

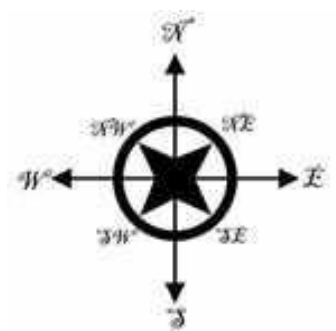


Caution

When the hour angle approaches 90° , a significant error of 1 or 2 miles, may occur when computing the altitude of celestial bodies.

It is a good plan to discard those sights, where the value of "K" is found to lie between the limits of $87^\circ 30'$ and $92^\circ 30'$.

Dead Reckoning Altitude and Azimuth Tables



Preface

This table was conceived, and the method and formula deduced, by Lieut. Arthur A. Ageton, United States Navy, while a member of the Line Class of the Postgraduate School, United States Naval Academy, Annapolis, Md.

Acknowledgment is made for helpful suggestions and constructive criticisms submitted by members of the staff of the Postgraduate School, members of the Line Class of the Postgraduate School and other officers of the Navy.

First published in 1931 by the U.S.Navy Hydrographic Office but discontinued as a separate publication in 1972 by the successor, the Defense Mapping Agency Hydrographic/Topographic Center and republished in 1975 by the same agency as table 35 of *Volume II: The American Practical Navigator* but is no longer included. Popularly known as the AGETON method.

The table is based on a divided triangle method in which a perpendicular is dropped from the geographic position (GP) of the body to the meridian of the observer.

The distinctive features of this method of navigation are:

1. The dead reckoning (D.R.) position of the ship is used for working sights and plotting lines of position.
2. There is no *interpolation* for practical navigation.
3. The azimuths can be most positively determined.
4. the solution is short, simple, and *uniform* under all conditions.

In spite of the several other short methods devised in recent years, there are still many navigators who prefer to work from their D.R. position. As the navigator's work at sea consists largely of computing lines of position, this table has been arranged primarily for computation of altitudes and azimuths from the D.R. position.

The time and labour required to work a sight from the D.R. position have been materially reduced. In point of time, this method compares favourably with the various short methods.

The method of solving navigational problems here given is applicable to all problems regardless of the position of the heavenly body, be it sun, moon, planet or star or latitude of the navigator. It requires few figures and gives quick solution for determining a line of position (LOP). The table is simple to use and offers, in conjunction with the Nautical Almanac, an alternative sight reduction method to, e.g. U.S. Pub. 229, U.S. Pub. 249 or NP303 (AP 3270) and as no navigator should ever become completely dependent on electronic navigation methods, a viable compact back-up method to these methods.

Problem IV - the latitude by Phi Prime, Phi Second - and figures 1 and 2 have been reproduced from "Primer of Celestial Navigation" by John Favill, M.D.

Every effort has been made to make this table error-free.

Method of Solution

The work form shown may be used for sun, moon, star and planet.

Typical solutions for the sun and a star are shown. The following steps are taken to obtain the altitude and azimuth in one combined solution.

1. Find the Greenwich hour angle (GHA) in degrees and minutes.
2. Apply to the GHA the D.R. longitude (Long D.R.) to obtain to the nearest tenth of a minute the local hour angle (LHA) east or west of the local meridian from 0° to 180° .
3. Enter on form declination (d) and D.R. latitude (Lat D.R.) to nearest tenth of a minute and name them N or S.
4. Correct Hs (sextant altitude) to obtain Ho (observed sextant altitude) to the nearest tenth of a minute.
5. The letters **A** and **B** on the form *merely indicate from which column to take their corresponding functions*.
6. Enter table with LHA and take from **A** column the nearest tabulated number. Enter table with declination and take tabulated number from **B** column. *Add* these numbers. For practical navigation do not interpolate*.
7. Look up the number thus obtained in **A** column and take from the **B** column the opposite tabulated number. *Subtract* this from the function of declination taken from the **A** column.
8. Enter **A** column with the number thus obtained and take out nearest tabulated value of **K**, the degrees from the top or bottom of the page and the minutes from the side.
9. **Give K the same name as declination. Combine K with latitude to obtain (K~L), adding K and latitude if different names and subtracting the smaller from the larger if same name.**
10. Enter table with (K~L) and take from the **B** column the nearest tabulated number. *Add* this to the **B** function of R as shown on the form.
11. With the number thus obtained, enter the **A** column and take Hc (calculated sextant altitude) from the table.
12. The difference between the computed altitude (Hc) and the observed altitude (Ho) is the altitude difference or altitude intercept abbreviated (a); "a" is measured from the D.R. position toward the body when Ho is greater than Hc, and away when smaller. The line of position is plotted from the D.R. position.
13. To compute the azimuth, look up Hc in the **B** column and *subtract* the number thus obtained from the **A** function of **R** which has already been determined.
14. With this number, enter the **A** column and take out **Z** to nearest minute. **Z** is always measured from the elevated pole (latitude) 0° to 180° east or west to the body.

At the top of the pages of the table are stated the only two rules required.

In **PROBLEM I**, LHA is less than 90° and **K** is taken from the top of the table.

When LHA is greater than 90° , **K** should be greater than 90° . In **PROBLEM II**, LHA is greater than 90° and **K** is therefore taken from the bottom of the table., which automatically converts **K** into the proper angle greater than 90° .

PROBLEM I illustrates the delicacy with which the azimuth may be determined even when the body is very near the prime vertical. **K** is a little less than the latitude and the same name. According to the azimuth rule, **Z** is taken from the bottom of the table.

PROBLEM II illustrates the case when **K** is the same name as and greater than the latitude, and **Z** is accordingly taken from the top of the table.

When **K** and latitude are different names, **Z** is taken from the bottom of the table.

ACCURACY

* This table gives an accuracy of solution to within five-tenths of a minute in altitude and an average error of only two-tenths of a minute without interpolation. The navigator who wishes greater accuracy should interpolate between tabulated functions.

If considered desirable, the possible error in Hc may be reduced to two-tenths of a minute by interpolating when taking Hc from the table.

SHORTCUTS

Certain shortcuts will become apparent with use of the table:

When entering the table with declination, take function from both **A** and **B** columns in one entry.

When taking Hc from the table, take the tabulated function from the **B** column at the same time, as it will be used in computing **Z**.

Line of Position Examples

For the sake of brevity the corrected observed altitude (Ho) will be given in each case instead of the sextant altitude (Hs).

PROBLEM I: At 7:31 AM on December 31 ship was in D.R. position, latitude $42^{\circ} 10' 30''$ S, longitude $68^{\circ} 37' 42''$ W.

Sun was observed on the prime vertical at (GMT)UT 12:31:16. Corrected observed altitude (Ho) is $35^{\circ} 57.0'$.

	h m s				
(GMT)UT	12 : 31 : 16				
GHA	7 - 03.9 (W)				Azimuth
Long D.R.	<u>68 - 37.7 W</u>	Add	Subtract	Add	Subtract
LHA (E or W)*	61 - 33.8 E	A 5583			
d	23 - 07.0 S	<u>B 3635</u>	A 40604		
R		A 9218	<u>B 23052</u>	B 23052	A 9218
K ¹	41 - 52.5 S < -----		A 17552		
Lat D.R.	<u>42 - 10.5 S</u>				
(K~L) ²	0 - 18.0 ----->			B 0.6	
Hc	36 - 01.5 < -----		A 23052.6		<u>B 9218</u>
Ho	<u>35 - 57.0</u>				
a Away/Towards	4.5 miles			A 0 = Z ³ S $90^{\circ} 00'$ E = Zn 90°	

PROBLEM II: At about 7:34 PM May 15 with ship in D.R. position, latitude $40^{\circ} 43'$ N, longitude $68^{\circ} 30'$ W, navigator observed the star Vega. Corrected observed altitude (Ho) $14^{\circ} 36.3'$.

	h m s				
(GMT)UT	0 : 34 : 27 (May 16)				
GHA	323 - 13.0 (W) = (36 - 47.0 E)				Azimuth
Long D.R.	<u>68 - 30.0 W</u>	Add	Subtract	Add	Subtract
LHA (E or W)*	105 - 17.0 E	A 1564			
d	38 - 42.9 N	<u>B 10777</u>	A 20379		
R		A 12341	<u>B 18146</u>	B 18146	A 12341
K ¹	108 - 13.0 N < -----		A 2233		
Lat D.R.	<u>40 - 43.0 N</u>				
(K~L) ²	67 - 30.0 ----->			B 41716	
Hc	14 - 35.5 < -----		A 59862		<u>B 1424</u>
Ho	<u>14 - 36.3</u>				
a Away /Towards	0.8 miles			A 10917 = Z ³ N $51^{\circ} 03'$ E = Zn 51°	

PROBLEM III: On July 2 the navigator of a ship in D.R. position, latitude $46^{\circ} 21'$ N, longitude $51^{\circ} 35'$ E observed the star Denebola at (GMT)UT 17h 23m 14s. Corrected observed altitude (Ho) $34^{\circ} 03.5'$.

	h m s				
(GMT)UT	17 : 23 : 14				
GHA	4 - 25.9 (W)				Azimuth
Long D.R.	<u>51 - 35.0 E</u>	Add	Subtract	Add	Subtract
LHA (E or W)*	56 - 00.9 W	A 8134			
d	14 - 56.3 N	<u>B 1494</u>	A 58866		
R		A 9628	<u>B 22298</u>	B 22298	A 9628
K ¹	25 - 31.5 N < -----		A 36568		
Lat D.R.	<u>46 - 21.0 N</u>				
(K~L) ²	20 - 49.5 ----->			B 2934	
Hc	34 - 00.5 < -----		A 25232		<u>B 8147</u>
Ho	<u>34 - 03.5</u>				
a Away /Towards	3.0 miles			A 1481 = Z ³ N $104^{\circ} 53'$ W = Zn 255°	

*LHA measured eastward or westward from the observer's meridian (Long D.R.) to the observed body's hour circle (GHA).

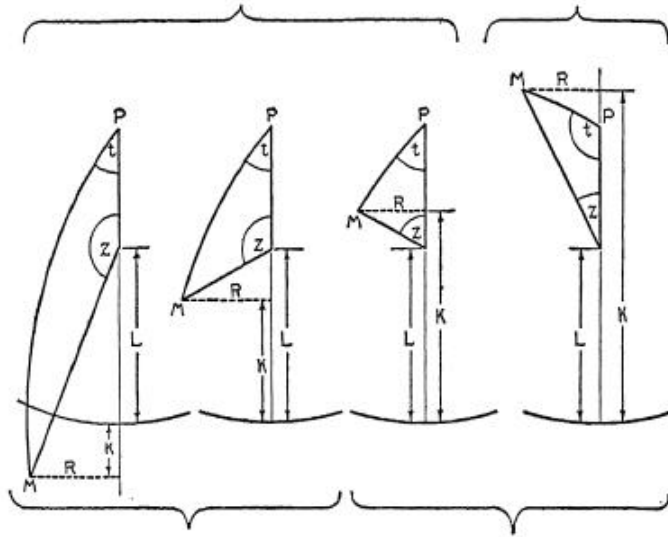
Note 1: Give "K" same name as declination (d) N or S and take from bottom of table if LHA (E or W) is greater than 90° .

Note 2: Combine LHA (E or W) and "K", adding when different names and subtracting when names are same.

Note 3: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table. Give "Z" prefix same name as elevated pole (Lat D.R.) and suffix same name as LHA (E or W).

"Z" is the azimuth measured from the elevated pole position (Lat D.R.) east or west through 180° . "Zn" is the azimuth measured from the north point clockwise through 360° and rounded to the nearest whole degree.

Rule 1: K is always $< 90^\circ$
Take K from top of table } except when $\begin{cases} t \text{ is } > 90^\circ \\ \text{Take } K \text{ from bottom of table} \end{cases}$



Rule 2: Z is always $> 90^\circ$
Take Z from bottom of table } except when $\begin{cases} K \text{ is same name as } \> \text{ latitude} \\ \text{Take } Z \text{ from top of table} \end{cases}$

Of course, if $\begin{cases} K = L \text{ then } Z = 90^\circ \\ t = 90^\circ \text{ then } K = 90^\circ \end{cases}$
 K takes same name as declination (N. or S.)

Fig. 1

Development of the Formulas

The spherical triangles used in navigation are shown projected on the plane of the horizon in above figures

The parts of the triangle are lettered as follows:

P. Pole

Z. Zenith of observer. The azimuth (angle PMZ) is also called Z.

M. Heavenly body observed.

L. Latitude of the observer.

d. Declination of body M.

t. (or LHA). Local hour angle of body M.

H. Altitude of body M.

R. Perpendicular let fall from M on PZ. This is an auxiliary part.

X. Intersection of R with PZ.

K. Arc from X to the equinoctial. This is an auxiliary part introduced to facilitate solution.

The following formulas have been derived:

From triangle PMX - 1. $\csc R = \csc t \sec d$ 2. $\csc K = \csc d / \sec R$

From triangle ZMX - 3. $\csc Hc = \sec R \sec (K \sim L)$ 4. $\csc Z = \csc R / \sec Hc$

In right triangle PMX, t and d are known. R may be found from formula (1). Knowing R and d , K may be found by formula (2). K is then combined algebraically with L to obtain $(K \sim L)$.

In triangle ZMX, the sides R and $(K \sim L)$ are known. Hc may be found by formula (3). the azimuth Z , is computed by formula (4).

All formulas are in terms of secants and cosecants. The table is arranged in parallel "A" and "B" columns, the "A" columns containing the log cosecants multiplied by 100,000 and the "B" columns log secants multiplied by 100,000. This device has greatly simplified the arithmetic solution. The tabulation of functions every half of a minute throughout the table has helped interpolation.

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		0° 00´		0° 30´		1° 00´		1° 30´		2° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30		0.0	205916	1.7	175814	6.6	158208	14.9	145718	26.5	30	00
		383730	0.0	205198	1.7	175454	6.7	157967	15.1	145538	26.7		
01	31	353627	0.0	204492	1.8	175097	6.8	157728	15.2	145358	26.9	29	59
		336018	0.0	203797	1.8	174742	7.0	157490	15.4	145179	27.1		
02	32	323524	0.0	203113	1.9	174391	7.1	157254	15.6	145000	27.3	28	58
		313833	0.0	202440	1.9	174042	7.2	157019	15.7	144823	27.6		
03	33	305915	0.0	201777	2.0	173696	7.3	156784	15.9	144646	27.8	27	57
		299221	0.0	201124	2.1	173352	7.4	156552	16.1	144470	28.0		
04	34	293421	0.0	200480	2.1	173012	7.5	156320	16.2	144295	28.3	26	56
		288306	0.0	199846	2.2	172674	7.6	156090	16.4	144120	28.5		
05	35	283730	0.0	199221	2.3	172339	7.8	155861	16.6	143946	28.7	25	55
		279591	0.1	198605	2.3	172006	7.9	155633	16.8	143773	28.9		
06	36	275812	0.1	197998	2.4	171676	8.0	155406	16.9	143600	29.2	24	54
		272336	0.1	197399	2.4	171348	8.1	155180	17.1	143428	29.4		
07	37	269118	0.1	196808	2.5	171023	8.2	154956	17.3	143257	29.6	23	53
		266121	0.1	196225	2.6	170700	8.4	154733	17.5	143086	29.9		
08	38	263318	0.1	195650	2.7	170379	8.5	154511	17.6	142916	30.1	22	52
		260685	0.1	195082	2.7	170061	8.6	154290	17.8	142747	30.4		
09	39	258203	0.1	194522	2.8	169745	8.7	154070	18.0	142579	30.6	21	51
		255855	0.2	193969	2.9	169432	8.9	153851	18.2	142411	30.8		
10	40	253627	0.2	193422	2.9	169121	9.0	153633	18.4	142243	31.1	20	50
		251508	0.2	192883	3.0	168811	9.1	153417	18.6	142077	31.3		
11	41	249488	0.2	192350	3.1	168505	9.3	153201	18.7	141911	31.5	19	49
		247558	0.2	191824	3.2	168200	9.4	152987	18.9	141745	31.8		
12	42	245709	0.3	191303	3.2	167897	9.5	152774	19.1	141581	32.0	18	48
		243936	0.3	190790	3.3	167597	9.7	152561	19.3	141417	32.3		
13	43	242233	0.3	190282	3.4	167298	9.8	152350	19.5	141253	32.5	17	47
		240594	0.3	189780	3.5	167002	9.9	152140	19.7	141090	32.8		
14	44	239015	0.4	189283	3.6	166708	10.1	151931	19.9	140928	33.0	16	46
		237491	0.4	188793	3.6	166415	10.2	151722	20.1	140766	33.3		
15	45	236018	0.4	188307	3.7	166125	10.3	151515	20.3	140605	33.5	15	45
		234594	0.4	187827	3.8	165836	10.5	151309	20.5	140445	33.7		
16	46	233215	0.5	187353	3.9	165550	10.6	151104	20.6	140285	34.0	14	44
		231879	0.5	186883	4.0	165265	10.8	150899	20.8	140125	34.2		
17	47	230583	0.5	186419	4.1	164982	10.9	150696	21.0	139967	34.5	13	43
		229324	0.6	185959	4.1	164701	11.0	150494	21.2	139809	34.7		
18	48	228100	0.6	185505	4.2	164422	11.2	150292	21.4	139651	35.0	12	42
		226910	0.6	185055	4.3	164144	11.3	150092	21.6	139494	35.3		
19	49	225752	0.7	184609	4.4	163868	11.5	149892	21.8	139338	35.5	11	41
		224624	0.7	184168	4.5	163594	11.6	149693	22.0	139182	35.8		
20	50	223525	0.7	183732	4.6	16332	11.8	149495	22.2	139027	36.0	10	40
		222452	0.8	183300	4.7	163052	11.9	149299	22.4	138872	36.3		
21	51	221406	0.8	182872	4.8	162783	12.1	149103	22.6	138718	36.5	09	39
		220384	0.9	182448	4.9	162516	12.2	148907	22.9	138564	36.8		
22	52	219385	0.9	182029	5.0	162250	12.4	148713	23.1	138411	37.1	08	38
		218409	0.9	181613	5.1	161986	12.5	148520	23.3	138258	37.3		
23	53	217455	1.0	181201	5.2	161724	12.7	148327	23.5	138106	37.6	07	37
		216521	1.0	180794	5.3	161463	12.8	148135	23.7	137955	37.9		
24	54	215607	1.1	180390	5.4	161204	13.0	147945	23.9	137804	38.1	06	36
		214711	1.1	179990	5.5	160946	13.1	147755	24.1	137653	38.4		
25	55	213834	1.1	179593	5.6	160690	13.3	147566	24.3	137504	38.6	05	35
		212974	1.2	179200	5.7	160435	13.4	147377	24.5	137354	38.9		
26	56	212130	1.2	178810	5.8	160182	13.6	147190	24.7	137205	39.2	04	34
		211303	1.3	178424	5.9	159930	13.8	147003	24.9	137057	39.4		
27	57	210491	1.3	178042	6.0	159680	13.9	146817	25.2	136909	39.7	03	33
		209695	1.4	177663	6.1	159431	14.1	146632	25.4	136761	40.0		
28	58	208912	1.4	177287	6.2	159184	14.2	146448	25.6	136615	40.3	02	32
		208143	1.5	176914	6.3	158938	14.4	146264	25.8	136468	40.5		
29	59	207388	1.5	176544	6.4	158693	14.6	146081	26.0	136322	40.8	01	31
		206646	1.6	176178	6.5	158450	14.7	145899	26.2	136177	41.1		
30	00	205916	1.7	175814	6.6	158208	14.9	145718	26.5	136032	41.4	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		179° 30´		179° 00´		178° 30´		178° 00´		177° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		2° 30´		3° 00´		3° 30´		4° 00´		4° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	136032	41.4	128120	59.6	121432	81.1	115641	105.9	110536	134.1	30	00
		135888	41.6	128000	59.9	121329	81.5	115551	106.4	110455	134.6		
01	31	135744	41.9	127880	60.2	121226	81.9	115461	106.8	110375	135.1	29	59
		135600	42.2	127760	60.6	121124	82.2	115371	107.3	110296	135.6		
02	32	135457	42.5	127640	60.9	121021	82.6	115282	107.7	110216	136.1	28	58
		135315	42.7	127521	61.2	120919	83.0	115192	108.1	110136	136.6		
03	33	135173	43.0	127403	61.6	120817	83.4	115103	108.6	110057	137.1	27	57
		135031	43.3	127284	61.9	120715	83.8	115014	109.0	109977	137.6		
04	34	134890	43.6	127166	62.2	120614	84.2	114925	109.5	109898	138.1	26	56
		134749	43.9	127049	62.6	120513	84.6	114836	109.9	109819	138.6		
05	35	134609	44.2	126931	62.9	120412	85.0	114747	110.4	109740	139.1	25	55
		134469	44.4	126814	63.3	120311	85.4	114659	110.8	109662	139.6		
06	36	134330	44.7	126697	63.6	120211	85.8	114571	111.3	109583	140.1	24	54
		134191	45.0	126581	63.9	120110	86.2	114483	111.7	109505	140.6		
07	37	134052	45.3	126465	64.3	120010	86.6	114395	112.2	109426	141.1	23	53
		133914	45.6	126349	64.6	119910	87.0	114307	112.7	109348	141.7		
08	38	133777	45.9	126233	65.0	119811	87.4	114220	113.1	109270	142.2	22	52
		133640	46.2	126118	65.3	119711	87.8	114133	113.6	109192	142.7		
09	39	133503	46.5	126003	65.7	119612	88.2	114045	114.0	109115	143.2	21	51
		133367	46.8	125888	66.0	119513	88.6	113958	114.5	109037	143.7		
10	40	133231	47.1	125774	66.4	119415	89.0	113872	114.9	108960	144.2	20	50
		133096	47.4	125660	66.7	119316	89.4	113785	115.4	108882	144.7		
11	41	132961	47.6	125546	67.1	119218	89.8	113699	115.9	108805	145.2	19	49
		132826	47.9	125433	67.4	119120	90.2	113612	116.3	108728	145.8		
12	42	132692	48.2	125320	67.8	119022	90.6	113526	116.8	108651	146.3	18	48
		132558	48.5	125207	68.1	118925	91.0	113440	117.3	108574	146.8		
13	43	132425	48.8	125094	68.5	118827	91.4	113354	117.7	108498	147.3	17	47
		132292	49.1	124982	68.8	118730	91.8	113269	118.2	108421	147.8		
14	44	132159	49.4	124870	69.2	118633	92.3	113183	118.7	108345	148.4	16	46
		132027	49.7	124759	69.6	118537	92.7	113098	119.1	108269	148.9		
15	45	131896	50.0	124647	69.9	118440	93.1	113013	119.6	108193	149.4	15	45
		131764	50.3	124536	70.3	118344	93.5	112928	120.1	108117	149.9		
16	46	131633	50.7	124425	70.6	118248	93.9	112843	120.5	108041	150.5	14	44
		131503	51.0	124315	71.0	118152	94.3	112759	121.0	107965	151.0		
17	47	131373	51.3	124204	71.3	118056	94.7	112674	121.5	107890	151.5	13	43
		131243	51.6	124095	71.7	117961	95.2	112590	121.9	107814	152.1		
18	48	131114	51.9	123985	72.1	117866	95.6	112506	122.4	107739	152.6	12	42
		130985	52.2	123875	72.4	117771	96.0	112422	122.9	107664	153.1		
19	49	130856	52.5	123766	72.8	117676	96.4	112338	123.4	107589	153.6	11	41
		130728	52.8	123657	73.2	117581	96.9	112255	123.9	107514	154.2		
20	50	130600	53.1	123549	73.5	117487	97.3	112171	124.3	107439	154.7	10	40
		130473	53.4	123441	73.9	117393	97.7	112088	124.8	107364	155.2		
21	51	130346	53.7	123332	74.3	117299	98.1	112005	125.3	107290	155.8	09	39
		130219	54.1	123225	74.6	117205	98.5	111922	125.8	107216	156.3		
22	52	130093	54.4	123117	75.0	117112	99.0	111839	126.2	107141	156.9	08	38
		129967	54.7	123010	75.4	117018	99.4	111757	126.7	107067	157.4		
23	53	129841	55.0	122903	75.8	116925	99.8	111674	127.2	106993	157.9	07	37
		129716	55.3	122796	76.1	116832	100.3	111592	127.7	106919	158.5		
24	54	129591	55.7	122690	76.5	116739	100.7	111510	128.2	106846	159.0	06	36
		129466	56.0	122584	76.9	116647	101.1	111428	128.7	106772	159.6		
25	55	129342	56.3	122478	77.3	116554	101.6	111346	129.2	106698	160.1	05	35
		129218	56.6	122372	77.6	116462	102.0	111264	129.7	106625	160.6		
26	56	129095	56.9	122267	78.0	116370	102.4	111183	130.1	106552	161.2	04	34
		128972	57.3	122161	78.4	116278	102.9	111101	130.6	106479	161.7		
27	57	128849	57.6	122057	78.8	116187	103.3	111020	131.1	106406	162.3	03	33
		128727	57.9	121952	79.2	116096	103.7	110939	131.6	106333	162.8		
28	58	128605	58.2	121848	79.5	116004	104.2	110858	132.1	106260	163.4	02	32
		128483	58.6	121743	79.9	115913	104.6	110777	132.6	106187	163.9		
29	59	128362	58.9	121639	80.3	115823	105.0	110696	133.1	106115	164.5	01	31
		128240	59.2	121536	80.7	115732	105.5	110616	133.6	106043	165.0		
30	00	128120	59.6	121432	81.1	115641	105.9	110536	134.1	105970	165.6	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		177° 00´		176° 30´		176° 00´		175° 30´		175° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		5° 00´		5° 30´		6° 00´		6° 30´		7° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	105970	165.6	101843	200.4	98076	239	94614	280	91411	325	30	00
		105898	166.1	101777	201.0	98017	239	94559	281	91359	326		
01	31	10582	166.7	101712	201.6	97957	240	94503	281	91308	326	29	59
		10575	167.2	101646	202.2	97897	241	94448	282	91257	327		
02	32	105683	167.8	101581	202.8	97837	241	94393	283	91205	328	28	58
		105611	168.4	101516	203.5	97777	242	94338	284	91154	329		
03	33	105539	168.9	101451	204.1	97717	243	94283	284	91103	330	27	57
		105468	169.4	101386	204.7	97658	243	94228	285	91052	330		
04	34	105397	170.0	101321	205.3	97598	244	94173	286	91001	331	26	56
		105325	170.6	101256	205.9	97539	245	94118	287	90950	332		
05	35	105254	171.1	101192	206.5	97480	245	94063	287	90899	333	25	55
		105183	171.7	101127	207.1	97420	246	94009	288	90848	333		
06	36	105113	172.3	101063	207.8	97361	247	93954	289	90798	334	24	54
		105042	172.8	100998	208.4	97302	247	93899	289	90747	335		
07	37	104971	173.4	100934	209.0	97243	248	93845	290	90696	336	23	53
		104901	174.0	100870	209.6	97184	249	93790	291	90646	337		
08	38	104830	174.5	100806	210.3	97126	249	93736	292	90595	337	22	52
		104760	175.1	100742	210.9	97067	250	93682	292	90545	338		
09	39	104690	175.7	100678	211.5	97008	251	93628	293	90494	339	21	51
		104620	176.2	100614	212.1	96950	251	93573	294	90444	340		
10	40	104550	176.8	100550	212.8	96891	252	93519	295	90394	341	20	50
		104480	177.4	100487	213.4	96833	253	93465	295	90344	341		
11	41	104411	178.0	100423	214.0	96774	253	93411	296	90293	342	19	49
		104341	178.5	100360	214.6	96716	254	93358	297	90243	343		
12	42	104272	179.1	100296	215.3	96658	255	93304	298	90193	344	18	48
		104202	179.7	100233	215.9	96600	255	93250	298	90143	345		
13	43	104133	180.3	100170	216.5	96542	256	93196	299	90093	345	17	47
		104064	180.8	100107	217.2	96484	257	93143	300	90044	346		
14	44	103995	181.4	100044	217.8	96426	257	93089	301	89994	347	16	46
		103926	182.0	99981	218.4	96368	258	93036	301	89944	348		
15	45	103857	182.6	99918	219.1	96310	259	92982	302	89894	349	15	45
		103788	183.2	99856	219.7	96253	260	92929	303	89845	349		
16	46	103720	183.7	99793	220.3	96195	260	92876	304	89795	350	14	44
		103651	184.3	99731	221.0	96138	261	92823	304	89746	351		
17	47	103583	184.9	99668	221.6	96080	262	92769	305	89696	352	13	43
		103515	185.5	99606	222.3	96023	262	92716	306	89647	353		
18	48	103447	186.1	99544	222.9	95966	263	92663	307	89597	353	12	42
		103379	186.7	99481	223.5	95909	264	92610	307	89548	354		
19	49	103311	187.2	99420	224.2	95851	264	92558	308	89499	355	11	41
		103243	187.8	99357	224.8	95795	265	92505	309	89450	356		
20	50	103175	188.4	99296	225.5	95737	266	92452	310	89401	357	10	40
		103107	189.0	99234	226.1	95681	267	92399	310	89352	357		
21	51	103040	189.6	99172	226.8	95624	267	92347	311	89303	358	09	39
		102973	190.2	99110	227.4	95567	268	92294	312	89254	359		
22	52	102905	190.8	99049	228.1	95510	269	92242	313	89205	360	08	38
		102838	191.4	98988	228.7	95454	269	92189	313	89156	361		
23	53	102771	192.0	98926	229.4	95397	270	92137	314	89107	362	07	37
		102704	192.6	98865	230.0	95341	271	92085	315	89059	362		
24	54	102637	193.2	98804	230.7	95285	271	92032	316	89010	363	06	36
		102570	193.8	98743	231.3	95228	272	91980	316	88961	364		
25	55	102504	194.4	98682	232.0	95172	273	91928	317	88913	365	05	35
		102437	195.0	98621	232.6	95116	274	91876	318	88864	366		
26	56	102371	195.6	98560	233.3	95060	274	91824	319	88816	366	04	34
		102304	196.2	98499	233.9	95004	275	91772	319	88767	367		
27	57	102238	196.8	98439	234.6	94948	276	91720	320	88719	368	03	33
		102172	197.4	98378	235.3	94892	276	91668	321	88671	369		
28	58	102106	198.0	98318	235.9	94836	277	91617	322	88623	370	02	32
		102040	198.6	98257	236.6	94781	278	91565	323	88574	371		
29	59	101974	199.2	98197	237.2	94725	279	91514	323	88526	371	01	31
		101908	199.8	98137	237.9	94670	279	91462	324	88478	372		
30	00	101843	200.4	98076	238.6	94614	280	91411	325	88430	373	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		174° 30´		174° 00´		173° 30´		173° 00´		172° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

Minutes		7° 30´		8° 00´		8° 30´		9° 00´		9° 30´			
		A	B	A	B	A	B	A	B	A	B		
30	00	88430	373	85644	425	83030	480	80567	538	78239	600	30	00
		88382	374	85599	426	82987	481	80527	539	78201	601		
31	01	88334	375	85555	426	82945	482	80487	540	78164	602	29	59
		88286	376	85510	427	82903	482	80447	541	78126	603		
32	02	88239	376	85465	428	82861	483	80407	542	78088	604	28	58
		88191	377	85420	429	82819	484	80368	543	78051	605		
33	03	88143	378	85376	430	82777	485	80328	544	78013	606	27	57
		88096	379	85331	431	82735	486	80288	545	77976	607		
34	04	88048	380	85286	432	82693	487	80249	546	77938	608	26	56
		88001	381	85242	433	82651	488	80209	547	77901	609		
35	05	87953	381	85197	434	82609	489	80170	548	77863	610	25	55
		87906	382	85153	434	82567	490	80130	549	77826	611		
36	06	87858	383	85108	435	82526	491	80091	550	77788	612	24	54
		87811	384	85064	436	82484	492	80051	551	77751	614		
37	07	87764	385	85020	437	82442	493	80012	552	77714	615	23	53
		87716	386	84976	438	82400	494	79973	553	77677	616		
38	08	87669	387	84931	439	82359	495	79933	554	77639	617	22	52
		87622	387	84887	440	82317	496	79894	555	77602	618		
39	09	87575	388	84843	441	82276	497	79855	556	77565	619	21	51
		87528	389	84799	442	82234	498	79816	557	77528	620		
40	10	87481	390	84755	443	82193	499	79777	558	77491	621	20	50
		87434	391	84711	444	82151	500	79737	559	77454	622		
41	11	87387	392	84667	444	82110	501	79698	560	77417	623	19	49
		87341	392	84623	445	82069	502	79659	561	77380	624		
42	12	87294	393	84579	446	82027	503	79620	562	77343	625	18	48
		87247	394	84535	447	81986	504	79581	563	77306	626		
43	13	87201	395	84492	448	81945	504	79542	564	77269	627	17	47
		87154	396	84448	449	81904	505	79503	565	77232	629		
44	14	87107	397	84404	450	81863	506	79465	566	77195	630	16	46
		87061	398	84361	451	81821	507	79426	567	77158	631		
45	15	87015	399	84317	452	81780	508	79387	568	77122	632	15	45
		86968	399	84273	453	81739	509	79348	569	77085	633		
46	16	86922	400	84230	454	81698	510	79309	570	77048	634	14	44
		86876	401	84186	454	81657	511	79271	571	77011	635		
47	17	86829	402	84143	455	81617	512	79232	573	76975	636	13	43
		86783	403	84100	456	81576	513	79193	574	76938	637		
48	18	86737	404	84056	457	81535	514	79155	575	76902	638	12	42
		86691	405	84013	458	81494	515	79116	576	76865	639		
49	19	86645	405	83970	459	81453	516	79078	577	76828	641	11	41
		86599	406	84927	460	81413	517	79039	578	76792	642		
50	20	86553	407	83884	461	81372	518	79001	579	76756	643	10	40
		86507	408	83840	462	81331	519	78962	580	76719	644		
51	21	86461	409	83797	463	81291	520	78924	581	76683	645	09	39
		86415	410	83754	464	81250	521	78886	582	76646	646		
52	22	86370	411	83711	465	81210	522	78847	583	76610	647	08	38
		86324	411	83668	466	81169	523	78809	584	76574	648		
53	23	86278	412	83626	467	81129	524	78771	585	76537	649	07	37
		86233	413	83583	467	81088	525	78733	586	76501	650		
54	24	86187	414	83540	468	81048	526	78694	587	76465	652	06	36
		86142	415	83497	469	81008	527	78656	588	76429	653		
55	25	86096	416	83455	470	80967	528	78618	589	76393	654	05	35
		86051	417	83412	471	80927	529	78580	590	76357	655		
56	26	86006	418	83369	472	80887	530	78542	591	76320	656	04	34
		85960	418	83327	473	80847	531	78504	592	76284	657		
57	27	85915	419	83284	474	80807	532	78466	593	76248	658	03	33
		85870	420	83242	475	80767	533	78428	594	76212	659		
58	28	85825	421	83199	476	80727	534	78390	595	76176	660	02	32
		85779	422	83157	477	89687	535	78352	597	76141	661		
59	29	85734	423	83114	478	80647	536	78315	598	76105	663	01	31
		85689	424	83072	479	80607	537	78277	599	76069	664		
00	30	85644	425	83030	480	80567	538	78239	600	76033	665	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		172° 00´		171° 30´		171° 00´		170° 30´		170° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		10° 00´		10° 30´		11° 00´		11° 30´		12° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	76033	665	73937	733	71940	805	70034	881	68212	960	30	00
		75997	666	73903	735	71908	807	70003	882	68182	961		
01	31	75961	667	73869	736	71875	808	69972	883	68153	962	29	59
		75926	668	73835	737	71843	809	69941	885	68123	964		
02	32	75890	669	73801	738	71810	810	69910	886	68093	965	28	58
		75854	670	73767	739	71778	811	69879	887	68064	966		
03	33	75819	672	73733	740	71746	813	69849	888	68034	968	27	57
		75783	673	73699	742	71713	814	69818	890	68005	969		
04	34	75747	674	73665	743	71681	815	69787	891	67975	970	26	56
		75712	675	73631	744	71649	816	69756	892	67945	972		
05	35	75676	676	73597	745	71616	818	69725	894	67916	973	25	55
		75641	677	73563	746	71584	819	69694	895	67886	974		
06	36	75605	678	73530	747	71552	820	69664	896	67857	976	24	54
		75570	679	73496	749	71520	821	69633	897	67828	977		
07	37	75534	680	73462	750	71488	823	69602	899	67798	978	23	53
		75499	682	73429	751	71455	824	69571	900	67769	980		
08	38	75464	683	73395	752	71423	825	69541	901	67739	981	22	52
		75428	684	73361	753	71391	826	69510	903	67710	982		
09	39	75393	685	73328	755	71359	828	69479	904	67681	984	21	51
		75358	686	73294	756	71327	829	69449	905	67651	985		
10	40	75322	687	73260	757	71295	830	69418	907	67622	987	20	50
		75287	688	73227	758	71263	831	69387	908	67593	988		
11	41	75252	690	73193	759	71231	833	69357	909	67563	989	19	49
		75217	691	73160	761	71199	834	69326	910	67534	991		
12	42	75182	692	73127	762	71167	835	69296	912	67505	992	18	48
		75147	693	73093	763	71135	836	69265	913	67476	993		
13	43	75112	694	73060	764	71104	838	69235	914	67447	995	17	47
		75077	695	73026	765	71072	839	69204	916	67417	996		
14	44	75042	696	72993	766	71040	840	69174	917	67388	997	16	46
		75007	698	72960	768	71008	841	69144	918	67359	999		
15	45	74972	699	72926	769	70976	843	69113	920	67330	1000	15	45
		74937	700	72893	770	70945	844	69083	921	67301	1002		
16	46	74902	701	72860	771	70913	845	69053	922	67272	1003	14	44
		74867	702	72827	772	70881	846	69022	924	67243	1004		
17	47	74832	703	72794	774	70850	848	68992	925	67214	1006	13	43
		74797	704	72760	775	70818	849	68962	926	67185	1007		
18	48	74763	706	72727	776	70786	850	68931	928	67156	1008	12	42
		74728	707	72694	777	70755	851	68901	929	67127	1010		
19	49	74693	708	72661	779	70723	853	68871	930	67098	1011	11	41
		74659	709	72628	780	70692	854	68841	932	67069	1013		
20	50	74624	710	72595	781	70660	855	68811	933	67040	1014	10	40
		74589	711	72562	782	70629	856	68781	934	67011	1015		
21	51	74555	712	72529	783	70597	858	68750	935	66982	1017	09	39
		74520	714	72496	785	70566	859	68720	937	66953	1018		
22	52	74486	715	72463	786	70534	860	68690	938	66925	1020	08	38
		74451	716	72430	787	70503	862	68660	939	66896	1021		
23	53	74417	717	72397	788	70471	863	68630	941	66867	1022	07	37
		74382	718	72365	790	70440	864	68600	942	66838	1024		
24	54	74348	719	72332	791	7040	865	68570	943	66810	1025	06	36
		74313	721	72299	792	70377	867	68540	945	66781	1026		
25	55	74279	722	72266	793	70346	868	68510	946	66752	1028	05	35
		74245	723	72234	794	70315	869	68480	947	66724	1029		
26	56	74210	724	72201	796	70284	870	68450	949	66695	1031	04	34
		74176	725	72168	797	70252	872	68421	950	66666	1032		
27	57	74142	726	72135	798	70221	873	68391	951	66638	1033	03	33
		74107	728	72103	799	70190	874	68361	953	66609	1035		
28	58	74073	729	72070	800	70159	876	68331	954	66580	1036	02	32
		74039	730	72038	802	70128	877	68301	955	66552	1038		
29	59	74005	731	72005	803	70097	878	68272	957	66523	1039	01	31
		73971	732	71973	804	70065	879	68242	958	66495	1040		
30	00	73937	733	71940	805	70034	881	68212	960	66466	1042	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		169° 30´		169° 00´		168° 30´		168° 00´		167° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

Minutes		12° 30´		13° 00´		13° 30´		14° 00´		14° 30´			
		A	B	A	B	A	B	A	B	A	B		
00	30	66466	1042	64791	1128	63181	1217	61632	1310	60140	1406	30	00
01	31	66438	1043	64764	1129	63155	1218	61607	1311	60116	1407	29	59
		66409	1045	64736	1130	63129	1220	61582	1313	60091	1409		
		66381	1046	64709	1132	63103	1221	61556	1314	60067	1411		
02	32	66352	1047	64682	1133	63076	1223	61531	1316	60042	1412	28	58
		66324	1049	64655	1135	63050	1224	61506	1317	60018	1414		
03	33	66296	1050	64627	1136	63024	1226	61481	1319	59994	1416	27	57
		66267	1052	64600	1138	62998	1227	61455	1321	59969	1417		
04	34	66239	1953	64573	1139	62971	1229	61430	1322	59945	1419	26	56
		66211	1054	64546	1141	62945	1230	61405	1324	59921	1421		
05	35	66182	1056	64518	1142	62919	1232	61380	1325	59896	1422	25	55
		66154	1057	64491	1144	62893	1234	61355	1327	59872	1424		
06	36	66126	1059	64464	1145	62867	1235	61330	1329	59848	1425	24	54
		66098	1060	64437	1147	62841	1237	61304	1330	59824	1427		
07	37	66069	1061	64410	1148	62815	1238	61279	1332	59800	1429	23	53
		66041	1063	64383	1150	62789	1240	61254	1333	59775	1430		
08	38	66013	1064	64356	1151	62763	1241	61229	1335	59751	1432	22	52
		65985	1066	64329	1152	62737	1243	61204	1336	59727	1434		
09	39	65957	1067	64302	1154	62711	1244	61179	1338	59703	1435	21	51
		65928	1069	64275	1155	62685	1246	61154	1340	59679	1437		
10	40	65900	1070	64248	1157	62659	1247	61129	1341	59654	1439	20	50
		65872	1071	64221	1158	62633	1249	61104	1343	59630	1440		
11	41	65844	1073	64194	1160	62607	1250	61079	1344	59606	1442	19	49
		65816	1074	64167	1161	62581	1252	61054	1346	59582	1444		
12	42	65788	1076	64140	1163	62555	1253	61029	1348	59558	1445	18	48
		65760	1077	64113	1164	62529	1255	61004	1349	59534	1447		
13	43	65732	1079	64086	1166	62503	1257	60979	1351	59510	1449	17	47
		65704	1080	64059	1167	62477	1258	60954	1352	59486	1450		
14	44	65676	1081	64032	1169	62451	1260	60929	1354	59462	1452	16	46
		65648	1083	64005	1170	62425	1261	60904	1356	59438	1454		
15	45	65620	1084	63978	1172	62400	1263	60879	1357	59414	1455	15	45
		65592	1086	63952	1173	62374	1264	60855	1359	59390	1457		
16	46	65564	1087	63925	1175	62348	1266	60830	1360	59366	1459	14	44
		65537	1089	63898	1176	62322	1267	60805	1362	59342	1460		
17	47	65509	1090	63871	1178	62296	1269	60780	1364	59318	1462	13	43
		65481	1091	64845	1179	62271	1270	60755	1365	59294	1464		
18	48	65453	1093	63818	1181	62245	1272	60730	1367	59270	1465	12	42
		65425	1094	63791	1182	62219	1274	60706	1368	59246	1467		
19	49	65398	1096	63764	1184	62194	1275	60681	1370	59222	1469	11	41
		65370	1097	63738	1185	62168	1277	60656	1372	59198	1470		
20	50	65342	1099	63711	1187	62142	1278	60631	1373	59175	1472	10	40
		65314	1100	63684	1188	62117	1280	60607	1375	59151	1474		
21	51	65287	1101	64658	1190	62091	1281	60582	1377	59127	1475	09	39
		65259	1103	63631	1191	62065	1283	60557	1378	59103	1477		
22	52	65231	1104	63605	1193	62040	1284	60533	1380	59079	1479	08	38
		65204	1106	63578	1194	62014	1286	60508	1381	59055	1480		
23	53	65176	1107	63551	1196	61989	1288	60483	1383	59032	1482	07	37
		65148	1109	63525	1197	61963	1289	60459	1385	59008	1484		
24	54	65121	1110	63498	1199	61938	1291	60434	1386	58984	1485	06	36
		65093	1112	63472	1200	61912	1292	60410	1388	58960	1487		
25	55	65066	1113	63445	1202	61887	1294	60385	1390	58937	1489	05	35
		65038	1114	63419	1203	61861	1295	60360	1391	58913	1490		
26	56	65011	1116	63392	1205	61836	1297	60336	1393	58889	1492	04	34
		64983	1117	63366	1206	61810	1299	60311	1394	58866	1494		
27	57	64956	1119	63340	1208	61785	1300	60287	1396	58842	1495	03	33
		64928	1120	63313	1209	61759	1301	60262	1398	58818	1497		
28	58	64901	1122	63287	1211	61734	1303	60238	1399	58795	1499	02	32
		64873	1123	63260	1212	61709	1305	60213	1401	58771	1500		
29	59	64846	1125	63234	1214	61683	1306	60189	1403	58748	1502	01	31
		64819	1126	63208	1215	61658	1308	60164	1404	58724	1504		
30	00	64791	1128	63181	1217	61632	1310	60140	1406	58700	1506	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		167° 00´		166° 30´		166° 00´		165° 30´		165° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		15° 00´		15° 30´		16° 00´		16° 30´		17° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	58700	1506	57310	1609	55966	1716	54666	1826	53406	1940	30	00
		58677	1507	57287	1611	55944	1718	54644	1828	53386	1942		
01	31	58653	1509	57265	1612	55922	1719	54623	1830	53365	1944	29	59
		58630	1511	57242	1614	55900	1721	54602	1832	53344	1946		
02	32	58606	1512	57219	1616	55878	1723	54581	1834	53324	1948	28	58
		58583	1514	57196	1618	55856	1725	54559	1836	53303	1950		
03	33	58559	1516	57174	1619	55834	1727	54538	1837	53283	1952	27	57
		58536	1517	57151	1621	55812	1728	54517	1839	53262	1954		
04	34	58512	1519	57128	1623	55790	1730	54496	1841	53241	1956	26	56
		58489	1521	57106	1625	55768	1732	54474	1843	53221	1958		
05	35	58465	1523	57083	1627	55746	1734	54453	1845	53200	1960	25	55
		58442	1524	57060	1628	55725	1736	54432	1847	53180	1962		
06	36	58418	1526	57038	1630	55703	1738	54411	1849	53159	1964	24	54
		58395	1528	57015	1632	55681	1739	54390	1851	53139	1966		
07	37	58372	1529	56992	1634	55659	1741	54368	1853	53118	1967	23	53
		58348	1531	56970	1635	55637	1743	54347	1854	53098	1969		
08	38	58325	1533	56947	1637	55615	1745	54326	1856	53077	1971	22	52
		58302	1534	56925	1639	55593	1747	54305	1858	53057	1973		
09	39	58278	1536	56902	1641	55572	1749	54284	1860	53036	1975	21	51
		58255	1538	56880	1642	55550	1750	54263	1862	53016	1977		
10	40	58232	1540	56857	1644	55528	1752	54242	1864	52995	1979	20	50
		58208	1541	56835	1646	55506	1754	54220	1866	52975	1981		
11	41	58185	1543	56812	1648	55484	1756	54199	1868	52954	1983	19	49
		58162	1545	56790	1649	55463	1758	54178	1870	52934	1985		
12	42	58138	1546	56767	1651	55441	1760	54157	1871	52914	1987	18	48
		58115	1548	56745	1653	55419	1761	54136	1873	52893	1989		
13	43	58092	1550	56722	1655	55397	1763	54115	1875	52873	1991	17	47
		58069	1552	56700	1657	55376	1765	54094	1877	52852	1993		
14	44	58046	1553	56677	1658	55354	1767	54073	1879	52832	1995	16	46
		58022	1555	56655	1660	55332	1769	54052	1881	52812	1997		
15	45	57999	1557	56632	1662	55311	1771	54031	1883	52791	1999	15	45
		57976	1559	56610	1664	55289	1772	54010	1885	52771	2001		
16	46	57953	1560	56588	1665	55267	1774	53989	1887	52751	2003	14	44
		57930	1562	56565	1667	55246	1776	53968	1889	52730	2005		
17	47	57907	1564	56543	1669	55224	1778	53947	1890	52710	2007	13	43
		57884	1565	56521	1671	55202	1780	53926	1892	52690	2009		
18	48	57860	1567	56498	1673	55181	1782	53905	1894	52670	2010	12	42
		57837	1569	56476	1674	55159	1783	53884	1896	52649	2012		
19	49	57814	1571	56454	1676	55138	1785	53864	1898	52629	2014	11	41
		57791	1572	56431	1678	55116	1787	53843	1900	52609	2016		
20	50	57768	1574	56409	1680	55095	1789	53822	1902	52588	2018	10	40
		57745	1576	56387	1682	55073	1791	53801	1904	52568	2020		
21	51	57722	1578	56365	1683	55051	1793	53780	1906	52548	2022	09	39
		57699	1579	56342	1685	55030	1795	53759	1908	52528	2024		
22	52	57676	1581	56320	1687	55008	1796	53738	1910	52508	2026	08	38
		57653	1583	56298	1689	54987	1798	53718	1911	52487	2028		
23	53	57630	1584	56276	1691	54965	1800	53697	1913	52467	2030	07	37
		57607	1586	56254	1692	54944	1802	53676	1915	52447	2032		
24	54	57584	1588	56231	1694	54922	1804	53655	1917	52427	2034	06	36
		57561	1590	56209	1696	54901	1806	53634	1919	52407	2036		
25	55	57538	1591	56187	1698	54880	1808	53614	1921	52387	2038	05	35
		57516	1593	56165	1700	54858	1809	53593	1923	52366	2040		
26	56	57493	1595	56143	1701	54837	1811	53572	1925	52346	2042	04	34
		57470	1597	56121	1703	54815	1813	53551	1927	52326	2044		
27	57	57447	1598	56099	1705	54794	1815	53531	1929	52306	2046	03	33
		57424	1600	56076	1707	54773	1817	53510	1931	52286	2048		
28	58	57401	1602	56054	1709	54751	1819	53489	1933	52266	2050	02	31
		57378	1604	56032	1710	54730	1821	53468	1935	52246	2052		
29	59	57356	1605	56010	1712	54708	1823	53448	1936	52226	2054	01	31
		57333	1607	55988	1714	54687	1824	53427	1938	52206	2056		
30	00	57310	1609	55966	1716	54666	1826	53406	1940	52186	2059	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		164° 30´		164° 00´		163° 30´		163° 00´		162° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

Minutes		17° 30´		18° 00´		18° 30´		19° 00´		19° 30´			
		A	B	A	B	A	B	A	B	A	B		
00	30	52186	2058	51002	2179	49852	2304	48736	2433	47650	2565	30	00
		52166	2060	50982	2181	49833	2306	48717	2435	47633	2568		
01	31	52146	2062	50963	2183	49815	2309	48699	2437	47615	2570	29	59
		52126	2064	50943	2185	49796	2311	48681	2439	47597	2572		
02	32	52106	2066	50924	2188	49777	2313	48662	2442	47579	2574	28	58
		52086	2068	50905	2190	49758	2315	48644	2444	47561	2576		
03	33	52066	2070	50885	2192	49739	2317	48626	2446	47544	2579	27	57
		52046	2072	50866	2194	49720	2319	48608	2448	47526	2581		
04	34	52026	2074	50846	2196	49702	2321	48589	2450	47508	2583	26	56
		52006	2076	50827	2198	49683	2323	48571	2453	47490	2885		
05	35	51986	2078	50808	2200	49664	2325	48553	2455	47472	2588	25	55
		51966	2080	50788	2202	49645	2328	48534	2457	47455	2590		
06	36	51946	2082	50769	2204	49626	2330	48516	2459	47437	2592	24	54
		51926	2084	50750	2206	49608	2332	48498	2461	47419	2594		
07	37	51906	2086	50730	2208	49589	2334	48480	2463	47402	2597	23	53
		51886	2088	50711	2210	49570	2336	48462	2466	47384	2599		
08	38	51867	2090	50692	2212	49551	2338	48443	2468	47366	2601	22	52
		51847	2092	50673	2214	49533	2340	48425	2470	47348	2603		
09	39	51827	2094	50653	2216	49514	2343	48407	2472	47331	2606	21	51
		51807	2096	50634	2218	49495	2345	48389	2474	47313	2608		
10	40	51787	2098	50615	2221	49477	2347	48371	2477	47295	2610	20	50
		51767	2100	50596	2223	49458	2349	48352	2479	47278	2613		
11	41	51747	2102	50576	2225	49439	2351	48334	2481	47260	2615	19	49
		51728	2104	50557	2227	49421	2353	48316	2483	47242	2617		
12	42	51708	2106	50538	2229	49402	2355	48298	2485	47225	2619	18	48
		51688	2108	50519	2231	49383	2357	48280	2488	47207	2622		
13	43	51668	2110	50499	2233	49365	2360	48262	2490	47189	2624	17	47
		51649	2112	50480	2235	49346	2362	48244	2492	47172	2626		
14	44	51629	2114	50461	2237	49327	2364	48225	2494	47154	2628	16	46
		51609	2116	50442	2239	49309	2366	48207	2496	47137	2631		
15	45	51589	2118	50423	2241	49290	2368	48189	2499	47119	2633	15	45
		51570	2120	50404	2243	49271	2370	48171	2501	47101	2635		
16	46	51550	2122	50385	2246	49253	2372	48153	2503	47084	2637	14	44
		51530	2124	50365	2248	49234	2375	48135	2505	47066	2640		
17	47	51510	2126	50346	2250	49216	2377	48117	2507	47049	2642	13	43
		51491	2128	50327	2252	49197	2379	48099	2510	47031	2644		
18	48	51471	2130	50308	2254	49179	2381	48081	2512	47014	2646	12	42
		51451	2132	50289	2256	49160	2383	48063	2514	46996	2649		
19	49	51432	2134	50270	2258	49141	2385	48045	2516	46978	2651	11	41
		51412	2136	50251	2260	49123	2387	48027	2519	46961	2653		
20	50	51392	2138	50232	2262	49104	2390	48009	2521	46943	2656	10	40
		51373	2141	50213	2264	49086	2392	47991	2523	46926	2658		
21	51	51353	2143	50194	2266	49067	2394	47973	2525	46908	2660	09	39
		51334	2145	50175	2269	49049	2396	47955	2527	46891	2662		
22	52	51314	2147	50156	2271	49030	2398	47937	2530	46873	2665	08	38
		51294	2149	50137	2273	49012	2400	47919	2532	46856	2667		
23	53	51275	2151	50117	2275	48993	2403	47901	2534	46839	2669	07	37
		51255	2153	50098	2277	48975	2405	47883	2536	46821	2672		
24	54	51236	2155	50080	2279	48957	2407	47865	2539	46804	2674	06	36
		51216	2157	50061	2281	48938	2409	47847	2541	46786	2676		
25	55	51197	2159	50042	2283	48920	2411	47829	2543	46769	2678	05	35
		51177	2161	50023	2285	48901	2413	47811	2545	46751	2681		
26	56	51158	2163	50004	2287	48883	2416	47793	2547	46734	2683	04	34
		51138	2165	49985	2290	48864	2418	47775	2550	46716	2685		
27	57	51119	2167	49966	2292	48846	2420	47758	2552	46699	2688	03	33
		51099	2169	49947	2294	48828	2422	47740	2554	46682	2690		
28	58	51080	2171	49928	2296	48809	2424	47722	2556	46664	2692	02	32
		51060	2173	49909	2298	48791	2426	47704	2559	46647	2694		
29	59	51041	2175	49890	2300	48772	2429	47686	2561	46630	2697	01	31
		51021	2177	49871	2302	48754	2431	47668	2563	46612	2699		
30	00	51002	2179	49852	2304	48736	2433	47650	2565	46595	2701	00	30
		A	B	A	B	A	B	A	B	A	B		
		162° 00´		161° 30´		161° 00´		160° 30´		160° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		20° 00´		20° 30´		21° 00´		21° 30´		22° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	46595	2701	45567	2841	44567	2985	43592	3132	42642	3283	30	00
		46577	2704	45551	2844	44551	2988	43576	3135	42627	3286		
01	31	46560	2706	45534	2846	44534	2990	43560	3137	42611	3288	29	59
		46543	2708	45517	2848	44518	2992	43544	3140	42596	3291		
02	32	46525	2711	45500	2851	44501	2994	43528	3142	42580	3294	28	58
		46508	2713	45483	2853	44485	2997	43512	3145	42564	3296		
03	33	46491	2715	45466	2855	44468	2999	43496	3147	42549	3299	27	57
		46473	2717	45449	2858	44452	3002	43480	3150	42533	3301		
04	34	46456	2720	45433	2860	44436	3004	43464	3152	42518	3304	26	56
		46439	2722	45416	2862	44419	3007	43448	3155	42502	3306		
05	35	46422	2724	45399	2865	44403	3009	43432	3157	42486	3309	25	55
		46404	2727	45382	2867	44386	3012	43416	3160	42471	3312		
06	36	46387	2729	45365	2870	44370	3014	43400	3162	42455	3314	24	54
		46370	2731	45348	2872	44354	3016	43385	3165	42440	3317		
07	37	46353	2734	45332	2874	44337	3019	43369	3167	42424	3319	23	53
		46335	2736	45315	2877	44321	3021	43353	3170	42409	3322		
08	38	46318	2738	45298	2879	44305	3024	43337	3172	42393	3324	22	52
		46301	2741	45281	2881	44288	3026	43321	3175	42378	3327		
09	39	46284	2743	45265	2884	44272	3029	43305	3177	42362	3329	21	51
		46266	2745	45248	2886	44256	3031	43289	3180	42347	3332		
10	40	46249	2748	45231	2889	44239	3033	43273	3182	42331	3335	20	50
		46232	2750	45214	2891	44223	3036	43257	3185	42316	3337		
11	41	46215	2752	45198	2893	44207	3038	43241	3187	42300	3340	19	49
		46198	2755	45181	2896	44190	3041	43225	3190	42285	3342		
12	42	46181	2757	45164	2898	44174	3043	43210	3192	42269	3345	18	48
		46163	2759	45147	2901	44158	3046	43194	3195	42254	3347		
13	43	46146	2761	45131	2903	44142	3048	43178	3197	42238	3350	17	47
		46129	2764	45114	2905	44125	3051	43162	3200	42223	3353		
14	44	46112	2766	45097	2908	44109	3053	43146	3202	42207	3355	16	46
		46095	2768	45081	2910	44093	3056	43130	3205	42192	3358		
15	45	46078	2771	45064	2913	44077	3058	43114	3207	42176	3360	15	45
		46061	2773	45047	2915	44060	3060	43099	3210	42161	3363		
16	46	46043	2775	45031	2917	44044	3063	43083	3212	42145	3366	14	44
		46026	2778	45014	2920	44028	3065	43067	3215	42130	3368		
17	47	46009	2780	44997	2922	44012	3068	43051	3217	42115	3371	13	43
		45992	2782	44981	2924	43995	3070	43035	3220	42099	3373		
18	48	45975	2785	44964	2927	43979	3073	43020	3222	42084	3376	12	42
		45958	2787	44947	2929	43963	3075	43004	3225	42068	3379		
19	49	45941	2789	44931	2932	43947	3078	42988	3227	42053	3381	11	41
		45924	2792	44914	2934	43931	3080	42972	3230	42038	3384		
20	50	45907	2794	44898	2936	43914	3083	42956	3233	42022	3386	10	40
		45890	2797	44881	2939	43898	3085	42941	3235	42007	3389		
21	51	45873	2799	44864	2941	43882	3088	42925	3238	41991	3391	09	39
		45856	2801	44848	2944	43866	3090	42909	3240	41976	3394		
22	52	45839	2804	44831	2946	43850	3092	42893	3243	41961	3397	08	38
		45822	2806	44815	2949	43834	3095	42878	3245	41945	3399		
23	53	45805	2808	44798	2951	43818	3097	42862	3248	41930	3402	07	37
		45788	2811	44782	2953	43801	3100	42846	3250	41915	3404		
24	54	45771	2813	44765	2956	43785	3102	42830	3253	41889	3407	06	36
		45754	2815	44748	2958	43769	3105	42815	3255	41884	3410		
25	55	45737	2818	44732	2961	43753	3107	42799	3258	41869	3412	05	35
		45720	2820	44715	2963	43737	3110	42783	3260	41853	3415		
26	56	45703	2822	44699	2965	43721	3112	42768	3263	41838	3418	04	34
		45686	2825	44682	2968	43705	3115	42752	3266	41823	3420		
27	57	45669	2827	44666	2970	43689	3117	42736	3268	41808	3423	03	33
		45652	2829	44649	2973	43673	3120	42721	3271	41792	3425		
28	58	45635	2832	44633	2975	43657	3122	42705	3273	41777	3428	02	32
		45618	2834	44616	2978	43641	3125	42689	3276	41762	3431		
29	59	45601	2836	44600	2980	43624	3127	42674	3278	41746	3433	01	31
		45584	2839	44583	2982	43608	3130	42658	3281	41731	3436		
30	00	45567	2841	44567	2985	43592	3132	42642	3283	41716	3438	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		159° 30´		159° 00´		158° 30´		158° 00´		157° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		22° 30´		23° 00´		23° 30´		24° 00´		24° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	41716	3438	40812	3597	39930	3760	39069	3927	38227	4098	30	00
		41701	3441	40797	3600	39915	3763	39054	3930	38213	4101		
01	31	41685	3444	40782	3603	39901	3766	39040	3932	38200	4103	29	59
		41670	3446	40768	3605	39886	3768	39026	3935	38186	4106		
02	32	41655	3449	40753	3608	39872	3771	39012	3938	38172	4109	28	58
		41640	3452	40738	3611	39857	3774	38998	3941	38158	4112		
03	33	41625	3454	40723	3613	39843	3777	38984	3944	38144	4115	27	57
		41609	3457	40708	3616	39828	3779	38969	3947	38130	4118		
04	34	41594	3459	40693	3619	39814	3782	38955	3949	38117	4121	26	56
		41579	3462	40678	3622	39799	3785	38941	3952	38103	4124		
05	35	41564	3465	40664	3624	39785	3788	38927	3955	38089	4127	25	55
		41549	3467	40649	3627	39771	3790	38913	3958	38075	4129		
06	36	41533	3470	40634	3630	39756	3793	38899	3961	38061	4132	24	54
		41518	3473	40619	3632	39742	3796	38885	3964	38048	4135		
07	37	41503	3475	40604	3635	39727	3799	38871	3966	38034	4138	23	53
		41488	3478	40590	3638	39713	3801	38856	3969	38020	4141		
08	38	41473	3480	40575	3640	39698	3804	38842	3972	38006	4144	22	52
		41458	3483	40560	3643	39684	3807	38828	3975	37992	4147		
09	39	41443	3486	40545	3646	39669	3810	38814	3978	37979	4150	21	51
		41427	3488	40530	3648	39655	3813	38800	3981	37965	4153		
10	40	41412	3491	40516	3651	39641	3815	38786	3983	37951	4155	20	50
		41397	3494	40501	3654	39626	3818	38772	3986	37937	4158		
11	41	41382	3496	40486	3657	39612	3821	38758	3989	37924	4161	19	49
		41367	3499	40471	3659	39597	3824	38744	3992	37910	4164		
12	42	41352	3502	40457	3662	39583	3826	38730	3995	37896	4167	18	48
		41337	3504	40442	3665	39569	3829	38716	3998	37882	4170		
13	43	41322	3507	40427	3667	39554	3832	38702	4000	37869	4173	17	47
		41307	3509	40413	3670	39540	3835	38688	4003	37855	4176		
14	44	41291	3512	40398	3673	39525	3838	38674	4006	37841	4179	16	46
		41276	3515	40383	3676	39511	3840	38660	4009	37828	4182		
15	45	41261	3517	40368	3678	39497	3843	38645	4012	37814	4185	15	45
		41246	3520	40354	3681	39482	3846	38631	4015	37800	4187		
16	46	41231	3523	40339	3684	39468	3849	38617	4017	37786	4190	14	44
		41216	3525	40324	3686	39454	3851	38603	4020	37773	4193		
17	47	41201	3528	40310	3689	39439	3854	38589	4023	37759	4196	13	43
		41186	3531	40295	3692	39425	3857	38575	4026	37745	4199		
18	48	41171	3533	40280	3695	39411	3860	38561	4029	37732	4202	12	42
		41156	3536	40266	3697	39396	3863	38547	4032	37718	4205		
19	49	41141	3539	40251	3700	39382	3865	38533	4035	37704	4208	11	41
		41126	3541	40236	3703	39368	3868	38520	4037	37691	4211		
20	50	41111	3544	40222	3705	39353	3871	38506	4040	37677	4214	10	40
		41096	3547	40207	3708	39339	3874	38492	4043	37663	4217		
21	51	41081	3549	40192	3711	39325	3876	38478	4046	37650	4220	09	39
		41066	3552	40178	3714	39311	3879	38464	4049	37636	4222		
22	52	41051	3555	40163	3716	39296	3882	38450	4052	37623	4225	08	38
		41036	3557	40149	3719	39282	3885	38436	4055	37609	4228		
23	53	41021	3560	40134	3722	39268	3888	38422	4057	37595	4231	07	37
		41006	3563	40119	3725	39254	3890	38408	4060	37582	4234		
24	54	40991	3565	40105	3727	39239	3893	38394	4063	37568	4237	06	36
		40976	3568	40090	3730	39225	3896	38380	4066	37554	4240		
25	55	40961	3571	40076	3733	39211	3899	38366	4069	37541	4243	05	35
		40946	3573	40061	3735	39197	3902	38352	4072	37527	4246		
26	56	40931	3576	40046	3738	39182	3904	38338	4075	37514	4249	04	34
		40916	3579	40032	3741	39168	3907	38324	4078	37500	4252		
27	57	40902	3581	40017	3744	39154	3910	38311	4080	37486	4255	03	33
		40887	3584	40003	3746	39140	3913	38297	4083	37473	4258		
28	58	40872	3587	39988	3749	39125	3916	38283	4086	37459	4261	02	32
		40857	3589	39974	3752	39111	3918	38269	4089	37446	4264		
29	59	40842	3592	39959	3755	39097	3921	38255	4092	37432	4266	01	31
		40827	3595	39945	3757	39083	3924	38241	4095	37419	4269		
30	00	40812	3597	39930	3760	39069	3927	38227	4098	37405	4272	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		157° 00´		156° 30´		156° 00´		155° 30´		155° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes	25° 00'		25° 30'		26° 00'		26° 30'		27° 00'			
	A	B	A	B	A	B	A	B	A	B		
00	37405	4272	36602	4451	35816	4634	35047	4821	34295	5012	30	00
	37392	4275	36588	4454	35803	4637	35035	4824	34283	5015		
01	37378	4278	36575	4457	35790	4640	35022	4827	34270	5018	29	59
	37365	4281	36562	4460	35777	4643	35009	4830	34258	5022		
02	37351	4284	36549	4463	35764	4646	34997	4833	34246	5025	28	58
	37337	4287	36535	4466	35751	4649	34984	4837	34233	5028		
03	37324	4290	36522	4469	35738	4651	34971	4840	34221	5031	27	57
	37310	4293	36509	4472	35725	4656	34959	4843	34209	5034		
04	37297	4296	36496	4475	35712	4659	34946	4846	34196	5038	26	56
	37283	4299	36483	4478	35699	4662	34933	4849	34184	5041		
05	37270	4302	36469	4481	35686	4665	34921	4852	34172	5044	25	55
	37256	4305	36456	4484	35674	4668	34908	4856	34159	5047		
06	37243	4308	36443	4487	35661	4671	34896	4859	34147	5051	24	54
	37229	4311	36430	4490	35648	4674	34883	4862	34134	5054		
07	37216	4314	36417	4493	35635	4677	34870	4865	34122	5057	23	53
	37203	4317	36403	4496	35622	4680	34858	4868	34110	5060		
08	37189	4320	36390	4499	35609	4683	34845	4871	34097	5064	22	52
	37176	4323	36377	4503	35596	4686	34832	4875	35085	5067		
09	37162	4326	36364	4506	35583	4690	34820	4878	34073	5070	21	51
	37149	4329	36351	4509	35571	4693	34807	4881	34061	5073		
10	37135	4332	36338	4512	35558	4696	34795	4884	34048	5076	20	50
	37122	4334	36325	4515	35545	4699	34782	4887	34036	5080		
11	37108	4337	36311	4518	35532	4702	34770	4890	34024	5083	19	49
	37095	4340	36298	4521	35519	4705	34757	4894	34011	5086		
12	37081	4343	36285	4524	35506	4708	34744	4897	33999	5089	18	48
	37068	4346	36272	4527	35493	4711	34732	4900	33987	5093		
13	37055	4349	36259	4530	35481	4714	34719	4903	33974	5096	17	47
	37041	4352	36246	4533	35468	4718	34707	4906	33962	5099		
14	37028	4355	36233	4536	35455	4721	34694	4910	33950	5102	16	46
	37014	4358	36220	4539	35442	4724	34682	4913	33938	5106		
15	37001	4361	36206	4542	35429	4727	34669	4916	33925	5109	15	45
	36988	4364	36193	4545	35417	4730	34657	4919	33913	5112		
16	36974	4367	36180	4548	35404	4733	34644	4922	33901	5115	14	44
	36961	4370	36167	4551	35391	4736	34632	4925	33889	5119		
17	36948	4373	36154	4554	35378	4739	34619	4929	33876	5122	13	43
	36934	4376	36141	4557	35365	4742	34607	4932	33864	5125		
18	36921	4379	36128	4560	35353	4746	34594	4935	33852	5128	12	42
	36907	4382	36115	4563	35340	4749	34582	4938	33840	5132		
19	36894	4385	36102	4566	35327	4752	34569	4941	33827	5135	11	41
	36881	4388	36089	4569	35314	4755	34557	4945	33815	5138		
20	36867	4391	36076	4573	35302	4758	34544	4948	33803	5142	10	40
	36854	4394	36063	4576	35289	4761	34532	4951	33791	5145		
21	36841	4397	36050	4579	35276	4764	34519	4954	33779	5148	09	39
	36827	4400	36037	4582	35263	4769	34507	4957	33766	5151		
22	36814	4403	36024	4585	35251	4771	34494	4961	33754	5155	08	38
	36801	4406	36011	4588	35238	4774	34482	4964	33742	5158		
23	36787	4409	35998	4591	35225	4777	34469	4967	33730	5161	07	37
	36774	4412	35985	4594	35212	4780	34457	4970	33717	5164		
24	36761	4415	35972	4597	35200	4783	34445	4973	33705	5168	06	36
	36747	4418	35959	4600	35187	4786	34432	4977	33693	5171		
25	36734	4421	35946	4603	35174	4789	34420	4980	33681	5174	05	35
	36721	4424	35933	4606	35161	4793	34407	4983	33669	5178		
26	36708	4427	35920	4609	35149	4796	34395	4986	33657	5181	04	34
	36694	4430	35907	4612	35136	4799	34382	4989	33644	5184		
27	36681	4433	35894	4615	35123	4802	34370	4993	33632	5187	03	33
	36668	4436	35881	4619	35111	4805	34357	4996	33620	5191		
28	36655	4439	35868	4622	35098	4808	34345	4999	33608	5194	02	32
	36641	4442	35855	4625	35085	4811	34332	5002	33596	5197		
29	36628	4445	35842	4628	35073	4815	34320	5005	33584	5200	01	31
	36615	4448	35829	4631	35060	4818	34308	5009	33572	5204		
30	36602	4451	35816	4634	35047	4821	34295	5012	33559	5207	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	154° 30'		154° 00'		153° 30'		153° 00'		152° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

Minutes	27° 30'		28° 00'		28° 30'		29° 00'		29° 30'			
	A	B	A	B	A	B	A	B	A	B		
00	33559	5207	32839	5406	32134	5610	31443	5818	30766	6030	30	00
	33547	5210	32827	5410	32122	5614	31431	5822	30755	6034		
01	33535	5214	32815	5413	32110	5617	31420	5825	30744	6038	29	59
	33523	5217	32803	5417	32099	5620	31409	5829	30733	6041		
02	33511	5220	32792	5420	32087	5624	31397	5832	30721	6045	28	58
	33499	5224	32780	5423	32076	5627	31386	5836	30710	6048		
03	33487	5227	32768	5426	32064	5631	31375	5839	30699	6052	27	57
	33475	5230	32756	5430	32052	5634	31363	5843	30688	6055		
04	33462	5233	32744	5433	32041	5638	31352	5846	30677	6059	26	56
	33450	5237	32732	5437	32029	5641	31340	5850	30666	6062		
05	33438	5240	32720	5440	32018	5645	31329	5853	30655	6066	25	55
	33426	5243	32709	5443	32006	5648	31318	5857	30643	6070		
06	33414	5247	32697	5447	31994	5651	31306	5860	30632	6073	24	54
	33402	5250	32685	5450	31983	5655	31295	5864	30621	6077		
07	33390	5253	32673	5454	31971	5658	31284	5867	30610	6080	23	53
	33378	5257	32661	5457	31960	5662	31272	5871	30599	6084		
08	33366	5260	32649	5460	31948	5665	31261	5874	30588	6088	22	52
	33354	5263	32638	5464	31936	5669	31250	5878	30577	6091		
09	33342	5266	32625	5467	31925	5672	31238	5881	30566	6095	21	51
	33330	5270	32614	5470	31913	5675	31227	5885	30555	6098		
10	33318	5273	32602	5474	31902	5679	31216	5888	30544	6102	20	50
	33306	5277	32590	5477	31890	5682	31204	5892	30532	6106		
11	33293	5280	32579	5481	31879	5686	31193	5895	30521	6109	19	49
	33281	5283	32567	5484	31867	5689	31182	5899	30510	6113		
12	33269	5287	32555	5487	31856	5693	31170	5902	30499	6116	18	48
	33257	5290	32543	5491	31844	5696	31159	5906	30488	6120		
13	33245	5293	32532	5494	31833	5700	31148	5909	30477	6124	17	47
	33233	5296	32520	5498	31821	5703	31137	5913	30466	6127		
14	33221	5300	32508	5501	31809	5707	31125	5917	30455	6131	16	46
	33209	5303	32496	5504	31798	5710	31114	5920	30444	6134		
15	33197	5306	32484	5508	31786	5714	31103	5924	30433	6138	15	45
	33185	5310	32473	5511	31775	5717	31091	5927	30422	6142		
16	33173	5313	32461	5515	31763	5720	31080	5931	30411	6145	14	44
	33161	5316	32449	5518	31752	5724	31069	5934	30400	6149		
17	33149	5320	32438	5521	31740	5727	31058	5938	30389	6153	13	43
	33137	5323	32426	5525	31729	5731	31046	5941	30378	6156		
18	33125	5326	32414	5528	31717	5734	31035	5945	30367	6160	12	42
	33113	5330	32402	5532	31706	5738	31024	5948	30356	6163		
19	33101	5333	32391	5535	31694	5741	31013	5952	30345	6167	11	41
	33089	5336	32379	5538	31683	5745	31001	5955	30334	6171		
20	33077	5340	32367	5542	31672	5748	30990	5959	30322	6174	10	40
	33065	5343	32355	5545	31660	5752	30979	5963	30311	6178		
21	33054	5346	32344	5549	31648	5755	30968	5966	30300	6181	09	39
	33042	5350	32332	5552	31637	5759	30956	5970	30289	6185		
22	33030	5353	32320	5555	31626	5762	30945	5973	30278	6189	08	38
	33018	5356	32309	5559	31614	5766	30934	5977	30267	6192		
23	33006	5360	32297	5562	31603	5769	30923	5980	30256	6196	07	37
	32994	5363	32285	5566	31591	5773	30912	5984	30245	6200		
24	32982	5366	32274	5569	31580	5776	30900	5988	30235	6203	06	36
	32970	5370	32262	5572	31569	5780	30889	5991	30224	6207		
25	32958	5373	32250	5576	31557	5783	30878	5995	30213	6210	05	35
	32946	5376	32239	5579	31546	5787	30867	5998	30202	6214		
26	32934	5380	32227	5583	31534	5790	30856	6002	30191	6218	04	34
	32922	5383	32215	5586	31523	5794	30844	6005	30180	6221		
27	32910	5386	32204	5590	31511	5797	30833	6009	30169	6225	03	33
	32898	5390	32192	5593	31500	5801	30822	6012	30158	6229		
28	32887	5393	32180	5596	31488	5804	30811	6016	30147	6232	02	32
	32875	5396	32169	5600	31477	5808	30800	6020	30136	6236		
29	32863	5400	32157	5603	31466	5811	30788	6023	30125	6240	01	31
	32851	5403	32145	5607	31454	5815	30777	6027	30114	6243		
30	32839	5406	32134	5610	31443	5818	30766	6030	30103	6247	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	152° 00'		151° 30'		151° 00'		150° 30'		150° 00'			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes	30° 00'		30° 30'		31° 00'		31° 30'		32° 00'			
	A	B	A	B	A	B	A	B	A	B		
00	30103	6247	29453	6468	28816	6693	28191	6923	27579	7158	30	00
	30092	6251	29442	6472	28806	6697	28181	6927	27569	7162		
01	30081	6254	29432	6475	28795	6701	28171	6931	27559	7166	29	59
	30070	6258	29421	6479	28785	6705	28161	6935	27549	7170		
02	30059	6262	29410	6483	28774	6709	28150	6939	27539	7174	28	58
	30048	6265	29399	6487	28763	6712	28140	6943	27528	7178		
03	30037	6269	29389	6490	28753	6716	28130	6947	27518	7182	27	57
	30026	6273	29378	6494	28743	6720	28119	6951	27508	7186		
04	30016	6276	29367	6498	28732	6724	28109	6954	27498	7190	26	56
	30005	6280	29357	6501	28722	6728	28099	6858	27488	7193		
05	29994	6284	29346	6505	28711	6731	28089	6962	27478	7197	25	55
	29983	6287	29335	6509	28701	6735	28078	6966	27468	7201		
06	29972	6291	29325	6513	28690	6739	28068	6970	27458	7205	24	54
	29961	6294	29314	6516	28680	6743	28058	6974	27448	7209		
07	29950	6298	29303	6520	28669	6747	28047	6978	27438	7213	23	53
	29939	6302	29293	6524	28659	6750	28037	6982	27428	7217		
08	29928	6305	29282	6528	28648	6754	28027	6985	27418	7221	22	52
	29917	6309	29271	6531	28638	6758	28017	6989	27408	7225		
09	29907	6313	29261	6535	28627	6762	28006	6993	27398	7229	21	51
	29896	6316	29250	6539	28617	6766	27996	6997	27387	7233		
10	29885	6320	29239	6543	28606	6770	27986	7001	27377	7237	20	50
	29874	6324	29229	6546	28596	6773	27976	7005	27367	7241		
11	29863	6328	29218	6550	28586	6777	27965	7009	27357	7245	19	49
	29852	6331	29207	6554	28575	6781	27955	7013	27347	7249		
12	29841	6335	29197	6558	28565	6785	27945	7017	27337	7253	18	48
	29831	6339	29186	6561	28554	6789	27935	7021	27327	7257		
13	29820	6342	29175	6565	28544	6793	27925	7024	27317	7261	17	47
	29809	6346	29165	6569	28533	6796	27914	7028	27307	7265		
14	29798	6350	29154	6573	28523	6800	27904	7032	27297	7269	16	46
	29787	6353	29144	6576	28513	6804	27894	7036	27287	7273		
15	29776	6357	29133	6580	28502	6808	27884	7040	27277	7277	15	45
	29766	6361	29122	6584	28492	6812	27874	7044	27267	7281		
16	29755	6364	29112	6588	28481	6815	27863	7048	27257	7285	14	44
	29744	6368	29101	6591	28471	6819	27853	7052	27247	7289		
17	29733	6372	29091	6595	28461	6823	27843	7056	27237	7293	13	43
	29722	6375	29080	6599	28450	6827	27833	7060	27227	7297		
18	29711	6379	29069	6603	28440	6831	27823	7064	27217	7301	12	42
	29701	6383	29059	6606	28429	6835	27812	7067	27207	7305		
19	29690	6386	28048	6610	28419	6839	27802	7071	27197	7309	11	41
	29679	6390	29038	6614	28409	6842	27792	7075	27187	7213		
20	29668	6394	29027	6618	28398	6846	27782	7079	27177	7317	10	40
	29657	6398	29016	6622	28388	6850	27772	7083	27167	7321		
21	29647	6401	29006	6625	28378	6854	27761	7087	27157	7325	09	39
	29636	6405	28995	6629	28367	6858	27751	7091	27147	7329		
22	29625	6409	28985	6633	28357	6862	27741	7095	27137	7333	08	38
	29614	6412	28974	6637	28346	6865	27731	7099	27127	7337		
23	29604	6416	28964	6640	28336	6869	27721	7103	27117	7341	07	37
	29593	6420	28953	6644	28326	6873	27711	7107	27107	7345		
24	29582	6423	28942	6648	28315	6877	27701	7111	27098	7349	06	36
	29571	6427	28932	6652	28305	6881	27690	7115	27088	7353		
25	29560	6431	28921	6655	28295	6885	27680	7118	27078	7357	05	35
	29550	6435	28911	6659	28284	6889	27670	7122	27068	7361		
26	29539	6438	28900	6663	28274	6893	27660	7126	27058	7365	04	34
	29528	6442	28890	6667	28264	6896	27650	7130	27048	7369		
27	29517	6446	28879	6671	28253	6900	27640	7134	27038	7373	03	33
	29507	6449	28869	6674	28243	6904	27630	7138	27028	7377		
28	29496	6453	28858	6678	28233	6908	27619	7142	27018	7381	02	32
	29485	6457	28848	6682	28222	6912	27609	7146	27008	7385		
29	29475	6461	28837	6686	28212	6916	27599	7150	26998	7389	01	31
	29464	6464	28827	6690	28202	6920	27589	7154	26988	7393		
30	29453	6468	28816	6693	28191	6923	27579	7158	26978	7397	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	149° 30'		149° 00'		148° 30'		148° 00'		147° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and and greater than latitude, in which case take "Z" from top of table

		32° 30´		33° 00´		33°30´		34° 00´		34° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	26978	7397	26389	7641	25811	7889	25244	8143	24687	8401	30	00
		26968	7401	26379	7645	25801	7893	25235	8147	24678	8405		
01	31	26958	7405	26370	7649	25792	7898	25225	8151	24669	8409	29	59
		26949	7409	26360	7653	25782	7902	25216	8155	24660	8414		
02	32	26939	7413	26350	7657	25773	7906	25206	8160	24650	8418	28	58
		26929	7417	26340	7661	25763	7910	25197	8164	24641	8422		
03	33	26919	7421	26331	7665	25754	7914	25188	8168	24632	8427	27	57
		26909	7425	26321	7670	25744	7919	25178	8172	24623	8431		
04	34	26899	7429	26311	7674	25735	7923	25169	8177	24614	8435	26	56
		26889	7433	26302	7678	25725	7927	25160	8181	24605	8440		
05	35	26879	7437	26292	7682	25716	7931	25150	8185	24595	8444	25	55
		26869	7441	26282	7686	25706	7935	25141	8189	24586	8448		
06	36	26860	7445	26273	7690	25697	7940	25132	8194	24577	8453	24	54
		26850	7449	26263	7694	25687	7944	25122	8198	24568	8457		
07	37	26840	7453	26253	7698	25678	7948	25113	8202	24559	8461	23	53
		26830	7458	26244	7702	25668	7952	25104	8207	24550	8466		
08	38	26820	7462	26234	7707	25659	7956	25094	8211	24540	8470	22	52
		26810	7466	26224	7711	25649	7961	25085	8215	24531	8475		
09	39	26800	7470	26214	7715	25640	7965	25076	8219	24522	8479	21	51
		26790	7474	26205	7719	25630	7969	25066	8224	24513	8483		
10	40	26781	7478	26195	7723	25621	7973	25057	8228	24504	8488	20	50
		26771	7482	26185	7727	25611	7977	25048	8232	24495	8492		
11	41	26761	7486	26176	7731	25602	7982	25038	8237	24486	8496	19	49
		26751	7490	26166	7736	25592	7986	25029	8241	24477	8501		
12	42	26741	7494	26157	7740	25583	7990	25020	8245	24467	8505	18	48
		26731	7498	26147	7744	25573	7994	25011	8249	24458	8510		
13	43	26722	7502	26137	7748	25564	7998	25001	8254	24449	8514	17	47
		26712	7506	26128	7752	25554	8003	24992	8258	24440	8518		
14	44	26702	7510	26118	7756	25545	8007	24983	8262	24431	8523	16	46
		26692	7514	26108	7760	25536	8011	24973	8267	24422	8527		
15	45	26682	7518	26099	7764	25526	8015	24964	8271	24413	8531	15	45
		26672	7522	26089	7769	25517	8020	24955	8275	24404	8536		
16	46	26663	7526	26079	7773	25507	8024	24946	8280	24395	8540	14	44
		26653	7531	26070	7777	25498	8028	24936	8284	24385	8545		
17	47	26643	7535	26060	7781	25488	8032	24927	8288	24376	8549	13	43
		26633	7539	26051	7785	25479	8037	24918	8292	24367	8553		
18	48	26623	7543	26041	7789	25469	8041	24909	8297	24358	8558	12	42
		26614	7547	26031	7793	25460	8045	24899	8301	24349	8562		
19	49	26604	7551	26022	7798	25451	8049	24890	8305	24340	8567	11	41
		26594	7555	26012	7802	25441	8053	24881	8310	24331	8571		
20	50	26584	7559	26002	7806	25432	8058	24872	8314	24322	8575	10	40
		26574	7563	25993	7810	25422	8062	24862	8318	24313	8580		
21	51	26565	7567	25983	7814	25413	8066	24853	8323	24304	8584	09	39
		26555	7571	25974	7818	25403	8070	24844	8327	24295	8589		
22	52	26545	7575	25964	7823	25394	8075	24835	8331	24286	8593	08	38
		26535	7579	25954	7827	25385	8079	24825	8336	24276	8597		
23	53	26526	7584	25945	7831	25375	8083	24816	8340	24267	8602	07	37
		26516	7588	25935	7835	25366	8087	24807	8344	24258	8606		
24	54	26506	7592	25926	7839	25356	8091	24798	8349	24249	8611	06	36
		26496	7596	25916	7843	25347	8096	24788	8353	24240	8615		
25	55	26486	7600	25907	7848	25338	8100	24779	8357	24231	8619	05	35
		26477	7604	25897	7852	25328	8104	24770	8362	24222	8624		
26	56	26467	7608	25887	7856	25319	8108	24761	8366	24213	8628	04	34
		26457	7612	25878	7860	25309	8113	24752	8370	24204	8633		
27	57	26447	7616	25868	7864	25300	8117	24742	8375	24195	8637	03	33
		26438	7620	25859	7868	25291	8121	24733	8379	24186	8641		
28	58	26428	7625	25849	7873	25281	8125	24724	8383	24177	8646	02	32
		26418	7629	25840	7877	25272	8130	24715	8388	24168	8650		
29	59	26409	7633	25830	7881	25263	8134	24706	8392	24159	8655	01	31
		26399	7637	25821	7885	25253	8138	24696	8396	24150	8659		
30	00	26389	7641	25811	7889	24244	8143	24687	8401	24141	8663	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		147° 00´		146° 30´		146° 00´		145° 30´		145° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes	35° 00'		35° 30'		36° 00'		36° 30'		37° 00'			
	A	B	A	B	A	B	A	B	A	B		
00	24141	8663	23605	8931	23078	9204	22561	9482	22054	9765	30	00
	24132	8668	23596	8936	23069	9209	22553	9487	22045	9770		
01	24123	8672	23587	8940	23061	9213	22544	9492	22037	9775	29	59
	24114	8677	23578	8945	23052	9218	22536	9496	22029	9779		
02	24105	8681	23569	8949	23043	9223	22527	9501	22020	9784	28	58
	24096	8686	23560	8954	23035	9227	22519	9505	22012	9789		
03	24087	8690	23551	8958	23026	9232	22510	9510	22003	9794	27	57
	24078	8694	23543	8963	23017	9236	22501	9515	21995	9798		
04	24069	8699	23534	8967	23009	9241	22493	9520	21987	9803	26	56
	24060	8703	23525	8972	23000	9246	22484	9524	21978	9808		
05	24051	8708	23516	8976	22991	9250	22476	9529	21970	9813	25	55
	24042	8712	23507	8981	22983	9255	22467	9534	21962	9818		
06	24033	8717	23498	8986	22974	9259	22459	8538	21953	9822	24	54
	24024	8721	23490	8990	22965	9264	22450	9543	21945	9827		
07	24015	8726	23481	8995	22957	9269	22442	9548	21937	9832	23	53
	24006	8730	23472	8999	22948	9273	22433	9552	21928	9837		
08	23997	8734	23463	9004	22939	9278	22425	9557	21920	9841	22	52
	23988	8739	23454	9008	22931	9282	22416	9562	21912	9846		
09	23979	8743	23446	9013	22922	9287	22408	9566	21903	9851	21	51
	23970	8748	23437	9017	22913	9292	22399	9571	21895	9856		
10	23961	8752	23428	9022	22905	9296	22391	9576	21887	9861	20	50
	23952	8757	23419	9026	22896	9301	22382	9581	21878	9865		
11	23943	8761	23410	9031	22887	9305	22374	9585	21870	9870	19	49
	23934	8766	23402	9035	22879	9310	22366	9590	21862	9875		
12	23925	8770	23393	9040	22870	9315	22357	9595	21853	9880	18	48
	23916	8775	23384	9044	22862	9319	22349	9599	21845	9885		
13	23907	8779	23375	9049	22853	9324	22340	9604	21837	9889	17	47
	23898	8783	23366	9054	22844	9329	22332	9609	21828	9894		
14	23889	8788	23358	9058	22836	9333	22323	9614	21820	9899	16	46
	23880	8792	23349	9063	22827	9338	22315	9618	21812	9904		
15	23871	8797	23340	9067	22818	9342	22306	9623	21803	9909	15	45
	23863	8801	23331	9072	22810	9347	22298	9628	21795	9913		
16	23854	8806	23323	9076	22801	9352	22289	9632	21787	9918	14	44
	23845	8810	23314	9081	22793	9356	22281	9637	21778	9923		
17	23836	8815	23305	9085	22784	9361	22272	9642	21770	9928	13	43
	23827	8819	23296	9090	22775	9366	22264	9647	21762	9933		
18	23818	8824	23288	9094	22767	9370	22256	9651	21754	9937	12	42
	23809	8828	23279	9099	22758	9375	22247	9656	21745	9942		
19	23800	8833	23270	9104	22750	9380	22239	9661	21737	9947	11	41
	23791	8837	23261	9108	22741	9384	22230	9665	21729	9952		
20	23782	8842	23252	9113	22732	9389	22222	9670	21720	9957	10	40
	23773	8846	23244	9117	22724	9394	22213	9675	21712	9962		
21	23764	8850	23235	9122	22715	9398	22205	9680	21704	9966	09	39
	23755	8855	23226	9126	22707	9403	22197	9684	21696	9971		
22	23747	8859	23218	9131	22698	9407	22188	9689	21687	9976	08	38
	23738	8864	23209	9136	22690	9412	22180	9694	21679	9981		
23	23729	8868	23200	9140	22681	9417	22171	9699	21671	9986	07	37
	23720	8873	23191	9145	22672	9421	22163	9703	21662	9990		
24	23711	8877	23183	9149	22664	9426	22154	9708	21654	9995	06	36
	23702	8882	23174	9154	22655	9431	22146	9713	21646	10000		
25	23693	8886	23165	9158	22647	9435	22138	9718	21638	10005	05	35
	23684	8891	23156	9163	22638	9440	22129	9722	21629	10010		
26	23675	8895	23148	9168	22630	9445	22121	9727	21621	10015	04	34
	23667	8900	23139	9172	22621	9449	22112	9732	21613	10019		
27	23658	8904	23130	9177	22612	9454	22104	9737	21605	10024	03	33
	23649	8909	23122	9181	22604	9459	22096	9741	21596	10029		
28	23640	8913	23113	9186	22595	9463	22087	9746	21588	10034	02	32
	23631	8918	23104	9190	22587	9468	22079	9751	21580	10039		
29	23622	8922	23095	9195	22578	9473	22070	9756	21572	10044	01	31
	23613	8927	23087	9200	22570	9477	22062	9760	21563	10049		
30	23605	8931	23078	9204	22561	9482	22054	9765	21555	10053	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	144° 30'		144° 00'		143° 30'		143° 00'		142° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		37° 30´		38° 00´		38° 30´		39° 00´		39° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	21555	10053	21066	10347	20585	10646	20113	10950	19649	11259	30	00
		21547	10058	21058	10352	20577	10651	20105	10955	19641	11265		
01	31	21539	10063	21050	10357	20569	10656	20097	10960	19634	11270	29	59
		21531	10068	21042	10362	20561	10661	20089	10965	19626	11275		
02	32	21522	10073	21033	10367	20553	10666	20082	10970	19618	11280	28	58
		21514	10078	21025	10372	20545	10671	20074	10975	19611	11285		
03	33	21506	10082	21017	10376	20537	10676	20066	10980	19603	11291	27	57
		21498	10087	21009	10381	20529	10681	20058	10986	19595	11296		
04	34	21489	10092	21001	10386	20522	10686	20050	10991	19588	11301	26	56
		21481	10097	20993	10391	20514	10691	20043	10996	19580	11306		
05	35	21473	10102	20985	10396	20506	10696	20035	11001	19572	11311	25	55
		21465	10107	20977	10401	20498	10701	20027	11006	19565	11317		
06	36	21457	10112	20969	10406	20490	10706	20019	11011	19557	11322	24	54
		21448	10116	20961	10411	20482	10711	20012	11016	19549	11327		
07	37	21440	10121	20953	10416	20474	10716	20004	11021	19541	11332	23	53
		21432	10126	20945	10421	20466	10721	19996	11027	19534	11338		
08	38	21424	10131	20937	10426	20458	10726	19988	11032	19527	11343	22	52
		21416	10136	20929	10431	20450	10731	19980	11037	19519	11348		
09	39	21407	10141	20921	10436	20442	10736	19973	11042	19511	11353	21	51
		21399	10146	20913	10441	20435	10741	19965	11047	19504	11359		
10	40	21391	10151	20905	10446	20427	10746	19957	11052	19496	11364	20	50
		21383	10155	20897	10451	20419	10751	19949	11057	19488	11369		
11	41	21375	10160	20888	10456	20411	10756	19942	11063	19481	11374	19	49
		21367	10165	20880	10461	20403	10761	19934	11068	19473	11380		
12	42	21358	10170	20872	10466	20395	10767	19926	11073	19466	11385	18	48
		21350	10175	20864	10471	20387	10772	19919	11078	19458	11390		
13	43	21342	10180	20856	10476	20379	10777	19911	11083	19450	11395	17	47
		21334	10185	20848	10481	20371	10782	19903	11088	19443	11400		
14	44	21326	10190	20840	10486	20364	10787	19895	11094	19435	11406	16	46
		21318	10195	20832	10491	20356	10792	19888	11099	19428	11411		
15	45	21309	10199	20824	10496	20348	10797	19880	11104	19420	11416	15	45
		21301	10204	20816	10500	20340	10802	19872	11109	19412	11422		
16	46	21293	10209	20808	10505	20332	10807	19864	11114	19405	11427	14	44
		21285	10214	20800	10510	20324	10812	19857	11119	19397	11432		
17	47	21277	10219	20792	10515	20316	10817	19849	11124	19390	11437	13	43
		21269	10224	20784	10520	20309	10822	19841	11130	19382	11443		
18	48	21260	10229	20776	10525	20301	10827	19834	11135	19375	11448	12	42
		21252	10234	20768	10530	20293	10832	19826	11140	19367	11453		
19	49	21244	10239	20760	10535	20285	10838	19818	11145	19359	11458	11	41
		21236	10243	20752	10540	20277	10843	19810	11150	19352	11464		
20	50	21228	10248	20744	10545	20269	10848	19803	11156	19344	11469	10	40
		21220	10253	20736	10550	20261	10853	19795	11161	19337	11474		
21	51	21212	10258	20728	10555	20254	10858	19787	11166	19329	11479	09	39
		21204	10263	20720	10560	20246	10863	19779	11171	19321	11485		
22	52	21195	10268	20712	10565	20238	10868	19772	11176	19314	11490	08	38
		21187	10273	20704	10570	20230	10873	19764	11181	19306	11495		
23	53	21179	10278	20696	10575	20222	10878	19756	11187	19299	11501	07	37
		21171	10283	20688	10580	20214	10883	19749	11192	19291	11506		
24	54	21163	10288	20680	10585	20207	10888	19741	11197	19284	11511	06	36
		21155	10293	20672	10590	20199	10894	19733	11202	19276	11516		
25	55	21147	10298	20665	10595	20191	10899	19726	11207	19269	11522	05	35
		21139	10302	20657	10600	20183	10904	19718	11213	19261	11527		
26	56	21131	10307	20649	10605	20175	10909	19710	11218	19253	11532	04	34
		21122	10312	20641	10610	20167	10914	19703	11223	19246	11537		
27	57	21114	10317	20633	10615	20160	10919	19695	11228	19238	11543	03	33
		21106	10322	20625	10620	20152	10924	19687	11233	19231	11548		
28	58	21098	10327	20617	10625	20144	10929	19680	11239	19223	11553	02	32
		21090	10332	20609	10630	20136	10934	19672	11244	19216	11559		
29	59	21082	10337	20601	10635	20128	10939	19664	11249	19208	11564	01	31
		21074	10342	20593	10640	20121	10945	19657	11254	19201	11569		
30	00	21066	10347	20585	10646	20113	10950	19649	11259	19193	11575	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		142° 00´		141° 30´		141° 00´		140° 30´		140° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes	40° 00'		40° 30'		41° 00'		41° 30'		42° 00'			
	A	B	A	B	A	B	A	B	A	B		
00	19193	11575	18746	11895	18306	12222	17873	12554	17449	12893	30	00
	19186	11580	18738	11901	18298	12228	17866	12560	17442	12898		
01	19178	11585	18731	11906	18291	12233	17859	12566	17435	12904	29	59
	19171	11590	18723	11912	18284	12238	17852	12571	17428	12910		
02	19163	11596	18716	11917	18277	12244	17845	12577	17421	12915	28	58
	19156	11601	18709	11922	18269	12249	17838	12582	17414	12921		
03	19148	11606	18701	11928	18262	12255	17831	12588	17407	12927	27	57
	19141	11612	18694	11933	18255	12260	17824	12593	17400	12932		
04	19133	11617	18686	11939	18248	12266	17816	12599	17393	12938	26	56
	19126	11622	18679	11944	18240	12271	17809	12605	17386	12944		
05	19118	11628	18672	11949	18233	12277	17802	12610	17379	12950	25	55
	19111	11633	18664	11955	18226	12282	17795	12616	17372	12955		
06	19103	11638	18657	11960	18219	12288	17788	12622	17365	12961	24	54
	19096	11644	18650	11966	18211	12293	17781	12627	17358	12967		
07	19088	11649	18642	11971	18204	12299	17774	12633	17351	12972	23	53
	19081	11654	18635	11977	18197	12305	17767	12638	17344	12978		
08	19073	11660	18627	11982	18190	12310	17760	12644	17337	12984	22	52
	19066	11665	18620	11987	18182	12316	17752	12650	17330	12990		
09	19058	11670	18613	11993	18175	12321	17745	12655	17323	12995	21	51
	19051	11676	18605	11998	18168	12327	17738	12661	17316	13001		
10	19043	11681	18598	12004	18161	12332	17731	12667	17309	13007	20	50
	19036	11686	18591	12009	18154	12338	17724	12672	17302	13012		
11	19028	11692	18583	12014	18146	12343	17717	12678	17295	13018	19	49
	19021	11697	18576	12020	18139	12349	17710	12683	17288	13024		
12	19013	11702	18569	12025	18132	12354	17703	12689	17281	13030	18	48
	19006	11708	18561	12031	18125	12360	17696	12695	17274	13035		
13	18998	11713	18554	12036	18117	12365	17689	12700	17267	13041	17	47
	18991	11718	18547	12042	18110	12371	17681	12706	17260	13047		
14	18983	11724	18539	12047	18103	12376	17674	12711	17253	13053	16	46
	18976	11729	18532	12053	18096	12382	17667	12717	17246	13058		
15	18968	11734	18525	12058	18089	12387	17660	12723	17239	13064	15	45
	18961	11740	18517	12063	18081	12393	17653	12728	17232	13070		
16	18953	11745	18510	12069	18074	12398	17646	12734	17225	13075	14	44
	18946	11750	18503	12074	18067	12404	17639	12740	17218	13081		
17	18939	11756	18495	12080	18060	12410	17632	12745	17212	13087	13	43
	18931	11761	18488	12085	18053	12415	17625	12751	17205	13093		
18	18924	11766	18481	12091	18045	12421	17618	12757	17198	13098	12	42
	18916	11772	18473	12096	18038	12426	17611	12762	17191	13104		
19	18909	11777	18466	12102	18031	12432	17604	12768	17184	13110	11	41
	18901	11782	18459	12107	18024	12437	17597	12774	17177	13116		
20	18894	11788	18451	12112	18017	12443	17590	12779	17170	13121	10	40
	18886	11793	18444	12118	18010	12448	17583	12785	17163	13127		
21	18879	11799	18437	12123	18002	12454	17575	12790	17156	13133	09	39
	18872	11804	18429	12129	17995	12460	17568	12796	17149	13139		
22	18864	11809	18422	12134	17988	12465	17561	12802	17142	13144	08	38
	18857	11815	18415	12140	17981	12471	17554	12807	17135	13150		
23	18849	11820	18408	12145	17974	12476	17547	12813	17128	13156	07	37
	18842	11825	18400	12151	17966	12482	17540	12819	17121	13162		
24	18834	11831	18393	12156	17959	12487	17533	12824	17114	13168	06	36
	18827	11836	18386	12162	17952	12493	17526	12830	17108	13173		
25	18820	11842	18378	12167	17945	12499	17519	12836	17101	13179	05	35
	18812	11847	18371	12173	17938	12504	17512	12841	17094	13185		
26	18805	11852	18364	12178	17931	12510	17505	12847	17087	13191	04	34
	18797	11858	18357	12184	17924	12515	17498	12853	17080	13196		
27	18790	11863	18349	12189	17916	12521	17491	12859	17073	13202	03	33
	18783	11868	18342	12195	17909	12526	17484	12864	17066	13208		
28	18775	11874	18335	12200	17902	12532	17477	12870	17059	13214	02	32
	18768	11879	18327	12205	17895	12538	17470	12876	17052	13220		
29	18760	11885	18320	12211	17888	12543	17463	12881	17046	13225	01	31
	18753	11890	18313	12216	17881	12549	17456	12887	17039	13231		
30	18746	11895	18306	12222	17873	12554	17449	12893	17032	13237	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	139° 30'		139° 00'		138° 30'		138° 00'		137° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		42° 30´		43° 00´		43° 30´		44° 00´		44° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	17032	13237	16622	13587	16219	13944	15823	14307	15434	14676	30	00
		17025	13243	16615	13593	16212	13950	15816	14313	15427	14682		
01	31	17018	13248	16608	13599	16205	13956	15810	14319	15421	14688	29	59
		17011	13252	16601	13605	16199	13962	15803	14325	15414	14694		
02	32	17004	13260	16595	13611	16192	13968	15797	14331	15408	14701	28	58
		16997	13266	16588	13617	16186	13974	15790	14337	15402	14707		
03	33	16990	13272	16581	13623	16179	13980	15784	14343	15395	14713	27	57
		16983	13277	16574	13628	16172	13986	15777	14349	15389	14719		
04	34	16977	13283	16567	13634	16166	13992	15771	14355	15382	14726	26	56
		16970	13289	16561	13640	16159	13998	15764	14362	15376	14732		
05	35	16963	13295	16554	13646	16152	14004	15758	14368	15370	14738	25	55
		16956	13301	16547	13652	16146	14010	15751	14374	15363	14744		
06	36	16949	13306	16540	13658	16139	14016	15744	14380	15357	14750	24	54
		16942	13312	16534	13664	16132	14022	15738	14386	15350	14757		
07	37	16935	13318	16527	13670	16126	14028	15731	14392	15344	14763	23	53
		16928	13324	16520	13676	16119	14034	15725	14398	15338	14769		
08	38	16922	13330	16513	13682	16112	14040	15718	14404	15331	14775	22	52
		16915	13336	16507	13688	16106	14046	15712	14411	15325	14782		
09	39	16908	13341	16500	13694	16099	14052	15705	14417	15318	14788	21	51
		16901	13347	16493	13700	16093	14058	15699	14423	15312	14794		
10	40	16894	13353	16487	13705	16086	14064	15692	14429	15306	14800	20	50
		16887	13359	16480	13711	16079	14070	15686	14435	15299	14807		
11	41	16880	13365	16473	13717	16073	14076	15679	14441	15293	14813	19	49
		16874	13370	16466	13723	16066	14082	15673	14447	15286	14819		
12	42	16867	13376	16460	13729	16060	14088	15666	14453	15280	14825	18	48
		16860	13382	16453	13735	16053	14094	15660	14460	15274	14831		
13	43	16853	13388	16446	13741	16046	14100	15653	14466	15267	14838	17	47
		16846	13394	16439	13747	16040	14106	15647	14472	15261	14844		
14	44	16839	13400	16433	13753	16033	14112	15640	14478	15255	14850	16	46
		16833	13405	16426	13759	16027	14118	15634	14484	15248	14857		
15	45	16826	13411	16419	13765	16020	14124	15627	14490	15242	14863	15	45
		16819	13417	16413	13771	16013	14130	15621	14496	15235	14869		
16	46	16812	13423	16406	13777	16007	14136	15614	14503	15229	14875	14	44
		16805	13429	16399	13783	16000	14142	15608	14509	15223	14882		
17	47	16798	13435	16392	13789	15994	14149	15602	14515	15216	14888	13	43
		16792	13440	16386	13794	15987	14155	15595	14521	15210	14894		
18	48	16785	13346	16379	13800	15980	14161	15589	14527	15204	14900	12	42
		16778	13452	16372	13806	15974	14167	15582	14533	15197	14907		
19	49	16771	13458	16366	13812	15967	14173	15576	14540	15191	14913	11	41
		16764	13464	16359	13818	15961	14179	15569	14546	15184	14919		
20	50	16757	13470	16352	13824	15954	14185	15563	14552	15178	14925	10	40
		16751	13476	16346	13830	15947	14191	15556	14558	15172	14932		
21	51	16744	13481	16339	13836	15941	14197	15550	14564	15165	14938	09	39
		16737	13487	16332	13842	15934	14203	15543	14570	15159	14944		
22	52	16730	13493	16325	13848	15928	14209	15537	14577	15153	14951	08	38
		16723	13499	16319	13854	15921	14215	15530	14583	15146	14957		
23	53	16717	13505	16312	13860	15915	14221	15524	14589	15140	14963	07	37
		16710	13511	16305	13866	15908	14227	15517	14595	15134	14969		
24	54	16703	13517	16299	13872	15901	14233	15511	14601	15127	14976	06	36
		16696	13523	16292	13878	15895	14240	15505	14608	15121	14982		
25	55	16689	13528	16285	13884	15888	14246	15498	14614	15115	14988	05	35
		16683	13534	16279	13890	15882	14252	15492	14620	15108	14995		
26	56	16676	13540	16272	13896	15875	14258	15485	14626	15102	15001	04	34
		16669	13546	16265	13902	15869	14264	15479	14632	15096	15007		
27	57	16662	13552	16259	13908	15862	14270	15472	14639	15089	15014	03	33
		16656	13558	16252	13914	15856	14276	15466	14645	15083	15020		
28	58	16649	13564	16245	13920	15849	14282	15459	14651	15077	15026	02	32
		16642	13570	16239	13926	15842	14288	15453	14657	15070	15033		
29	59	16635	13575	16232	13932	15836	14294	15447	14663	15064	15039	01	31
		16628	13581	16225	13838	15829	14300	15440	14670	15058	15045		
30	00	16622	13587	16219	13944	15823	14307	15434	14676	15051	15051	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		137° 00´		136° 30´		136° 00´		135° 30´		135° 00´			

RULE 1: When LHA (E or W)° is greater than 90, take "K" from bottom of table

		45° 00'		45° 30'		46° 00'		46° 30'		47° 00'			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	15051	15051	14676	15434	14307	15823	13944	16219	13587	16622	30	00
		15045	15058	14670	15440	14300	15829	13938	16225	13581	16628		
01	31	15039	15064	14663	15447	14294	15836	13932	16232	13575	16635	29	59
		15033	15070	14657	15453	14288	15842	13926	16239	13570	16642		
02	32	15026	15077	14651	15459	14282	15849	13920	16245	13564	16649	28	58
		15020	15083	14645	15466	14276	15856	13914	16252	13558	16656		
03	33	15014	15089	14639	15472	14270	15862	13908	16259	13552	16662	27	57
		15007	15096	14632	15479	14264	15869	13902	16265	13546	16669		
04	34	15001	15102	14626	15485	14258	15875	13896	16272	13540	16676	26	56
		14995	15108	14620	15492	14252	15882	13890	16279	13534	16683		
05	35	14988	15115	14614	15498	14246	15888	13884	16285	13528	16689	25	55
		14982	15121	14608	15505	14240	15895	18878	16292	13523	16696		
06	36	14976	15127	14601	15511	14233	15901	13872	16299	13517	16703	24	54
		14969	15134	14595	15517	14227	15908	13866	16305	13511	16710		
07	37	14963	15140	14589	15524	14221	15915	13860	16312	13505	16717	23	53
		14957	15146	14583	15530	14215	15921	13854	16319	13499	16723		
08	38	14951	15153	14577	15537	14209	15928	13848	16325	13493	16730	22	52
		14944	15159	14570	15543	14203	15934	13842	16332	13487	16737		
09	39	14938	15165	14564	15550	14197	15941	13836	16339	13481	16744	21	51
		14932	15172	14558	15556	14191	15947	13830	16346	13476	16751		
10	40	14925	15178	14552	15563	14185	15954	13824	16352	13470	16757	20	50
		14919	15184	14546	15569	14179	15961	13818	16359	13464	16764		
11	41	14913	15191	14540	15576	14173	15967	13812	16366	13458	16771	19	49
		14907	15197	14533	15582	14167	15974	13806	16372	13452	16778		
12	42	14900	15204	14527	15589	14161	15980	13800	16379	13446	16785	18	48
		14894	15210	14521	15595	14155	15987	13794	16386	13440	16792		
13	43	14888	15216	14515	15602	14149	15994	13788	16392	13435	16798	17	47
		14882	15223	14509	15608	14142	16000	13783	16399	13429	16805		
14	44	14875	15229	14503	15614	14136	16007	13777	16406	13423	16812	16	46
		14869	15235	14496	15621	14130	16013	13771	16413	13417	16819		
15	45	14863	15242	14490	15627	14124	16020	13765	16419	13411	16826	15	45
		14857	15248	14484	15634	14118	16027	13759	16426	13405	16833		
16	46	14850	15255	14478	15640	14112	16033	13753	16433	13400	16839	14	44
		14844	15261	14472	15647	14106	16040	13747	16439	13394	16846		
17	47	14838	15267	14466	15653	14100	16046	13741	16446	13388	16853	13	43
		14831	15274	14460	15660	14094	16053	13735	16453	13382	16860		
18	48	14825	15280	14453	15666	14088	16060	13729	16460	13376	16867	12	42
		14819	15286	14447	15673	14082	16066	13723	16466	13370	16874		
19	49	14813	15293	14441	15679	14076	16073	13717	16473	13365	16880	11	41
		14807	15299	14435	15686	14070	16079	13711	16480	13359	16887		
20	50	14800	15306	14429	15692	14064	16086	13705	16487	13353	16894	10	40
		14794	15312	14423	15699	14058	16093	13699	16493	13347	16901		
21	51	14788	15318	14417	15705	14052	16099	13694	16500	13341	16908	09	39
		14782	15325	14411	15712	14046	16105	13688	16507	13336	16915		
22	52	14775	15331	14404	15718	14040	16112	13682	16513	13330	16922	08	38
		14769	15338	14398	15725	14034	16119	13676	16520	13324	16928		
23	53	14763	15344	14392	15731	14028	16126	13670	16527	13318	16935	07	37
		14757	15350	14386	15738	14022	16132	13664	16534	13312	16942		
24	54	14750	15357	14380	15744	14016	16139	13658	16540	13306	16949	06	36
		14744	15363	14374	15751	14010	16146	13652	16547	13301	16956		
25	55	14738	15370	14368	15758	14004	16152	13646	16554	13295	16963	05	35
		14732	15376	14362	15764	13998	16159	13640	16561	13289	16970		
26	56	14725	15382	14355	15771	13992	16166	13634	16567	13283	16977	04	34
		14719	15389	14349	15777	13986	16172	13628	16574	13277	16983		
27	57	14713	15395	14343	15784	13980	16179	13623	16581	13272	16990	03	33
		14707	15402	14337	15790	13974	16185	13617	16588	13266	16997		
28	58	14701	15408	14331	15797	13968	16192	13611	16595	13260	17004	02	32
		14694	15414	14325	15803	13962	16199	13605	16601	13254	17011		
29	59	14688	15421	14319	15810	13956	16205	13599	16608	13248	17018	01	31
		14682	15427	14313	15816	13950	16212	13593	16615	13243	17025		
30	00	14676	15434	14307	15823	13944	16219	13587	16622	13237	17032	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		134° 30'		134° 00'		133° 30'		133° 00'		132° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		47° 30´		48° 00´		48° 30´		49° 00´		49° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	13237	17032	12893	17449	12554	17873	12222	18306	11895	18746	30	00
		13231	17039	12887	17456	12549	17881	12216	18313	11890	18753		
01	31	13225	17045	12881	17463	12543	17888	12211	18320	11885	18760	29	59
		13220	17052	12876	17470	12538	17895	12205	18327	11879	18768		
02	32	13214	17059	12870	17477	12532	17902	12200	18335	11874	18775	28	58
		13208	17066	12864	17484	12526	17909	12195	18342	11868	18783		
03	33	13202	17073	12859	17491	12521	17916	12189	18349	11863	18790	27	57
		13196	17080	12853	17498	12515	17924	12184	18357	11858	18797		
04	34	13191	17087	12847	17505	12510	17931	12178	18364	11852	18805	26	56
		13185	17094	12841	17512	12504	17938	12173	18371	11847	18812		
05	35	13179	17101	12836	17519	12499	17945	12167	18378	11842	18820	25	55
		13173	17108	12830	17526	12493	17952	12162	18386	11836	18827		
06	36	13168	17114	12824	17533	12487	17959	12156	18393	11831	18834	24	54
		13162	17121	12819	17540	12482	17966	12151	18400	11825	18842		
07	37	13156	17128	12813	17547	12476	17974	12145	18408	11820	18849	23	53
		13150	17135	12807	17554	12471	17981	12140	18415	11815	18857		
08	38	13144	17142	12802	17561	12465	17988	12134	18422	11809	18864	22	52
		13139	17149	12796	17568	12460	17995	12129	18429	11804	18872		
09	39	13133	17156	12790	17576	12454	18002	12123	18437	11799	18879	21	51
		13127	17163	12785	17583	12448	18010	12118	18444	11793	18886		
10	40	13121	17170	12779	17590	12443	18017	12112	18451	11788	18894	20	50
		13116	17177	12774	17597	12437	18024	12107	18459	11782	18901		
11	41	13110	17184	12768	17604	12432	18031	12102	18466	11777	18909	19	49
		13104	17191	12762	17611	12426	18038	12096	18473	11772	18916		
12	42	13098	17198	12757	17618	12421	18045	12091	18481	11766	18924	18	48
		13093	17205	12751	17625	12415	18053	12085	18488	11761	18931		
13	43	13087	17212	12745	17632	12410	18060	12080	18495	11756	18939	17	47
		13081	17218	12740	17639	12404	18067	12074	18503	11750	18946		
14	44	13075	17225	12734	17646	12398	18074	12069	18510	11745	18953	16	46
		13070	17332	12728	17653	12393	18081	12063	18517	11740	18961		
15	45	13064	17239	12723	17660	12387	18089	12058	18525	11734	18968	15	45
		13058	17246	12717	17667	12382	18096	12053	18532	11729	18976		
16	46	13053	17253	12711	17674	12376	18103	12047	18539	11724	18983	14	44
		13047	17260	12706	17681	12371	18110	12042	18547	11718	18991		
17	47	13041	17267	12700	17689	12365	18117	12036	18554	11713	18998	13	43
		13035	17274	12695	17696	12360	18125	12031	18561	11708	19006		
18	48	13030	17281	12689	17703	12354	18132	12025	18569	11702	19013	12	42
		13024	17288	12683	17710	12349	18139	12020	18576	11697	19021		
19	49	13018	17295	12678	17717	12343	18146	12014	18583	11692	19028	11	41
		13012	17302	12672	17724	12338	18154	12009	18591	11686	19036		
20	50	13007	17309	12666	17731	12332	18161	12004	18598	11681	19043	10	40
		13001	17316	12661	17738	12327	18168	11998	18605	11676	19051		
21	51	12995	17323	12655	17745	12321	18175	11993	18613	11670	19058	09	39
		12990	17330	12650	17752	12316	18182	11987	18620	11665	19066		
22	52	12984	17337	12644	17760	12310	18190	11982	18627	11660	19073	08	38
		12978	17344	12638	17767	12305	18197	11976	18635	11654	19081		
23	53	12972	17351	12633	17774	12299	18204	11971	18642	11649	19088	07	37
		12967	17358	12627	17781	12293	18211	11966	18650	11644	19096		
24	54	12961	17365	12622	17788	12288	18219	11960	18657	11638	19103	06	36
		12955	17372	12616	17795	12282	18226	11955	18664	11633	19111		
25	55	12950	17379	12610	17802	12277	18233	11949	18672	11628	19118	05	35
		12944	17386	12605	17809	12271	18240	11944	18679	11622	19126		
26	56	12938	17393	12599	17816	12266	18248	11939	18686	11617	19133	04	34
		12932	17400	12593	17824	12260	18255	11933	18694	11612	19141		
27	57	12927	17407	12588	17831	12255	18262	11928	18701	11606	19148	03	33
		12921	17414	12582	17838	12249	18269	11922	18709	11601	19156		
28	58	12915	17421	12577	17845	12244	18277	11917	18716	11596	19163	02	32
		12910	17428	12571	17852	12238	18284	11912	18723	11590	19171		
29	59	12904	17435	12566	17859	12233	18291	11906	18731	11585	19178	01	31
		12898	17442	12560	17866	12227	18298	11901	18738	11580	19186		
30	00	12893	17449	12554	17873	12222	18306	11895	18746	11575	19193	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		132° 00´		131° 30´		131° 00´		130° 30´		130° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		50° 00´		50° 30´		51° 00´		51° 30´		52° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	11575	19193	11259	19649	10950	20113	10646	20585	10347	21066	30	00
		11569	19201	11254	19657	10945	20121	10640	20593	10342	21074		
01	31	11564	19208	11249	19664	10939	20128	10635	20601	10337	21082	29	59
		11559	19216	11244	19672	10934	20136	10630	20609	10332	21090		
02	32	11553	19223	11239	19680	10929	20144	10625	20617	10327	21098	28	58
		11548	19231	11233	19687	10924	20152	10620	20625	10322	21106		
03	33	11543	19238	11228	19695	10919	20160	10615	20633	10317	21114	27	57
		11537	19246	11223	19703	10914	20167	10610	20641	10312	21122		
04	34	11532	19253	11218	19710	10909	20175	10605	20649	10307	21131	26	56
		11527	19261	11213	19718	10904	20183	10600	20657	10302	21139		
05	35	11522	19269	11207	19726	10899	20191	10595	20665	10298	21147	25	55
		11516	19276	11202	19733	10894	20199	10590	20672	10293	21155		
06	36	11511	19284	11197	19741	10888	20207	10585	20680	10288	21163	24	54
		11506	19291	11192	19749	10883	20214	10580	20688	10283	21171		
07	37	11501	19299	11187	19756	10878	20222	10575	20696	10278	21179	23	53
		11495	19306	11181	19764	10873	20230	10570	20704	10273	21187		
08	38	11490	19314	11176	19772	10868	20238	10565	20712	10268	21195	22	52
		11485	19321	11171	19779	10863	20246	10560	20720	10263	21204		
09	39	11479	19329	11166	19787	10858	20254	10555	20728	10258	21212	21	51
		11474	19337	11161	19795	10853	20261	10550	20736	10253	21220		
10	40	11469	19344	11156	19803	10848	20269	10545	20744	10248	21228	20	50
		11464	19352	11150	19810	10843	20277	10540	20752	10243	21236		
11	41	11458	19359	11145	19818	10838	20285	10535	20760	10239	21244	19	49
		11453	19367	11140	19826	10832	20293	10530	20768	10234	21252		
12	42	11448	19375	11135	19834	10827	20301	10525	20776	10229	21260	18	48
		11443	19382	11130	19841	10822	20308	10520	20784	10224	21269		
13	43	11437	19390	11124	19849	10817	20316	10515	20792	10219	21277	17	47
		11432	19397	11119	19857	10812	20324	10510	20800	10214	21285		
14	44	11427	19405	11114	19864	10807	20332	10505	20808	10209	21293	16	46
		11421	19412	11109	19872	10802	20340	10500	20816	10204	21301		
15	45	11416	19420	11104	19880	10797	20348	10496	20824	10199	21309	15	45
		11411	19428	11099	19888	10792	20356	10491	20832	10195	21318		
16	46	11406	19435	11094	19895	10787	20364	10486	20840	10190	21326	14	44
		11400	19443	11088	19903	10782	20371	10481	20848	10185	21334		
17	47	11395	19450	11083	19911	10777	20379	10476	20856	10180	21342	13	43
		11390	19458	11078	19918	10772	20387	10471	20864	10175	21350		
18	48	11385	19466	11073	19926	10767	20395	10466	20872	10170	21358	12	42
		11380	19473	11068	19934	10761	20403	10461	20880	10165	21367		
19	49	11374	19481	11063	19942	10756	20411	10456	20888	10160	21375	11	41
		11369	19488	11057	19949	10751	20419	10451	20897	10155	21383		
20	50	11364	19496	11052	19957	10746	20427	10446	20905	10151	21391	10	40
		11359	19504	11047	19965	10741	20435	10441	20913	19146	21399		
21	51	11353	19511	11042	19973	10736	20442	10436	20921	10141	21407	09	39
		11348	19519	11037	19980	10731	20450	10431	20929	10136	21416		
22	52	11343	19527	11032	19988	10726	20458	10426	20937	10131	21424	08	38
		11338	19534	11027	19996	10721	20466	10421	20945	10126	21432		
23	53	11332	19542	11021	20004	10716	20474	10416	20953	10121	21440	07	37
		11327	19549	11016	20012	10711	20482	10411	20961	10116	21448		
24	54	11322	19557	11011	20019	10706	20490	10406	20969	10112	21457	06	36
		11317	19565	11006	20027	10701	20498	10401	20977	10107	21465		
25	55	11311	19572	11001	20035	10696	20506	10396	20985	10102	21473	05	35
		11306	19580	10996	20043	10691	20514	10391	20993	10097	21481		
26	56	11301	19588	10991	20050	10686	20522	10386	21001	10092	21489	04	34
		11296	19595	10986	20058	10681	20529	10381	21009	10087	21498		
27	57	11291	19603	10980	20066	10676	20537	10376	21017	10082	21506	03	33
		11285	19611	10975	20074	10671	20545	10372	21025	10078	21514		
28	58	11280	19618	10970	20082	10666	20553	10367	21033	10073	21522	02	32
		11275	19626	10965	20089	10661	20561	10362	21042	10068	21531		
29	59	11270	19634	10960	20097	10656	20569	10357	21050	10063	21539	01	31
		11265	19641	10955	20105	10651	20577	10352	21058	10058	21547		
30	00	11259	19649	10950	20113	10646	20585	10347	21066	10053	21555	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		129° 30´		129° 00´		128° 30´		128° 00´		127° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		52° 30´		53° 00´		53° 30´		54° 00´		54° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	10053	21555	9765	22054	9482	22561	9204	23078	8931	23605	30	00
		10049	21563	9760	22062	9477	22570	9200	23087	8927	23613		
01	31	10044	21572	9756	22070	9473	22578	9195	23095	8922	23622	29	59
		10039	21580	9751	22079	9468	22587	9190	23104	8918	23631		
02	32	10034	21588	9746	22087	9463	22595	9186	23113	8913	23640	28	58
		10029	21596	9741	22096	9459	22604	9181	23122	8909	23649		
03	33	10024	21605	9737	22104	9454	22612	9177	23130	8904	23658	27	57
		10019	21613	9732	22112	9449	22621	9172	23139	8900	23667		
04	34	10015	21621	9727	22121	9445	22630	9168	23148	8895	23675	26	56
		10010	21629	9722	22129	9440	22638	9163	23156	8891	23684		
05	35	10005	21638	9718	22138	9435	22647	9158	23165	8886	23693	25	55
		10000	21646	9713	22146	9431	22655	9154	23174	8882	23702		
06	36	9995	21654	9708	22154	9426	22664	9149	23183	8877	23711	24	54
		9990	21662	9703	22163	9421	22672	9145	23191	8873	23720		
07	37	9986	21671	9699	22171	9417	22681	9140	23200	8868	23729	23	53
		9981	21679	9694	22180	9412	22690	9136	23209	8864	23738		
08	38	9976	21687	9689	22188	9407	22698	9131	23218	8859	23747	22	52
		9971	21696	9684	22197	9403	22707	9126	23226	8855	23755		
09	39	9966	21704	9680	22205	9398	22715	9122	23235	8850	23764	21	51
		9962	21712	9675	22213	9394	22724	9117	23244	8846	23773		
10	40	9957	21720	9670	22222	9389	22732	9113	23252	8842	23782	20	50
		9952	21729	9665	22230	9384	22741	9108	23261	8837	23791		
11	41	9947	21737	9661	22239	9380	22750	9104	23270	8833	23800	19	49
		9942	21745	9656	22247	9375	22758	9099	23279	8828	23809		
12	42	9937	21754	9651	22256	9370	22767	9094	23288	8824	23818	18	48
		9933	21762	9647	22264	9366	22775	9090	23296	8819	23827		
13	43	9928	21770	9642	22272	9361	22784	9085	23305	8815	23836	17	47
		9923	21778	9637	22281	9356	22793	9081	23314	8810	23845		
14	44	9918	21787	9632	22289	9352	22801	9076	23323	8806	23854	16	46
		9913	21795	9628	22298	9347	22810	9072	23331	8801	23863		
15	45	9909	21803	9623	22306	9342	22818	9067	23340	8797	23871	15	45
		9904	21812	9618	22315	9338	22827	9063	23349	8792	23880		
16	46	9899	21820	9614	22323	9333	22836	9058	23358	8788	23889	14	44
		9894	21828	9609	22332	9329	22844	9054	23366	8783	23898		
17	47	9889	21837	9604	22340	9324	22853	9049	23375	8779	23907	13	43
		9885	21845	9599	22349	9319	22862	9044	23384	8775	23916		
18	48	9880	21853	9595	22357	9315	22870	9040	23393	8770	23925	12	42
		9875	21862	9590	22366	9310	22879	9035	23402	8766	23934		
19	49	9870	21870	9585	22374	9305	22887	9031	23410	8761	23943	11	41
		9865	21878	9581	22382	9301	22896	9026	23419	8757	23952		
20	50	9861	21887	9576	22391	9296	22905	9022	23428	8752	23961	10	40
		9856	21895	9571	22399	9292	22913	9017	23437	8748	23970		
21	51	9851	21903	9566	22408	9287	22922	9013	23446	8743	23979	09	39
		9846	21912	9562	22416	9282	22931	9008	23454	8739	23988		
22	52	9841	21920	9557	22425	9278	22939	9004	23463	8734	23997	08	38
		9837	21928	9552	22433	9273	22948	8999	23472	8730	24006		
23	53	9832	21937	9548	22442	9269	22957	8995	23481	8726	24015	07	37
		9827	21945	9543	22450	9264	22965	8990	23490	8721	24024		
24	54	9822	21953	9538	22459	9259	22974	8985	23498	8717	24033	06	36
		9818	21962	9534	22467	9255	22983	8981	23507	8712	24042		
25	55	9813	21970	9529	22476	9250	22991	8976	23516	8708	24051	05	35
		9808	21978	9524	22484	9246	23000	8972	23525	8703	24060		
26	56	9803	21987	9520	22493	9241	23009	8967	23534	8699	24069	04	34
		9798	21995	9515	22501	9236	23017	8963	23543	8694	24078		
27	57	9794	22003	9510	22510	9232	23026	8958	23551	8690	24037	03	33
		9789	22012	9505	22519	9227	23035	8954	23560	8686	24096		
28	58	9784	22020	9501	22527	9223	23043	8949	23569	8681	24105	02	32
		9779	22029	9496	22536	9218	23052	8945	23578	8677	24114		
29	59	9775	22037	9491	22544	9213	23061	8940	23587	8672	24123	01	31
		9770	22045	9487	22553	9209	23069	8936	23596	8668	24132		
30	00	9765	22054	9482	22561	9204	23078	8931	23605	8663	24141	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		127° 00´		126° 30´		126° 00´		125° 30´		125° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes	55° 00'		55° 30'		56° 00'		56° 30'		57° 00'			
	A	B	A	B	A	B	A	B	A	B		
00	8663	24141	8401	24687	8143	25244	7889	25811	7641	26389	30	00
	8659	24150	8396	24696	8138	25253	7885	25821	7637	26399		
01	8655	24159	8392	24706	8134	25263	7881	25830	7633	26409	29	59
	8650	24168	8388	24715	8130	25272	7877	25840	7629	26418		
02	8646	24177	8383	24724	8125	25281	7873	25849	7624	26428	28	58
	8641	24186	8379	24733	8121	25291	7868	25859	7620	26438		
03	8637	24195	8375	24742	8117	25300	7864	25868	7616	26447	27	57
	8633	24204	8370	24752	8113	25309	7860	25878	7612	26457		
04	8628	24213	8366	24761	8108	25319	7856	25887	7608	26467	26	56
	8624	24222	8362	24770	8104	25328	7852	25897	7604	26477		
05	8619	24231	8357	24779	8100	25338	7848	25907	7600	26486	25	55
	8615	24240	8353	24788	8096	25347	7843	25916	7596	26496		
06	8611	24249	8349	24798	8092	25356	7839	25926	7592	26506	24	54
	8606	24258	8344	24807	8087	25366	7835	25935	7588	26516		
07	8602	24267	8340	24816	8083	25375	7831	25945	7584	26526	23	53
	8597	24276	8336	24825	8079	25385	7827	25954	7579	26535		
08	8593	24286	8331	24835	8075	25394	7823	25964	7575	26545	22	52
	8589	24295	8327	24844	8070	25403	7818	25974	7571	26555		
09	8584	24304	8323	24853	8066	25413	7814	25983	7567	26565	21	51
	8580	24313	8318	24862	8062	25422	7810	25993	7563	26574		
10	8575	24322	8314	24872	8058	25432	7806	26002	7559	26584	20	50
	8571	24331	8310	24881	8053	25441	7802	26012	7555	26594		
11	8567	24340	8305	24890	8049	25451	7798	26022	7551	26604	19	49
	8562	24349	8301	24899	8045	25460	7793	26031	7547	26614		
12	8558	24358	8297	24909	8041	25469	7789	26041	7543	26623	18	48
	8553	24367	8292	24918	8036	25479	7785	26051	7539	26633		
13	8549	24376	8288	24927	8032	25488	7781	26060	7535	26643	17	47
	8545	24385	8284	24936	8028	25498	7777	26070	7531	26653		
14	8540	24395	8280	24946	8024	25507	7773	26079	7526	26663	16	46
	8536	24404	8275	24955	8020	25517	7769	26089	7522	26672		
15	8531	24413	8271	24964	8015	25526	7764	26099	7518	26682	15	45
	8527	24422	8267	24973	8011	25536	7760	26108	7514	26692		
16	8523	24431	8262	24983	8007	25545	7756	26118	7510	26702	14	44
	8518	24440	8258	24992	8003	25554	7752	26128	7506	26712		
17	8514	24449	8254	25001	7998	25564	7748	26137	7502	26722	13	43
	8510	24458	8249	25011	7994	25573	7744	26147	7498	26731		
18	8505	24467	8245	25020	7990	25583	7740	26157	7494	26741	12	42
	8501	24477	8241	25029	7986	25592	7736	26166	7490	26751		
19	8496	24486	8237	25038	7982	25602	7731	26176	7486	26761	11	41
	8492	24495	8232	25048	7977	25611	7727	26185	7482	26771		
20	8488	24504	8228	25057	7973	25621	7723	26195	7478	26781	10	40
	8483	24513	8224	25066	7969	25630	7719	26205	7474	26790		
21	8479	24522	8219	25076	7965	25640	7715	26214	7470	26800	09	39
	8475	24531	8215	25085	7961	25649	7711	26224	7466	26810		
22	8470	24540	8211	25094	7956	25659	7707	26234	7462	26820	08	38
	8466	24550	8207	25104	7952	25668	7702	26244	7458	26830		
23	8461	24559	8202	25113	7948	25678	7698	26253	7453	26840	07	37
	8457	24568	8198	25122	7944	25687	7694	26263	7449	26850		
24	8453	24577	8194	25132	7940	25697	7690	26273	7445	26860	06	36
	8448	24586	8189	25141	7935	25706	7686	26282	7441	26869		
25	8444	24595	8185	25150	7931	25716	7682	26292	7437	26879	05	35
	8440	24605	8181	25160	7927	25725	7678	26302	7433	26889		
26	8435	24614	8177	25169	7923	25735	7674	26311	7429	26899	04	34
	8431	24623	8172	25178	7919	25744	7670	26321	7425	26909		
27	8427	24632	8168	25188	7914	25754	7665	26331	7421	26919	03	33
	8422	24641	8164	25197	7910	25763	7661	26340	7417	26929		
28	8418	24650	8160	25206	7906	25773	7657	26350	7413	26939	02	32
	8414	24660	8155	25216	7902	25782	7653	26360	7409	26949		
29	8409	24669	8151	25225	7898	25792	7649	26370	7405	26958	01	31
	8405	24678	8147	25234	7893	25801	7645	26379	7401	26968		
30	8401	24687	8143	25244	7889	25811	7641	26389	7397	26978	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	124° 30'		124° 00'		123° 30'		123° 00'		122° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		57° 30'		58° 00'		58° 30'		59° 00'		59° 30'			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	7397	26978	7158	27579	6923	28191	6693	28816	6468	29453	30	00
		7393	26988	7154	27589	6920	28202	6690	28827	6464	29464		
01	31	7389	26998	7150	27599	6916	28212	6686	28837	6460	29475	29	59
		7385	27008	7146	27609	6912	28222	6682	28848	6457	29485		
02	32	7381	27018	7142	27619	6908	28233	6678	28858	6453	29496	28	58
		7377	27028	7138	27630	6904	28243	6674	28869	6449	29507		
03	33	7373	27038	7134	27640	6900	28253	6671	28879	6446	29517	27	57
		7369	27048	7130	27650	6896	28264	6667	28890	6442	29528		
04	34	7365	27058	7126	27660	6892	28274	6663	28900	6438	29539	26	56
		7361	27068	7122	27670	6889	28284	6659	28911	6434	29550		
05	35	7357	27078	7118	27680	6885	28295	6655	28921	6431	29560	25	55
		7353	27088	7115	27690	6881	28305	6652	28932	6427	29571		
06	36	7349	27098	7111	27701	6877	28315	6648	28942	6423	29582	24	54
		7345	27107	7107	27711	6873	28326	6644	28953	6420	29593		
07	37	7341	27117	7103	27721	6869	28336	6640	28964	6416	29604	23	53
		7337	27127	7099	27731	6865	28346	6637	28974	6412	29614		
08	38	7333	27137	7095	27741	6862	28357	6633	28985	6409	29625	22	52
		7329	27147	7091	27751	6858	28367	6629	28995	6405	29636		
09	39	7325	27157	7087	27761	6854	28378	6625	29006	6401	29647	21	51
		7321	27167	7083	27772	6850	28388	6622	29016	6397	29657		
10	40	7317	27177	7079	27782	6846	28398	6618	29027	6394	29668	20	50
		7313	27187	7075	27792	6842	28409	6614	29038	6390	29679		
11	41	7309	27197	7071	27802	6839	28419	6610	29048	6386	29690	19	49
		7305	27207	7068	27812	6835	28429	6607	29059	6383	29701		
12	42	7301	27217	7064	27823	6831	28440	6603	29069	6379	29711	18	48
		7297	27227	7060	27833	6827	28450	6599	29080	6375	29722		
13	43	7293	27237	7056	27843	6823	28461	6595	29091	6372	29733	17	47
		7289	27247	7052	27853	6819	28471	6591	29101	6468	29744		
14	44	7285	27257	7048	27863	6815	28481	6588	29112	6364	29755	16	46
		7281	27267	7044	27874	6812	28492	6584	29122	6361	29766		
15	45	7277	27277	7040	27884	6808	28502	6580	29133	6457	29776	15	45
		7273	27287	7036	27894	6804	28513	6576	29144	6353	29787		
16	46	7269	27297	7032	27904	6800	28523	6573	29154	6349	29798	14	44
		7265	27307	7028	27914	6796	28533	6569	29165	6346	29809		
17	47	7261	27317	7024	27925	6792	28544	6565	29175	6342	29820	13	43
		7257	27327	7021	27935	6789	28554	6561	29186	6338	29831		
18	48	7253	27337	7017	27945	6785	28565	6558	29197	6335	29841	12	42
		7249	27347	7013	27955	6781	28575	6554	29207	6331	29852		
19	49	7245	27357	7009	27965	6777	28586	6550	29218	6327	29863	11	41
		7241	27367	7005	27976	6773	28596	6546	29229	6324	29874		
20	50	7237	27377	7001	27986	6770	28607	6543	29239	6320	29885	10	40
		7233	27387	6997	27996	6766	28617	6539	29250	6316	29896		
21	51	7229	27398	6993	28006	6762	28627	6535	29261	6313	29907	09	39
		7225	27408	6989	28017	6758	28638	6531	29271	6309	29917		
22	52	7221	27418	6985	28027	6754	28648	6528	29282	6305	29929	08	38
		7217	27428	6982	28037	6750	28659	6524	29293	6302	29939		
23	53	7213	27438	6978	28047	6747	28669	6520	29303	6298	29950	07	37
		7209	27448	6974	28058	6743	28680	6516	29314	6294	29961		
24	54	7205	27458	6970	28068	6739	28690	6513	29325	6291	29972	06	36
		7201	27468	6966	28078	6735	28701	6509	29335	6287	29983		
25	55	7197	27478	6962	28089	6731	28711	6505	29346	6283	29994	05	35
		7193	27488	6958	28099	6728	28722	6502	29357	6280	30005		
26	56	7190	27498	6954	28109	6724	28732	6498	29367	6276	30015	04	34
		7186	27508	6951	28119	6720	28743	6494	29378	6272	30026		
27	57	7182	27518	6947	28130	6716	28753	6490	29389	6269	30037	03	33
		7178	27528	6943	28140	6712	28763	6487	29399	6265	30048		
28	58	7174	27539	6939	28150	6709	28774	6483	29410	6261	30059	02	32
		7170	27549	6935	28161	6705	28784	6479	29421	6258	30070		
29	59	7166	27559	6931	28171	6701	28795	6475	29432	6254	30081	01	31
		7162	27569	6927	28181	6697	28806	6472	29442	6251	30092		
30	00	7158	27579	6923	28191	6693	28816	6468	29453	6247	30103	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		122° 00'		121° 30'		121° 00'		120° 30'		120° 00'			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		60° 00´		60° 30´		61° 00		61° 30´		62° 00´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	6247	30103	6030	30766	5818	31443	5610	32134	5406	32839	30	00
		6243	30114	6027	30777	5815	31454	5607	32145	5403	32851		
01	31	6240	30125	6023	30788	5811	31466	5603	32157	5400	32863	29	59
		6236	30136	6020	30800	5808	31477	5600	32169	5396	32875		
02	32	6232	30147	6016	30811	5804	31488	5596	32180	5393	32887	28	58
		6229	30158	6012	30822	5801	31500	5593	32192	5390	32898		
03	33	6225	30169	6009	30833	5797	31511	5590	32204	5386	32910	27	57
		6221	30180	6005	30844	5794	31523	5586	32215	5383	32922		
04	34	6218	30191	6002	30856	5790	31534	5583	32227	5380	32934	26	56
		6214	30202	5998	30867	5787	31546	5579	32239	5376	32946		
05	35	6210	30213	5995	30878	5783	31557	5575	32250	5373	32958	25	55
		6207	30224	5991	30889	5780	31569	5572	32262	5370	32970		
06	36	6203	30235	5987	30900	5776	31580	5569	32274	5366	32982	24	54
		6200	30245	5984	30912	5773	31591	5566	32285	5363	32994		
07	37	6196	30256	5980	30923	5769	31603	5562	32297	5360	33006	23	53
		6192	30267	5977	30934	5766	31614	5559	32309	5356	33018		
08	38	6189	30278	5973	30945	5762	31626	5555	32320	5353	33030	22	52
		6185	30289	5970	30956	5759	31637	5552	32332	5350	33042		
09	39	6181	30300	5966	30968	5755	31649	5549	32344	5346	33054	21	51
		6178	30311	5963	30979	5752	31660	5545	32355	5343	33065		
10	40	6174	30322	5959	30990	5748	31672	5542	32367	5340	33077	20	50
		6171	30334	5955	31001	5745	31683	5538	32379	5336	33089		
11	41	6167	30345	5952	31013	5741	31694	5535	32391	5333	33101	19	49
		6163	30355	5948	31024	5738	31706	5532	32402	5330	33113		
12	42	6160	30367	5945	31035	5734	31717	5528	32414	5326	33125	18	48
		6156	30378	5941	31046	5731	31729	5525	32426	5323	33137		
13	43	6152	30389	5938	31058	5727	31740	5521	32438	5320	33149	17	47
		6149	30400	5934	31069	5724	31752	5518	32449	5316	33161		
14	44	6145	30411	5931	31080	5720	31763	5515	32461	5313	33173	16	46
		6142	30422	5927	31091	5717	31775	5511	32473	5310	33185		
15	45	6138	30433	5924	31103	5714	31786	5508	32484	5306	33197	15	45
		6134	30444	5920	31114	5710	31798	5504	32496	5303	33209		
16	46	6131	30455	5917	31125	5707	31809	5501	32508	5300	33221	14	44
		6127	30466	5913	31137	5703	31821	5498	32520	5296	33233		
17	47	6124	30477	5909	31148	5700	31833	5494	32532	5293	33245	13	43
		6120	30488	5906	31159	5696	31844	5491	32543	5290	33257		
18	48	6116	30499	5902	31170	5693	31856	5487	32555	5286	33269	12	42
		6113	30510	5899	31182	5689	31867	5484	32567	5283	33281		
19	49	6109	30521	5895	31193	5686	31879	5481	32579	5280	33293	11	41
		6106	30532	5892	31204	5682	31890	5477	32590	5276	33306		
20	50	6102	30544	5888	31216	5679	31902	5474	32602	5273	33318	10	40
		6098	30555	5885	31227	5675	31913	5470	32614	5270	33330		
21	51	6095	30566	5881	31238	5672	31925	5467	32625	5266	33342	09	39
		6091	30577	5878	31250	5669	31936	5464	32638	5263	33354		
22	52	6088	30588	5874	31261	5665	31948	5460	32649	5260	33366	08	38
		6084	30599	5871	31272	5662	31960	5457	32661	5257	33378		
23	53	6080	30610	5867	31284	5658	31971	5454	32673	5253	33390	07	37
		6077	30621	5864	31295	5655	31983	5450	32685	5250	33402		
24	54	6073	30632	5860	31306	5651	31994	5447	32697	5247	33414	06	36
		6070	30643	5857	31318	5648	32006	5443	32709	5243	33426		
25	55	6066	30655	5853	31329	5644	32018	5440	32720	5240	33438	05	35
		6062	30666	5850	31340	5641	32029	5437	32732	5237	33450		
26	56	6059	30677	5846	31352	5638	32041	5433	32744	5233	33462	04	34
		6055	30688	5843	31363	5634	32052	5430	32756	5230	33475		
27	57	6052	30699	5839	31375	5631	32064	5427	32768	5227	33487	03	33
		6048	30710	5836	31386	5627	32076	5423	32780	5224	33499		
28	58	6045	30721	5832	31397	5624	32087	5420	32792	5220	33511	02	32
		6041	30733	5829	31409	5620	32099	5417	32803	5217	33523		
29	59	6037	30744	5825	31420	5617	32110	5413	32815	5214	33535	01	31
		6034	30755	5822	31431	5614	32122	5410	32827	5210	33547		
30	00	6030	30766	5818	31443	5610	32134	5406	32839	5207	33559	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		119° 30´		119° 00´		118° 30´		118° 00´		117° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		62° 30´		63° 00´		63° 30´		64° 00´		64° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	5207	33559	5012	34295	4821	35047	4634	35816	4451	36602	30	00
		5204	33572	5009	34308	4818	35060	4631	35829	4448	36615		
01	31	5200	33584	5005	34320	4815	35073	4628	35842	4445	36628	29	59
		5197	33596	5002	34332	4811	35085	4625	35855	4442	36641		
02	32	5194	33608	4999	34345	4808	35098	4622	35868	4439	36655	28	58
		5191	33620	4996	34357	4805	35111	4619	35881	4436	36668		
03	33	5187	33632	4993	34370	4802	35123	4615	35894	4433	36681	27	57
		5184	33644	4989	34382	4799	35136	4612	35907	4430	36694		
04	34	5181	33657	4986	34395	4796	35149	4609	35920	4427	36708	26	56
		5178	33669	4983	34407	4793	35161	4606	35933	4424	36721		
05	35	5174	33681	4980	34420	4789	35174	4603	35946	4421	36734	25	55
		5171	33693	4977	34432	4786	35187	4600	35959	4418	36747		
06	36	5168	33705	4973	34444	4783	35200	4597	35972	4415	36761	24	54
		5164	33717	4970	34457	4780	35212	4594	35985	4412	36774		
07	37	5161	33730	4967	34469	4777	35225	4591	35998	4409	36787	23	53
		5158	33742	4964	34482	4774	35238	4588	36011	4406	36801		
08	38	5155	33754	4961	34494	4771	35251	4585	36024	4403	36814	22	52
		5151	33766	4957	34507	4767	35263	4582	36037	4400	36827		
09	39	5148	33779	4954	34519	4764	35276	4579	36050	4397	36841	21	51
		5145	33791	4951	34532	4761	35289	4576	36063	4394	36854		
10	40	5142	33803	4948	34544	4758	35302	4573	36076	4391	36867	20	50
		5138	33815	4945	34557	4755	35314	4569	36089	4388	36881		
11	41	5135	33827	4941	34569	4752	35327	4566	36102	4385	36894	19	49
		5132	33840	4838	34582	4749	35340	4563	36115	4382	36907		
12	42	5128	33852	4935	34594	4746	35353	4560	36128	4379	36921	18	48
		5125	33864	4932	34607	4742	35365	4557	36141	4376	36934		
13	43	5122	33876	4929	34619	4739	35378	4554	36154	4373	36948	17	47
		5119	33889	4925	34632	4736	35391	4551	36167	4370	36961		
14	44	5115	33901	4922	34644	4733	35404	4548	36180	4367	36974	16	46
		5112	33913	4919	34657	4730	35417	4545	36193	4364	36988		
15	45	5109	33925	4916	34669	4727	35429	4542	36206	4361	37001	15	45
		5106	33938	4913	34682	4724	35442	4539	36220	4358	37014		
16	46	5102	33950	4910	34694	4721	35455	4536	36233	4355	37028	14	44
		5099	33962	4906	34707	4718	35468	4533	36246	4352	37041		
17	47	5096	33974	4903	34719	4714	35481	4530	36259	4349	37055	13	43
		5093	33987	4900	34732	4711	35493	4527	36272	4346	37068		
18	48	5089	33999	4897	34744	4708	35506	4524	36285	4343	37081	12	42
		5086	34011	4894	34757	4705	35519	4521	36298	4340	37095		
19	49	5083	34024	4890	34770	4702	35532	4518	36311	4337	37108	11	41
		5080	34036	4887	34782	4699	35545	4515	36325	4334	37122		
20	50	5076	34048	4884	34795	4696	35558	4512	36338	4332	37135	10	40
		5073	34061	4881	34807	4693	35571	4509	36351	4329	37149		
21	51	5070	34073	4878	34820	4690	35583	4506	36364	4326	37162	09	39
		5067	34085	4875	34832	4686	35596	4503	36377	4323	37176		
22	52	5064	34097	4871	34845	4683	35609	4500	36390	4320	37189	08	38
		5060	34110	4868	34858	4680	35622	4497	36403	4317	37203		
23	53	5057	34122	4865	34870	4677	35635	4493	36417	4314	37216	07	37
		5054	34134	4862	34883	4674	35648	4490	36430	4311	37229		
24	54	5051	34147	4859	34896	4671	35661	4487	36443	4308	37243	06	36
		5047	34159	4856	34908	4668	35674	4484	36456	4305	37256		
25	55	5044	34172	4852	34921	4665	35686	4481	36469	4302	37270	05	35
		5041	34184	4849	34933	4662	35699	4478	36483	4299	37283		
26	56	5038	34196	4846	34946	4659	35712	4475	36496	4296	37297	04	34
		5034	34209	4843	34959	4656	35725	4472	36509	4293	37310		
27	57	5031	34221	4840	34971	4652	35738	4469	36522	4290	37324	03	33
		5028	34233	4837	34984	4649	35751	4466	36535	4287	37337		
28	58	5025	34246	4833	34997	4646	35764	4463	36549	4284	37351	02	32
		5022	34258	4830	35009	4643	35777	4460	36562	4281	37365		
29	59	5018	34270	4827	35022	4640	35790	4457	36575	4278	37378	01	31
		5015	34283	4824	35035	4637	35803	4454	36588	4275	37392		
30	00	5012	34295	4821	35047	4634	35816	4451	36602	4272	37405	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		117° 00´		116° 30´		116° 00´		115° 30´		115° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes	65° 00'		65° 30'		66° 00'		66° 30'		67° 00'			
	A	B	A	B	A	B	A	B	A	B		
00	4272	37405	4098	38227	3927	39069	3760	39930	3597	40812	30	00
	4269	37419	4095	38241	3924	39083	3757	39945	3595	40827		
01	4266	37432	4092	38255	3921	39097	3755	39959	3592	40842	29	59
	4264	37446	4089	38269	3918	39111	3752	39974	3589	40857		
02	4261	37459	4086	38283	3916	39125	3749	39988	3587	40872	28	58
	4258	37473	4083	38297	3913	39140	3746	40003	3584	40887		
03	4255	37487	4080	38311	3910	39154	3744	40017	3581	40902	27	57
	4252	37500	4078	38324	3907	39168	3741	40032	3579	40916		
04	4249	37514	4075	38338	3904	39182	3738	40046	3576	40931	26	56
	4246	37527	4072	38352	3902	39197	3735	40061	3573	40946		
05	4243	37541	4069	38366	3899	39211	3733	40076	3571	40961	25	55
	4240	37554	4066	38380	3896	39225	3730	40090	3568	40976		
06	4237	37568	4063	38394	3893	39239	3727	40105	3565	40991	24	54
	4234	37582	4060	38408	3890	39254	3725	40119	3563	41006		
07	4231	37595	4057	38422	3888	39268	3722	40134	3560	41021	23	53
	4228	37609	4055	38436	3885	39282	3719	40149	3557	41036		
08	4225	37623	4052	38450	3882	39296	3716	40163	3555	41051	22	52
	4222	37636	4049	38464	3879	39311	3714	40178	3552	41066		
09	4220	37650	4046	38478	3876	39325	3711	40192	3549	41081	21	51
	4217	37663	4043	38492	3874	39339	3708	40207	3547	41096		
10	4214	37677	4040	38506	3871	39353	3705	40222	3544	41111	20	50
	4211	37691	4037	38520	3868	39368	3703	40236	3541	41126		
11	4208	37704	4035	38533	3865	39382	3700	40251	3539	41141	19	49
	4205	37718	4032	38547	3863	39396	3697	40266	3536	41156		
12	4202	37732	4029	38561	3860	39411	3695	40280	3533	41171	18	48
	4199	37745	4026	38575	3857	39425	3692	40295	3531	41186		
13	4196	37759	4023	38589	3854	39439	3689	40310	3528	41201	17	47
	4193	37773	4020	38603	3851	39454	3686	40324	3525	41216		
14	4190	37786	4017	38617	3849	39468	3684	40339	3523	41231	16	46
	4187	37800	4015	38631	3846	39482	3681	40354	3520	41246		
15	4185	37814	4012	38645	3843	39497	3678	40368	3517	41261	15	45
	4182	37828	4009	38660	3840	39511	3676	40383	3515	41276		
16	4179	37841	4006	38674	3838	39525	3673	40398	3512	41291	14	44
	4176	37855	4003	38688	3835	39540	3670	40413	3509	41307		
17	4173	37869	4000	38702	3832	39554	3667	40427	3507	41322	13	43
	4170	37882	3998	38716	3829	39569	3665	40442	3504	41337		
18	4167	37896	3995	38730	3826	39583	3662	40457	3502	41352	12	42
	4164	37910	3992	38744	3824	39597	3659	40471	3499	41367		
19	4161	37924	3989	38758	3821	39612	3657	40486	3496	41382	11	41
	4158	37937	3986	38772	3818	39626	3654	40501	3494	41397		
20	4155	37951	3983	38786	3815	39641	3651	40516	3491	41412	10	40
	4153	37965	3981	38800	3813	39655	3648	40530	3488	41427		
21	4150	37979	3978	38814	3810	39669	3646	40545	3486	41443	09	39
	4147	37992	3975	38828	3807	39684	3643	40560	3483	41458		
22	4144	38006	3972	38842	3804	39698	3640	40575	3480	41473	08	38
	4141	38020	3969	38856	3801	39713	3638	40590	3478	41488		
23	4138	38034	3966	38871	3799	39727	3635	40604	3475	41503	07	37
	4135	38048	3964	38885	3796	39742	3632	40619	3473	41518		
24	4132	38061	3961	38899	3793	39756	3630	40634	3470	41533	06	36
	4129	38075	3958	38913	3790	39771	3627	40649	3467	41549		
25	4127	38089	3955	38927	3788	39785	3624	40664	3465	41564	05	35
	4124	38103	3952	38941	3785	39799	3622	40678	3462	41579		
26	4121	38117	3949	38955	3782	39814	3619	40693	3459	41594	04	34
	4118	38130	3947	38969	3779	39828	3616	40708	3457	41609		
27	4115	38144	3944	38984	3777	39843	3613	40723	3454	41625	03	33
	4112	38158	3941	38998	3774	39857	3611	40738	3452	41640		
28	4109	38172	3938	39012	3771	39872	3608	40753	3449	41655	02	32
	4106	38186	3935	39026	3768	39886	3605	40768	3446	41670		
29	4103	38200	3933	39040	3766	39901	3603	40782	3444	41685	01	31
	4101	38213	3930	39054	3763	39915	3600	40797	3441	41701		
30	4098	38227	3927	39069	3760	39930	3597	40812	3438	41716	00	30
	A	B	A	B	A	B	A	B	A	B	Minutes	
	114° 30'		114° 00'		113° 30'		113° 00'		112° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

Minutes		67° 30'		68° 00'		68° 30'		69°00'		69° 30'			
		A	B	A	B	A	B	A	B	A	B		
00	30	3438	41716	3283	42642	3132	43592	2985	44567	2841	45567	30	00
01	31	3436	41731	3281	42658	3130	43608	2982	44583	2839	45584	29	59
		3433	41746	3278	42674	3127	43624	2980	44600	2836	45601		
02	32	3431	41762	3276	42689	3125	43641	2978	44616	2834	45618	28	58
		3428	41777	3273	42705	3122	43657	2975	44633	2832	45635		
03	33	3425	41792	3271	42721	3120	43673	2973	44649	2829	45652	27	57
		3423	41808	3268	42736	3117	43689	2970	44666	2827	45669		
04	34	3420	41823	3266	42752	3115	43705	2968	44682	2825	45686	26	56
		3418	41838	3263	42768	3112	43721	2965	44699	2822	45703		
05	35	3415	41853	3260	42783	3110	43737	2963	44715	2820	45720	25	55
		3412	41869	3258	42799	3107	43753	2961	44732	2818	45737		
06	36	3410	41884	3255	42815	3105	43769	2958	44748	2815	45754	24	54
		3407	41899	3253	42830	3102	43785	2956	44765	2813	45771		
07	37	3404	41915	3250	42846	3100	43801	2953	44782	2811	45788	23	53
		3402	41930	3248	42862	3097	43818	2951	44798	2808	45805		
08	38	3399	41945	3245	42878	3095	43834	2949	44815	2806	45822	22	52
		3397	41961	3243	42893	3092	43850	2946	44831	2804	45839		
09	39	3394	41976	3240	42909	3090	43866	2944	44848	2801	45856	21	51
		3391	41991	3237	42925	3088	43882	2941	44864	2799	45873		
10	40	3389	42007	3235	42941	3085	43898	2939	44881	2797	45890	20	50
		3386	42022	3233	42956	3083	43914	2936	44898	2794	45907		
11	41	3384	42038	3230	42972	3080	43931	2934	44914	2792	45924	19	49
		3381	42053	3227	42988	3078	43947	2932	44931	2789	45941		
12	42	3379	42068	3225	43004	3075	43963	2929	44947	2787	45958	18	48
		3376	42084	3222	43020	3073	43979	2927	44964	2785	45975		
13	43	3373	42099	3220	43035	3070	43995	2924	44981	2782	45992	17	47
		3371	42115	3217	43051	3068	44012	2922	44997	2780	46009		
14	44	3368	42130	3215	43067	3065	44028	2920	45014	2778	46026	16	46
		3366	42145	3212	43083	3063	44044	2917	45031	2775	46043		
15	45	3363	42161	3210	43099	3060	44060	2915	45047	2773	46061	15	45
		3360	42176	3207	43114	3058	44077	2913	45064	2771	46078		
16	46	3358	42192	3205	43130	3056	44093	2910	45081	2768	46095	14	44
		3355	42207	3202	43146	3053	44109	2908	45097	2766	46112		
17	47	3353	42223	3200	43162	3051	44125	2905	45114	2764	46129	13	43
		3350	42238	3197	43178	3048	44142	2903	45131	2761	46146		
18	48	3348	42254	3195	43194	3046	44158	2901	45147	2759	46163	12	42
		3345	42269	3192	43210	3043	44174	2898	45164	2757	46181		
19	49	3342	42285	3190	43225	3041	44190	2896	45181	2755	46198	11	41
		3340	42300	3187	43241	3038	44207	2893	45198	2752	46215		
20	50	3337	42316	3185	43257	3036	44223	2891	45214	2750	46232	10	40
		3335	42331	3182	43273	3033	44239	2889	45231	2748	46249		
21	51	3332	42347	3180	43289	3031	44256	2886	45248	2745	46266	09	39
		3329	42362	3177	43305	3029	44272	2884	45265	2743	46284		
22	52	3327	42378	3175	43321	3026	44288	2881	45281	2741	46301	08	38
		3324	42393	3172	43337	3024	44305	2879	45298	2738	46318		
23	53	3322	42409	3170	43353	3021	44321	2877	45315	2736	46335	07	37
		3319	42424	3167	43369	3019	44337	2874	45332	2734	46353		
24	54	3317	42440	3165	43385	3016	44354	2872	45348	2731	46370	06	36
		3314	42455	3162	43400	3014	44370	2870	45365	2729	46387		
25	55	3312	42471	3160	43416	3012	44386	2867	45382	2727	46404	05	35
		3309	42486	3157	43432	3009	44403	2865	45399	2724	46422		
26	56	3306	42502	3155	43448	3007	44419	2862	45416	2722	46439	04	34
		3304	42518	3152	43464	3004	44436	2860	45433	2720	46456		
27	57	3301	42533	3150	43480	3002	44452	2858	45449	2717	46473	03	33
		3299	42549	3147	43496	2999	44468	2855	45466	2715	46491		
28	58	3296	42564	3145	43512	2997	44485	2853	45483	2713	46508	02	32
		3294	42580	3142	43528	2994	44501	2851	45500	2711	46525		
29	59	3291	42596	3140	43544	2992	44518	2848	45517	2708	46543	01	31
		3289	42611	3137	43560	2990	44534	2846	45534	2706	46560		
30	00	3286	42627	3135	43576	2987	44551	2844	45551	2704	46577	00	30
		3283	42642	3132	43592	2985	44567	2841	45567	2701	46595		
		A	B	A	B	A	B	A	B	A	B	Minutes	
		112° 00'		111° 30'		111° 00'		110° 30'		110° 00'			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

		70° 00'		70° 30'		71° 00'		71° 30'		72° 00'			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	2701	46595	2565	47650	2433	48736	2304	49852	2179	51002	30	00
		2699	46612	2563	47668	2431	48754	2302	49871	2177	51021		
01	31	2697	46630	2561	47686	2429	48772	2300	49890	2175	51041	29	59
		2694	46647	2559	47704	2427	48791	2298	49909	2173	51060		
02	32	2692	46664	2556	47722	2424	48809	2296	49928	2171	51080	28	58
		2690	46682	2554	47740	2422	48828	2294	49947	2169	51099		
03	33	2688	46699	2552	47758	2420	48846	2292	49966	2167	51119	27	57
		2685	46716	2550	47775	2418	48864	2290	49985	2165	51138		
04	34	2683	46734	2547	47793	2416	48883	2287	50004	2163	51158	26	56
		2681	46751	2545	47811	2413	48901	2285	50023	2161	51177		
05	35	2678	46769	2543	47829	2411	48920	2283	50042	2159	51197	25	55
		2676	46786	2541	47847	2409	48938	2281	50061	2157	51216		
06	36	2674	46804	2539	47865	2407	48957	2279	50080	2155	51236	24	54
		2672	46821	2536	47883	2405	48975	2277	50098	2153	51255		
07	37	2669	46839	2534	47901	2403	48993	2275	50117	2151	51275	23	53
		2667	46856	2532	47919	2400	49012	2273	50137	2149	51294		
08	38	2665	46873	2530	47937	2398	49030	2271	50156	2147	51314	22	52
		2662	46891	2528	47955	2396	49049	2269	50175	2145	51334		
09	39	2660	46908	2525	47973	2394	49067	2266	50194	2143	51353	21	51
		2658	46926	2523	47991	2392	49086	2264	50213	2141	51373		
10	40	2656	46943	2521	48009	2390	49104	2262	50232	2138	51392	20	50
		2653	46961	2519	48027	2387	49123	2260	50251	2136	51412		
11	41	2651	46978	2516	48045	2385	49141	2258	50270	2134	51432	19	49
		2649	46996	2514	48063	2383	49160	2256	50289	2132	51451		
12	42	2646	47014	2512	48081	2381	49179	2254	50308	2130	51471	18	48
		2644	47031	2510	48099	2379	49197	2252	50327	2128	51491		
13	43	2642	47049	2507	48117	2377	49216	2250	50346	2126	51510	17	47
		2640	47066	2505	48135	2375	49234	2248	50365	2124	51530		
14	44	2637	47084	2503	48153	2372	49253	2246	50385	2122	51550	16	46
		2635	47101	2501	48171	2370	49271	2243	50404	2120	51570		
15	45	2633	47119	2499	48189	2368	49290	2241	50423	2118	51589	15	45
		2631	47137	2496	48207	2366	49309	2239	50442	2116	51609		
16	46	2628	47154	2494	48226	2364	49327	2237	50461	2114	51629	14	44
		2626	47172	2492	48244	2362	49346	2235	50480	2112	51649		
17	47	2624	47189	2490	48262	2360	49365	2233	50499	2110	51668	13	43
		2622	47207	2488	48280	2358	49383	2231	50519	2108	51688		
18	48	2619	47225	2485	48298	2355	49402	2229	50538	2106	51708	12	42
		2617	47242	2483	48316	2353	49421	2227	50557	2104	51728		
19	49	2615	47260	2481	48334	2351	49439	2225	50576	2102	51747	11	41
		2613	47278	2479	48352	2349	49458	2223	50596	2100	51767		
20	50	2610	47295	2477	49371	2347	49477	2221	50615	2098	51787	10	40
		2608	47313	2474	48389	2345	49495	2218	50634	2096	51807		
21	51	2606	47331	2472	48407	2343	49514	2216	50653	2094	51827	09	39
		2604	47348	2470	48425	2340	49533	2214	50673	2092	51847		
22	52	2601	47366	2468	48443	2338	49551	2212	50692	2090	51867	08	38
		2599	47384	2466	48462	2336	49570	2210	50711	2088	51886		
23	53	2597	47402	2463	48480	2334	49589	2208	50730	2086	51906	07	37
		2594	47419	2461	48498	2332	49608	2206	50750	2084	51926		
24	54	2592	47437	2459	48516	2330	49626	2204	50769	2082	51946	06	36
		2590	47455	2457	48534	2328	49645	2202	50788	2080	51966		
25	55	2588	47472	2455	48553	2325	49664	2200	50808	2078	51986	05	35
		2585	47490	2453	48571	2323	49683	2198	50827	2076	52006		
26	56	2583	47508	2450	48589	2321	49702	2196	50846	2074	52026	04	34
		2581	47526	2448	48608	2319	49720	2194	50866	2072	52046		
27	57	2579	47544	2446	48626	2317	49739	2192	50885	2070	52066	03	33
		2576	47561	2444	48644	2315	49758	2190	50905	2068	52086		
28	58	2574	47579	2442	48662	2313	49777	2188	50924	2066	52106	02	32
		2572	47597	2439	48681	2311	49796	2185	50943	2064	52126		
29	59	2570	47615	2437	48699	2309	49815	2183	50963	2062	52146	01	31
		2568	47633	2435	48717	2306	49833	2181	50982	2060	52166		
30	00	2565	47650	2433	48736	2304	49852	2179	51002	2058	52186	00	30
		A	B	A	B	A	B	A	B	A	B		Minutes
		109° 30'		109° 00'		108° 30'		108° 00'		107° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		72° 30'		73° 00'		73° 30'		74° 00'		74° 30'			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	2058	52186	1940	53406	1826	54666	1716	55966	1609	57310	30	00
		2056	52206	1938	53427	1824	54687	1714	55988	1607	57333		
01	31	2054	52226	1936	53448	1823	54708	1712	56010	1605	57356	29	59
		2052	52246	1935	53468	1821	54730	1710	56032	1604	57378		
02	32	2050	52266	1933	53489	1819	54751	1709	56054	1602	57401	28	58
		2048	52286	1931	53510	1817	54773	1707	56076	1600	57424		
03	33	2046	52306	1929	53531	1815	54794	1705	56099	1598	57447	27	57
		2044	52326	1927	53551	1813	54815	1703	56121	1597	57470		
04	34	2042	52346	1925	53572	1811	54837	1701	56143	1595	57493	26	56
		2040	52366	1923	53593	1809	54858	1700	56165	1593	57516		
05	35	2038	52387	1921	53614	1808	54880	1698	56187	1591	57538	25	55
		2036	52407	1919	53634	1806	54901	1696	56209	1590	57561		
06	36	2034	52427	1917	53655	1804	54922	1694	56231	1588	57584	24	54
		2032	52447	1915	53676	1802	54944	1692	56254	1586	57607		
07	37	2030	52467	1913	53697	1800	54965	1691	56276	1584	57630	23	53
		2028	52487	1911	53718	1798	54987	1689	56298	1583	57653		
08	38	2026	52508	1910	53738	1796	55008	1687	56320	1581	57676	22	52
		2024	52528	1908	53759	1795	55030	1685	56342	1579	57699		
09	39	2022	52548	1906	53780	1793	55051	1683	56365	1578	57722	21	51
		2020	52568	1904	53801	1791	55073	1682	56387	1576	57745		
10	40	2018	52588	1902	53822	1789	55095	1680	56409	1574	57768	20	50
		2016	52609	1900	53843	1787	55116	1678	56431	1572	57791		
11	41	2014	52629	1898	53864	1785	55138	1676	56454	1571	57814	19	49
		2012	52649	1896	53884	1783	55159	1674	56476	1569	57837		
12	42	2010	52670	1894	53905	1782	55181	1673	56498	1567	57860	18	48
		2009	52690	1892	53926	1780	55202	1671	56521	1565	57884		
13	43	2007	52710	1890	53947	1778	55224	1669	56543	1564	57907	17	47
		2005	52730	1889	53968	1776	55246	1667	56565	1562	57930		
14	44	2003	52751	1887	53989	1774	55267	1665	56588	1560	57953	16	46
		2001	52771	1885	54010	1772	55289	1664	56610	1559	57976		
15	45	1999	52791	1883	54031	1771	55311	1662	56632	1557	57999	15	45
		1997	52812	1881	54052	1769	55332	1660	56655	1555	58022		
16	46	1995	52832	1879	54073	1767	55354	1658	56677	1553	58046	14	44
		1993	52852	1877	54094	1765	55376	1657	56700	1552	58069		
17	47	1991	52873	1875	54115	1763	55397	1655	56722	1550	58092	13	43
		1989	52893	1873	54136	1761	55419	1653	56745	1548	58115		
18	48	1987	52914	1871	54157	1760	55441	1651	56767	1546	58138	12	42
		1985	52934	1870	54178	1758	55463	1650	56790	1545	58162		
19	49	1983	52954	1868	54199	1756	55484	1648	56812	1543	58185	11	41
		1981	52975	1866	54220	1754	55506	1646	56835	1541	58208		
20	50	1979	52995	1864	54242	1752	55528	1644	56857	1540	58232	10	40
		1977	53016	1862	54263	1750	55550	1642	56880	1538	58255		
21	51	1975	53036	1860	54284	1749	55572	1641	56902	1536	58278	09	39
		1973	53057	1858	54305	1747	55593	1639	56925	1534	58302		
22	52	1971	53077	1856	54326	1745	55615	1637	56947	1533	58325	08	38
		1969	53098	1854	54347	1743	55637	1635	56970	1531	58348		
23	53	1967	53118	1853	54368	1741	55659	1634	56992	1529	58372	07	37
		1966	53139	1851	54390	1739	55681	1632	57015	1528	58395		
24	54	1964	53159	1849	54411	1738	55703	1630	57038	1526	58418	06	36
		1962	53180	1847	54432	1736	55725	1628	57060	1524	58442		
25	55	1960	53200	1845	54453	1734	55746	1627	57083	1523	58465	05	35
		1958	53221	1843	54474	1732	55768	1625	57106	1521	58489		
26	56	1956	53241	1841	54496	1730	55790	1623	57128	1519	58512	04	34
		1954	53262	1839	54517	1728	55812	1621	57151	1517	58536		
27	57	1952	53283	1837	54538	1727	55834	1619	57174	1516	58559	03	33
		1950	53303	1836	54559	1725	55856	1618	57196	1514	58583		
28	58	1948	53324	1834	54581	1723	55878	1616	57219	1512	58606	02	32
		1946	53344	1832	54602	1721	55900	1614	57242	1511	58630		
29	59	1944	53365	1830	54623	1719	55922	1612	57265	1509	58653	01	31
		1942	53386	1828	54644	1718	55944	1611	57287	1507	58677		
30	00	1940	53406	1826	54666	1716	55966	1609	57310	1506	58700	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		107° 00'		106° 30'		106° 00'		105° 30'		105° 00'			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes		75° 00'		75° 30'		76° 00'		76° 30'		77° 00'			
		A	B	A	B	A	B	A	B	A	B		
00	30	1506	58700	1406	60140	1310	61632	1217	63181	1128	64791	30	00
		1504	58724	1404	60164	1308	61658	1215	63208	1126	64819		
01	31	1502	58748	1403	60189	1306	61683	1214	63234	1125	64846	29	59
		1500	58771	1401	60213	1305	61709	1212	63260	1123	64873		
02	32	1499	58795	1399	60238	1303	61734	1211	63287	1122	64901	28	58
		1497	58818	1398	60262	1301	61759	1209	63313	1120	64928		
03	33	1495	58842	1396	60287	1300	61785	1208	63340	1119	64956	27	57
		1494	58866	1394	60311	1299	61810	1206	63366	1117	64983		
04	34	1492	58889	1393	60336	1297	61836	1205	63392	1116	65011	26	56
		1490	58913	1391	60360	1295	61861	1203	63419	1114	65038		
05	35	1489	58937	1390	60385	1294	61887	1202	63445	1113	65066	25	55
		1487	58960	1388	60410	1292	61912	1200	63472	1112	65093		
06	36	1485	58984	1386	60434	1291	61938	1199	63498	1110	65121	24	54
		1484	59008	1385	60459	1289	61963	1197	63525	1109	65148		
07	37	1482	59032	1383	60483	1288	61989	1196	63551	1107	65176	23	53
		1480	59055	1381	60508	1286	62014	1194	63578	1106	65204		
08	38	1479	59079	1380	60533	1284	62040	1193	63605	1104	65231	22	52
		1477	59103	1378	60557	1283	62065	1191	63631	1103	65259		
09	39	1475	59127	1377	60582	1281	62091	1190	63658	1101	65287	21	51
		1474	59151	1375	60607	1280	62117	1188	63684	1100	65314		
10	40	1472	59175	1373	60631	1278	62142	1187	63711	1099	65342	20	50
		1470	59198	1372	60656	1277	62168	1185	63738	1097	65370		
11	41	1469	59222	1370	60681	1275	62194	1184	63764	1096	65398	19	49
		1467	59246	1368	60706	1274	62219	1182	63791	1094	65425		
12	42	1465	59270	1367	60730	1272	62245	1181	63818	1093	65453	18	48
		1464	59294	1365	60755	1270	62271	1179	63845	1091	65481		
13	43	1462	59318	1364	60780	1269	62296	1178	63871	1090	65509	17	47
		1460	59342	1362	60805	1267	62322	1176	63898	1089	65537		
14	44	1459	59366	1360	60830	1266	62348	1175	63925	1087	65564	16	46
		1457	59390	1359	60855	1264	62374	1173	63952	1086	65592		
15	45	1455	59414	1357	60879	1263	62400	1172	63978	1084	65620	15	45
		1454	59438	1356	60904	1261	62425	1170	64005	1083	65648		
16	46	1452	59462	1354	60929	1260	62451	1169	64032	1081	65676	14	44
		1450	59486	1352	60954	1258	62477	1167	64059	1080	65704		
17	47	1449	59510	1351	60979	1257	62503	1166	64086	1079	65732	13	43
		1447	59534	1349	61004	1255	62529	1164	64113	1077	65760		
18	48	1445	59558	1348	61029	1253	62555	1163	64140	1076	65788	12	42
		1444	59582	1346	61054	1252	62581	1161	64167	1074	65816		
19	49	1442	59606	1344	61079	1250	62607	1160	64194	1073	65844	11	41
		1440	59630	1343	61104	1249	62633	1158	64221	1071	65872		
20	50	1439	59654	1341	61129	1247	62659	1157	64248	1070	65900	10	40
		1437	59679	1340	61154	1246	62685	1155	64275	1969	65928		
21	51	1435	59703	1338	61179	1244	62711	1154	64302	1067	65957	09	39
		1434	59727	1336	61204	1243	62737	1152	64329	1066	65985		
22	52	1432	59751	1335	61229	1241	62763	1151	64356	1064	66013	08	38
		1430	59775	1333	61254	1240	62789	1150	64383	1063	66041		
23	53	1429	59800	1332	61279	1238	62815	1148	64410	1061	66069	07	37
		1427	59824	1330	61304	1237	62841	1147	64437	1060	66098		
24	54	1425	59848	1329	61330	1235	62867	1145	64464	1059	66126	06	36
		1424	59872	1327	61355	1234	62893	1144	64491	1057	66154		
25	55	1422	59896	1325	61380	1232	62919	1142	64518	1056	66182	05	35
		1421	59921	1324	61405	1230	62945	1141	64546	1054	66211		
26	56	1419	59945	1322	61430	1229	62971	1139	64573	1053	66239	04	34
		1417	59969	1321	61456	1227	62998	1138	64600	1052	66267		
27	57	1416	59994	1319	61481	1226	63024	1136	64627	1050	66296	03	33
		1414	60018	1317	61506	1224	63050	1135	64655	1049	66324		
28	58	1412	60042	1316	61531	1223	63076	1133	64682	1047	66352	02	32
		1411	60067	1314	61556	1221	63103	1132	64709	1046	66381		
29	59	1409	60091	1313	61582	1220	63129	1130	64736	1045	66409	01	31
		1407	60116	1311	61607	1218	63155	1129	64764	1043	66438		
30	00	1406	60140	1310	61632	1217	63181	1128	64791	1042	66466	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		104° 30'		104° 00'		103° 30'		103° 00'		102° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

Minutes		77° 30´		78° 00´		78° 30´		79° 00´		79° 30´			
		A	B	A	B	A	B	A	B	A	B		
00	30	1042	66466	960	68212	881	70034	805	71940	733	73937	30	00
		1040	66495	958	68242	879	70065	804	71973	732	73971		
01	31	1039	66523	857	68272	878	70097	803	72005	731	74005	29	59
		1038	66552	955	68301	877	70128	802	72038	730	74039		
02	32	1036	66580	954	68331	876	70159	800	72070	729	74073	28	58
		1035	66609	953	68361	874	70190	799	72103	728	74107		
03	33	1033	66638	951	68391	873	70221	798	72136	726	74142	27	57
		1032	66666	950	68421	872	70252	797	72168	725	74176		
04	34	1031	66695	949	68450	870	70284	796	72201	724	74210	26	56
		1029	66724	947	68480	869	70315	794	72234	723	74245		
05	35	1028	66752	946	68510	868	70346	793	72266	722	74279	25	55
		1026	66781	945	68540	867	70377	792	72299	721	74313		
06	36	1025	66810	943	68570	865	70409	791	72332	719	74348	24	54
		1024	66838	942	68600	864	70440	790	72365	718	74382		
07	37	1022	66867	941	68630	863	70471	788	72397	717	74417	23	53
		1021	66896	939	68660	862	70503	787	72430	716	74451		
08	38	1020	66925	938	68690	860	70534	786	72463	715	74486	22	52
		1018	66953	937	68720	859	70566	785	72496	714	74520		
09	39	1017	66982	935	68750	858	70597	783	72529	712	74555	21	51
		1015	67011	934	68781	856	70629	782	72562	711	74589		
10	40	1014	67040	933	68811	855	70660	781	72595	710	74624	20	50
		1013	67069	932	68841	854	70692	780	72628	709	74659		
11	41	1011	67098	930	68871	853	70723	779	72661	708	74693	19	49
		1010	67127	929	68901	851	70755	777	72694	707	74728		
12	42	1008	67156	928	68931	850	70786	776	72727	706	74763	18	48
		1007	67185	926	68962	849	70818	775	72760	704	74797		
13	43	1006	67214	925	68992	848	70850	774	72794	703	74832	17	47
		1004	67243	924	69022	846	70881	772	72827	702	74867		
14	44	1003	67272	922	69053	845	70913	771	72860	701	74902	16	46
		1002	67301	921	69083	844	70945	770	72893	700	74937		
15	45	1000	67330	920	69113	843	70976	769	72926	699	74972	15	45
		999	67359	918	69144	841	71008	768	72960	698	75007		
16	46	997	67388	917	69174	840	71040	767	72993	696	75042	14	44
		996	67417	916	69204	839	71072	765	73026	695	75077		
17	47	995	67447	914	69235	838	71104	764	73060	694	75112	13	43
		993	67476	913	69265	836	71135	763	73093	693	75147		
18	48	992	67505	912	69296	835	71167	762	73127	692	75182	12	42
		991	67534	910	69326	834	71199	761	73160	691	75217		
19	49	989	67563	909	69357	833	71231	759	73193	690	75252	11	41
		988	67593	908	69387	831	71263	758	73227	688	75287		
20	50	987	67622	907	69418	830	71295	757	73260	687	75322	10	40
		985	67651	905	69449	829	71327	756	73294	686	75358		
21	51	984	67681	904	69479	828	71359	755	73328	685	75393	09	39
		982	67710	903	69510	826	71391	753	73361	684	75428		
22	52	981	67739	901	69541	825	71423	752	73395	683	75464	08	38
		980	67769	900	69571	824	71455	751	73429	682	75499		
23	53	978	67798	899	69602	823	71488	750	73462	680	75534	07	37
		977	67828	897	69633	821	71520	749	73496	679	75570		
24	54	976	67857	896	69664	820	71552	747	73530	678	75605	06	36
		974	67886	895	69694	819	71584	746	73563	677	75641		
25	55	973	67916	894	69725	818	71616	745	73597	676	75676	05	35
		972	67945	892	69756	816	71649	744	73631	675	75712		
26	56	970	67975	891	69787	815	71681	743	73665	674	75747	04	34
		969	68005	890	69818	814	71713	742	73699	673	75783		
27	57	968	68034	888	69849	813	71746	740	73733	672	75819	03	33
		966	68064	887	69879	811	71778	739	73767	670	75854		
28	58	965	68093	886	69910	810	71810	738	73801	669	75890	02	32
		964	68123	885	69941	809	71843	737	73835	668	75926		
29	59	962	68153	883	69972	808	71875	736	73869	667	75961	01	31
		961	68182	882	70003	807	71908	735	73903	666	75997		
30	00	960	68212	881	70034	805	71940	733	73937	665	76033	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		102° 00´		101° 30´		101° 00´		100° 30´		100° 00´			

RULE 1: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes		80° 00´		80° 30´		81° 00´		81° 30´		82° 00´			
		A	B	A	B	A	B	A	B	A	B		
00	30	665	76033	600	78239	538	80567	480	83030	425	85644	30	00
		664	76069	599	78277	537	80607	479	83072	424	85689		
01	31	663	76105	598	78315	536	80647	478	83114	423	85734	29	59
		661	76141	597	78352	535	80687	477	83157	422	85779		
02	32	660	76176	595	78390	534	80727	476	83199	421	85825	28	58
		659	76212	594	78428	533	80767	475	83242	420	85870		
03	33	658	76248	593	78466	532	80807	474	83284	419	85915	27	57
		657	76284	592	78504	531	80847	473	83327	418	85960		
04	34	656	76320	591	78542	530	80887	472	83369	418	86006	26	56
		655	76357	590	78580	529	80927	471	83412	417	86051		
05	35	654	76393	589	78618	528	80967	470	83455	416	86096	25	55
		653	76429	588	78656	527	81008	469	83497	415	86142		
06	36	652	76465	587	78694	526	81048	468	83540	414	86187	24	54
		650	76501	586	78733	525	81088	467	83583	413	86233		
07	37	649	76537	585	78771	524	81129	467	83626	412	86278	23	53
		648	76574	584	78809	523	81169	466	83668	411	86324		
08	38	647	76610	583	78847	522	81210	465	83711	411	86370	22	52
		646	76646	582	78886	521	81250	464	83754	410	86415		
09	39	645	76683	581	78924	520	81291	463	83797	409	86461	21	51
		644	76719	580	78962	519	81331	462	83840	408	86507		
10	40	643	76756	579	79001	518	81372	461	83884	407	86553	20	50
		642	76792	578	79039	517	81413	460	83927	406	86599		
11	41	641	76828	577	79078	516	81453	459	83970	405	86645	19	49
		639	76865	576	79116	515	81494	458	84013	405	86691		
12	42	638	76902	575	79155	514	81535	457	84056	404	86737	18	48
		637	76938	574	79193	513	81576	456	84100	403	86783		
13	43	636	76975	573	79232	512	81617	455	84143	402	86829	17	47
		635	77011	571	79271	511	81657	454	84186	401	86876		
14	44	634	77048	570	79309	510	81698	454	84230	400	86922	16	46
		633	77085	569	79348	509	81739	453	84273	399	86968		
15	45	632	77122	568	79387	508	81780	452	84317	399	87015	15	45
		631	77158	567	79426	507	81821	451	84361	398	87061		
16	46	630	77195	566	79465	506	81863	450	84404	397	87107	14	44
		629	77232	565	79503	505	81904	449	84448	396	87154		
17	47	627	77269	564	79542	504	81945	448	84492	395	87201	13	43
		626	77306	563	79581	504	81986	447	84535	394	87247		
18	48	625	77343	562	79620	503	82027	446	84579	393	87294	12	42
		624	77380	561	79659	502	82069	445	84623	392	87341		
19	49	623	77417	560	79698	501	82110	444	84667	392	87387	11	41
		622	77454	559	79737	500	82151	444	84711	391	87434		
20	50	621	77491	558	79777	499	82193	443	84755	390	87481	10	40
		620	77528	557	79816	498	82234	442	84799	389	87528		
21	51	619	77565	556	79855	497	82276	441	84843	388	87575	09	39
		618	77602	555	79894	496	82317	440	84887	387	87622		
22	52	617	77639	554	79933	495	82359	439	84931	387	87669	08	38
		616	77677	553	79973	494	82400	438	84976	386	87716		
23	53	615	77714	552	80012	493	82442	437	85020	385	87764	07	37
		614	77751	551	80051	492	82484	436	85064	384	87811		
24	54	612	77788	550	80091	491	82526	435	85109	383	87858	06	36
		611	77826	549	80130	490	82567	434	85153	382	87906		
25	55	610	77863	548	80170	489	82609	434	85197	381	87953	05	35
		609	77901	547	80209	488	82651	433	85242	381	88001		
26	56	608	77938	546	80249	487	82693	432	85286	380	88048	04	34
		607	77976	545	80288	486	82735	431	85331	379	88096		
27	57	606	78013	544	80328	485	82777	430	85376	378	88143	03	33
		605	78051	543	80368	484	82819	429	85420	377	88191		
28	58	604	78088	542	80407	483	82861	428	85465	376	88239	02	32
		603	78126	541	80447	482	82903	427	85510	376	88286		
29	59	602	78164	540	80487	482	82945	426	85555	375	88334	01	31
		601	78201	539	80527	481	82987	426	85599	374	88382		
30	00	600	78239	538	80567	480	83030	425	85644	373	88430	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		99° 30´		99° 00´		98° 30´		98° 00´		97° 30´			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		82° 30´		83° 00´		83° 30´		84° 00´		84°30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	373	88430	325	91411	280	94614	238.6	98076	200.4	101843	30	00
		372	88478	324	91462	279	94670	237.9	98137	199.8	101908		
01	31	371	88526	323	91514	279	94725	237.2	98197	199.2	101974	29	59
		371	88574	323	91565	278	94781	236.6	98257	198.6	102040		
02	32	370	88623	322	91617	277	94836	235.9	98318	198.0	102106	28	58
		369	88671	321	91668	276	94892	235.3	98378	197.4	102172		
03	33	368	88719	320	91720	276	94948	234.6	98439	196.8	102238	27	57
		367	88767	319	91772	275	95004	233.9	98499	196.2	102304		
04	34	366	88816	319	91824	274	95060	233.3	98560	195.6	102371	26	56
		366	88864	318	91876	274	95116	232.6	98621	195.0	102437		
05	35	365	88913	317	91928	273	95172	232.0	98682	194.4	102504	25	55
		364	88961	316	91980	272	95228	231.3	98743	193.8	102570		
06	36	363	89010	316	92032	271	95285	230.7	98804	193.2	102637	24	54
		362	89059	315	92085	271	95341	230.0	98865	192.6	102704		
07	37	362	89107	314	92137	270	95397	229.4	98926	192.0	102771	23	53
		361	89156	313	92189	269	95454	228.7	98988	191.4	102838		
08	38	360	89205	313	92242	269	95510	228.1	99049	190.8	102905	22	52
		359	89254	312	92294	268	95567	227.4	99111	190.2	102973		
09	39	358	89303	311	92347	267	95624	226.8	99172	189.6	103040	21	51
		357	89352	310	92399	267	95681	226.1	99234	189.0	103107		
10	40	357	89401	310	92452	266	95737	225.5	99296	188.4	103175	20	50
		356	89450	309	92505	265	95795	224.8	99357	187.8	103243		
11	41	355	89499	308	92558	264	95851	224.2	99419	187.2	103311	19	49
		354	89548	307	92610	264	95909	223.5	99482	186.7	103379		
12	42	353	89597	307	92663	263	95966	222.9	99544	186.1	103447	18	48
		353	89647	306	92716	262	96023	222.3	99606	185.5	103515		
13	43	352	89696	305	92769	262	96080	221.6	99668	184.9	103583	17	47
		351	89746	304	92823	261	96138	221.0	99731	184.3	103651		
14	44	350	89795	304	92876	260	96195	220.3	99793	183.7	103720	16	46
		349	89845	303	92929	260	96253	219.7	99856	183.2	103788		
15	45	349	89894	302	92982	259	96310	219.1	99918	182.6	103857	15	45
		348	89944	301	93036	258	96368	218.4	99981	182.0	103926		
16	46	347	89994	301	93089	257	96426	217.8	100044	181.4	103995	14	44
		346	90044	300	93143	257	96484	217.2	100107	180.8	104064		
17	47	345	90093	299	93196	256	96542	216.5	100170	180.3	104133	13	43
		345	90143	298	93250	255	96600	215.9	100233	179.7	104202		
18	48	344	90193	298	93304	255	96658	215.3	100296	179.1	104272	12	42
		343	90243	297	93358	254	96716	214.6	100360	178.5	104341		
19	49	342	90293	296	93411	253	96774	214.0	100423	178.0	104411	11	41
		341	90344	295	93465	253	96833	213.4	100487	177.4	104480		
20	50	341	90394	295	93519	252	96891	212.8	100550	176.8	104550	10	40
		340	90444	294	93573	251	96950	212.1	100614	176.2	104620		
21	51	339	90494	293	93628	251	97008	211.5	100678	175.7	104690	09	39
		338	90545	293	93682	250	97067	210.9	100742	175.1	104760		
22	52	337	90595	292	93736	249	97126	210.3	100806	174.5	104830	08	38
		337	90646	291	93790	249	97184	209.6	100870	174.0	104901		
23	53	336	90696	290	93845	248	97243	209.0	100934	173.4	104971	07	37
		335	90747	289	93899	247	97302	208.4	100998	172.8	105042		
24	54	334	90798	289	93954	247	97361	207.8	101063	172.3	105113	06	36
		333	90848	288	94009	246	97420	207.1	101127	171.7	105183		
25	55	333	90899	287	94063	245	97480	206.5	101192	171.1	105254	05	35
		332	90950	287	94118	245	97539	205.9	101256	170.6	105325		
26	56	331	91001	286	94173	244	97598	205.3	101321	170.0	105397	04	34
		330	91052	285	94228	243	97658	204.7	101386	169.5	105468		
27	57	330	91103	284	94283	243	97717	204.1	101451	168.9	105539	03	33
		329	91154	284	94338	242	97777	203.5	101516	168.4	105611		
28	58	328	91205	283	94393	241	97837	202.8	101581	167.8	105683	02	32
		327	91257	282	94448	241	97897	202.2	101646	167.2	105754		
29	59	326	91308	281	94503	240	97957	201.6	101712	166.7	105826	01	31
		326	91359	281	94559	239	98017	201.0	101777	166.0	105898		
30	00	325	91411	280	94614	239	98076	200.4	101843	165.6	105970	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		97° 00´		96° 30´		96° 00´		95° 30´		95° 00´			

RULE 2: When LHA (E or W) is greater than 90°, take "K" from bottom of table

Minutes		85° 00'		85° 30'		86° 00'		86° 30'		87° 00'			
		A	B	A	B	A	B	A	B	A	B		
00	30	165.6	105970	134.1	110536	105.9	115641	81.1	121432	59.6	128120	30	00
		165.0	106043	133.6	110616	105.5	115732	80.7	121536	59.2	128241		
01	31	164.5	106115	133.1	110696	105.0	115823	80.3	121639	58.9	128362	29	59
		163.9	106187	132.6	110777	104.6	115913	79.9	121743	58.6	128483		
02	32	163.4	106260	132.1	110858	104.2	116004	79.5	121848	58.2	128605	28	58
		162.8	106333	131.6	110939	103.7	116096	79.2	121952	57.9	128727		
03	33	162.3	106406	131.1	111020	103.3	116187	78.8	122057	57.6	128849	27	57
		161.7	106479	130.6	111101	102.9	116278	78.4	122161	57.3	128972		
04	34	161.2	106552	130.1	111183	102.4	116370	78.0	122267	56.9	129095	26	56
		160.6	106625	129.6	111264	102.0	116462	77.6	122372	56.6	129218		
05	35	160.1	106698	129.2	111346	101.6	116554	77.3	122478	56.3	129342	25	55
		159.6	106772	128.7	111428	101.1	116647	76.9	122584	56.0	129466		
06	36	159.0	106846	128.2	111510	100.7	116739	76.5	122690	55.7	129591	24	54
		158.5	106919	127.7	111592	100.3	116832	76.1	122796	55.3	129716		
07	37	157.9	106993	127.2	111674	99.8	116925	75.8	122903	55.0	129841	23	53
		157.4	107067	126.7	111757	99.4	117018	75.4	123010	54.7	129967		
08	38	156.9	107141	126.2	111839	99.0	117112	75.0	123117	54.4	130093	22	52
		156.3	107216	125.8	111922	98.5	117205	74.6	123225	54.1	130219		
09	39	155.8	107290	125.3	112005	98.1	117299	74.3	123332	53.7	130346	21	51
		155.2	107364	124.8	112088	97.7	117393	73.9	123441	53.4	130473		
10	40	154.7	107439	124.3	112171	97.3	117487	73.5	123549	53.1	130600	20	50
		154.2	107514	123.8	112255	96.8	117581	73.2	123657	52.8	130728		
11	41	153.6	107589	123.4	112338	96.4	117676	72.8	123766	52.5	130856	19	49
		153.1	107664	122.9	112422	96.0	117771	72.4	123875	52.2	130985		
12	42	152.6	107739	122.4	112506	95.6	117866	72.1	123985	51.9	131114	18	48
		152.1	107814	121.9	112590	95.2	117961	71.7	124095	51.6	131243		
13	43	151.5	107890	121.5	112674	94.7	118056	71.3	124204	51.3	131373	17	47
		151.0	107965	121.0	112759	94.3	118152	71.0	124315	51.0	131503		
14	44	150.5	108041	120.5	112843	93.9	118248	70.6	124425	50.7	131633	16	46
		149.9	108117	120.1	112928	93.5	118344	70.3	124536	50.3	131764		
15	45	149.4	108193	119.6	113013	93.1	118440	69.9	124647	50.0	131896	15	45
		148.9	108269	119.1	113098	92.7	118537	69.5	124759	49.7	132027		
16	46	148.4	108345	118.7	113183	92.3	118633	69.2	124870	49.4	132159	14	44
		147.8	108421	118.2	113269	91.8	118730	68.8	124982	49.1	132292		
17	47	147.3	108498	117.7	113354	91.4	118827	68.5	125094	48.8	132425	13	43
		146.8	108574	117.3	113440	91.0	118925	68.1	125207	48.5	132558		
18	48	146.3	108651	116.8	113526	90.6	119022	67.8	125320	48.2	132692	12	42
		145.8	108728	116.3	113612	90.2	119120	67.4	125433	47.9	132826		
19	49	145.2	108805	115.9	113699	89.8	119218	67.1	125546	47.6	132961	11	41
		144.7	108882	115.4	113785	89.4	119316	66.7	125660	47.3	133096		
20	50	144.2	108960	114.9	113872	89.0	119415	66.4	125774	47.1	133231	10	40
		143.7	109037	114.5	113958	88.6	119513	66.0	125888	46.8	133367		
21	51	143.2	109115	114.0	114045	88.2	119612	65.7	126003	46.5	133503	09	39
		142.7	109192	113.6	114133	87.8	119711	65.3	126118	46.2	133640		
22	52	142.2	109270	113.1	114220	87.4	119811	65.0	126233	45.9	133777	08	38
		141.6	109348	112.7	114307	87.0	119910	64.6	126349	45.6	133914		
23	53	141.1	109426	112.2	114395	86.6	120010	64.3	126465	45.3	134052	07	37
		140.6	109505	111.7	114483	86.2	120110	63.9	126581	45.0	134191		
24	54	140.1	109583	111.3	114571	85.8	120211	63.6	126697	44.7	134330	06	36
		139.6	109662	110.8	114659	85.4	120311	63.3	126814	44.4	134469		
25	55	139.1	109740	110.4	114747	85.0	120412	62.9	126931	44.2	134609	05	35
		138.6	109819	109.9	114836	84.6	120513	62.6	127049	43.9	134749		
26	56	138.1	109898	109.5	114925	84.2	120614	62.2	127166	43.6	134890	04	34
		137.6	109978	109.0	115014	83.8	120715	61.9	127284	43.3	135031		
27	57	137.1	110057	108.6	115103	83.4	120817	61.6	127403	43.0	135173	03	33
		136.6	110136	108.1	115192	83.0	120919	61.2	127521	42.7	135315		
28	58	136.1	110216	107.7	115282	82.6	121021	60.9	127640	42.5	135457	02	32
		135.6	110296	107.3	115371	82.2	121124	60.6	127760	42.2	135600		
29	59	135.1	110375	106.8	115461	81.9	121226	60.2	127880	41.9	135744	01	31
		134.6	110455	106.4	115551	81.5	121329	59.9	128000	41.6	135888		
30	00	134.1	110536	105.9	115641	81.1	121432	59.6	128120	41.4	136032	00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		94° 30'		94° 00'		93° 30'		93° 00'		92° 30'			

RULE 2: Always take "Z" from bottom of table, except when "K" is same name and greater than latitude, in which case take "Z" from top of table

		87° 30´		88° 00´		88° 30´		89° 00´		89° 30´			
Minutes		A	B	A	B	A	B	A	B	A	B		
00	30	41.4	136032	26.5	145718	14.9	158208	6.6	175814	1.7	205916	30	00
		41.1	136177	26.2	145899	14.7	159450	6.5	176178	1.6	206646		
01	31	40.8	136322	26.0	146081	14.6	158693	6.4	176544	1.5	207388	29	59
		40.5	136468	25.8	146264	14.4	158938	6.3	176914	1.5	208143		
02	32	40.3	136615	25.6	146448	14.2	159184	6.2	177287	1.4	208912	28	58
		40.0	136761	25.4	146632	14.1	159431	6.1	177663	1.4	209695		
03	33	39.7	136909	25.2	146817	13.9	159680	6.0	178042	1.3	210491	27	57
		39.4	137057	24.9	147003	13.7	159930	5.9	178424	1.3	211303		
04	34	39.2	137205	24.7	147190	13.6	160182	5.8	178810	1.2	212130	26	56
		38.9	137354	24.5	147377	13.4	160435	5.7	179200	1.2	212974		
05	35	38.6	137503	24.3	147566	13.3	160690	5.6	175593	1.1	213834	25	55
		38.4	137653	24.1	147755	13.1	160946	5.5	179990	1.1	214711		
06	36	38.1	137804	23.9	147945	13.0	161204	5.4	180390	1.1	215607	24	54
		37.8	137955	23.7	148135	12.8	161463	5.3	180794	1.0	216521		
07	37	37.6	138106	23.5	148327	12.7	161724	5.2	181201	1.0	217455	23	53
		37.3	138258	23.3	148520	12.5	161986	5.1	181613	0.9	218409		
08	38	37.1	138411	23.1	148713	12.4	162250	5.0	182029	0.9	219385	22	52
		36.8	138564	22.8	148907	12.2	162516	4.9	182448	0.9	220384		
09	39	36.5	138718	22.6	149103	12.1	162783	4.8	182872	0.8	221406	21	51
		36.3	138872	22.4	149299	11.9	163052	4.7	183300	0.8	222452		
10	40	36.0	139027	22.2	149495	11.8	163322	4.6	183732	0.7	223525	20	50
		35.8	139182	22.0	149693	11.6	163594	4.5	184168	0.7	224624		
11	41	35.5	139338	21.8	149892	11.5	163868	4.4	184609	0.7	225752	19	49
		35.3	139494	21.6	150092	11.3	164144	4.3	185055	0.6	226910		
12	42	35.0	139651	21.4	150292	11.2	164422	4.2	185505	0.6	228100	18	48
		34.7	139809	21.2	150494	11.0	164701	4.1	185959	0.6	229324		
13	43	34.5	139967	21.0	150696	10.9	164982	4.1	186419	0.5	230583	17	47
		34.2	140125	20.8	150899	10.8	165265	4.0	186883	0.5	231879		
14	44	34.0	140285	20.6	151104	10.6	165550	3.9	187353	0.5	233215	16	46
		33.7	140445	20.5	151309	10.5	165836	3.8	187827	0.4	234594		
15	45	33.5	140605	20.3	151515	10.3	166125	3.7	188307	0.4	236018	15	45
		33.2	140766	20.1	151722	10.2	166415	3.6	188793	0.4	237491		
16	46	33.0	140928	19.9	151931	10.1	166708	3.6	189283	0.4	239015	14	44
		32.8	141090	19.7	152140	9.9	167002	3.5	189780	0.3	240594		
17	47	32.5	141253	19.5	152350	9.8	167298	3.4	190282	0.3	242233	13	43
		32.3	141417	19.3	152561	9.7	167597	3.3	190790	0.3	243936		
18	48	32.0	141581	19.1	152774	9.5	167897	3.2	191303	0.3	245709	12	42
		31.8	141745	18.9	152987	9.4	168200	3.2	191824	0.2	247558		
19	49	31.5	141911	18.7	153201	9.3	168505	3.1	192350	0.2	249488	11	41
		31.3	142077	18.6	153417	9.1	168811	3.0	192883	0.2	251508		
20	50	31.1	142243	18.4	153633	9.0	169121	2.9	193422	0.2	253627	10	40
		30.8	142411	18.2	153851	8.9	169432	2.9	193969	0.2	255855		
21	51	30.6	142579	18.0	154070	8.7	169745	2.8	194522	0.1	258203	09	39
		30.4	142747	17.8	154290	8.6	170061	2.7	195082	0.1	260685		
22	52	30.1	142916	17.6	154511	8.5	170379	2.7	195650	0.1	263318	08	38
		29.9	143086	17.5	154733	8.4	170700	2.6	196225	0.1	266121		
23	53	29.6	143257	17.3	154956	8.2	171023	2.5	196808	0.1	269118	07	37
		29.4	143428	17.1	155180	8.1	171348	2.4	197399	0.1	272336		
24	54	29.2	143600	16.9	155406	8.0	171676	2.4	197998	0.1	275812	06	36
		28.9	143773	16.8	155633	7.9	172006	2.3	198605	0.1	279591		
25	55	28.7	143946	16.6	155861	7.8	172339	2.3	199221	0.0	283730	05	35
		28.5	144120	16.4	156090	7.6	172674	2.2	199846	0.0	288306		
26	56	28.3	144295	16.2	156320	7.5	173012	2.1	200480	0.0	293421	04	34
		28.0	144470	16.1	156552	7.4	173352	2.1	201124	0.0	299221		
27	57	27.8	144646	15.9	156784	7.3	173696	2.0	201777	0.0	305915	03	33
		27.6	144823	15.7	157019	7.2	174042	1.9	202440	0.0	313833		
28	58	27.4	145000	15.6	157254	7.1	174391	1.9	203113	0.0	326018	02	32
		27.1	145179	15.4	157490	6.9	174742	1.8	203797	0.0	336018		
29	59	26.9	145358	15.2	157728	6.8	175097	1.8	204492	0.0	353627	01	31
		26.7	145538	15.1	157967	6.7	175454	1.7	205198	0.0	383730		
30	00	26.5	145718	14.9	158208	6.6	175814	1.7	205916	0.0		00	30
		A	B	A	B	A	B	A	B	A	B	Minutes	
		92° 00´		91° 30´		91° 00´		90° 30´		90° 00´			

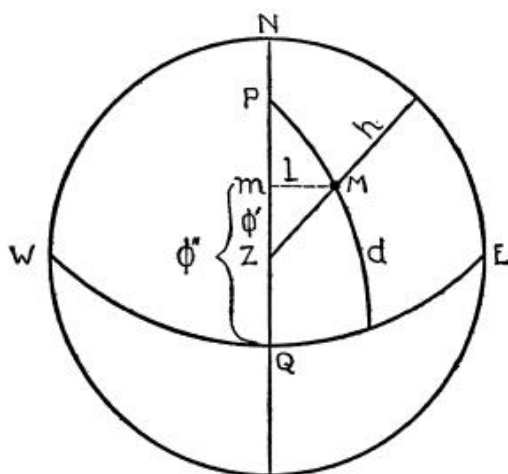
APPENDIX A

Latitude by Phi Prime, Phi Second (Favill)

PROBLEM IV: At anchor, in evening of August 21, in latitude $42^{\circ} 12' N$, longitude $87^{\circ} 48' W$, observed star Deneb, bearing ENE, as follows: sextant altitude (Ho) $58^{\circ} 52'$, at Universal Time ((GMT)UT) 1:39:20 AM August 22.

	h	m	s			
(GMT)UT	01	: 39	: 20	(Aug. 22)		
GHA	44	- 27.4	(W)			
Long	87	- 48.0	W	Add		Subtract
LHA	43	- 20.6	E	A 16346		
d	45	- 03.1	N	<u>B 15089</u>	A 15014	
Ho						A 6754
R				A 31435	<u>B 5822</u>	<u>B 5822</u>
ϕ''	54	- 01.5	N	<-----	A 9192	
ϕ'	11	- 49.5	N	<-----	B 932	
Lat	42	- 12	N			

Old method for determining latitude from (a) a single altitude of a body not on the meridian, (b) UT of the observation and (c) known longitude but is now seldom used. The method is best restricted to conditions where the body is within 3 hours (45 degrees) of meridian passage, of declination at least 3° and not over 45° from the meridian in azimuth. This last means that a line from the body to zenith should not make an angle of over 45° with meridian. (see Fig. 2)



Projection of the Celestial Sphere on the Plane of the Horizon.

WQE = Equator	h = Altitude
Z = Zenith	Mm = Perpendicular from Body to Meridian = l
P = Elevated Pole	$\phi' = mZ$ = Zenith distance of m
M = Body	$\phi'' = mQ$ = Declination of m
d = Declination	QZ = Latitude to be found

NOTE:

Give ϕ'' same name as declination

ϕ' is N if body bears N & E or N & W

ϕ' is S if body bears S & E or S & W

Combine by adding if different, subtracting if alike

Lat = $\phi' \pm (180^{\circ} - \phi'')$ for lower transit

Fig. 2

Reduction to the Meridian

To use H.O. 211 for reduction to the meridian, two conditions *must be fulfilled*.

1. The LHA must be less than 20 minutes time (5° arc)
2. The angular distance between the sun and the zenith of the DR position ($L-d$) must be greater than 15° arc.

The following formulas are used:

$$1. \csc R = \csc t \sec d \quad 2. \csc K = \csc d / \sec R \quad 3. \sec (K-L) = \csc Ho / \sec R$$

Knowing the D.R. latitude, K and $(K-L)$ may be combined to give the latitude at the time of the sight. It will be noted that the first two formulas are the same as those used in computing the altitude and that the third is the reverse of the third altitude formula.

PROBLEM V: An altitude of the sun was taken near Local Apparent Noon (LAN) and the following data obtained: Local Hour Angle (LHA) $2^{\circ} 30' E$, declination (d) $3^{\circ} 45' S$, DR latitude (L) $21^{\circ} 06' S$, sextant altitude (Ho) $72^{\circ} 31.1'$.

	Add	Subtract		Subtract
LHA	2 - 30.0 E	A 136032		
d	3 - 45.0 S	<u>B 93.1</u>	A 118440	Ho 72 - 31.1
R		A 136125.1	<u>B 41.1</u>	<u>B 41.1</u>
K	3 - 45.0 S	<-----	A 118398.9	
$(K-L)$	17 - 18.5	<-----	B 2012.9	
L	21 - 03.5 S	(at time of sight)		

As long as LHA is less than 5° and $(L-d)$ is greater than 15° , the error will not usually be greater than $0.5'$ of latitude. Occasionally the $0.4'$ possible error of the table and the $0.5'$ possible error of this approximation may combine to produce a maximum error of $0.9'$ in latitude.

When conditions do not conform to the requirements of this method, compute the altitude and the azimuth in the usual manner and plot the line of position on the chart.

NOTES

