	28-80	88-40	148-03	207-71	267-45	327-27	387-19	447-24	507-42	567-76	628-28	29
30	29-80	89-40	149-03	208-70	268-44	328-27	388-19	448-24	508-42	568-77	629-29	30
31	30-79	90-39	150-02	209-70	269-44	329-26	389-19	449-24	509-43	569-78	630-30	31
32	31-78	91-39	151-02	210-69	270-43	330-26	390-19	450-24	510-43	570-78	631-31	32
33	32-78	92-38	152-01	211-69	271-43	331-26	391-19	451-24	511-44	571-79	632-33	33
34	33-77	93-37	153-00	212-68	272-43	332-26	392-19	452-25	512-44	572-80	633-34	34
35	34-76	94-37	154-00	213-68	273-42	333-26	393-19	453-25	513-45	573-81	634-35	35
36	35-76	95-36	154-99	214-67	274-42	334-25	394-19	454-25	514-45	574-81	635-36	36
37	36-75	96-35	155-99	215-67	275-42	335-25	395-19	455-25	515-45	575-82	636-37	37
38	37-74	97-35	156-98	216-66	276-41	336-25	396-19	456-25	516-46	576-83	637-38	38
39	38-74	98-34	157-97	217-66	277-41	337-25	397-19	457-25	517-46	577-84	638-39	39
40	39-73	99-33	158-97	218-65	278-41	338-25	398-19	458-26	518-47	578-84	639-40	40
41	40-72	100-33	159-96	219-65	279-40	339-24	399-19	459-26	519-47	579-85	640-41	41
42	41-72	101-32	160-96	220-64	280-40	340-24	400-19	460-26	520-48	580-86	641-42	42
43	42-71	102-31	161-95	221-64	281-40	341-24	401-19	461-26	521-48	581-87	642-43	43
44	43-70	103-31	162-95	222-64	282-39	342-24	402-19	462-27	522-49	582-87	643-44	44
45	44-70	104-30	163-94	223-63	283-39	343-24	403-19	463-27	523-49	583-88	644-46	45
46	45-69	105-30	164-94	224-63	284-39	344-23	404-19	464-27	524-50	584-89	645-47	46
47	46-68	106-29	165-93	225-62	285-38	345-23	405-19	465-27	525-50	585-90	646-48	47
48	47-68	107-28	166-92	226-62	286-38	346-23	406-19	466-28	526-51	586-91	647-49	48
49	48-67	108-28	167-92	227-61	287-38	347-23	407-19	467-28	527-51	587-91	648-50	49
50	49-66	109-27	168-91	228-61	288-37	348-23	408-19	468-28	528-52	588-92	649-51	50
51	50-66	110-26	169-91	229-60	289-37	349-23	409-19	469-29	529-52	589-93	650-52	51
52	51-65	111-26	170-90	230-60	290-37	350-23	410-19	470-29	530-53	590-94	651-53	52
53	52-64	112-25	171-90	231-59	291-36	351-22	411-19	471-29	531-54	591-95	652-55	53
54	53-64	113-24	172-89	232-59	292-36	352-22	412-19	472-29	532-54	592-96	653-56	54
55	54-63	114-24	173-88	233-59	293-36	353-22	413-19	473-30	533-55	593-96	654-57	55
56	55-62	115-23	174-88	234-58	294-35	354-22	414-19	474-30	534-55	594-97	655-58	56
57	56-62	116-23	175-87	235-58	295-35	355-22	415-20	475-30	535-56	595-98	656-59	57
58	57-61	117-22	176-87	236-57	296-35	356-22	416-20	476-30	536-56	596-99	657-60	58
59	58-60	118-21	177-86	237-57	297-35	357-22	417-20	477-31	537-57	598-00	658-62	59
60	59-60	119-21	178-86	238-56	298-34	358-22	418-20	478-31	538-58	599-01	659-63	60
M	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	M
0	659.63	720.46	781.52	842.83	904.41	966.28	1028.46	1090.99	1153.87	1217.14	0
1	660.64	721.47	782.54	843.85	905.43	967.31	1029.50	1092.03	1154.92	1218.19	1
2	661.65	722.49	783.56	844.88	906.46	968.35	1030.54	1093.08	1155.97	1219.25	2
3	662.67	723.51	784.58	845.90	907.49	969.38	1031.58	1094.12	1157.02	1220.31	3
4	663.68	724.52	785.60	846.92	908.52	970.41	1032.62	1095.17	1158.08	1221.37	4
5	664.69	725.54	786.62	847.95	909.55	971.45	1033.66	1096.21	1159.13	1222.43	5
6	665.70	726.55	787.64	848.97	910.58	972.48	1034.70	1097.26	1160.18	1223.49	6
7	666.72	727.57	788.66	850.00	911.61	973.52	1035.74	1098.30	1161.23	1224.54	7
8	667.73	728.59	789.68	851.02	912.64	974.55	1036.78	1099.35	1162.28	1225.60	8
9	668.74	729.60	790.70	852.05	913.67	975.59	1037.82	1100.40	1163.34	1226.66	9
10	669.75	730.62	791.72	853.07	914.70	976.62	1038.86	1101.44	1164.39	1227.72	10
11	670.77	731.64	792.74	854.10	915.73	977.66	1039.90	1102.49	1165.44	1228.78	11
12	671.78	732.65	793.76	855.12	916.76	978.69	1040.94	1103.53	1166.49	1229.84	12
13	672.79	733.67	794.78	856.14	917.79	979.72	1041.98	1104.58	1167.55	1230.90	13
14	673.80	734.69	795.80	857.17	918.82	980.76	1043.02	1105.63	1168.60	1231.96	14
15	674.82	735.70	796.82	858.19	919.85	981.79	1044.06	1106.67	1169.65	1233.02	15
16	675.83	736.72	797.84	859.22	920.88	982.83	1045.10	1107.72	1170.70	1234.08	16
17	676.84	737.74	798.86	860.25	921.91	983.86	1046.14	1108.77	1171.76	1235.14	17
18	677.86	738.75	799.88	861.27	922.94	984.90	1047.18	1109.81	1172.81	1236.20	18
19	678.87	739.77	800.90	862.30	923.97	985.93	1048.23	1110.86	1173.86	1237.26	19
20	679.88	740.79	801.93	863.32	925.00	986.97	1049.27	1111.91	1174.92	1238.32	20
21	680.90	741.80	802.95	864.35	926.03	988.01	1050.31	1112.95	1175.97	1239.38	21
22	681.91	742.82	803.97	865.37	927.06	989.04	1051.35	1114.00	1177.02	1240.44	22
23	682.92	743.84	804.99	866.40	928.09	990.08	1052.39	1115.05	1178.08	1241.50	23
24	683.94	744.85	806.01	867.42	929.12	991.11	1053.43	1116.10	1179.13	1242.56	24
25	684.95	745.87	807.03	868.45	930.15	992.15	1054.47	1117.14	1180.18	1243.62	25
26	685.96	746.89	808.05	869.48	931.18	993.19	1055.51	1118.19	1181.24	1244.68	26
27	686.98	747.91	809.07	870.50	932.21	994.22	1056.56	1119.24	1182.29	1245.74	27
28	687.99	748.92	810.10	871.53	933.24	995.26	1057.60	1120.29	1183.35	1246.80	28
29	689.00	749.94	811.12	872.55	934.27	996.29	1058.64	1121.33	1184.40	1247.86	29
30	690.02	750.96	812.14	873.58	935.30	997.33	1059.68	1122.38	1185.45	1248.92	30
31	691.03	751.98	813.16	874.61	936.33	998.37	1060.72	1123.43	1186.51	1249.98	31
32	692.04	752.99	814.18	875.63	937.37	999.40	1061.77	1124.48	1187.56	1251.04	32
33	693.06	754.01	815.21	876.66	938.40	1000.44	1062.81	1125.53	1188.62	1252.11	33
34	694.07	755.03	816.23	877.69	939.43	1001.48	1063.85	1126.58	1189.67	1253.17	34
35	695.09	756.05	817.25	878.71	940.46	1002.51	1064.89	1127.62	1190.73	1254.23	35
36	696.10	757.07	818.27	879.74	941.49	1003.55	1065.94	1128.67	1191.78	1255.29	36
37	697.12	758.08	819.29	880.77	942.52	1004.59	1066.98	1129.72	1192.84	1256.35	37
38	698.13	759.10	820.32	881.79	943.56	1005.62	1068.02	1130.77	1193.89	1257.41	38
39	699.14	760.12	821.34	882.82	944.59	1006.66	1069.06	1131.82	1194.95	1258.48	39
40	700.16	761.14	822.36	883.85	945.62	1007.70	1070.11	1132.87	1196.00	1259.54	40
41	701.17	762.16	823.38	884.88	946.65	1008.74	1071.15	1133.92	1197.05	1260.60	41
42	702.19	763.18	824.41	885.90	947.68	1009.77	1072.19	1134.97	1198.12	1261.66	42
43	703.20	764.19	825.43	886.93	948.72	1010.81	1073.24	1136.02	1199.17	1262.73	43
44	704.22	765.21	826.45	887.96	949.75	1011.85	1074.28	1137.07	1200.23	1263.79	44
45	705.23	766.23	827.47	888.99	950.78	1012.89	1075.32	1138.11	1201.28	1264.85	45
46	706.25	767.25	828.50	890.01	951.81	1013.92	1076.37	1139.16	1202.34	1265.92	46
47	707.26	768.27	829.52	891.04	952.85	1014.96	1077.41	1140.21	1203.40	1266.98	47
48	708.28	769.29	830.54	892.07	953.88	1016.00	1078.46	1141.26	1204.45	1268.04	48
49	709.29	770.31	831.57	893.10	954.91	1017.04	1079.50	1142.31	1205.51	1269.11	49
50	710.31	771.32	832.59	894.12	955.94	1018.08	1080.54	1143.36	1206.57	1270.17	50
51	711.32	772.34	833.61	895.15	956.98	1019.11	1081.59	1144.41	1207.62	1271.23	51
52	712.34	773.36	834.64	896.18	958.01	1020.15	1082.63	1145.46	1208.68	1272.30	52
53	713.35	774.38	835.66	897.21	959.04	1021.19	1083.68	1146.51	1209.74	1273.36	53
54	714.37	775.40	836.68	898.24	960.08	1022.23	1084.72	1147.56	1210.79	1274.43	54
55	715.38	776.42	837.71	899.26	961.11	1023.27	1085.76	1148.62	1211.85	1275.49	55
56	716.40	777.44	838.73	900.29	962.14	1024.31	1086.81	1149.67	1212.91	1276.55	56
57	717.41	778.46	839.76	901.32	963.18	1025.35	1087.85	1150.72	1213.96	1277.62	57
58	718.43	779.48	840.78	902.35	964.21	1026.39	1088.90	1151.77	1215.02	1278.68	58
59	719.44	780.50	841.80	903.38	965.24	1027.42	1089.94	1152.82	1216.08	1279.75	59
60	720.46	781.52	842.83	904.41	966.28	1028.46	1090.99	1153.87	1217.14	1280.81	60
M	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°	M
0	1280.81	1344.92	1409.49	1474.54	1540.11	1606.21	1672.89	1740.18	1808.09	1876.67	0
1	1281.88	1345.99	1410.57	1475.63	1541.20	1607.32	1674.01	1741.30	1809.23	1877.82	1
2	1282.94	1347.07	1411.65	1476.72	1542.30	1608.43	1675.13	1742.43	1810.37	1878.97	2
3	1284.01	1348.14	1412.73	1477.81	1543.40	1609.53	1676.24	1743.56	1811.50	1880.12	3
4	1285.07	1349.21	1413.81	1478.89	1544.50	1610.64	1677.36	1744.68	1812.64	1881.27	4
5	1286.14	1350.28	1414.89	1479.98	1545.59	1611.75	1678.48	1745.81	1813.78	1882.42	5
6	1287.20	1351.36	1415.97	1481.07	1546.69	1612.86	1679.59	1746.94	1814.92	1883.57	6
7	1288.27	1352.43	1417.05	1482.16	1547.79	1613.96	1680.71	1748.07	1816.06	1884.72	7
8	1289.33	1353.50	1418.13	1483.25	1548.89	1615.07	1681.83	1749.19	1817.20	1885.87	8
9	1290.40	1354.58	1419.21	1484.34	1549.99	1616.18	1682.95	1750.32	1818.34	1887.02	9
10	1291.47	1355.65	1420.30	1485.43	1551.09	1617.29	1684.06	1751.45	1819.47	1888.17	10
11	1292.53	1356.72	1421.38	1486.52	1552.18	1618.39	1685.18	1752.58	1820.61	1889.32	11
12	1293.60	1357.80	1422.46	1487.61	1553.28	1619.50	1686.30	1753.71	1821.75	1890.47	12
13	1294.66	1358.87	1423.54	1488.70	1554.38	1620.61	1687.42	1754.84	1822.89	1891.62	13
14	1295.73	1359.94	1424.62	1489.79	1555.48	1621.72	1688.54	1755.96	1824.03	1892.78	14
15	1296.80	1361.02	1425.70	1490.88	1556.58	1622.83	1689.66	1757.09	1825.17	1893.93	15
16	1297.86	1362.09	1426.79	1491.97	1557.68	1623.94	1690.78	1758.22	1826.31	1895.08	16
17	1298.93	1363.17	1427.87	1493.06	1558.78	1625.05	1691.89	1759.35	1827.45	1896.23	17
18	1300.00	1364.24	1428.95	1494.16	1559.88	1626.16	1693.01	1760.48	1828.59	1897.38	18
19	1301.06	1365.32	1430.03	1495.25	1560.98	1627.27	1694.13	1761.61	1829.74	1898.54	19
20	1302.13	1366.39	1431.12	1496.34	1562.08	1628.38	1695.25	1762.74	1830.88	1899.69	20
21	1303.20	1367.47	1432.20	1497.43	1563.18	1629.49	1696.37	1763.87	1832.02	1900.84	21
22	1304.27	1368.54	1433.28	1498.52	1564.28	1630.60	1697.49	1765.00	1833.16	1901.99	22
23	1305.33	1369.62	1434.37	1499.61	1565.38	1631.71	1698.61	1766.13	1834.30	1903.15	23
24	1306.40	1370.69	1435.45	1500.70	1566.48	1632.82	1699.73	1767.26	1835.44	1904.30	24
25	1307.47	1371.77	1436.53	1501.80	1567.58	1633.93	1700.85	1768.39	1836.58	1905.46	25
26	1308.54	1372.84	1437.62	1502.89	1568.68	1635.04	1701.97	1769.53	1837.73	1906.61	26
27	1309.61	1373.92	1438.70	1503.98	1569.79	1636.15	1703.09	1770.66	1838.87	1907.76	27
28	1310.67	1374.99	1439.78	1505.07	1570.89	1637.26	1704.22	1771.79	1840.01	1908.92	28
29	1311.74	1376.07	1440.87	1506.16	1571.99	1638.37	1705.34	1772.92	1841.15	1910.07	29
30	1312.81	1377.14	1441.95	1507.26	1573.09	1639.48	1706.46	1774.05	1842.30	1911.23	30
31	1313.88	1378.22	1443.04	1508.35	1574.19	1640.59	1707.58	1775.18	1843.44	1912.38	31
32	1314.95	1379.30	1444.12	1509.44	1575.29	1641.70	1708.70	1776.32	1844.58	1913.54	32
33	1316.02	1380.37	1445.20	1510.54	1576.40	1642.82	1709.82	1777.45	1845.73	1914.69	33
34	1317.09	1381.45	1446.29	1511.63	1577.50	1643.93	1710.94	1778.58	1846.87	1915.85	34
35	1318.15	1382.53	1447.37	1512.72	1578.60	1645.04	1712.07	1779.71	1848.01	1917.00	35
36	1319.22	1383.60	1448.46	1513.82	1579.70	1646.15	1713.19	1780.85	1849.16	1918.16	36
37	1320.29	1384.68	1449.54	1514.91	1580.81	1647.26	1714.31	1781.98	1850.30	1919.31	37
38	1321.36	1385.76	1450.63	1516.00	1581.91	1648.38	1715.43	1783.11	1851.45	1920.47	38
39	1322.43	1386.84	1451.72	1517.10	1583.01	1649.49	1716.56	1784.25	1852.59	1921.63	39
40	1323.50	1387.91	1452.80	1518.19	1584.12	1650.60	1717.68	1785.38	1853.74	1922.78	40
41	1324.57	1388.99	1453.89	1519.29	1585.22	1651.72	1718.80	1786.51	1854.88	1923.94	41
42	1325.64	1390.07	1454.97	1520.38	1586.32	1652.83	1719.93	1787.65	1856.03	1925.10	42
43	1326.71	1391.15	1456.06	1521.48	1587.43	1653.94	1721.05	1788.78	1857.17	1926.25	43
44	1327.78	1392.22	1457.14	1522.57	1588.53	1655.06	1722.17	1789.92	1858.32	1927.41	44
45	1328.85	1393.30	1458.23	1523.67	1589.63	1656.17	1723.30	1791.05	1859.46	1928.57	45
46	1329.92	1394.38	1459.32	1524.76	1590.74	1657.28	1724.42	1792.19	1860.61	1929.73	46
47	1330.99	1395.46	1460.40	1525.86	1591.84	1658.40	1725.54	1793.32	1861.76	1930.89	47
48	1332.06	1396.54	1461.49	1526.95	1592.95	1659.51	1726.67	1794.46	1862.90	1932.04	48
49	1333.13	1397.61	1462.58	1528.05	1594.05	1660.63	1727.79	1695.59	1864.05	1933.20	49
50	1334.20	1398.69	1463.66	1529.14	1595.16	1661.74	1728.92	1796.73	1865.20	1934.36	50
51	1335.28	1399.77	1464.75	1530.24	1596.26	1662.86	1730.04	1797.86	1866.34	1935.52	51
52	1336.35	1400.85	1465.84	1531.33	1597.37	1663.97	1731.17	1799.00	1867.49	1936.68	52
53	1337.42	1401.93	1466.92	1532.43	1598.47	1665.08	1732.29	1800.13	1868.64	1937.84	53
54	1338.49	1403.01	1468.01	1533.53	1599.58	1666.20	1733.42	1801.27	1869.78	1939.00	54
55	1339.56	1404.09	1469.10	1534.62	1600.68	1667.32	1734.54	1802.41	1870.93	1940.16	55
56	1340.63	1405.17	1470.19	1535.72	1601.79	1668.43	1735.67	1803.54	1872.08	1941.32	56
57	1341.70	1406.25	1471.28	1536.82	1602.90	1669.55	1736.80	1804.68	1873.23	1942.48	57
58	1342.78	1407.33	1472.36	1537.91	1604.00	1670.66	1737.92	1805.82	1874.38	1943.64	58
59	1343.85	1408.41	1473.45	1539.01	1605.11	1671.78	1739.05	1806.95	1875.53	1944.80	59
60	1344.92	1409.49	1474.54	1540.11	1606.21	1672.89	1740.18	1808.09	1876.67	1945.96	60
M	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	M
0	1945.96	2015.98	2086.78	2158.39	2230.86	2304.23	2378.54	2453.85	2530.20	2607.64	0
1	1947.12	2017.15	2087.97	2159.59	2232.08	2305.46	2379.79	2455.11	2531.48	2608.94	1
2	1948.28	2018.33	2089.15	2160.79	2233.29	2306.69	2381.04	2456.38	2532.76	2610.24	2
3	1949.44	2019.50	2090.34	2161.99	2234.51	2307.92	2382.28	2457.64	2534.01	2611.54	3
4	1950.60	2020.68	2091.53	2163.20	2235.72	2309.15	2383.53	2458.91	2535.33	2612.84	4
5	1951.77	2021.85	2092.72	2164.40	2236.94	2310.39	2384.78	2460.17	2536.61	2614.15	5
6	1952.93	2023.03	2093.90	2165.60	2238.16	2311.62	2386.03	2461.44	2537.89	2615.45	6
7	1954.09	2024.20	2095.09	2166.80	2239.37	2312.85	2387.28	2462.70	2539.13	2616.75	7
8	1955.25	2025.38	2096.28	2168.00	2240.59	2314.08	2388.53	2463.97	2540.46	2618.05	8
9	1856.41	2026.55	2097.47	2169.21	2241.81	2315.32	2389.77	2465.23	2541.74	2619.36	9
10	1957.58	2027.73	2098.66	2170.41	2243.03	2316.55	2391.02	2466.50	2543.03	2620.66	10
11	1958.74	2028.90	2099.85	2171.61	2244.24	2317.78	2392.27	2467.77	2544.31	2621.96	11
12	1959.90	2030.08	2101.04	2172.82	2245.46	2319.02	2393.52	2469.03	2545.60	2623.27	12
13	1961.07	2031.25	2102.23	2174.02	2246.68	2320.25	2394.77	2470.30	2546.88	2624.57	13
14	1962.23	2032.43	2103.42	2175.22	2247.90	2321.48	2396.02	2471.57	2548.17	2625.88	14
15	1963.39	2033.61	2104.61	2176.43	2249.12	2322.72	2397.27	2472.84	2549.45	2627.18	15
16	1964.56	2034.78	2105.80	2177.63	2250.34	2323.95	2398.53	2474.10	2550.74	2628.49	16
17	1965.72	2035.96	2106.99	2178.84	2251.56	2325.19	2399.78	2475.37	2552.03	2629.79	17
18	1966.89	2037.14	2108.18	2180.04	2252.78	2326.42	2401.03	2476.64	2553.31	2631.10	18
19	1968.05	2038.31	2109.37	2181.25	2254.00	2327.66	2402.28	2477.91	2554.60	2632.40	19
20	1969.22	2039.49	2110.56	2182.45	2255.22	2328.89	2403.53	2479.18	2555.89	2633.71	20
21	1970.38	2040.67	2111.75	2183.66	2256.44	2330.13	2404.78	2480.45	2557.18	2635.02	21
22	1971.55	2041.85	2112.94	2184.86	2257.66	2331.37	2406.04	2481.72	2558.46	2636.32	22
23	1972.71	2043.03	2114.13	2186.07	2258.88	2332.60	2407.29	2482.99	2559.75	2637.63	23
24	1973.88	2044.20	2115.32	2187.27	2260.10	2333.84	2408.54	2484.26	2561.04	2638.94	24
25	1975.04	2045.38	2116.52	2188.48	2261.32	2335.08	2409.80	2485.53	2562.33	2640.25	25
26	1976.21	2046.56	2117.71	2189.69	2262.54	2336.31	2411.05	2486.80	2563.62	2641.56	26
27	1977.38	2047.74	2118.90	2190.89	2263.76	2337.55	2412.30	2488.07	2564.91	2642.86	27
28	1878.54	2048.92	2120.10	2192.10	2264.98	2338.79	2413.56	2489.35	2566.20	2644.17	28
29	1979.71	2050.10	2121.29	2193.31	2266.21	2340.03	2414.81	2490.62	2567.49	2645.48	29
30	1980.88	2051.28	2122.48	2194.52	2267.43	2341.27	2416.07	2491.89	2568.78	2646.79	30
31	1982.04	2052.46	2123.68	2195.73	2268.65	2342.50	2417.32	2493.16	2570.07	2648.10	31
32	1983.21	2053.64	2124.87	2196.93	2269.88	2343.74	2418.58	2494.44	2571.36	2649.41	32
33	1984.38	2054.82	2126.06	2198.14	2271.10	2344.98	2419.83	2495.71	2572.65	2650.72	33
34	1985.55	2056.00	2127.26	2199.35	2272.32	2346.22	2421.09	2496.98	2573.94	2652.03	34
35	1986.71	2057.18	2128.45	2200.56	2273.55	2347.46	2422.35	2498.26	2575.24	2653.35	35
36	1987.88	2058.36	2129.65	2201.77	2274.77	2348.70	2423.60	2499.53	2576.53	2654.66	36
37	1989.05	2059.55	2130.84	2202.98	2276.00	2349.94	2424.86	2500.80	2577.82	2655.97	37
38	1990.22	2060.73	2132.04	2204.19	2277.22	2351.18	2426.12	2502.08	2579.12	2657.28	38
39	1991.39	2061.91	2133.23	2205.40	2278.45	2352.42	2427.38	2503.35	2580.41	2658.60	39
40	1992.56	2063.09	2134.43	2206.61	2279.67	2353.66	2428.63	2504.63	2581.70	2659.91	40
41	1993.73	2064.27	2135.62	2207.82	2280.90	2354.91	2429.89	2505.90	2583.00	2661.22	41
42	1994.90	2065.46	2136.82	2209.03	2282.12	2356.15	2431.15	2507.18	2584.29	2662.54	42
43	1996.06	2066.64	2138.02	2210.24	2283.35	2357.39	2432.41	2508.46	2585.58	2663.85	43
44	1997.23	2067.82	2139.21	2211.45	2284.57	2358.63	2433.67	2509.73	2586.88	2665.16	44
45	1998.40	2069.01	2140.41	2212.66	2285.80	2359.87	2434.93	2511.01	2588.17	2666.48	45
46	1999.57	2070.19	2141.61	2213.87	2287.03	2361.12	2436.19	2512.29	2589.47	2667.79	46
47	2000.74	2071.37	2142.81	2215.09	2288.25	2362.36	2437.45	2513.56	2590.77	2669.11	47
48	2001.92	2072.56	2144.00	2216.30	2289.48	2363.60	2438.71	2514.84	2592.06	2670.42	48
49	2003.09	2073.74	2145.20	2217.51	2290.71	2364.85	2439.97	2516.12	2593.36	2671.74	49
50	2004.26	2074.92	2146.40	2218.72	2291.94	2366.09	2441.23	2517.40	2594.66	2673.06	50
51	2005.43	2076.11	2147.60	2219.94	2293.17	2367.33	2442.49	2518.68	2595.95	2674.37	51
52	2006.60	2077.29	2148.80	2221.15	2294.39	2368.58	2443.75	2519.96	2597.25	2675.69	52
53	2007.77	2078.48	2149.99	2222.36	2295.62	2369.82	2445.01	2521.23	2598.55	2677.01	53
54	2008.94	2079.66	2151.19	2223.57	2296.85	2371.07	2446.27	2522.51	2599.85	2678.33	54
55	2010.12	2080.85	2152.39	2224.79	2298.08	2372.31	2447.53	2523.79	2601.14	2679.64	55
56	2011.29	2082.03	2153.59	2226.00	2299.31	2373.56	2448.80	2525.07	2602.44	2680.96	56
57	2012.46	2083.22	2154.79	2227.22	2300.54	2374.80	2450.06	2526.35	2603.74	2682.28	57
58	2013.63	2084.41	2155.99	2228.43	2301.77	2376.05	2451.32	2527.63	2605.04	2683.60	58
59	2014.81	2085.59	2157.19	2229.65	2303.00	2377.30	2452.58	2528.92	2606.34	2684.92	59
60	2015.98	2086.78	2158.39	2230.86	2304.23	2378.54	2453.85	2530.20	2607.64	2686.24	60
M	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	M
0	2686-24	2766-05	2847-13	2929-55	3013-38	3098-70	3185-59	3274-13	3364-41	3456-53	0
1	2687-56	2767-39	2848-49	2930-93	3014-79	3100-14	3187-05	3275-62	3365-93	3458-08	1
2	2688-88	2768-73	2849-85	2932-32	3016-20	3101-57	3188-51	3277-11	3367-45	3459-64	2
3	2690-20	2770-07	2851-22	2933-71	3017-61	3103-01	3189-97	3278-60	3368-97	3461-19	3
4	2691-52	2771-41	2852-58	2935-09	3019-02	3104-44	3191-44	3280-09	3370-49	3462-74	4
5	2692-84	2772-75	2853-94	2936-48	3020-43	3105-88	3192-90	3281-58	3372-01	3464-29	5
6	2694-16	2774-10	2855-31	2937-87	3021-85	3107-32	3194-36	3283-07	3373-54	3465-85	6
7	2695-49	2775-44	2856-67	2939-26	3023-26	3108-76	3195-83	3284-57	3375-06	3467-40	7
8	2696-81	2776-78	2858-04	2940-64	3024-67	3110-19	3197-29	3286-06	3376-58	3468-96	8
9	2698-13	2778-13	2859-40	2942-03	3026-08	3111-63	3198-76	3287-55	3378-11	3470-52	9
10	2699-45	2779-47	2860-77	2943-42	3027-50	3113-07	3200-23	3289-05	3379-63	3472-07	10
11	2700-78	2780-81	2862-14	2944-81	3028-91	3114-51	3201-69	3290-54	3381-16	3473-63	11
12	2702-10	2782-16	2863-50	2946-20	3030-32	3115-95	3203-16	3292-04	3382-68	3475-19	12
13	2703-42	2783-50	2864-87	2947-59	3031-74	3117-39	3204-63	3293-54	3384-21	3476-75	13
14	2704-75	2784-85	2866-24	2948-98	3033-15	3118-83	3206-10	3295-03	3385-73	3478-30	14
15	2706-07	2786-19	2867-60	2950-37	3034-57	3120-27	3207-56	3296-53	3387-26	3479-86	15
16	2707-40	2787-54	2868-97	2951-76	3035-99	3121-71	3209-03	3298-03	3388-79	3481-42	16
17	2708-72	2788-89	2870-34	2953-15	3037-40	3123-16	3210-50	3299-52	3390-32	3482-98	17
18	2710-05	2790-23	2871-71	2954-55	3038-82	3124-60	3211-97	3301-02	3391-85	3484-54	18
19	2711-38	2791-58	2873-08	2955-94	3040-23	3126-04	3213-44	3302-52	3393-38	3486-11	19
20	2712-70	2792-93	2874-45	2957-33	3041-65	3127-49	3214-91	3304-02	3394-91	3487-67	20
21	2714-03	2794-28	2875-82	2958-73	3043-07	3128-93	3216-38	3305-52	3396-44	3489-23	21
22	2715-36	2795-62	2877-19	2960-12	3044-49	3130-37	3217-86	3307-02	3397-97	3490-79	22
23	2716-68	2796-97	2878-56	2961-51	3045-91	3131-82	3219-33	3308-52	3399-50	3492-36	23
24	2718-01	2798-32	2879-93	2962-91	3047-33	3133-26	3220-80	3310-02	3401-03	3493-92	24
25	2719-34	2799-67	2881-30	2964-30	3048-75	3134-71	3222-27	3311-53	3402-56	3495-49	25
26	2720-67	2801-02	2882-67	2965-70	3050-17	3136-15	3223-75	3313-03	3404-10	3497-05	26
27	2722-00	2802-37	2884-05	2967-09	3051-59	3137-60	3225-22	3314-53	3405-63	3498-62	27
28	2723-33	2803-72	2885-42	2968-49	3053-01	3139-05	3226-69	3316-03	3407-16	3500-18	28
29	2724-66	2805-07	2886-79	2969-89	3054-43	3140-49	3228-17	3317-54	3408-70	3501-75	29
30	2725-99	2806-42	2888-17	2971-28	3055-85	3141-94	3229-64	3319-04	3410-23	3503-32	30
31	2727-32	2807-77	2889-54	2972-68	3057-27	3143-39	3231-12	3320-55	3411-77	3504-89	31
32	2728-65	2809-13	2890-91	2974-08	3058-70	3144-84	3232-60	3322-05	3413-30	3506-45	32
33	2729-98	2810-48	2892-29	2975-48	3060-12	3146-29	3234-07	3323-56	3414-84	3508-02	33
34	2731-31	2811-83	2893-66	2976-88	3061-54	3147-74	3235-55	3325-07	3416-38	3509-59	34
35	2732-64	2813-18	2895-04	2978-28	3062-97	3149-19	3237-03	3326-57	3417-92	3511-16	35
36	2733-97	2814-54	2896-42	2979-68	3064-39	3150-64	3238-51	3328-08	3419-45	3512-73	36
37	2735-31	2815-89	2897-79	2981-08	3065-81	3152-09	3239-98	3329-59	3420-99	3514-31	37
38	2736-64	2817-25	2899-17	2982-48	3067-24	3153-54	3241-46	3331-10	3422-53	3515-88	38
39	2737-97	2818-60	2900-54	2983-88	3068-66	3154-99	3242-94	3332-60	3424-07	3517-45	39
40	2739-30	2819-95	2901-92	2985-28	3070-09	3156-45	3244-42	3334-11	3425-61	3519-02	40
41	2740-64	2821-31	2903-30	2986-68	3071-52	3157-90	3245-90	3335-62	3427-15	3520-60	41
42	2741-97	2822-67	2904-68	2988-08	3072-94	3159-35	3247-38	3337-13	3428-70	3522-17	42
43	2743-31	2824-02	2906-06	2989-48	3074-37	3160-81	3248-87	3338-65	3430-24	3523-75	43
44	2744-64	2825-38	2907-43	2990-88	3075-80	3162-26	3250-35	3340-16	3431-78	3525-32	44
45	2745-98	2826-73	2908-81	2992-29	3077-23	3163-71	3251-83	3341-67	3433-32	3526-90	45
46	2747-31	2828-09	2910-19	2993-69	3078-66	3165-17	3253-31	3343-18	3434-87	3528-47	46
47	2748-65	2829-45	2911-57	2995-09	3080-09	3166-62	3254-80	3344-69	3436-41	3530-05	47
48	2749-98	2830-81	2912-95	2996-50	3081-52	3168-08	3256-28	3346-21	3437-95	3531-63	48
49	2751-32	2832-16	2914-33	2997-90	3082-95	3169-54	3257-77	3347-72	3439-50	3533-21	49
50	2752-66	2833-52	2915-72	2999-31	3084-38	3170-99	3259-25	3349-24	3441-05	3534-79	50
51	2754-00	2834-88	2917-10	3000-71	3085-81	3172-45	3260-74	3350-75	3442-59	3536-37	51
52	2755-33	2836-24	2918-48	3002-12	3087-24	3173-91	3262-22	3352-27	3444-14	3537-95	52
53	2756-67	2837-60	2919-86	3003-53	3088-67	3175-37	3263-71	3353-78	3445-69	3539-53	53
54	2758-01	2838-96	2921-24	3004-93	3090-10	3176-83	3265-20	3355-30	3447-23	3541-11	54
55	2759-35	2840-32	2922-63	3006-34	3091-53	3178-28	3266-68	3356-82	3448-78	3542-69	55
56	2760-69	2841-68	2924-01	3007-75	3092-97	3179-74	3268-17	3358-33	3450-33	3544-27	56
57	2762-03	2843-04	2925-39	3009-16	3094-40	3181-20	3269-66	3359-85	3451-88	3545-85	57
58	2763-37	2844-40	2926-78	3010-56	3095-83	3182-66	3271-15	3361-37	3453-43	3547-44	58
59	2764-71	2845-77	2928-16	3011-97	3097-27	3184-13	3272-64	3362-89	3454-98	3549-02	59
60	2766-05	2847-13	2929-55	3013-38	3098-70	3185-59	3274-13	3364-41	3456-53	3550-60	60
M	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°	M
0	3550.60	3646.74	3745.05	3845.69	3948.78	4054.48	4162.97	4274.43	4389.06	4507.08	0
1	3552.19	3648.36	3746.71	3847.38	3950.52	4056.27	4164.81	4276.31	4391.00	4509.07	1
2	3553.77	3649.98	3748.37	3849.08	3952.26	4058.05	4166.64	4278.20	4392.94	4511.07	2
3	3555.36	3651.60	3750.03	3850.78	3954.00	4059.84	4168.47	4280.08	4394.88	4513.07	3
4	3556.95	3653.22	3751.69	3852.48	3955.74	4061.63	4170.31	4281.97	4396.82	4515.07	4
5	3558.53	3654.84	3753.35	3854.18	3957.48	4063.41	4172.14	4283.86	4398.76	4517.07	5
6	3560.12	3656.47	3755.01	3855.88	3959.23	4065.20	4173.98	4285.75	4400.70	4519.08	6
7	3561.71	3658.09	3756.67	3857.58	3960.97	4066.99	4175.82	4287.64	4402.65	4521.08	7
8	3563.30	3659.72	3758.33	3859.29	3962.72	4068.78	4177.66	4289.53	4404.59	4523.08	8
9	3564.89	3661.34	3760.00	3860.99	3964.46	4070.57	4179.50	4291.42	4406.54	4525.09	9
10	3566.48	3662.97	3761.66	3862.69	3966.21	4072.37	4181.34	4293.31	4408.49	4527.09	10
11	3568.07	3664.59	3763.33	3864.40	3967.96	4074.16	4183.18	4295.20	4410.43	4529.10	11
12	3569.66	3666.22	3764.99	3866.10	3969.70	4075.95	4185.02	4297.09	4412.38	4531.11	12
13	3571.25	3667.85	3766.66	3867.81	3971.45	4077.75	4186.86	4298.99	4414.33	4533.12	13
14	3572.85	3669.48	3768.32	3869.52	3973.20	4079.54	4188.71	4300.89	4416.28	4535.13	14
15	3574.44	3671.11	3769.99	3871.22	3974.95	4081.34	4190.55	4302.78	4418.24	4537.14	15
16	3576.03	3672.74	3771.66	3872.93	3976.70	4083.13	4192.40	4304.68	4420.19	4539.15	16
17	3577.63	3674.37	3773.33	3874.64	3978.46	4084.93	4194.24	4306.58	4422.14	4541.17	17
18	3579.22	3676.00	3774.99	3876.35	3980.21	4086.73	4196.09	4308.48	4424.10	4543.18	18
19	3580.82	3677.63	3776.66	3878.06	3981.96	4088.53	4197.94	4310.38	4426.05	4545.20	19
20	3582.41	3679.26	3778.33	3879.77	3983.71	4090.33	4199.79	4312.28	4428.01	4547.21	20
21	3584.01	3680.89	3780.00	3881.48	3985.47	4092.13	4201.64	4314.18	4429.97	4549.23	21
22	3585.61	3682.53	3781.68	3883.19	3987.22	4093.93	4203.49	4316.08	4431.93	4551.25	22
23	3587.20	3684.16	3783.35	3884.91	3988.98	4095.73	4205.34	4317.98	4433.89	4553.27	23
24	3588.80	3685.79	3785.02	3886.62	3990.74	4097.54	4207.19	4319.89	4435.85	4555.29	24
25	3590.40	3687.43	3786.69	3888.33	3992.49	4099.34	4209.04	4321.79	4437.81	4557.31	25
26	3592.00	3689.07	3788.37	3890.05	3994.25	4101.14	4210.90	4323.70	4439.77	4559.33	26
27	3593.60	3690.70	3790.04	3891.76	3996.01	4102.95	4212.75	4325.61	4441.73	4561.36	27
28	3595.20	3692.34	3791.72	3893.48	3997.77	4104.75	4214.61	4327.52	4443.70	4563.38	28
29	3596.80	3693.98	3793.40	3895.20	3999.53	4106.56	4216.46	4329.42	4445.66	4565.41	29
30	3598.40	3695.61	3795.07	3896.91	4001.29	4108.37	4218.32	4331.33	4447.63	4567.44	30
31	3600.01	3697.25	3796.75	3898.63	4003.06	4110.18	4220.18	4333.24	4449.60	4569.46	31
32	3601.61	3698.89	3798.43	3900.35	4004.82	4111.99	4222.04	4335.16	4451.56	4571.49	32
33	3603.21	3700.53	3800.11	3902.07	4006.58	4113.80	4223.90	4337.07	4453.53	4573.52	33
34	3604.82	3702.17	3801.79	3903.79	4008.35	4115.61	4225.76	4338.98	4455.50	4575.55	34
35	3606.42	3703.82	3803.47	3905.51	4010.11	4117.42	4227.62	4340.90	4457.48	4577.59	35
36	3608.03	3705.46	3805.15	3907.24	4011.88	4119.23	4229.48	4342.81	4459.45	4579.62	36
37	3609.63	3707.10	3806.83	3908.96	4013.64	4121.05	4231.34	4344.73	4461.42	4581.65	37
38	3611.24	3708.74	3808.51	3910.68	4015.41	4122.86	4233.21	4346.65	4463.40	4583.69	38
39	3612.85	3710.39	3810.19	3912.41	4017.18	4124.67	4235.07	4348.56	4465.37	4585.72	39
40	3614.46	3712.03	3811.88	3914.13	4018.95	4126.49	4236.94	4350.48	4467.35	4587.76	40
41	3616.06	3713.68	3813.56	3915.86	4020.72	4128.31	4238.80	4352.40	4469.32	4589.80	41
42	3617.67	3715.32	3815.25	3917.58	4022.49	4130.12	4240.67	4354.32	4471.30	4591.84	42
43	3619.28	3716.97	3816.93	3919.31	4024.26	4131.94	4242.54	4356.25	4473.28	4593.88	43
44	3620.89	3718.62	3818.62	3921.04	4026.03	4133.76	4244.41	4358.17	4475.26	4595.92	44
45	3622.50	3720.26	3820.30	3922.77	4027.80	4135.58	4246.28	4360.09	4477.24	4597.96	45
46	3624.12	3721.91	3821.99	3924.50	4029.58	4137.40	4248.15	4362.02	4479.22	4600.01	46
47	3625.73	3723.56	3823.68	3926.23	4031.35	4139.22	4250.02	4363.94	4481.21	4602.05	47
48	3627.34	3725.21	3825.37	3927.96	4033.13	4141.04	4251.89	4365.87	4483.19	4604.10	48
49	3628.95	3726.86	3827.06	3929.69	4034.90	4142.87	4253.77	4367.80	4485.18	4606.15	49
50	3630.57	3728.51	3828.75	3931.42	4036.68	4144.69	4255.64	4369.72	4487.16	4608.19	50
51	3632.18	3730.16	3830.44	3933.15	4038.45	4146.52	4257.52	4371.65	4489.15	4610.24	51
52	3633.80	3731.81	3832.13	3934.88	4040.23	4148.34	4259.39	4373.58	4491.14	4612.29	52
53	3635.41	3733.47	3833.82	3936.62	4042.01	4150.17	4261.27	4375.51	4493.13	4614.34	53
54	3637.03	3735.12	3835.52	3938.35	4043.79	4151.99	4263.15	4377.45	4495.12	4616.40	54
55	3638.64	3736.77	3837.21	3940.09	4045.57	4153.82	4265.02	4379.38	4497.11	4618.45	55
56	3640.26	3738.43	3838.90	3941.83	4047.35	4155.65	4266.90	4381.31	4499.10	4620.50	56
57	3641.88	3740.08	3840.60	3943.56	4049.13	4157.48	4268.78	4383.25	4501.09	4622.56	57
58	3643.50	3741.74	3842.29	3945.30	4050.92	4159.31	4270.67	4385.18	4503.09	4624.62	58
59	3645.12	3743.40	3843.99	3947.04	4052.70	4161.14	4272.55	4387.12	4505.08	4626.67	59
60	3646.74	3745.05	3845.69	3948.78	4054.48	4162.97	4274.43	4389.06	4507.08	4628.73	60
M	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°	M
0	4628.73	4754.29	4884.06	5018.36	5157.57	5302.11	5452.43	5609.09	5772.68	5943.89	0
1	4630.79	4756.42	4886.26	5020.64	5159.93	5304.56	5454.99	5611.76	5775.47	5946.82	1
2	4632.85	4758.55	4888.46	5022.92	5162.30	5307.02	5457.55	5614.43	5778.26	5949.74	2
3	4634.92	4760.68	4890.66	5025.20	5164.67	5309.48	5460.11	5617.10	5781.05	5952.67	3
4	4636.98	4762.81	4892.87	5027.48	5167.04	5311.94	5462.67	5619.77	5783.85	5955.60	4
5	4639.04	4764.94	4895.07	5029.77	5169.41	5314.40	5465.24	5622.45	5786.65	5958.53	5
6	4641.11	4767.08	4897.28	5032.05	5171.78	5316.87	5467.81	5625.13	5789.45	5961.47	6
7	4643.17	4769.21	4899.49	5034.34	5174.15	5319.34	5470.37	5627.81	5792.25	5964.40	7
8	4645.24	4771.35	4901.70	5036.63	5176.52	5321.80	5472.94	5630.49	5795.05	5967.34	8
9	4647.31	4773.48	4903.91	5038.92	5178.90	5324.27	5475.51	5633.17	5797.86	5970.28	9
10	4649.38	4775.62	4906.12	5041.21	5181.28	5326.74	5478.09	5635.86	5800.66	5973.23	10
11	4651.45	4777.76	4908.33	5043.50	5183.66	5329.22	5480.66	5638.54	5803.47	5976.17	11
12	4653.52	4779.90	4910.55	5045.80	5186.04	5331.69	5483.24	5641.23	5806.29	5979.12	12
13	4655.60	4782.04	4912.76	5048.09	5188.42	5334.17	5485.82	5643.92	5809.10	5982.07	13
14	4657.67	4784.18	4914.98	5050.39	5190.80	5336.65	5488.40	5646.62	5811.92	5985.03	14
15	4659.75	4786.33	4917.20	5052.69	5193.19	5339.13	5490.98	5649.31	5814.74	5987.98	15
16	4661.82	4788.47	4919.42	5054.99	5195.57	5341.61	5493.57	5652.01	5817.56	5990.94	16
17	4663.90	4790.62	4921.64	5057.29	5197.96	5344.09	5496.15	5654.71	5820.38	5993.90	17
18	4665.98	4792.77	4923.86	5059.59	5200.35	5346.57	5498.74	5657.41	5823.21	5996.86	18
19	4668.06	4794.92	4926.08	5061.89	5202.74	5349.06	5501.33	5660.11	5826.04	5999.83	19
20	4670.14	4797.07	4928.30	5064.20	5205.14	5351.55	5503.92	5662.82	5828.87	6002.80	20
21	4672.22	4799.22	4930.53	5066.51	5207.53	5354.04	5506.51	5665.52	5831.70	6005.77	21
22	4674.30	4801.37	4932.76	5068.81	5209.92	5356.53	5509.11	5668.23	5834.53	6008.74	22
23	4676.39	4803.52	4934.99	5071.12	5212.32	5359.02	5511.71	5670.94	5837.37	6011.72	23
24	4678.47	4805.68	4937.22	5073.43	5214.72	5361.51	5514.31	5673.66	5840.21	6014.69	24
25	4680.56	4807.83	4939.45	5075.75	5217.12	5364.01	5516.91	5676.37	5843.05	6017.67	25
26	4682.65	4809.99	4941.68	5078.06	5219.52	5366.51	5519.51	5679.09	5845.89	6020.66	26
27	4684.74	4812.15	4943.91	5080.37	5221.93	5369.01	5522.11	5681.81	5848.74	6023.64	27
28	4686.83	4814.31	4946.15	5082.69	5224.33	5371.51	5524.72	5684.53	5851.58	6026.63	28
29	4688.92	4816.47	4948.38	5085.01	5226.74	5374.01	5527.33	5687.25	5854.43	6029.62	29
30	4691.01	4818.63	4950.62	5087.33	5229.14	5376.51	5529.94	5689.98	5857.29	6032.61	30
31	4693.10	4820.79	4952.86	5089.65	5231.55	5379.02	5532.55	5692.70	5860.14	6035.60	31
32	4695.19	4822.96	4955.10	5091.97	5233.96	5381.53	5535.16	5695.43	5863.00	6038.60	32
33	4697.29	4825.12	4957.34	5094.29	5236.38	5384.04	5537.78	5698.16	5865.86	6041.60	33
34	4699.39	4827.29	4959.58	5096.62	5238.79	5386.55	5540.39	5700.90	5868.72	6044.60	34
35	4701.48	4829.46	4961.83	5098.94	5241.21	5389.06	5543.01	5703.63	5871.58	6047.61	35
36	4703.58	4831.63	4964.07	5101.27	5243.62	5391.57	5545.63	5706.37	5874.44	6050.62	36
37	4705.68	4833.80	4966.32	5103.60	5246.04	5394.09	5548.25	5709.11	5877.31	6053.63	37
38	4707.78	4835.97	4968.57	5105.93	5248.46	5396.61	5550.88	5711.85	5880.18	6056.64	38
39	4709.89	4838.14	4970.82	5108.26	5250.88	5399.13	5553.50	5714.59	5883.05	6059.65	39
40	4711.99	4840.32	4973.07	5110.60	5253.31	5401.65	5556.13	5717.34	5885.93	6062.67	40
41	4714.09	4842.49	4975.32	5112.93	5255.73	5404.17	5558.76	5720.09	5888.80	6065.69	41
42	4716.20	4844.67	4977.57	5115.27	5258.16	5406.70	5561.39	5722.84	5891.68	6068.71	42
43	4718.30	4846.85	4979.83	5117.61	5260.59	5409.22	5564.03	5725.59	5894.56	6071.73	43
44	4720.41	4849.03	4982.08	5119.95	5263.02	5411.75	5566.66	5728.34	5897.45	6074.76	44
45	4722.52	4851.21	4984.34	5122.29	5265.45	5414.28	5569.30	5731.10	5900.33	6077.79	45
46	4724.63	4853.39	4986.60	5124.63	5267.88	5416.81	5571.94	5733.85	5903.22	6080.82	46
47	4726.74	4855.57	4988.86	5126.97	5270.31	5419.34	5574.58	5736.61	5906.11	6083.86	47
48	4728.86	4857.76	4991.12	5129.32	5272.75	5421.88	5577.23	5739.37	5909.00	6086.90	48
49	4730.97	4859.94	4993.38	5131.66	5275.19	5424.42	5579.87	5742.14	5911.90	6089.94	49
50	4733.08	4862.13	4995.65	5134.01	5277.63	5426.96	5582.52	5744.90	5914.80	6092.98	50
51	4735.20	4864.31	4997.91	5136.36	5280.07	5429.50	5585.17	5747.67	5917.70	6096.02	51
52	4737.32	4866.50	5000.18	5138.71	5282.51	5432.04	5587.82	5750.44	5920.60	6099.07	52
53	4739.45	4868.69	5002.45	5141.06	5284.95	5434.58	5590.47	5753.21	5923.50	6102.12	53
54	4741.55	4870.88	5004.72	5143.42	5287.40	5437.13	5593.12	5755.99	5926.41	6105.17	54
55	4743.67	4873.08	5006.99	5145.77	5289.85	5439.67	5595.78	5758.76	5929.32	6108.23	55
56	4745.80	4875.27	5009.26	5148.13	5292.30	5442.22	5598.44	5761.54	5932.23	6111.28	56
57	4747.92	4877.47	5011.53	5150.49	5294.75	5444.77	5601.10	5764.32	5935.14	6114.34	57
58	4750.04	4879.66	5013.81	5152.85	5297.20	5447.32	5603.76	5767.11	5938.06	6117.41	58
59	4752.17	4881.86	5016.08	5155.21	5299.65	5449.88	5606.42	5769.89	5940.97	6120.47	59
60	4754.29	4884.06	5018.36	5157.57	5302.11	5452.43	5609.09	5772.68	5943.89	6123.54	60
M	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°	M

(Terrestrial Spheroid) MERIDIONAL PARTS. Compression $\frac{1}{293.465}$											
M	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	M
0	6123-54	6312-55	6512-01	6723-21	6947-70	7187-33	7444-37	7721-64	8022-70	8352-11	0
1	6126-61	6315-78	6515-43	6726-84	6951-56	7191-46	7448-81	7726-45	8027-94	8357-87	1
2	6129-68	6319-02	6518-85	6730-47	6955-43	7195-60	7453-26	7731-27	8033-19	8363-65	2
3	6132-76	6322-26	6522-28	6734-11	6959-30	7199-74	7457-72	7736-09	8038-45	8369-43	3
4	6135-84	6325-51	6525-71	6737-75	6963-18	7203-89	7462-19	7740-92	8043-72	8375-22	4
5	6138-92	6328-75	6529-14	6741-39	6967-06	7208-05	7466-66	7745-76	8048-99	8381-02	5
6	6142-00	6332-00	6532-58	6745-04	6970-95	7212-21	7471-13	7750-61	8054-27	8386-83	6
7	6145-09	6335-26	6536-02	6748-69	6974-84	7216-37	7475-61	7755-46	8059-56	8392-65	7
8	6148-18	6338-51	6539-46	6752-34	6978-73	7220-54	7480-10	7760-32	8064-86	8398-48	8
9	6151-27	6341-77	6542-91	6756-00	6982-63	7224-71	7484-59	7765-18	8070-17	8404-32	9
10	6154-37	6345-03	6546-36	6759-66	6986-53	7228-89	7489-09	7770-05	8075-49	8410-17	10
11	6157-46	6348-30	6549-81	6763-32	6990-44	7233-07	7493-59	7774-93	8080-81	8416-03	11
12	6160-56	6351-57	6553-27	6766-99	6994-35	7237-26	7498-10	7779-82	8086-14	8421-90	12
13	6163-66	6354-84	6556-73	6770-67	6998-26	7241-45	7502-62	7784-71	8091-48	8427-78	13
14	6166-77	6358-11	6560-19	6774-34	7002-18	7245-65	7507-14	7789-61	8096-83	8433-67	14
15	6169-88	6361-39	6563-65	6778-02	7006-11	7249-85	7511-66	7794-51	8102-18	8439-56	15
16	6172-99	6364-67	6567-12	6781-71	7010-03	7254-06	7516-19	7799-43	8107-55	8445-47	16
17	6176-10	6367-95	6570-60	6785-40	7013-97	7258-27	7520-73	7804-35	8112-92	8451-39	17
18	6179-21	6371-23	6574-07	6789-09	7017-90	7262-49	7525-28	7809-27	8118-30	8457-32	18
19	6182-33	6374-52	6577-55	6792-78	7021-84	7266-72	7529-83	7814-21	8123-69	8463-26	19
20	6185-45	6377-81	6581-04	6796-48	7025-79	7270-95	7534-38	7819-15	8129-09	8469-21	20
21	6188-58	6381-11	6584-52	6800-18	7029-74	7275-18	7538-94	7824-09	8134-49	8475-17	21
22	6191-70	6384-41	6588-01	6803-89	7033-69	7279-42	7543-51	7829-05	8139-91	8481-14	22
23	6194-83	6387-71	6591-50	6807-60	7037-65	7283-66	7548-09	7834-01	8145-33	8487-12	23
24	6197-97	6391-01	6595-00	6811-32	7041-62	7287-91	7552-67	7838-98	8150-76	8493-11	24
25	6201-10	6394-32	6598-50	6815-04	7045-58	7292-16	7557-25	7843-95	8156-20	8499-11	25
26	6204-24	6397-63	6602-01	6818-76	7049-56	7296-42	7561-84	7848-93	8161-65	8505-12	26
27	6207-38	6400-94	6605-51	6822-49	7053-53	7300-69	7566-44	7853-92	8167-10	8511-14	27
28	6210-52	6404-26	6609-02	6826-22	7057-51	7304-95	7571-05	7858-92	8172-57	8517-17	28
29	6213-66	6407-58	6612-54	6829-95	7061-50	7309-23	7575-66	7863-93	8178-04	8523-21	29
30	6216-81	6410-90	6616-05	6833-69	7065-49	7313-51	7580-27	7868-94	8183-52	8529-26	30
31	6219-96	6414-22	6619-57	6837-43	7069-48	7317-79	7584-89	7873-95	8189-01	8535-33	31
32	6223-12	6417-55	6623-10	6841-18	7073-48	7322-08	7589-52	7878-98	8194-51	8541-40	32
33	6226-27	6420-88	6626-63	6844-93	7077-49	7326-38	7594-15	7884-01	8200-02	8547-49	33
34	6229-43	6424-22	6630-16	6848-68	7081-49	7330-68	7598-79	7889-05	8205-54	8553-58	34
35	6232-59	6427-55	6633-69	6852-44	7085-51	7334-98	7603-44	7894-10	8211-06	8559-69	35
36	6235-76	6430-89	6637-23	6856-20	7089-52	7339-29	7608-09	7899-15	8216-60	8565-80	36
37	6238-92	6434-24	6640-77	6859-97	7093-54	7343-61	7612-75	7904-21	8222-14	8571-93	37
38	6242-09	6437-58	6644-32	6863-74	7097-57	7347-93	7617-42	7909-28	8227-69	8578-07	38
39	6245-27	6440-93	6647-87	6867-51	7101-60	7352-26	7622-09	7914-36	8233-25	8584-22	39
40	6248-44	6444-29	6651-42	6871-29	7105-64	7356-59	7626-76	7919-44	8238-82	8590-38	40
41	6251-62	6447-64	6654-97	6875-07	7109-68	7360-93	7631-45	7924-53	8244-40	8596-55	41
42	6254-80	6451-00	6658-53	6878-86	7113-72	7365-27	7636-14	7929-63	8249-98	8602-73	42
43	6257-99	6454-36	6662-10	6882-65	7117-77	7369-62	7640-83	7934-74	8255-58	8608-92	43
44	6261-17	6457-73	6665-66	6886-44	7121-83	7373-97	7645-53	7939-85	8261-19	8615-12	44
45	6264-36	6461-10	6669-23	6890-24	7125-88	7378-33	7650-24	7944-97	8266-80	8621-34	45
46	6267-56	6464-47	6672-81	6894-04	7129-95	7382-69	7654-96	7950-10	8272-42	8627-56	46
47	6270-75	6467-84	6676-38	6897-85	7134-02	7387-06	7659-68	7955-24	8278-05	8633-80	47
48	6273-95	6471-22	6679-96	6901-66	7138-09	7391-44	7664-41	7960-38	8283-70	8640-05	48
49	6277-15	6474-60	6683-55	6905-47	7142-17	7395-82	7669-14	7965-53	8289-35	8646-31	49
50	6280-35	6477-99	6687-14	6909-29	7146-25	7400-21	7673-88	7970-69	8295-01	8652-58	50
51	6283-56	6481-38	6690-73	6913-11	7150-33	7404-60	7678-63	7975-85	8300-68	8658-86	51
52	6286-77	6484-77	6694-32	6916-94	7154-42	7408-99	7683-38	7981-03	8306-35	8665-15	52
53	6289-98	6488-16	6697-92	6920-77	7158-52	7413-40	7688-14	7986-21	8312-04	8671-46	53
54	6293-20	6491-56	6701-52	6924-60	7162-62	7417-80	7692-90	7991-40	8317-74	8677-77	54
55	6296-42	6494-96	6705-13	6928-44	7166-73	7422-22	7697-68	7996-59	8323-44	8684-10	55
56	6299-64	6498-36	6708-74	6932-28	7170-84	7426-64	7702-46	8001-80	8329-16	8690-44	56
57	6302-86	6501-77	6712-35	6936-13	7174-95	7431-06	7707-24	8007-01	8334-88	8696-79	57
58	6306-09	6505-18	6715-97	6939-98	7179-07	7435-49	7712-03	8012-23	8340-62	8703-15	58
59	6309-32	6508-59	6719-59	6943-84	7183-20	7439-93	7716-83	8017-46	8346-36	8709-52	59
60	6312-55	6512-01	6723-21	6947-70	7187-33	7444-37	7721-64	8022-70	8352-11	8715-91	60
M	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	M

(Terrestrial Spheroid) **MERIDIONAL PARTS.** Compression $\frac{1}{293.465}$

M	81°	82°	83°	84°	85°	86°	87°	88°	89°	M
0	8715.91	9122.25	9582.55	10113.57	10741.27	11509.13	12498.70	13893.00	16276.12	0
1	8722.31	9129.44	9590.77	10123.15	10752.76	11523.50	12517.86	13921.78	16333.90	1
2	8728.72	9136.65	9599.00	10132.76	10764.29	11537.92	12537.12	13950.79	16392.67	2
3	8735.14	9143.87	9607.26	10142.39	10775.86	11552.41	12556.50	13980.06	16452.46	3
4	8741.57	9151.10	9615.53	10152.05	10787.47	11566.96	12575.99	14009.57	16513.31	4
5	8748.01	9158.35	9623.82	10161.74	10799.12	11581.56	12595.59	14039.34	16575.25	5
6	8754.47	9165.62	9632.13	10171.45	10810.80	11596.23	12615.29	14069.37	16638.34	6
7	8760.94	9172.90	9640.47	10181.19	10822.53	11610.97	12635.11	14099.66	16702.60	7
8	8767.42	9180.20	9648.82	10190.96	10834.30	11625.77	12655.05	14130.23	16768.08	8
9	8773.91	9187.51	9657.19	10200.76	10846.10	11640.63	12675.10	14161.06	16834.84	9
10	8780.42	9194.84	9665.59	10210.58	10857.95	11655.55	12695.27	14192.18	16902.92	10
11	8786.94	9202.19	9674.00	10220.43	10869.84	11670.54	12715.56	14223.58	16972.37	11
12	8793.47	9209.55	9682.43	10230.31	10881.77	11685.60	12735.97	14255.27	17043.26	12
13	8800.01	9216.92	9690.89	10240.22	10893.74	11700.72	12756.50	14287.25	17115.64	13
14	8806.56	9224.31	9699.37	10250.16	10905.75	11715.91	12777.16	14319.54	17189.57	14
15	8813.13	9231.72	9707.86	10260.13	10917.81	11731.16	12797.94	14352.13	17265.13	15
16	8819.71	9239.14	9716.38	10270.12	10929.91	11746.49	12818.85	14385.03	17342.39	16
17	8826.30	9246.58	9724.92	10280.15	10942.05	11761.88	12839.88	14418.25	17421.42	17
18	8832.90	9254.04	9733.48	10290.20	10954.23	11777.34	12861.04	14451.79	17502.32	18
19	8839.52	9261.51	9742.06	10300.28	10966.45	11792.87	12882.34	14485.67	17585.16	19
20	8846.15	9268.99	9750.66	10310.39	10978.72	11808.47	12903.77	14519.88	17670.05	20
21	8852.79	9276.50	9759.28	10320.54	10991.03	11824.14	12925.32	14554.44	17757.09	21
22	8859.44	9284.02	9767.93	10330.71	11003.39	11839.89	12947.02	14589.34	17846.39	22
23	8866.11	9291.55	9776.60	10340.91	11015.79	11855.70	12968.86	14624.60	17938.07	23
24	8872.79	9299.10	9785.29	10351.14	11028.24	11871.59	12990.83	14660.23	18032.26	24
25	8879.48	9306.67	9794.00	10361.40	11040.73	11887.55	13012.94	14696.24	18129.11	25
26	8886.19	9314.26	9802.73	10371.70	11053.27	11903.59	13035.20	14732.62	18228.76	26
27	8892.91	9321.86	9811.48	10382.02	11065.85	11919.70	13057.61	14769.39	18331.39	27
28	8899.64	9329.48	9820.26	10392.37	11078.48	11935.89	13080.15	14806.56	18437.18	28
29	8906.38	9337.11	9829.06	10402.76	11091.15	11952.15	13102.85	14844.14	18546.32	29
30	8913.14	9344.76	9837.88	10413.18	11103.87	11968.49	13125.70	14882.13	18659.05	30
31	8919.91	9352.43	9846.73	10423.63	11116.64	11984.91	13148.70	14920.54	18775.59	31
32	8926.70	9360.12	9855.59	10434.11	11129.46	12001.41	13171.86	14959.39	18896.23	32
33	8933.50	9367.82	9864.48	10444.62	11142.32	12017.99	13195.18	14998.68	19021.25	33
34	8940.31	9375.54	9873.39	10455.16	11155.23	12034.65	13218.65	15038.43	19150.99	34
35	8947.13	9383.28	9882.33	10465.74	11168.19	12051.38	13242.28	15078.64	19285.83	35
36	8953.97	9391.03	9891.29	10476.35	11181.20	12068.20	13266.08	15119.33	19426.16	36
37	8960.82	9398.80	9900.27	10486.99	11194.26	12085.11	13290.04	15160.51	19572.47	37
38	8967.68	9406.59	9909.28	10497.66	11207.37	12102.09	13314.17	15202.18	19725.29	38
39	8974.56	9414.40	9918.31	10508.37	11220.53	12119.16	13338.48	15244.36	19885.21	39
40	8981.45	9422.23	9927.36	10519.11	11233.73	12136.32	13362.95	15287.07	20052.94	40
41	8988.36	9430.07	9936.44	10529.89	11246.99	12153.56	13387.60	15330.32	20229.28	41
42	8995.28	9437.93	9945.54	10540.70	11260.30	12170.89	13412.43	15374.12	20415.15	42
43	9002.21	9445.81	9954.66	10551.54	11273.67	12188.30	13437.44	15418.48	20611.64	43
44	9009.16	9453.70	9963.81	10562.42	11287.08	12205.81	13462.63	15463.42	20820.06	44
45	9016.12	9461.62	9972.98	10573.33	11300.55	12223.40	13488.01	15508.96	21041.92	45
46	9023.09	9469.55	9982.18	10584.27	11314.07	12241.08	13513.57	15555.11	21279.11	46
47	9030.08	9477.50	9991.40	10595.25	11327.64	12258.86	13539.33	15601.88	21533.87	47
48	9037.09	9485.47	10000.65	10606.27	11341.27	12276.73	13565.28	15649.31	21809.04	48
49	9044.11	9493.46	10009.92	10617.32	11354.95	12294.69	13591.43	15697.39	22108.16	49
50	9051.14	9501.46	10019.21	10628.40	11368.68	12312.74	13617.78	15746.16	22435.81	50
51	9058.18	9509.48	10028.53	10639.52	11382.47	12330.89	13644.33	15795.63	22798.02	51
52	9065.24	9517.53	10037.88	10650.68	11396.32	12349.14	13671.09	15845.81	23202.93	52
53	9072.32	9525.59	10047.25	10661.88	11410.22	12367.48	13698.06	15896.75	23661.97	53
54	9079.41	9533.67	10056.65	10673.11	11424.18	12385.92	13725.24	15948.45	24191.91	54
55	9086.51	9541.77	10066.07	10684.37	11438.19	12404.46	13752.64	16000.94	24818.68	55
56	9093.63	9549.89	10075.52	10695.68	11452.26	12423.10	13780.26	16054.24	25585.79	56
57	9100.76	9558.03	10084.99	10707.02	11466.39	12441.85	13808.10	16108.38	26574.77	57
58	9107.91	9566.18	10094.49	10718.40	11480.58	12460.69	13836.17	16163.39	27968.66	58
59	9115.07	9574.36	10104.02	10729.82	11494.83	12479.64	13864.47	16219.30	30351.52	59
60	9122.25	9582.55	10113.57	10741.27	11509.13	12498.70	13893.00	16276.12		60
M	81°	82°	83°	84°	85°	86°	87°	88°	89°	M

