

三角测量归心改正及 a、b系数计算用表

测量计算用表编算组编算

测绘出版社

本表为三角测量进行归心改正计算和坐标平差中计算 a 、 b 系数提供了五个辅助用表。用本表可简化计算，提高效率，并保证各等三角测量计算精度要求。

本表供大地测量和各工程部门控制测量计算工作者使用。

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a 、 b 系数计算用表

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前 言

本表适用于高精度三角锁(网)概算与平差计算。全表载有五个计算用表,即:

一、 $C' = \sin(M + \theta) \cdot \rho''$

二、 $d'' = 0.01 \sin(M + \theta) 206.265$

三、 $a' = \sin \alpha_{k,i} \cdot 20.6265, b' = -\cos \alpha_{k,i} \cdot 20.6265$

四、 $K = \frac{\rho''}{S^2}$

五、 $K = \frac{\rho''}{S^2} \cdot 0.1$

其中表二原可与表三合并,为了减少计算时的思考,特将表三中 a' 摘出,并附以归心计算时 $(M + \theta)$ 之值在 $0^\circ \sim 360^\circ$ 范围内的正弦符号编成表二。此外又考虑到实际作业中的不同情况与计算者的习惯,将 a, b 系数按不同公式计算而编成了表三、表四、表五,计算者可依情况选用。

本用表适用于计算机按真数公式计算。

目 录

前 言

表一 归心计算辅助用表(一) ($C' = \sin(M + \theta) \cdot \rho''$) (1)

表二 归心计算辅助用表(二) ($d'' = 0.01 \sin(M + \theta) \cdot 206.265$) (7)

表三 a, b 系数计算辅助用表(一)

($a' = \sin \alpha_{k,i} \cdot 20.6265$ $b' = -\cos \alpha_{k,i} \cdot 20.6265$) (20)

表四 a, b 系数计算辅助用表(二)

($K = \frac{\rho''}{S^2}$) (36)

表五 a, b 系数计算辅助用表(三)

($K = \frac{\rho''}{S^2} \cdot 0.1$) (97)

表一 归心计算辅助用表(一)

$$(C' = \sin(M + \theta) \cdot \rho'')$$

表的编法:

$$C'' = \frac{C'}{S} l$$

$$C' = \sin(M + \theta) \cdot \rho''$$

$$(M + \theta) = \sin^{-1} \frac{C'}{\rho''}$$

$$\sin(M + \theta) = 0.048481 C'$$

式中: l 以分米为单位, S 以公里为单位。

编表计算时 $C' = 0.0125, 0.0375, 0.0625 \dots$

编表时表列数值采用 $C' = 0.025, 0.075, 0.125 \dots$

表的精度: 按原始公式和按本表计算的归心改正数之差, 一般在 $0''.005$ 以内, 保证不差 $0''.01$ 。很明显, C'' 的误差全是 C' 误差的影响, 其影响也随 l, S 值而变, 限差如下表:

限 差

$S(km)$	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
$l(dm)$	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.0	8.4	8.8	9.2

1 公里的 l 的限差为 0.4 分米

表的用法: 以 $(M + \theta)$ 为引数查相应间隔内的 C' , 当 $M + \theta$ 为表列数时, 取上、下 C' 的中数。再以 $C' \times l$ (以分米为单位) 除以 S (以公里为单位), 即得归心改正 C'' 。

当 $(M + \theta)$ 大于 90° 时要用 180° 或 360° 减 $(M + \theta)$, 也就是全部化为小于 90° 角度去查表。

C'' 的符号: $M + \theta > 180^\circ$ 时, C'' 为负, $M + \theta < 180^\circ$ 时, C'' 为正。

例: $S = 8.302 km$, $l = 2.9 dm$, $M + \theta = 118^\circ 32'$

以 $M + \theta$ 为引数查得 $C' = 18''.125$

则

$$C'' = \frac{+18''.125}{8.302} \times 2.9 = +6''.33$$

$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'
0° 02'	0.025	2° 57'	1.075	5° 53'	2.125	8° 49'	3.175
06	0.050	3° 01'	1.100	57	2.150	53	3.200
10	0.075	06	1.125	6° 01'	2.175	58	3.225
15	0.100	10	1.150	05	2.200	9° 02'	3.250
19	0.125	14	1.175	09	2.225	06	3.275
23	0.150	18	1.200	14	2.250	10	3.300
27	0.175	22	1.225	18	2.275	14	3.325
31	0.200	26	1.250	22	2.300	19	3.350
35	0.225	31	1.275	26	2.325	23	3.375
40	0.250	35	1.300	30	2.350	27	3.400
44	0.275	39	1.325	35	2.375	31	3.425
48	0.300	43	1.350	39	2.400	36	3.450
52	0.325	47	1.375	43	2.425	40	3.475
56	0.350	51	1.400	47	2.450	44	3.500
1° 00'	0.375	56	1.425	51	2.475	48	3.525
05	0.400	4° 00'	1.450	56	2.500	53	3.550
09	0.425	04	1.475	7° 00'	2.525	57	3.575
13	0.450	08	1.500	04	2.550	10° 01'	3.600
17	0.475	12	1.525	08	2.575	05	3.625
21	0.500	16	1.550	12	2.600	09	3.650
25	0.525	21	1.575	17	2.625	14	3.675
30	0.550	25	1.600	21	2.650	18	3.700
34	0.575	29	1.625	25	2.675	22	3.725
38	0.600	33	1.650	29	2.700	26	3.750
42	0.625	37	1.675	33	2.725	31	3.775
46	0.650	42	1.700	38	2.750	35	3.800
50	0.675	46	1.725	42	2.775	39	3.825
55	0.700	50	1.750	46	2.800	43	3.850
59	0.725	54	1.775	50	2.825	48	3.875
2° 03'	0.750	58	1.800	54	2.850	52	3.900
07	0.775	5° 02'	1.825	59	2.875	56	3.925
11	0.800	07	1.850	8° 03'	2.900	11° 00'	3.950
15	0.825	11	1.875	07	2.925	05	3.975
20	0.850	15	1.900	11	2.950	09	4.000
24	0.875	19	1.925	15	2.975	13	4.025
28	0.900	23	1.950	20	3.000	17	4.050
32	0.925	28	1.975	24	3.025	22	4.075
36	0.950	32	2.000	28	3.050	26	4.100
40	0.975	36	2.025	32	3.075	30	4.125
45	1.000	40	2.050	37	3.100	34	4.150
49	1.025	44	2.075	41	3.125	39	4.175
53	1.050	49	2.100	45	3.150	43	4.200
57		53		49		47	

$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'
11° 47'	4.225	14° 47'	5.275	17° 49'	6.325	20° 55'	7.375
51	4.250	51	5.300	54	6.350	59	7.400
56	4.275	56	5.325	58	6.375	21° 04'	7.425
12° 00'	4.300	15° 00'	5.350	18° 02'	6.400	08	7.450
04	4.325	04	5.375	07	6.425	13	7.475
08	4.350	08	5.400	11	6.450	17	7.500
13	4.375	13	5.425	16	6.475	22	7.525
17	4.400	17	5.450	20	6.500	26	7.550
21	4.425	21	5.475	24	6.525	31	7.575
25	4.450	26	5.500	29	6.550	35	7.600
30	4.475	30	5.525	33	6.575	39	7.625
34	4.500	34	5.550	37	6.600	44	7.650
38	4.525	39	5.575	42	6.625	48	7.675
42	4.550	43	5.600	46	6.650	53	7.700
47	4.575	47	5.625	51	6.675	57	7.725
51	4.600	52	5.650	55	6.700	22° 02'	7.750
55	4.625	56	5.675	59	6.725	06	7.775
13° 00'	4.650	16° 00'	5.700	19° 04'	6.750	11	7.800
04	4.675	05	5.725	08	6.775	15	7.825
08	4.700	09	5.750	13	6.800	20	7.850
12	4.725	13	5.775	17	6.825	24	7.875
17	4.750	18	5.800	22	6.850	39	7.900
21	4.775	22	5.825	26	6.875	33	7.925
25	4.800	26	5.850	30	6.900	38	7.950
30	4.825	31	5.875	35	6.925	42	7.975
34	4.850	35	5.900	39	6.950	47	8.000
38	4.875	39	5.925	44	6.975	52	8.025
42	4.900	44	5.950	48	7.000	56	8.050
47	4.925	48	5.975	53	7.025	23° 01'	8.075
51	4.950	52	6.000	57	7.050	05	8.100
55	4.975	57	6.025	20° 01'	7.075	10	8.125
14° 00'	5.000	17° 01'	6.050	06	7.100	14	8.150
04	5.025	06	6.075	10	7.125	19	8.175
08	5.050	10	6.100	15	7.150	23	8.200
12	5.075	14	6.125	19	7.175	28	8.225
17	5.100	19	6.150	24	7.200	32	8.250
21	5.125	23	6.175	28	7.225	37	8.275
25	5.150	27	6.200	32	7.250	41	8.300
30	5.175	32	6.225	37	7.275	46	8.325
34	5.200	36	6.250	41	7.300	50	8.350
38	5.225	40	6.275	46	7.325	55	8.375
43	5.250	45	6.300	50	7.350	24° 00'	8.400
47		49		55		04	

$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'
24° 04'	8.425	27° 18'	9.475	30° 38'	10.525	34° 06'	11.575
09	8.450	23	9.500	43	10.550	11	11.600
13	8.475	28	9.525	48	10.575	16	11.625
18	8.500	32	9.550	53	10.600	21	11.650
22	8.525	37	9.575	58	10.625	26	11.675
27	8.550	42	9.600	31° 03'	10.650	31	11.700
32	8.575	47	9.625	08	10.675	36	11.725
36	8.600	51	9.650	12	10.700	41	11.750
41	8.625	56	9.675	17	10.725	46	11.775
45	8.650	28° 01'	9.700	22	10.750	51	11.800
50	8.675	05	9.725	27	10.775	56	11.825
55	8.700	10	9.750	32	10.800	35° 01'	11.850
59	8.725	15	9.775	37	10.825	06	11.875
25° 04'	8.750	20	9.800	42	10.850	12	11.900
08	8.775	24	9.825	47	10.875	17	11.925
13	8.800	29	9.850	52	10.900	22	11.950
18	8.825	34	9.875	56	10.925	27	11.975
22	8.850	39	9.900	32° 01'	10.950	32	12.000
27	8.875	43	9.925	06	10.975	37	12.025
31	8.900	48	9.950	11	11.000	42	12.050
36	8.925	53	9.975	16	11.025	47	12.075
41	8.950	58	10.000	21	11.050	52	12.100
45	8.975	29° 02'	10.025	26	11.075	58	12.125
50	9.000	07	10.050	31	11.100	36° 03'	12.150
55	9.025	12	10.075	36	11.125	08	12.175
59	9.050	17	10.100	41	11.150	13	12.200
26° 04'	9.075	21	10.125	46	11.175	18	12.225
08	9.100	26	10.150	51	11.200	23	12.250
13	9.125	31	10.175	56	11.225	29	12.275
18	9.150	36	10.200	33° 01'	11.250	34	12.300
22	9.175	41	10.225	06	11.275	39	12.325
27	9.200	45	10.250	11	11.300	44	12.350
32	9.225	50	10.275	16	11.325	49	12.375
36	9.250	55	10.300	21	11.350	55	12.400
41	9.275	30° 00'	10.325	26	11.375	37° 00'	12.425
46	9.300	05	10.350	31	11.400	05	12.450
50	9.325	09	10.375	36	11.425	10	12.475
55	9.350	14	10.400	41	11.450	15	12.500
27° 00'	9.375	19	10.425	46	11.475	21	12.525
04	9.400	24	10.450	51	11.500	26	12.550
09	9.425	29	10.475	56	11.525	31	12.575
14	9.450	34	10.500	34° 01'	11.550	36	12.600
18		38		06		42	

$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'
37° 42'	12.625	41° 29'	13.675	45° 30'	14.725	49° 50'	15.775
47	12.650	34	13.700	36	14.750	57	15.800
52	12.675	40	13.725	42	14.775	50° 03'	15.825
58	12.700	46	13.750	48	14.800	09	15.850
38° 03'	12.725	51	13.775	54	14.825	16	15.875
08	12.750	57	13.800	46° 00'	14.850	23	15.900
13	12.775	42° 02'	13.825	06	14.875	29	15.925
19	12.800	08	13.850	12	14.900	36	15.950
24	12.825	14	13.875	18	14.925	42	15.975
29	12.850	19	13.900	24	14.950	49	16.000
35	12.875	25	13.925	30	14.975	55	16.025
40	12.900	31	13.950	36	15.000	51° 02'	16.050
45	12.925	36	13.975	42	15.025	09	16.075
51	12.950	42	14.000	48	15.050	15	16.100
56	12.975	48	14.025	54	15.075	22	16.125
39° 01'	13.000	53	14.050	47° 01'	15.100	29	16.150
07	13.025	59	14.075	07	15.125	35	16.175
12	13.050	43° 05'	14.100	13	15.150	42	16.200
18	13.075	10	14.125	19	15.175	49	16.225
23	13.100	16	14.150	25	15.200	56	16.250
28	13.125	22	14.175	31	15.225	52° 02'	16.275
34	13.150	27	14.200	37	15.250	09	16.300
39	13.175	33	14.225	44	15.275	16	16.325
45	13.200	39	14.250	50	15.300	23	16.350
50	13.225	45	14.275	56	15.325	30	16.375
55	13.250	51	14.300	48° 02'	15.350	36	16.400
40° 01'	13.275	56	14.325	08	15.375	43	16.425
06	13.300	44° 02'	14.350	15	15.400	50	16.450
12	13.325	08	14.375	21	15.425	57	16.475
17	13.350	14	14.400	27	15.450	53° 04'	16.500
23	13.375	20	14.425	34	15.475	11	16.525
28	13.400	25	14.450	40	15.500	18	16.550
34	13.425	31	14.475	46	15.525	25	16.575
39	13.450	37	14.500	52	15.550	32	16.600
45	13.475	43	14.525	59	15.575	39	16.625
50	13.500	49	14.550	49° 05'	15.600	46	16.650
56	13.525	55	14.575	12	15.625	53	16.675
41° 01'	13.550	45° 01'	14.600	18	15.650	54° 00'	16.700
07	13.575	06	14.625	24	15.675	07	16.725
12	13.600	12	14.650	31	15.700	14	16.750
18	13.625	18	14.675	37	15.725	21	16.775
23	13.650	24	14.700	44	15.750	29	16.800
29		30		50		36	

$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'	$M+\theta$	C'
54° 36'	16.825	59° 35'	17.800	65° 27'	18.775	73° 07'	19.750
43	16.850	43	17.825	37	18.800	21	19.775
50	16.875	51	17.850	47	18.825	36	19.800
57	16.900	60° 00'	17.875	58	18.850	51	19.825
55° 05'	16.925	08	17.900	66° 08'	18.875	74° 06'	19.850
12	16.950	17	17.925	18	18.900	21	19.875
19	16.975	25	17.950	29	18.925	37	19.900
27	17.000	33	17.975	39	18.950	53	19.925
34	17.025	42	18.000	50	18.975	75° 09'	19.950
41	17.050	50	18.025	67° 00'	19.000	25	19.975
49	17.075	59	18.050	11	19.025	42	20.000
56° 04'	17.100	61° 08'	18.075	22	19.050	59	20.025
11	17.125	16	18.100	33	19.075	76° 16'	20.050
19	17.150	25	18.125	44	19.100	34	20.075
26	17.175	34	18.150	55	19.125	52	20.100
34	17.200	42	18.175	68° 06'	19.150	77° 11'	20.125
41	17.225	51	18.200	17	19.175	30	20.150
49	17.250	62° 00'	18.225	28	19.200	49	20.175
56	17.275	09	18.250	40	19.225	78° 09'	20.200
57° 04'	17.300	18	18.275	51	19.250	30	20.225
12	17.325	27	18.300	69° 03'	19.275	51	20.250
20	17.350	36	18.325	14	19.300	79° 13'	20.275
27	17.375	45	18.350	26	19.325	36	20.300
35	17.400	54	18.375	38	19.350	59	20.325
43	17.425	63° 03'	18.400	50	19.375	80° 24'	20.350
51	17.450	13	18.425	70° 02'	19.400	49	20.375
58	17.475	22	18.450	15	19.425	81° 16'	20.400
58° 06'	17.500	31	18.475	27	19.450	44	20.425
14	17.525	40	18.500	40	19.475	82° 14'	20.450
22	17.550	50	18.525	52	19.500	46	20.475
30	17.575	59	18.550	71° 05'	19.525	83° 20'	20.500
38	17.600	64° 09'	18.575	18	19.550	58	20.525
46	17.625	19	18.600	31	19.575	84° 40'	20.550
54	17.650	28	18.625	44	19.600	85° 29'	20.575
59° 02'	17.675	38	18.650	58	19.625	86° 28'	20.600
10	17.700	48	18.675	72° 11'	19.650	87° 53'	20.625
19	17.725	57	18.700	25	19.675	90° 00'	
27	17.750	65° 07'	18.725	39	19.700		
35	17.775	17	18.750	53	19.725		
		27		73° 07'			

表二 归心计算辅助用表(二)

$$(d'' = 0.01 \sin(M + \theta) \cdot 206.265)$$

计算公式:

$$C''(\text{或}\gamma'') = \frac{e \cdot \sin(M + \theta)}{S} \quad \rho'' = \frac{0.01 e^{cm} \sin(M + \theta)}{S^{km}} \cdot 206.265$$

令

$$d'' = 0.01 \sin(M + \theta) \cdot 206.265$$

则

$$C''(\text{或}\gamma'') = \frac{e^{cm} d''}{S^{km}}$$

式中: S^{km} ——边长, 以公里为单位;

e^{cm} ——偏心距, 以厘米为单位;

d'' ——表列数值。

用法说明:

1. 按归心原素表内所列的 $(M + \theta)$ 值, 可直接从本表所载其值与之最接近的 $(M + \theta)$ 一列中查得 d'' , 不必进行内插, 计算精度可达 $0''.001$ 。

2. 当 $(M + \theta)$ 在 $0^\circ - 90^\circ$ 或 $180^\circ - 270^\circ$ 时, 于表左边查取; 当 $(M + \theta)$ 在 $90^\circ - 180^\circ$ 或 $270^\circ - 360^\circ$ 时, 于表右边查取。

3. 归心改正数符号: 当 $(M + \theta)$ 在 $0^\circ - 90^\circ - 180^\circ$ 时为正, 当 $(M + \theta)$ 在 $180^\circ - 270^\circ - 360^\circ$ 时为负。在表内 $(M + \theta)$ 栏上已附有正负号。

4. 例:

$(M + \theta)$	$194^\circ 53'$	$154^\circ 36'$	$317^\circ 44'$
e	$0.003m$	$0.020m$	$0.500m$
S	$9.456km$	$15.672km$	$18.946km$
d''	-0.53095	$+0.88529$	-1.38686
c 或 γ	$-0''.017$	$+0''.113$	$-3''.660$

$M + \theta$		d''	$M + \theta$	
+	-		+	-
0°	180°00'	0.00000	180°00'	360°
	05	0.00300	55	
	10	0.00600	50	
	15	0.00900	45	
	20	0.01200	40	
	25	0.01500	35	
	30	0.01800	30	
	35	0.02100	25	
	40	0.02400	20	
	45	0.02700	15	
	50	0.03000	10	
	55	0.03300	05	
1	181 00	0.03600	179 00	359
	05	0.03900	55	
	10	0.04200	50	
	15	0.04500	45	
	20	0.04800	40	
	25	0.05099	35	
	30	0.05399	30	
	35	0.05699	25	
	40	0.05999	20	
	45	0.06299	15	
	50	0.06599	10	
	55	0.06899	05	
2	182 00	0.07198	178 00	358
	05	0.07498	55	
	10	0.07798	50	
	15	0.08098	45	
	20	0.08398	40	
	25	0.08697	35	
	30	0.08997	30	
	35	0.09297	25	
	40	0.09596	20	
	45	0.09896	15	
	50	0.10196	10	
	55	0.10495	05	
3	183 00	0.10795	177 00	357
	05	0.11095	55	
	10	0.11394	50	
	15	0.11694	45	
	20	0.11993	40	
	25	0.12293	35	
	30	0.12592	30	
	35	0.12892	25	
	40	0.13191	20	
	45	0.13490	15	
	50	0.13790	10	
	55	0.14089	05	
4	184 00	0.14388	176 00	356

$M + \theta$		d''	$M + \theta$	
+	-		+	-
4°	184°00'	0.14388	176°00'	356°
	05	0.14688	55	
	10	0.14987	50	
	15	0.15286	45	
	20	0.15585	40	
	25	0.15884	35	
	30	0.16183	30	
	35	0.16482	25	
	40	0.16782	20	
	45	0.17080	15	
	50	0.17379	10	
	55	0.17678	05	
5	185 00	0.17977	175 00	355
	05	0.18276	55	
	10	0.18575	50	
	15	0.18874	45	
	20	0.19172	40	
	25	0.19471	35	
	30	0.19770	30	
	35	0.20068	25	
	40	0.20367	20	
	45	0.20665	15	
	50	0.20964	10	
	55	0.21262	05	
6	186 00	0.21560	174 00	354
	05	0.21859	55	
	10	0.22157	50	
	15	0.22455	45	
	20	0.22754	40	
	25	0.23052	35	
	30	0.23350	30	
	35	0.23648	25	
	40	0.23946	20	
	45	0.24244	15	
	50	0.24542	10	
	55	0.24840	05	
7	187 00	0.25137	173 00	353
	05	0.25435	55	
	10	0.25733	50	
	15	0.26030	45	
	20	0.26328	40	
	25	0.26626	35	
	30	0.26923	30	
	35	0.27220	25	
	40	0.27518	20	
	45	0.27815	15	
	50	0.28112	10	
	55	0.28409	05	
8	188 00	0.28707	172 00	352

$M+\theta$		d''	$M+\theta$	
+	-		+	-
8°	188°00'	0.28707	172°00'	352°
	05	0.29004	55	
	10	0.29301	50	
	15	0.29598	45	
	20	0.29894	40	
	25	0.30191	35	
	30	0.30488	20	
	35	0.30785	25	
	40	0.31081	20	
	45	0.31378	15	
	50	0.31674	10	
	55	0.31971	05	
9	189 00	0.32267	171 00	351
	05	0.32563	55	
	10	0.32859	50	
	15	0.33156	45	
	20	0.33452	40	
	25	0.33748	35	
	30	0.34044	30	
	35	0.34339	25	
	40	0.34635	20	
	45	0.34931	15	
	50	0.35227	10	
	55	0.35522	05	
10	190 00	0.35818	170 00	350
	05	0.36113	55	
	10	0.36408	50	
	15	0.36704	45	
	20	0.36999	40	
	25	0.37294	35	
	30	0.37589	30	
	35	0.37884	25	
	40	0.38179	20	
	45	0.38473	15	
	50	0.38768	10	
	55	0.39063	05	
11	191 00	0.39357	169 00	349
	05	0.39652	55	
	10	0.39946	50	
	15	0.40240	45	
	20	0.40535	40	
	25	0.40829	35	
	30	0.41123	30	
	35	0.41417	25	
	40	0.41710	20	
	45	0.42004	15	
	50	0.42298	10	
	55	0.42591	05	
12	192 00	0.42885	168 00	348

$M+\theta$		d''	$M+\theta$	
+	-		+	-
12°	192°00'	0.42885	168°00'	348°
	05	0.43178	55	
	10	0.43472	50	
	15	0.43765	45	
	20	0.44058	40	
	25	0.44351	35	
	30	0.44644	30	
	35	0.44937	25	
	40	0.45230	20	
	45	0.45522	15	
	50	0.45815	10	
	55	0.46107	05	
13	193 00	0.46400	167 00	347
	05	0.46692	55	
	10	0.46984	50	
	15	0.47276	45	
	20	0.47568	40	
	25	0.47860	35	
	30	0.48152	30	
	35	0.48443	25	
	40	0.48735	20	
	45	0.49026	15	
	50	0.49318	10	
	55	0.49609	05	
14	194 00	0.49900	166 00	346
	05	0.50191	55	
	10	0.50482	50	
	15	0.50773	45	
	20	0.51064	40	
	25	0.51354	35	
	30	0.51645	30	
	35	0.51935	25	
	40	0.52225	20	
	45	0.52515	15	
	50	0.52805	10	
	55	0.53095	05	
15	195 00	0.53385	165 00	345
	05	0.53675	55	
	10	0.53965	50	
	15	0.54254	45	
	20	0.54543	40	
	25	0.54833	35	
	30	0.55122	30	
	35	0.55411	25	
	40	0.55700	20	
	45	0.55989	15	
	50	0.56277	10	
	55	0.56566	05	
16	196 00	0.56854	164 00	344

$M+\theta$		d''	$M+\theta$	
+	-		+	-
16°	196°00'	0.56854	164°00'	344°
	05	0.57143	55	
	10	0.57431	50	
	15	0.57719	45	
	20	0.58007	40	
	25	0.58295	35	
	30	0.58582	30	
	35	0.58870	25	
	40	0.59157	20	
	45	0.59445	15	
	50	0.59732	10	
	55	0.60019	05	
17	197 00	0.60306	163 00	343
	05	0.60593	55	
	10	0.60880	50	
	15	0.61166	45	
	20	0.61453	40	
	25	0.61739	35	
	30	0.62025	30	
	35	0.62311	25	
	40	0.62597	20	
	45	0.62883	15	
	50	0.63168	10	
	55	0.63454	05	
18	198 00	0.63739	162 00	342
	05	0.64025	55	
	10	0.64310	50	
	15	0.64595	45	
	20	0.64880	40	
	25	0.65164	35	
	30	0.65449	30	
	35	0.65733	25	
	40	0.66018	20	
	45	0.66302	15	
	50	0.66586	10	
	55	0.66870	05	
19	199 00	0.67153	161 00	341
	05	0.67437	55	
	10	0.67720	50	
	15	0.68004	45	
	20	0.68287	40	
	25	0.68570	35	
	30	0.68853	30	
	35	0.69135	25	
	40	0.69418	20	
	45	0.69700	15	
	50	0.69983	10	
	55	0.70265	05	
20	200 00	0.70547	160 00	340

$M+\theta$		d''	$M+\theta$	
+	-		+	-
20°	200°00'	0.70547	160°00'	340°
	05	0.70829	55	
	10	0.71110	50	
	15	0.71392	45	
	20	0.71673	40	
	25	0.71955	35	
	30	0.72235	30	
	35	0.72516	25	
	40	0.72797	20	
	45	0.73078	15	
	50	0.73358	10	
	55	0.73639	05	
21	201 00	0.73919	159 00	339
	05	0.74199	55	
	10	0.74479	50	
	15	0.74758	45	
	20	0.75038	40	
	25	0.75317	35	
	30	0.75596	30	
	35	0.75875	25	
	40	0.76154	20	
	45	0.76433	15	
	50	0.76712	10	
	55	0.76990	05	
22	202 00	0.77268	158 00	338
	05	0.77546	55	
	10	0.77824	50	
	15	0.78102	45	
	20	0.78379	40	
	25	0.78657	35	
	30	0.78934	30	
	35	0.79211	25	
	40	0.79488	20	
	45	0.79765	15	
	50	0.80042	10	
	55	0.80318	05	
23	203 00	0.80594	157 00	337
	05	0.80870	55	
	10	0.81146	50	
	15	0.81422	45	
	20	0.81697	40	
	25	0.81973	35	
	30	0.82248	30	
	35	0.82523	25	
	40	0.82798	20	
	45	0.83073	15	
	50	0.83347	10	
	55	0.83621	05	
24	204 00	0.83896	156 00	336

$M+\theta$		d''	$M+\theta$	
+	-		+	-
24°	204°00'	0.83896	156°00'	336°
	05	0.84170	55	
	10	0.84443	50	
	15	0.84717	45	
	20	0.84990	40	
	25	0.85264	35	
	30	0.85537	30	
	35	0.85810	25	
	40	0.86082	20	
	45	0.86355	15	
	50	0.86627	10	
	55	0.86899	05	
25	205 00	0.87171	155 00	335
	05	0.87443	55	
	10	0.87715	50	
	15	0.87986	45	
	20	0.88257	40	
	25	0.88529	35	
	30	0.88799	30	
	35	0.89070	25	
	40	0.89341	20	
	45	0.89611	15	
	50	0.89881	10	
	55	0.90151	05	
26	206 00	0.90421	154 00	334
	05	0.90690	55	
	10	0.90960	50	
	15	0.91229	45	
	20	0.91498	40	
	25	0.91766	35	
	30	0.92035	30	
	35	0.92303	25	
	40	0.92572	20	
	45	0.92839	15	
	50	0.93107	10	
	55	0.93375	05	
27	207 00	0.93642	153 00	333
	05	0.93910	55	
	10	0.94176	50	
	15	0.94443	45	
	20	0.94710	40	
	25	0.94976	35	
	30	0.95243	30	
	35	0.95509	25	
	40	0.95774	20	
	45	0.96040	15	
	50	0.96305	10	
	55	0.96571	05	
28	208 00	0.96836	152 00	332

$M+\theta$		d''	$M+\theta$	
+	-		+	-
28°	208°00'	0.96836	152°00'	332°
	05	0.97100	55	
	10	0.97365	50	
	15	0.97629	45	
	20	0.97893	40	
	25	0.98157	35	
	30	0.98421	30	
	35	0.98685	25	
	40	0.98948	20	
	45	0.99211	15	
	50	0.99474	10	
	55	0.99737	05	
29	209 00	0.99999	151 00	331
	05	1.00261	55	
	10	1.00524	50	
	15	1.00785	45	
	20	1.01047	40	
	25	1.01308	35	
	30	1.01570	30	
	35	1.01831	25	
	40	1.02091	20	
	45	1.02352	15	
	50	1.02613	10	
	55	1.02873	05	
30	210 00	1.03132	150 00	330
	05	1.03392	55	
	10	1.03652	50	
	15	1.03911	45	
	20	1.04170	40	
	25	1.04429	35	
	30	1.04687	30	
	35	1.04946	25	
	40	1.05204	20	
	45	1.05462	15	
	50	1.05720	10	
	55	1.05977	05	
31	211 00	1.06234	149 00	329
	05	1.06491	55	
	10	1.06748	50	
	15	1.07005	45	
	20	1.07261	40	
	25	1.07517	35	
	30	1.07773	30	
	35	1.08029	25	
	40	1.08284	20	
	45	1.08540	15	
	50	1.08794	10	
	55	1.09049	05	
32	212 00	1.09304	148 00	328

$M+\theta$		d''	$M+\theta$	
+	-		+	-
32°	212°00'	1.09304	148°00'	328°
	05	1.09558	55	
	10	1.09812	50	
	15	1.10066	45	
	20	1.10320	40	
	25	1.10573	35	
	30	1.10826	30	
	35	1.11079	25	
	40	1.11332	20	
	45	1.11584	15	
	50	1.11836	10	
	55	1.12088	05	
33	213 00	1.12340	147 00	327
	05	1.12591	55	
	10	1.12843	50	
	15	1.13094	45	
	20	1.13344	40	
	25	1.13595	35	
	30	1.13845	30	
	35	1.14095	25	
	40	1.14345	20	
	45	1.14595	15	
	50	1.14844	10	
	55	1.15093	05	
34	214 00	1.15342	146 00	326
	05	1.15590	55	
	10	1.15839	50	
	15	1.16087	45	
	20	1.16335	40	
	25	1.16582	35	
	30	1.16830	30	
	35	1.17077	25	
	40	1.17324	20	
	45	1.17570	15	
	50	1.17817	10	
	55	1.18063	05	
35	215 00	1.18309	145 00	325
	05	1.18554	55	
	10	1.18800	50	
	15	1.19045	45	
	20	1.19290	40	
	25	1.19534	35	
	30	1.19779	30	
	35	1.20023	25	
	40	1.20267	20	
	45	1.20510	15	
	50	1.20754	10	
	55	1.20997	05	
36	216 00	1.21239	144 00	324

$M+\theta$		d''	$M+\theta$	
+	-		+	-
36°	216°00'	1.21239	144°00'	324°
	05	1.21482	55	
	10	1.21724	50	
	15	1.21967	45	
	20	1.22208	40	
	25	1.22450	35	
	30	1.22691	30	
	35	1.22932	25	
	40	1.23173	20	
	45	1.23414	15	
	50	1.23654	10	
	55	1.23894	05	
37	217 00	1.24133	143 00	323
	05	1.24373	55	
	10	1.24612	50	
	15	1.24851	45	
	20	1.25090	40	
	25	1.25328	35	
	30	1.25566	30	
	35	1.25804	25	
	40	1.26042	20	
	45	1.26279	15	
	50	1.26516	10	
	55	1.26753	05	
38	218 00	1.26989	142 00	322
	05	1.27226	55	
	10	1.27462	50	
	15	1.27697	45	
	20	1.27933	40	
	25	1.28168	35	
	30	1.28403	30	
	35	1.28638	25	
	40	1.28872	20	
	45	1.29106	15	
	50	1.29340	10	
	55	1.29573	05	
39	219 00	1.29807	141 00	321
	05	1.30040	55	
	10	1.30272	50	
	15	1.30505	45	
	20	1.30737	40	
	25	1.30969	35	
	30	1.31201	30	
	35	1.31432	25	
	40	1.31663	20	
	45	1.31894	15	
	50	1.32124	10	
	55	1.32355	05	
40	220 00	1.32585	140 00	320

$M+\theta$		d''	$M+\theta$	
+	-		+	-
40°	220°00'	1.32585	140°00'	320°
	05	1.32814	55	
	10	1.33044	50	
	15	1.33273	45	
	20	1.33502	40	
	25	1.33730	35	
	30	1.33958	30	
	35	1.34186	25	
	40	1.34414	20	
	45	1.34642	15	
	50	1.34869	10	
	55	1.35096	05	
41	221 00	1.35322	139 00	319
	05	1.35548	55	
	10	1.35774	50	
	15	1.36000	45	
	20	1.36225	40	
	25	1.36450	35	
	30	1.36675	30	
	35	1.36900	25	
	40	1.37124	20	
	45	1.37348	15	
	50	1.37572	10	
	55	1.37795	05	
42	222 00	1.38018	138 00	318
	05	1.38241	55	
	10	1.38463	50	
	15	1.38686	45	
	20	1.38908	40	
	25	1.39129	35	
	30	1.39351	30	
	35	1.39572	25	
	40	1.39792	20	
	45	1.40013	15	
	50	1.40233	10	
	55	1.40453	05	
43	223 00	1.40672	137 00	317
	05	1.40892	55	
	10	1.41111	50	
	15	1.41329	45	
	20	1.41548	40	
	25	1.41766	35	
	30	1.41984	30	
	35	1.42201	25	
	40	1.42418	20	
	45	1.42635	15	
	50	1.42852	10	
	55	1.43068	05	
44	224 00	1.43284	136 00	316

$M+\theta$		d''	$M+\theta$	
+	-		+	-
44°	224°00'	1.43284	136°00'	316°
	05	1.43499	55	
	10	1.43715	50	
	15	1.43930	45	
	20	1.44145	40	
	25	1.44359	35	
	30	1.44573	30	
	35	1.44787	25	
	40	1.45000	20	
	45	1.45214	15	
	50	1.45427	10	
	55	1.45639	05	
45	225 00	1.45851	135 00	315
	05	1.46063	55	
	10	1.46275	50	
	15	1.46486	45	
	20	1.46698	40	
	25	1.46908	35	
	30	1.47119	30	
	35	1.47329	25	
	40	1.47538	20	
	45	1.47748	15	
	50	1.47957	10	
	55	1.48166	05	
46	226 00	1.48375	134 00	314
	05	1.48583	55	
	10	1.48791	50	
	15	1.48998	45	
	20	1.49206	40	
	25	1.49413	35	
	30	1.49619	30	
	35	1.49826	25	
	40	1.50032	20	
	45	1.50237	15	
	50	1.50443	10	
	55	1.50648	05	
47	227 00	1.50853	133 00	313
	05	1.51057	55	
	10	1.51261	50	
	15	1.51465	45	
	20	1.51669	40	
	25	1.51872	35	
	30	1.52074	30	
	35	1.52277	25	
	40	1.52479	20	
	45	1.52681	15	
	50	1.52883	10	
	55	1.53084	05	
48	228 00	1.53285	132 00	312